

**MINISTRY OF HIGHER AND SECONDARY SPECIALIZED  
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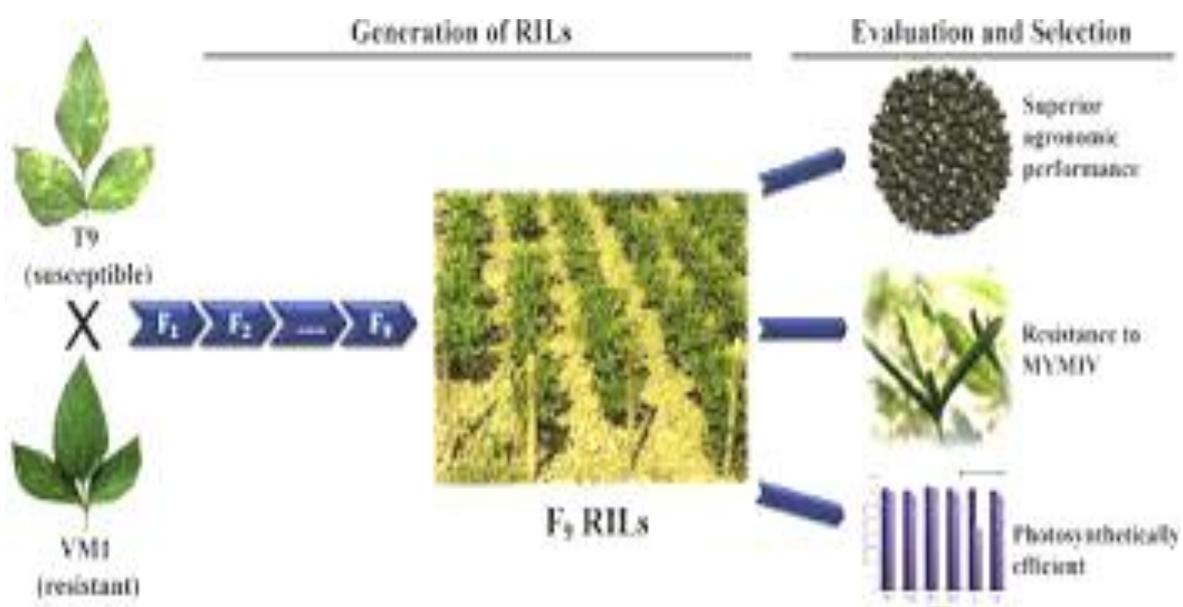
**TASHKENT STATE AGRARIAN UNIVERSITY**

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**5410400 - Selection and seed production of agricultural crops**

The work - book on practical and laboratory lessons on the subject

**Selection and seed breeding of grain and grain-  
bean crops**



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The manual “**Selection and seed breeding of grain and grain-bean crops**” is targeted to conduct practical classes for bachelor students of agricultural educational establishments

It also may be used by the masters, research assistants and teachers

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## **Annotation**

This manual has been intended for the students being educated on the direction of plant breeding and seed production of agricultural crops at the higher establishments.

Teaching manual has been prepared on the base of working program of the subject of plant breeding and seed production of grain and grain-bean crops, department of genetics, plant breeding and seed production of agricultural crops, the TSAU. Taking into account of expecting changes in the working program relatively to size of themes the supplementary trainings have been added.

The teaching manual focusing on the conducting of practical and laboratory trainings on the subject of plant breeding and seed production of grain and grain-bean crops occupies the following questions: importance of crop diversities, the aim of the trainings, necessary aids for leading trainings, conducting order of trainings, analysis and analysis outcomes, the questions for every theme of trainings, as well as the minimum glossaries for Russian, English and German versions of the manual.

The themes in the manual embrace the most of knowledge to be studied on the subject of plant breeding and seed production of grain crops, they are necessary for young scientists, breeders, seed producers and farmers.

## **FOREWORD**

Our republic had mapped out the attaining of grain independence as one of the prestigious challenges from the time of achieving of its independence and the great works have been implemented in this field.

Various crops of grain and grain-bean crops are grown by our nation. The demands of neighboring and worldwide countries are being also increased. Our government pays much attention to this field in order to meet the requirements in products of these crops. Today, the high qualified and world out looking specialists are needed to manage the works of plant breeding and seed production on the base of novel, up to date technologies. Their potentials in deeply mastering of foreign languages will give them opportunity to be competitive to world specialists in international experience and knowledge. Including the extension of learning the principle sciences in English would be a great factor for youth in the strengthening of relations in science, economy and social fields with overseas specialists in the nearest future. Such trend of development has been specially emphasized by the decree “On measurements of further improvement of learning foreign languages” of the President of the republic of Uzbekistan on the number of PK-1875, dated December 10, 2012.

Mentioned below, the teaching manual of “Selection and seed breeding of grain and grain – bean crops” in English, German, Russian and Uzbek languages is the first work – book, designated for the teachers to conduct practical and laboratory trainings for students who are taught in these groups. The manual corresponding to the working program on science is planned for 10 hours of practical and 46 hours of laboratory trainings and was compiled by the specialists, who teach in general the lessons of the direction of grain and grain – bean crops.

The manual has been provided with additional 16 hours trainings taking into account of expected changes in the teaching and working programs of the subject. The students will get practical experiences out of work-book on the analysis of initial breeding materials, system of breeding and seed production, definition of seed quality of grain and grain – bean crops, traits of farm and variety, seed

certification, approbation of seed plantations and seed storage procedures, which have been learnt in the lecture courses.

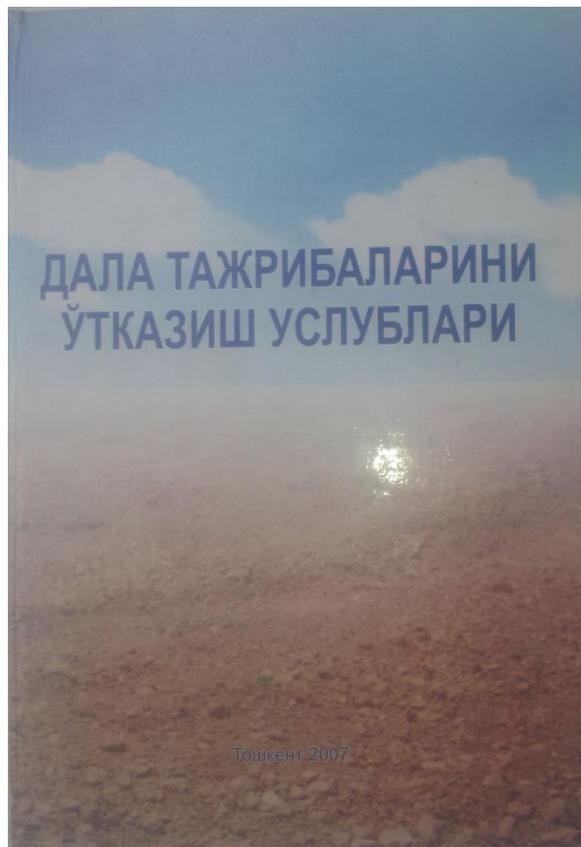
There are tasks and questions at the end of every lesson for the profound firming of mastered knowledge from the trainings by the bachelors. Beside, the minimum dictionaries are also given in English, German and Russian copies.

1-practical training.

**Study of field and industrial experiments production on the base of “The methods for field experimentation procedures”.**

Field and industrial experiments are attributed to the main methods for decision of various problems not only in the cropping but in breeding and seed production of agricultural crops also.

Field and industry experiments in the breeding and seed production, the researches in this process, observation and conducting of other measures are implemented by the guide of the methods, rules and requirements of the manual presented below (photo 1.).



**Photo 1. Manual for scientific research experiments' production.**

**The aim of the training.** To teach the students about the conducting of field and industrial experiments on the base of “The methods for field experimentation procedures” is the aim of this training.

**Teaching items for the training.** Note books of students on the lecture and practical trainings, teaching manual for conduction practical and laboratory trainings on the subject of grain and grain-bean crops, experimental journal, maps of experimental fields, device of ekker with compass, clothesline of 100 m, 4 planks of 2 m, dozens of wood pegs of 30 cm, hammer, field note books, pens, pencils, rulers and erasers.

**1-work. Production of field experiment.** The students are bounded to build skills on the goals of the experiment, methodic requirements and kinds of the factors before production of field experiment.

In this point of view, the students get acquainted with above presented manual and copy the necessary concepts in their copy books.

Including:

**Experiment's goal** is consisted of comparatively, scientific-practical and economic assessments on the new method, new varieties and hybrids under investigation by employing the results of researches in the various natural and farm conditions to introduce into production.

Scientific value and fitness to introduction the results of every field experiment really depend upon execution of definite methodic requirements on the placement and condition of experiment procedures.

Namely, **choosing area to the experiment.** For this, it requires to get acquainted with the soil map of area of scientific establishment or soil map of farm, which is being targeted to conduct the experiment. Having understandable imagination about the typicality (similarity) of the soil of chosen area to the certain zone gives opportunity to suggest the introduction of the experimental outcomes into other zones possessing identical soil types.

The students also must learn **soil history of chosen area** for experiment. Because, cultivating of one, the same crop on the chosen plot for the last three years is one of the methodic requirements. Naturally, every crop at the time of its vegetation is cultivated with specific for itself agro-practice and consequently the soil melioration and agrochemical status acquire a constant state. The experimental

area should correspond to requirements about **constancy in the significance of space and period**. For this, the borders' placement of the experimental area in regard to light sides are marked by means of certain dead point. These data are fixed in the area's chart map on the page of experimental journal (chart 1.). The students draw in their copy books a chart similar to model chart in the journal of the experiment. Correspondence of space placement of experimental area in regard of its place and during the years of succession to the drawn map is strictly requested. It is required to attain experimental area into a defined slope (plain) in the conditions of irrigation depending on the width of the area. The plants studied in the experiment along the plots, variants and layers should be grown in the same watering conditions. At the choice of forms, varieties, hybrids or mutants of the studied plants, their peculiarity on the **typicality of morphologic and farm traits are considered**. It gives a great opportunity to

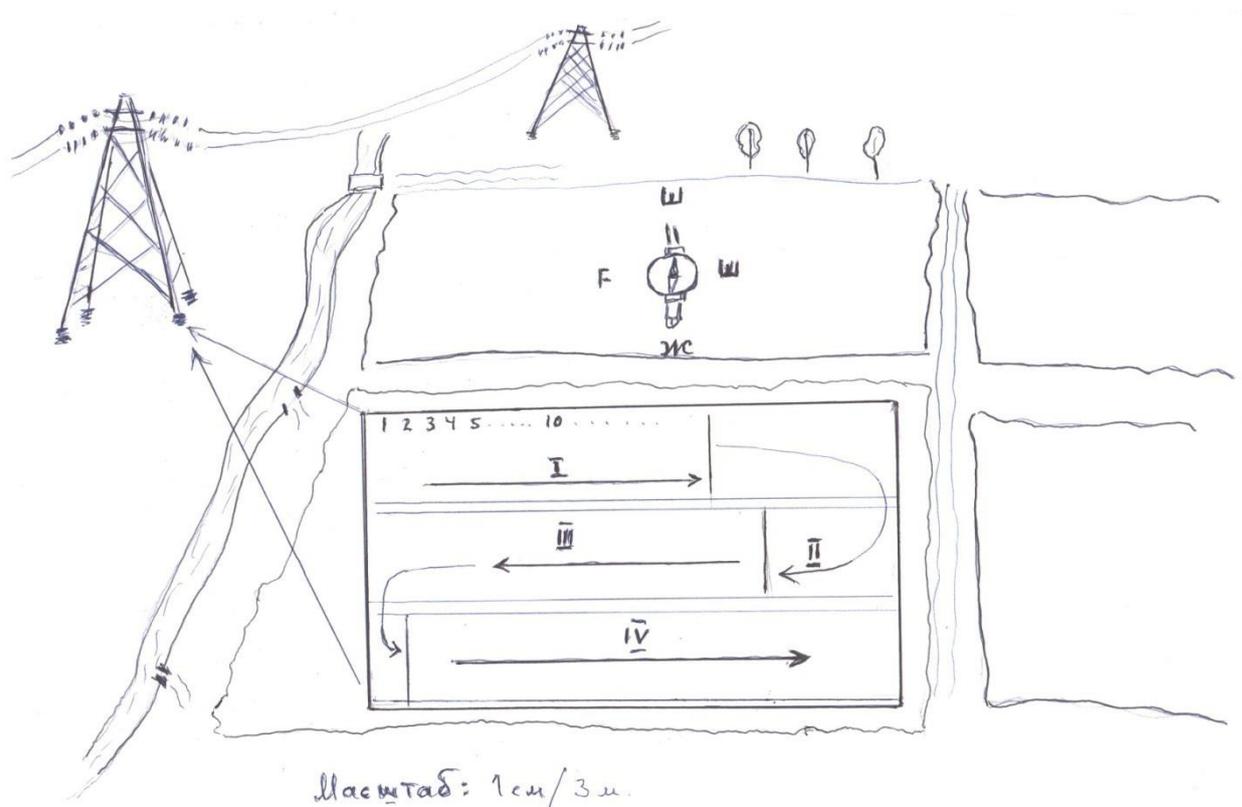


Chart 1. **Exemplary map of the experimental area.**

achieving of precision in the experiment. The studied factors require to follow the rule of single factor in experiment variants. That is, every experimental

variant on the replications is grown in the condition of one factor (plant stand thickness, rate of fertilizer, inter row distance and so on). It is necessary to provide fulfilling of planned works as phenological observations, record of yield and harvesting for all variants of the experiment in the course of one day. In other way, takes place a disorder of methodic-organizational requests at the time of comparison between plants of replications and variants. In the consequences of the last case, the divergence between plants of different variants is decreased, uncertainty of results of experiment is increasing. It is necessary **to choice registered plants** in one of the same number from all variants of the experiment and to check marking them with labels with corresponding numbers. Recording the data in the field note book at the time of phenological observations collected only from registered plants.

The students discuss with each other today's problems in breeding and seed production of grain crops. They, individually or in small groups (3-4 people each of them) choose one of the problems to study and solve in the experiment. The topic of the experiment, experimental variants and factors are chosen. They form drawn shape of experiment area in their note - books. To this case they use the exemplary map scheme of experimental area in the journal of experiment as an example (chart 1.). It will be purposeful if to plan the part of university's area belong to the chair for their drawn map of experimental area. Space – scheme of map is divided into content parts on the base of methodic manual (Dosphephov B.A. and others 1984; 1985).

It is preferable to pose the map on the initial pages of the field note book. The map facilitates to find locality of the replications of the variants or even shows sole plot, in what layer or in what place of layer is it, posed at the multi layer experiment.

**Task 1.** Discuss correspondence of composed map to above listed requests.

### **2-work. Implementation of field and industrial experiments.**

For students, before starting of conducting the field experiment, it is necessary to get acquainted with methodic – organizational works in the researches

of grain crops, conducted by the scientists with help of corresponding methodic manuals. For example, they are acquainted with scientific – research works of scientists of the chair of plant growing, carried out in the experimental area of the university to study 50 varieties of wheat (photo 2). Possessing sufficient knowledge and skills, the students with necessary working instrument go out on experimental area of the chair to production and implement of field experiment.

By means of schematic map, the students are able to pick out needed part of land for experiment from area for themselves or for groups. Using working instruments they mark out the borders of the experimental area relatively to dead point. The order of the place of defend paths, layers, replications and plots is done on the base of map. For example, scientific – research work on the theme of “Study of productivity of wheat varieties registered in the state register” is implemented as the example in the experiment.

The experiment consists of 5 variants, rate of seed planting makes of 4.5 mln., and has been planned to sow by help of special grain seeder. Width of plot makes of 3.6 m, length of 13.9 m., the area of the every plot accounts for 50 m<sup>2</sup>. Monitoring of experimental variants has been planned in 3 replications. To place experimental variants on one layer it requires below accounted area.



Photo 2. **Experimental area of the chair of Plant Growing, 2017.**

There are 5 variants in the experiment and 3 replications:  $5 \times 3 = 15$  so it requires select 15 plots.

Total width of area under plots consists of:  $15 \times 3.6 = 54.0$  m. Together with two side defend paths (2.5 m + 2.5 m) makes of 59.0 m.

Defending paths of 10 m should be left from above and below sides of the recording area for mechanic cultivator. And a gap of 2 meters is also left for irrigation and drainage ditches. And a path of 1 m for observing path. So, a total length of experimental area consists of:  $13.9 + 10 + 2 + 1 = 26.9$  m.

In general, targeted experiment for chosen topic requires to select 0.86 (59.0 + 26.9) hectare of land. At this, the plants of the experimental variants occupy 0.70 hectare (54.0 + 13.9).

By means of clothesline, planks and pegs the borders of plots and layer are marked. With ekker and compass setting up temporary – constant sides of light has been done comparatively to the certain dead point of one constant neighboring object to the experimental area (chart 1.).

At the distribution of experimental variants along the layer, the students use standard order which is widely applied in the experiments associated with breeding, seed production and state trials.

After planting, layer, replication and plot array are marked by the numbered pegs. Pegs with their numbers and orders are copied on to appropriate columns of the chart in field notebook in time. The data containing charts of field notebook are performed corresponding to the order of the developing phases of the wheat. They are: date of sowing, germination, emerging of the third leaf, kusheniya, tubering, kolosheniye, milk ripening, wax or full ripening, date of crop harvesting. Initiation and completing of registration the records of phenological observations start at the 5-10% and 50-70% of plants' readiness.

Agro-practice measures for agrotechnies of plants of the experiment are carried out similarly as accepted methods in the experimental area of the university. Phenological observations are implemented on the plants bearing 100 numbered labels selected from the registered area of every variant.

On the columns containing implementation dates of phenological observations charts are recorded the following dates: the 1<sup>st</sup> of March, for recording of the plant height and number of leaves; 1<sup>st</sup> of April, for height of plants, number and length of stalk nodes; 1<sup>st</sup> of May, for height of plants, number of nodes, length of nodes and spikes; 1<sup>st</sup> of June, for spike length, number of spikelets of in the spike, number of grains in the spike.

Height of main stalks of plants, the number of nodes on the stalks of the plants, number of leaves, number of grains in the spikes and tillering stage on the experiment variants are determined on the base of data, gathered from phenological observations.

To define the grain productivity in the experimental variants, the plots of variants are thoroughly inspected several days prior to the starting of the harvest. The state of plants is monitored through separating the borders of plots. Recording of the crop is filled in the plants of the plots with the state of meeting the requirements on the damage and plant stand density.

Various proportions and equations are used at the establishing of the productivity depending upon spring or winter wheat and simple or complicated with the purpose of attaining to the maximum precision.

We use the most suitable proportion to define the productivity in the experiment on the topic which was selected by the students. At this, the productivity is defined comparatively to the grain productivity taken from each three places of the plots with the area of 1m<sup>2</sup>. That is: on the sample of grain yield taken from plots: on the first sample 650 g., on the second sample 640 g., on the third sample 660 g. Average yield on the sample consists of 650 g.

The result is: 1 m<sup>2</sup> – 650 g.

10 000 m<sup>2</sup> – 6 500 000 g. = 6 500 kg or 6.5 tons per hectare.

Productivity of all variants on the varieties in the field experiment and also on the comparison of their productivity with control variety is shown by using below presented table (table 1.).

**Table 1. Productivity of the variants on the replications and on the comparison with control.**

Variants	Productivity on the replications, ton\ha.			Average productivity, ton\ha	Difference from control, ton\ha.
	I	II	III		
1 (control)	60,3	58,5	57,5	58,8	-
2	56,5	58,6	55,4	56,8	-2,0
3	<b>65,0</b>	67,2	63,4	65,2	+6,4
4	58,2	59,3	57,6	58,4	-0,4
5	55,2	54,3	53,5	54,3	-4,5

The students, on the base of the data of table taken from experiment can do definite summary account about productivity of 5 wheat varieties introduced into state register. That is, the varieties studied in the field experiment have differed in the various significances with each other on their productivity. The highest productivity on the comparison with control (+0.6 ton\ha) attributes variant 3. The very lower one (-0.5 ton\ha) on the productivity variant 5. The same as the control on its potentiality in the productivity was variant 4.

Organizing an fulfilment of the industrial experiment, methods are more simple comparing to conductivity of production experiments. Only one variety had shown the most highest results in the field experiments compared to control in the industrial experiments associated with breeding and seed production of crops. The variety grown in the farm fills the task of control. At the choice of the area for experiment, attention is paid to peculiarity of soil's state and melioration on the farm, district and regional level. Because, the introduction of the results of experiment is proposed on the conditions of above listed territories. The size of the experimental area depends upon availability of the seed sufficiency and economical questions and makes 2 to 4 hectares.

Mostly, suitability of the variety to technical means, precocity, productivity and quality of products are monitored in the industrial experiment and the result compares with the indexes of growing variety on that farm.

**Task 2.** Watch and discuss the procedures of experimental works on other topics of field experiments (appendix-11).

**The questions on the considered topic:**

1. What kind of significance do the methodic manuals compare?
2. For what purposes are the field experiment created?
3. What methodic difference is there between field and industrial experiments?

**Glossary:** Production of field and industrial experiments - постановка полевых и производственных опытов – дала ва ишлаб чиқариш тажрибаларини қўйиш; teaching manual - учебное руководство – ўқув қўлланма; constancy in the space and temporary significance - постоянство в пространственном и временном значении – фазо ва вақтда доимийлик аҳамияти; experimental precision - точность опыта – тажриба аниқлиги.

2-practical training.

**Putting into practice phonological observations and works of biometric calculation on the base of “The methods of state variety trial of agricultural crops”.**

State trial is carried out in two methods: competition and extended – competition (industrial).

The main goal of state variety trial is to comprehensively, truthfully and precisely assess and either separate the varieties the more suitable to recommend for introducing into production (photos 3, 4.).



Photos 3, 4. **Exemplary appearances of state variety trial plots of grain crops.**

The varieties of grain and grain-bean crops are evaluated on the following indexes:

Fitness to intensive technology of growing, grain productivity, susceptibility to diseases and pests, tolerance to cold (winter crops), duration of vegetation, resistance to lodging and shedding, plant height, bushiness, correlation of grain and straw, mass of 1000 grains, product quality and others. For this, phonological observations and biometric calculations are carried out.

**The aim of the training.** To teach the students the conducting of phonological observations and biometric calculations on the base of “The methods of state variety trial of agricultural crops” (appendix 1) is the aim of this training.

**Necessary teaching items.** The note books on the lecture and practical classes, literature on the methods of biometric calculations and method of state

variety trial, teaching manuals on carrying out practical and laboratory trainings, blank table examples of register of phonological observations, pencils, rulers and erasers.

**1<sup>st</sup> work.** The students get acquainted with phonological observations putting into practice state variety trials of grain crops from the method of state variety trial and draw in their note books the tables (appendix 1) for filling in at the time of phonological observations.

**In the phonological observations of winter wheat, ray, triticale, barley and oats are to be marked:** germination (beginning and full), beginning of tillering, ear formation or tasseling (beginning and full), full blooming of ray; maturity of grain; milk and wax (farm) and full (if at the full of maturity to be done harvest). Beside them, completion dates of vegetation in the autumn and beginning of newly sprouting of leaves in the spring are marked.

**In the phonological observations of spring wheat, triticale, barley, oats and millet are to be marked:** germination (beginning and full), beginning of tillering, ear formation or tasseling (beginning and full), milk maturity of grain (but millet), wax (farm) and full (if the harvest is done at the full of maturity).

At the carrying out of some phonological observations it is needed to pay attention the following features.

Observation of germination (beginning and completion) grain crops is similar with phonological observation of field experiment which has been considered in the 1<sup>st</sup> practical training.

In the case of deficiency of moisture and establishing of clouds or in other cases can be seen a few germination. If seedlings emerge after the precipitation, observation is conducted again.

Dates of beginning of tillering are marked at the time of first leaf emerging from sheath of side shoot on the 10-15% of registered plants.

The date of setting of air temperature at +5°C is received as the completion days of vegetation of winter wheat, triticale and winter barley, for winter rye at +4°C.

The data of closely located hydro - weather station are used for identifying ceasing of vegetation.

The date, when the light green color appears on the base of the top leaf is received as the beginning of renewed vegetation. Ear formation and tassiling are marked for rye, wheat and barley, when approximately the half of spikes appears from sheath of top leaf. For millet and oats, the date, when the top part of tassel puts out from the sheath of top leaf. The stages of this trait are marked on the stalks of above located layer.

For beginning and full blooming are marked also the date of the field experiments which have been considered in the first training. That is, in the percents of 10-15 and 75. The date when was illustrated the anthers out of most spikelet is marked for full blooming of rye.

The date when the grain on the middle part of ear attains its length is received as the day of milk maturity, on the oats the top part of tassel (photo 5.) but still has

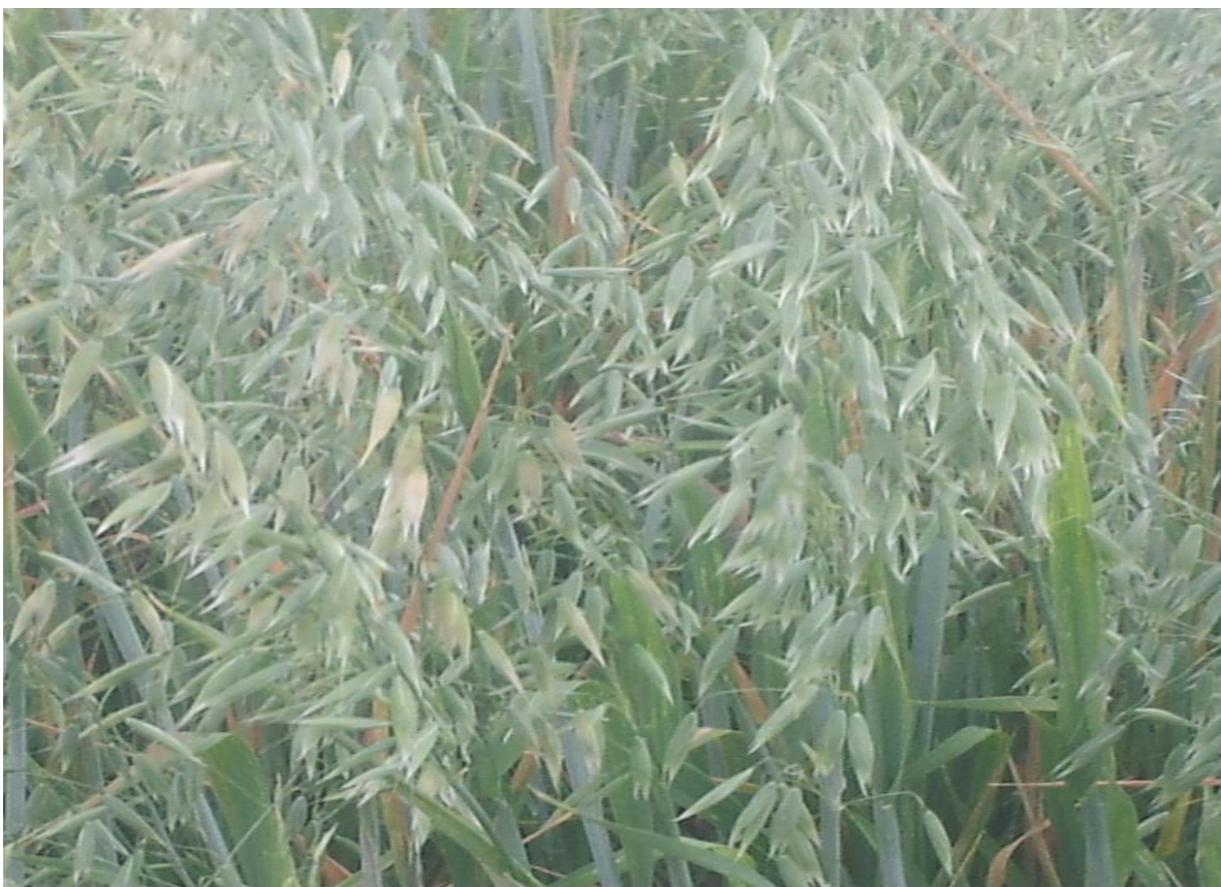


Photo 5. **Appearance of oats at the time of wax maturity phase.**

green color with accumulating liquid composition. If the grain is pressed by the fingers its peel bursts and the composition rushes out. On the rye, the composition looks like to the boiled albumen in the yellow color, on the wheat and triticale the time when the liquid acquires the appearance of liquid milk. The plants are still green, getting of yellowness is watched only on the lower leaves of the stalk.

Wax maturity (farm or harvest) is characterized by the below listed traits: grain has the yellow color, it is hard but if it is pressed by the nail, it is cut easily; on the rye, barley and oats the grain breaks at the bending, the tassel of the oats has acquired yellow color (photo 6.).

The inhibition of wax maturity and becoming yellow color by plants can be expected with the setting in the worst conditions of weather. In the result of that situation, the lightness of the dried grains is increased.



Photo 6. **The state of oats' tassel at wax maturity phase.**

Full maturity of grain crops is marked in the coming in the moment of hardening of grains, they are cracked at the pressing them by the knife. The grains must spill at the shaking of spike or tassel. If the harvest is started since the full maturity has set in, the date of that day is considered as the day of full maturity.

For the durability of vegetation period, subtracting the amount of day from full germination to day of wax (farm, harvesting) maturity.

**1<sup>st</sup> task.** The students by means of corresponding literature and “Methods of state variety trial of agricultural crops” must get acquainted, how to fill the plant density of stand, phonological observation on the assessment of cold resistance, selection and analysis probe bundle, assessment of grain crop quality, moisture of grains, mass of 1000 grains, nature of grain and seed quality and prepare the diligent summary.

**2<sup>nd</sup> task.** The students analyze the tables put on the pages of enclosure to apply in the phonological observations to draw them into their note books.

**2<sup>nd</sup> work.** The students study the meaning of the method of biometric dimension or calculation.

At the time of variety testing, their data date gathered together through phonological observations are subjected to biometric calculation (statistic analysis) for substantially assessment. This process fills the task of the achieving the precision of experiment, examining of the authentic grade of generalization of the result and stating the right conclusion.

The methods of mathematic statistics have various opportunities and fields of their application. Since the using of unfit method to itself results in mistaken estimating, the outcome is generalized incorrectly and is stated by the groundless conclusions.

Biometric dimension or calculation acquaints the biologists, researchers with the methods of dimension and calculation and assists them at the selection of suitable method of statistical analysis to the experiment is being studied. Before the beginning of statistical analysis, it is necessary to identify the task to be solved

via mathematic way. These tasks in the method of biometric dimension and calculations are:

1. Calculation of arithmetic mean and its error, coefficient of variation and others characterizing the number of figure lines, brought together from phonological observations.

2. Determination of dependence (correlation) in two and more than two attendant numbers between traits.

3. Determination of dependence shape (regression) of one trait from another, in two figures standing side by side.

4. Examining hypothesis about differences (or likeness) between traits or variances.

**3<sup>rd</sup> task.** The students are proposed to master more dipper the method of biometric measurements or calculations by the help of corresponding literature and state adequate summary.

#### **The questions on the studied training:**

1. What phonological observations and biometric calculations are needed for?

2. What is the goals of state variety trial content?

3. How the studying varieties in the state variety trials are estimated?

#### **Glossary:**

state variety trial- государственная сортоиспытания- давлат нав синови;  
fitness to intensive technology-пригодность к интенсивной технологии-  
интенсив технологияга мослиги; susceptibility to diseases- восприимчивость к  
болезням- касалликларга мойиллиги; lodging and shedding- полегание и  
опадение- ётиб қолиш ва тўкилиши; bushiness- кустистость- шоҳланиш;  
grain and straw- зерно и сено- дон ва сомон; tillering- кущение- тупланиш;  
ear formation or tasseling- колошение или выметывание- бошоқлаш ёки рўваклаш;  
milk and wax maturity- молочная и восковая спелость- сут ва мум пишиши;  
completion- завершение- тугалланиши; establishing of clouds- образование  
корки- кесак пойдо бўлиши, қатқолоқ; sheath of side shoot- влагалище

боковой ветви- ён шоҳ қўлтиғи; ceasing- прекращение- тугаши; spike- колос- бошок; stalks of above located layer- стебли верхнего яруса- юкориғи ярус поялари; spikelet- колоски- бошоқчалар; liquid composition- жидкая масса или содержимое- суюқ модда ёки борлиғи; the composition rushes out- содержимое просачивается наружу- борлиғи ташқарига сизиб чиқади; when the liquid acquires the appearance- тогда, когда жидкость приобретает вид- суюқлик шаклга кирганда; the grain breaks at the bending- зерно ломается при изгибе- дон эгилганда синади; by the setting in the worst conditions of weather- с ухудшением погодных условий- ёмон хаво шароити келганда; the lightness of the dried grains- легкость просушенных зерен- қуритилган донлар енгиллиги; hardening of grains- затвердивание зерна- донларнинг қаттиқланиши; density of stand- густота стояния- ўсимлик қалинлиги; probe bundle- пробный сноп- намуна боғлами; the diligent summary- соответствующий конспект- арзугулик конспект; dimension or calculation – измерение или расчёты- ўлчаш ва ҳисоблаш; substantially assessment- обоснованная оценка- асосланиб баҳоланиш; achieving to the precision of experiment- достижение точности опыта- тажриба аниқлиғига еришиш; authentic grade of generalization – степени достоверности обобщения- хотиманинг ишончлилиқ даражаси; incorrectly- неправильно- нотўғри; is stated by the groundless conclusions – излагается с необоснованными выводами- асоссиз хулосалар келтирилиши; since the using – так как использование- чунки ишлатилиши; likeness- сходство- ўхшашлиги; variance- изменение или отклонение – ўзгариш ва фарқланиш;

3-practical training.

### **Statistical analysis calculations of field experiments on the base of B.A.Dospekhov method**

On the opinion of B.A.Dospekhov (1984), field experiment is the method of sampled research which is being advanced scientifically by the observations of plants, soils and external conditions and also by the lab analysis. The aim of sampling is more exactly characterizing of the whole combination of objects in the statistics specified as general combination by the indexes of small sample (middle sample).

Researcher in the consequences of his observations gathers data with figures on the studying signs from each member of sample combination. Analysis of variability (variation) of signs makes the foundation of a statistical treatment.

**The aim of the training.** To teach the students analysis of statistical treatment of observation of data of field experiment on the base of method of B.A.Dospekhov.

**Necessary teaching items.** Lecture books, literature referred to the statistical methods of B.A.Dospekhov, teaching manual on the practical and laboratory classes of the subject of breeding and seed production of grain and grain-bean crops, note books on the practical classes, pencils, rulers and erases.

**1<sup>st</sup> work.** The students by using the literature of D.A.Dospekhov implement the treating of data on the height of plants brought gathered from observing variants in the field experiment (look at the materials of 2-training).

The primary statistical treatment of data belongs to study of distribution indexes of frequency values of sign variability (variation) and to present its results in the form of graphical presentation, they master the procedures of methodic work from the example given in literature.

That is, there was taken following data on the observation (measurements) of 100 plants' height (cm):

90	109	99	100	115	68	70	72	73	70
76	82	80	68	69	74	72	69	80	79
79	84	84	108	83	84	99	98	102	101
45	59	60	63	78	87	94	91	88	90
72	68	80	81	84	77	79	81	84	76
70	67	100	103	69	72	74	66	67	72
79	78	83	92	93	81	82	86	89	93
77	76	88	89	94	82	80	81	77	80
92	91	76	79	73	84	79	84	79	84
89	85	93	90	79	83	91	87	89	94

Correspondingly to the method, such kind of forms of variability of 100 plants' height doesn't fit to characteristics of the height of plants under study. That is why, dimensions of the signs of indexes  $X_1, X_2, \dots, X_n$  are grouped to  $k$  in the intervals  $i$ .

Approximately, the quantity of groups (classes) is equal to the square root of sample quantity which, however, should not be less than 5 and more than 20.

The dimension of the class interval is determined by following ratio:

$$i = \frac{X_{\max} - X_{\min}}{\text{number of classes}} = \frac{R}{k}$$

In the example of used literature, there were taken 7 classes. Because, in the result of that the value of the interval was equal to the whole number:

$$i = \frac{R}{k} = \frac{115 - 45}{7} = \frac{70}{7} = 10 \text{ cm.}$$

At the choosing of the boundary of classes it should be paid the attention to that, the upper and lower boundaries must differ from each other on one number. In that example it was 1 cm. The presented data has been grouped in the following order:

1. Width of variability in the result of measurements, that is the differences of the very small and large value series of the measurements is defined:

$$R = X_{\max} - X_{\min}$$

2.The number of classes  $k$  and value of grouping are determined :  $i= R\backslash k$ .

3.Tabulated the frequency distribution of the groups in the result of measurements (table 2). the first column entries (group intervals) are intervals, the second column entries are amount of results included in one width of the interval, that is frequency  $f$  is mentioned.

**Table 2. Frequency distribution in data of measurements of 100 plants' height according to groups.**

Groups (grouping interval)	Frequency	Average value of groups (grouped variants)
45-54	1	50
55-64	3	60
65-74	21	70
75-84	40	80
85-94	23	90
95-104	9	100
105-115	3	110

4.The amount of data corresponding to every interval is calculated and entered into the corresponding column of table.

Even numbers series mentioned in the table makes empiric distribution of frequency on  $f$  over values  $X_i$ . The size of frequencies is equal to size of totality  $\sum f = n = 100$ .

It is noted that the state of the distributing frequency is more visual, if it is represented in the form of data of graphic figure.

This way is more convenient and it can occupy itself the important aspects of observation and principles of distribution. Graphical imagination of variability series (variation) is called curve distribution or variation curve.

For building curve distribution, the values of group interval are placed on the horizontal line (line of absis) and the amount of those values or frequencies of those values  $f$  on the vertical line (line ordinat). At the choosing of scales of these two directions, it is needed to pay attention to the shape of graphic that it would be in more convenient and easy comprehensive form. Graphic with columns in the

shape of steps is called histogram. It has height which is proportional with frequency and width equal to interval of classes. Sooner from it may be taken a curve distribution and polygon by the way of connecting the directions of average values (photo 7.) of the groups.

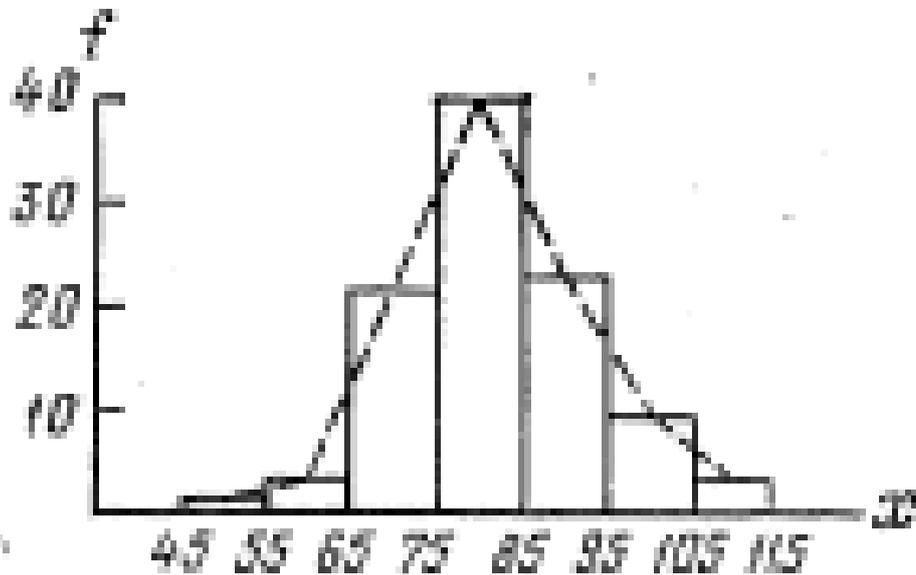


Photo 7. **Gistogram for sign of 100 sample plants' height in the sample.**

At the building of graphic it is purposeful to follow to the rules of manual “golden crosses” to select ratio between scales of lines absis and ordinat. That is, as under- lined in it, the ratio of graphic height to its width should be 5 : 8.

View of picture produces some of general principles characterizing distribution of height of 100 sample plants: groups of accidental values around center and diminishing their frequency with movement to right or left.

**The average arithmetics** of statistical characteristics  $\bar{x}$  is found in the surroundings of center of distribution of frequency in the tendency of grouping values of the character (trait) and is called the central tendency.

**Standard deviation**  $-s$ , is the measure of dispersion values of individual observation around the average values of character. As the average arithmetics, it is one of the characteristics of empiric distribution. Square of standard deviation-  $s^2$  is called **dispersion** or mean square. Standard deviation and dispersion are considered as widely used and stable characteristics in the distribution of variable

(variation) traits. That is, with the increasing of standard deviation or dispersion, more wide dispersion of average individual value of trait is observed in average surroundings. At this, the widening of distribution in average surroundings confirms the occurrence of increase of variability of investigated trait and contrarily, decreasing shows- insignificance of variations.

**1<sup>st</sup> task.** The students in small groups (with 3, 4 people) by the help of above analyzed example make statistical analysis of data over plant height and other characteristics of experimental variants, gathered by them from field experiments.

**The questions from studied theme:**

1. What distinction is there between whole and sample combination?
2. Why is the variability of characteristics happened?
3. Why is the variation analyze considered as the first in the statistical analysis?
4. What is the importance of graphic variability?

**Glossary:** Whole combination- всей совокупности- бутун жамланма; totality- генеральная совокупность- умум жамланма; values of frequencies- частота значений- катталиклар частотаси (учраш тасодифи); average sample- средняя выборка- ўртача танлам; figure data- цифровые данные- сонли маълумотлар; statistical data treatment- статистические обработки данных- маълумотларнинг статистик таҳлили; sample size- объем выборки- танлам миқдори; curve distribution- кривая распределения- тарқалиш эгрилиги; dispersion of individual values- рассеяния индивидуальных значений- ёлғиз катталикларнинг сочилиши.

4- practical training.

### **Study of characteristics of grain crops' varieties.**

From grain crops: wheat, triticale, rye, barley, oats, corn, sorghum and rice make a special group in agricultural crops.

As noted in the literature, the variety is a major means in the process of crop growing technology and strengthening food provision and national industry.

**The aim of the training.** The students study in the training about kinds of varieties and determination of the varieties, the requirements of the industry to the varieties and the characteristics of grain crops' varieties which are being grown.

**Necessary teaching subjects to conduct the training.** Lecture materials, teaching manual of the practical and lab classes on the science of selection and seed production of grain crops, state register for agricultural crops, note books for practical trainings, pencils, rulers and erasers.

**1<sup>st</sup> work.** The students study the variety kinds and concepts about the varieties, requirements to the varieties by the help of literature, articles of journals inserted in the internet, the materials of the conferences and to prepare exemplary summary material in the note book of practical training.

The varieties of crop, depending on origin and the method of the creation are: local varieties, breeding varieties, population varieties, strain varieties, hybrid varieties and clone varieties.

Determination given to the variety in the literature is as the following: **the variety is a group of cultured plants, developed through breeding, which has identical, stable inheriting morphology, farm traits and attributes.** In the law of "About plant breeding" which is the main law of the breeding it has been remarked that "Variety" is a group of plants, which is determined according to traits distinct from others, stable in transferring to heredity, certain genotype and combination of genotypes and differs one or several traits from the group of other plants involving in a definite botanic taxonomy.

The varieties, created by the scientific –research and other establishments are requested by the side of industry below presented requirements:

- to give annually highest and stable crop;
- to be resistant to inadequate conditions of growing, diseases and pests;
- to adapted to technical means of care, growing and harvest of crop;
- the highest quality of product;
- adaptability to external conditions;

the first of all, the potential of the plants in intensive technology and new agro practice conditions should be directed to increase the productivity.

According to the above presented requirements, the traits and the attributes of the varieties are subdivided into several groups:

1. At the remarking of the highest yield: yield per one plant, number of fruiting branches or fruiting stalks, number of grains per spike (cob and panicle), weight and others.

**1<sup>st</sup> task.** The students, by the means of corresponding literature, review distinct determinations of local variety, breeding variety, population variety, strain variety, hybrid variety and clone variety and prepare exemplary summary.

**2<sup>nd</sup> task.** To characterize other traits and attributes fitting to requirements posed for defining of high yield.

**2<sup>nd</sup> work.** The students get acquainted with the examples of state register for agricultural crops available in the disposal of the chair and the varieties of grain crops, registered in them. By studying the varieties which are being developed, they select suitable varieties to their regions. The characteristics of the varieties are presented in the view of tables.

The new varieties of the grain crops: wheat, triticale, corn, rice, barley, sorghum, oats and rye are being created in the breeding and seed production centers of the republic and delivered to commission of state trials. The varieties having the traits and attributes, meeting the requirements of industry are inserted into register and will be recommended to the extension.

Breeding and seed production processes of wheat varieties: Zumrad, Kukbulak, Karlik 85, Makuz (hard) and others created by the scientists of the republic passed by local conditions and entirely meet the requirements of the industry.

**The characteristics of the variety of Zumrad.** The variety was developed by the individual selection from hybrid combination of Eritrosprium 100 x Surkhak 5688 at the Uzbek SRI of grain production (SRA “Don”).

Coauthors: Beknazarov N.B., Katkova R.O., and others.

Since 2001 this variety has been included into state register for winter planting in the rain fed areas of Djizzakh, Kashkadaria and Samarkand regions.

The variety belongs to the diversity of Grecum. Biologic winter type. Spike is white, silindric shape, in medium length and density. Spikelet glume is oval-elongated, coarse, well rooted. Shoulder is wider, cutted, the tip is very conspicuous. Own is white, spike is equal or short, coarse, spread. The grain is a middle size, white, in a oval-elongated shape, longitudinal cut is shallow, weight of 1000 grains is 38,5- 44,9 g.

Vegetation period has an average of 228 days, in the north it ripens for 250 days, in the south, for 190 days. The variety tolerates to lodging and shading, resistant to cold and equal to 5,0 ball. The variety belongs to the middle ripening varieties. The vegetation period is an average of 246 days. The variety is resistant to cold and tolerate in regard of lodging and shading by 5,0 ball. Resistant to drought.

An average productivity of grain in the trial period in 1996-2000 was 1,6 ton in the condition of rain fed of the VTA, and in the Kamashy VTA -2,3 ton. The productivity made of 0,8 ton in the heavy rain fed condition on the account of inadequate weather conditions of Kattakurgan rain fed grain crops'VTA. Infection by the diseases (yellow rust) at the weak extant, nearly 17 %, was registered in the years of test at Gallaaral rain fed grain VTA.

Bread baking quality is perfect. Gluten content is 25 %, protein -9 %. Lifting volume of bread is 297 m<sup>3</sup>. Total bread baking score is 3,0 ball.

**3<sup>rd</sup> task.** Shift the characteristics of the varieties in the texts of literature to view of tabled data.

To build the characteristics of the varieties in the table order facilitates easy defining of farm important traits and attributes and comparison opportunity in comparison of varieties with one another (table 3.).

**Table 3 Wheat characteristics.**

Varieties	Coauthors	Year of register	Biological diversity	Vegetation period, days	Productivity, t/ha.	Gluten content, %.	Content of protein, %.	Attributes	Bread baking score, in balls
1.Zumrad	Beknazarov N.B., Katkova R.O, and others.	2001	Grecum	246	1,7 (in rain fed)	25	9,3	Tolerant to lodging and shading. Resistant to cold and yellow rust	3,0
2.Kukbulok									
3.Karlik 85									
4.Makuz									
5.Ulugbek 600									
6.Sherdor									
7.Sanzar									
8.Khosildor									
9.Sanzar 6									
10.Dobraya									

**4<sup>th</sup> task.** Prepare the tabled data over farm-valuable traits and attributes of triticale, corn, rice, barley, sorghum, oats and rye varieties (tables 4, 5, 6, 7, 8, 9 and 10).

Table 4.

**Characteristics of triticale varieties.**

Varieties	Coauthors	Year of registering	Height of plants, cm	Vegetation period, days.	Productivity, t/ha.	Gluten content, %.	Protein content, %.	Nutritious unit, per 1 kg of green mass.	Attributes
1.Prag-1	Dagistan variety	1982	170-185	178-183	Green mass 3,0-3,5; grain 0,4.	24,8	14,5	0,3	Tolerant to external stresses
2.Farkhad									
3.Prag serebristiy									
4.Bakhodir									
5.Mnogozer niy									
6.Uzor									

Table 5.

**Characteristics of corn varieties**

Varieties	Coauthors	Year of register	Biological diversity	Vegetation period, days	Productivity, t/ha.	Protein content, %.	Content of lizin, per 100 g of protein	Attributes	Number of cobs per 1 plant, unit.
1. Hybrid Uzbekistan 420 VL	Massino I.V. and others	2002	Simple hybrid	102–108	Grain 10,3	9,6–10,5	4,38	Insignificantly infected by diseases and pests.	1,1
2. Hybrid Qorasuv 350 AMV									
3. Hybrid Uzbekistan 601 ESV									
4. Hybrid Vatan									

**Table 6. Characteristics of rice varieties.**

Varieties	Coauthors	Year of registering	Biological diversities	Vegetation period, days	Productivity, t/ha.	Glitering, %.	Number of rice, %.	Attributes	Quality of plov
1.Lazurniy	Isakhonov and Pulina P.A.	2004	Long grain	98-120	0,50-0,66	98,0-99,0	85	Resistant to Picalyari oz	Excellent
2.Nukus-2									
3.Intesivniy									
4.Tolmas									
5.Uz Ros-7-13									
6.Jaykhun									
7.Gulzar									
8.Arpa-shali mestniy									
9.Avangard									
10.Alanga									

**Table 7. Characteristics of barley varieties.**

Varieties	Coauthors	Year of registration	Biological diversities	Vegetation period, days.	Productivity, t/ha.	Weight of 1000 grains, g.	Protein content, %.	Attributes	Resistance to cold, scors.
1.Mavlon a	Mamatkulov and others	1997	Parallelum	205-224	0,4-0,5,	40,4-48,8	10,2	Tolerant to shading and lodging and resistant to pests	4,7-5,0
2.Aykor									
3.Afrosiyob									
4.Bolgaly.									
5.Gulnoz									
6.Khonogokh									
7.Karshinskiy									
8.Lalmikor.									
9.Nutans									
10.Timur									

**Table 8. Characteristics of sorghum varieties.**

Varieties	Coauthors	Year of registration	Biological diversities	Vegetation period, days.	Productivity, t\ha	Protein content, %.	Sweetness of juice, %.	Attributes
1. Shrin 91	Oleynik P.P., Ergashev N.E.	1998	Belongs to South African groups	Silos 117-120; full 138-140.	Dry substance 268,5; grain 62,4	6,4	18,7-19,0	Resistant to drought and salinity and not damaged from pests.
2. Uzbekistan 5								
3. Karlik Uzbekistan								
4. Uzbekistan 18								
5. Tashkentskoye belozernoeye								
6. Asal Bag								
7. Qandlik djugara								
8. Sanzar								

**Table 9. Characteristics of oats varieties.**

Varieties	Coauthors	Year of registration	Shape of panicle	Vegetation period, days.	Productivity, t\ha	Weight of 1000 grains, g.	Overleafness of variety, %.	Attributes
1. Dustlik 85	Shepetkov A.A., and others	1993	A half spread	162-170 green mass; 190-200 grain.	0,3 dry substance	31,7	45,0-47,0	Resistant to diseases and pests
2. Tashkent 1								
3. Uspekh								
4. Uzbekskiy shirokolistniy								

Table 10. **Characteristics of rye varieties.**

Varieties	Coauthors	Year of registration	Diversity	Vegetation period, days.	Productivity, t/ha	Weight of 1000 grain, g.	Attributes
1.Vakhshskaya 116	Parshkura N.S. and others	1983	Vulgare	For green food 163; For grain 179.	0,6-0,7	18,0-20,0	Early ripening, mean infection with diseases and considerably with pests
2.Chulpan (Russia)							
3. Kharkovskaya 78 (Russia)							
4. Korotkostebel'naya 69 (Russia)							

**The questions over learned topic:**

- 1.How is the variety characterized?
2. How are the varieties distinguished by their traits and attributes?
- 3.Why are not the varieties of rye grown in Uzbekistan widely?

**Glossary:** Industry of national economy- промшленность народного хозяйства- халқ хўжалиги саноати; determination about the variety- понятие о сорте- нав хакида тушунча; exemplary summary- образцовый конспект- намунавий конспект; descend (or origin)- происхождение- келиб чиқиши; rain fed lands- богарные земли- лалмикор ерлар; length and density- длина и плотность- бўйи ва зичлиги; tolerance to lodging and shading- вынослив к полеганию и опадению- ётиб қолиш ва тўкилишга бардошли; bread baking apprise- хлебопекарная оценка- нон пишириш баҳоси; species diversity- разновидности- тур хиллари; longitudinal cut- продольный срез- бўйига ариқча;

5-laboratory training.

**Study of variety characteristics, farm valuable traits and attributes of soft and hard wheat varieties.**

The species of hard (*T.durum* L.  $n=14$ ,  $2n=28$ ) and soft (*T.aestivum* L.  $n=21$ ,  $2n=42$ ) wheat are grown the most areas in the world and the largest part of those areas contain soft or common wheat plantations. Variety characteristics of grown varieties are worsened in consequence of successive plantings in the agricultural industry. The lowering of variety characteristics causes in decreasing of crop and spoiling of product's quality. That is why, selection of identical plants and propagation of their seeds were foreseen in the process of plant breeding and seed production. Because, only the variety of high grade is able to demonstrate own hereditary and farm valuable traits and attributes in the industry.

**The aim of the training.** The students study variety characteristics by means of herbariums of laboratory and farm valuable traits by the help of literature and also attributes of soft and hard wheat varieties.

**Necessary teaching subjects.** Lecture note books, manual on the practical trainings of the subject of selection and seed production of grain crops, source of internet, laboratory note books, pencils, rulers and erasers.

Variety characteristics of wheat varieties:

1.The appearances of ear (photo 8) are: mallet, oval and prismatic.



Photo 8.

**Ears of wheat and their structural components.**

2. Ear density – it is defined by the way of division of total number of spikelet on the ear to the length of ear rod in the centimeters. The ear is friable for soft wheat varieties if there are 1,6 units of spikelet in 1 cm of ear rod; a mean if there are 1,7 up to 2, dense when there are 2,3-2,6 units and too dense if there are 2,8 and more.

A friable ear in the varieties of hard wheat is considered if there are up to 2,4 spikelet in 1 cm of ear rod; a mean – dense, there are 2,4 up to 2,9 and dense, when more than 2.9.

3. The characteristics of awns – appearance of awns in the varieties of wheat are coarse; plain and mean coarse.

A) coarse awns – the tooth have a good development.

B) plain awns – the tooth have not a good development.

C) mean coarse developed – arranged between coarse and plain.

4. Shape of spikelet squama – a long-lancet, it equally narrows from tip up to end. Length is two times larger than a cross section.

5. Tooth of ear squama.

A) like a short mallet shape.

B) sharp prolonged.

C) sharp ended.

D) it is widened towards the center.

6. Arm of spikelet squama. It is broad if it is more than 2 mm, a mean if it is within 1 and 2 mm and narrow if it is up to 1 mm.

7. Shape of grains. Mostly, there are two kinds of grains: egg and oval shapes. In some varieties may be occurred the grains like prolonged or contrarily short grains (photo 8).

A) an egg shape has slightly broadened lower part, and top part narrowed.

B) in oval shape, from beginning till the end it is narrowing.

8. Length of ear. Ear length of the varieties of wheat has three kinds: short, mean and prolonged.

In the varieties of soft wheat: short- about 8 cm, mean – 8-10 cm and a prolonged is longer than 10 cm.

In the varieties of hard wheat: short is up to 6 cm, mean is about 7-8 cm and long is 10 cm.

9. Density of ear. The very friable , if there are up to 8 spikelet on 4 cm; a friable if there are 8-11 spikelet on 4 cm, mean friable from 15 to 19 and very dense, when there are more than 19 spikelet on 4 cm.

**1<sup>st</sup> work.** The students arrange the data found from literature about characteristics of varieties and over analyses of herbariums in the order as the table 11.

For this, the students draw the table 11 in their note books. By dividing into working groups of 3, 4 people. They select the herbariums of the varieties for themselves. Variety characteristics are studied on the components of the ear as were above listed orders. Separate them to structural parts and measure them. Data on variety characteristics collected from analysis are placed in columns of table in order and in line of the varieties. Identity (distinctness) and difference of variety characteristics of soft and hard wheat varieties are discussed.

**2<sup>nd</sup> work.** By means of literature, the students study the farm valuable traits and biological attributes of wheat varieties. The outcomes are demonstrated in the view of summaries.

On the data of literature, the traits of the varieties are comparatively divided into two kinds: quantitative and qualitative. The traits, can be seen by the eye (ear with awn or without it, egg grain or oval egg, white or yellow egg) and noting their distinction are named **qualitative traits**. The traits (number and weight of grains on one plant, number of grains in one ear, weight of grain, height of plants and others) which can not be distinguished by unarmmed eye, and needed to measure, weight and calculation for determining are called as the **quantitative traits**.

Physiologic, biochemical and technological peculiarities of plants are named their **attributes**. Resistance of plants to drought, frost, cold, diseases and pests belong to physiologic attributes of the plants.

Productivity of varieties of grain crops is also considered the first farm valuable trait. The productivity of the variety depends upon plants' productivity and stand density. However, the productivity associated with number of productive stalks, the number of grains in the ear and mass of 1000 grains.

The productivity of the wheat varieties, being studied in the plant breeding research works, is determined by one of the following methods:

1. Over-all harvest;
2. By the help of sample binds;
3. By the way of sample area;
4. On line meters.

Table 11.

**Variety characteristics of soft and hard wheat varieties**

Varieties	<b>Soft wheat varieties</b>								
	Shape of ear	Density of ear.	Awn characteristics	Shape of spikelet squama	Tooth of spikelet squama	Arm of spikelet squama	Shape of grain	Length of ear	Density of spikelet
1.Zumrad									
2.Dobraya									
3.Sanzar 4									
4.Kuk-buloq									
5.									
6.									
7.									
8.									
	<b>Hard wheat varieties</b>								
1.Marvarid									
2.Makuz									
3.Alexandrovka									
4.Karlik 85									
5.									
6.									
7.									
8.									

1. Over-all harvest of crop and defining its size are considered as the generally used method at the monitoring of the productivity. Consequently, the students use their data on the productivity collected from field experiment in the 3<sup>rd</sup> practical training for determination of certain variety's (variant's) productivity. Here, the crop is combined from every plot and counted out the productivity per hectare. At the calculation of the productivity it is necessary to know the actual humidity of the grains. Because, the productivity is defined on the standard moisture.

**1<sup>st</sup> task.** The students by using of crop data on the varieties of field experiment from 3<sup>rd</sup> training identify the productivity of the varieties on the methods of 2, 3 and 4. For these, previously they should assimilate the content of these methods by using of literature.

**3<sup>rd</sup> work.** Resistance of the varieties to drought is considered as one of the valuable biological attributes for farms. Resistance to drought is identified via evaluation of the resistance of the plants by using methods of: direct, indirect and provocation.

A direct assessment in the field. At this, resistance of the varieties to drought is defined by the differences of crop size and product quality of the year from previous years. Assessment is carried out in the plot of planted varieties and doesn't require a special experimentation.

Study of resistance of the varieties through indirect method is based on the definition of development extent of root system and accumulation of dried substances. Therefore, at the time of vegetation from 50 to 100 plants of the varieties pulling out them in every 2 or 3 days they are examined by the development extent of root systems and accumulation of dried substances. The data of variety indexes give evidence what they are resistant to drought.

At the monitoring of the resistance of varieties to drought through the method of provocation or drying up, the plot of planted variety is divided into two parts. One of the plots is covered by the oil paper. The second part is left open. The soil humidity in the part covered by the oil paper is concentrated. The crop from

both part is combined along and is compared each other. The resistance of the varieties to drought is evaluated by looking at the differences of productivity.

**2<sup>nd</sup> task.** Tolerance and resistance of soft wheat variety Dobraya and hard wheat variety Alezandrovka to frost, cold, diseases and pests are studied by using of literature and prepare an exemplary syllabus.

**Answer the questions related to the studied materials:**

1. What is the significance of variety characteristics of wheat varieties?
2. From what kind of traits the variety characteristics are emerged?
3. Does the variety grade affect on the farm dignity of variety?
4. What kind of distinctions are available between traits and attributes?

**Glossary:** variety characteristics - признаки сортности - навдорлик белгилари; in consequence of successive plantings- в последствиях повторного посева- такрорий экишлар натижасида; high grade- высокой сорт- юкори нав; total number of spikelet- общие количества колосков- бошоқчаларнинг умумий сони; awn- ости- қилтиқ; coarse, plain and mean coarse- грубый, гладкий и средне грубый- ғадир, силлик ва ўртача ғадир; squama-чешуя- қобик; friable-рыхлый- тарқоқ; distinctness- ясность- аниқлиги; outcomes- результаты- натижалар; summary (syllabus) – конспект- конспект; comparatively- сравнительно, условно или относительно – шартли ёки нисбатан тенглаш; distinction – отличие- фарқланиши; associated with- связанной с- билан боғланган; its size- её величина- унинг катталиги; generally using- повсеместно используемой- кенг фойдаланиладиган; consequently- поэтому- шунинг учун; sample binds- пробные связки- намуна боғламлари; assimilate- освоит- ўзлаштириб олмоқ; to give evidence –свидетельствовать- дарак бермоқ.

6-laboratory training.

### Study of soft and hard wheat diversities.

It is known, from the textbook of plant growing (ЎСИМЛИҚШУНОСЛИК, 1987.) that there exist 17 (table 12) diversities of soft wheat and 14 diversities (table 14.) of hard wheat. The representatives of these two species have differences between species and on the hereditary morphological traits (photo 9.) and biological attributes within each species.

Investigation of diversities of these two species has a great significance in the breeding and seed production of wheat.

**The aim of the training.** The students get acquainted with scientific denomination, ears, grains and breeding traits and attributes of diversities' representatives of soft and hard wheat.

Necessary training aids. Teaching manual for conducting practical and laboratory trainings on the subject of selection and seed production of grain – bean crops, tables and placates for diversities of wheat, herbariums on the wheat ear of the diversities of wheat, laboratory notebooks, pencils, rulers and erasers.

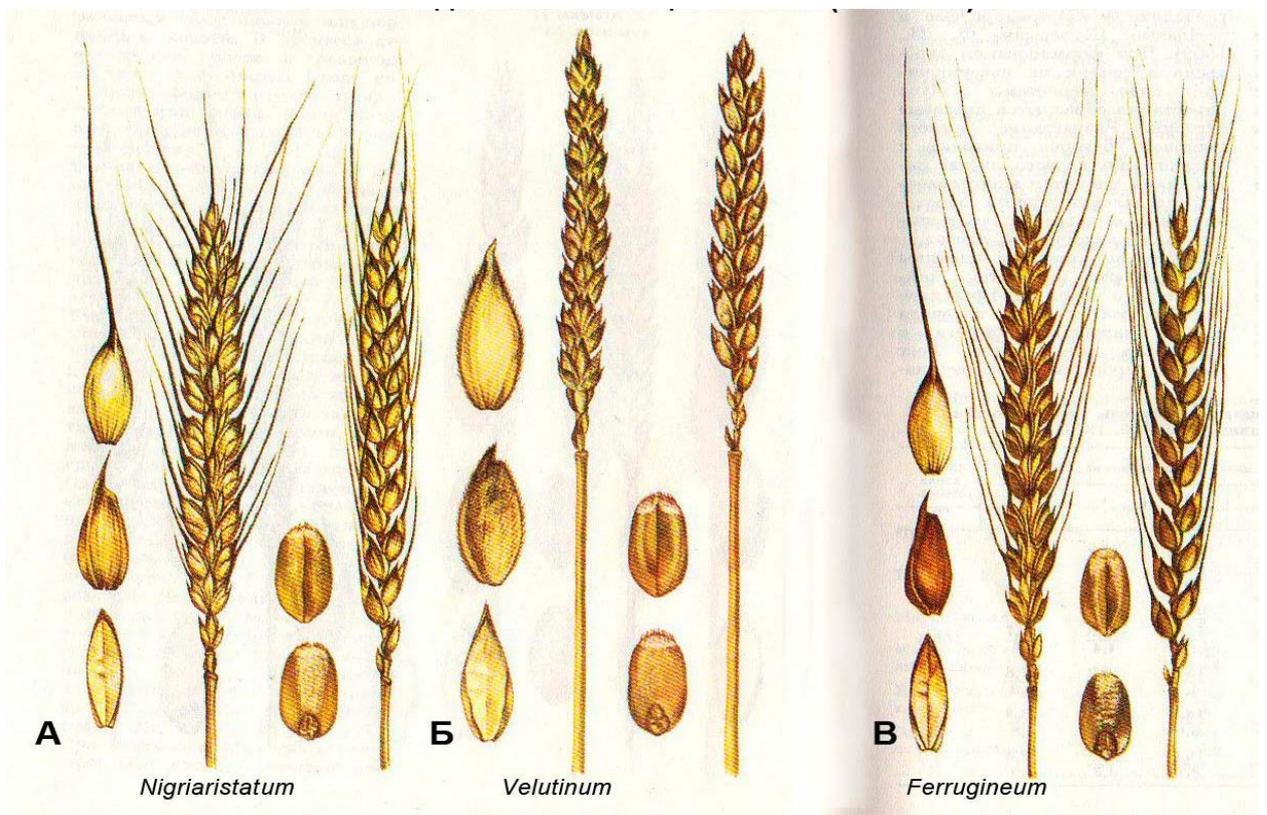


Photo 9.

**The diversities of soft (aestivum) wheat.**

**1<sup>st</sup> work.** The students are divided into two groups to assimilate the table data over the diversities of soft and hard wheat, stated in the appendixes (2, 3) and transfer them into their notebooks (as exemplary tables 12 and 13).

**1<sup>st</sup> task.** By the help of appendixes (2, 3), internet, literature and herbarium analysis to continue filling in the tables of 12 and 13 with necessary data.

Table 12. **The data of soft wheat diversities.**

Diversities	Availability of awn	Downy of spikelet sequama	Color			Farm valuable traits	Biological attributes
			ears	awns	grains		
Albidum	Without awn	Not downy	White	-	White		
Lutescens							
Milturum							
Alborubrum							
ErythrospERMUM							
Graecum							
Ferruginum							
Erythroleucon							
Nigriaristatum							
Caesium							
Pyrothrix							
Velutinum							
Hostianum							
Barbarossa							
Leucospermum							
Alborubrum							
Delfi							

Table 13. **The data of hard wheat diversities**

Diversities	Availability of awn	Downy of spikelet sequama	Color			Farm valuable traits	Biological attributes
			ears	awns	grains		
Leucurum	With awn	Not downy	White	White	White		
Affine							
Leucomelan							
Reichenbachii							
Hordeiforme							
Erythromelun							
Provinciale							
Melanopus							
Coerulescens							
Valenciae							
Italicum							
Africanum							
Apulicum							
Libycum							

**2<sup>nd</sup> task.** By means of scientific sources they define by the view of point of the breeding, farm valuable traits and diversities' attribute and put them in corresponding columns of above drawn tables.

**Answer the questions related to the considered theme:**

1. What is the significance of the study of diversities for breeding?
2. Do you know the varieties of wheat evolved by the participation of diversities?
3. Is there any connection between morphological and farm valuable traits?
4. Does the biological attribute affect on farm valuable trait?

**Glossary:** Diversities of soft wheat- разновидности мягкой пшеницы- юмшоқ буғдойнинг тур хиллари; appendix- приложение- илова; exemplary tables- образцовые таблицы- наъмунавий жадваллар; awn bearing- остистость- қилтиқлиги; downy- опушенность- туклилиги; corresponding columns- соответствующие столбики- тааллуқли устунлар.

7-laboratory training.

**Determination of sprouting energy and germination of wheat seeds.**

**Germination of seed** according to the literary data of breeding and seed production is one of the indexes characterizing of planting qualities and also exhibits their biological and economical values. **Sprouting energy** is considered for complete estimation of seed's planting quality. Indexes of sprouting energy and germination are subtracted from total amount of seeds selected а҃к здфтештп and denoted in the percents.

Planting qualities of seed in the practical seed production of agricultural crops are estimated on the base of laboratory analysis. The laboratory conditions are mostly proper to seed sprout and germination of seeds will always superior than in the field. In spite of this, it was accepted that germination of seed in the laboratory has pronounced the more exactly the fitness, quality of seed to planting.

**The aim of training.** Training of students for determining wheat seeds' sprouting energy and germination (photo 10) in the condition of laboratory is the aim of the training.



Photo 10.

**Outlook of wheat seeds.**

Analysis of seeds to determine of germination in the conditions of laboratory is conducted in correspondence of state standard (GOST 12038-84) at the optimal temperature of thermostat (photo 11) and with other required conditions (table 14).

Table 14. **Determination of sprouting energy and germination of wheat seeds**

№	Crops	Necessary things	Temperature and growing, , 20°C.	Light and darkness	Days of record, in days		Results of analysis, an average in %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1	Soft wheat	Filter paper, sand	., ., .,	Darkness	3	7		
2	Durum wheat	Filter paper, sand	., ., .,	Darkness	4	8		

**Necessary manuals and laboratory devices for conducting of seed analysis.** Manuals, tables, copybooks, pencils, eraser, rulers, average seed samples of wheat, pre-infected cooling and heating thermostats, petry cups, hand water sprayer, germinators (photo 103), filter paper, pincers, tiny blades and compressors.



Photo 11. **Thermostat for analyze of seed germination**

**1-work.** The students after a brief instruction of teacher about the order of laboratory work are divided into small groups of 3-6 persons each depending on

the availability of wheat seed samples. In the next step, like the work of one of the accredited central laboratory (look at the photo 13 and laboratory training 8) the data of seeds are written in the working copybooks.

After that, table 16 is drawn for full in with results of analysis to be done.

Germination of seeds is determined by the means of thermostat. All devices and instruments should be disinfected prior to initiation of analyzes and for this purpose the solution prepared in the ratio of 2 part of water and 1 part of formalin 40% or it could be replaced by technical ethylene alcohol (96%). By the help of moistened cloth with disinfectant solution wipe all inside walls of thermostat and devices, instruments. Then all these will put into thermostat and leave firmly closed. At time of permanent function of laboratory the disinfection is proposed to do one time in every 10 days.

One student from each group heaps seed from his pre-cleaned seed sample on the table for analysis. The students of other groups watch him and follow his further work.

To analyze the seeds continues under oversee of teacher and in four replications. Consequently, every student takes four subprobes on 100 seeds each one out of heaped seeds. Their sprouting energy and germination are determined solely. The results as average indexes in percents are written in the corresponding cells of table in the working notebook.

Plastic and metal dishes (photo 98) are used for seed growing. These dishes will be provided with attached labels written the number of subprobes and date of initial and general recording days on them.

After those, filter paper cut on appropriate size of dishes laid on the floor, through dividing into two parts by partitioning barriers or by the paper itself. The filter paper is moistened and selected 100 seeds are placed on it in soil (photo 112). Every two dishes with two replications of seeds, together as four replications are ready now for analysis of one certain wheat variety. The seed dishes is deposited into working thermostat and once for 24 hours, at the time of initial putting, the

seed dishes took out of thermostat and moistened again by the help of water sprayer.

The temperature of the thermostat (20°C) is verified three times for every 24 hours: in the morning, midday and in the evening and regularly remarked in the table of copybook. The required temperature of the thermostat (20°C) for seed growing doesn't exceed or lower than  $\pm 2^{\circ}\text{C}$ . A dish with water is placed into bottom of thermostat. The water level 1.5-2.0 cm in the dish is kept and refreshed for every 3-5 days.

Sprouting energy and germination of seeds are analyzed according to conditions and terms exhibited in table 15 and determined of sprouting energy and germination. The results of analysis are written on the leaflet for germination of seed subprobes presented in the enclosure 4 (it should be drawn in notebook).

**Table 15                      The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for $4 \times 100$ )
99 or 1	$\pm 2$
From 97 to -98 or from 2 to -3	$\pm 3$
From 95 to -96 or from 4 to -5	$\pm 4$
From 92 to -94 or from 6 to -8	$\pm 5$
From 88 to -91 or from 9 to -12	$\pm 6$
From 83 to -87 or from 13 to -17	$\pm 7$
From 75 to -82 or from 18 to -25	$\pm 8$
From 62 to -74 or from 26 to -38	$\pm 9$
From 39 to -61	$\pm 10$

Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined solely. At the defining of initial growing the counting of normally grown and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds, all not grown seeds are counted and separated into groups (normally grown, abnormal

grown, swollen and rotted). Mean germination of seeds in four replications is subtracted.

The results of analysis are considered correct if the difference between replications doesn't exceed than admissible indexes of GOST (table 15). In contrast case the analysis should be repeated.

**Tasks:**

1.To repeat the analysis for determining sprouting energy and germination of other wheat kinds or variety seeds as self-work in order to firm accumulated skills by the students.

2.To repeat analysis by the groups of students, whose data with differences have exceeded than admissible difference of the GOST, also need self-work.

**Questions:**

1.What significance has sprouting energy and germination of seeds in the field of seed production?

2.What order has the method for determination of seed sprouting energy?

3. What order has the method for determination of seed germination?

**Minimum dictionary:** denoted-обозначенный - белгиланган; partitioning off- отгораживание- ажратилиш; barrier -перегородка- тўсик; normally grown, swollen and rotted- нормально проросшие - набухшие и загнившие- намунали ўсган - ёмон ўсган - намга бўккан ва чириган; admissible difference – допустимая разница- руҳсат этиладиган фарқ; in contrast- в противном случае - бошқача ҳолатда.

8-practical training.

**Definition of weight of 1000 seeds and moisture of wheat seeds on the base of accepted methods**

According to the data of literature, the weight of 1000 seeds of wheat is one of the indexes of planting qualities. Plump and largest seeds usually germinate even and rapidly. The weight of 1000 seeds of wheat is differentiated depending upon diversities of varieties and growing conditions.

The weight of 1000 wheat seeds is defined only for conditioned seeds.

The moisture of wheat seeds has a great significance at the time of storage, transportation and reprocessing. The fixed rates of grain moisture correspondingly by the standard (photo 12), insure of safety the initial grain quality. According to

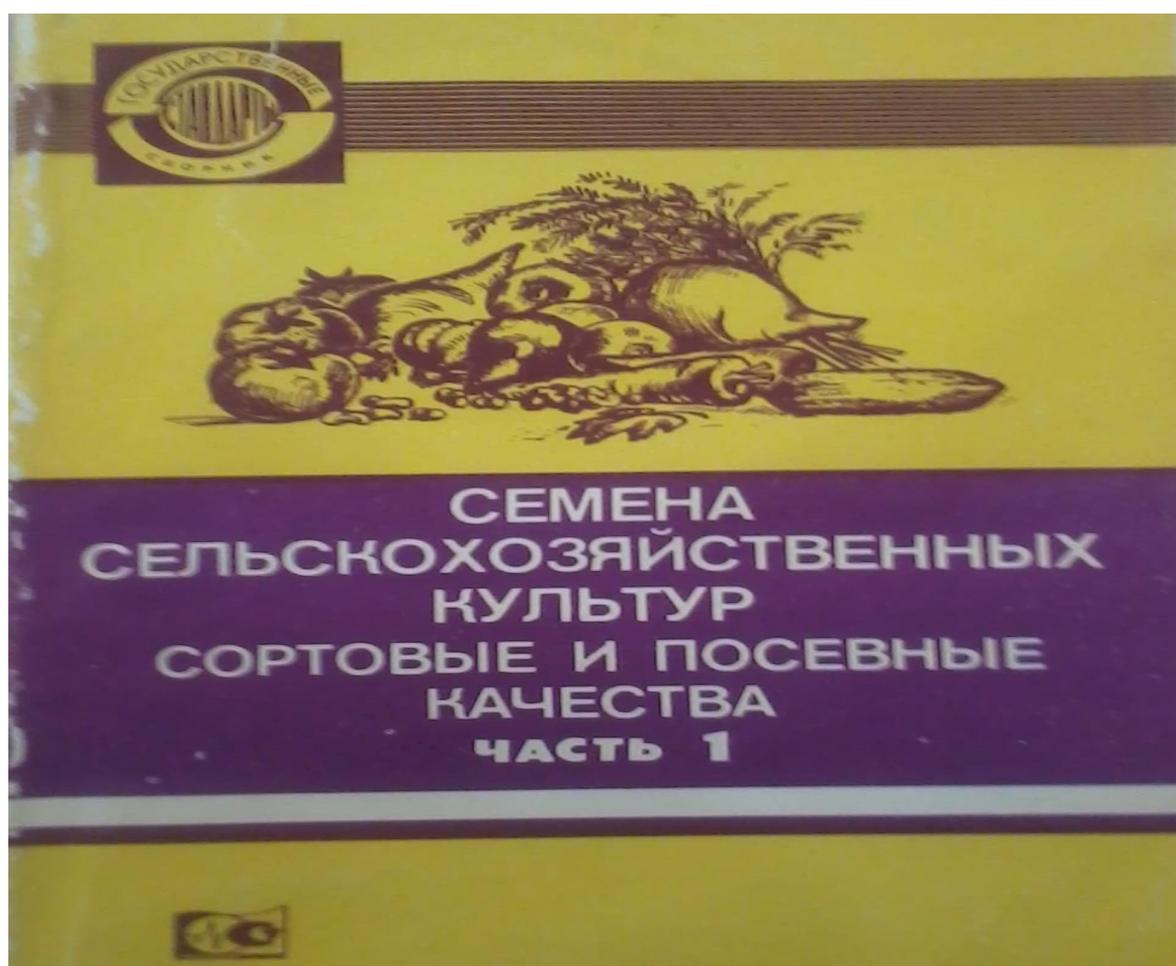


Photo 12. **GOST 10467-76. The seeds of agricultural crops. Varietal and planting qualities. Technical conditions.**

standard of “wheat and spelt”, “Varietal and planting qualities” technical conditions, the humidity of wheat seeds intended to storage should not exceed 14%. The humidity of winter wheat seeds permissible up to 15%, when they are prepared to sow in the year of their harvest. It is supposed that the conserving wheat seeds at this bound of moisture able to be kept for more prolonged period without signs of grown action and impacts by microorganisms.

**The purpose of the training.** To study the determining methods of weight of 1000 wheat seeds and seed moisture in the conditions of laboratory is the main task of this training.

**Necessary teaching subjects and laboratory facilities.** Teaching and methodological manuals for practical and laboratory trainings, middle samples from different wheat varieties, laboratory and electron scales at precision of 0.01, sieves, drying dresser with limits of 100C° to 150°C at + - 2° C, laboratory mills (appendix 8), metal dishes (photo 98), electron coolers or exicators (photo 107), sand timers, pencils, pincers, erasers, rulers and others.

A short instruction of the teacher about work array in the laboratory prefaces the laboratory training.

The students according to previous laboratory analysis with the participation of academic groups divided into subgroups by 3, 6 person each one, depending upon availability of middle samples of wheat seeds belonging to different places of production and varieties.

**1-work.** In order to determine the weight of 1000 seeds of wheat, each group of students according to the methods of standard chose one out of average wheat seed samples with label on it. Then, on the example of work array at one of accredited central laboratories (photo 13), inserted the data of seed material to analysis the seed quality indexes of the agricultural crops in the conditions of laboratory. The identity of attached documents to samples is studied in the testing laboratories and the name of farm and variety, reproduction, year of harvest, origin, seed batch number and weight, place number and other data requiring by the standard are included into register.

One student from each group is filled the on cleaned part of the table the seeds prior analyzed on the clearness and takes two working subsamples, without choice on 500 units each. They are weighed by the electron scales up to precision of 0,01. The weight of 1000 seeds is determined through multiplying of taken data of weight to two.



**Photo 13. Registration and identification of seed samples of agricultural crops, submitted to analysis the seed quality. Khasanov Ulugbek, the head of the accredited central testing laboratory and Narzullaeva Yulduz, practitioner, student of 4 year study, TSAU.**

According to the GOST 12042-80, the data of weight from two replications along each one combined together and by dividing to two is calculated an average data. At the same time, the difference between two replication is identified and compared with permissible divergence (table 16). Comparison is performed in the correspondence on data of the table 16.

For example, the weight of the 1<sup>st</sup> subsample is 13,68 g.

The weight of the 2<sup>nd</sup> subsample is 14,05 g.

Total weight of two probes:  $13,68 + 14,05 = 27,73$  or 28 g.

The identified difference between two replications is  $14,05 - 13,68 = 0,37$  g.

The weight of two replications is made of 28 g. on the base of this from table ... , we can find 2 on the column “Decimal” and 8 on the column “Unit”. On the crossing cell across of these two figures in the table, the permissible divergence 0,42 is defined. Thus, the difference between two parallel analysis (0.37) is less than permissible divergence (0.42), that is proved by the correctness of conducted analysis. If the difference between two analyzes is more than permissible divergence, the third subsample is selected and taken data calculated in association with above taken two data from two subsamples and the newly taken data is compared with permissible divergence.

Table 16 **Indexes of permissible divergence, g.**

Decimals	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

**Task.** Debate the results on the weight of 1000 seeds of spring and winter varieties of wheat by comparing received data between subgroups of the students and substantiate of existence the differences between indexes on the base of scientific and practical knowledge.

**2-work.** To define the moisture of seed also it would need to guide by fixed methods of GOST. The students are to be observed the drawing of the working

table (table 17) in their work copies to record of initial and resulting data of analysis.

The method of analysis has been based on the weighing of milled and dried seeds in the chamber dryers of laboratory (photo 96). At this, the students of every subgroups choice probes with weight of 50 g seeds from the second middle sample placed in bottle (photo 13). The seeds are grounded for the period of 40 second by means of laboratory mill.

By the means of electron scales of laboratory (photo 96), two subsamples are weight out of milled seeds 5 g each one. Placed them into beforehand prepared and numbered metal cups (photo 98), The cups with seeds are laid into warmed (up to 150° C) dryer (their leads also placed near). The door of dryer is closed firmly and by checking the temperature indexes at the 150° C is fixed the time. Drying is conducted for 20 minutes at the temperature of 150° C. By the end of given time, the dried cups are getting out and covered by their leads. Cooling of cups are executed in the exicators (photo 107). For this, the cups placed in the exicators for 15-20 minute to fully cooling. After cooling of cups with seeds is weight once more.

The amount of loosed moisture is determined via calculating of difference of taken index of cups' weights up to drying and index of cups after cooling.

The percent of moisture is determined through multiplying of loosed moisture to 100 and taken amount is divided to initial weight of seeds (5.0 g).

For instance, if the loosed moisture of the cup with the number of №2 is made of 0.57 g., it should be multiplied to 100. The taken 57 is divided to initial weight of subsample, that is 5 g. and the moisture of 14 % is determined. At the same array, the loosed moisture 0.55 g. of second cup with the number of №19 is multiplied to 100 and through dividing of result 55 to initial 5 g. is determined of 11.0 %. Now, by adding of both results is to take:  $11.4 + 11.0 = 22.4$ . This result is divided to 2 and determines of middle moisture, that is 11.2 %.

Table 17 **The table for calculating of seed moisture**

№ probe	Weight of cup, g.	Weight of seed subsample, g.	Weight of cup with seed subsample, g.		Moisture loosed		Middle moisture, %.
			Up to drying	After drying	In grams	In percents	
1							
2							

The taken difference between indexes of moisture of both subsamples is to be not exceeded of 0.5 %. At this result, the determination of moisture is considered concluded in correspondence with standard claims. In the case of data more than 0.5 %, the procedure is repeated until taking of result less than 0.5 %. The calculated middle index with convince is recorded in the column of middle moisture.

**Task.** Review the laboratory analysis on the determination of seed moisture of other varieties of wheat, it would be desirable if were included the varieties of breed and during wheat.

**The questions:**

1. What economical significance has the weight of 1000 seeds of wheat?
2. Why of 14 % of wheat seed moisture is necessary?
3. From what part of middle sample is taken the probes to define the weight of 1000 wheat seeds?
4. From what part of middle sample is taken the probes to define the moisture of wheat seeds?

**Dictionary:** plump, large seeds-выполненные, крупные семена- тўқ ва йирик уруғлар; in the period of storage and reprocessing-в период хранения и переработки-сақлаш ва қайта ишлаш даврида; fixed rates- установленные нормы-ўрнатилган меъёрлар; supposed-предполагается-тушунилади; facilities-оборудование -асбоб, ускуналар; subsample-субпроба-субнамуна; substantiate the existence of differences- обосновать существенности разности-фарқнинг мавжудлигини асослаш; initial data- исходные данные- дастлабки маълумотлар.

## 9-laboratory training.

### **Study of variety signs, farm – valuable and biological features of barley.**

Appearance and indexes of morphological structures are called crop signs. The traits specific to plants of every individual variety are called variety signs.

Physiological, biochemical and technological features of variety plants represent their properties. Resistance of plants to droughts, frost, cold, diseases and insects belong to physiological features. Responses of plants to humidity, climate and light are biological properties. The crop and its quality taken from variety rely upon the results of properties and responses (photo 14).



**Photo 14. Bobur Shayusupov, assistant of zootechny department, TSAU conducts phonological inspection to study biological properties of barley. November 19, 2017.**

**The aim of the training.** To teach the students about variety, farm valuable signs and biological properties of barley.

**Necessary teaching and laboratory aid subjects to conduct the training.** The herbariums prepared from plants and spikes of barley, geographic, teaching

maps about distribution of domesticated crops, lecture copy books, literature on grain crops, tables on farm valuable signs of barley varieties, seeds of barley varieties, laboratory copy books, pencils, erasers and rulers.

### **Variety signs of barley varieties.**

Variety signs of barley varieties are: the shape of ear, toothy awn, shape of grain, shifting property of lemmas, covering of vallecule with coarse hairs on the base of grain, color of lemma and palea lines and ear lemmas.

*The shape of the ear:* rectangular square, square, rhomb, and may be hexangular. This is defined by across cutting. Spike can be looked through three sides by avoiding of its breaking (photos 15, 16).



Photo 15. **Two-row barley spike**



Photo 16. **Many-row barley spike**

The shape of six sided ear usually occurs in the dense and pressed ears. The other shapes of spikes belong to thinned ear kinds.

*The shape of the grain:* prolonged, shapes of ellipsis and rhomb. The most broadened part of prolonged shape is disposed above of middle part of grain (photo 17).

Narrowing of the grains along to the end of the grains occur remarkably than narrowing to base. The main mass of grain germ has concentrated above of the middle part of grain. Germ is disposed equally along of all cavity of grain in the shape of ellipsis. Gradually narrowing is characteristic to both of grain tips. Germ

is placed in the central part of grain in the grain shape of rhomb. Here, the narrowing takes place remarkably towards of tip.



Photo 17. **Appearance of the barley grains.**

Passing part of lemma awn: gradually, equally, suddenly and may be widely (photo 18).

*Covering with hairs of furrow in the base of grain:* hillocks (hairs or short, imperceptible hairs) and hairy (hairs are well pronounced).

Anthocyan color of flower palea (scales): yellow color on the lines of flower lemmas and paleas in some of barley varieties. It is in the same type with color of scale, red-violet line presents in others. Gradually with ripening of grain these colors make weaker and disappear at the time of storage.

*Ear scales (here, palea and lemma)-* are being without hairs (in the winter varieties) or downy (it is noticeable in the tip part of lemma).

*Toothy shape of awn:* toothy, moderate toothy and may be smooth. Toothy awns are wide, brittle and large –toothy, occurs either of without tooth awns. Therefore, the feature of awns is defined by the presence or absence of tooth. Mean toothy awns observed in the most commercialized varieties.

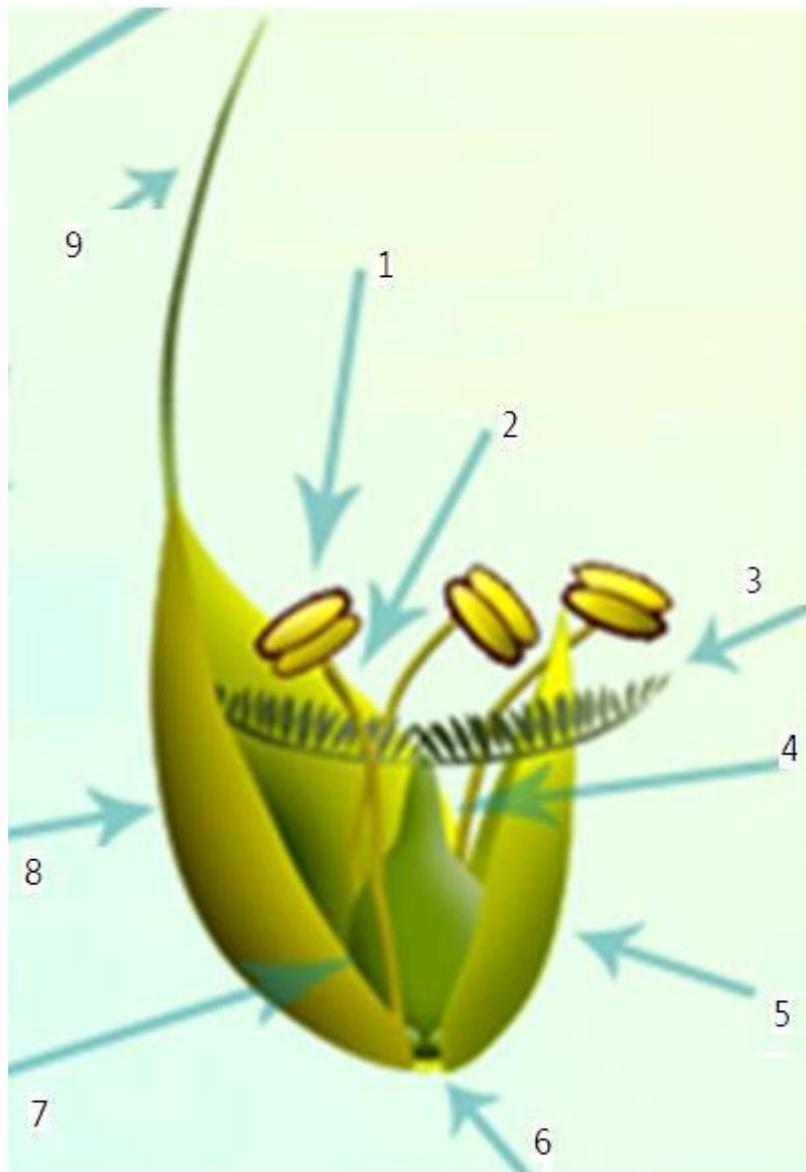


Photo 18. **Parts of barley flower:** 1-anther; 2-filament; 3-stigma; 4-style; 5-palea; 6-lodicles, 7-ovary; 8-lemma; 9-awn.

**Task 1.** To study the plants of varieties and spikes on the examples of herbariums and by means of above mentioned characteristics and identify their variety grades.

**Profitable crop** is one of the farm valuable signs of barley and it is supposed to be corresponded with intensive technology. Such kind of varieties are characterized with adaptation to different – climatic conditions of the republic. The varieties Aykor, Mavlano, Bolgaly and Karshinskiy perform the row of varieties which give yield by 5.0 and more tons per hectare.

The traits as resistance to drought, frost, salinity, diseases, pests, shedding and lodging of barley in our republic and Central Asia are either involved in farm valuable signs.

**Production of quality beer** from grain of barley is also extremely accepted as one of its properties in the national economy. The established varieties on their fitness to beer production are characterized by more than 90% of floury germ of grain in the texture of prepared extract. The variety of Unimly on the base of testing has been considered as the most suitable to beer production, which produces about 2.0 tons of crop per hectare in the rain fed conditions.

Owing of property on the **tolerance of barley varieties to drought** it provides getting of planned crop from rain fed land, even in the consequences of later plantings in spring. The varieties of Lalmikor and Unimly got 5 point from 5 regarding their drought resistance.

Barley as the wheat planted in winter and in spring. Safeguarding of plant standing in the result of cold impact ensures a plenty crop of barley. Khonokokh, Mavlano, Karshinskiy are made up a row of **cold resistant varieties**.

**Tolerance to soil salinity** of barley varieties in the fields of regions subjected to salinity ensures taking of adequate seedlings from sown seeds in the plots, that guarantees to get bumper harvest of hay and grain to the hectare of land. Out of varieties included into register: Gulnoz, Nutance 799 and Vodka distinguished as the extraordinarily suitable varieties for growing in the salt affected soils of regions through the republic.

The diseases of barley develops since the seed germination in the form of root rot, smut, powdery mildew, line, net and zonal spots (photo 19) and others. They cause to lose more 40-50% of established crop. The great contribution has been performed by the scientists of Samarkand agricultural institute which is developed variety of Temur has dealt with this problem and also with other problems as lodging and shedding. Beside this, the varieties of Gulnoz and Zafar also have **disease resistance properties**.

The variety of Vodka has shown the superior **resistance to pests** at the testing plots of the republic.

Barley plants have increasing response to humidity. The seeds of barley germinate at the temperature of 1-2°C and setting 5-8 rootstocks. If the moisture is adequate the seedlings start to get grow actively (photo 14).

The plants able withstand of occasionally short frosts of -8°C. The response of this crop to light can be easily guessed by its spreading up to 68 - 70° of northern



Photo 19. **Infected parts of barley plants (1, 2, 4) with pathogen of Phynchosporium secalis (2) zonal spot.**

width and up to equator in the south and also out of its competition on settling of mountains' top, and getting superiority than all other crops.

**Task 2.** Study of data about the farm – valuable properties of the new varieties and lines of barley from the breeding – experimental plots and forecast their areas of growing in the future.

**The questions:**

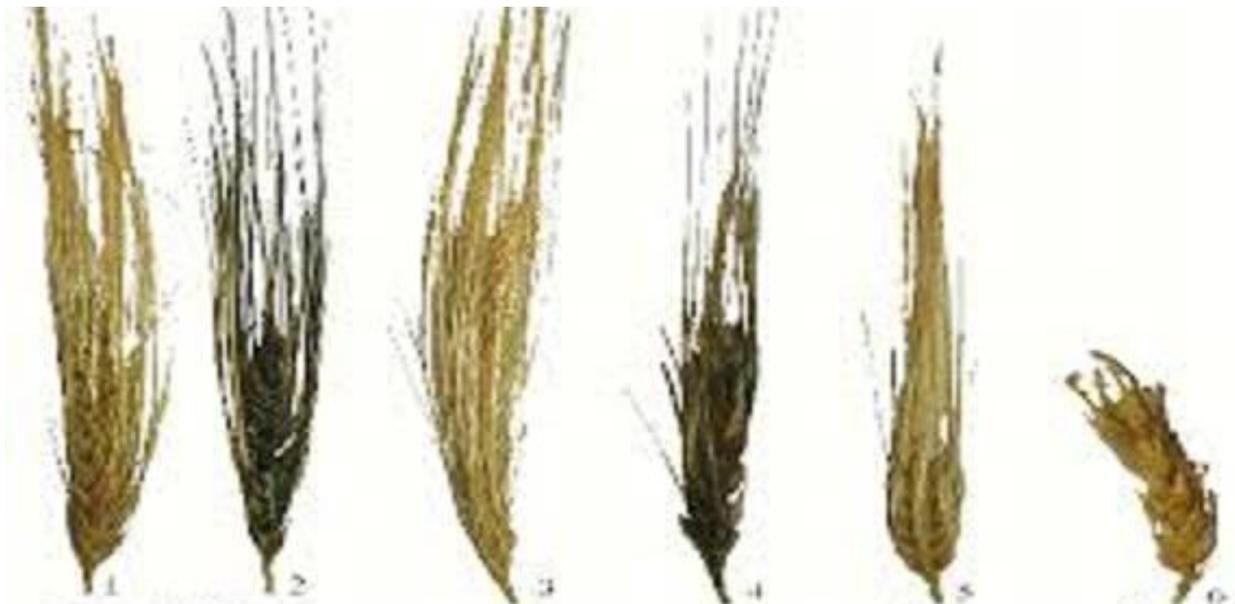
1. What differences between biological and economical features are exist?
2. What signs of barley do constitute of variety signs?
3. What kinds of varieties are preferable to plant in regions of Uzbekistan?

**Glossary:** variety signs- сортовые признаки- наводорлик белгилари; plant features - особенности растений-ўсимликлар хоссалари; belong to - относится к - таллуқли; spike (or ear) - колос- бошоқ; toothy awn- зубчатость ости- қилтиқнинг тишлилиги; shape of grain - форма зерна-дон шакли; flower scales- цветковые чешуйки- гул қобиқлари; covered row with coarse hairs - покрытие грубыми волосками бороздки – эгатнинг сезиларли туклар билан қопланганлиги; on the base of grain - на основании зерна-дон асосида; color of flowers' lines in the scales - окраска линий цветковых чешуек – гул қобиғи чизиқларининг ранги; downy of ear scales - опушенность колосовых чешуек – бошоқ қобиқларининг туклилиги; anther - пыльник-чангчи; filament - нитка пыльника-чангчи ипи; stigma - рыльце-оналик тумшукчаси; stile - столбик- устунча; internal flower's palea - внутренние цветковые чешуйки- ички гул қобиғи; lodicles - лодиккулы- лодиккулар; ovary - завязь- тугунча; external flower lemma - внешние цветковые чешуйки- ташқи гул қобиғи; awn - ость- қилтиқ; mildew germ - мучнистая эндосперма-унли эндосперм; rain fed land - богарные земли- лалмикор ер; root rot - корневая гниль- илдиз чириши; black smut - черная головня – қора куя; powdery mildew - мучнистая роса- ун шудринги; out of competition – вне конкуренции-тенгсиз.

10-laboratory training.

**Definition of barley species diversity.**

Order of *Hordeum* L belongs to the family of cereals. There are about 30 barley species. They establish polyploidy ranges (lines):  $2n = 14, 28$  and  $42$ . Only one species of *H.sativum* Jassen has been domesticated for the growing. Which is divided into three subspecies: *H.vulgare* L – common barley (photo 20.),



**Photo 20. Species diversity of common barley: 1- pallidum; 2- nigrum; 3- ricotense; 4- leicorrhynchum; 5- parallelum; 6- trfurcatum.**

*H.disticum* L – two-row barley and *H.intermedium* Vav.et Orl – intermediate barley (photo 21)..



**Photo 21. Species diversity of dublerow barley: 1- nutans; 2- hugpicans; 3- medicum; 4- persicum.**

Only, the varieties derived from common and double-row barley are grown.

**The aim of the training.** The students study the ways of definition of the species diversities of barley.

**Necessary training and visual aids.** Literature, manual for conducting practical and lab training on the subject of selection and seed production of grain and grain-bean crops, herbariums on the ear and stalks of barley, source of internet, lab note books, pencils, rulers and erasers.

The species diversities of barley are defined on the following morphological traits:

1. Film coating of kernel or naked .
2. Density of ear – friable or dense.
3. Awned and ear structure – awned or awnless.
4. Indentation of awns – serrated or smooth.
5. Color of ear – yellow or black.

**1<sup>st</sup> work.** The students by using literature, source of internet or appendixes 5 and 6 learn the diversities of barley and draw the following tables (tables 18 and 19) in their note books for filling in them with needed data.

Table 18 **The main diversities of common barley.**

Species diversities	Density of ear	Awned	Indentation of awns	Ear color	Film coating of kernel
1. Pallidum	Friable	Awned	Serrated	Yellow	Film coated
2. Nigrum					
3. Ricotense					
4. Parallelum					
5. Coeleste					
6. Horsfordianum					
7. Trifurcatum					
8. Leicorrhynchum					
9. Pyramidatum					

Table 19.

**The main diversities of two-row barley.**

Species diversities	Density of ear	Awned	Indentation of awns	Ear color	Film coating of kernal
1. Nutans	Friable	Awned	Serrated	Yellow	Film coated
2. Medicum					
3. Nudum					
4. Persicum					
5. Erectum					
6. Hugpicans					
7. Deficiens					
8. Nudideficiens					

**Answer the questions related to the considered context:**

1. What do you know about intermediate barley?
2. What significance has the study of barley diversity?
3. Are the wild species of barley used in the breeding?

**Glossary:** Domesticated – окультурованный- маданийлаштирилган; subspecies- под типы- кенжа турлари; common barley- многорядный ячмень- кўпқаторли арпа; two-row barley- двурядный ячмень- икки қаторли арпа; intermediate barley- промежуточный ячмень- оралиқ арпа; derived from – происходивший от- нимадан дир келиб чиққан; film coating of kernal or naked- плёнчатость зерна или голое- қобикли ёки ялонғоч; friable or dense- рыхлый или плотный- сийрак ёки зич; awned or awnless- остистость или безостость- қилтиқли ёки қилтиқсиз; indentation of awns – зазубрённость остей- қилтиқларининг тишлилиги; serrated or smooth- зазубренный или гладкий- тишли ёки силлик; appendix- приложение- илова.

11 – laboratory training.

**Study of variety, farm - valuable traits and biological properties of oats.**

This crop is the source of feeding for man and agricultural animals (photo 22). According to data information it is clear that in the texture of oats grain consist of albumin -10 – 15 %, starch – 40 – 60 %, fat - 4 – 6 % and cellulose – 8 – 10 %.



Photo 22.

**Appearance of oats**

**The aim of the training.** Study of the traits of variety, farm valuable and biological properties is the aim of this training.

**Necessary training and visual aids of the lab to conduct this training:** teaching and laboratory manuals, lecture and lab copy books of the student, literature, herbariums out of oats plants, samples of oat seeds, table database for oats, pencils and eraser.

Variety traits of oats varieties usually remarkable in the breeding and seed production of grain crops are:

*Stalks* – strong, erect standing, dense, half spread, circle, weakly bended, spreading, without hair, greenish, greenish blue.

*Leaf* – lancet, sharp ending, wide, wrinkled or smooth, greenish, dark – green, with ligula or without it, surrounded with tooth or free of tooth.

*Panicle* – spread or compressed, half compressed (one facet), white colored, yellow, length of 19 to 25 cm (photo 22).

*Spikelet* – bulging, double or even with four flowers, seldom single flowered. Depending upon varieties the spikelet may have 35 to 45 tassels. On the surface of scale there are 5 to 9 lines, the shape is concave, egg shaped, lancet, ended with two awns.

*Grain* – oblong or spindle like, haired depending upon variety or bared, light white, brown, it has prolonged furrow, with awns or free of awn, base of awn painted, tiny or enlarged (photo 23).



Photo 23.

**The grains of oats.**

**1<sup>st</sup>task.** The students by the means of literature, herbariums of plants and grains of oats monitor the variety traits of oats varieties and filled out summarizing and drawing in lab copy books as above mentioned order.

**Farm valuable traits of oats.** The productivity, resistance to lodging, precocity, shattering of grain, availability of the grain coating, double grain,

tubing, amount of albumin and fat, evenness of grain, tolerance to drought, resistance to smut and rust are farm valuable traits of oats varieties.

Profitable crop of oat varieties is the outcome of traits and properties of oats varieties depending upon growing conditions. Growing of productivity on the account of tuber establishing does not approve in the literature because of such approach likely leads late maturity, different ripening and unevenness of grains.

Only the productivity of panicle turns out a sign providing the productivity of plants. At this situation the productivity depends only upon the quantity of grains and their weight. The amount of grains in the panicle of varieties is the one of the stable traits. Specially noted, that the amount of grains in the high agro practice growing conditions may attend from 100 to 120.

Resistance to lodging. Integrated attention is paid to enhancing of resistance to lodging and productivity in the breeding practices. The selections have resulted in shortening of stalks and increasing of yield indexes. Owing to reason of good consumption of hay by agricultural animals it does not considered reasonable to decrease of the stalks more than 75 – 80 cms. That is why, breeding trends focused on strengthening and flexibility of stalks, widening and elongation of stalks between nodes, development of roots and providing of compressed and branching forms of panicle.

**2<sup>nd</sup> task.** By the means of literature, get together into groups of oats varieties developed by world and native scientists on the following traits: precocity, shattering of grains, seed coating, double grain, tubing, amount of albumin and fat, evenness of grain, tolerance to drought, resistance to smut and rust diseases causing agents.

**Biological properties of oats.** Planting oats in agriculture as a spring crop, the seeds are started to grow at the temperature of 1- 2°C (photo 24). The young seedlings tolerant to the low temperature as -3 – 5°C, and even to -8, 9°C. By the further lowering the growing and development are inhabited. For the normal development at the time of germination and tubing it requires the temperature of 15

-18°C. Totally, to vegetation of precocity varieties require 1000 – 1500°C, middle maturing varieties -1350 – 1650°C, and the late ripening varieties - 1500 – 1800°C.

In comparison with other crops the oats is more moisture response crop. Transpiration coefficient of which is equal to 430 – 500. To much requiring period of plants to humidity is remarked at the time from setting of tubers up to panicle establishment.

Oat doesn't response to soil. It is able to grow in the sandy soil, clay and in the boggy soils.

Oats also considered as the one of the soil acidity tolerant crops (up to PH -5 -6 ). The roots have possibility to assimilate from soil hardly soluble nutrient substances. In regard to nitrogen it has a high response than other crops.



Photo 24.

**The early seedlings of oats.**

**3<sup>rd</sup>task.** To describe about the achievements and problems of oats breeding and its seed production on the base of characteristics of varieties studied in the

lecture courses and on the data about the biological properties of commercialized varieties throughout the republic and either on the base of tables and state registers.

**The questions:**

1. Why the oats is considered as the feeding crop?
2. What traits of oats plants comprise the variety signs of varieties?
3. On what traits have to pay attention the breeders to enhance the productivity of varieties?

**Glossary:** strong- крепкая –мустахам; erect standing- прямостоящая- тик турувчи; compressed - плотная- зич; half spread- полу раскидистая- ярим таркоқ; sharp ended- остро конечная- ўткир учли; there is legula on the base of leaf- имеет язычок в основе листа- барг асосида тилчаси бор; concave shape- форма вогнутая- чўккан шакл; prolonged or spindled - продолговатая или веретеновидная- узунчоқ ва тўкмоқ; oblong furrow- продольная борозда- узунасига арик; grain shattering- осыпаемость зерна- дон тўкилувчанлиги; focused on the strengthening and flexibility of stalks- сосредоточиваются на укреплении и эластичности стебля- мустахамланиши ва эгилувчанлигига эътибор қаратилади; more moist response- более влаголюбивое- нам севар; from tuber setting up to panicle establishment- от трубкообразования до метёлкования- найча ҳосил қилганидан рўвак шаклланганича; hard soluble- труднорастворимый- қийин эрийдиган.

12-laboratory training.

**Study of variety characteristics, valuable farm traits and biologic features of triticale varieties.**

Triticale had artificially been created as a hybrid plant between wheat and rye by the scientists and has been entered in the history of the XX century (Ан Хе Сунг and others, 2017).

The part “triti” in the name of triticale was taken from Latin name of wheat and “cale” from Latin name of rye, which in together mean the name of the newly developed plant. For plant’s significance in the national economy it has become one of the great achievements reached by the plant breeding in the last century (photo 25).



Photo 25. **Plants of triticale at their spiking stage.**

**The aim of the training.** Study of the valuable traits and biological attributes of triticale varieties is the aim of training.

**Teaching and laboratory appliances are needed.** Teaching or methodical manuals for practical and laboratory trainings of grain and grain-bean crops, state register for agricultural crops, herbariums of plants and ears of triticale from different varieties, lecture copy-books, literature on grain crops, tables on valuable economical traits of triticale varieties, laboratory copy-books, pencils, eraser and rulers.

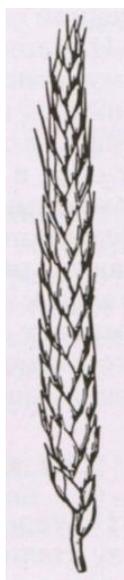
**Economically valuable traits of triticale varieties.**

The varieties of Prag serebristiy, Tuyimly, Bakhodir, Mnogozerniy-2, Prag-1 and Uzor are grown in the irrigated agricultural lands of our republic.

Productivity is the main economical characteristic. Specially, its productivity in regard to heredity is a complicated sign and hereby it depends upon the number of plant's spikes, size of the spike, the number of grains per spike and also the size of every grain. In the evaluation of spike in comparison with parental plants of wheat and rye, it is described as a little longer than wheat, and more heavy and shorter than rye (photos below).



**Wheat spike**



**Rye spike**



**Triticale spike**

On the differences of grains, the grain of triticale is longer than wheat, and is too heavy, longer than rye and the appearances are dimmed than both (photos below).



**Wheat grains**



**Rye grains**



**Triticale grains**

Triticale is resistant to powdery mildew, lodging and other harmful stresses. It is food, concentrated fodder and forage crop for farming.

The grain of triticale has a rich structure with albumin and lysin, irreplaceable amino acids like triftofans. It contains protein of 3-4 % more than wheat, on gluten it is equal to wheat but 2-4 % is more than rye but the quality is slightly inferior. The grain of triticale in viewpoint of its reprocessing for bread baking (by mixing with wheat flour), in getting ready of confectionary products and beer brewing, in the preparation of combined fodder (or mixed fodder) for livestock has an immense importance in the national economy. Harvested green mass and produced silos of triticale have more superior digestive features (from 0.1 to 1.0%) than wheat and rye (photo 26).

**Prag serebristiy.** This variety of triticale has been developed by the cooperation of Uzbek and Daghistan plant breeders. It was entered into the state register for growing in all regions of the republic. The plants of this variety are resistant to frosty temperatures of the winter.

The height of stalk reaches up to 140 – 150 cms. and has a good bushy performance. Vegetation period is differentiated within of 178-183 days. The weight of 1000 seeds equal to 49-50 gs. Productivity, on the cutting of green mass makes of 302-305 c\ha, grain yield gives 38-41 c\ha. Hay yield productivity consists of 64.3 c\ha.

**1-task.** Study of farm valuable characteristics of triticale varieties like Tuyimly, Bakhodir, Mnogozerniy-2, Prag-1, Uzor and other recently developed

varieties entered in the list of state register and rewriting them in copy books in the order as above.

**Biological attributes of triticale varieties.**

The seeds start to grow at the temperature of 3-4°C and get speed in the retaining seeds by the rising of temperature. Biological response to the temperature varies depending upon the precocity of varieties and within 6-8 days it covers all surface of the ground (photo 27).



Photo 26. **Harvest of green mass in the fields of Pirag serebrictiy.**

Bushing of triticale occurs in the 34-37 days after germination of its seeds. Bushing depends on the plant stand density and accounts for 2 to 6 of normal



Photo 27. **Germination of triticale seeds in the field condition.**

bushes per plant. The bushing of plants starts in autumn and by the withstanding at winter temperatures of  $-18$   $-20^{\circ}\text{C}$  it completes the last bushing stage in spring (photo 28).

Shooting stage starts in the days of 140, 145 after seed germination. And ear forming gets started after 154 through 163 days. The milky ripeness passes in the days of 184 and 202. Waxy ripeness is observed in the days of 196 through 218. The days of 206 through 225 are considered as the conclusion of full grain ripening and will be an appropriate terms for grain harvesting.



Photo 28. **Fall bushing**

**Spring bushing**

**2-task.** Forecast the periods of developing stages of recently registered triticale varieties by keeping into mind their biological features.

### **Answer the questions:**

1. What was the history of triticale developing?
2. What terms do content of farm valuable traits of triticale varieties?
3. What are the biological features of triticale?
4. What varieties have been recommended for planting by the last year register?

**Glossary:** artificially- искусственный- суний; together means- означает вместе- биргаликда билдиради; spiking stage- фаза колошение- бошоқлаш даври; heavy-плотный- йўғон; is dimmed- мутный- хира; powdery mildew- мучнистая роса- ун шудринги; harmful stresses- вредные стрессы- зарарли стреслар; combined fodder (or mixed fodder)- корма (или комбинированный корм)- ем; an immense importance- большое значение- катта аҳамият; frosty temperatures- морозные температуры- музлаш хараротлари; bushy performance- кустование- тупланиш; response to- требование к чему нибудь- талаби нимагадир; to withstand- перетерпение- қарши тура олиш; shooting stage- фаза трубкование- найчалаш даври; waxu ripeness- восковая спелость- мум пишиши; an appropriate terms- оптимальные сроки- қулай муддати; forecast- прогнозировать- башорат қилиш; recently- недавно- яқинда;

13-laboratory training.

### **Study of farm valuable traits and biological properties of corn varieties and hybrids.**

Corn is one of the major grain and forage crops in the world agriculture and it ranks third on its planted area, the first on the productivity and the second on the gross harvest (photo 29).



Photo 29.

**Plantation of corn**

**The aim of the training.** Study of the farm-valuable traits and biological attributes of corn varieties and hybrids is the aim of this training.

**Necessary literature and laboratory aids.** Teaching and methodic manuals for grain crops, table data for corn varieties and hybrids, herbariums prepared by the help of corn cobs and plants, the last issue of state register of Uzbekistan on agricultural crops, copy books for lecture and practical classes, pencils and erasers.

Productivity, precocity, grain quality, resistance to diseases and pests are **farm-valuable traits** of corn.

Productivity of corn depends on the number of cobs per plant, size of a cob, number of grains per cob and weight of 1000 grains. Today, a great interest is being regenerated by the breeders to the creation of multi cob shapes of plants in the increasing of productivity. This explained by the stable maintenance of cobs

number growing and productivity of hybrids, in spite of the years with unfavorable climatic conditions. Two, three and many cob accessions are existed among of collection materials and broadened researches are executed by the breeders for further enhancement of corn productivity (photo 30).

Precocity of corn has made possible to widening planting areas of farms to produce grain and thereby in rapid accumulation and maturation of yield, and provides them to radically enlarge the gross product.

Introduction of early and middle ripening hybrids to get silos leads to improving of nutritious dignity of food for agricultural livestock. That is why, along with accelerating of milk and wax maturation occurred early and plump accumulation of dry substances in the texture of lives, stock and cobs.



Photo 30.

**The new, two cob strain of corn**

The quality of corn grain is characterized by the insurance of carbon availability (up to 65-70 %), albumin (up to 9-12 %), oil (up to 3-5 %) and ashes

(up to 2 %) in the structure of grain for manufacturing of flour, fodder, starch and other food products (bunch of photos 31).



**Bunch of photos 31      Products of corn**

The creation of hybrids with structural stabilized amino acids and improved quality of protein is the most important trend of grain quality in today's breeding. Because, by the way of protein increasing up to 16-20 %, the decreasing of valuable lysin and other amino acids in the structure of albumin is observed.

Corn is infected by more of 40 fungi, bacterial and virus nature disease agents. The most destructive of them are powdery mildew, loose smut, mosaic leaf and others. These diseases damage stocks, leaves and cobs of plants that cause of entirely destroy of harvest (photos 32, 33).



**Photo 32. A cob injured by powdery mildew of corn**



**Photo 33. Leaves infected by mosaic leaf**

Corn suffers from attacks of more than 25 pests. From them corn or stock butterfly and also corn aphid or corn leaf aphid are listed as the most injurious. Caterpillar of corn butterfly damages the leaves, grain in the cobs, pith and nodes of cobs. In the result of that the stocks break or lie down. By this not only worsening or decreasing of crop quality but the results of technical harvest of crop are also lowered. The aphids of corn or leaves slow down the whole development of plants in the field. Decrease the efficacy of applied fertilizers to feed plants is occurred. The harvested grain at the end of harvest presents inferiority and inadequate quality (photos 34, 35).



Photo 34. **Corn butterflies**



Photo 35. **Damages made by caterpillar**

Therefore, the goals of incorporation the genes controlling of complex resistance to diseases and pests into genotype of newly developed hybrids posed before the breeders, who were taking up with corn selection.

The varieties of Uzbekskaya zubovidnaya, Uzbekskaya -100, Kremnistiyy UzROS and hybrids Uzbekskaya 601 ESV, Karasuv 350 AMV and many others were developed in various years and had been included into state register to plant in the production.

Currently, in the state register (2017) can be seen two hybrids: Uzbekskiy 400 DR and Uzbekskiy 300 MV.

Uzbekskiy 400 DR is the bred hybrid by the Uzbek scientific experimental station of corn and sorghum. It was recommended in 2009 for the growing in the regions of the republic of Uzbekistan.

A common hybrid. It belongs to the toothy type of corn. The height of plant is an average of 225-235 cm. Vegetation period is 109-112 days.

Weight of 1000 seeds is an average of 240,0-250,0 g. An average it yields of 60,0-65,0 c/ha. Grain output consists of 68,8%. Resistant to lodging.

Its damage from agricultural diseases and pests was not observed in the years of trial.

**Task 1.** Prepare the information about corn damage made by the corn aphids or leaf aphids' and from other local pests and outcomes, achievements of breeders in controlling them.

**Task 2.** Study of farm-valuable traits of the second hybrid Uzbekskiy 300 MV, included into state register and to explain the difference from above listed varieties and hybrids.

**Biological attributes.** Response to light is one of the biological attributes of corn. In this point, corn reacts not on duration of the day but on the intensity of the light. The crop is also responsive to heat. In spite of its tolerance to low temperature (-2-3°C) at the time of initial development, its growth and development are delayed in successive temperature conditions of 15°C. Contrarily, along with the rising temperature by 45-50°C, the plants are also lagging behind in their developments. On the response to humidity, corn is distinguished in its various periods of growth. The highest response to humidity arises at 10-15 days prior to panicle setting and continues up to period of milk grain maturity.

The scholars of the Tashkent state agrarian university are carrying out the researches with the aim of study the responses of collection accessions to humidity and light for optimizing them in the newly developed hybrids (photo 36).

**Task 3.** Investigate the biological responses of corn hybrids Uzbekskiy 400 DR and Uzbekskiy 300 MV by using of literature and experiment data.

**Answer the questions:**

1. Why are being grown mostly corn hybrids in the production?
2. What farm valuable traits are improved in the breeding of corn?

3. In what purpose of hybridization is concluded the improving of biological attributes?



**Photo 36. Nurillaev Ilkhom, a student of 3 course, 76 group on the teaching direction of breeding and seed production of agricultural crops studies corn hybridization in the experimental-research station of the Tashkent state agrarian university (2017).**

**Glossary:** Forage crop- фуражный культур- хашаки экин; gross harvest- валовий сбор- ялпи ҳосил; plant cobs- початки растений- ўсимлик сўталари; last issue- последний выпуск- охирги сон; regenerates the great interest- появляется огромный интерес- катта қизиқиш ўйғотади; wax maturity- восковая созреваия- мум пишиш; ashes- золь- кул; powdery mildew- мучнистая роса- ун шунринг.

14-laboratory training.

### **Study of corn subspecies.**

Corn is an annual crop, American continent is guessed as its primary and secondary native land. But, currently it has distributed to the continents of Asia, Europe, Africa and its grain has become daily food for the people of many countries (photo 37).



Photo 37. **One of the favorite foods made from corn grain.**

**The aim of the training.** Study of corn subspecies by the students is the aim of this training.

**Necessary training aids.** Notebooks for the lecture classes of the subject, methodic and teaching manuals for grain crops, scientific literature on the corn, internet source, notebooks for laboratory classes, pencils, rulers and erasers.

*Zea mays* L. is the only domesticated species. 8 subspecies of the *Zea mays* L. are existed:

Dent corn – *Z. mays*, ssp *indentata* Sturt.

Flint corn –*Z. mays*, ssp. *indurate* Sturt.

Starchy corn – *Z. mays*, ssp. *amylaceae* Sturt.

Sweet corn – *Z. mays*, ssp. *sacharata* Sturt.

Pop-corn – *Z. mays*, ssp. *everrta* Sturt.

Waxy corn – *Z. mays*, ssp. *ceratina* Kulesh.

Pod corn – *Z. mays*, ssp. *tunicate* Sturt.

Starchy-sweet corn – *Z. mays*, ssp. *amylessacharata* Sturt.

The first five out of them have agricultural significance (photo 38). The grown varieties and hybrids of corn are considered as the created from one of them or by their participation at the breeding process.



Photo 38. **Cobs and grains of corn:** 1- flint corn; 2-starchy corn; 3-dent corn; 4-pop-corn; 5-sweet corn.

**1<sup>st</sup> work.** The characteristics of subspecies are studied by drawing of lower presented table and by its help on the base accepted traits (appendix 7). The characteristics of varieties, cobs and grains of variety and hybrids pertaining to the subspecies available from the deposits of laboratory are analyzed, examined the results with the data of appendix 7 and write in needed columns of table 20.

Table 20. **The characteristics of corn subspecies and their varieties and hybrids.**

Corn subspecies	Variety or hybrid	Appearance of grains.	Pod of grain	Color of grain	Structure of endosperm	Starch content in grain, %.	Albumen content in grain, %.
1.Dent corn							
2.Flint corn							
3.Starchy corn							
4.Sweet corn							
5.Pop-corn							

**1<sup>st</sup> task.** To collect important information about breeding and seed production of corn subspecies from internet and other sources.

**Answer the question related to studied topic:**

1.What do you know about the subspecies of waxy corn, pod corn and starchy-sweet corn?

**Glossary:** Primary and secondary native land- первичная и вторичная родина- бирламчи ва иккиламчи ватани; accepted traits- принятые признаки- кобул қилинган белгилар; information- информация- маълумотлар; pod of grains- пленчатость зерна- донларнинг пўстлилиги; starch- крахмал- крахмал; albumen- белок- оқсил.

15-laboratory training.

**Study of variety, farm valuable traits and biological properties of sorghum varieties.**

**The aim of the training.** Teaching the students the variety and farm valuable traits and biological attributes of sorghum varieties is the main aim of the training.

**Necessary teaching aids.** Lecture note books of students, text books and manuals, placards, sorghum herbariums, registers, lab note books, pencils, rulers and erasers.

Sorghum is one of the oldest growing crops in the world agriculture and occupies the fifth place after wheat, rice, corn and barley (photo 40). According to available



Photo 40.

**One of the sorghum plantations**

data, in the turn of the 20<sup>th</sup> century it was grown on the area of 140 thousand hectares throughout the Uzbekistan and the productivity of grain makes 24-28

centners per hectare. Currently, the planting area has considerably reduced. The productivity of grain ranges around of 10 centners.

Order of Sorghum consists of 4, extensively growing species: *S. vulgare* (common sorghum); *S. chinense*; *S. cernuum* (sorghum) и *S. sudanense* (Sudan grass).

**Variety traits of sorghum varieties:** height of plants, resistant to wind affects, number of stalk nodes, number, shape and downy of leaves, shape, length and color of panicle legs, shape, size and presence of grain capsules (photos 41,42)

1-work. The students analyze the variety traits of plant by using herbariums and sorghum varieties stored at the laboratory on the base of above listed data, fill up the drawn table in their note books with the eventual data (exemplary table 21).



Photo 41. **Stalk, leaves and panicles of one of sorghum diversities.**

Table 21

**Variety traits of sorghum varieties.**

Varieties	Analyze date:					
	Height of plants, cm.	Broken stalks, unit \relatively.	Number of nodes, unit.	Number, shape, color of leaves.	Shape, color, length of panicle	Presence of capsules, shape, size and color of grain.
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

Farm valuable traits of sorghum varieties. Grain and forage (common), panicle and other species of sorghum are existed in agriculture. Grain, silos, green mass, hay and other feeding product diversities are produced from them to agricultural cattle rising. The grain consists of 12-13% of protein, 70-75% of starch and 3-5% of oil. 1kg grain is equal to 1.3 feeding units, and 1kg of silos is either equal to 0.24 feeding units.

An accelerated development, multi-cutting, precocity, productivity and presence of valuable feeding substances in the texture of grain are those, what have been accumulated in sorghum is needed by the peasant from plants which has extraordinary significance for farm either (photo 42).



Photo 42. **The seeds of sorghum diversities**

On the precocity of sorghum, there are China's sorghum dwarfs, grain accessions with vegetation periods of 80-90 days (photo 43), which deserve as the quality of important materials to breeding process. In the collections of the SRI of plant growing there are selection diversities of sugar comprising forms with the productivity making of 10 ton of grain, 60-70 ton of green mass per hectare and 22-29% of sugar content in the grain texture. The amount of albumin in the structure of grain in some of the varieties gets up to 19.3% and at this, it contents 3 and more per cent of lysin, which is one of the irreplaceable amino acids. With such of indexes the sorghum presents itself as the one of the incomparable forage crops for animals in the farm. The variety diversities comprising useful substances for the health of human are preferably grown by the people and extensively used the seeds to consumption. But, the grain in the panicles of many varieties remain without protection in the regard of birds attacks and it seems as easy getting to them and this leads to lose of the most part of expected crop of grain. Therefore,

this situation remains in the breeding one of the problems to be solved. Decision of this problem promotes to use the farm valuable traits of sorghum more fully.

By the side of land users of our republic are being grown many varieties of sorghum: Dualet, Dwarf Uzbekistan, Uzbekistan 5, Uzbekistan 18, Taskentskoye belozernoye, Karabash, Oranjevoe 160 and many others.

**Dualet.** The bred variety of the scientific – research station of corn. It was evolved by the crossing of hybrid population of local six month variety with dwarf sample of sorghum Khigery.

Botany characteristics: the grains are white, without seed coat. Weight of 1000 seeds makes 30.0-32.0 g. The stalk is green and juicy. Height of plant makes of 170.0 cm.

Panicle is like an egg shape, longer, dense, enlarged with length of 22.5-25.0 cm.

Agrobiological characteristics: the variety is middle ripening, vegetation period consists of 125-130 days. Resistant to salinity and drought.

Farm characteristics: Productivity of grain gets about 55.0-60.0 centners per hectare, yield of green mass makes 220.0-240.0 centners.

Since 2010 it has been included in state register for producing good grain forage in the farms situated in all water deficit regions of Uzbekistan and the republic of Karakalpakistan.

**1-task.** To make summarized material about farm-valuable traits of newly regionized sorghum varieties.

**2-task.** By the help of the materials of summary to point out what seed in the photo ... similar to what variety.

**Biological attributes of sorghum:** sorghum has an extraordinary resistance to heat, drought and to soil salinity. Response of sorghum to warm weather is dominated compared to millet and corn. Because, it is lost at the temperature of -2 -3°C. The seeds require the temperatures: to germinate 12 -16 °C, optimal temperatures of 14 -15 °C at the time of blooming and 20 -35 °C for getting maturity. The sum of active temperature for vegetation makes 2250 - 2500 °C. Response of the varieties to day light consists of: on the early ripening varieties 90-

105, middle ripening -106-120. On the biology of blooming, sorghum belongs to cross-pollinating plants.

Sorghum may be easily grown in the extensive dry farming areas of the republic. Transpiration coefficient of which makes 150 – 200. Its persistence to retain green color of leaves at the time of entire maturity is an another possibility.

Sorghum presents a great potential to regions of the republic subjected to soil salinity. It demonstrates persistence to the soil condition of salt concentration up to 0,6-0,8 % (photo 43).



**Photo 43. Farmer Achilov Safar in the farm of Chuly Gulistan, Zarbdor district Djizzakh region inspects the persistence of sorghum diversities to indigenous saline conditions (2017).**

**3-task.** Define biological attributes of newly developed sorghum varieties by using breeding and seed production materials. On the base of identified biological attributes to forecast the probable regions of their extension in the future.

**Questions:**

1. What kinds of sorghum are grown in Uzbekistan?
2. What is the difference of sudan grass from common sorghum?
3. What problems are facing to sorghum selection and seed production?

**Glossary:** manuals- пособия - қўлланмалар; ancient species- старинные виды – қадимги турлар; number of nodes- количество междуузлия – бўғин оралиғи; length of panicle legs- длина ножки метёлки- рўвак оёқчаси узунлиги; availability of capsules- наличие оболочки – пўсти борлиги; forage- фуражные - хашаки; gets up to- доходит до - .. гача; incomparable- несравнимый - тенгсиз; cross-pollinating- перекрестно-опыляющий – четдан чангланувчи; persistence- адаптация- мос келиши.

16-laboratory training.

**Study of variety characteristics and farm valuable traits, biological properties of rye varieties.**

Common rye is cultivated plant, it is grown mainly in Northern hemisphere. There are winter and spring diversities of rye (photo 44).



Photo 44

**Appearance of rye field.**

Germany, Russia and Poland are leading on the growing of rye. In 2011-2016 in the share of these three countries made of 60 to 68% of the world's production (table 22).

**Table 22 Rye production in the years (data from FAO), thousand tons.**

Countries	1985	1995	2005	2013	2016
Germany	-	4521	2812	4689	3174
Russia	-	4098	3628	3360	2541
Poland	7600	6288	3404	3360	2200

**The aim of the training.** Teaching the students about origin, grade, farm valuable traits and biological properties of rye varieties is the aim of this training.

**Necessary teaching aids and appliances.** Literature on the breeding and seed production of grain crops, teaching and visual aids for practical and laboratory trainings, the map of centers of cultivated crops' origin, summaries on lecture and lab trainings, herbariums made by plants of rye varieties, seed samples from varieties of rye, pencils, erasers and rulers.

Only one variety of **Vakhshskaya 116** (photo 45) has been registered in the state register to plant in the agricultural fields of the republic. This variety was released



Photo 45. **Field planted to variety of Vakhshskaya 116.**

in the Vakhsh department of the Tadjik Scientific Research Institute of Farming, through pollination of wild rye 7323 and winter rye of Bernub 9939 with multiple selection and repeated individual selection in the succeeding generations at the breeding process.

The authors of the variety are N.S.Parishkura, M.K.Zarshikov, N.V.Livov and M.Rakhmanov. It was included into state register in 1983 to plant in the irrigated lands for intermediate crop to produce green forage.

Variety belongs to plant diversity of vulgare. Plant canopy is erect, branches are amply developed, height of bush reaches to 76-110 cm, and tight. Color of leaves is green, the spots absent on the leaves. Color of ear is white, prismatic, the length of ear is 14-20 cm. Awn of ear is white, it grows straight, its length is 3 cm. Glumes of ear are like an arrow with the length of 10 mm. The grains have light-brown color with mean length with smooth basic of grain, weight of 1000 grains makes of 18,0–20,0 g.

Origin of intensive varieties as Kalinka, Lota, Biruza, Kharkovskaya-60, Saratovskaya 4, Tatarskaya 6, Sarataovskaya 7 and other tetraploid varieties like Pukhovchenko, Veresen, Zavel-2 is closely integrated with species of *S.cereale* L. Some of desirable genes from other species diversities were used in the breeding process for creating them.

**1 task.** By the help of literature to collect data on breeding significances of varieties and 6 species of rye which had not been mentioned in this text.

**Variety traits of rye varieties.** The next morphological characteristics are used to differentiate one variety from another variety of rye: the shape of canopy, height, shape of leaf, presence of spot on the surface of leaves. The shape of ear is prismatic which easily narrowing up to top with ellipsoid form (collection of photos 46-49). Length of ear is short, a mean length and occurs longer. If the



Collection of photos 46-49. **Spikes and grains of various rye varieties.**

length of the ear is up to 8 cm, it considers as short, the mean is from 8 to 12 cm and in the case where the length of ear longer than 12 cm, such variety is called as a long ear rye.

Closely packed ear (number of ears in 10 cm). Presence of 32-35 ears in one ear refers as thinned, a mean at 36-39 and 40 to more is called as variety with closely packed ear.

The awns may be short, at mean length and longer. It is short, when its length is at least of 1 cm, a mean – 1-3 cm and longer 3 cm – a long awn variety.

The state of awns is being as brittle, rude-strong and tender and also joined to ear, half – bended or bended by the side.

Color of grains may be yellow, bluish and brown (take a look at collection of photos 46-49).

Length, inner and appearance of grain. Length of grain (it is longer if the length of grain is longer than 8 mm), mean (7-8 mm) and short (less than 7 mm); size of grain (weight of 1000 seeds): enlarged (more 25 g.), mean size (20-25 g) and small (less than 25 g) appearance of grain- lasted (the length of grain is up to 3.3 in comparison to plumpness) and prolonged (the length of grain is 3.3 time longer than filling of grain).

On the inner appearance of grain the grain may be mealy, semi-glass and glassy.

On the state of grain coupling with flowering lemma (photo 46). In some of varieties, flowering lemma of grain couples with grain and in others on the contrary. Such phenomenon signifies that the variety has resistance to shattering of grain or grain shedding.

The varieties of rye also vary from presence or absence of pappus on the grain top.

**Farm valuable traits of rye varieties.** Rye is the second bread crop in many countries of the world (photo 50).



Photo 50.

**Bread baked from rye flour.**

Bread baked from the rye flour is distinguished for its high calorie, nutritiousness and attractive taste. The albumin in the grain has a high value, rich in irreplaceable amino acids. In its structure it has the vitamins containing of group as A, C, E and V. A 100 gram of product from rye grain consists of 13.7 g water, 8.8 g albumin, 1.7 g fats, 60.7 g carbons, 13.2 g nutritious fiber and 1.9 g mineral substances.

Hay and grain are used as the forage for feeding of agricultural animals in the animal farms (photo 51). Rye grains are considered as lysin saturated and for this

reason it is used as the supplement at the preparation of combined nutritious fodder in the livestock production.

**2-task.** By the help of internet prepare the information material about another manufactures producing from plants and grain of rye.

**Biological attributes of rye varieties.** Rye is also passes through those phonological phases of development as wheat in own ontogenesis. The plants of rye are growing 1-2 days earlier than wheat in the similar condition of growing. On the tillering either it forestalls on 1-2 days. The development of tiller nodes is also built closely (1.7-2.5 cm) to soil than wheat and frequently sets a plant with two or three nodes. The tillering on the rye usually takes place in the fall. In the spring at its 18-20 days, after snow melting begins tuber setting, and via 40-50 days it forms ears. Blooming begins after 7-12 days of ear formation (on the wheat it begins after 4-5 days) and prolongs up to 7-9 days. The milk maturity takes beginning in 10-14 days after blooming and lasts for 8-10 days. Via 2 months after ear setting the rye ripens.

The grains of rye have prolonged period of ripening (vernalization). That is why, rye frequently grows on the spikes.

Rye has less response to soil conditions than wheat. Because of its more developed



Photo 51.

**Feeding animals with the hay of rye.**

roots they able to get deeper of 1.5 and 2 meters. And also has a least sensitiveness to soil acidity.

In comparison to other cereals, rye is a more cold resistant plant (photo 52). At the time of tillering it withstands to 19-23°C of winter colds. The seeds take their sprouting even at the temperature of 0.5-2.0°C. At just of starting of winter it completes its vegetation. Resumes it again by the coming of spring days with the temperature 3-4°C.

Total active temperatures for its growth are: for early ripening varieties 1000-1700, for middle ripening 1200-1800 and for late ripening varieties made of 1300-1850°C.

Rye prefers moisture, at the time of germination, it requires to soak up 50-70 % from its weight. Transpiration coefficient is equal to 400.

Response of rye to water at the time of vegetation grows since the moment of transfer from tuber formation to heading stage.

Rye belongs to the group of cross pollination crops.

**3-task.** By using information from internet and literatures supplement own summaries on the description of biological attributes of rye.



Photo 52.

**Rye at its over winter time.**

**The questions:**

1. Why the breeding of rye and its growing in our republic are not developed in comparison with other crops?

2. What state has the seed production of rye in the republic?

**Glossary:** in Northern hemisphere - северное полушарие - шимолий ярим кенглик; world's production - мировое производство – бутун дунё ишлаб чиқариши; teaching and visual aids - учебные и наглядные пособия – ўқув ва намунавий қўлланмалар; centers of genetic origin - центры генетического происхождения – генетик келиб чиқиш марказлари; only one - один единственный сорт – битта ягона нав; farming - земледельческий – деҳқончилик; intermediate crop - промежуточная культура – оралик экини; closely packed ear - привитой к колосу – дон бошоқчасига ёпишган; is considered - считается – саналади; prolonged - продленные – кенгроқ; longer - удлиненные – жуда узун холатлари; inner appearance - поперечное сечение – кўндаланг кесими; absorb or soaking up - впитывание – намни сингдириши.

17-laboratory training.

### **Study of variety grade, farm valuable traits and biological attributes of millet varieties.**

Millet is grown mainly for getting grain, which is incomparable fodder in the poultry and pig farming (photo 53).

Gruel prepared out of cereals is characterized with its high excellent taste and nutritiousness (or food value) at the people's consuming.



Photo 53.

**The plants of millet varieties.**

More than 50 varieties of millet are existing and successfully grown in the broadened fields of the ICS (Independent Commonwealth States).

The varieties of millet have not been developed in Uzbekistan. The Russian variety of Saratovskoye 853 is planted in the farms. This variety was regionized to grow in the watering and rain fed conditions.

**The aim of the training.** The aim of the training is to study by the students about the variety grade, farm valuable traits and biological attributes of millet varieties.

**Necessary training aids.** The literature dedicated to the plants of millet, teaching manuals for conducting laboratory classes on the subject of field, grain and grain-bean crops, herbariums seeds and plants out of millet varieties.

**Variety grade traits** of millet varieties consist of:

- shape of plant stalks (photo 53);
- shape of leaves and downy of leaves;
- shape of tassel (or panicle) and bent;
- shape and color of grains (photo 54, 55 and 56).



Photo 54, 55 and 56. **The grains of millet.**

**1<sup>st</sup> task.** The plant herbariums of millet varieties are analyze over their variety grade traits. The outcomes of analysis are examined with the characteristics of varieties (practical training of 18 in the teaching manual for practical trainings of field crops). The inferences about variety grade of millet varieties will be done on the base of examination.

Millet is grown in the conditions of Uzbekistan as the basic and successive (or replicated) crop. In the agrarian industry it has the significance of getting two yields of grain a year. Beside this, the little planting rate, precocity and phenomenon to short day are its **farm valuable traits** and they facilitate to rise this crop's worth (or dignity).

The diversities of preparing meals in the cookery out of millet gruel are popular among customers for its unique on the taste and food value.

Alcohol is separated out of millet gruel and added starch, at this the starch of millet is converted into sugar more quickly than rice starch.

Hey of millet fits for feeding of agricultural animals and grain has incomparable importance for the development of pig and poultry farming.

The precocity of millet plants makes of 50 to 120 days. This is why, it considers as the major to peasant within farm valuable traits of millet.

**The biological attributes** of millet connected with its plants warm favor. The seeds of millet start to germinate at the soil temperature of 8-10<sup>0</sup>C. Biological requirement of plants to active physiological development consists of: temperatures at the tillering 18<sup>0</sup>C, making of panicle 20<sup>0</sup>C and at the time of ripening 21<sup>0</sup>C.

The pores of leaves present one of the biological attributes, that is – resistance to hot. In the result of that they provide the normal course of physiological processes, even at the temperature of 38-40.

The nature of short day plant is the other biological attribute of millet. It characterized by the ability of too much fruitfully using of soil in the second half of the year, in the fall conditions of the harvesting year.

Tolerance of millet to soil salinity is the another attribute of millet. Hereinafter, millet is considered as the most suitable crop in the relatively difficult soil and water provisioned conditions of agriculture.

Using of millet as one of the basic crops after winter wheat in the soil conditions of Syrdaria and Djizakh regions has a great economical significance.

Tolerance to drought also is considered a great economical importance between biological attributes of millet. This attribute of millet associated with transpiration coefficient, which is equal to 200-250. Owing to which, the considerable damage is not observed in the conditions of drought. One more rare attribute of millet is its grain ripening from top to down on the panicle.

**2<sup>nd</sup> task.** Learn the attribute of millet varieties' resistance to diseases and pests from found information in the result of working with internet and scientific researches.

**Answer the questions related to the studied topic:**

1. Approximately, at what variety grades were the millet varieties analyzed by you?

2. What farm valuable trait is considered as the basic one for your industrial condition?

3. Has the downy or hairless of leaves connection with the biological attributes?

**Glossary:** In comparable fodder- несравнимый корм – тенгсиз ем; taste and food value- вкус и питательность – таъми ва тўйимлиги; broadened fields- широкие поля – кенг далалар; variety grade- сортность - наводорлик; downy of leaves- опушенность листьев – баргларнинг туклилиги; basic and successive- основная и повторная культура – ососий ва такрорий экин; bent- изогнутость (или наклонность) - эгилувчанлик; diversities of food- разнообразность пици- овқат турлари; unique- уникальность- ноёблиги; pores of leaves- устьица листьев- барглар оғизчалари; tolerance- выносливость- бардошлиги.

18-laboratory training.

**Study of variety grade, farm valuable traits and biological attributes of rice varieties.**

Polished rice is a product cleaned from peel of paddy rice which has become the main meal staff of two third part of world's people. Therefore, the importance of this crop in agriculture ranked second after wheat (photo 57).



Photo 57. **Appearance of one of rice plantations.**

For the full satisfaction of the need of world's people to the rice it is required to develop by breeders the new high productive rice varieties. Abundance and quality of produced rice mostly depend upon variety grade, farm traits and biological attributes of planting varieties.

**The aim of the training.** The students investigate variety grade, farm valuable traits and biological attributes of rice varieties at the time of class.

**Necessary training aids.** Literature dedicated to rice plant, internet source, teaching manual for conducting of lab trainings on the subject of selection and seed production of grain and grain-bean crops and laboratory copy books.

Below listed traits pertain to **variety grade traits** of rice varieties:

1. Panicle state – may be straight dense, like a straight panicle, dense bent, bent panicle (photo 58).

2. Density of panicle – thin (up to 3,2 spikelet arranged per centimeter of panicle), mean (up to 3,3-4,3), dense (from 4,4-5,4) and too dense (more than 5,5).

3. Length of panicle (photo 58) – short (if the length from lower node up to top is short 18 cm). mean (19-25 cm) and longer (longer than 25 cm).



Photo 58 and 59. **Panicles and grains of rice plant.**

4. Downy or hairless of beneath panicle modules.

5. Grains – enlarged, mean, small, elongated and circled.

6. Color of spikelet glume – hey-yellow, red, brown, black and violet.

7. Peel of grain – little (residue of ear and flowering glume is less than 18%), mean (up to 18-20%) and much (more than 20%).

8. Color of modules of stalk – light-green, red, violet and black.

9. Availability of own – owned, without own and half owned.

Spikes of half owned varieties have 10-15 mm apophysis.

10. Color of grains - the grains of regionized varieties are usually white, at times may be red, brown, light-yellow and in other colors (photo 59).

**1<sup>st</sup> task.** By using the characteristics of rice varieties and plant herbariums in depository of the laboratory to investigate variety grade traits through analyzing them over above listed order.

Precocity, fruitful tillering, weight of 1000 grain, shape and amount of kernel are pertain to **farm valuable traits** of rice.

The creation of dwarf varieties has a great significance in the securing of precocity. Vegetation period of 130-140 days is considered as the optimum for our conditions.

Fruitful tillering is necessary to develop the varieties having 3, 4 side branches beside their basic panicles, ripening simultaneously with basic ones (photo 60).



Photo 60. **One of the rice varieties with basic panicle and 3, 4 side branches.**

Circle shaped grain (relation between length and across is 1,6-2) varieties usually are high productive. The amount of kernel in them makes of 85-95%, cereals output is 70-71%. Length grain (relation of length to across is equal to 2,2-3) varieties indicate lower yields. Here, the amount of kernel is 80-85% and the output of cereals is equal to 66-68%.

Productivity, resistance of stalks to lodging, resistance to diseases and pests are **biological attributes** of rice.

The productivity of rice is provided by the number of plants per unit of area, amount of fruitful bushes and yield of panicle.

Yield of panicle depends upon length, density, number of grains and weight of 1000 grains. Here, grain-enlarged and thinned peel of grain have a mighty importance for farmers.

Resistance of stalks to lodging. This attribute of rice is identified by three factors: strength of stalks, height and weight of panicles. The first two are decided by the breeders through releasing of dwarf varieties. These kind of varieties are occupied about 25% of the world area planted under rice. The variety of Uzbekskiy 5 either involved in such kind of varieties.

Annually, 10% of harvested crop is lost by the reasons of plant diseases. Priculyorious is the most injurious of them.

Rice fly, rice midge out of pest and others cause significant damage on the losing and worsening the quality of crop. The creation of varieties resistant to diseases and pests is remaining one of the problems standing before breeders and seed producers. At this, widely using of world gene pool of rice with attributes of resistance is specially emphasized.

**2<sup>nd</sup> task.** To get acquainted with variety characteristics of rice and determine the extent of correspondence of varieties over required farm valuable traits and biological attributes.

**Answer the questions related to above considered theme:**

1. What farm valuable traits consist of variety grade traits of rice?
2. What kind of tires are existed between farm valuable traits and biological attributes.

**Glossary:** Peel of rice grain- шелуха шалы- шоли дони қобиғи; abundance- обильность- мўллиги; dense- плотный- зич; module- узел- бўғин; node междоузлие- бўғин оралиғи; residue of spikelet- остатки колоска- бошоқча қолдиғи; listed order- перечисленном порядке- санаб ўтилган тартибда; output of cereals- выход крупы- ёрма чиқиши; amount of kernel- количество ядра- мағиз миқдори; unite of area- единица площади- майдон бирлиги; world gene pool- мировой генофонд- дунё ген захираси.

19-laboratory training.

**Study of variety grade, farm valuable traits and biological attributes of Lucerne.**

Animal husbandry has also been developed in our agriculture. For enhancing productivity of hey – fodder grass varieties and multiply diversity of manufacturing forages from them increasing of getting products from stock breeding and improving their quality have been foreseen. Lucerne is the very important crop within hey-forage crop (photo 61). The fully assimilation of variety grade, farm valuable



Photo 61. **One of the fields planted to Lucerne.**

traits and biological attributes of varieties by the scholars and specialists of this field is required for efficiently using of Lucerne varieties.

**The purpose of the training.** The students at the class firm their knowledge on variety grade, farm valuable signs and biological attributes of Lucerne.

**Necessary materials to carry out the training.** Teaching manuals for conducting lab trainings on the subjects selection and seed production of grain,

grain-bean and field crops, the characteristics of Lucerne varieties, herbariums on the plants of Lucerne varieties, literature, summaries of lecture classes, laboratory notebooks, scales for weighing of seeds, pencils and erasers.

**Variety grade signs of Lucerne varieties:**

- height of plants, form of branching, state of height;
- extent of hairiness of stalks and branches;
- size of leaves, color and coggedness(photo 62);
- color of flower, size of flower bract and color (photo 63);
- form of cluster, size and spiral form of bean;
- color of matured bean (photo 64);
- size of seed, form and color (photo 65).



Photo 62, 63, 64 and 65. **Leaves, flowers, beans and seeds of Lucerne.**

**1<sup>st</sup> task.** To analyze herbarium binds of Lucerne variety plants on variety grade traits. To compare the outcomes of analysis with the traits has been presented in the characteristics of Lucerne varieties in the 31<sup>st</sup> practical training of the teaching manual on the subject of selection and seed production of field crops.

**Farm valuable traits of Lucerne.** Lucerne is the most valuable crop among perennial fodder grasses. Its importance in the national and agricultural industry is explained by large number of products gained from Lucerne. Various methods in the medicine on the getting of drugs from plants of Lucerne to protect health of people have been worked out by the scientists (photos 66, 67). Green feeding mass,



Photo 66, 67 and 68. **Product diversity taken from Lucerne plants.**

hay (photo 68), breaket, vitamin flour and other kinds of forages are produced for livestock production. Above mentioned fodder products are easily digested in the organisms of animals. These products provide animals all year round with nutritious feeding. All necessary ingredients for ensuring food value of animal fodder are available in the composition of Lucerne products (table 23).

Lucerne is an irreplaceable crop in agriculture as rotation crop for other crops. Lucerne retains the soil from water and wind erosion. It provides the soil with humus. The nitrogen bacterial tubers disposed in the roots of Lucerne accumulate the atmospheric nitrogen in the structure of soil and by this way they improve the fertility of soil which has made it possible to radically increase the productivity of agricultural crops.

Table 23 **Food value of Lucerne (the data of D.L.Abdukarimov, 2007).**

Products	In the composition of 100 kg					Consume- without resi due , %.
	Digesting protein, kg.	Unit of food value, kg.	Calcium, kg.	Phosphorus, kg.	Protein, gram	
Green mass	4.8	21	0.78	0.80	6.5	92.6
Hey	11.6	49	0.77	0.22	4.5	95.0
Lucerne flour	22.8	73		0.17	12.0	100.0

**Biological attributes of Lucerne.** The attribute of Lucerne productivity depends upon soil moisture. That is why, Lucerne is considered as a water

preferable crop and biological response to water is satisfied in the condition of accumulation of 280-350 mm precipitation. In the similar conditions of growing, Lucerne produces stable yields during the course of several years. In the conditions of 350-400 mm and more precipitation, Lucerne produces high and stable yields for many years.

Due to Lucerne's relative resistance to drought and salinity it is planted in all lands of Uzbekistan with different soil and climatic conditions and so promotes the development of agriculture.

**3<sup>rd</sup> task.** Recopy in the lab notebooks the numerical data about resistance of Lucerne to salinity and cold from literature and lecture materials.

**Answer the questions related to studied materials:**

1. What traits of Lucerne are considered as the variety grade traits of varieties?

2. What do you know about farm valuable traits of Lucerne?

3. On the base of what Lucerne has resistance to salinity, drought and cold?

**Glossary:** Hey- fodder grass- сено-кормовых трав- сомон ва эм ўти; efficiency using- эффективное использование- самарали фойдаланиш; to firm their knowledge- закреплять свои знания- ўз билимларини мустаҳкамлаш; form of cluster- форма соцветия- тўпгул шакли; beans- бобы- дуккаклар; large number of various products- множество различных продуктов- кўпчилик турли туман маҳсулотлар; humus- перегной- чиринди; radically- коренным образом- тубдан фарқланувчи.

20-laboratory training.

**Study of variety grade, farm valuable traits and biological attributes of chick pea.**

Chick pea is specially appreciated among bean bearing crops and it is used in various aims of national economy (photo 69). In most cases it is used as food products. In particular, light colored grain variety species are grown for producing food staffs, and dark colored grain ones for feeding of agricultural animals.



Photo 69.

**One of the fields planted under chick pea.**

**The purpose of the training.** The main aim of conducting this training is to improve the knowledge and practical skills of students on variety grade, economic valuable signs and biological attributes of chick pea varieties.

**Necessary training aids.** Various kinds of herbariums of chick pea plant available in the depository of the chair, summaries of students on manufacturing practices, internet source and other training and visual aids for lab trainings.

**Variety grade traits** of chick pea varieties are:

- plant height;
- shape of canopy, shape of stem (photo 70);
- complication of leaf, hairiness and arrangement order of leaves;

- state of leaf stalk, shape and number of stipules;
- generative parts of flower (photo 71);
- shape of beans, size, length (photo 72);
- disposition of the first bean;
- the number of grains in bean, color and plumpness of bean;
- shape of grains, color and sizes (photo 73).

**1<sup>st</sup> work.** The students by the instruction of the teacher select herbariums of chick pea varieties and analyze variety grade traits on the above listed order. The outcomes of the analyses are exhibited as the view of reports.



Photos 70, 71, 72 and 73. **Variety grade traits of chick pea.**

**Farm valuable signs** of chick pea are characterized by the advantage in its growing it in agriculture and also by consuming demand to its products in national economy.

Early ripening of every crop species is the source of many opportunities in agriculture which attracts attention of peasants and industrial manufacturers. Vegetation period of chick pea is various. Early ripening varieties are matured for 65 days. Middle ripening varieties require 70-85 days. While at late ripening varieties their vegetation period accounts for 100, 110 days. Peasants depending on possibilities of their fields select one of above mentioned varieties and use conditions of farming. It is known that there exist everywhere reigning of biological law of inverse correlation between earliness and productivity. Besides, there is an increasing opportunity of selecting from diversities of above listed varieties in regard the conditions of agriculture of northern, steppe, hill sides, irrigation, rain fed and southern regions.

Fitness of chick pea to mechanical harvesting of crop is the another farm valuable trait of chick pea for peasant (photo 74).



Photo 74.

**Chick pea harvesting by mechanical means.**

**Biological attributes of chick pea.** Chick pea plant is one of the most cold resistant plant among legumes. It is also has a great importance for our agriculture. It gives a chance to overcome the problems in case of arising of cold in early spring in foot hill regions which maintains a stable planned yield. From plant breeding point of view, the representatives of Mediterranean and desert ecological groups have the most resistance to cold and considered as the initial materials to improve the local chick pea varieties.

Resistance of plants to the diseases is the next farm valuable traits of growing crops. Chick pea also has a specific diseases and resistance to them is highly evaluated by peasants and plant breeders. Unfortunately, chick pea is severely infected by ascochitosis. Symptoms of infection of chick pea with this disease are emerging of yellow or black spots on leaves and branches of chick pea plants. Depending on disease intensity grains do not develop in beans. The varieties of steppe group and particularly Kubanskiy are breeding materials which are highly resistant to this disease. Besides this disease, chick pea is also infected

by fusarial wilt. In these cases, varieties resistant to this disease, also come to help to peasants.

The best feature of chick pea is non-breaking of beans at the time of maturity. Such varieties as: Kubanskiy 16, Sredneasiatskiy 400, Kievskiy 120, Uzbekistan 8 and others possessing by such properties are not only good breeding material but also they enhance harvesting efficiency of grown crop.

Nutritiousness of chick pea products as for people and so for agricultural animals also has a great importance. Rich content of protein in the structure of grain does not give in other bean bearing crops. Protein in the amount of 18-32 % in the structure of chick pea grain contents such amino acids as lysin, arginin, gistidin, tirasin, sistein and others essential for improving activities of men's and animal's organisms.

**1<sup>st</sup> task.** By using of internet to investigate farm valuable traits and biological attributes of new chick pea varieties. Select suitable varieties adaptable to own regions.

Answer the questions related to the text:

1. What kind of grains has chick pea?
2. Why variety grade and farm valuable traits of chick pea are studied?
3. How the biological attributes are characterized?

**Glossary:** Form of canopy and stem- форма куста и стебля- туб ва поя шакли; complication, hairiness and arrangement order- сложность, опущенность и порядок расположения листьев- баргларнинг мураккаблиги, туклилиги ва жойлашиш тартиби; state of leaf stalk, form and number of stipules- состояние черешка, форма и количество прилистников- бандининг холати, ён баргнинг шакли ва сони; generative parts of flower- генеративные части цветка- гулнинг генератив қисми; size, length of bean- крупность, длина боба- дуккагининг катталиги, узунлиги; disposition of the first bean- местоположение первого боба- биринчи дуккакнинг жойи; number, color and plumpness of bean- количество зерна, цвет, полновесность боба- дуккакдаги дон сони, ранги ва

тўқлиги; consuming demand- потребительский спрос- истемол талаби;  
industrial manufacture- перерабатывающая промышленность- қайта ишлаш  
саноати; steppe, hill sides - степной, передгорный- чўл, тоғ олди.

## **21-laboratory training.**

### **Study of species variety grade, farm-valuable signs and biological attributes of soya.**

According to the data of literature, the growing of soya in Uzbekistan has begun since 1930. It has come from China and the countries of Far East (photo 75).



Photo 75.

**One of the plantations of soya.**

**The purpose of the training.** The students independently, using the laboratory possibilities study variety grade, farm valuable characteristics and biological attributes of soya.

**Necessary training items.** Literature, lecture summaries, internet source, herbariums of soya variety plants, different grains of soya and laboratory devices and scales.

**The variety signs** of the regionized varieties of soya are:

1. Color of flowers- white, yellow and others (photo 76).
2. Color of plants hairiness- white or yellow.
3. Shape of grain- circled, prolonged, egg shaped with nose (photo 77).
4. Color of grain- yellow, green, brown and others.

5. Size of grain- 6 to 13 mm in the length, and 4 to 8.5 mm in the width.

6. Color of the beans' tip - colorless, brown and black (photo 78).

7. Size, color and shape of leaves.

8. Height and shape of plants (photo 79).

**1-task.** By using of literature, herbariums of variety plants stored in the laboratory to analyze their variety grade traits on the above listed order.

Soy is considered as an older ancient crop in agriculture of the world. Availability of much albumin (35-52%), oil (12-27%) and various vitamins: A, B, C, D and E and the deposits of active enzymes in the composition of grains are **the farm valuable signs** of soya among bean bearing crops.



Photo 76, 77, 78 and 79. .

### **Variety grade traits of soya plants**

One of the farm-valuable sign of soya is its palatable taste (photo 80).



Photo 80.

### **Vegetable oil extracted from the grains of soya.**

By the trait of precocity of soya (from 75 up to 200 days) is determined the very enlarged planted area of soya among the oil bearing plants in the world.

The influence of natural selection for the development of super early ripening forms of northern ecotypes is increased with the enlargement of planted area. But in eastern latitude, vegetation period of plants of soya varieties is considerable decreased with frequent rising of low-productive and dwarf plants.

According to data, super northern early ripening varieties of northern ecotype are resistant to cold, blooming and formation of beans can take place at the temperature of 14-16°C. The sum of active temperature at 2800-3500°C is required for the eastern ecotypes (table 24).

**Table 24 Classification of soya varieties depending on vegetation period (Data by D.T.Abdukarimov., 2012).**

Varieties	Vegetation period, from sprouts to maturity, days.	Sum of active temperature, °C.
Super early	At least 80	1700 and less
More early	81-90	1701-1900
Early	91-110	1901-2200
Mid- early	111-120	2201-2300
Mid-ripening	121-130	2301-2400
Mid- late	131-150	2401-2600
Late	151-160	2601-3000
More late	161-170	3001-3500
Super late	More than 170	3500 and more

The parts of plants remaining after taking of yield serve as concentrated fodder to feed agricultural animals.

The trait of plant height varies from 20 to 200 centimetres. At this, the heights of regionized varieties distinguish at the limit of 60 to 180 centimetres. As it is known, that productivity of grain and stalks depend on plant height. In this time of situation, the farmers regarding to their possibility of time and field size for planting prefer to select certain varieties.

**Biological attributes of soya.** Albumin structure of products represents easily digested fraction (up to 94%). Having an enormous amount of irreplaceable

amino acids, in which the amino acid of lysin exceeds by 9 fold than in wheat, than in chick pea for 2-3 fold and 2 fold in comparison with meat.

Three kinds of albumin content products are produced from soya grain on industrial scale:

- 70% of albumin content concentrates;
- isolates (up to 90% of protein) and
- products like meat products.

Oil of soya has more culinary properties on comparison with other oils of plant origin. Because, it has physiological active and irreplaceable saturate amino acids.

Soya is considered as the main oil plant in the world and annually produced 9 million tons of plant oil.

In correspondence of literary data, in about 62 countries of the world soya are grown. For the last 20-25 years the area planted by soya has enlarged to 2.5 times.

One more farm valuable features of soya is the availability of tuber bacteria in the texture of roots. They accumulate nitrogen from atmospheric air in the quantity of 200-250 kilograms per hectare of soil (photo 81).



Photo 81.

**The tubers on the roots of soya plants.**

Plants of soya have attribute to be problem for breeding. That is associated with shading of bean flowers (14-90%), seeds (up to 40%). According to literature data, features of genotype, humidity scarcity, nutrition and influence of short day are the reason of such tribute of soya. Among the regionized varieties it fluctuates in the limit of 15 to 34%.

The top growing bud of plant has an attribute of the restrictor of plants' vegetation period. Determinate and indeterminate forms of plants in an ending of the top of plants with cluster or without it, provide precocity or plants late ripening. The late ripening varieties usually are more productive.

**2<sup>nd</sup> task.** To analyze farm valuable traits and biological attributes of genpool diversities from literature and internet. On the base of outcomes to choose high productive and suitable materials for our conditions.

**Questions concerning to the theme:**

1. How soya is differentiated from other grain-bean crops?
2. From what variety grade and far valuable traits of soya consists of?
3. What of that problematic attribute of soya can be solved in breeding and seed production?

**Glossary:** It has come from- она пришла из- у қаердандир келган; color of bean's tip- цвет кончика боба- дуккак учининг ранги; availability of an enormous amount- наличие большого количества- катта миқдорда борлиги; the sum of active temperature- сумма активной температуры- фаол ҳарорат миқдори; remaining parts- остальные части- қолган қисмлари; concentrated fodder- концентрированный корм- тўйимли озуқа; varies from- варьирует от- дан ўзгаради; differentiates in the limit of- различаются в пределах- холатларда ўзгаради; in this situation- в таком состоянии дел- бу холатда; easily digesting fraction- легко усваиваемые фракции- енгил хазм бўладиган фракция; irreplaceable amino acid- незаменимых аминокислот- алмаштириб бўлмас аминокислоталар; in comparison with meat- по сравнению с мясом- гўшт билан таққосланганда; in the industrial scale- в промышленном масштабе-

саноат миқёсида; plant origin- растительного происхождения-ўсимликдан кеб  
чиққанган; availability of tuber bacteria- наличие клубеньковых бактерий-  
тугунак бактерияларнинг борлиги; shading of flowers- опадение цветков-  
гулларнинг тўкилиши; genotype features- особенности генотипа- генотип  
хоссаси; humidity scarcity- нехватка влаги- нам етишмаслиги; nutrition-  
питание- озиқлантириш; determined and indeterminate- детерминантные и не  
детерминантные- аниқ ва ноаниқ; plant top- кончик растения- ўсимлик  
тепаси;

22-laboratory training.

**Study of variety grade, farm valuable characteristics and biological attributes of common bean.**

Common bean among field crops is considered as a valuable food plant. There are more than 200 species diversities of common bean and only 20 species of them are employed for planting. Mainly, common bean - *Phaseolus vulgaris* L. is grown on the vast areas (photo 82).



Photo 82.

**Field of common bean**

**The purpose of the training.** To teach students the variety grade, farm valuable characteristics and biological attributes of common bean.

**Necessary teaching items.** Literature, internet source, herbariums of common bean plants, their different seeds, lab scales, rulers and pencils, erasers.

**Variety signs of common bean are:**

- form of leaf, color and hairiness (photo 83);
- form of shrub and height;
- form of flowers and size (photo 84);

-form of beans, color, amount of grain (photo 85);

-size of grains (seeds), shape and color (photo 86).

**1<sup>st</sup> task.** The students analyze the variety grade characteristics of herbariums of plants and seeds and enter the taken data in cells of table 25 in front of every variety.

**Farm valuable characteristics of common bean.** Seeds and green beans of plants are used by population (photo 87), both in fresh and canned state. Such products have a nice taste, they are rapidly prepared and easily assimilated by the organism. Seeds contain albumin in the amount of 28-30%, and 18% -in green beans. Except this there is 2% of sugar and 27 mg of vitamins per 100 g of green bean mass.



Photos 83, 84, 85 and 86. **Variety grade characteristics of common bean.**

Table 25. **The results of analyzed plants of common bean.**

Varieties	Variety grade characteristics				
	Form of leaf, color and hairiness	Form of shrub and height	Form of flowers and size	Form of beans, color, amount of grain	Size of grains (seeds), shape and color
1.Ravot					
2.Oltin					
3.Nulifar					
4.Oltin soch					
5.Osiyo					
6.Karalevskiy					
1\13.					
7					
8.					
9.					
10.					
11.					

Early ripening varieties of common bean give an opportunity to gain two crops in a year.

Owing to its high content of potassium it is used in the diet feeding at the atesclorose and at the disorder of heart rhythm activity (photo 88).

Glumes (or pods) of common beans are used in the medicine and known under the name of Phaseoli peticarpium. Extract out of “glumes” lowers the content of blood sugar and increase diures. Common bean is involved in the collection of “Arfazetin”, which is applied at the diabet (photo 89).

If you pay attention to the facts of literature, the native land of large seed species is American continent, and the native land of small seed species is South Asia.

Planted area of the world agriculture maks 27 million hectares with productivity of 3-3.5 tons per hectare.



Photos 87, 88 and 89. **The products of common bean are being used in culinary and medicine.**

**Biological attributes of common bean.** Advantageous property of common bean, in comparison with other field crops is its neutral response to the soil. It is seeded throughout all the regions of Uzbekistan. Thanks to bacteria which lives at symbiosis with root system of common bean, it allows to accumulate 25 kg of nitrogen per hectare at vegetation period (photo 90). The plants of common bean



Photo 90. **Professor of the Sam AI N.KH. Khalilov and scientific collaborator P.KH.Bobomirzaev examine the root tubers.**

are resistant to drought, easily withstand to drought at the time of budding.

Stoma of leaves of common bean depending on the water security is opened or closed. This phenomenon, in its turn permits to economy irrigation water and retain plants' fruit organs.

Chine's bean contains 27-28% of albumin, 62% of carbon waters, 1.3-1.5% of oil and 2.8-5.2% of tissue. All amino acids forming protein composition are presented. Greens and hay are nutritious fodder for agricultural animals. It is seeded even in areas where Lucerne is not sown and thereby it provides continuous provision of forage for animals.

### **Questions concerning the theme:**

- 1.What farm valuable characteristics has common bean?
2. How does common bean response to soil?
- 3.Thanks of what biological attributes the common bean is known ?

**Glossary:** Common bean diversities- разновидность фасоли- ловия турхиллари; consuming by the people- потребляются населением- аҳоли томонидан истеъмол қилинади; easily digestible- легко усваиваются- енгил хазм бўлиши; heart activity- сердечная деятельность- юрак фаолияти; is known under the name- известны под названием- номи билан таниш; applied at the diabet- применяемый при диабете- диабетда қобул қилинадиган; neutral response to soil- неприхотливость к посевной почве- тупрокни фарқламаслиги; able to accumulate- способны накапливать- йиғиш қобилияти; presented albumin composition- входящие в состав белка- оқсил таркибини ташкил қилувчилар; even in areas where- даже в тех местах- хатто шундай жойлар; continuous- непрерывность- доимийлиги.

23-laboratory training.

**Study of variety grade, farm valuable traits and biological attributes of corn field pea - *Vigna sp.***

Corn field pea Chine's or cow pea (Vinogradov B.I. and others. 1987), is an annual grass plant. Grain corn field pea (cow pea) – *Vigna sinensis* has the most distribution area (photo 91).



Photo 91. **Field of cow pea.**

**The aim of the training.** Teaching the students about variety grade and farm valuable characteristics and biological attributes of cow pea is the aim of this training.

**Necessary teaching items.** Literature, internet source, teaching manual for conducting of lab and practical classes on the subject of selection and seed production of grain and grain-bean crops, herbariums of plant canopies of cow pea varieties and their seeds, lab note books.

**Variety grade traits of cow pea varieties are:**

1.Plant height and stoutness of stems correspondingly from 30 to 100 cm and 1,2-1,5 cm.

2.Form of canopy are straight standing, half lodging, trailing, climbing, in some of varieties characterized with rare hairs, greenish (photo 92).

3.The leaves depending upon varieties: disposed on the longer channeled petioles, triple, with egg shaped stipules, rarely hairy, green or dark-green colored.

4.The flowers disposed in the leaf axil, by 2-8 flowers together establish the flower clusters on the longer flower peduncles.

5.Color of flowers – from white to violet.

6.Form of bean, on the form beans are lined, like sabre, cylindrical; length from 7 up to 80 cm, color- yellow or brown. The number of seeds in the beans make of 4 up to 17 units. The beans are hanged down, with firm pods.

7.Form of seeds are oval, kidney formed, circled, smoothed or wrinkled (photo 93).

8.Color of seeds – white, red, brown and black.

9.Form of seed eye – oval.



Photos 92 and 93. **Variety grade characteristics of cow pea plants.**

**1<sup>st</sup> task.** On the characteristics of varieties to examine their variety grade signs by the help of analysis of herbarium plants and on the data presented above to every trait.

**Farm valuable traits of cow pea varieties.** Cow pea is preferable to farmers particularly for seeds which have high germination, unpretentiousness of plants and prolonged period of fruit setting (beginning, dependently on varieties

since 65-80 daily plants after sprouts). From every plant can be taken the yield of 0,5 up to 3, 4 kgs (from trailing or spreading). The beans may be used in the quality of nutritious food for animals (photo 94).The residents of west and central Africa, in the tropic regions of America, in the south and east of Asia, in Russia also widely grow cow pea as the forage crop. The residents of Southern USA consume cow pea in their food (photo 95). May be eaten not only younger beans but the seeds either. The most useful is the sprouted seeds of cow pea, comprising up to 28% of protein and 47% of starch.

Cow pea, either pertain to medicine plants.

The crop harvest begins usually through 40-50 days after sprouts. The green leaves are harvested since their shaping, during of a month or a month and a half. The mature beans are harvested and since when they dried, the pods dehiscence and the seeds get out. Cow pea seeds is a nutritious component in the human diet, as well as a nutritious fodder for livestock feeding.

Similar to other grain legumes, cow pea contains trypsin inhibitors which limit protein utilization.

The protein in the cow pea seeds is rich in the amino acids, lysine and tryptophan, compared to cereal grains; however, it is deficient in methionine and cystine when compared to animal proteins. Therefore, cow pea seed is valued as a nutritional supplement to cereals and an extender of animal proteins.



Photos 94 and 95. **The products of cow pea to feed animals and for culinary.**

In the many regions of the world, the hey of cow pea is considered as the single high quality cereal fodder to feed animals. In such conditions the cow pea is used as the green state (photo 94) as well as in the state of dried fodder. It either is used for application as manure crop, nitrogen fixing or soil erosion control.

**Biological attributes of cow pea.** Cow pea is a warm-season crop, it is well tolerable to semi-shade. It is able to grow in any conditions. But its yield accumulation depends on growing conditions. It requires the soil humidity. In otherwise it shades its fruit components.

Cow pea generally is day neutral. The open display of flowers above the foliage and presence of floral nectaries contribute to the attraction of insects. That is why the cow pea primarily is self pollinating. Two or three pods per peduncle are common and often four or more pods are carried on a single peduncle, which facilitates the easy harvest of upcoming crop.

Cow pea is a warm-season crop well adopted to many areas of the humid tropics and temperate zones. It tolerates heat and dry conditions more than common bean, but is intolerant of frost.

So, cow pea can be grown under both conditions of irrigated and non-irrigated.

**Answer the questions related to the theme:**

1. On what variety grade characteristics does cow pea substantially differ in comparison with common bean?
2. What varieties of cow pea have grown in your farms?
3. What breeding and seed production significances has cow pea, being as a self pollinating crop?

**Glossary:** Grass or herbaceous plant- травинистое растение- ўт ўсимлиги; semi-lodging, trailing, climbing- полулежачие, стелелющие, выющиеся- ярим эгри, ер бўйлаб тарқоқ, баландга ўрмаловчи; channel petioles- желобчатые черешки- навсимон бандлар; axils of leaves- пазухи листьев- баргалар қўлтиғлари; sabre like- саблевидный- қиличсимон; oval-овальная- узун эгри; kidney liked- почковидная- юрак симон; seed eye-

семенной рубчик- уруғ тумшукчаси; preferable- предпочтительно- афзалроқ;  
since the shaping- по мере их формирования- шаклланишига қараб; tolerate the  
semi-shade- переносить полутень- ярим сояга чидамли; petal of flower- венчик  
цветка- гул тожи барги; longer fruit peduncle- длинная плодоножка- узун мева  
новдаси.

24-laboratory training.

**Identification of the weight of 1000 seeds, sprouting energy and germination of barley seeds on the base of accepted method.**

Planting quality seeds of agricultural crops is evaluated by characteristics as clearness, weight of 1000 seeds, energy of sprouting, germination and others.

**The aim of the training.** Study of the methods on defining of weight of 1000 seeds, sprouting energy and germination of barley seeds by the students is the aim of the training.

**Necessary materials and lab equipments.** Teaching and methodic manuals to conduct practical and lab trainings, middle samples of seeds from various barley varieties, lab electronic balance with the measuring precision of 0.01 and special electronic device for accounting seeds (photo 96), sieve, preliminarily



Photo 96. **Electronic lab scale and special electronic seed counter.**

disinfected thermostat, petri dishes, mechanical water sprayer, pot for seed planting, pincers, tiny blades and compressors, copybooks, pencils, erasers and rulers.

**1<sup>st</sup> work.** Subgroups of the students picking out the sacks with seed samples on the barley varieties with corresponding labels at them for determining the weight of 1000 seeds. And then, the data of seeds, accordingly to the lab work orders in one of the accredited central testing lab to analysis seed qualities of agricultural crops rewritten in their note books. The correctness of the documents presented to the seed simple are studied and the name of farm, reproduction, year of crop production, origin, number of batch, seed weight, place number and other figures are recorded in the note books or in register.

One of the students from every subgroup heaps the seeds from seed sample on the plate of electron counter to get needed seed amounts (photo 96). So, two subsamples per 500 seeds each one are taken by the help of electron counter. Then every subsample is weighed by the electron balance with the precision of 0.01 g. Through multiplying of averaged index of two subsamples to two will get the weight of 1000 seeds.

Accordingly of the GOST 12042-80, the data of two replications united and successive dividing two 2 gets a mean. By this, the difference between two replications and it compares with admissible divergence (table 26). The comparison is made as on the figures of table 28.

Table 26. **The indexes of the admissible divergence, g.**

Decimal	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

For example, the weight of 23.50 g was taken on the first seed subsample of variety Kizilkurgan and 24.05 g on the second subsample.

The total weight of both subsamples will be  $23.50 + 24.05 = 47.55$  or 48 g. The actual difference between two replications is subtracted:  $23.50 - 24.05 = 0.55$ g.

Taking into account of total weight (48 g) to get 4 from column of table “Decimal”. And along the “Unit” to be found 8 and from their crossing cell 0.72 which presents of an admissible divergence. So, the difference between two subsamples (0.55) less than an admissible divergence (0.72). Therefore, the results of analysis are considered correct. If the index between two weights is more than index of admissible divergence, the third subsample is to be taken and its result is calculated together with those two subsamples and the new mean is compared again with admissible divergence.

**Exercise.** Determine weight of 1000 seeds from average seed samples of barley varieties stored at the laboratory and compare the results with literature data presented below:

Abu Gofur -57 – 58 g., Savrukh -58 – 60 g., Bolgaly 40-42.8g, Gulnoz 43.0-45.0g, Zafar 42.6g, Unimly arpa 48.6-60.0g, Novasadskiy – 565, 49g., Lalmikor 59.5-61.8 g, Mavlano - 40.9-48.8 g, Nutans 799, 59.2-61.4 g, Timur 43.9g, Khonokokh 42.0-47.1 g., and Vodka 35.5 g.

**2<sup>nd</sup> work.** Analysis of seed germination on agricultural crops in the lab condition is conducted according with standard (GOST 12038-84) by the help of optimal temperature condition of thermostat (photo 11) and other requirements (table 27) .

The analysis begin with the instructions of the teacher about the orders on the seed quality analysis in the laboratory condition.

In all other laboratory experiments, the students divided into small groups from 3 to 6 students each one depending upon availability of seed sample amounts originated from various regions and even for convenience to master of knowledge.

**Table 27. Determination of sprouting energy and germination of barley seeds.**

№	Verieties	Exposition	Growth temperature, 20°C.	Light or darkness	Terms of defining, days		Results, an average, %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1		Filter paper, sand	., ., .,	Darkness	3	7		
2		Filter paper, sand	., ., .,	Darkness	3	7		
3		Filter paper, sand	., ., .,	Darkness	3	7		
4		Filter paper, sand	., ., .,	Darkness	3	7		

And then, the students as the succession of the work in the one of the accredited central testing laboratory conducting of lab analysis on the seed quality of agricultural crops, recording in their note books all data concerning to seed sample (take a look at photo 13, 8 – training). Besides they, draw in note books the table 28 to fill in it with results taken from analysis.

Germination of seeds is defined by the help of thermostat. All the instruments and equipment must be disinfected prior to start of analysis for defining of germination. In order to this, the solution of formalin should be prepared. The solution consists of 2 part of water to 1 part of 40% formalin or may be replaced by ethyl alcohol at 96% and all internal sides of thermostat and working instruments should be wiped by wet cloth. After, all instruments will loaded in the thermostat and left firmly closed. In a regular functioning of laboratory the disinfection is repeated within every 10 days.

One of the students heaps the seed on the table from sample sack, preliminary cleaned seed for analysis. The students from other groups observed the action of this student and repeat same with own analysis.

The analysis are supposed to be done under the supervision of teacher in four replications. That is why, every student picks out 100 seeds in sole, four times (as four subsamples). Their sprouting energy and germinations are determined individually. The results, the average indexes in percents will be recorded in corresponding cells of columns in the table of working note book.

The plastic or metal growers (photo 97) are used for growing seeds. The growers bear labels attached on them with the notes of subsample number and the day of starting and main days of germination.

After those, filter paper is cut on size of grower laid in floor of them, through dividing into two parts by partitioning barriers or by the paper itself. The filter paper is moistened and the selected 100 seeds are laid on it in sole (photo 112). Every two growers with two replications of seeds, together as four replications are ready now for analysis of one certain barley variety. The seed dishes is deposited into working thermostat and once for 24 hours, at just time of initial putting, the seed dishes taking out of thermostat and moistened again by the help of water sprayer.

The fixed temperature (20°C) of of thermostat is examined for three times a day: in the morning, in the half of the day and in the noon by regularly recording in note books. The required temperature (20°C) for growing should not exceed or lowered than  $\pm 2^{\circ}$ . A dish with water in it is disposed into lower floor of thermostat. The level of the water in the dish is supplied permanently at the height of 1,5-2.0 cm and its water is refreshed once in 3-5days.

The sprouting energy and germination of seeds in the growers are analysed according to conditions and terms exhibited in table 28 and determined their sprouting energy and germination. The results of analysis are recorded on the sheet on the defining of germination of seed sample presented in enclosure 4 (it is necessary to draw it into note books).

Table 28. **The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for 4x100)
99 or 1	+ 2
From 97 to -98 or from 2 to -3	+ 3
From 95 to -96 or from 4 to -5	+ 4
From 92 to -94 or from 6 to -8	+ 5
From 88 to -91 or from 9 to -12	+ 6
From 83 to -87 or from 13 to -17	+ 7
From 75 to -82 or from 18 to -25	+ 8
From 62 to -74 or from 26 to -38	+ 9
From 39 to -61	+ 10

Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined individually. At the defining of initial growing the counting of normally grown (photo 97) and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds and all not grown seeds are counted and separated in to groups (normally grown, abnormal grown, swollen and rotted). Mean germination of seeds in four replications is subtracted.



Photo 97. **Normally germinated seedlings of barley.**

The results of analysis are considered correct if the difference between replications doesn't exceed admissible indexes of GOST (table 28). In contrast case the analysis is repeated.

**Tasks:**

1.To repeat again the analysis with other seeds of another varieties and reproductions of barley in order to consolidate the knowledge, mastered in the results of study on the defining of sprouting energy and germination.

2.To repeat analysis by the groups of students, whose data with differences have exceeded an admissible difference of the GOST.

### Questions:

1. On what order the weight of 1000 seeds of barley is determined?
2. What kind of result on the defining of weight of 1000 seeds is considered correct?
3. Can you retell the lab analysis in succession to determine the sprouting energy and germination of barley seeds?

**Minimum dictionary:** sprouting energy and germination- энергия прорастания и всхожести семян-ўсиш қуввати ва унувчанлик; sieve, preliminary disinfection- сито, предварительно обеззараженное- элак, бирламчи зарарсизлантириш; with corresponding label- с соответствующими этикетками- тегишли ёрлиғи билан; data or figures of seed- данные семян- уруғлар маълумоти; presented to seed samples- представленные на образцы семян- уруғлик намуналарига келтирилган; journal of register- регистрационная тетрадь- қайд қилиш журнали; with the precision at- с точностью до 0.01 грамма- 0.01 грамм аниқлигидаги; subsample- субпроб – кичик намуна; with below presented- ниже приведенная- қуйида келтириляётган; exposition- экспозиция- фойдаланиладиган; lighting or darkness- освещение или темнота- ёруғлик ёки қоронғулик; column of table- столбец таблицы- жадвал устуни; rewrite- переписывать- кўчириш; to subtract- вычитывать- ҳисобини чиқариш; an admissible difference- допустимая разница- руҳсат этилган фарқ.

25-laboratory training.

**To define weight of 1000 seeds, sprouting energy and germination of oats seeds on the base of accepted method.**

Conformity certificate for seed quality at the time of seed preparation will be taken after estimation of seed purity, weight of 1000 seeds, energy of sprouting, germination of seeds and others.

**The aim of the training.** Study of the methods on the defining of weight of 1000 seeds, sprouting energy and germination of oats seeds by the students is the aim of this training.

**Necessary teaching subjects and lab equipments.** Teaching and methodic manuals to conduct practical and lab trainings, note book, pencil, eraser, ruler, average seed samples from various varieties of oats, metal and plastic growers, tiny compressors, dish (photo 98), lab electronic balance with the measuring, blades



Photo 98.

**Instruments are needed to grow the seeds.**

precision of 0.01 and special electronic apparatus on accounting of seeds, sieve, preliminarily disinfected thermostat, basin, mechanical water sprayer, pincers.

**1<sup>st</sup> work.** Small groups of the students pick out the sacks with seed samples on the oats varieties with corresponding labels at them for determining the weight of 1000 seeds. Recording of seed label's notes into note book, verifying the accuracy of data and their entry into laboratory register are being done similarly as the order of 10<sup>th</sup> laboratory training.

One of the students from every subgroup heaps the seeds from seed sample on the plate of electron counter seed amounts to be needed. So, two subsamples per 500 seeds each one are taken by the means of electron counter. Then every subsample is weighed by the electron balance with the precision of 0.01 g. Through multiplying averaged index of two subsamples to two will get the weight of 1000 seeds.

According to the GOST 12042-80, the data of two replications united and successive dividing into two gets a mean. By this, the difference between two replications is observed and it compares with admissible divergence (table 29). The comparison is made on the figures of table 31.

Table 29. **The indexes of the admissible divergence, g.**

Decimal	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

For example, the weight of 30.50 g was taken on the first seed subsample of variety Uzbekskiy shirokolistniy and 31.20 g on the second subsample.

The total weight of two subsamples will be  $30,50 + 31,20 = 61.70$  or 62 g.

The actual difference between two replications is subtracted:  $31,20 - 30.50 = 0,70$  g.

Taking into account of total weight (62 g) we get 6 from column of table “Decimal”, and along the “Unit” to be found 2 and from their crossing cell 0.93 which presents of an admissible divergence. So, the difference between two subsamples (0.70) is less than an admissible divergence (0.93). Therefore, the results of analysis are considered correct. If the index between two weights is more than index of admissible divergence, the third subsample is to be taken and its result is calculated together with those two subsamples and the new mean is compared again with admissible divergence.

**Exercise.** Determine the weight of 1000 seeds from average seed samples of oats varieties or its elite seeds stored at the laboratory and verify the results in correspondence of fixed method.

**2<sup>nd</sup> work.** Analysis of seed germination on agricultural crops in the lab condition is conducted according to standard (GOST 12038-84) by the help of optimal temperature condition of thermostat (photo 11) and other requirements (table 30) .

Table 30. **Determination of sprouting energy and germination of oats seeds.**

№	Varieties	Exposition	Growth temperature, 20°C.	Light or darkness	Terms of defining, days		Results, an average, %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1		Filter paper, sand	., ., .,	Darkness	4	7		
2			., ., .,					
3			., ., .,					
4			., ., .,					

The analysis begins with the instructions of the teacher about the orders on the seed quality analysis in the condition of laboratory.

As all other laboratory experiments, the students are divided into small groups from 3 to 6 students, each one depending upon availability of seed sample amounts originated from various regions and even for convenience to master of knowledge. And then, the students as the succession of the work in one of the accredited central testing laboratory conduct analysis on the seed quality of agricultural crops, record in their note books all data concerning to seed sample (take a look at photo 13, 8 – lab training).

Beside of this, draw in note book the table 31 to fill it with results to be taken from analysis.

Germination of seeds is defined by the help of thermostat. All the instruments and equipments should be disinfected prior to start of analysis for defining of germination. Disinfection is accomplished by the chemical solution (look through the 2<sup>nd</sup> work of 8- training).

One of the students heaps the seed on the table from sample sack, preliminary cleaned seed for analysis. The students from other groups observe the action of this student and repeat similarly with own analysis.

The analysis is foreseen to fill in four replications. That is why, every student picks out on 100 seeds in sole, four times (as four subsamples). Their sprouting energy and germinations are determined individually.

The results, the average indexes in percents will be recorded in working note book.

Two growers from plastic or metal growers (photo 98) are selected for growing seeds. The growers bear labels attached on them or just placed in grower on visible part with the notes of subsample number and the day of starting and main days of germination.

After those, filter paper is to cut on size of the growers and it is laid in floors of them, through dividing into two parts by partitioning barriers or by the paper itself (photo 104). The filter paper is moistened and the selected 100 seeds are laid

on it in sole. Every two growers with two replications of seeds, together as four replications are ready now for analysis of one certain oats variety or its elite seeds. The seed dishes are placed into working thermostat and one time for 24 hours, at just time of initial putting, the seed dishes are taken out from thermostat and moistened again by the help of water sprayer. The moistened growers are placed again into thermostat.

The temperature of thermostat, inspection order and other conditions are dealt according to the rule (look at the 2<sup>nd</sup> work of the 26- lab training).

The sprouting energy and germination of seeds in the growers are analyzed according to conditions and terms exhibited in table 31 and determined their sprouting energy and germination. The results of analysis are recorded on the sheet on the defining of germination of seed sample presented in enclosure 4 (it is necessary to draw it into note books).

**Table 31                      The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for 4x100)
99 or 1	+ . 2
From 97 to -98 or from 2 to -3	+ . 3
From 95 to -96 or from 4 to -5	+ . 4
From 92 to -94 or from 6 to -8	+ . 5
From 88 to -91 or from 9 to -12	+ . 6
From 83 to -87 or from 13 to -17	+ . 7
From 75 to -82 or from 18 to -25	+ . 8
From 62 to -74 or from 26 to -38	+ . 9
From 39 to -61	+ . 10

Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined solely. At the defining of initial growing the counting of normally grown and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds, not all grown seeds are counted and separated (photo 99) into groups (normally grown,

abnormal grown, swollen and rotted). An average germination of seeds in four replications is subtracted.

The results of analysis are considered correct, when the difference between replications doesn't exceed than admissible indexes of GOST (table 31). In other result, the analysis is repeated.

**Tasks:**

1.To fill the self analysis on sprouting energy and germination of oats seeds belong to other varieties and reproductions.



**Photo 99. The students of 4-77, R.Tashpulatova and G.Mansurov are determining the seed germination of oats (2018).**

2.To repeat analysis, when the data have exceeded from difference than an admissible one on the GOST and verify the new result.

### Questions:

1. What things are needed for defining of the weight of 1000 seeds of oats?
2. What result on the defining of weight of 1000 seeds is considered correct?
3. When the result of sprouting energy and germination is considered incorrect?

**Minimum dictionary:** conformity certificate- сертификат соответствия- муоффиқлик сертификати; basin for sand - таз для песка – қум тоғараси; difference between two replications- разница между двух повторений – икки такрор орасидаги фарқ; initial and main days of determination - начальные и основные дни определения – дастлабки ва асосий кузатув кунлари; is observed on rule - соблюдается по правилу – қоидага итоат этилади; according to conditions and terms - соответственно по условиям и срока – шароит ва муддатига биноан; all were not germinated - все не проросшие – жами ўсмаган; swollen and rotted - набухшие и загнившие – бўккан ва чириган; method of determination - методика определения – аниқлаш усули.

26-laboratory training.

**Definition of 1000 grains weight and sprouting energy and germination of triticale seeds.**

Weight of 1000 seeds, sprouting energy (or speed) and germination have a special signification in the study of seed planting qualities of triticale. These indexes are identified in the consequences of analysis carried out in the conditions of laboratory.

Weight of 1000 seeds in the varieties of triticale depends upon heredity and growing conditions.

Weight of 1000 seeds of the varieties of triticale is defined only in the conditioned seeds (photos 100, 101).



Photo 100. **Packaged seeds of triticale**



Photo 101. **Triticale seeds**

**The aim of training.** Definition of the weight of triticale, sprouting speed and germination is the main aim of this training.

**Necessary materials and lab equipments.** Teaching manuals for conducting of laboratory trainings, average samples of different seeds from triticale seeds, electron laboratory scales of 0,01 g accuracy, special electron seed counters (photo 96), prior disinfected thermostat, petri dishes, mechanical water sprayer, pot for seed planting, tempered sand (seeds of grain, grain-been crops are only grown in the sand), kept boiled water, pincers, metal buffers, tiny blades and compressors, copybooks, pencils, erasers and rulers.

Training starts after a short instruction about the orders of the laboratory analysis given by the teacher.

Academic group of the students according to arrangement of the experiments on the lab analysis is divided into small groups (like teams) of 4, 6 persons each depending on availability of average seed samples from different triticale varieties.

**1-work.** Each team of students on the base of method to define the weight of 1000 triticale seeds selects one seed bag containing an average samples marked by corresponding label (photo 102). The next, the data of seeds for analysis of seed quality indexes on agricultural crops is registered in the own copy books. Study of the correctness of seed documents attached on the lab seed samples and the registration of these data are dealt on the order of 7<sup>th</sup> lab training.

One of the students from every team pours prior cleaned seeds out of his bag on the table. 2 subprobs per 500 units are picked out without selection from this working samples with the help of electron counter. They are weighed on the electron scales with the accuracy of 0,01g. By the multiplying of these data to two the weight of 1000 seeds is determined.

According to the GOST 12042-80, the data of two replications united and successive dividing into 2 gets a mean. By this, the difference between two replications is taken and it compares with admissible divergence (table 34). The comparison is made as on the figures of table 32.

For example, the weight of first seed subprobe is 46.53 g.

The weight of the second subprobe is 46.10 g.

The total weight of both subprobs will be  $46.53 + 46.10 = 92.63$  or 93 g.

Identified difference between two replications is:  $46.53 - 46.10 = 0,43$  g.

The total weight of two replications is consisted of 93 g. On the base of this we get 9 from column of table “Decimal”. And along the “Unit” to be found 3 and from their crossing cell 1.40 which presents of an admissible divergence. So, the difference between two subsamples is 0.43 less than an admissible divergence (1.40) and it proves that the analysis was made correctly. If the index between two weights is more than index of admissible divergence, the third subprobe is to be

taken and its result is calculated together with those two subprobes and the new mean is compared again with admissible divergence.

Table 32. **The indexes of the admissible divergence, g.**

Decimal	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

**Task.** To discuss the weights of 1000 triticale seeds from different varieties by comparing taken data between teams of the students and substantiate the differences.

**2-work.** Every team of students on the instruction of teacher or experienced lab assistant is acquainted with requirements of standard (GOST 12038-84) to analyze seed germination of triticale varieties in the lab condition.

The degree of insurance by thermostat with optimal temperature is studied. Draw necessary table (table 33) for observing the analyzing condition and registration of analyze results in the copy book.

Table 33. **Determination of sprouting energy and germination of triticale seeds.**

№	Varieties	Exposition	Growth temperature, 20°C.	Light or darkness	Terms of defining, days		Results, an average, %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1		Tempered and soaked sand	., ., .,	Darkness	?	?		
2		Tempered and soaked sand	., ., .,	Darkness	?	?		
3		Tempered and soaked sand	., ., .,	Darkness	?	?		

Then, the students by following the succession of work of certain accredited central testing laboratory conduct lab analysis on the qualities of agricultural crop seeds, rewrite data of seeds in their copy books (look at 8<sup>th</sup> lab training and photo 13).

All the instruments and equipment must be disinfected prior to start of analysis for defining of germination. In order to this, the solution of formalin should be prepared. The solution consists of 2 part of water to 1 part of 40% formalin or may be replaced by ethyl alcohol at 96% and all internal sides of thermostat and working instruments should be wiped by wet cloth. After, all instruments will be loaded in the thermostat and left firmly closed. In a regular functioning of laboratory the disinfection is repeated within every 10 days.

One of the students heaps the seed on the table from sack, preliminary cleaned seed for analysis (photo 102). The students from other groups observe the action of this student and repeat the same with own analysis.

The analysis is supposed to be done under the supervision of teacher in four replications. That is why, every student picks out 100 seeds in sole, four times (as four subprobes). Their sprouting energy and germinations are determined individually. The results, the average indexes in percents will be recorded in corresponding cells of columns in the table of working note book.



Photo 102. **Selecting of work probe from average seed sample**

Analysis in four replications is dealt under the supervision of the teacher in succession:

1.To define sprouting energy and germination of seeds, the students select individually 100 seeds (four subprobes).

2.The students select two growers: plastic or metal (photo 103) to grow seeds. The label with number of subprobe and also records of date on the starting and main days of seed germination is attached on every grower.

3.Bring and putt on the table special basin with tempered and soaked sand (at the 60 % of its full moisture capacity).

4.The sand is laid on two growers with layer up to 2 cm and slightly pressed and smoothed with compressor.

5.The sand in the growers is divided into two parts with the help of metal buffers.

6.The seeds are laid out on the sand of first grower, per 100 seeds in two replications (photos 103, 104). Together with two replications of the second grower it accounts for four replications.

7.The growers with planted seeds are numbered, weighed on the scales and their data is registered in the lab note books of students.



Photos 103, 104. **Plastic growers to grow seeds and laying out the seeds in them.**

8. The growers are placed on the shelves of normally (in good order) functioning thermostat with the temperature of 20°C (photo 105).

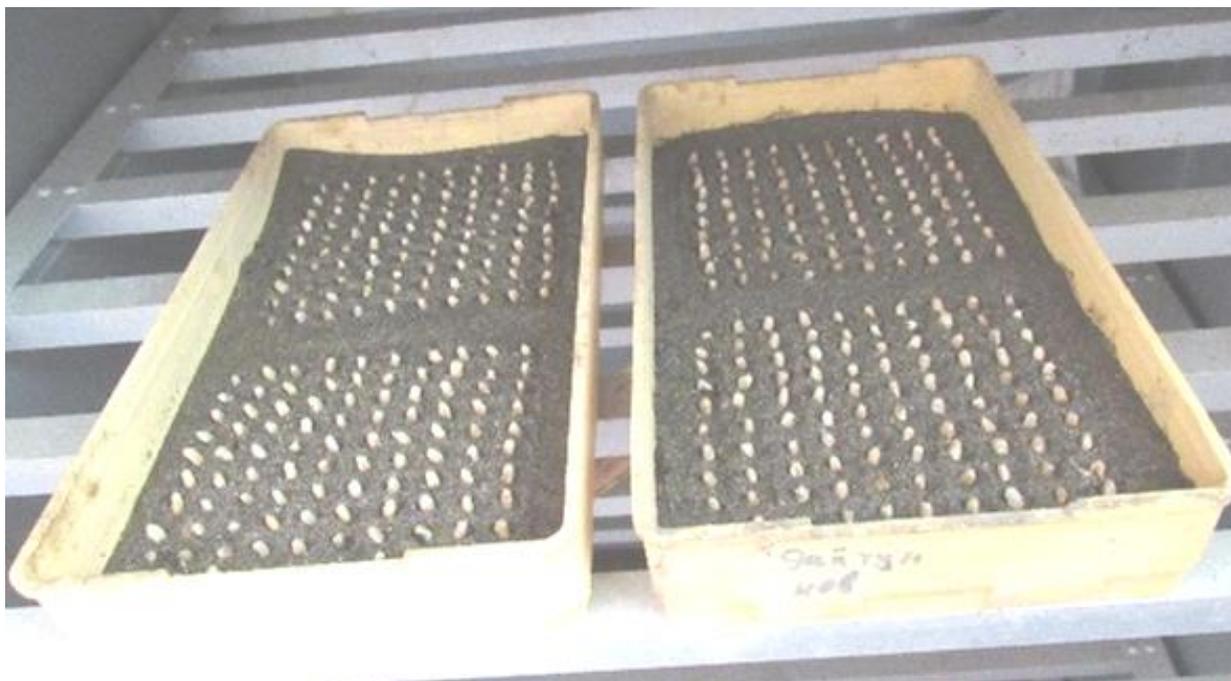


Photo 105. **Seed probes of triticale placed on the shelves of thermostat.**

9. The growers are taken out of thermostat and moistened by the help of mechanical water sprayer for 24 hours, desirably at the time of seeds planting on the sand and placed again in the thermostat.

10. The fixed temperature of thermostat (20°C) is verified three times for 24 hours: in the morning, in the half of the day and in the noon. The required temperature (20°C) for growing should not exceed or lowered than  $\pm 2^{\circ}\text{C}$ . A dish with water in it is disposed into lower floor of thermostat. The level of the water in the dish is supplied permanently at the height of 1,5-2.0 cm and its water is refreshed once in 3-5 days.

11. The sprouting energy and germination of seeds in the growers are analyzed according to conditions and terms exhibited in table 34 and determined their sprouting energy and germination. The results of analysis are recorded on the sheet on the defining of germination of seed sample presented in enclosure 4 (it is necessary to draw it into note books).

Table 34.

**The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for 4x100)
99 or 1	+-. 2
From 97 to -98 or from 2 to -3	+-. 3
From 95 to -96 or from 4 to -5	+-. 4
From 92 to -94 or from 6 to -8	+-. 5
From 88 to -91 or from 9 to -12	+-. 6
From 83 to -87 or from 13 to -17	+-. 7
From 75 to -82 or from 18 to -25	+-. 8
From 62 to -74 or from 26 to -38	+-. 9
From 39 to -61	+-. 10

12. Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined individually. At the defining of initial growing the counting of normally grown and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds and all not grown seeds are counted and separated in to groups (normally grown, abnormal grown, swollen and rotted).

13. Mean germination of seeds in four replications is subtracted. The results of analysis are considered correct if the difference between replications doesn't exceed admissible indexes of GOST (table 34). In contrast case the analysis is repeated.

**Tasks:** To review together the analysis of the triticale seed probes, whose resulting data are exceeded the requirements of the GOST and compare the new indexes with the requirements of the GOST.

**Answer the questions:**

1. What planting qualities do seeds of triticale consist of?
2. Can you describe the method of definition the weight of 1000 seeds?
3. What order of work has the method of determination the sprouting energy and germination of seeds?

Glossary. A special signification - особое значение- алохида ахамияти; are defined- определяются- аникланади; heredity and growing condition -

наследственность и условия возделывания- ирсияти ва экиш шароити;  
accuracy of measure- точность измерения- ўлчов аниқлиги; tempered sand-  
прозакаленный песок- тобланган қум; after a short instruction- после короткого  
инструктажа- қисқа кўрсатмасидан сўнг; to select- выбирать- танламоқ; unite  
(or incorporate)- объединять- бирлаштирмақ; to grow- проращивать- ўстирмақ;  
the mean is subtracted - вычисляется средняя- ўртача ҳисобланади; to  
substantiate of difference- обосновать разность- фарқни асослаш; in  
individually- в отдельности- алоҳида; placed in the thermostat- помещается в  
термостат- термостатга жойлаштирилади; to compare of taken data- сравнить  
полученные данные- олинган маълумотларни таққослаш; to weight on the  
scale- взвешивать- торозида тортиш; degree of insurance- степень  
обеспеченности- таъминланиш даражаси; working thermostat in good order (or  
normally) - в исправно работающий термостат- тўғри ишлаётган термостат;  
presented in the enclosure- представленные в приложении- иловада  
келтирилган.

27-laboratory training.

**Definition of 1000 grains weight and moisture of corn seeds.**

As previously considered grain crops, weight of 1000 corn grain is only determined for conditioned seeds. The moisture of grain in all breeding diversities is required to be not more than 14 % in accordance of below presented standard (photo 106).

Defining of weight of 1000 grains and moisture of grains which were prepared for planting is conducted in the conditions of laboratory on order of the method of standard GOST 10467-76. Seeds of Agricultural Plants. Varietal and sowing characteristics. Specifications. shown in the 7<sup>th</sup> lab training (photo 106).

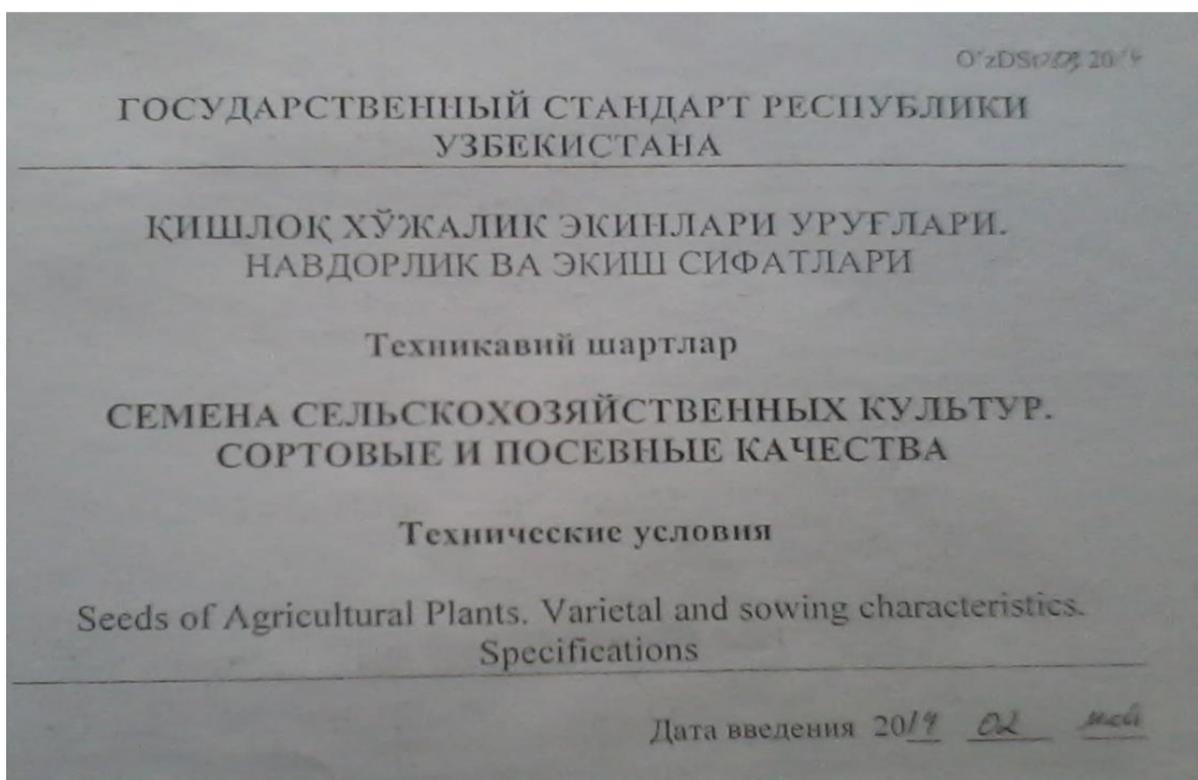


Photo 106. **State standard for seed quality of agricultural crops.**

**The purpose of the training.** To study the determining methods of weight of 1000 сўкт seeds and seed moisture in the conditions of laboratory is the main task of this training.

**Necessary teaching subjects and laboratory facilities.** Teaching and methodological manuals for practical and laboratory trainings, middle samples from different corn diversities, laboratory and electron scales at precision of 0.01,

sieves, drying dresser with limits of 100C° to 150°C at + - 2° C, laboratory mills (appendix 8), metal dishes (photo 98), electron coolers or exicators (photo 105), sand timers, pencils, pincers, erasers, and rulers.

The training begins with the instruction of teacher or experienced lab assistant.

**The 1<sup>st</sup> work.** Every subgroup of the students takes out for yourself one of the average seed sample bags of corn varieties or hybrids with tags of conformity to define the weight of 1000 seeds on the base of standard method.

Correctness of data and their registration in the note book of laboratory are carried out in correspondence with array of description in the 7<sup>th</sup> training.

One of the students from every subgroup takes out of seeds from own sample and puts on the cup of electronic seed counter. Two working probes (subprobs) with 500 seeds each one are getting by the help of this electronic counter. Then every subprobs individually are subjected to weighing on the electron scale at the accuracy of 0,01 g. The weight 1000 seeds is got through multiplying of average weights of two subprobs to two.

On the GOST of 12042-80, the average index is calculated by dividing two into the summarized weights of two replications. Along with the divergence within two replications is determined and compared with admissible divergence (table 35). Comparison is dealt on the data of table 35.

Table 35 **Indexes of admissible divergence, g.**

Decimals	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

For example, the weight of the 1<sup>st</sup> subprobe from working probe of hybrid seeds Uzbekskiy 400 DP is equal to 122,0 g.

2<sup>nd</sup> subprobe – 124, 4 g.

Total weight of two subprobes:  $122,0 + 124,4 = 246.4$  or 246 g.

Here it is worthy to remind that if the weight of 1000 seeds is equal to 100 or more grams, according to the above mentioned standard, the admissible divergence is calculated from the data of table as follow:

Picking out the figures, corresponding to decimals and units of summarized weights, is added to constant index corresponding to 100, 200, 300 and others.

a) On the example of the first subgroup of students, total weight is equal to 246 g., the admissible divergence is found by the figures of 46, it is 0,69 then on the figure of 200 (it is found to 2 – 0,30 and this index is increased in ten times) –  $0,30 \times 10 = 3,0$ . The admissible divergence is equal to  $0,69 + 3,0 = 3,69$ .

Real difference between two replications:  $122,0 - 124,4 = 2,4$  g.

If the difference between two subprobs (2,4) is more than admissible divergence (3,69), the third subprobe is taken and continues the analysis.

But the difference of results between subprobs analyzed by the first subgroup of students is less than admissible divergence. Therefore, the result (246 g) is accepted as a correct and is written in the note book by the reliance.

**Task 1.** Identify weight of 1000 seeds out of self pollinated lines of corn, parental accessions or hybrids, verify the correctness of results on the method.

**2-work.** To determine the moisture of seed also it would need to guide by fixed methods of GOST. The students are to observe the drawing of the working table (table 36) in their work copies to record of initial and resulting data of analysis.

Table 36 **The table for calculating of seed moisture**

№ probe	Weight of cup, g.	Weight of seed subsample, g.	Weight of cup with seed subsample, g.		Moisture loosed		Middle moisture, %.
			Up to drying	After drying	In gramms	In percents	
1							
2							

The method of analysis has been based on the weighing of milled and dried seeds in the chamber dryers of laboratory (photo 107). At this, the students of every subgroups choose probes with weight of 50 g seeds from the second middle sample placed in bottle (photo 109). This probe is divided into two parts. The first part is used for the analysis, the second part is placed into glass with lid and kept until taking the result from analysis. This would be used only in the case of necessity to third subprobe in the results of analysis.

The seeds are grounded for the period of 60 seconds by means of laboratory mill.

By the means of electron scales of laboratory, two subsamples are weighed out of milled seeds 5 g each one. Placing them into beforehand dried, weighed and numbered metal cups (photo 98), the cups with seeds are laid into warmed (up to 150° C) dryer (their leads also placed near or under them). The door of dryer is closed firmly and by checking the temperature indexes at the 150° C is fixed the time. Drying is conducted for 20 minutes at the temperature of 150° C. By the end of given time, the dried cups are taking out and covered by their leads. Cooling of cups are executed in the exicators (photo 107). For this, the cups placed in the exicators for 15-20 minute to fully cooling. After cooling cups with seeds are weighed once more.



Photo 107.

**Laboratory cooling facilities**

The amount of loosed moisture is determined via calculating difference of taken index of cups' weights up to drying and index of cups after cooling.

The percent of moisture is determined through multiplying loosed moisture to 100 and taken amount is divided into initial weight of seeds (5.0 g).

For instance, if the loosed moisture of the cup with the number of №1 is made of 0.67 g., it should be multiplied to 100. The taken 67 is divided to initial weight of subsample, that is 5 g. and the moisture of 13.4 % is determined. At the same array, the loosed moisture 0.65 g. of second cup with the number of №2 is multiplied to 100 and through dividing the result 65 into initial 5 g. is determined of 13.0 %.

Now, by adding both results the following is to taken:  $13,4 + 13,0 = 26,4$ . This result is divided into 2 and determines of middle moisture, that is 13.2 %.

The taken difference between indexes of moisture of both subsamples is to be not exceeded of 0.5 %. At this result, the determination of moisture is considered as concluded in correspondence with standard claims. In the case of data more than 0.5 %, the procedure is repeated with the second part placed into glass cup until taking of result less than 0.5 %. The calculated middle index with convince is recorded in the column of middle moisture.

**Task 2.** Make a new analysis with other breeding accessions of corn to consolidate into memory the method for determining the seed moisture.

**The questions:**

1. When and why the weight of 1000 seeds is defined?
2. What result of analysis on the seed moisture determining is considered correct?

**Glossary:** below presented- ниже приведенны-куйда келтирилган; breeding accessions- селекционные формы- селекцион шакллар; instruction- инструкция-йўриқнома; calculated- вычитывать- айириш; total data- сложные данные- жамланган маълумотлар; above mentioned- вышеупомянутый- юқорида эслатилган; analysis is followed- последуют

анализы- таҳлиллар давом эттирилади; grounded- раздробленный-  
майдаланган; with convince- с уверенностью- ишонч билан.

28-laboratory training.

**Definition of sprouting speed and germination of corn seeds.**

**Seeds germination** of corn is one of the main planting qualities which exhibits biological and farm value of seeds (photo 108).

**Sprouting speed** either is taken into mind for concluded assessment of seed planting quality. They are defined in percentage of number of healthy germinated seeds from general number of seeds that had been taken for germination.

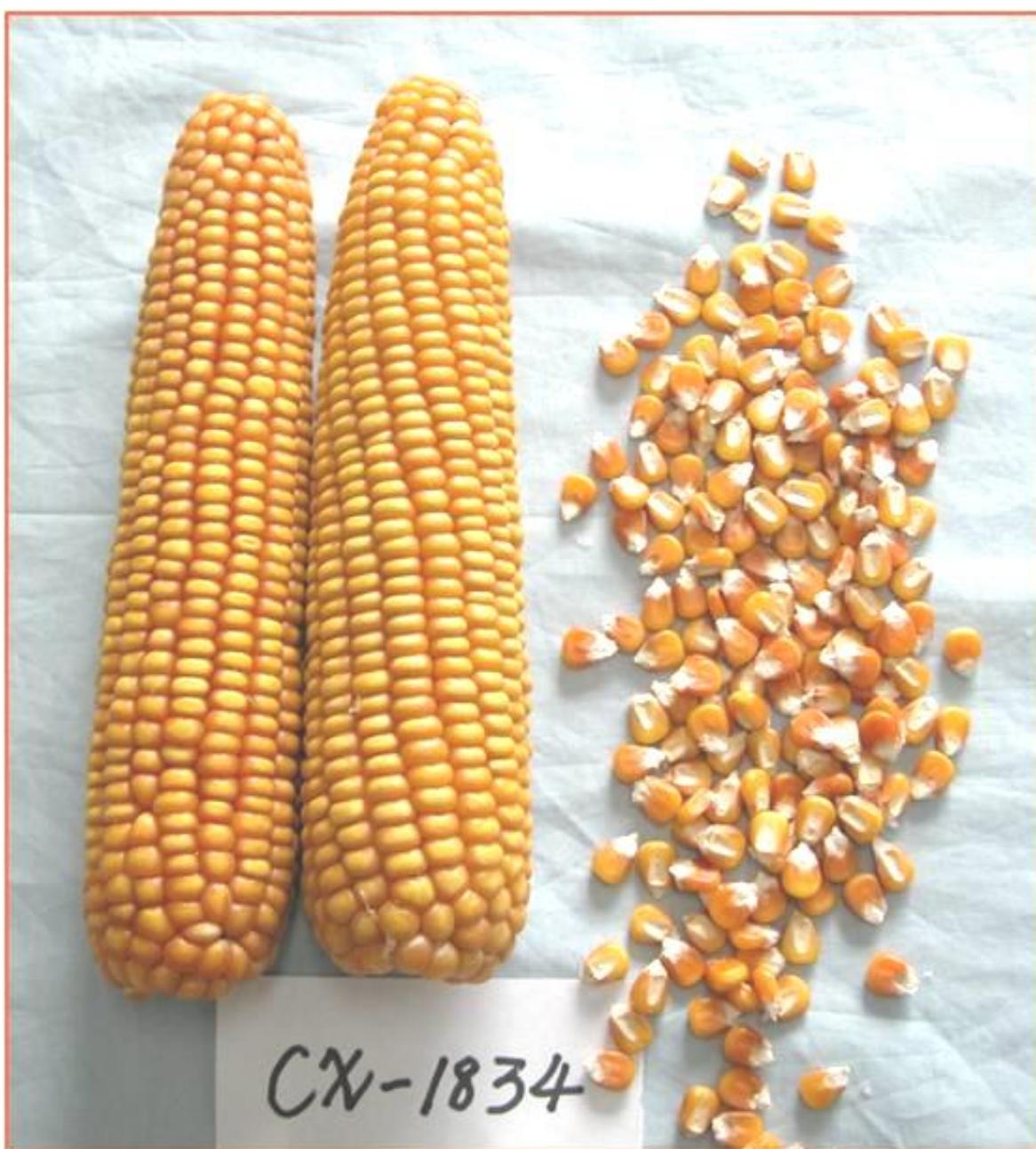


Photo 108.

**Appearance of corn cobs and seeds**

The planting qualities of corn seeds is evaluated on the base of laboratory analysis data.

**The aim of the training.** Teaching the students the method of sprouting speed and germination of corn seeds in the laboratory conditions is the aim of the training.

**Necessary teaching items and laboratory equipments.** Teaching manuals for practical and laboratory trainings, the average seed samples of corn varieties and hybrids, laboratory scales by the accuracy of 0.01 g., and special electronic seed counter equipments, previously disinfected thermostat, different plastic cups (photo 103), mechanic sprayer of water, seed germinators, tempered sand (seeds of grain – bean crops are germinated only on the sand), still boiled water, pincer, metal divisions, small shovels and sand compressor, note book, pencil, eraser, ruler.

The training begins by short instruction of teacher about lab analysis.

The laboratory analysis are conducted by the taking part of academic groups of students and carried out with dividing students into subgroups of 4, 6 persons each one depending on the availability of average seed samples of corn varieties and hybrids at the disposal of the laboratory.

Analysis of seed germination in the conditions of laboratory is implemented on the method worked out by the standard (GOST 12038-84).

One person out of each subgroup of students along with instruction of a laboratory specialist segregates 2 working probes on 200 grams each one by the help of scales from the average sample sack of seeds (photo 109).



**Photo 109. Leading assistant of accredited central testing laboratory Tojibaeva Mavluda and a practitioner, student of 3<sup>rd</sup> year picking out of working probes from an average seed sample.**

The working probes are numbered by the Rome figures (I and II) at the paper labels.

The first working probe is employed for analysis of sprouting speed and seed germination. The second working probe is set apart for analysis of other seed quality indexes.

In the next, the students segregate four subprobes in small cups from the first working probe on 50 units each one to plant in four replications (photo 110).



**Photo 110. Assistant of accredited central testing laboratory Akhunjanova Malokhat and practitioner, a student of the 3<sup>rd</sup> year at the TSAU are sowing the seeds on the growing bathes.**

The seeds in small cups are planted on the prepared bathes with moistened sand. Sowing, planting the seeds in the sand is carried out on the order of placing the two replications on 50 seeds each one on two parts of bathes. The planted seeds are covered with sand and slightly compacted and smoothed out by the help of sand compressor. Every bath is numbered, attached with the date of seeding.

Germination is defined by the means of thermostat. Subgroups of the students are getting repeated acquaints with disinfection and order of disinfection

of thermostat and other its working items (take a look at the materials of 8<sup>th</sup> training).

The germination is fulfilled in the special thermostat (photo 98) with optimal temperature (25°C) and other required conditions (table 37).

**Table 37. Determination of sprouting energy and germination of corn seeds.**

№	Name of varieties and hybrids	Exposition	Growth temperature, 25°C.	Light or darkness	Terms of defining, days		Results, an average, %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1		Sand	., ., .,	Darkness	4	7		
2		Sand	., ., .,	Darkness	4	7		
3		Sand	., ., .,	Darkness	4	7		
4		Sand	., ., .,	Darkness	4	7		

The subgroups are placing their bathes with planted seeds on the shelves of thermostat under function.

The temperature (25°C) of thermostat is checked three times a day: in the morning, midday and in the evening and periodically are marked in the table of copy book. The required temperature (25°C) of the thermostat for germination does not exceed or lower than  $\pm 2^{\circ}$ . The vessel with water is put on the bottom of thermostat. The level of the water in the vessel is kept at the height of 1,5-2.0 cm and refreshed in 3-5 days.

Sprouting speed and germination of seeds in the seed bathes are analyzed according to the conditions and dates exhibited in the table 38 and determined their sprouting speed and germination. The results of analysis are recorded on the leaflet for the definition of the quality of seed probes presented in the enclosure 4 (it should be drawn in the lab books).

Table 38 **The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for 4x100)
99 or 1	+ 2
From 97 to -98 or from 2 to -3	+ 3
From 95 to -96 or from 4 to -5	+ 4
From 92 to -94 or from 6 to -8	+ 5
From 88 to -91 or from 9 to -12	+ 6
From 83 to -87 or from 13 to -17	+ 7
From 75 to -82 or from 18 to -25	+ 8
From 62 to -74 or from 26 to -38	+ 9
From 39 to -61	+ 10

Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined solely. At the defining of initial growing the counting of normally grown and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds, all not grown seeds are counted and separated into groups (normally grown, abnormal grown, swollen and rotted). Mean germination of seeds in four replications is subtracted.

The results of analysis are considered correct if the difference between replications doesn't exceed than admissible indexes of GOST (table 38). In contrast case the analysis should be repeated.

For example, the correctness of the results of the first subgroup of students on the analysis of seeds of Hybrid Uzbekistan 400 DP is examined. The germination on the replications is taken: 96,0; 96,0; 96,0 and 96,5 %. From the results it is obvious, that the difference between replications is less than admissible +.4, shown in the table 38. That is why, the results of the first subgroup with the seeds of Hybrid Uzbekistan 400 DP are considered correct.

**Tasks:**

1.To repeat the analysis with other seeds of corn varieties and hybrids in order to consolidate a knowledge gain by the students on the determination of sprouting speed and germination of corn seeds.

2.To repeat again the analysis in the subgroups, if the outcomes do not correspond to the requirements of the GOST.

**The questions:**

1.In what articles does the table, shown in the enclosure 1 to fill the results of analysis consist of?

2.How the sprouting speed of seeds is determined?

3. How the germination of seeds is determined?

**Glossary:** general number - общее количество- умумий сони; on the base of data- на основе данных- маълумотлар ососида; in the aim of the training- целью занятия- машғулот мақсади; tempered sand- закаленный песок- тобланган кум; cooled boiled water- остывшая кипяченая вода- қайнатилиб совутилган сув; short instruction- короткая инструкция- қисқа йўлланма; availability of average samples- наличие средних образцов- ўртача намуналарнинг борлиги; by Rome figures- римские цифры- рим рақами; to leave along- оставляется в стороне- четда қолдирилади; dates of planting- дата посева- экиш саналари; covered by the sand- покрывается песком- кум билан ёпилади; periodically is marked- регулярно отмечаются- даврий қайд қилинади; kept at the height of- поддерживается на высоте-маълум баландликда тутилади; normally grown- нормально проросшие- етарлича ўсган; is considered right or correct- считается правильным- тўғри деб ҳисоблаш.

29-laboratory training.

**Definition of 1000 grains weight, sprouting speed and germination of sorghum seeds.**

**The aim of the training.** To familiarize the students with the method of defining the weight of 1000 seeds, sprouting speed and germination of sorghum seeds is the aim of this training.

The weight of 1000 seeds of sorghum is defined only in the conditioned seeds.

**Necessary teaching items and laboratory partings.** The teaching and methodic manuals for practical and laboratory trainings, an average seed samples of sorghum varieties, electron lab scales with the accuracy of 0.01g. (photo 96), prior disinfected thermostat, lab cups, mechanic sprayer, growers, moistened sand, metal partitions, filter papers, pincer, the small shovel and compressors (photo 111), pencils, erasers and rulers.



Photo 111. **Necessary working items for laboratory analysis.**

The training begins with instruction by the lab specialist about the order of fulfillment the laboratory analysis.

For comprehensive understanding of lab analysis, the students of the group are divided into subgroups of 3, 6 persons each one depending upon the gathered average seed samples in the lab from different sorghum varieties oratory.

**The 1<sup>st</sup> work.** The subgroups of the students guiding by the standard pick out the sacks containing average samples of sorghum with corresponding label to define the weight of 1000 seeds. Then, likely as the order of one of the accredited central testing laboratory they define the seed quality of agricultural crops (photo 13), rewrite the data of seeds in their notebooks. The correctness of the documents attached to samples is studied at the laboratory and entered into register the name of farm, variety, reproduction, year of crop, origin, a lot and weight of seeds, number of place and other required data by the standard.

One of the students of the subgroup from each one pours out the seeds from their seed samples have passed through seed purity on the table. From this working probe, without selection they pick out two subprobes on the 500 units each one. They are weighed on the electron scales by the accuracy of 0,01 g. The weight of 1000 seeds is identified through multiplying the taken data to two.

According to the GOST 12042-80, the data from two replications are united and subsequently divided into two is taken an average. By this way, the divergence between two replications is defined and compared with admissible divergence (table 41). Comparison is conducted on the data of this table 39.

Table 39 **Indexes of permissible divergence, g.**

Decimals	Unit									
	0	1	2	3	4	5	6	7	8	9
0	-	0,02	0,03	0,04	0,06	0,08	0,09	0,10	0,12	0,14
1	0,15	0,16	0,18	0,20	0,21	0,22	0,24	0,26	0,27	0,28
2	0,30	0,32	0,33	0,34	0,36	0,38	0,39	0,40	0,42	0,44
3	0,45	0,46	0,48	0,50	0,51	0,52	0,54	0,56	0,57	0,58
4	0,60	0,62	0,63	0,64	0,66	0,68	0,69	0,70	0,72	0,74
5	0,75	0,76	0,78	0,79	0,81	0,82	0,84	0,85	0,87	0,88
6	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,00	1,02	1,04
7	1,05	1,06	1,08	1,10	1,11	1,12	1,14	1,16	1,17	1,18
8	1,20	1,22	1,23	1,24	1,26	1,28	1,29	1,30	1,32	1,34
9	1,35	1,37	1,38	1,40	1,41	1,42	1,44	1,45	1,47	1,48

For example, the weight of the first subprobe is 16.68 g. and the weight of the second is 17.05 g.

Total weight of two subprobs makes of  $16.68 + 17.05 = 33.73$  or 34 g.

The real divergence of two replications is  $17.05 - 16.68 = 0,37$  g.

The weight of two replications made 34 g. on the base of this from table 39, we can find 3 on the column “Decimal” and 7 on the column “Unit”. On the crossing cell across of these two figures in the table, the permissible divergence 0,51 is defined. Thus, the difference between two parallel analysis (0.37) is less than permissible divergence (0.51), that is proved by the correctness of conducted analysis. If the difference between two analysis is more than permissible divergence, the third subsample is selected and taken data is calculated in association with above taken two data from two subprobes and the newly taken data is compared with permissible divergence.

**Task 1.** The subgroups of the students compare the results of analyzed data on the weight of 1000 seeds and substantiate the occurred difference on the base of scientific and practical knowledge.

**The 2<sup>nd</sup> work.** Analyze seed sprouting speed and germination of sorghum in the conditions of laboratory implements on the worked out state standard (ГОСТ 12038-84) of method seed sowing on filter paper (photo 112), in folded paper or in

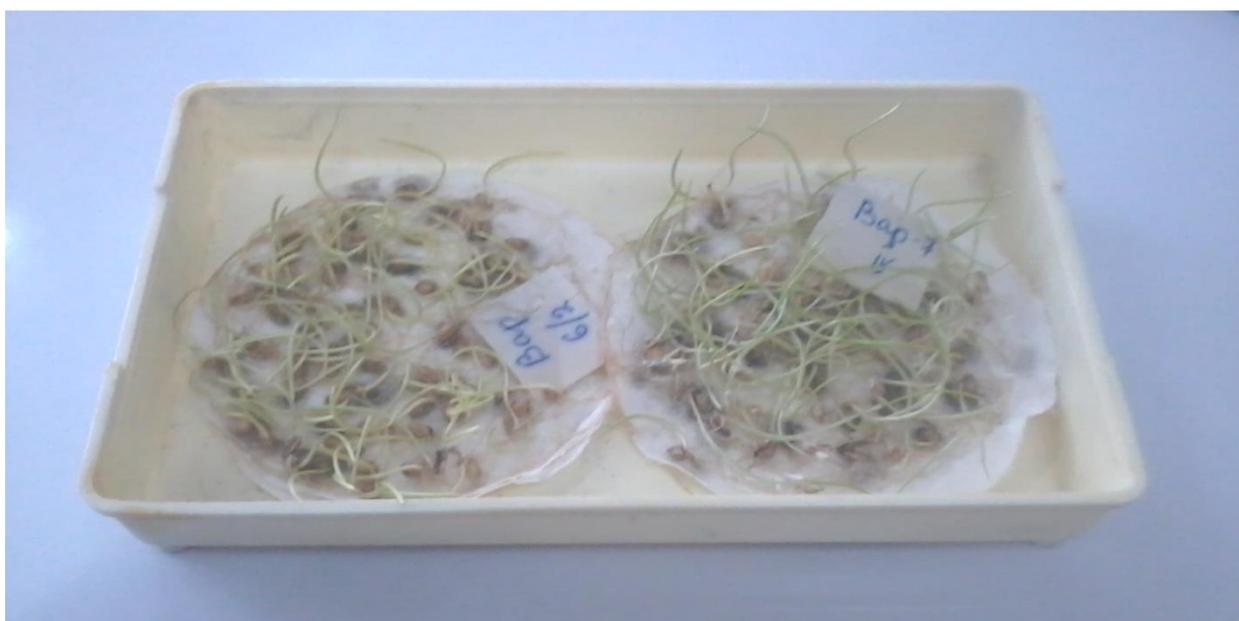


Photo 112. **Seed growing by the means of filter paper.**

moistened sand.

One student from subgroups of the students following the instructions of the lab assistant pickes out 4 subprobes on 100 units each one in the cups from 250 g of working seed sample. These subprobes are numbered on the order of Rome figures (I, II, III and V).

The seed subprobes from small cups are planted in the sand of growers which have prepared for seed planting (photo 113). The planting is conducted by laying out the 100 seeds in the sand which disparted into two parts consisting of two replications. After this, the seeds are covered with sand and easily compressed by the help of compressor which smoothes out the surface of the sand (photo 98). Each grower is numbered, even is written the date of sowing.

The germination of seeds is defined by the help of thermostat. The students of subgroups again will get acquainted with the disinfection and order of thermostat and other working things (on the base of the data illustrated in the 8<sup>th</sup> training).

Germination of seeds is fulfilled in special (photo 11) optimal temperature (25°C) and other required conditions (table 40).

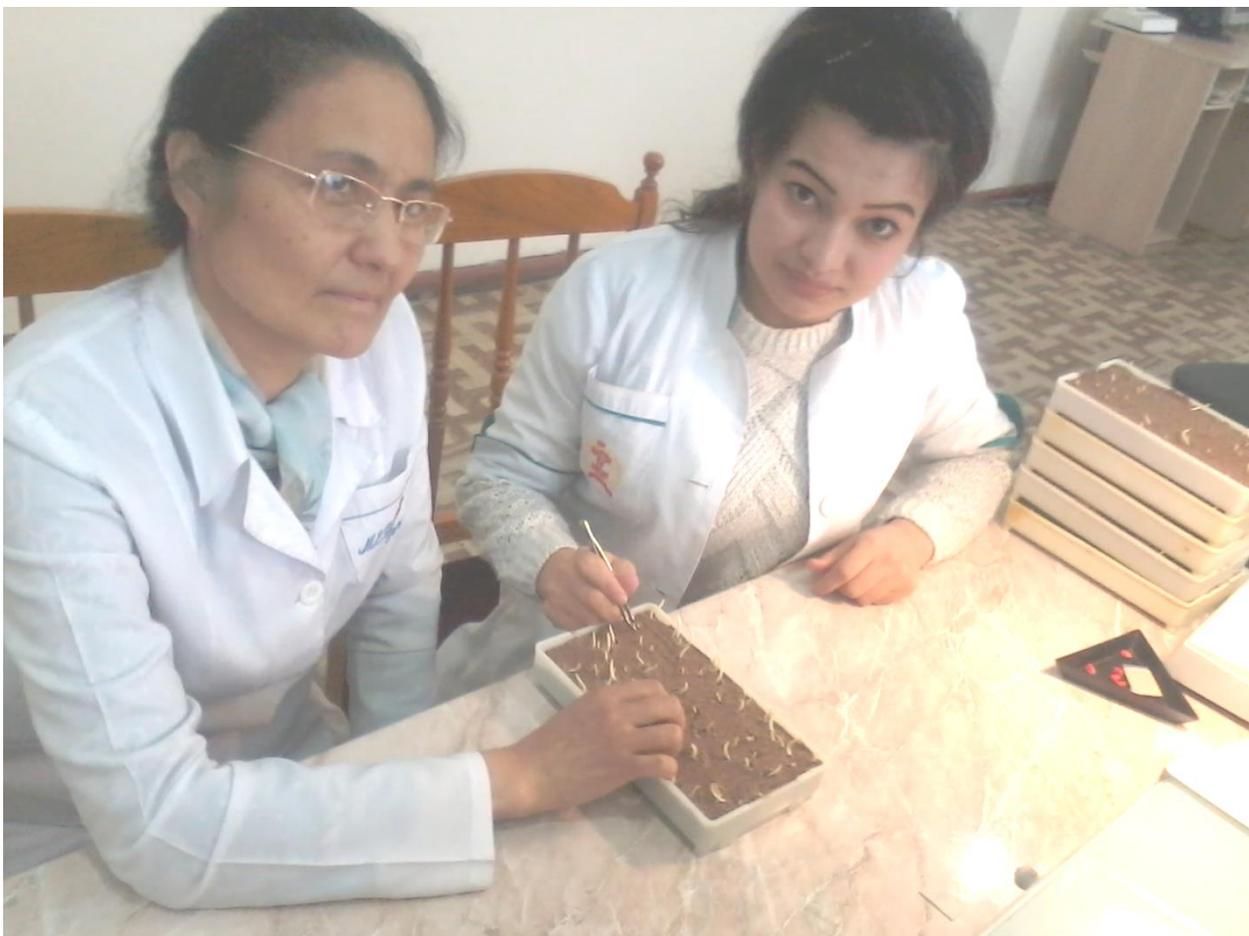
**Table 40. Determination of sprouting energy and germination of sorghum seeds**

№	Varieties	Necessary things	Temperature and growing, 25°C.	Light and darkness	Days of record, in days		Results of analysis, an average in %.	
					Sprouting energy	Germination	Sprouting energy	Germination
1		Sand	., ., .,	Darkness	4	8		
2		Sand	., ., .,	Darkness	4	8		
3		Sand	., ., .,	Darkness	4	8		
4		Sand	., ., .,	Darkness	4	8		

The growers are put on the shelves of working thermostat by the students of subgroups (photo 105).

The temperature of the thermostat (25°C) is verified three times for every 24 hours: in the morning, midday and in the evening and regularly remarked in the table of copybook. The required temperature of the thermostat (25°C) for seed growing doesn't exceed or lower than  $\pm 2^{\circ}\text{C}$ . A dish with water is placed into bottom of thermostat. The water level 1.5-2.0 cm in the dish is kept and refreshed for every 3-5 days.

Sprouting energy and germination of seeds are analyzed (photo 113) according to



**Photo 113. Assistants of central accredited testing laboratory Aripova Nasiba and Gafurova Nasiba are analyzing seeds' sprouting speed of sorghum.**

conditions and terms exhibited in table 41 and determined by sprouting energy and germination. The results of analysis are written on the leaflet for

quality of seed subprobes presented in the enclosure 4 (it should be drawn in notebook and filled with data by the help of specialist).

Table 41 **The results of seed germination analysis**

Mean arithmetic percentage of germination	Admissible difference, in %. (for 4x100)
99 or 1	+ 2
From 97 to -98 or from 2 to -3	+ 3
From 95 to -96 or from 4 to -5	+ 4
From 92 to -94 or from 6 to -8	+ 5
From 88 to -91 or from 9 to -12	+ 6
From 83 to -87 or from 13 to -17	+ 7
From 75 to -82 or from 18 to -25	+ 8
From 62 to -74 or from 26 to -38	+ 9
From 39 to -61	+ 10

Initial growing of seeds (sprouting energy) and general germination along every subprobe are determined solely. At the defining of initial growing the counting of normally grown and rotted seeds is done individually by removing away the last ones. And at defining of general germination, the grown seeds, all not grown seeds are counted and separated into groups (normally grown, abnormal grown, swollen and rotted). Mean germination of seeds in four replications is subtracted.

The results of analysis are considered correct if the difference between replications doesn't exceed than admissible indexes of GOST (table 41). In contrast case the analysis should be repeated.

For example, by the students of the first subgroup is checked the correctness of the results of analysis on the variety Dwarf Uzbekistan. The germination along the replications is: 95,7; 96,0; 95,0 and 95,5 %. It is obvious from these results that difference between replications is less than difference + 4 indicated in the table. That is why, the results of this subgroup is concluded correct.

**Task 2.** Every subgroup verifies the significance of variations of thermostat temperature and level of water in the bottom of thermostat in the days before analysis recorded in the notebooks.

### **Questions:**

1. In what order the weight of 1000 seeds is defined?
2. Is there a difference in the methods of defining of germination between corn and sorghum?
3. Why foreseen the periodic checking of temperature and water level in the thermostat?
4. For what the sprayer is needed?

**Glossary:** Mechanic sprayer- механический пульвизатор - механик сув сепгич; compressors - прессовщик - зичлагич; agricultural crops - сельскохозяйственных культур - кишлок хўжалиги экинлари; Rome figures - римские цифры - рим рақамлари; prepared for - приготовленный - тайёрланган; replication – повторение - такроп; unit - единица- бирлик; divergence - расхождение - фарқланиш; again compared - проверяется снова – яна тенглаштирилади; date of sowing - даты посева – экиш саналари; seed growing - проращивание семян – уруғни ўстириш; in the bottom of thermostat - в поддоне термостата – термостат таглигида.

30-practical training.

### **Study of the approbation in seed plantations of grain crops.**

The steady control has been established for saving of high yields of variety seeds and yields of varieties in our republic. Approbation is conducted in the seed plantations of crops for determining the quality of variety seeds (photos 114 and 115). The following definition was given to approbation in the state law about



Photos 114 and 115. **Approbations conducting in the plantations of wheat and corn.**

seed production: “**Conducting of approbation** – this is a research, conducted in the field to identify genetic (variety) clearness, resistance to diseases, pests and general state of planting seeds”.

The farms should not plant seeds unfit to planting, with lowered seed quality from varieties according to the regulation of variety and seed control.

**The aim of the training.** The students are taught the order of approbation conducting in the seed plantations of grain crops.

**The necessary teaching aids.** Lecture notebooks, instruction on the conducting of approbation in the seed plantations of grain crops (appendix 10), manual on the leading of lab and practical trainings on the subject of selection and seed production of grain crops, sample bundles of plants taken out of seed plantations of grain crops, notebooks and pencils.

**1<sup>st</sup> work.** The students of the group are divided into subgroups of 6 people each one. They get acquainted with instruction on conducting of approbation. One

of the students out of each subgroup, fulfills the duty of the agronomist – approbatory, who have passed through special preparation prior to approbation and have corresponding certification. Agronomists – approbatories of every subgroups acquaint the students of their subgroups with works: preparation to conducting of approbation, selection of sample bundles, analyzing of samples and field observation, documentation of the analysis results, handing in the documents on the fulfillment of works in the field approbation to the place of destination.

**2<sup>nd</sup> work.** The students recopy the order of filling woks on the preparation to conducting of approbation into their notebooks, selection of sample bundles, sample analysis and field observation, documentation of results of analysis, handing in the documents to the place of destination. At this, on the first work: to organize the availability of documents for seed plantation of the farms, becoming weedy of the field with the seeds of other varieties or hybrids, at the necessity weeding for variety clearness and identity of the view and also to inspect space isolation width.

On the second work, that is selection of sample: approbation bundles (photo 116) on the wheat, barley, triticale and oats are executed at the beginning of



**Photo 116. Selected approbation bundles by the students at the time of field practices.**

wax ripening of grain (on the corn, at the time of grain texture forming, color of grain and rod of cobs). At this, they walk along the diagonal of the field pulling out 1500 normally developed plants from 150 points, approximately equal intervals each other and establish one bundle. One sample bundle from above mentioned crops is selected out of 450 hectares. On the corn, 250 cobs are selected from 25 points, 10 cobs each one, through the diagonal of the field consisting of 50 hectares and subjecting to analysis.

The students, except those works mentioned above, also should remember that the agronomist – approbatory provides every bundle with corresponding label with necessary notes. Also pays attention to eye assessment on the rate of impurity of the field with weeds: in the case of the field when it is free of weed – 0; inconsiderable occurrence -1; average occurrence of them -2 and too many -3.

In the third work, the students by using of the manuals or literature investigate and write down to their notebooks the order of bundle analysis (photos 117, 118),



Photos 117 and 118.

### **Inspection of bundles.**

documentation of the results of analysis and handing in the documents to the places of destinations. Here, picking out the stocks of plants at the time of inspection of bundle or analysis and making the groups as the following orders:

- 1.The normally developed stocks of plants of approbation variety.
- 2.The plants of other varieties, variety diversity and species of this crop.
- 3.The stocks of infected or damaged plants of the variety by the diseases and insects.

4. Hardly picking out stocks of cultivated plants.

5. Hardly picking out stocks of weedy plants.

6. The stocks of prohibited (quarantine) plants.

7. The stocks of the very dangerous weedy plants.

In the next turn, the percentage amount of plants in each group is defined.

The approbation statement (appendix 10) is filled in on the basis of the taken data.

The field journal is handed in together with the approbation statement.

The approbation statement is filled in by two copies: one to the farm and the second to send to the district agro-industrial association.

**1<sup>st</sup> task.** Study the width of border (isolation) for crops from the instruction of approbation or literature, to the group of analyzed plants, the labels attached to them and the destination of the seeds infected by the diseases.

The seeds are considered as unfit for provision of seeding material if they present the following states:

1. If the general mixture of cultivated plants is hardly picked out will be more than 5 %.

2. If the general mixture of weedy plants is hardly picked out will be more than 3 %.

3. If wheat or barley were spoiled by black smut more than 2 % or by hard smut more than 5 %.

Also, the elite plantations of wheat, barley, oats injured by powder smut more than 0.1 % or elite plantations of wheat, barley and oats were injured by hard smut more than 0.5 % their seeds are considered as unfitted seeds to the quality of elite seeds.

In this situation, the approbatory draw up the statement of unfitted seeds.

If more than 85 % of cobs' traits (signs) exhibit the identity, in this is to point the species diversity (tooth like, flinty and further) in the statement of corn. In other wise of the situation where the uniformity of cobs seems to be less than 85 % (on

average of two replications) the statement of approbation is filled as “Mixture of diversity”.

The questions concerning the considered text:

1. From what work is the preparation of plantation to approbation consist of?
2. What kind of documents are required to execute the approbation?
3. What information is filled in the field journal?

**Glossary:** Variety seeds- сортовые семена – навдор уруғлар; variety and seed control- сортовой и семенной контроль- нав ва уруғ назорати; seed plantations- семенные посевы - уруғлик экинлари; weedy for variety clearness- прополки для чистосортности – нав тозалиги учун ўтоқ қилиш; to the place of destination- к месту назначения – керакли жойга; single bundle- один сноп- бир боғлам намунаси; black smut- черная головня- қора қуя; statement of unfitness- акт непригодности- яроқсизлик акти; draw up the statement- составить акта- акт тузиш.

### Glossary of some key terms

Name of terms	In English	In Uzbek	In Russian	In German
<b>Approbation –</b>	Research conducting in the field with the purpose of determination the genetic purity rate (grade) of plants, resistance to diseases, pests and the general state of seeds, designated to the planting.	Ўсимликларнинг генетик (нав) жихатидан қанчалик тоза эканлигини, касалликларга, заракунадаларга чидамлилиги ва экишга мўлжалланган уруғликнинг умумий ҳолатини аниқлаш мақсадида далада ўтказиладиган тадқиқот.	Исследование, проводимое на поле с целью определения генетической (сортовой) чистоты растений, устойчивости к болезням, вредителям и общего состояния семян, предназначенных для заготовки посевных семян.	Eine Feldforschung zur Bestimmung der genetischen Reinheit (Grad) der Pflanzen, der Widerstandsfähigkeit gegen Krankheiten, Schädlinge und des allgemeinen Zustands der Aussatzur Ernte des bestimmten Samen.
<b>Biological impurity of the variety –</b>	Natural pollination of the variety with other variety or crop taking place in the result of accidental mutations.	Навнинг бошқа нав ёки экин билан табиий чангланиши ва кичик мутациялар натижасида кечадиган ифлосланиш.	Загрязнение происходящее в результате естественных скрещиваний одного сорта с другим сортом или культурой и случайных мутаций.	Die natürliche Bestäubung der Sorte mit anderen Sorten oder Ernten und Verschmutzungen findet aufgrund der kleinen Mutationen statt.
<b>Bred variety –</b>	The variety developed at the scientific research enterprises on the base of	Илмий-тадқиқот муассасаларида селекциянинг илмий	Сорт созданный в научно - исследовательских	Die Sorte, die in den wissenschaftlichen Forschungsunternehmen

	scientific selection methods.	узуллари асосида яратилган нав.	учреждениях на основе научных методов селекции.	n auf der Grundlage wissenschaftlicher Auswahlmethoden entwickelt wurde.
<b>CMS –</b>	Cytoplasmic male sterility (infertility), that is pollen grains inability to impregnation.	Цитоплазматик эркак стериллиги (пуштсизлиги), яъни чанг доначаларнинг наслсиз (пуч) бепушт бўлиши.	Цитоплазматическая мужская стерильность (не способность к оплодотворению), то есть, пыльцевые зерна неспособные к оплодотворению (щуплые).	Zytoplasmatische männliche Sterilität (nicht die Fähigkeit zur Befruchtung), d. h. Staubbeutel, die nicht befruchten können (schwach).
<b>Coefficient of propagation –</b>	Ratio of conditioned seed stock yield to the amount of planted seed stock.	Кондицияли уруғлик ҳосилининг экилган уруғлик миқдорига нисбати.	Соотношение урожая кондиционных семян к количеству посеянных семян.	Verhältnis der Ertragsmenge des konditionierten Samens zur Menge des gepflanzten Saatguts
<b>Dominancy –</b>	The privilege of one over other on allele traits in the heterosis organism.	Гетрозигота орагнизимда аллель белгилардан бирининг иккинчисидан устун туриши.	Преимущество одного над другим по аллельным признакам в гетерозисном организме.	Das Privileg eines der Allelmerkmale als das zweite im Heterosisorganismus.
<b>Elite –</b>	Seed stock produced from propagation of the best plants belonging to the variety which all inherited characteristics to the next generation.	Навга хос энг яхши ўсимликларнинг танлаб, кўпайтириб олинган уруғлиги бўлиб, навнинг барча ирсий белги ва хусусиятларини кейинги	Семена, полученные путем отбора и размножения от наиболее типичных для сорта растений, которые передают все	Samen, der aus der Vermehrung der besten Pflanzen gewonnen wird, ähnelt der Sorte hinsichtlich ihrer erblichen

		бўғинларша ўтказади.	наследственные признаки и свойства сорта следующему потомству.	Eigenschaften, Eigenschaften und Übertragungen an die folgenden Generationen.
<b>Emasculation –</b>	Nipping off (removing) grain pollens from flowers of maternal plant.	Она сифатида олинган ўсимликнинг гулидаги чангдонларни териб олиш (юлиб ташлаш).	Удаление пыльников из цветков материнских растений.	Pflücken von dem Staubbeutel die Blüten mütterlicher Pflanzen.
<b>Family –</b>	Progeny of one cross pollinating plant taken via propagating.	Четдан чангланувчи битта ўсимликни кўпайтириб олинган авлод.	Потомство одного перекрестно опыляемого растения, полученного путем размножения.	Nachkommen einer durch Vermehrung entnommenen Kreuzbestäubungsanlage.
<b>Heredity –</b>	Transferring of trait and properties of the organism from generation to generation.	Организмдаги белги ва хусусиятларнинг наслдан наслга ўтиши.	Передача признаков и свойств организма от потомства к потомству.	Übertragung von Merkmalen und Attributen im Organismus von Generation zu Generation.
<b>Heterosis –</b>	Becoming vigorous, viability and productivity of the first hybrid generation (F <sub>1</sub> ) comparing with parental organisms.	Биринчи бўғин (F <sub>1</sub> ) дурагайининг ота ва она организмларга нисбатан кучли, ҳаётчан ва маҳсулдор бўлиши.	Мощность, жизнеспособность и продуктивность первого поколения гибридов (F <sub>1</sub> ) по сравнению с родительскими	Die Leistungsfähigkeit, Lebensfähigkeit und Produktivität der ersten Hybridgeneration (F <sub>1</sub> )

			организмами.	im Vergleich zu Elternorganismen.
<b>Hybrid –</b>	A new generation distinguishing with hereditary traits and properties taken by crossing of two and more organisms.	Ирсий белги ва хусусиятлари билан фарқ қиладиган икки ва ундан ортиқ организмларни чатиштириб олинган янги бўғин.	Поколение, полученное путем скрещивания двух и более организмов, отличающихся по наследственным признакам и характеристикам.	Eine neue Generation, die sich durch erbliche Merkmale und Eigenschaften auszeichnet, die durch Kreuzung zweier Organismen übernommen werden.
<b>Hybrid population –</b>	Totality of organisms differing from each other on hereditary sign, taken in the result of crossing.	Чатиштириш натижасида олинган ирсий жихатдан бир – биридан фарқланувчи организмлар тўплами.	Совокупность организмов, полученных путем скрещивания, отличающихся друг от друга по наследственному признаку.	Eine Gruppe von Organismen unterscheidet sich hinsichtlich der Erbfolge, was das Ergebnis der Kreuzung darstellt.
<b>Hybridization of remote forms –</b>	Hybridization of plants different in their species and genus.	Турлари ёки туркумлари бошқа бошқа бўлган ўсимликларни дурагайлаш.	Гибридизация растений от разных видов и родов.	Hybridisierung von Pflanzen, die sich in ihrer Art und Gattung unterscheiden.
<b>Industry based seed breeding –</b>	Specialization, seed stock material concentration in a specialized productions, meeting the requirements of the State standards on variety, seed stock and	Нав, уруғлик ва ҳосил сифатлари бўйича давлат стандарти ва техник талабларга жавоб берадиган уруғлик материаллар махсус	Специализация, концентрация производства семенных материалов в особо специализированных хозяйствах, отвечающих	Speziell die Samenproduktion von Samenmaterial auf der Grundlage von Sorte, Samenbestand und Erntegutqualität, die

	crop quality, and also seed breeding organization on the base of all technological processes mechanization and automation, using the least labour expenditure.	ихтисослашган хўжаликларда ишлаб чиқаришни ихтисослаштириш, концентрациялаш, барча технологик жараёнларни механизациялаштириш ҳамда автоматлаштириш асосида энг кам меҳнатни сарфлаб уруғчиликни ташкил этиш.	техническим и государственным стандартам по сортовым, посевным и урожайным качествам, а также организация семеноводства на основе механизации и автоматизации всех технологических процессов, используя наименьшие затраты труда.	den Anforderungen der staatlichen Normen und Verfahren, der Konzentration, der Mechanisierung aller technologischen Prozesse und der Organisation der Samenproduktion genügen Mindestens Arbeitsaufwand aufgrund der Automatisierung.
<b>Insurance seed fund –</b>	Seed reserve (stock) established at the state depositories or directly in the farms to use in the time of natural disasters. Its amount is different depending on the various sections of seed stock system. For example, Insurance fund in the primary seed sections makes 100 % in ratio to seed stock necessity, depositing amounts are	Табиий офатлар вақтида фойдаланиш учун тўғридан-тўғри хўжаликларда ёки давлат жамғармаларида яратиладиган уруғ захираси (запаси). Унинг миқдори уруғлик тизимининг турли звеноларида ҳар хил бўлиб, масалан, бирламчи уруғлик звеноларида эхтиёт фонди уруғликка бўлган эхтиёжга нисбатан	Запас посевных семян, созданный из непосредственно хозяйственных или государственных закров, для их использования во время природных катастроф. Его объём различается в зависимости от звеньев в системе семеноводства. Например, объём набора страхового фонда в звеньях первичного	Samenreserve (Bestand), die bei den staatlichen Verwahrstellen oder direkt in den Betrieben zur Verwendung in Zeiten von Naturkatastrophen eingerichtet wird. Die Menge hängt von den verschiedenen Abschnitten des Samensystems ab. Zum Beispiel macht

	consisted for super elite - 50 %, elite and 1 reproduction – 25-30 %.	100 % миқдорда, суперэлита учун 50 %, элита ва 1 репродукция учун 25-30 % миқдорда жамғарилади.	семеноводства составляет 100% от их нужд в посевных семенах, для супер элиты 50%, для элиты и 1 репродукции 25-30%.	der Versicherungsfonds in den primären Samensegmenten von 100% im Verhältnis zur Samenbedürfnis, die Einzahlungsbeträge für Superelite - 50%, Elite und 1 Reproduktion - 25-30%.
<b>Intensive type variety –</b>	The variety possessing by high photosynthesis capacity, possibility in effective using of environmental factors (soil, water, fertilizer and light) and also resistant to lodging, diseases, pests and adverse external stresses and give capability to bumper crop with quality products.	Фотосинтетик қобилияти юқори бўлиб, ташки муҳит омилларидан (тупроқ, сув, ўғит ва ёриғликдан) унумли фойдалана оладиган, ҳамда юқори агротехник шароитида ётиб қолишга, касаллик, зараркунанда ва бошқа ноқулай таъсирларга чидаб, мўл ҳосил ва сифатли маҳсулот берадиган нав.	Сорт с высокой фотосинтетической способностью, отзывчивый к условиям внешних факторов (почва, вода, удобрения и свет), устойчив к полеганию, болезням, вредителям и другим стрессам и способный дать большой урожай и качественную продукцию.	Die Sorte besitzt eine hohe Photosynthesekapazität, die bei der effektiven Nutzung von Umweltfaktoren (Boden, Wasser, Dünger und Licht) und auch bei Beherrschung, Krankheiten, Schädlingen und widrigen äußeren Beanspruchungen möglich ist.
<b>Introduction –</b>	Bringing of the species	Ўсимликларнинг тур ва	Привоз видов и сортов	Die Arten und Sorten

	and varieties of plants from other territories.	навларини бошқа жойлардан келтириш.	растений из других территорий.	von Pflanzen aus anderen Territorien einzuführen
<b>Mechanical contamination of the variety –</b>	Seed stock's mixing (pollution) with other variety or crop at harvest, renewing, purification, transportation processes.	Ҳосилни йиғиш, янгилаш, тозалаш ташиш каби жараёнларда уруғликнинг бошқа нав ёки экин уруғига аралашиб кетиши (ифлосланиши).	Загрязнение посевных семян семенами других сортов или культур во время сбора урожая, обновление, очищение и транспортировки.	Vermischung (Verschmutzung) des Saatbestands mit anderen Sorten oder Ernten bei der Ernte, Erneuerung, Reinigung.
<b>Modification variability –</b>	Not hereditary (phenotype) variability.	Ирсий бўлмаган (фенотипик) ўзгарувчанлик.	Ненаследственная (фенотипическая) изменчивость.	Keine Variabilität der Vererbung (Phänotyp).
<b>Mutational variability –</b>	It arises by the external influences and does not transmit from generation to the generation.	У ташқи шароит таъсирида юзага келиб, бўғиндан–бўғинга берилмайди.	Она возникает под влиянием внешней условия но не передается по наследству.	Es entsteht durch die äußeren Einflüsse und überträgt nicht von Generation zu Generation.
<b>Mutation –</b>	A sudden (by spasmodic way) hereditary altering of traits and properties in the organism.	Организмдаги белги ва хусусиятларнинг тасодифий (сакраш йўли билан) ирсий ўзгариши.	Случайная (неожиданная), наследственная изменчивость признаков и свойств организма.	Eine Ebene der plötzlichen (auf unerwartete Weise) erblichen Veränderung von Merkmalen und Attributen im Organismus.
<b>Phenotype –</b>	Sum of external and	Организм генотипи билан	Совокупность внешних	Summe der äußeren

	internal traits (properties) formed together in the organism in the result of interactions of organism's genotype and environmental conditions.	ташқи шаротининг ўзаро таъсири натижасида организмда шаклландиган ташқи ва ички белгилар (хусусиятлар) йиғиндиси.	и внутренних признаков (свойств) сформировавшиеся в результате взаимодействия генотипа организма и условий окружающей среды.	und inneren Merkmale (Eigenschaften), die im Organismus als Ergebnis von Interaktionen des Organismusgenotyps und der Umweltbedingungen zusammengebracht werden.
<b>Population –</b>	A group of plants spreading in a certain areal (territory), belonging to one species, freely mats within species, but differs in regard of heredity.	Муайян ареалда (территорияда) тарқалган, бир турга мансуб бўлган, ўзаро эркин чатишадиган, лекин бир-биридан ирсий жиҳатдан фарқ қиладиган ўсимликлар тўплами.	Группа растений распространённых в определенном ареале (территории), относящихся к одному виду, свободно скрещивающиеся между собой, но наследственно отличающиеся друг от друга.	Gesamtmenge der Pflanzen, die sich in einem bestimmten Gebiet (Gebiet) ausbreiten, gehört zu einer Art, ist innerhalb der Art frei mattsbar, unterscheidet sich jedoch hinsichtlich der Vererbung.
<b>Polyploids –</b>	Hereditary variation depending on multiply increasing the haploid chromosome sum of organism.	Организм гаплоид хромосомалар йиғиндисининг каррали ортиши билан боғлиқ бўлган ирсий ўзгарувчанлик.	Наследственная изменчивость, связанная с кратным увеличением гаплоидных наборов хромосом организма.	Erbliche Variation, die von der mehrfachen Erhöhung der haploiden Chromosomensumme des Organismus abhängt.

<b>Reproduction –</b>	It means copy taking, that is a consecutive seed obtaining by the propagating of elite seeds, taking of 1-reproduction through planting of elite seed stocks, and from it to produce the 2-reproduction, from this to produce the 3-the last reproductions.	Нусха кўчириш деган маънони билдириб, элита уруғликларни кўпайтириб олинган урууғлик, яъни элита уруғлик экилиб 1-репродукция уруғлик, ундан эса 2-репродукция, ундан 3 ва сўнги репродукция уруғликлар олинади.	Означает снятие копии, т.е. последовательное получение семян, посевная от размножения элиты, 1-репродукция от посевов элиты, далее 2-репродукция, 3-и последнее репродукции.	Es handelt sich um Kopiervorgänge, einen Samenbestand, der durch Vermehrung von Elitsaatgut gewonnen wurde, dh um 1-Reproduktion durch Anpflanzen von Elitsaatgutbeständen und daraus, um die 2-Reproduktion zu erzeugen, daraus die 3-Reproduktion und so weiter andere Reproduktionen.
<b>Seed control –</b>	A system of measures directed to inspect seed sowing suitability at the time of producing, storage and releasing from warehouses.	Уруғни етиштириш, сақлаш ва амборлардан чиқариш вақтларида уруғликнинг экинбоплик хусусиятларини текширишга қаратилган тадбирлар тизими.	Система мероприятий, направленных на проверку посевных свойств семян во время выращивания, хранения и выноса их из хранилищ.	System von Maßnahmen zur Überprüfung der Eignung der Samenaussaat zum Zeitpunkt der Herstellung, Lagerung und Freigabe aus Lagerhäusern.
<b>Seed production –</b>	It is the special branch of agricultural production, the main aim of which is	Қишлоқ хўжалик ишлаб чиқаришнинг махсус тармоғи бўлиб, унинг	Являясь специальной отраслью производства сельского хозяйства, её	Es ist der besondere Zweig der landwirtschaftlichen

	to mass multiplication of zoned and registered into state register seeds of growing varieties in peasant, farmer and community farms through maintain their variety purity, biologic and farm properties.	асосий мақсади дехқон, фермер ва жамоа хўжалиқларини районлаштирилган, Давлат реестрига киритилиб экилаётган навларнинг уруғини нав тозалиги, биологик ва хўжалиқ хусусиятларини сақлаб оммавий равишда кўпайтириш.	основной целью является сохранение сортовой чистоты, биологических хозяйственных свойств и массовое размножение сортов семян, районированных в дехканских и фермерских хозяйствах, включенных в государственный реестр.	Produktion, dessen Hauptziel die Massenvervielfachung von Zonensaatgut ist, das in Saatgut von Samensorten in Bauern, Landwirt und Gemeindefarmen eingetragen wird, wobei die Sortenreinheit, die biologischen Eigenschaften und die landwirtschaftlichen Eigenschaften erhalten bleiben.
<b>Seed production scheme –</b>	A complex of inter linked nurseries and seed stock plantations designed to renew (reproduction of seed stock) of the variety via purposeful order of selection and propagation.	Муайян тартибда танлаш ва кўпайтириш билан навларни янгилаб туришга (уруғликни қайта етиштириб туришга) қаратилган ўзаро боғланган питомниклар ва уруғлик экинзорларнинг мажмуи.	Комплекс связанных между собой питомников и семенных посевов направленных на сорто - обновление с определенным порядком отбора и размножения (перепроизводство посевных семян).	Der Komplex aus miteinander verbundenen Baumschulen und Samenplantagen, das zur Erneuerung (Reproduktion des Saatbestandes) der Sorte durch gezielte Sortierreihenfolge und Vermehrung bestimmt

				ist.
<b>Seed production system –</b>	A complex of inter linked production nets providing all crop plantations with excellent quality seeds of one or several crops according to the state plan.	Давлат планига мувофиқ барча экин майдонларини бир ёки бир қанча экинларнинг аъло сифатли уруғликлари билан таъминлаб турадиган бир-бири билан ўзарор боғланган ишлаб чиқариш тармоқларининг мажмуи.	Комплекс производственных отраслей, связанных между собой и обеспечивающих всех посевные площади высококачественными семенами одной или нескольких культур соответственно с государственным планом.	Der Komplex aus miteinander verbundenen Produktionsnetzen, das allen Kulturpflanzen Plantagen mit hervorragendem Samen von einer oder mehreren Kulturen gemäß dem staatlichen Plan zur Verfügung stellt.
<b>Strain –</b>	Progeny of one, self pollinating plant.	Ўзидан чангланувчи битта ўсимликнинг авлоди.	Потомство одного самоопыляющего растения.	Nachkommen einer einzigen selbstbestäubenden Pflanze.
<b>Strain changing –</b>	Changing of one elder variety of the crop grown in the industry variety by the new more productive and fine quality product variety.	Бирор экиннинг ишлаб чиқаришда экиб келинаётган эски навини серҳосил ва маҳсулотнинг сифати яхшироқ бўлган янги нав билан алмаштириш.	Замена старого сорта одной из культур высеваемого в производстве новым сортом с лучшими по урожайности и качеству продукции характеристиками.	Wechsel eines der angebauten älteren Sortenzuden neuen produktivität und produktqualität Sorten.
<b>Super elite –</b>	Seed stock of superior productivity, grade and	Маҳсулдорлиги, нав ва экинбоплик хусусиятлари	Посевные семена с наивысшими	Samen mit überlegener Produktivität, Sorte

	planting attributes. It is produced from the nursery of family multiplication established at the process of elite seed production.	энг юқори бўлган уруғлик. У элита уруғлари етиштириш жараёнида ташкил этиладиган оилаларни кўпайтириш питомнигидан олинади.	продуктивными, сортными и посевными свойствами. Она получается путем размножения семей, созданных в процессе производства семян элиты.	und Pflanzung. Es wird aus der Gärtnerei der Familienvermehrung hergestellt, die im Zuge der Elitsaatproduktion etabliert wurde.
<b>The plant breeding –</b>	The creation of the new varieties (hybrids) in the farming branch and the science about the methods of improving the varieties under production.	Дехқончилик соҳасида янги навлар (дурагайлар) яратиш ва экилиб келинаётган навларни яхшилаш усуллари тўғрисидаги фан.	Наука о методике улучшения высеваемых сортов и создания новых сортов (гибридов) в отрасли земледелия.	Die Schaffung der neuen Sorten (Hybriden) in der Landwirtschaft und die Wissenschaft über die Methoden zur Verbesserung der Sorten in der Produktion.
<b>Triticale –</b>	56 and 42 chromosomal wheat - rye amphidiploids.	56 ва 42 хромосомали буғдой-жавдар амфидиплоидлари.	56 ва 42 хромосомали буғдой-жавдар амфидиплоидлари.	56 und 42 chromosomale Weizen - Roggen - Amphidiploide.
<b>Variation –</b>	Quality and quantity altering of traits.	Белгининг сифат ва миқдор жиҳатидан ўзгариши.	Качественные или количественные изменения признаков.	Veränderung die Qualität und Quantität nach dem Merkmale.
<b>Variability –</b>	Difference of organism progeny on some of characteristics and	Организм авлодининг ўз аждодларидан қандайдир белги ёки хусусиятлар	Отличие потомства организма от своих предков по каким нибудь	Unterschied der Nachkommenschaft des Organismus in

	properties from own ancestors.	билан фарқ қилиши.	признакам и свойствам.	einigen Merkmalen und Eigenschaften von eigenen Vorfahren.
<b>Variety –</b>	A group of plants created by the method of selection, which have a certain hereditary, morphologic, farm, biologic trait and attributes.	Селекция усуллари билан яратилган, аниқ ирсий морфологик, биологик хўжалик, белги ва хусусиятларга эга бўлган ўсимликлар гуруҳи.	Группа растений, созданная методом селекции обладающая определенной наследственностью, морфологией, хозяйственно биологическими признаками и свойствами.	Die Gruppe von Pflanzen, die durch die Auswahlmethode erstellt wurde und bestimmte erbliche morphologische, landwirtschaftliche, biologische, Eigenschaften und Merkmale aufweist.
<b>Variety control –</b>	A system of measure directed to the full ensurance of all cropping fields by high quality seed stock on the base of state standard requirements, realizing with the help of approbation.	Дала апробацияси ёрдамида амалга ошириладиган барча экин майдонларини давлат стандарти талаблари асосида юқори сифатли уруғлик билан тўла таъминлашга қаратилган тадбирлар тизими.	Система мероприятий направленных на полное обеспечение всех посевных площадей культурами с высококачественными семенами на основе государственных стандартов, осуществляемых путем апробации.	Ein Massnahmensystem, das mithilfe von Approbation im Feld implementiert wird, um sicherzustellen, dass alle Feldfrüchte mit einem qualitativ hochwertigen Samenbestand auf der Grundlage der staatlichen Standardanforderungen sichergestellt

				werden.
<b>Variety renewing –</b>	Rotation of high planting quality seeds of the same variety after diminishing its crop, seed planting qualities and biological attributes in the result of growing in the industry.	Бир нав ишлаб чиқаришда экилиб, унинг ҳосили, уруғликни экиш сифатлари ва биологик хусусиятлари пасайганидан сўнг шу навнинг уруғлик сифати юқори бўлган уруғ билан алмаштириб экиш.	Замена семян сорта, высеваемых в производстве после того как у них понизились урожайность, посевное качество и биологические свойства, семенами этого же сорта, обладающими высоким семенным качеством.	Rotation von Saatgut hoher Sorte der gleichen Sorte nach Verminderung der Ernte, Samenqualität und biologischen Eigenschaften als Ergebnis des Wachstums in der Produktion.
<b>Variety trials –</b>	To pass the variety through preliminary (small), competitive (enlarged), ecologic industrial, dynamic and state trials in the process of this new variety creation.	Янги нав яратиш жараёнида шу навни дастлабки (кичик), конкурс (катта), экологик ишлаб чиқариш, динамик ва давлат навсинашлардан ўтказиш.	Проведение предварительных (станционный), конкурсных (расширенный), производственно-экологических, динамических и государственных сортоиспытаний в процессе создания нового сорта.	Um die Sorte durch vorläufige (kleine), wettbewerbsfähige (erweiterte), ökologische industrielle, dynamische und staatliche Versuche im Entwicklungsprozess dieser neuen Sorte zu führen.

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## APPENDIXES

Appendix 1

ГОСУДАРСТВЕННАЯ КОМИССИЯ ПО СОРТОНСПЫТАНИЮ  
СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

### МЕТОДИКА ГОСУДАРСТВЕННОГО СОРТОИСПЫТАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

ВЫПУСК ВТОРОЙ

ЗЕРНОВЫЕ, КРУПЯНЫЕ, ЗЕРНОБОБОВЫЕ,  
КУКУРУЗА И КОРМОВЫЕ КУЛЬТУРЫ

Москва — 1989

**The data of soft and hard wheat diversities.**

Diversities	Availability of awn	Downy of spikelet sequama	Color		
			ears	awns	grains
Albidum	Without awn	Not downy	White	-	White
Lutescens	Without awn	Not downy	White	-	Red
Milturum	Without awn	Not downy	Red	-	Red
Alborubrum	Without awn	Not downy	Red	-	White
Erythrosperrum	With awn	Not downy	White	White	Red
Graecum	With awn	Not downy	White	White	White
Ferrugineum	With awn	Not downy	Red	Red	Red
Erythroleucum	With awn	Not downy	Red	Red	White
Nigriaristatum	With awn	Not downy	White	Black	Red
Caesium	With awn	Not downy	Рыжая	Red	Red
Pyrothrix	Without awn	Downy	Красная	-	Red
Velutinum	Without awn	Downy	Белая	-	Red
Hostianum	With awn	Downy	Красная	Белая	Red
Barbarossa	With awn	Downy	Красная	Красная	Red
Leucosperum					
Alborubrum					
Delfi					

**The data of hard wheat diversities**

Diversities	Availability of awn	Downy of spikelet sequama	Color		
			ears	awns	grains
Leucurum	With awn	Not downy	White	White	White
Affine	With awn	Not downy	White	White	Red
Leucomelan	With awn	Not downy	White	Black	White
Reichenbachii	With awn	Not downy	White	Black	Red
Hordeiforme	With awn	Not downy	Red	Red	White
Erythromelun	With awn	Not downy	Red	Black	White
Provinciale	With awn	Not downy	Black	Black	White
Melanopus	With awn	Downy	White	Black	White
Coerulescens	With awn	Downy	Black	Black	White
Valenciae					
Italicum					
Africanum					
Apulicum					
Libycum					

**DIFINITION OF GERMINATION.**

Beginning \_\_\_\_\_ 20\_\_ y.

Ended \_\_\_\_\_ 20\_\_ y.

Thermostat №\_\_ Temperature \_\_\_\_°C

Under light

In the dark

Beginning \_\_\_\_\_ 20\_\_ y.

Ended \_\_\_\_\_ 20\_\_ y.

Thermostat №\_\_ Temperature \_\_\_\_°C

(For arbitration)

Growing days	Dates	Subsamples				An average	Growing days	Dates	Subsamples				An average
		I	II						I	II	III	IV	
Sprouting energy						Sprouting energy							
Germination						Germination							
Total						Total							
Total hard seeds						Total hard seeds							
Part of non-germinated seeds						Part of non-germinated seeds							
In that number:						In that number:							
Soaked.						Soaked.							
Rotted.						Rotted.							
Recording of germination at the time of sprouting energy records.						Recording of germination at the time of sprouting energy records.							
Record of germination.						Record of germination.							
Abnormal germinated seeds.						Abnormal germinated seeds.							
Total:		100	100	100	100	Total:		100	100	100	100	100	

Sprouting energy \_\_\_\_\_ %

Germination \_\_\_\_\_ %

Sprouting energy \_\_\_\_\_ %

Germination \_\_\_\_\_ %

**The main diversities of common barley.**

Species diversities	Density of ear	Availability of awn	Indentation of awns	Ear color	Film coating of kernel
1. Pallidum	Friable	Awned	Serrated	Yellow	Film coated
2. Nigrum	Friable	Awned	Toothy	Black	Film coated
3. Ricotense	Friable	Awned	Smooth	Yellow	Film coated
4. Parallelum	Dense	Awned	Toothy	Yellow	Film coated
5. Coeleste	Friable	Awned	Toothy	Yellow	Naked
6. Horsfordianum	Friable	Additionally three toothy	-		Film coated
7. Trfurcatum					
8. Leicorrhynchum					
9. Piramidatum					

**The main diversities of two-row barley.**

Species diversities	Density of ear	Availability of awn	Indentation of awns	Ear color	Film coating of kernel
1. Nutans	Friable	Awned	Serrated	Yellow	Film coated
2. Medicum	Friable	Awned	Smooth	Yellow	Film coated
3. Nudum	Friable	Awned	Toothy	Yellow	Naked
4. Persicum	Friable	Awned	Smooth	Black	Film coated
5. Erectum	Dense	Awned	Toothy	Yellow	Film coated
6. Hugpicans					
7. Deficiens					
8. Nudideficiens					

**The characteristics of corn subspecies and their varieties and hybrids.**

Corn subspecies	Appearance of grains.	Coating of grain	Color of grain	Structure of endosperm	Starch content in grain, %.	Albumen content in grain, %.
1.Dent corn	Enlarged, prolonged, plane, corner. It has depression in the top part	Top is mealy and horned film shape in only the side and lower part.	White, Yellow, light-yellow.	Porous flour occupies center and top part of grain	68-78	8-14
2.Flint corn	Circle, the top part steps out.	Smooth, transparent.	White, yellow, red.	Endosperm is horned, central part is only mealy	65-83	8-18
3.Starchy corn	Enlarged, circle, the top part is steps out.	Smooth	White, grey, light-yellow.	Endosperm consists of mealy and mealy starch	72-85	6-13
4.Sweet corn	Enlarged and middle	Wrinkled.	White, light-yellow, grey.	Endosperm is transparent horned and porous		
5.Pop-corn	Smaller, circled and prolonged		Mainly white.	Endosperm is horned	62-70	10-15

**Laboratory mills**





Statement checked by \_\_\_\_\_  
post, signature

-----  
post address of the farm

Seed plot

Plantation has been recognized \_\_\_\_\_ reproduction  
\_\_\_\_\_ category

STATEMENT № \_\_\_\_\_ APPROBATION

Seed plot \_\_\_\_\_

name of the crop

“ \_\_\_\_\_ ” 201 \_\_\_\_ y. by me, approbatory \_\_\_\_\_  
family name and others

at attending of farm representatives: \_\_\_\_\_

indicate the post and, the names

carried out approbation of the field \_\_\_\_\_ plants in the farm  
\_\_\_\_\_ district agricultural governing

**By the data of approbation have been identified:**

1. Name of the variety \_\_\_\_\_ botanic diversity  
point out the bred №

2. General area of the plantation subjecting to approbation crop in the farm \_\_\_\_ ha, including to seed plot \_\_\_\_ ha,  
from that planted variety seeds and was approbated \_\_\_\_ ha.

3. Disposition of the plantation under approbation № \_\_\_\_ plot \_\_\_\_

4. By what seeds planting has been done \_\_\_\_\_  
private or received, if the seeds were received

\_\_\_\_\_ point out from what organization

5. Denomination № and date of variety document for planted seeds \_\_\_\_\_

6. If the planting was done by own crop, point out, when and from whom they were taken, reproduction \_\_\_\_

7. What year the elite seeds produced from breeding experiment establishment \_\_\_\_\_

8. Variety quality of planted seeds: reproduction: (generation) \_\_\_\_\_

Categories \_\_\_\_\_ variety clearness (identity) \_\_\_\_\_ % of sunflower's armour  
\_\_\_\_\_ % . corn xenia \_\_\_\_\_ of grain.

9. Are there in the farm or in the neighboring farm other varieties of this variety or population, name and area under  
them in 200 \_\_\_\_ y. \_\_\_\_\_

10. Space isolation from other across crossing cultivars has been observed  
\_\_\_\_\_ interval \_\_\_\_\_ meters.

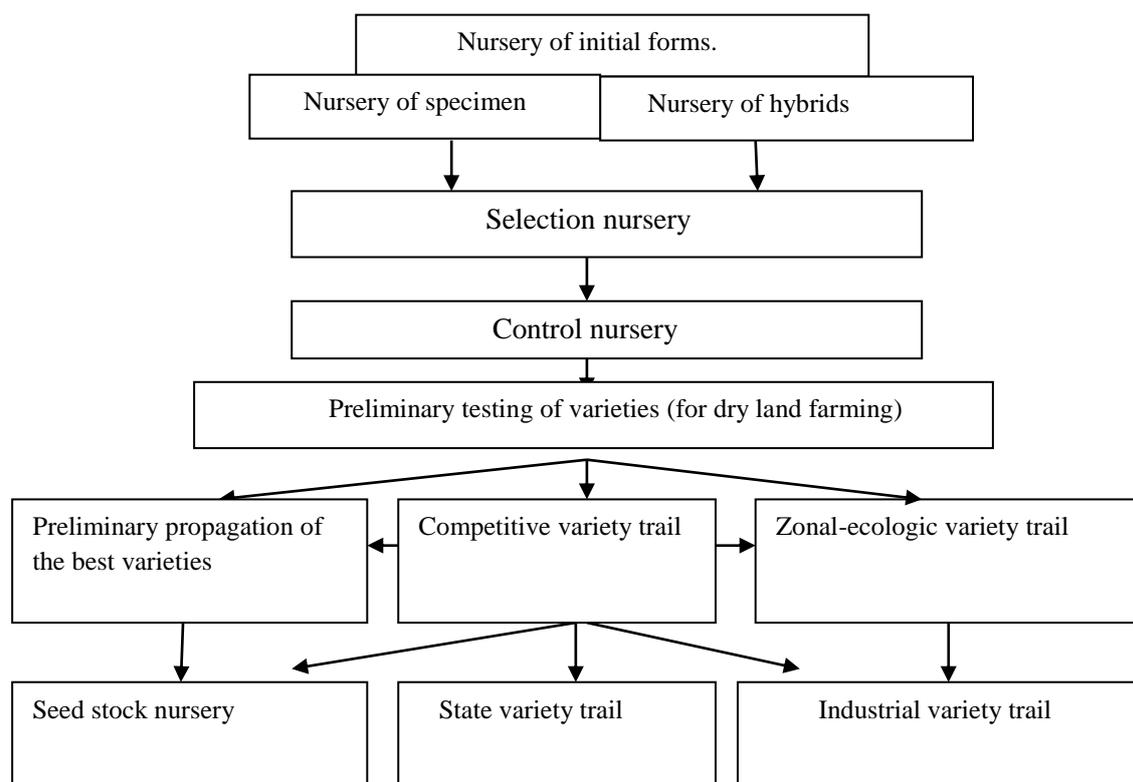
11. Predecessors of the plantation (crops, varieties and areas under them) \_\_\_\_\_

12. Main agro-practices, applied in the farm on the seed plantation (what fertilizers and how many, preparation of  
seeds and quality-class, heating, disinfection, weeding)

13. Phase of development in the moment of approbation

14. Weediness of the plantation by weeds (on the indexes) \_\_\_\_\_

15. Crop expecting, per hectare \_\_\_\_\_

**General procedure of grain-bean crop selection process.****Scope of the work with investigating varieties and forms in the nurseries**

Year	Nurseries name	Sowing method in the experiment	Scope of the work
1	Crossing F <sub>0</sub>	-	200-250 crossing combinations; emasculated and pollinated 10-12 spikes from each combination
2	Nursery of progeny F <sub>1</sub> of 1 year	F <sub>1</sub> hand planting, 5x20 cm	200-250 combinations
3	Nursery of progeny F <sub>2</sub>	CKC-6-10 3m <sup>2</sup> Planting without replications	Selection of 4000-5000 plants out of plot
4	Breeding nursery	CKC-6-10 5m <sup>2</sup> Planting without replications	Selected 1500-2000 typical forms are studied in the control nursery
5	Control nursery	CKC-6-10 10m <sup>2</sup> Planting in 2 replications	200-400 samples are studied, the perspective forms are selected.
6	Control nursery	CKC-6-10 10m <sup>2</sup> Planting in 2 replications	200-400 samples are studied, the perspective formss are selected.
7	Competitive variety trail	CKC-6-10 25m <sup>2</sup> Planting in 4 replications	30-40 perspective varieties are studied
8	Competitive variety trail	CKC-6-10 25m <sup>2</sup> Planting in 4 replications	30-40 perspective varieties are studied
9	Competitive variety trail	CKC-6-10 25m <sup>2</sup> Planting in 4 replications	30-40 perspective varieties are studied

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