

**Ministry of agriculture and water resources of the republic of
Uzbekistan**

Tashkent State Agrarian University

The work - book on practical lessons of the subject

Selection and seed breeding of field crops



Tashkent- 2017

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

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

Compilers:

M.Ashurov – a senior teacher of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

U.T.Abdullayeva – the head of the department of foreign languages, TSAU.

D.Rasulova- a senior teacher of the department of foreign languages, TSAU.

R.Abdumajitova – a senior teacher of the department of foreign languages, TSAU.

G.Shodmonova – an assistant of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

N.Mavlonova – an assistant of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

D.Umirov – an assistant of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

Z.Asqarova – an assistant of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

A.Baratova – an assistant of the chair of Genetics, selection and seed production of agricultural crops, TSAU.

Reviewers:

A.A.Abdullaev

Doctor of biologic sciences, professor,
academician of the Academy of
Sciences of the republic of Uzbekistan

G.Normatova -

Senior teacher of the department
of foreign languages, TSAU.

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FOREWORD

Since the independence of Uzbekistan, the international relations between local and foreign representatives of all industries were considerably broadened, including the relations with higher educational institutions; students and specialists in agriculture field.

Various field crops are widely grown by our nation and products, manufactured from them, are consumed not only by the people of the republic but different countries' consumers of the world at high demands. Therefore, a number of measurements directed to improve agricultural products and the enhancing young staffs' international competence at this field are implemented. The most important of them is wide introduction of English language in teaching of professional subjects, in order to consolidate economical relations of young people with developed foreign countries in the nearest future. This tendency of progress has been announced by the declaration of the President of the republic of Uzbekistan: "About measurements on further improvement of foreign languages learning system" dated on December 10th, 2012 on the number of PK-1875.

In the result of above mentioned activities it is primarily foreseen the development of agriculture towards the high ranks of the world. At higher educational institutions this aim is achieved by learning of the main subjects in English. The rapid providing of major teaching subjects with contemporary literature written in English has a great importance in strengthening of gained achievements

This work - book is designed for practical classes on "Selection and seed breeding of field crops" written in English, Russian and Uzbek for corresponding language groups of students is the first manual purposed to achieve above mentioned initiatives. It comprises of 64 academic hours according to working program and has been composed by the teachers, who are closely concerned with teaching of students in plant breeding direction of agricultural crops and their seed production. It has broad scope of knowledge devoted to the organization of field crops breeding, study of economical characteristics and properties, approbation, product quality and seed reproduction which will be acquired by the students through practical classes.

At accomplishing part of teaching materials for every lesson, exercises, questions and minimum glossaries are presented to get firmly establishment of bachelors' knowledge adopted in lecture courses.

In front page: mungbean – one of widely cultivating crop yielding highly nutritive grains for cuisine and hay for feed stock.

Recommended themes of seminar and practical lessons

№	Themes	Kind of training	Hours
1	Records and inspections in plant breeding and seed production nurseries.	Practical	2
2	Kinds of nurseries.	Practical	2
3	Defining of seed sowing norms of grain-bean crops.	Practical	2
4	Crossing orders of chick pea and soya.	Practical	2
5	Order of individual selection in crops of common bean and mungbean.	Practical	2
6	Determination of variety characteristics of sunflower and flax crops.	Practical	4
7	The rules for middle seed sample selection of field crops.	Laboratory	2
8	Determination of seeds' germinative energy and germinative capacity of field crops.	Laboratory	2
9	Conducting orders of approbation of seed plantations of field crops.	Laboratory	2
10	Regulations of approbation results documentary registration.	Laboratory	2
11	Storage and control of variety purity of field crops.	Laboratory	2
12	Documentation of variety plantations and their conducting orders.	Laboratory	2
13	Study of species diversity and farm valuable characteristics of sunflower.	Laboratory	2
14	Study of tobacco species diversity and its farm valuable traits.	Laboratory	2
15	Study of characteristics of zoned tobacco varieties and its variety traits.	Practical	2
16	Study of species variety and economical traits of oil flax.	Laboratory	2
17	Study of species variety and economic valuable signs of millet.	Laboratory	2
18	Study of variety characteristics and signs of zoned millet.	Practical	2
19	Study of variety and economically valuable signs of zoned varieties of chick pea.	Practical	2

20	Study of variety and farm valuable signs of zoned mungbean (<i>Phaseolus Pip</i>) varieties.	Practical	2
21	Study of species diversity and farm-valuable signs of soya.	Laboratory	2
22	Study of characteristics and variety signs of zoned soya varieties.	Practical	2
23	Study of species diversities and farm valuable characteristics of common bean.	Laboratory	2
24	Study of characteristics of varieties and variety signs of common bean.	Practical	2
25	Study of variety diversity and farm valuable characteristics of buckwheat.	Laboratory	2
26	Study of characteristics and variety signs of buckwheat.	Practical	2
27	Study of variety diversities and farm valuable characteristics of safflower.	Laboratory	2
28	Study of characteristics and variety signs of zoned varieties of safflower.	Practical	2
29	Study of variety and farm valuable signs of ambary	Practical	2
30	Study of variety diversity and farm valuable signs of Lucerne.	Laboratory	2
31	Study of characteristics and variety signs of zoned varieties of Lucerne.	Practical	2
Totally			64

1-practical lesson.

Records and inspections in the plant breeding and seed production nurseries.

Aim of the lesson. To train the students on conducting of phenological inspections such as sprouting, budding, blooming, recording on speed of crop setting and inspection of hybrids at the time of vegetation in correspondence with the plans of scientific research initiated by the breeders and seed producers in the nurseries of plant breeding and seed production.

On the account of biological features of field crops the scientific experiments on plant breeding and seed production are organized at one of irrigating or rain feed fields (photo 1).



Photo 1. Scientific employees of the department of quarantine introduction at the SRI of plant growing are carrying out vegetation inspections of collection mung bean samples (2016).

Scientific research on mung bean as one of field crops is carried out only in irrigating plots. Plantings are implemented by mechanical means or by hand. Width of rows is 70-90 cm, with selection of 1 or 2 ribbon sowing of 15 or 20 width.

The size of nurseries in plant breeding and seed production plots are distinguished on dependence of crop species (table 1).

Table 1

The size of nurseries of crops and amount of the plants in every nursery

№	Crop species	Nursery size, m.	Area of nursery, m ²	Width between plants, cm.	Amount of plants in the nursery, units.	The number of recording plants, units.
1	Mun bean	0.7x4	2.0	20	20	10
2	Pea					
3	Cow pea					
4	Sunflower					
5	Soya					
6	Lucerne					
7	Buckwheat					
8	Ambar					
9	Flax					
10	Millet					
11	Safflower					

Records and inspections in the scientific experiments with field crops in dependence on seeds belonging to local or introduced samples are implemented by usually accepted methods or by the method of international center on study of vegetable crops – ASIRO.

Phenologic inspections. Phenological inspections on the study of farm-valuable characteristics of field crops are carried out on every third day at the development from the beginning of seedlings up to complete ripe of fruits and harvesting.

Usually phenological inspections are executed by the register, accounting and measuring.

1. At the time of germination:

-the days until sprouting the seedlings. Through visually, approximately up to 50% of plants' germination. "The days of seedlings" is defined through detaching of the dates of planting from the dates of plant germination (table 2);

-thickness of plant spacing after thinning. The thinning is carried out along of appearing of seedlings in order to avoid plants' thickness on seed holes. The

records of plants in nurseries from which should be harvested the yield and total amount of registering plants on the replications and bring into the field notebook.

2.In the period of blooming:

-the period prior to the first flowering. The period from sowing to 50% of appearing of flowers on the plants. 10 typical plants are singled out of every nursery and their height are measured by the measuring height from surface of the soil up to growing point.

3.After blooming:

-the period up to completing of blooming. The amount of days from sowing up to 50% of completing of plant blooming. The height of plants gets by measures the height of that 10 plants after blooming. The measurements repeat from the surface of the soil up to growing point of every plant and the taken data bring into the field notebook.

4.At the time of ripening:

-the period of ripening. Visually, 95% of ripening of plants' fruit element in nurseries are taken into account. The necessary days until ripening are calculated by picking out the data of ripening from the date of sowing.

-plants' height at the time of ripening. Measurements are repeated on 10 stood out plants and the data marked in the needed pages of the field notebook.

5.Record of productivity.

Harvest of yield and identification of quantitative indexes are being done at the time of biological maturing. That is, the data of harvest, the quantity of registered plants and the volume of crop. Crumbing of pods are carried out by hand.

6.Morphological description.

The following morphological traits are determined on all detached registered plants of field crops:

-type of stem (determined, semi-determined or undetermined) compactness, stamp bush, semi-stamp, spreading bush, semi-spreading, occurrence of forsin on the main stem, leafy of the bush, number of nodes on the main stem).

-the number of young leaves (3, 4-6, 7 and more), shape of leaf, color, type of leaf, form, leaf area, fuzziness of leaf, leaf smooth, length, type of wideness (circle, elongate, egg shape, inverse-egg shaped);

-kinds of fruit elements: pods of beans, color of pods at the time of technical or complete mature, dehiscing of pods, seed shading from pods at the time of 10-50, 70% of ripening and color of pods at the complete mature;

-the shape of leaf (3-narrow- 1 \width- 2.2 or excess- lanset type; 5-mean- 1\w. 1.9.2.1;7- width- 1w. 1.8 or excess of- oval).

Lodging of plants up to crop harvesting is defined visually as following:

1) all the plants are standing; 2) all the plants are easily lodging or up to 10% of plants were lodged; 3) lodged from 10 to 50%; 4) lodged plants account from 50 to 80%; 5) all the plants have lodged. The record of the lodged plants is executed on the plants of restricted growth, dwarf and straight standing.

Table 2

Vegetation period of mung bean at spring sowing (data by D.Pirnazarov and others., 2015).

№	Name of samples	Days from seedlings up to blooming, days.		Days from seedling up to ripening, days.
		Mass germination, At 75%	blooming, At 75%	Complete mature of the seeds, At 75%
1	2	3	4	5
Ultra-early ripening				
St.	Дурдана	10	38	69
1	vi004789 BG	10	46	69
2	vi004781 BG	10	43	72
3	vi004915 BG	10	46	72
4	vi0025 29 B-BL	10	46	72
5				
6				
Early ripening				
7	vi0062 5 B-BR	7	45	77
8	vi0047 10 AG	10	46	79
19	vi0020 3 B-BR	10	55	79
10	vi0014 03 BR	10	57	79
11				
12				
Late ripening				
13	vi0036 99 B-BR	14	73	104
14	vi0003	7	52	111

	17 B-BR			
15	vi0015 48 AG	10	82	115
16	vi0015 56 BG	7	79	115
17				
18				

The tasks and questions to firm the educational resources.

1.Fill in the blanks of the 1-table with the data of remained field crops on their proper sizes of nurseries and number of plants, through using the scientific data of literature corresponding to those crops.

2. Fill in the lines of the 2-table on ultra-early ripening, early ripening and late ripening with proper data of samples belonging to mung bean on the bases of proposal literature, made by the lecturer at the time of lecture trainings.

3.What kind of inspections are carried out in plant breeding and seed production nurseries?

4.What has to know the researcher at the time of inspection and collecting of the data?

5.What laying out the nurseries?

Glossary:

Records and inspections- учёт и наблюдения-маълумотларни ҳисобга олиш ва кузатув; plant breeding and seed production nurseries- питомники селекции и семеноводства-селекция ва уруғчилик кўчатзорлари; sprouting- появление всходов-ўсимтанинг пайдо бўлиши; budding- образование бутонов-шоналаш; blooming- цветение-гуллаш; scientific research- научная исследование-илмий тадқиқот; breeders and seed producers- селекционеры и семеноводы-селекционер ва уруғчилар; biological features- биологические особенности-биологик хусусиятлари; rain feed fields- полив на счет дождей-суғорилмайдиган далалар; laying out- закладка-жойлаштириш.

2-practical lesson.

Kinds of nurseries.

The purpose of the training. The purpose of this training is to acquaint the students with commonly adopted orders of variety nurseries using by the breeders in the process of selection and breeding works in them (photo 2).

In general there are 4 kinds of nurseries:

- 1.Nursery of initial materials.
- 2.Selection nursery.
- 3.Control nursery.
- 4.Special nursery.

The nursery of initial materials in its turn divided into two nurseries: a) nursery of collection and b) nursery of hybridization.

The order of above listed nurseries are slightly subjecting to variation on dependence of the methods of field crops' re-pollination. That is the self-pollinating plants are being planted closely to each other and the seeds taken in from them may be employed to plant in the subsequent years. The seeds taken in from cross pollinating plants, standing closely in the nursery, are unfit for the next sowing. Such seeds have been genetically contaminated for reason of cross pollination.



Photo 2. An exemplary outlook of one of nurseries in the experimental plot of the SRI are being laid in the practical plant breeding.

Consequently, the breeder, in order to maintain the intended purities of studied selection materials, are enforced to leave the strips or to apply other measurements.

Different works for organization of phenological inspections and records of data with the direction importance of scientific research are under way in the nurseries.

The orders of heredity principles of necessary characteristics and new properties of numerous selection materials are being studied in the **collection nursery** and the best, productive ones of high quality materials of products were select out of them. With the propose of utmost providing the following process of selection with selected pioneer materials the researchers proceeding from their opportunities organize patches with the area of 1-3m² (for instance of buckwheat) and investigate in them some dozens and even hundred accessions with collection numbers (table 3).

Table 3

Scheme of collection samples' placing of soya in the collection nursery by the breeders of plant growing SRI (2015).

St.		1		2				4												
	19		18		17			16		15		14		13		12		11		10
20		21		22		23		24		25		26		27		28		29		
	39		38		37			36		35		34		33		32		31		30
40		41		42		43		44		45		46		47		48		49		
	59		58		57			56		55		54		53		52		51		50
60		61		62		63		64		65		66		67		68		69		
	79		78		77			76		75		74		73		72		71		70
80		81		82		83		84		85		86		87		88		89		
	99		98		97			96		95		94		93		92		91		90
100		101		102		103		104		105		106		107		108		109		
	119		118		117			116		115		114		113		112		111		110
120		121		122		123		124		125		126		127		128		129		
	139		138		137			136		135		134		133		132		131		130
140		141		142		143		144		145		146		147		148		149		
	159		158		157			156		155		154		153		152		151		150
160		161		162		163		164		165		166		167		168		169		
	179		178		177			176		175		174		173		172		171		170
180		181		182		183		184		185		186		187		188		189		
	199		198		197			196		195		194		193		192		191		190
200		201		202		203		204		205		206		207		208		209		
	219		218		217			216		215		214		213		212		211		210
220		221		222		223		224		225		226		227		228		229		
	239		238		237			236		235		234		233		232		231		230
240		242		243		244		245		246		247		248		249		250		251

Defence stripe with the variety of Orzu.

The seeds of collection numbers recognized as the best ones on the result of nursery's phenological inspections are harvested and getting prepared to plant in the next nursery.

The **nursery of hybridization** services to assessment of hybrid population taken out through pollination and to select the best elite plants from them for planting in the selection nurseries. The seeds of the first and the following generations of all hybrids are sown in these nurseries. The area of the smallest patches on dependence of seed amount may be diversified without replications. Also, the parental forms are being planted along the every pair of crossings to compare with the hybrid plants.

The objection of the **nursery of selection** is that to assess elite plant families planted in the patch area of 3-4m² on the indexes of productivity and biochemical technology via primary comparison with the standard variety placed after 10-20 numbers and to select the best progeny to study and propagate in the sequent years. The strict select is carried out in this nursery with simultaneous sowing of dozens and even hundreds of strains and hybrid families. Up to 75% of families available, any shortcomings are discarded.

The productivity of materials, selected in the last year was evaluated in the **control nursery** via planting their seeds in the smallest patches. The farm valuable characteristics of 20 to 100 and, according to the possibilities of the SRI, even more selection materials are investigated in this nursery by means of planting them in some similar nurseries. The special seed drills are employed to sowing. The sowing is performed on small patches with the size of 2m² up to 10-15m² (without replications, by the frequent placing of standard variant) or with 2-3 replications quartered in the areas of 5-10m². The seeds of standard variant are laid in after every 5-10 numbers. Undoubtedly, the outcome of the phenological inspections carried out at the time of vegetation are compared with the indexes of standard variant and correspondingly evaluated every material.

Special nurseries. Special nurseries are the nurseries which have been build up through artificial infection by the diseases for assessment of resistance of selection numbers to diseases. They are build up together in the period of creating of main nurseries- selection and control. Some nurseries designed in the limited areas for carrying out above self-pollinated strains by using of cyto-plasmatic male sterility either belong to special nurseries.

The tasks and questions for consolidation of teaching material:

1. To prepare the abstract about scientific work and observations conducted in the variety of nurseries are being used in the breeding of chick pea (*Cicer orietinum*) and cow pea on the base of literature and scientific reports.

2.Explain the characteristics of special nurseries in the experiments of cow-pea and millet selection and research observations which have carried out in them.

3.Consolidate the theme by using of literary data belong to the size of patches' area of special nurseries.

4.What make up the differences of nursery varieties are being used in the process of breeding?

5. What populations of plants are studied in the selection nursery?

6.What are the tasks of selection nursery?

Glossary:

Nursery-кўчатзор-питомник; variety-хар хил ёки ўсимлик нави-разновидность или сорт растения; re-pollination-чангланиш-перепыление; self-pollinating, cross pollinating plants-ўзидан ёки четдан чангланувчи ўсимликлар-само или перекрестно-опыляемые растения; employed to plant-экиш учун фойдаланилган-использованный для посева; subsequent years-кейинги йиллар-последующие годы; genetically contaminated-ирсий ифлосланган-генетически загрязненные; experimental plot-тажриба участкаси-опытный участок; enforced to leave-қолдиришга мажбур қилган-вынужден оставить ; a patch-бўлакча-делянка; accessions-ашёлар-материалы.

3-practical lesson.

Definition the norms of sowing seed of grain-bean crops.

The purpose of the lesson. The students should be able to acquire and use knowledge concerning to the definition the norms of planting seed, to convert the weight of seeds into quantity and possibilities of accounting the plant amount per hectare not only at the practical auditoriums, in the courses of field-training and extension practices, but either to be able to express the concrete opinions on the questions referring to the above mentioned knowledge in the discussions with peasants and specialists of agricultural industry on the bases of acquired knowledge.

Consequently, to bring aforesaid knowledge to the students is the main aim of the lesson.

The norms of planting seeds of field crops are explained proceeding from the schemes and thousand of developed plants per hectare depending on the natural forms and seed weight, height and plants' branching.

The norms of planting are defined proceeding from the recommendations in the results of experimental achievements of the profitable crop with the schemes of



3-photo. **Development of mungbean is being cultivated by the peasant Ural Umrzakov, Mirzachol division, Mirzabad district of Syrdariya region planted by the scheme of 90x20x3 (10.08.16).**

sowing: on Lucerne- 60x30x2-3 (and others), mungbean-70-90x15-20x3 (photo 3), soya-60x3-5x1, sunflower- 60x30x1 and from the planning up to 400-500 and 600-700 thousands of developed plants per hectare, such field crops as millet, flax are planting by means of other special drills.

Theoretical calculations of planting norms for any crops are based on the weight of 1000 seeds.

The weight of 1000 seeds of Lucerne varieties make up from 1.5 to 3.5 grams (in Baygul variety -2.0g., photo 4), mungbean from 20 to 78 grams (in Durdana variety - 62g.), soya from 40 to 250 grams (in Orzu variety -175g., photo 5), sunflower from 40 to 175 grams (in Jakhongir variety - 74g.), on millet varieties from 3.5 to 9grams (Kazanskoye variety -4.2g.), and flax from 3 to 13grams (in Bakhmalskiy variety -2.9g.).



4-photo. **The seeds of Lucerne of Tashkent-2009 variety.**



5-photo. Fruits and seeds of Orzu variety of soya.

Define the planting norms on the base of planting schemes.

1. From planting schemes of Lucerne and mungbean: 60x30x3 and 90x20x3 we can easily calculate ($10\ 000\text{m}^2 : 0.6\text{m} \text{ и} : 0.9\text{m}$) the availability of 16 666 for the seeds of Lucerne and 11 111 **strap meters** of area for seeds of mungbean per hectare.

2. The amounts of **seed nests** at 16 666 and 11 111 for Lucerne and mungbean are determined through dividing of rows' length in the hectare to the indexes of width (or length of gap) between nests: 16 666 : 30cm (or 0.3m) and 11 111 : 20cm (or 0.2m). And it turned out that it is necessary 55 553 nests to Lucerne and 55 555 nests to mungbean.

3. The amount of seeds and their kilograms to the area of hectare, that is the **norm of planting** is calculated for Lucerne by multiplying 55 553 to 3 the number of seeds, laying into every nest and in the mungbean 55 555 either by multiplying to 3 and it will be for Lucerne 166 659 seeds and for mungbean 166 665. And now by using one known arithmetic proportion, we can estimate the necessary kilograms of seeds to both crops:

If, 1000 seeds of Lucerne weigh 2.5g.

Than how many grams or kilograms will be 166 659 seeds?

The result is: 416 grams or 0.416 kilograms.

If, 1000 seeds of mungbean weigh 49 g.

Then how many gram or kilogram will be 166 665 seeds?

The result is: 8 167 grams or 8.2 kilograms.

These results are the calculation data without taking into account of correcting coefficients linked with the classes on the seed germination ability and the other losses, inevitable in the practices of agricultural industry.

Calculations of seeds planting norms on the base of plant amount, necessary per hectare.

According to the recommendations on the necessity of 400-500 and 600-700 thousand normally developed plants of millet and flax per hectare, the planting norms can be determined by the following modes:

1.500 thousand of normally developed plants are the outcome from 500 thousand vital seeds.

Once more we have to pay attention to proportions:

that is: if 1000 seeds of millet weigh – 6 grams,

how many grams or kilograms would be 500 thousand?

The result is: 3 thousand grams or 3 kilograms.

2. 1000 seeds of flax weigh – 8 grams,

how many grams or kilograms would be 700 thousand?

The result is: 5 600 grams or 5.6 kilograms.

Data of these results are also the calculations without taking into account of correcting coefficients linked with the classes on the seed germination abilities and the other losses, inevitable in the practices of agricultural industry.

The questions and tasks to consolidate the knowledge:

1. What is the sowing norms of seeds?

2. What seeds index is major at determination of the norms of planting?

3. What is the importance of planting scheme and amount of plants in calculation of the norms of seeds of field crops.

4. Define planting norms of soya and sunflower seeds basing on the planting schemes.

5. Calculate necessary theoretical sowing norms of ambary and safflower crops on the base of recommended amounts of plants per hectare.

4-practical lesson. **Crossing orders of chick pea and soya.**

The purpose of the lesson. The breeders artificially mating initial materials with each other in the most of employing methods at the practical selection to create new forms. The efficiency of the artificial crossing depending mostly on the degree of mastering of the structure of field crops' flowers, features, rules of pollination and order by the men who execute the crossing.

The aim of the lesson is to explain this knowledge to students on the example of chick pea and soya.

The flowers of chick pea are small, every flower is single and develops separately. They are in different colors, in general are white, violet and pink- violet (photo 6).

Calyx of the flower have five-toothed shape, consisting of corolla and 10 stamina, 9 of them intergrown. One has grown single.

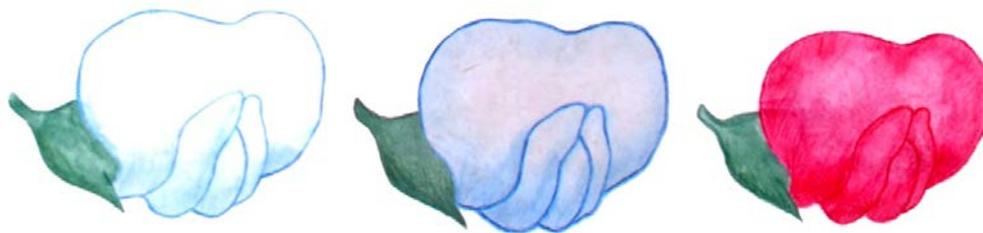


Photo 6.

Outlook of the flowers of chick pea.

Flowers of most bean crops evolve in odd separately and one or two of them are placed on the bases of the leaves. The flowers of some plants grow up together and establish the clusters. The flowers of beans are classified as pea family. Corolla has five petals with diverse shape and sizes. The upper one is the biggest and called a sail. It develops in the odd state. The two side stationed petals are wings or oars. Another two stationed beneath are growing and build up a small boat. 10 above mentioned stamina are located inside the small boat and 9 of them are longer. And here is the ovary (photo 7).

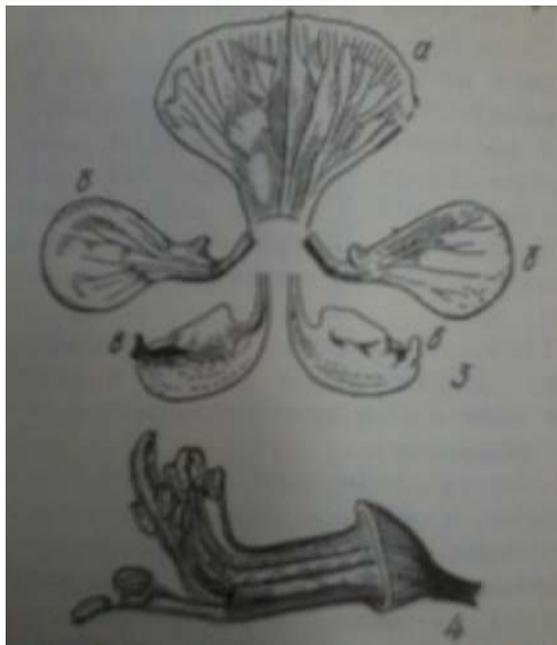
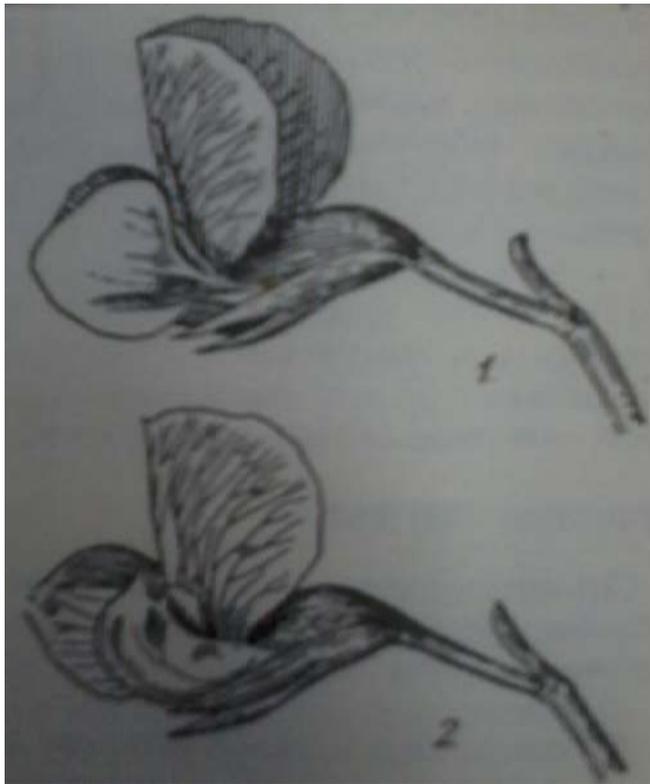


Photo 7. **General structure of bean crops' flowers.**

Here: 1-outlook; 2-a general outlook with one opened wing; 3- corolla; a- sail; b-wing or oar; c-boat; 3- generative part of the flower.

The flowers of soya grow together as clusters out of bases of the leaf. In general they are without odor. There for, they can't attract insects to themselves (photo 8).

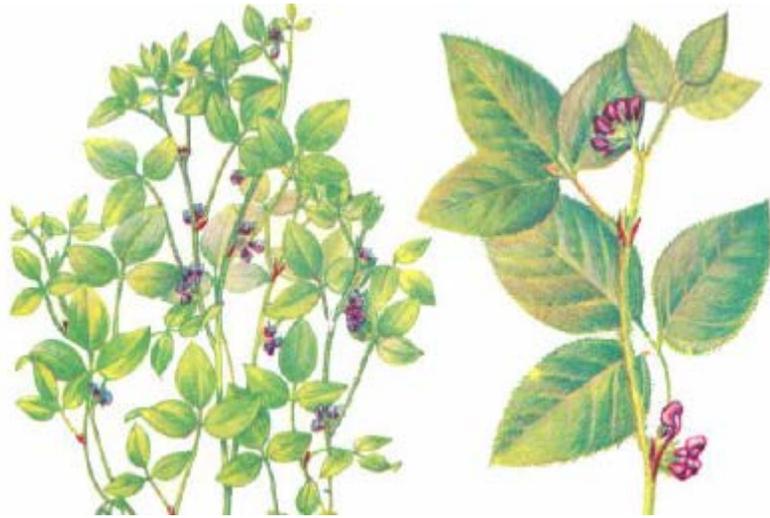


Photo 8. **Soya and its flowers.**

Every cluster has 3, in some of them 13 and more flowers. On the bases of upper leaves are settled single ones. The flowers are small, their size about 7 to 14 mm. The scapes are short hairy. On the base of scape there is a stipule in the shape of lancet. Unopened flowers directed to the up. Calyx is green, sometimes there are anthocyan spots, there is a downy, the color of corolla is white or violet with different tinges.

Order of the pollination. Artificial pollination involves three sequential acts:

- preparation of the flower to pollination,
- emasculation and
- pollination.

Emasculation is the removing of stamina out of maternal plant's flower, and the **pollination**, is the bringing of the paternal plant's pollens on the stigma of emasculated flower.

Emasculation is required to the self-pollinating plants as self-pollination at the cross-pollinating occurs inconsiderably. That is why mainly, they are not emasculated in practical selection.

It would be better to emasculate and pollinate in order to be absolutely confident in receiving the hybrid plants.

Preparation of flowers of chick pea and soya for pollination begins from the selection of maternal plants. The beginning of blooming phase is identified, when the stamina of flowers established, but they haven't ripened fully yet. At this time, it is easily managed to remove the stamina without damaging flower's stigma. Besides, in the middle or at the end of blooming phase most of buds fall off.

Pollination. The flower of chick pea is subjected to the emasculation in the evening, and it is better to conduct pollination itself in the morning. In order to develop properly the emasculated flowers are left unclosed. In the connection with

that the duration of the chick pea's phase of flowering makes 20 days, planting is carried out in the early of spring or in the terms of autumn , that it is necessary to conduct hybridization in warmer days.

The flowers of soya are small and fragile, that is why, the pollination of soya is carried out in the closed state of the flower. That is why pollination of soya causes considerable difficulties.

The pollination is fulfilled in the early morning at 5-7 a.m. and in the evening at 5-7 p.m. For the emasculation, the flowers which will be open in the planning day of pollination is selected.

1-2 soya flowers out of flower clusters are emasculated. The others are removed. Pollens are combined from just opened, completely developed flowers for pollination. The pollens can be stored for 1 hour in the moistened condition. The labels are tied up on the scapes of flowers prepared to pollination or pollinated flowers. The labels have records of pollination combinations. For the isolation the leaves of this plant may be used. The pergament hoods are used in the conditions of precipitation or high moisture. The purpose of the isolation of pollinated flowers of soya is the protection from exceeded moisture and rays of the sun. Conducted works according to the plan of pollination are registered in time on the copy book for pollination.

Necessary instruments: copy book for pollination, pencil, special labels, medicine pincers, smooth brush, small cup, cotton wool.

The questions and tasks to consolidate gained knowledge:

1. What structure has the flower of bean crops?
2. What properties in the biology of blooming have the plants of chick pea and soya?
3. In what order the emasculation and the pollination are fulfilled?
4. Plan your experiment and procedure on getting the hybrids of chick pea plants.
5. Plan your experiment and procedure on getting the hybrids of soya plants.

Glossary: artificially mating- сунъий уруғланишга бирлаштириш- искусственно спаривать; artificial crossing- сунъий чанглантериш- искусственное опыление; calyx of the flower- гулнинг косачабарги- чашелистик цветка; five-toothed- беш учли-пяти зубчатый; outlook –ташки кўриниши- внешний вид; general outlook –умумий кўриниши- общий вид; corolla- гул тожи - венчик; sail- элкан- парус; wing of oar- крыло или весло- канот ёки ешкак; generative part -генератив қисми – генеративная часть; to remove – олиб ташлаш- удалять; stamen-чангчи- тычинка; stigma- оналик тумшукчаси- рыльце; ovary-тугунча- завязь.

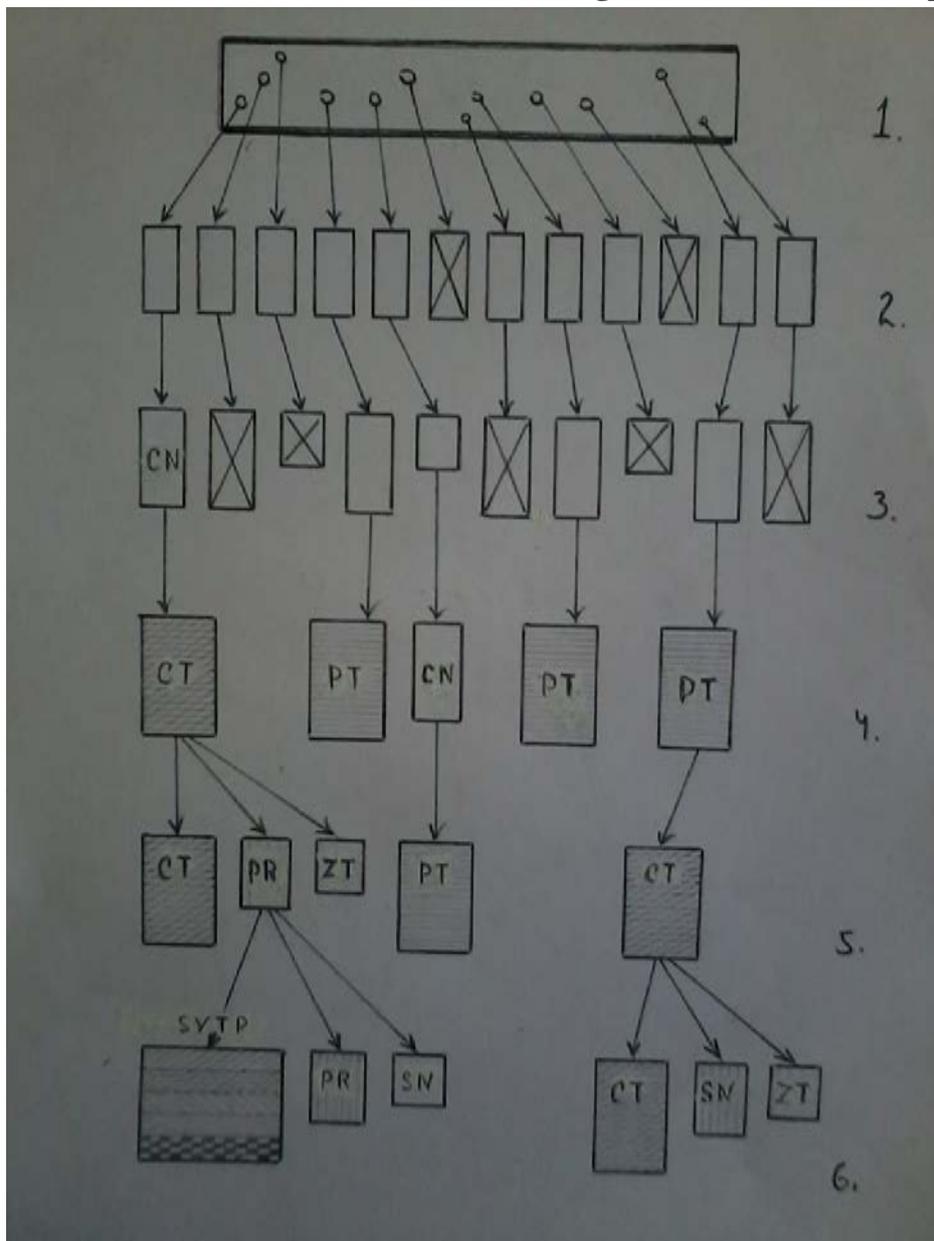
5-practical lesson.

Order of individual selection of common bean and mungbean crops.

Individual selection (pic. 1), is one of the methods employing in the process of breeding. Traditionally, it is applied in the self pollinating crops. As the common bean and so the mungbean belong to the group of self pollinating, they have similar character of blooming. Individual selection in the breeding of these crops is the main method which

Picture 1

The breeding scheme of bean crops



Where: CN-control nursery; CT- competitive variety trial; PT- preliminary variety trial; PR- preliminary seed reproduction; ZT- zonal variety trial; SVTP- state variety trial plot; SN- seed nursery.

ensures the success in creating of new variety.

The purpose of the lesson. The students master the order of individual selections of plants common to bean and mungbean, analyzing in the conditions of practice and laboratory.

Overwhelming majority of the varieties in the republic have been created by the method of single individual selection from the population of local varieties or introduced accessions and also by repeated selection in the course of investigation of their progenies in the nurseries. By such kind of means the varieties of common bean: Shtambovaya-661, Gibridnaya-7, Oltin, Ravot and of mungbean: Marjon, Durдона, Zilola and others (draft 1) were developed.

Breeding processes of cow pea and mungbean plants are similar. That is, by the breeders the surveys in the nursery of collection or initial materials on economically valuable traits of plants in vegetative period are carried out. The plants repeatedly examined at the every development phase. At the phases of development the attention of the breeder is paid on the character of plant development, accumulation of fruit elements, immunity to fungus, virus and bacterial diseases, unfalling and uncracking of beans. The breeder is also check the registration in the book copy of special student who conducting the phenological observations on studied plants with the characteristics meeting the requirements to the new varieties.

Breeder and special student - researchers permanently discuss gathered data of field copy books collected at the time of phenological inspections. The potential plant development attracting the scientists' attention is formed (photos 9, 10, 11, 12 and 13).

The harvests of seeds from healthy, early ripening and productive plants are planned (have a look at the photo presented on the cover page of this manual) are planned.



Photo 9. Three seeds of mungbean laid in seed nest.



Photo 10. Five days seedling of mungbean.



Photo 11. Ten days seedling of mungbean.

The beans from every plant are taken individually to selection sacs which have been sewed to the harvest of individual crops. The numbers of the sacs is checking in the copy book or journal for the registration of harvests on individual selections. The sacs of crops of individual selection samples or families' crops harvested from nurseries are fastening on solely garlands placed in crop sacs and are provided their delivering in sequence to ware-houses.

According to the numbers of registration the beans from crop sacs of individual selections grains are thrashing and separating by hand in the condition of laboratory. At the time of thrashing the amount of beans, the number of grains in every bean and the weight of 1000 grains, health and color of grains are recorded in the blank tables of beforehand prepared copy book for lab analyses. Index of possible grain damages in mechanical thrashing is also recorded in the copy book.

Seed grains possessing by considerable negative indexes on the bases of their sac numbers are discarded. By the number of remained seeds the seeding list is made up. And on the base of the seeding list **the first year selection (2) nursery** (draft 1) is established.

The plants of the first year nursery are classified as elite plants and phenological and laboratory analyses of last year are repeated. The results of the analyses are compared with the indexes of standard variety, planted in the same nursery. At the time of comparing, data of collection nursery and lab copy book are

taking into account. The seed grains of individual selections without having advantage, in comparing with the standard variety are discarded and no more studied. The seeds of individual selections revealed indexes of high economical characteristics in the comparing with standard are classified as the suitable for studying of their elite plants.

Besides, the numbers of seeds of individual selections with good characteristics on phenological inspections and lab analyses are included into the seeding list to establish the **control nursery** and seeds with the highest characteristics are also included into the list of seeding list for **selection nursery (3) of second year** (draft 1). In such sequence the seeds of good elite plants of individual selections are studied in the sequent nurseries of the breeding process. The bad progenies are discarded. In future, the seeds which pass by good characteristics in nurseries of preliminary variety trial and competition variety trial (4), are transferred to the nurseries of preliminary seed reproduction and zonal variety trial (5) and so on.



Photo 12. Forty days plant of mungbean.



Photo 13. Experimental plot on the selection of the new common bean varieties of plant growing department of Samarkand Agricultural Institute.

Questions and tasks for consolidating of mastered knowledge of students:

- 1.Can you remember the breeding scheme of bean crops by heart?
- 2.Why the method of individual selection is not considered as main to all of the plant species?
- 3.What other kind of selection methods except individual selections do you know?
- 4.What seeds of individual selections, control and selection nurseries are established from?
- 5.Full in the table 4 by indexes of economically valuable characteristics of common bean varieties on the base of plants' and seeds' herbariums which is necessary for a report.
- 6.Prepare the table data by defining the indexes of necessary economically valuable characteristics of mungbean varieties on the base of plants' and seeds' herbariums.

Table 4

Economically valuable characteristics of varieties ...

№ of plants	On the plants					On the best bean			Grains in plant		
	Number of fruit branches, p.	With bad developed	Total number of branches, p.	Height of plant, sm	State of main stem	Amount		Color of grain	Number of grain, p.	Weight of grain, gr.	Weight of 1000 grains, gr.
						Number of developed, p.	Number of grains, p.				
1	2	3	4	5	6	7	8	9	10	11	12

Glossary: control nursery (CN)- назорат кўчатзори (НК) -контрольный питомник (КП); competitive variety trial (CT)- конкурс нав синови (КС); - конкурсное сортоиспытание (КС); preliminary variety trial (PT)- дастлабки нав синаш (ДС) - предварительное сортоиспытание (ПС); preliminary seed reproduction(PR)- дастлабки уруғ кўпайтириш (ДК) - предварительное размножение (ПР); zonal variety trial (ZT)- худудий нав синови (ХС) - зональное сортоиспытание (ЗС); state variety trial plot (SVTP)- давлат нав синаш шахобчаси (ДНСШ)- государственный сорто испытательный участок (Госсортосеть); seed nursery (SN)- уруғ кўчатзори (УК) - семенной питомник (СП); to ensure the success- ютуқни таъминлаш- обеспечивать успех; accumulation of fruit elements- мева элементларини тўплаш – накопление плодэлементов.

6-practical lesson.

Determination of variety characteristics of sunflower and flax crops.

The purpose of the lesson. The students at the lesson are to learn the importance of plants' typicalness to their variety, grade- in the first place, the importance of seeds' purity or their contamination extent.

Sunflower is a major oil plant and 75% of plant producing in the world production constitute this plant. This plant has a great importance in Uzbekistan and is grown in the conditions of irrigation. The varieties of this plant are used to produce oil, to consume its seeds and to provision by silos feeding animals (photo 14).

Flax is the next oil crop. Its oil has a dietetic property and extensively used for provision of foods. It is grown in the rain fed lands of mountain districts of Uzbekistan (photo 18).

Only variety plants and the pure seeds are able to transfer to the progenies all characteristics and properties of the varieties and can ensure by the expected yield.



hoto 14. Sunflower plantation.

The identity of sunflower varieties is identified by means of the following morphological traits:

1. The height of the plants is measured by the means of ruler, the height of plant is considered the length from root neck to the head. The varieties on this

trait are divided into three groups: the dwarfs -0.65-1.25m; mean-1.26-2.0m, and high growth- 2.1 to 4.0m (photo 15).



Photo 15. Outlook of one of high growing sunflower varieties.

2. The shape of head- convex, concave and flat. The shape is defined by visual way (photo 16).
3. Diameter of the head: small- 9-12cm, mean size- 13-20cm and greater



Photo 16. **The head of sunflower**

diameter, more than -21cm, which is defined by the ruler.

4. The color of fruits: black, white, grey, striped- is defined visually.
5. The shape of seeds: long, oval with sharp tip, less rib.
6. Output of husk: at low 22-29% and 22-40% at high output of oil. It is hand cleaning and weighing by the special scales.
7. Output of seeds: high-55-65%, mean-45-55%. Separating of seeds from husk is done by hand and the weighing it executed by the scales.



Photo 17. **The seeds of sunflower**

8. Weight of 1000 seeds: light - up to 50g., mean -50-70g and heavy – more than 71g.

These indices are determined by weighing on technical scales.

9. Shellness properties of seeds: 1.By scratching of edges of shell with sand or sharp knife. 2.Steaming out (by means of boiled water). 3.By the method

of treatment with special acid. These three methods have made it possible to define the existence or absence up to 70% of carbon containing shield between cover tissue and xylem.

Grade of flax varieties:

1. Via outlook of the plants: the height, standness, thinness, smoothness, cylindrical shape and branching of the varieties are determined. In the conditions of rain fed land the height of plants vary from 20 to 50cm (photo 18), in the irrigation conditions 50-70cm.



Photo 18. **The field of flax**

2. The size of leaves: the leaves of flax are small, sessile, line-lanceted shapes, naked, placed on the stem in turn.

3. Flowers (pic. 19): they set up on the top of stalk and the side branching and in total combination, they establish umbrella flower clusters. The varieties distinguish on the number and size in the clusters. The flowers make up of calyx lobes, five sharp lobes and corolla out of five petals. The color of corolla is blue, violet-blue.

4. Fruit. Fruit has round shape, consisting of five nest balls. The number of bolls in one plant reaches up to 20-50 (photo 20).



Photo 19. **Flowers and seeds of flax**



Photo 20. **Fruit balls of flax**

5. Seeds. The seeds of flax varieties have an egg like shape, plate, smooth, glittering. Their color: yellow, pale –yellow and from dark-yellow to brown (photo 19).

The questions and tasks to consolidate the acquired knowledge:

1. What is the importance of establishing grade of seeds in selection and seed breeding?

2. What characteristics, types of sunflower varieties are defined by?
3. What characteristics, the types of flax varieties are defined by?
4. Establish the grade of one sunflower variety on the base of herbarium and literature.
5. Establish the grade of one flax variety on the base of herbarium and literature.

Glossary: it is constituted out- иборат- состоит из; rain fed land- лалмик ер- богарная почва; first turn- биринчи навбатта- в первую очередь; from root neck to the head- томир бўғзидан мева саватигача- от шейки корня до корзинки; dwarf- пакана – карлик; husk or shell- писта пўчоғи- лузги; seed- мағиз- семя плода.

7-lab training.

The rules for middle seed sample selection of field crops.

A great importance attributes to the quality of seeds in the growing of agricultural crops as the better, the higher its productivity (photo 21).



Photo 21. Cleaned seeds of millet

Examining of the quality of planting seeds by the seed inspection is carrying out on the average samples, which submitted from the farms.

The purpose of the lab training. The students are acquainted with such conceptions as seed batches, control units of the batches and the order of average seed sample selection of the field crops at their storing places.

The necessary articles employing at the time of studying the selection of seed sample in the lab: extracts out of the state standards: on the orders of storing and average seed selection of field crops (12036-85), table of the sizes of control units for average sample selection of field crops, models of the granary gauges, technical scales, wax, paper packages and glass cans, paper labels and statement form on the selection of average sample.

The average samples are selected on the adopted methods from control units of seed batch.

The seed batch – it is a definite amount of uniform seeds (of one crop, variety, reproduction, category, variety purity, year of crop, similar origin, numbered and conformed by corresponding documents).

The control unite– one average sample of particular amount or its parts is taken to determine the quality of seeds at separate batch.

The following sizes of control units for the field crops have been set up by the state standard of 1236-85 from which the average samples are selected (table 5).

The average sample selection – is a very responsible measurement, so as on it the planting quality of all seed batches is evaluated, from which the sample was selected and the right to its selection is presented to the specially authorized person

(agronomist of the farmer, scientific establishment), frequently by the persons, who implemented inter-farm control and passed through special instruction at the seed inspections.

Seed batches before taking the sample are examined, conformity with the name of variety to outlook of grain is compared.

Table 5

The size of control unites and average samples of field crops

Names of crops	The size of batches (control units), from which one sample is taken, ton.	Weight of average sample, g.
Mungbean.	10	500
Chick pea and common bean and soya.	25	1000
Safflower.	10	500
Oil flax.	10	500
Millet.	20	500
Sunflower.	25	1000
Lucerne.	10	250
Ambarry	10	500
Buckwheat	10	500

If the weight of seed batch exceeds control unit, it'll be visually divided into parts, not exceeding the weight of control unit, and from each of such parts independent samples are selecting.

At seeds storage in the piles the average sample is selected by the granary gauges from different places (photo 22). If the seeds are stored in sacks, three probes from upper, middle and lower parts are taken by the gauge. The seeds of probes are consolidated and established the initial sample. The weight of initial sample is matched with the weight of above required weight of average sample. At equal weight the seeds of initial sample are used as the average sample to the

analysis. If the weight of initial sample more than the weight of average sample it decreases by the method of cross division until it gets the average sample's weight.

Three average samples are selected for seed quality testing:

The first – for definition of purity, growing speed and germination, vitality, authenticity, weight of 1000 seeds.

The second- for definition of moisture and the damage caused by the granary pests;

The third- for definition of the infection caused by the diseases.



Photo 22. Gauge types for taking seeds.

The first sample is placed into clean disinfected sack prepared from tight fabric, which is sealed by wax seal or stamped.

The label is stationed into it.

The second sample is placed into clean, dried glass vessel (its volume depends of the size of sample), the cork covered by the wax. The intended form of label is pasted outside.

The third sample is placed in the paper package.

The selection of samples is registered by the statement (form 1) in two copies:

One – for State seed inspection, another – for farm, on the case of arbitration determination.

The statement is signed by the persons, who took part in the selection of sample.

The signed statement is sealed by the seal of the farm. The selected sample is to be sent to test in the course of two days after its taking.

Taking into mind the importance of properly selection of sample the seed inspection, in the order of state control, regularly picks up control samples straightly from the mass of planting materials of the farm to compare them with submitted samples to the inspection.

The questions and tasks to consolidate the gained knowledge:

1. What is the seed batch?
2. What is the control unite for selection of the average sample?
3. Who has the right to select an average sample?
4. What document the average sample is drawn up?
5. Speak about the order of average sample taking on the example of seed of one crop which is available in your lab.

Glossary: it attributes to- таллуқли-относится к; seed batches-уруғ партияси- партии семян; control units-назорат бирлиги- контрольные единицы; seed inspection-уруғ инспекцияси-семенная инспекция; average samples-ўртача намуна-средний образец; uniform of seeds-бир хил уруғлар-однородность семян; extracts out of the state standards-гостдан кўчирмалар-выписки из госта; statement form-акт шакли-форма акта; adopted methods-қобул қилинган усуллар-принятые методики; have been set up-ўрнатилган-установлены; conformity with the name of variety-номига мослиги-соответствие с названием; responsible measurement-масулиятли тадбирлар-ответственные мероприятия; special instruction-махсус қўлланма-специальный инструктаж; granary gauges-омбор шуплари- складские щупы; tight fabric-мустахам мато-крепкая ткань; label pastes-ёрлик ёпиштирилади-этикетка наклеивается; taking into mind of- эътиборга олиб- обращающая внимание на; properly selection-тўғри танлов-правильный отбор; submitted samples-берилган намуналар-представленные образцы; authenticity- ишончилиги-подлинность.

Statement on the selection of sample.

АКТ № _____

ГОСТ 12036-85

приложение 2.

Уруғлик материалнинг экин сифатини белгилаш учун ўрта намуналарни шу акт бўйича танлаб олинган намуналар икки кечаю икки кундуз ичида уруғ инспекциясига юборилиши керак
Отобранные по настоящему акту пробы подлежат отправке в Государственную семенную инспекцию не позднее двух суток.

Танлаб олиш ҳақида _____

уруғ
партиясидан _____ 20__ й _____

_____ хўжалик, ташкилот номи _____ республика, област, район (кун, ой)

_____ дан иборат комиссия томонидан _____ да
вазифаси. фамилияси, исми _____ вазифаси, ҳар қайсининг оти _____ бригада, совхоз бўлими, элеватор
сақланиб турган уруғ кўрилди ва қуйидаги уруғ партияларидан ўрта намуналар танлаб олинди:

Отбора средних проб семян подлежащих для определения качества

_____ 20__ г _____

_____ Название хозяйства, организации _____ республика, область, район (месяц, число)

Мною _____ при
участии _____
_____ должность, фамилия и инициалы _____ должность, фамилия и инициалы каждого
произведен осмотр семян и отбор проб от партии,
хранящихся _____
бригада, отделение совхоза, элеватор

Уруғлар хақида маълумот
Сведения о семенах

Кининг номи Культура	Э орт и сор т	орт хужжатин инг номи, № ва датаси	С % хиллиги	Н азвание, № дата сортового документа	Сорт тозаллиги ёки хиллиги Сортовая чистота или типичность в проц	Репродукцияси Репродукция	Хосил йили Год урожая	Уруғ партиясининг № партия	Уруғ тонна партиясининг вазни (тонна) масса партия в центренах	№ Контрол бирликлар № контрольнх единиц	Жой (қоп) сони Число мест (мешков)	Уруғ сақланадиган жой (омбор, склад, вагон №) Место хранения семян (№ склад, закрома, вагона)	Уруғ қаердан ва қачон олинган Откуда и когда получен семена	Уруғлар қайтадан қандай ишланган, препарат номи Какой препарат подвергались семена , препарат	Уруғ партияси нечинчи марта анализ қилинди ва охириги анализнинг номери ва вакти Который раз партия подвергается анализу, дата № последнего анализа	ол-ва редста вленны х проб.	Намуна Бандай анализ Учун олинган для какого	Уруғни тайин нг этилиши (Участкаларида Экиш учун,

2, _____ образцы _____ направлены
в _____ Государственную семенную
инспекцию

Намуна ГОСТ 12036-66 “Уруғлар. Экиш сифатини аниқлаш усуллари” да кўрилган қондларига мувофиқ танлаб олинди.

Отбор образцов семян произведен по ГОСТу 12036-85 “Семена сельскохозяйственных культур. Правила приёмки. Методы отбора проб”

Подпись _____ лица,
отбирающего образцы: _____

Подписи

членов

комиссии: _____

_____ (Ф.И.Ш) (имзо)
М.Ў. **Кафолат** _____ шу уруғни тўғри қараш ва сақлаш йўли билан

уларни бошқаларга аралаштирмасдан

хўжалик ташкилот номи

ифлосланмасдан униб чиқиш қобилиятини ва бошқа экиш сифатларини пасайтирмасдан, ҳамда намуналар дубликатларининг омон сақланишини ўз зиммасига олади.

Гарантия. Сохранность партии семян от смешения, засорения понижения всхожости и других посевных качеств, а также сохранность дубликатов, образцов

_____ гарантирует.

Название хозяйства, организации

одамнинг имзоси

ответственного за хранение _____

М.Ў

Сақлашга маъсул

Подпись лица,

(Ф.И.Ш) подпись

8- lab training.

Determination of seeds' germinative energy and germinative capacity of field crops.

The purpose of the training. The students, repeating the lecture on the ideas of seeds' germinative energy and germinative capacity and determination of their terms (table 6) will practice the growing of seeds of Lucerne and chick pea in the correspondence of GOST in the conditions of laboratory for identifying their germinative energy and germinative capacity.

Germinative energy is characterized by the speed of seeds sprouting and expressed in percent of grown seeds at the first term of calculation.

Germinative capacity is the amount of normal grown seeds, expressed in the percents to the number of seeds laying for growing in the optimal condition for appointed term.

Table 6

Determination terms of germinative energy and germination of grown seeds

Types of crops	Terms, days	
	Germinative energy	Germinative capacity
Common bean	4	7
Chick pea	3	7
Flax	3	7
Sunflower	3	5
Safflower	4	10
Soya	3	7
Lucerne	4	7
Peas	4	8
Millet	3	7

Necessary instruments and equipment to grow seeds: subscription from corresponding GOST about the orders of growing of field crops' seeds, seeds of Lucerne (400 seeds) and chick pea (200 seeds) from the first average sample (take a look at the materials of the 7 lab training), growing tray, metal division, tempered sand (seeds of grain-bean crops are grown only in sand), filter paper, gauze, technical scale, boiled water cooled till room temperature, measuring glass, pincers and thermostat.

The orders of the work:

1. The seeds of Lucerne (photo 4) and chick pea (photo 22) are divided into four sample parts on 100 and 50 units each correspondingly.



Photo 22. **The seeds of chick pea.**

2.Sand preliminary soaked up to 60% of its full water capacity.

3.Four growing trays filled in with sand and leveled, slightly pressed till about 2 cm thickness.

4.Sand in growing tray is divided into two equal parts with the metal division.

5.Accounted seed simples spread on the sand (photo 23).

6.Sand with the spread seeds covered with soaked gauze and filled with sand to the upper part of the growing tray.

7.Growing trays are numbered and weight on the scales and the date of planting is registered in the laboratory book on seed growing.

8.The growing trays are put in thermostat, where invariable temperature is kept at 20°C.

9.To define the germinative energy of Lucerne seeds, on the fourth day after the beginning of seed laying in the growing tray the grown seeds with rootlets are accounted (photo 24). At this, accounted only normal grown ones and all the rotted ones (they removed away).

10.The second accounting for determination of germinative capacity is carried out on the 7 day. At this into growing seeds, soaked seeds, and also with abnormal seedlings and shoots are included.

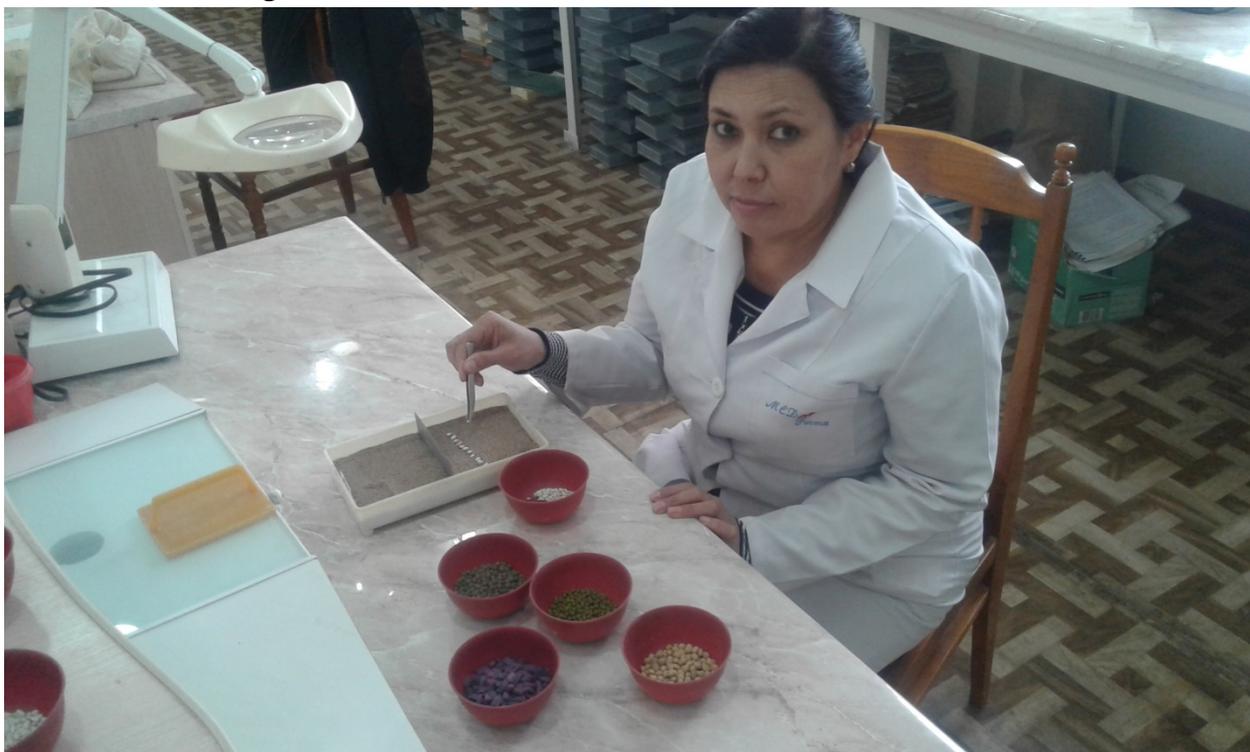


Photo 23. **G.Bakieva, technologist of seed testing laboratory of the Uzbek State Seed Control Center laying out the seeds on the sand of growing tray.**

11.The grown seeds at every sample are calculated with the accuracy of 0.1% on the equation of:

$$X = \frac{A}{B} \times 100$$

Here: A- the grown seeds in every sample; B- the amount of seeds taken to analysis.

Suppose, that in the first sample of 100 seeds of Lucerne in four days 5 ; in the second- 3; in the third- 4; in the fourth- 6 seeds didn't grow. In 7 days in the first- 2; in the second- 1; in the third- 3 and in the fourth- 4 seeds grew.

The amount of grown seeds in four samples accounts for: 95; 97; 96 and 94.



Photo 24. Kh.Sharipova, technologist of seed testing laboratory of the Uzbek State Seed Control Center taking the growing trays out of the thermostat to determine germinative energy.

An average, we summed the **germinative energy of Lucerne seeds**, which made 94.5 or 95%.

Germinative capacity of seeds is defined as the average arithmetic of the results of four samples:

$$\frac{(95+ 97+ 96+ 94)}{400} \times 100 = 95.5\%.$$

Quantity of sprouted seeds in four samples in seven days is equal to: 95+2=97; 97+1=98; 96+3=99; 94+4=98.

Germinative capacity of Lucerne seeds is equal to: (97+98+99+98) ----- x 100= 98%.
400

Deviation of the results of solely samples from average arithmetic units is to be in the top of permitted norm. So, at the arithmetic unit of germinative capacity from 100 to 98% permitted difference is +-2%; from 98.9 to 95% is 3%; from 94.9 to 90% is +-4%; from 89.9 to 85% is +-5% and from 84.9 to 80% is +-5.5%.

The questions and tasks for consolidation of acquired knowledge:

- 1.What is the germinative energy of seeds?
- 2.What is the germinative capacity?
- 3.Identify the germinative energy and germinative capacity of sprouted seeds of chick pea in growing trays in two determination terms.
- 4.According to the above executed analysis list the order of works on defining of germinative energy and germinative capacity of seeds which are preferable for you and available in the lab.

Glossary: germinative energy and germinative capacity- кўқариш кучи ва унувчанлик-энергия прорастаня и всхожести; sprouted seeds-унган уруғлар - проростки; subscription from –дан кўчирма-выписка из; appointed term – белгиланган мухлат-определенный срок; deviation of the results- натижалардаги фарқлар-отклонения в результатах; metal division-темир бўлгич-металлическая перегородка; tempered sand-тобланган кум-прокалённый песок; growing tray-ўстириш ликобчаси-ростильня; soaked gauze-намланган дока-намоченная марля; rootlets and shoots- уруғ палла ва ўсимталар-семядоли и ростки.

9-laboratory training.

Conducting orders of approbation of seed plantations of field crops.

The purpose of the training. To study the main principles of approbation of seed plantations of field crops and to master approbation orders on the examples of soya (photo 25) and chick pea (photo 26).

Task. To conduct approbation examining of soya plants and to divide chick pea approbation bundles on fraction components. To calculate the variety purity and other states of soya plantation.



Photo 25. **Seed plantation of soya**

Approbation- this is the field inspection of seed plantation with the aim of determination of its variety purity, or similarity of plants, content of weeds, infection by the diseases and damage caused by the pests, evaluation of variety quality of agricultural crop plantations.

Conducting order of approbation:



Photo 26. Seed plantation of chick pea

1. It is necessary to check the existence of conformational documents such as approval statement, variety certificate, identity to the seeds, certificate to the seeds, that the planting has been done with the seeds of selection varieties, self-pollinated strains or hybrids to conduct field approval.

2. The practitioner is bound to do before the beginning of approval:

1) to check the availability of documents to the planted seeds in the farm;
2) to define that the seeds of varieties, self-pollinated strains or hybrids subjecting to the approval have not been mixed at the time of storage or at the time of planting with the seeds of other varieties or hybrids.

3) to survey the seed plantations and in the case of necessity to carry out the measurements for maintaining and improving the qualities of variety plantations (variety and species weeding, extermination of weeds and so on).

The norms of variety purity (similarity) of grain-bean crops were fixed by the State standards (table 7.).

Table 7.

The norms of variety purity

Crops	Variety purity, %, not less			
	Original seeds, elite	Reproducing plantations		
		I category	II category	III category
Millet	99.7	99.5	98.0	95.0
Peas	99.7	99.5	98.0	95.0
Mungbean, chick pea	99.8	99.5	98.0	95.0
Sunflower	99.8	99.8	98.0	-
Oil flax	99.6	99.6	98.0	-
Soya	99.5	99.5	98.0	-
Safflower	99.6	99.6	97.0	90.0

Approbation of soya.

The utmost area to examine plants (or to select one approbation bundle), number of stations for examine of plants, amount of these plants and norms of space isolation have shown in table 8.

Similarity or variety purity of plantation, availability of impurities, infection caused by the diseases and damage by the pests of soya are established at the examination of plant bushes and divided into the following groups:

- plants, seeds or pods of main variety;
- plants, seeds or pods of other varieties;
- plants of other crops;
- impurities of weedy plants, including of quarantine and poisoners;
- plants, infected by the diseases, and plants damaged by the pests;
- under developed stocks of the main crops.

The variety purity or similarity of soya is defined by the ratio of the number of seeds or plants of main variety to the number of analyzed plants, seeds or pods.

Example. In the result of analyze it was established that soya plants of Orzu variety's number accounts for 500, other varieties and species diversity -5, stocks of main crops, infected by the fusariosis -2;

Hardly separating cultural plants- 3;

Hardly separating weeds- 1;

For calculation of variety purity percentage the number (500) of the main variety is written on the numerator of fraction, multiplied to 100; on the denominator –the number of shrubs of the main variety (500) plus the number of shrubs of other varieties and species diversities (5).

Variety purity is:

$$\frac{500 \times 100}{500 + 5} = 99.09\%.$$

By the meaning of turning the share of hundreds into the whole number by mathematical way it'll be written in the approbation statement the variety purity of 99.1%.

Turning the hundreds of share into the whole, it'll be shown in the approbation statement the variety purity of 99.1%.

For calculation the percent of impurity of plantation with the hardly separating cultural plants, the number of shrubs of hardly separating cultural plants (3) by multiplying it to 100 is written on the numerator and on the denominator of fraction, the number of the plants of main variety (500) plus the number of the shrubs of other variety and species diversity (5) plus the number of plants of hardly separating cultural plants (3) are written and sum up.

The impurity of hardly separating cultural plants (with chick pea) is:

$$\frac{3 \times 100}{500 + 5 + 3} = 0.59\%.$$

The impurity of hardly separating weeds is calculated in the same way as impurity of hardly separating cultural plants.

If the total impurity of soya plantation with the hardly separating cultural plants does not excess 3%, the practician gives the instruction to the farm on careful cleaning of the seeds, if it excesses 3%, the plantation is confessed as unfit for using for seed purposes.

To calculate the percentage of damage by the fusarium, the number of plants damaged by the fusarium (2) is written on the numerator by multiplying it to 100 and the total number of plants of main variety (500) plus other variety and species diversity (5) plus the number of shrubs of damaged by the fusarium (2) are written on the denominator of the fraction and sum up:

$$\frac{2 \times 100}{500 + 5 + 2} = 0.94\%.$$

Approbation of chick pea. At examining of plant bushes in the phase of blooming and the beginning of maturity the practician must fix the correspondence of plantation to the variety, which is shown in the documents, available in the farms.

The variety purity of plantation (photo 27), availability of impurities, rate of infection by the diseases and damage by pests of chick pea varieties in the phase of ripening of lower pods are defined by the method of examining plant bushes or



Photo 27. Approbation bundles of chick pea

selection of approbation binds from the area no more than 100 ha. Along the “necessary lines” of plantation on 50 points (table 8.) 5-6 plants in succession, without chose, no less than 250 developed plants are selected.

Variety purity of plants is analyzed on morphological traits, general for chick pea: shape, color and size of the pod on the middle deck (large, mean, small), the character of the surface, shape, size, color of seed and scar.

Except that, additionally determined: shape of bush (close or spread), availability of anthocyan color on the stock and pods.

At the approbation of plantations of local chick pea varieties, the similarity of seeds: shape (circle, angular, intermediate), color (white, yellow, pink, red, brown, black), size (large, mean and small seed types) are also determined.

At analyzing plants the following groups are selected:

- the main variety of crop subjecting to approbation;
- variety impurity;
- other cultural plants, involving grain beans;
- plants of main crop, affected by diseases and pests;
- quarantine weeds;
- hardly separating weeds;
- poisonous plants.

Questions and tasks to consolidate the understanding of essentiality of field crops' approbation (or approving):

1. What is the approbation of seed plantations?
2. What does the conducting order of approbation consist of?
3. On the example of soya approbation establish the variety purity of chick pea on approbation bundles of herbariums (as the photo of 27).

Table 8.

Instruction on selection of bundles (sample) and examination of plants at approbation of field crops

Crops	Phase of plants	Utmost area to examine plants or selection of bundle, ha	Number of points to examine plants or selection of bundle	Number of analyzing bushes from total area (at least)	Norms of space isolation, m.
Millet	After appearing of color on the flower cover on the top part of panicle.	350	150	1500	-
Back wheat	Not earlier than half of seeds on the plants will be brownish.	100	100	500	200
Bean, chick pea, mungbean.	Maturing of lower pods on the main mass of plants.	100	50	250	-
Peas	Maturing of lower pods on the main mass of plants.	200	50	250	-
Soya	Availability of ripened pods on the	300	50	500	-

Safflower	main mass of plants in the lower part At the beginning of seeds	50	25	250	500
-----------	--------------------------------------------------------------------	----	----	-----	-----

Glossary: practitioner- апробацияни бажарувчи- апробатор; seed plantations-уруғлик далалари-семенные посеы; to take to pieces-бўлакларга бўлиш-разобрать на части; bundles on the fractions- боғлам фракциялари-фракции снопа; variety purity-нав тозалиги-сортовая чистота; other states- бошқа ҳолатлари-другие состояния; similarity of plants-ўсимликлар ўхшашлиги типичность растений; content of weeds-бегона ўтлар микдори-содержание сорняков; evaluation of variety quality-нав сифатини баҳолаш-оценка качества сорта; in the severe conformity with-қатиян бирлигида-в строгом соответствии; utmost area-майдон кенлиги-предельная площадь; ratio of the number-сон нисбати-отношение числа; numerator-сурати-числитель; denominator –махражи-знаменатель; fraction-каср-дробь.

10-lab training.

Regulations of approbation results documentary registration.

The purpose of the training. Study of general regulation of documentary registration of approbation results.

Tasks. To copy one of the approbation act forms and fill it in on the example of one farm with its crop of reproducing seeds using lecture material and teacher's advice (on the example of form 195) and also to make culling act (on the example of form 200).

Essential materials: Various table materials and forms of the documents on the results of approbation, plants herbariums, characteristics of fruits and seeds, varieties of field crops (photo 28.) and lecture notes.



Photo 28. **Fruits, seeds and plant herbariums of field crops**

Approbation statements are drawing up for plantations went under approbation on the forms accepted to documentation of the results of field crop approbations.

The following documents are filled in on the bases of the approbation results of grain bean crop plantations:

to reproducing plantations, seed crop which is intended to use for own demands, -approbation statement on the form of 193;

to reproducing plantations, seed crop which is intended to use for sale, -
approbation statement on the form of 195;

to plantation of original and elite seeds, on the form of 199;

to plantations, have been recognized as unfitted for planting purposes –
culling statement on the form of 200.

Statement of approbation is filled in at the range of culling statement to the plantations which were recognized as unfitted because of hardly separating cultural plants (more than 3% on the example of soya) and weeds, which was not signed by the senior practician. The practician makes conclusion in the statement of the culling that if in the result of seed treatment of the plantations, subjected to the culling, because of impurities of hardly separating cultural and weedy plants, will be up to State standards on the variety and planting quality of seeds (less than 3% on the example of soya) via the special permitting of the government bodies of agriculture, the statement of culling is annulled, the statements of approbation enclosed to the statements of culling is confirmed by the senior practician. The certificate or seed conditions, given by the district State seed inspection, is also enclosed to them.

Senior practician numbers forms of approbation statements, beginning with the first number. The practician gets under his receipt necessary number of definite forms and corresponding amount of numbers (for example, the first practician receives forms with the numbers from 1 to 30, the second from 31 to 60, the third from 61 to 100 and so on).

The approbation statements are filled in:

to seed plantations, the seed crop of which is intended to use for own demands **in two copies**, one of them making up for farm, and the other one to the State seed inspection;

to seed plantations, the seed crop of which is intended for sale, **in three copies**, the third of them is directed to the official in charge of purchases (purchaser) of seeds.

To every approbation plot making up the separated approbation statement.

If at analysis of plants on several plots of reproducing plantations in one farm the uniformity of plantations on variety and other qualities (within one category and reproduction) will set up, the practician can make up one approbation statement, pointing out in them weighed medium percent of variety purity and other qualities of plantations.

The data of analyses on every plot is to be pointed separately in the corresponding item of approbation.

Every given statement must be signed by the practician and representatives of the farm, which were participated in the approbation.

Senior practitioner is responsible to examine the correctness of approbation, legalization of all approbation documents and confirm them.

Approbation statements unsigned by the senior practitioner are invalid.

Form №

195

Agricultural enterprise _____ Proved by the Ministry
_____ of Water Resources

and

region, land, republic Agriculture
Statement has been done _____

_____ position, sign
Seed plantation _____ reproduction

_____ by the sign
plantation has been recognized

_____ position, sign

APPROBATION STATEMENT № _____

_____ y. by me (us) practitioner (s) _____

_____ full

names, position

At the attending of farm representatives as _____

_____ name and position
Approbation of plantations have been conducted on

_____ crop
In the farm

_____ district

According to the data of approbation were set up

1.Name of the variety (hybrid,
strain) _____

_____ selection number

_____ if it has conformed variety

2. Total plantation area of crop under approbation in the farm ____ ha, including

seed plantation ____ ha, out of variety seeds planted and subjected to approbation ____ ha.

3. Location of seed approbation plantation:

field № ____, team № ____, plot № ____.

4. What seeds were planted

own or imported

if the seeds imported, to point out the exporter organization

5. Name, number and date of seed document to the planted seeds

6. If planting was made by the seeds of own seed crop, point out when and from whom they have been received for planting _____

7. In what year the seeds of elite released from selection-experiment establishment

8. Variety quality of planted seeds: reproduction (generation) _____, category _____, variety purity (uniformity) _____%.

9. Do other varieties or populations exist in neighboring farm boarding with crop plantation under approbation: name and area, occupied or in ____ y. _____

10. Space isolation from other varieties (for cross pollinator crops)

_____ and makes up _____ m.
observed, unobserved

11. Predecessors of plantation (crops, varieties and area under them) _____

Reverse side of approbation statement on the form of № 195 is available on the table materials of the lab and is filled together with all students of the group.

Form № 200

Physical (juridical) person _____
(region, land, republic)

Executor of the statement

(position, signature)

seed plantation, other plantations (unnecessary delete)

STATEMENT № _____

culling of plantation out of the fitted ones for use to seed purposes

_____ 20 ____ y. under my (our) practician (s)

(full names and positions)

with attendance of farm representatives

(full name and position)

crop plantations _____

Varieties, hybrid, strain _____

belong to the farm _____

district _____

recognized unfit for seed purposes and culled.

1. Culled plantation is located in the field № _____ the area of _____ ha.

2. Result of analysis:

a) approbation bundle (plants)

№ of	Develope	Compositions of variety impurities	Number of
------	----------	------------------------------------	-----------

bundle	stock of the main variety							undeveloped stocks of approved crop	
	unit	%	Name and amount						Total ly
1									
2									
3									
4									
5									

Reverse side of approbation statement on the form of № 200 is available on the table material of the lab and is filled together with all students of the group.

Questions and tasks for repeating the materials of this lab training:

1. What kinds of approbation statements are used in the practice?
2. When does the approbation statement on the form of № 200 fill in?
3. Make up the approbation statement on the base of your industrial practice.

11-laboratory training.

Storage and control of variety purity of field crops.

Storage and control of variety purity deserve a great attention within a wide range of measurements conducting to satisfy the claims on production of high quality seeds of agricultural crops.

The factors of environment: moisture, temperature, the modes of keeping, pests, diseases and some others effecting on quality and purity of planting seed materials at the time of storage.

The purpose of the training. The students master seed placing regulations of field crops in the open and covered storehouses for maintaining and control of quality and purity of the seeds.

Essential materials. Calculating means, measuring tape, thermometer, and moisture meters for warehouses rooms, plans for open and covered warehouse (photo 29), extracts from standards on seed quality, their storage and also lecture materials and sieves.



Photo 20. View of one of up to date warehouse is designed for seed storage.

At the planning of seeds' laying out in the warehouses it is necessary to follow the required **rules** to ensure the retaining of seed quality and prevent from

mixture of seeds belong to certain batch with seeds on another batch, foreseen moisture of the covered warehouse (14-16%) and temperature (10°C).

The **order** of seed placing in the warehouse accompanied with matching of seed specie, variety, within the variety its purity, category (with availability of statement of approbation and copy book of the farm on the record of planting seed), classes on germination and also moisture of seed, availability of seeds of weed plants, damage of the seeds with pests and so on.

To prevent mixing of one seeds' species with another one, loading of seeds into racks standing side by side is done not until upper edge, leaving of 15-20 cm. Besides, it is impossible to place (photo 30) hard separating seeds close to each other (on the examples of common bean and soya).



Photo 30. **Similarity and difference of seeds of some field crops.**

The seeds of some valuable varieties of crop, elite seeds and reproductions brought from scientific establishments are required to storage in sacks. Stating of sacks on asphalt, brick or ground prop is executed by providing of 10-20 cm of a gap from the floor. The sacks are put on the racks in two or three lines. On the first line two sacks are put closely to each other, and third is put above them in a perpendicular state. At packing sacks in three lines, on the first two lines the sacks are put parallel and densely to each other, and on the third line, the sacks are placed perpendicular to the lower lines. Such kind of sacks has established the first

trio. Above them the sacks of the second trio are stationed only in reverse order of sacks' putting. In this order of sacks the third trio has repeated the sacks order in the first trio. Naturally, between the sacks about 10 cm gap is formed. The space between the racks and between the racks and walls of storehouse amounts to 0.5-0.7 m.

1st task. Fill up below presented table on the base of the standards for recommended height limits of racks to storage of seeds in bulks or piles and sacks.

Name of crops	Moisture of seeds, not more than %	Season of the year			
		Cold		Hot	
		Height of seed pile, m.	Amount of sacks on the rack, unit.	Height of seed pile, m.	Amount of sacks on the rack, unit.
Backwheat					
Chick pea					
Common bean					
Mungbean					
Sunflower					
Flax					
Peas					
Millet					
Soya					

In the calculations of required volume of warehouse to every crop it should be know the weight of seeds per 1m^2 , height of rack for seed pile, height of sacks on the seed shelves and wideness of space between shelves, racks and walls of warehouse.

Weight of seeds per 1m^2 is listed in the table 9.

Table 9.

Volume weight of planting seeds

Kind of seeds	Seed weight per 1 M ² , kg.	Kind of seeds	Seed weight per 1 M ² , kg.
Chick pea	750-850	Backwheat	560-650
Common bean	700-800	Millet	670-730
Flax	580-690	Sunflower	325-440
Peas		Lucerne	780-850
Hemp		Mungbean	

During seed plants storing on variety purity control (table 7) in the storehouses or granaries at the first turn it is necessary to keep in mind the invasion of seeds by pests.

At the conception of damage by the barn pests or simply contamination it is understanding that an availability of pests per mass of the seeds.

The damage rate in every stored batch of the seeds is the compulsory index of grain quality.

Except of the losing of seed purity in the result of accumulation and activity of the pests, the temperature and moisture are increased. Damage rate is analyzed through visual and secretive states.

Damage rate of seeds storing in piles is determined on the average samples selected from different layers of the piles from 100 M² area.

At this, three samples are selected per pile with the height of 1.5 m, from upper part (with 10 cm depth), middle and lower parts. From the piles lower than 1.5 m, the sample is taken from two – upper and lower layers.

Analyze of the samples is carried out at that day. Every sample is analyzed solely.

Definition of the rate of seed damage at every stored batch is done on the base of the highest index of damage of piles layers or sack lines.

Conclusion about the rate of seed damage is done on the base of amount of separated alive pests, per 1kg of seed by means of special sieves.

The first rate of damage from 1 to 20 pests;

The second rate of damage from 20 and more pests;

The third rate of damage –the pests have gathered in the heaps of several layers.

Depending on the rate of damage one of the measures according to the nomenclature documents is used.

2nd task. Determine the rate of seed damage by using seeds of field crops deposited in the fund of the chair

Answer the questions:

1. How can the quality of seeds at the time of storage be secured?
2. What does seed purity consist of?
3. How many ways of seed storage is used ?
4. What kind of conservation orders for seed sacks in storehouses is taken?
5. What does a damage rate or impurity of seeds mean?

Glossary: measuring tape- рулетка- узунликни ўлчагич; sieve-сито- элак; claim-требование- талаб; laying out-класть- жойлаш; matching of- проверка- текшириш; loading of-загрузка- жойлаш; racks-стелаж- норлар; upper edge- верхний край- юқори сатхи; pile- куча- уюмлар; in bulk- без упаковки- тўкма; similarity and difference- сходство и различия- ўхшашлиги ва фарқи; layer- слой- кавати; secretive state- скрытое состояние- кўринмас ҳолати.

12-lab training.

Documentation of variety plantations and their conducting orders.

The purpose of the lesson. The students acquire skills and experiences on the name and documentation of seeds and more over rules of their conducting for correctly implementation of seed producing works of agricultural crops in our country.

Necessary materials. Teaching posters depicting breeding process schemes and seed producing systems of field crops, placard depicting the scheme of stock seed production, copy of register of made works in the farm on stock seed production , extracts of those parts of the law on seed production which concern the lesson theme, copies of various forms of approbation statements.

The seeds produced from nurseries of scientific research institutes and from their experimental plots (photo 31) for developing and reproducing seeds of new varieties of field crops **are named** and documented as following:

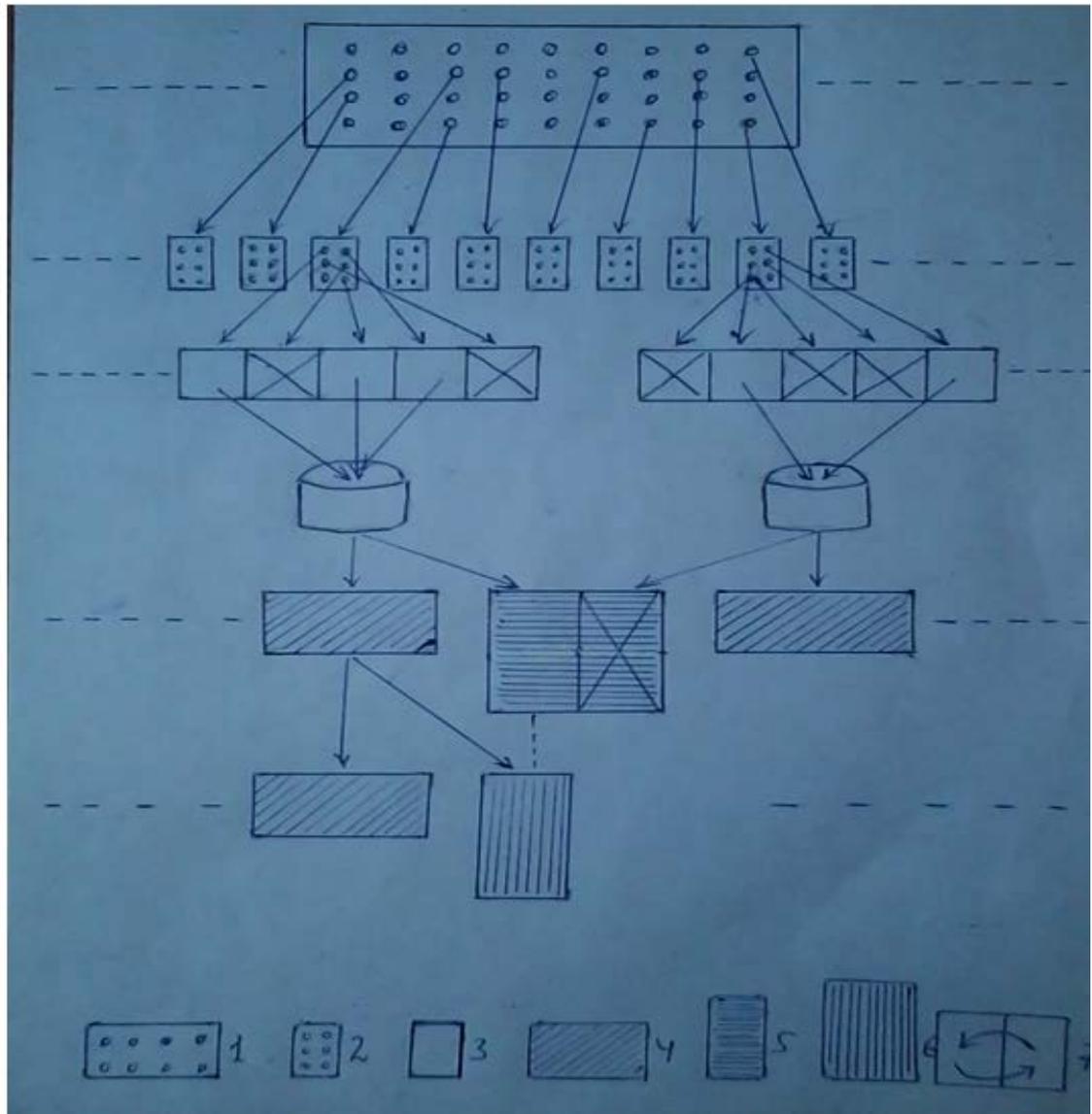


Photo 31. An exemplary view of experimental plot of one of scientific research institutes on breeding and seed production of agricultural crops.

1) the seeds (ear or pod) of the best plants selected for planting in the nursery of the first year progeny inspection are called genealogies (pictures 1 and 2);

Picture 2.

Scheme of individual-family breeding and seed reproduction



2) the seeds taken from nursery of the first year progeny verification are called – the seeds of nursery of first year progeny verification;

3) the seeds taken from nursery of the second year progeny verification are called – the seeds of nursery of the second year progeny verification;

4) the seeds taken from nursery of multiplication are called the seeds of (1-4 year) multiplication nursery;

5) the seeds taken from the nurseries of super stock seeds are called the seeds of super stock seed;

6) the seeds taken from plantations of super stock seed are called stock seeds.

1-task. Copy on your note book the picture 2 and instead of the points leaved beside the period of nurseries breeding process fill in the years of seed multiplication and names of taken seeds from the lesson materials and to check the correctness of filling in.

In the **order** of documentation and arrangement, seed plantations beginning from the nurseries of multiplication of seed crops are approbated for evaluation the purity of selected material. One of the approbation statements (on the example of the form of 195 or 200) is filled up on the dependence of approbation results.

The results of fulfilled scientific works (selection of starting genealogy – individual select of plants, selection of plants in the nurseries of the first and second years progenies study) conducted in nurseries in initial periods of breeding process it is also necessary to make up corresponding statement. Statement is signed by the scientist, who carried out the above mentioned works, an agronomist of the farm and the specialist of the seed production department of scientific organization which took part in the procedure of approbation.

Selection of seeds from families, which meet the requirements to the varieties in the process of progenies formation are transferred to the farms of preliminary reproduction and stock seed production. Works on multiplication of seeds at these farms are carried out on the base of special methods and conducting works are marked in the journal on running of the farm.

The seeds, are being propagated in the production farms have to possess the following **documents**:

1)if the seeds are being produced by the own farm they have to possess “Certificate of seed condition” to exhibit the planting qualities and statement of approbation for variety quality of seeds;

2)the variety seeds (super stock seed and stock seed) received from state warehouses, or for exchange purposes between farms have to possess “Seed certification”, if the planting quality do not meet the standard requirements then “Identity card of variety”.

Sale seeds corresponding to the standard requirements on their quality have to possess:

1)variety seeds and seeds of super elite and elite of self-pollinated strains – “Seed attestation”;

2)the sequenced seeds of reproductions – “Seed certification”.

Variety seeds (super elite and elite) of farms and scientific organizations are delivered not achieving condition of purity and humidity at the restricted situations of seeds preparation meet the standard requirements have to possess “Identity card of variety”.

2-task. Define to what period of multiplication of seeds concern the marks on the below part of the picture 2 and distribute the documents overseen to them on the requirement.

Questions for theme repeating:

1.How the seeds at the time of multiplication in the breeding and seed production are called?

2.What is the order of seeds documentation and housekeeping?

3.What for the kinds of seed documents depend on?

Glossary:

posters depicting breeding process- плакаты изображающие селекционный процесс- селекция жараёнини кўрсатувчи таблица ; stock seed – семена элиты- элита уруғи; extracts of parts – выписки частей- ёзиб олинган қисмлари; concerning to- касающиеся к- таллуқли; an exemplary view of – примерный вид чего то- ниманингдир намунавий кўриниши; ear or pod (bean) – колос или стручек (боб) – бошоқ ёки чаноғи (дуккак); more over – более того- ундан ташқари; to inspect the progeny of – проверка потомства- авлодини текшириш; genealogies – родословные- уруғ боши; progeny verification- проверка потомства- авлодини текшириш; nursery of multiplication – питомник размножения- кўпайтириш кўчатзори; super elite seeds – семена супер элиты- супер элита уруғи; and arrangement- и ведение- ва фаолиятлаштириш; to check the correctness – проверить правильность- тўғрилигини текшириш; are transferred to – передаются в- қайергадир юбориш; to possess – иметь- эга бўлмоқ; identity card – свидетельство- гувоҳнома; to distribute – распространять-тарқатмоқ; overseen- предусмотренный- тегишли;

13- laboratory training.

Study of species diversity and farm valuable characteristics of sunflower.

The purpose of the training. Study of species diversity and farm valuable traits of sunflower by using of the literature and practice data (photo 32).



Photo 32. **The general view of one of grown varieties of sunflower.**

Necessary materials. Literature on sunflower, posters depicting the world centers of agricultural crops' origin, internet source, herbarium of plants, seeds of sunflower, measure tape, regulars, colored pencils and analytic lab scales.

North and south continents of America are the centers of sunflowers' origination.

Sunflower having a large number of diversities is belonged to family of Asteraceae L., (thistle family Compositae L.) and polymorph genus of Helianthus. On the classification of American scientist K.Khayzer, sunflower is characterized by 68 perennial and annual species.

A.B.Anishenko (1980), who have studied the genetic evolution of sunflower proved that genus Helianthus consists of 10 species. In accordance with his classification, there is one annual diploid species *H. annuus* L. , and the rest of them are perennial diploids, tetraploids and hexaploids.

On the data of literature, two species: annual diploid *H. annuus* L. ($2n=34$) and perennial hexaploid *H. tuberosus* ($2n=102$) that is Jerusalem artichoke, are used in agricultural industry.

1 task. Write in this table the concerned characteristics of sunflower species studied by the scientists.

Name of species	Genome composition	Subspecies	Wild forms	Domestic forms

A lot (more than 30) of scientific-research works are carried out in selection and seed production of sunflower with the aim of improving the indexes of farm traits and properties up to the level of requirements. The requirements to **farm-valuable traits and properties** of varieties and hybrids are almost the same and consists of: profitable crop, resistance to diseases and pests, oil content and its quality, technological properties and adaptation to the environment.

1. Profitable crop. Productivity of sunflower depends on productivity of the head and the amount of plants per every hectare.

Productivity of every head is determined by the amount and weight of seeds (photo 33).

2 task. Define the amount of seeds per head and kernel output on average on 10 seeds from varieties and hybrids of lab herbariums, converting the result to the indexes of 1000 seeds, sum up a conclusion about the differences on productivity of studied varieties and hybrids.

In sunflower productivity, oil output has a great importance. It was emphasized by the scientists that the increase of kernel of regionized varieties and hybrids for 10% has made possible to increase the oil output to 6-7%.

Crop of varieties and hybrids of sunflower taking per every hectare depends on the amount of plants. Consequently, in order to increase the productivity of sunflower in scientific-researches of breeding and seed production a special attention is paid for selecting of plants capable to withstand the density.



Photo 33. **Order of sunflower head's and seeds disposition.**

Farm valuable traits of sunflower are the following ones: resistance to diseases and pests, oil quality, technological properties and adaptation to environmental stresses.

3 task. Fill in the below presented table with above mentioned farm valuable traits of currently growing varieties and hybrids of sunflower by the help of knowledge acquired on lecture classes and corresponding literature.

Farm valuable traits of sunflower varieties and hybrids

Name of varieties and hybrids	Rate of resistance to diseases	Kinds of pests and resistance to them	Oil content, %	Amount of plants\ha	Vegetation period, days	Productivity, ton\ha.

Answer the following questions concerning to the theme:

1. What differences exist between diversities on the number of chromosome?
2. What correlation exists between productivity and vegetation period?
3. Can many wild species of sunflower in the nature cause any affect on the improving of farm valuable traits?

Glossary: diverse-различный- хар хил; huge number of- огромное количество- жуда кўп; belonged to-принадлежит к-таллуқли; perennial and annual species-многолетние и однолетние виды- кўп ва бир йиллик турлар; Jerusalem artichoke-топинамбур- топинамбур; farm traits and properties- хозяйственные признаки и свойства- хўжалик белгилари ва хусусиятлари; genome composition- состав генома- геном таркиби; subspecies-подвиды- аенжа турлар; profitable crop-высокий урожай- юқори ҳосил; heads-зд. корзинки подсолнечника- саватчалар; kernel- ядро семечки- писта мағзи;

14-lab training.

The study of tobacco species diversity and its farm valuable traits.

Tobacco is a narcotic plant, the leaves of which are used to manufacture various types of cigarettes and cigars. Some kinds of chewing and sucking products are prepared from a range of tobacco species with perfume odor.

The purpose of the training. The students analyze the species of tobacco and its farm valuable traits in the condition of laboratory and prepare essential summaries by usage of herbariums and literature.

Necessary materials. The herbariums of tobacco plants and seeds, placards about centers of domesticated plants origin, literature, internet source, analytic scales, measure tape, regular and pencils.

The native land for tobacco (*Nicotiana tabacum*) is south America and it belongs to nightshade family (*Solanaceae*). Only two species of genus *Nicotiana* - *N.tabacum* (photo 34) and rustic tobacco- *N.rustica* L (photo 35) are the domesticated species and the remaining, about seventy of them are wild species



Photo 34. A plantation of one variety of *N.tabacum* species



Photo 35. One of the varieties belonging to species of *N.rustica* L.

and are not used in the industry. Overwhelming majority of them possessing by the resistance to diseases and pests are widely employed in the breeding purposes.

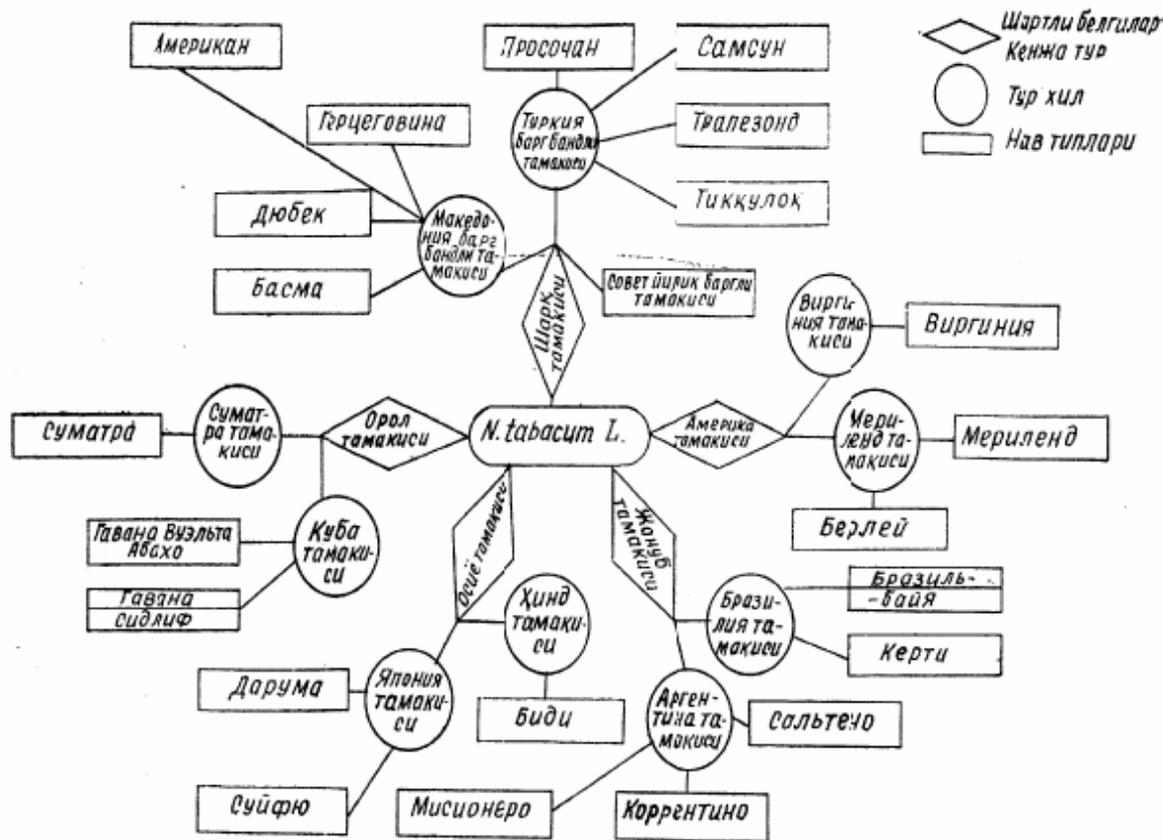
1-task. Fill in the following table on significance of wild species usage in breeding by the data of literature.

Tobacco species	Native land	Resistance to diseases	Resistance to pests	Breeding methods

According to the data of D.A.Abdukadirov (2012), the classification of tobacco plants developed by E.A.Pisaryov on the base of morphology and origin of plants, is the perfect one (pic. 3).

Picture 3.

A scheme of inter species classification of plants of *Nicotiana tabacum* (by D.A.Abdukarimov, 2012).



2-task. By means of 3-draw dispose the agro-ecological types of tobacco plants using placard of original centers of domesticated plants.

Farm valuable characteristics of tobacco are: bumper crop, duration of vegetation period, resistance of plants to diseases and pests.

Productivity of tobacco plants depends on the number of formed (from 16-20 up to 40-50) leaves and their size. On the size of leaves, the growing varieties are divided into 2 groups: small- leaf ones (15-20 cm) and large-leaf ones (40-50 cm).

On vegetation period, plant species of tobacco are divided into 3 groups:

- 1.Short period species – *N.kaniculyta* and others, in all 30 species.
- 2.Middle period species- *N.silvestres* and others, in all 4 species.
- 3.Late season – *N.otophoro* and others, 6 species.

3-task. By means of literature and laboratory herbariums present the potential of materials of initial species diversity for selection of resistance to destructive diseases and pests of tobacco plants.

Answer the questions concerning the theme:

1. What is the importance of tobacco plants in national economy?
2. On what base has been developed the classification of tobacco species?
3. Can you characterize the breeding value of wild tobacco species?
4. How the farm valuable traits of domesticated tobacco plants are characterized?

Glossary: to manufacture-производит- ишлаб чиқариш; chewing and sucking products-жевательные и сосательные продукты- чайналадиган ва сўриладиган махсулотлар; perfume odor- приятный запах- ёқимли хид; essential summaries- нужные конспекты- керакли конспектлар; domesticated plants- окультуренные растения- маданийлаштирилган ўсимликлар; native land- родина -ватан; nightshade family- семейство пасленных- итузумлилар оиласи; perfect one- совершенный- етук; bumper crop- большой урожай- катта ҳосил; destructive-губительный -хавфли;

15-practical training.

Study of characteristics of regionized tobacco varieties and its variety traits.

The purpose of the training. The students analyze the characteristics of tobacco variety plants and its variety traits.

Necessary materials. The herbariums of tobacco varieties, seeds of different varieties, laboratory scales, rulers, pencils, rubbers, state registers and corresponding literatures.

According to the literature, the varieties of Dubek 44-07, Izmir and Basma have been included into the state register for planting in Uzbekistan.

Variety Izmir. This variety is included in the south group and it has developed in the places of high temperature and dry climate with poor soil fertility.

This variety is extensively grown in Turkey, it has spread in tobacco growing regions of Uzbekistan since 1998 (photo 36).



Photo 36. The plants of variety Izmir

The plants have an ellipse shape, height of plants attain up to 80-100 cm by the recommended conditions of agro-practices, the leaves are without leaf stalks, small, length of leaf on the middle part of stem is 10-12 cm, and the wide of leaf is 4-6 cm. On every plant bush up to 25-30 leaves are developed for harvesting. Ellipse formed leaves have curved and directed to the top, developed in a half vertical state. The shape of leaf is relatively plain at the beginning of vegetation, at

the time of maturity set firm and tubercles are arise on the surface. The structure of leaf is dense, the tissue is fat. In many cases the color of leaf is light green, in some soil conditions it is dark green.

At drying, the leaves acquire yellow shade and produce lemon colored raw materials.

The seeds of tobacco is characterized by their rapid germination in the conditions of green house and in good conditions they develop for 45-50 days. The roots branching take place for 5-7days after transplanting them in the soil (photo 37).



Photo 37. Grown seedlings of the variety of Izmir in the condition of greenhouse.

This variety is considered as early maturing one. Completion of the maturity of top part leaves on the main stalk from transplanting on the field lasts for 90-95 days. The blooming begins on the 40-45 days since the day of seedlings' transplanting on the field. The form of flower clusters is shield shaped, the color of corolla is light rose.

The variety is highly resistant to drought and is able to produce the yield even in the conditions of poor soil fertility. An average productivity per hectare made 0.7-1.2 ton. The plants grown in the good conditions produce aroma raw materials.

1-task. Enter the characteristics of the Dubek 44-07 and Basma varieties in the below presented tables.

The characteristics of Dubek 44-07 variety

Indexes	Characteristics
Bush shape Shape of clusters State of the leaf on the stalk Leaf shape Number of leaves, unit Plant height, cm Leaf length, cm Width of leaf, cm Vegetation period, day Resistance to diseases Damage caused by the pests Leaf color Resistance to drought	

The characteristics of Basma variety

Indexes	Characteristics
Bush shape Shape of clusters State of the leaf on the stalk Leaf shape Number of leaves, unit Plant height, cm Leaf length, cm Width of leaf, cm Vegetation period, day Resistance to diseases Damage caused by the pests Leaf color Resistance to drought	

The varietal traits of the tobacco plants are:

- plants' shape;
- shape of clusters;
- state of the leaf on the stalk;
- leaf shape;
- leaf color;
- color of corolla.

Answer the questions concerning to the theme:

1.How Dubek 44-07 variety is characterized?

2. How Basma variety is characterized?

3. What properties of Dubek 44-07 and Basma varieties can be highly evaluated for our cropping conditions?

Glossary: corresponding literature-соответствующая литература-таллуқли адабиёт; high temperature and dry climate-высокая температура и сухой климат-юқори харорат ва қуруқ климат; poor fertile soil-неплодородная- озуқасиз тупроқ; extensively grown- широко засеянный-кент экилган; has spread along-распространился по-га тарқалди; shape- форма-шакли; height-рост-бўйи; leaf stalks-черешок- гул банди; plant bush-куст растения-ўсимлик тупи; have curved-изогнутый- эгилган; relatively plain-относительно ровный –рисбатан текис; seedlings' transplanting-пересаживаемые сеянцы- кўчириб ўтқазиладиган кўчатлар; flower clusters-соцветия- гулчамбар; arise tubercles-появляются выпуклости- бўртиб чиқиш; firm and fat-плотно и полно- зич ва тўлик; tissue- ткань- тўқима; aroma raw materials-душистое сырьё- хушбўй хомашё.

16-laboratory training.

Study of species variety and economical traits of oil flax.

Oil flax seeds contain 32 to 52% of vegetable oil. Consequently, this crop is grown in rain fed and hill side lands of Uzbekistan. According to the data of 1998 (D.A.Abdukarimov, 2012), the area planted by this crop made 4.0 thousand hectares and the average productivity per hectare was equal to 0.3 ton.

The purpose of the training. The students will analyze species and economical traits of oil flax.

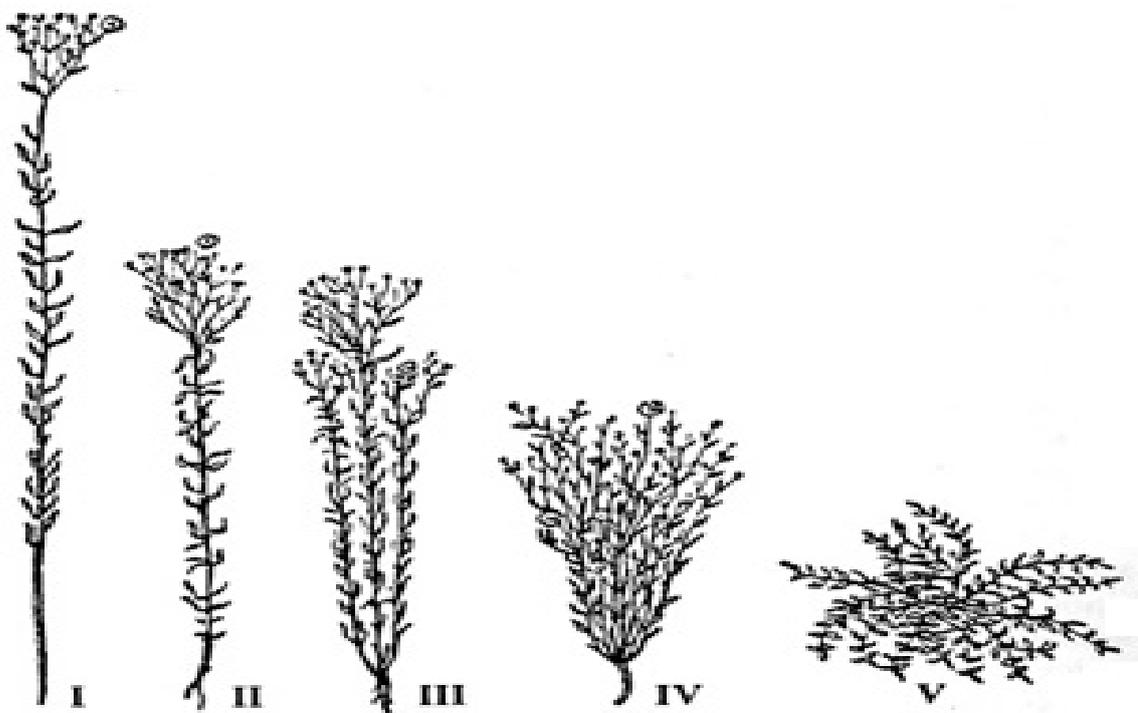
Necessary materials. The herbariums concerning to the plants of oil flax, the seeds of oil flax, placards with pictures of oil flax, maps depicting centers of domesticated plant origins, analytical scales, pencils, erasers, literatures and internet source.

Oil flax- genus *Linum* L.- belong to the family of linum. There are about 200 species of this crop. Among them, there is the domesticated *Linum usitatissimum* L. – which is extensively grown for producing oil and fiber .

Domesticated flax has the following varieties as: spinning flax or fiber flax, oil flax-intermediate flax, crown or common flax and creeping flax (draw 4).

Draw 4

Species variety of oil flax



A lot of flax species occur around the Mediterranean Sea. In the Central Asia 24 species of flax grow and one of them is domesticated. Some of wild species are either fit to extract vegetable oils. According to the classification of oil flax there

are 3 species varieties of oil flax: small seeded, middle seeded and large seeded flax (Vinogradov B.I., others, 1987).

1-task. By the help of literature and maps of centers of domesticated crops origin define the agro-ecological regions of flax species variety.

Plants of **small seed flax** have the height 20-50 cm with many branches and abundant to fruit balls and leaves. The varieties of this group are: Bukharskiy 32, Gissarskiy 1474, Bakhmalskiy 2 (photo 38) and others.



Photo 38.

Plantation of Bakhmalskiy 2 variety

2-task. By means of analytical scales of laboratory determine the weight of 1000 seeds of flax varieties stored in laboratory store-rooms and pick out those, which belong to the group of small flax.

The varieties of short fiber crown flax are included into **middle seeded flax** with the height, up to 50 cm. The varieties of this group are: VIR 1647, VIR 446, VINIIMK 5237, Voronejskiy 1308. The seeds have brown color, the weight of 1000 seeds reach up to 6.6-8.0 grams with the high oil content.

The plants of the **large seeded flax** are also characterized by the height up to 50 cm. Plant bush is a single stalk, the leaves are large, lancet-shaped, green and glittering. The flowers are large, bluish color, the diameter attains to 25-31 mm. Fruit balls are large, width of them are 8.1-8.6 mm. The seeds are large of brown color, the weight of 1000 seeds is equal to 9.1-13 grams (photo 39). The varieties are middle ripening with high oil content. Resistant to diseases.



Photo 39. **Morphological characteristics of flax plants**

Bakhmalskiy 2 variety has currently included into the state register for planting in the conditions of our agriculture.

According to the data of literature on **farm valuable traits**, the variety Бахмалский 2 belongs to the group of small seeded flax. As its weight of 1000 seeds is amounted to 5.9 gramm. This variety was developed by the method of individual selection from the variety of Bakhmal 1056 at the Uzbek scientific research institute of grain breeding. The authors of this variety are: Kovolev A.I., Bekbutaev M.B., Fedoseeva A.M. In 1986 it was included in the state register for planting in the rain fed lands of Kashkadariya and Surkhandariya regions.

The plants are green, stalk up straight growing (take a look at the draw of 4), not large. The leaves are lence shaped. The flower has blue color (photo 38). The seeds are brown. The weight of 1000 seeds is equal to 5.9 gramm. In our variable conditions, the variety yields on average made 0.5-0.8 ton. Vegetaion period lasts from 75 to 85 is considered as an early ripening one. The best farm valuable traits of this variety are: resistance to drought, shading, lodging, diseases and pests. Oil content in the seeds is amount to 40.9%.

Answer the questions:

- 1.What agro-ecological species variety of flax are existed?
- 2.How the morphological traits of flax species variety are characterized?
- 3.What is the difference between Bakhmalskiy 2 and other varieties?

Glossary: rain fed-за богарный-лалми; hill side lands- предгорные земли- тоғ олди ерлари; area planted to- площадь под посевы- экилган майдон; is extensively grown-широк возделывается- кенг экилади; spinning flax- волокнистый лен- толали зиғир; crown flax- лен кудряш- пакана зиғир; fit to extract- годный к извлечению- ажратишга яроқли; creeping flax-стелющийся лен- ўрмалаб ўсувчи; abundant- обильный- бой; the store-room- кладовая- захира хона; pick out- выделить- айириш; reach up to- достигать- етишиш; a single stalk- одно стебельный- ёлғиз поя; glittering- блестящий- ялтироқ; was developed- выведено- чиқарилган; straight growing-прямо растущий- тик ўсувчи; lence shaped- пикообразный- найзага ўхшаш; variable conditions- переменные условия- ўзгарувчан шароит; variety yields- урожай сорта- ҳосил беради; is considered as- рассматривается как- саналади; to drought, shading, lodging- к засухе, опаданию, полеганию- қурғоқчиликка, тўкилишга, ётиб қолишга.

17-laboratory training.

Study of species variety and economic valuable signs of millet.

The purpose of the training. The students get acquaintance with the diversities of species and farm valuable traits of millet.

Necessary materials. The herbariums of millet plant, the seeds, placards depicting the plant of millet and its parts, the map of the centers of domestic plants origin, pencils, erasers, essential literature and internet source.

Millet *Panicum miliaceum* L. is being included to grass family (Graminaea) belongs to genus *Panicum*.

Genus *Panicum* L. unites more than 500 species. The most of them have fodder importance, but a few of them (*P.virgatum*, *P.maximum* and other) have been domesticated and are being grown.

More commonly spread species, as sowing one is *P. milaceum* L. – common, sowing, broom corn millet. Common millet has 5 subspecies (photo 40).

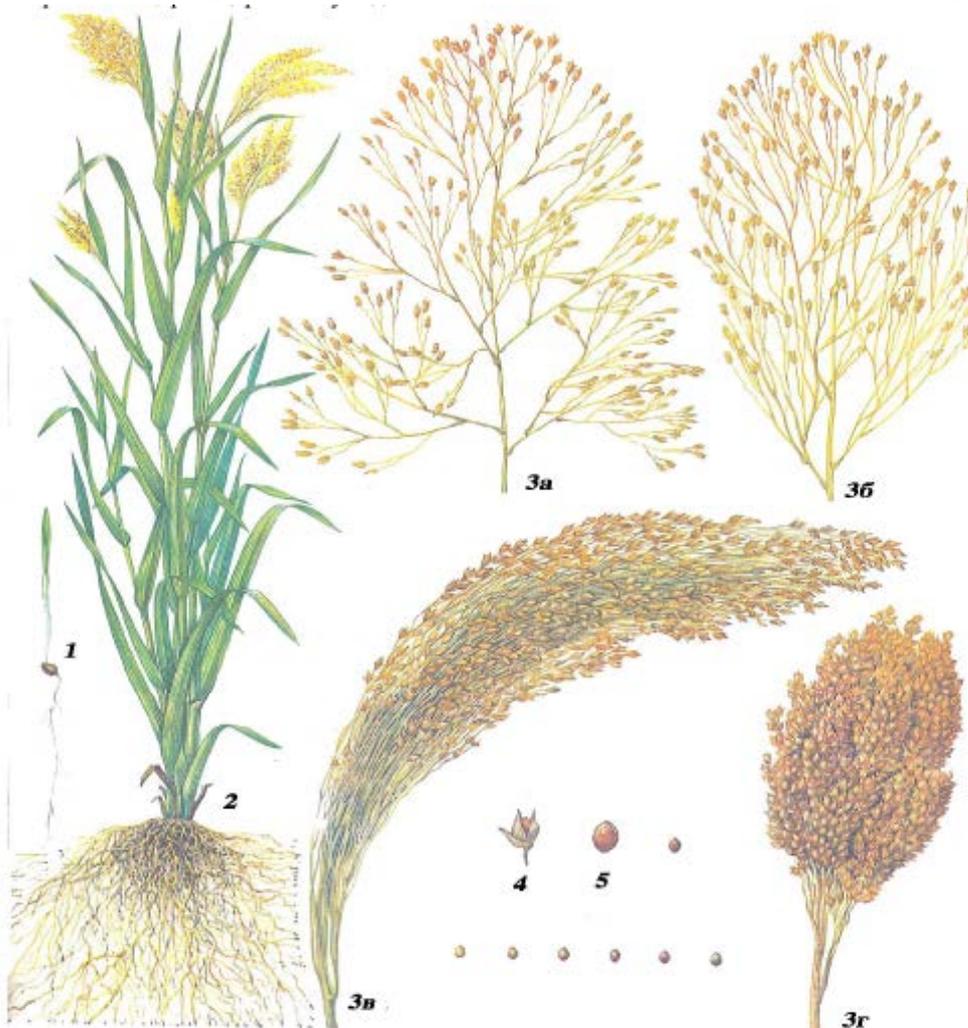


Photo 40. Subspecies of millet

Here: 1,2-common millet at the time of germination and in the phase of grain filling; 3-brooms of subspecies: 3a-pitched Patentissimum, 3б-panicle Effusum, 3в-clump Contractum, 3г-oval Ovatum and compact millet Compactum; 4-ear; 5-grains.

Species variety of millet is sub divided on the base of two traits: grain color (external flower glume) and spike glume. Grain colors are various: white, cream-colored, light yellow, red, brown and others.

1-task. By means of literature make up classification of millet species variety on the base of grain color and list their economic and breeding – valuable characteristics and properties.

Species variety P. Obtusum and P. Repens have the properties of fastening the sand from sweeping away and destruction of ravines. P. miliare Lam – is sowing to produce grain in South-Eastern Asia, India and the Caucasus.

Eastern and Central Asia is the center of millet's origin.

Millet is grown as the basic crop or succession crop in the conditions of Uzbekistan. Getting of two crops in a year is enhancing its importance. Except that, low norm of sowing, short vegetation period and short day availability are being of millet's economic –valuable traits have made it possible to grow its importance.

For example, at the 3 practical training we have determined the sowing norms of field crops. In the result of which was defined that to ensure of 500 thousand millet plants per hectare theoretically were needed only 3 kilograms of seeds.

Porridge cooked from groat of millet is *unrivaled* on taste and nutritional properties in culinary.

Alcohol and starch are produced from millet grain which can be rapidly converted into sugar than starch produced from grain of rice.

Millet as forage for agricultural animals and grain in development of swine and poultry breeding possess a great importance.

Syrdaria region, on conditions of soil and irrigated water supply is one of difficult regions of home agriculture. Millet is being mentioned in this condition as one of succession crops after basic winter wheat (photo 41).

On the report of peasant Davron Abdusattatov, in this region peasants do sow millet till 10th of August. In 2016 he has planted millet variety, the name of it was Broom head (Saratovskaya 853) by the way of scattering on July 20 and after it he had made ridges by means of cultivator. By taking into consideration local condition 55-60 kilograms of seeds were spent per hectare. Thanks to the experience of the peasant the crop of millet would ripe for 90 days. At the time of

growing 3 times of watering were planned. It was expected to get a crop in the size of 0.2 tons per hectare.

On the opinion of peasant, millet easily withstands high temperature (38-42°C) and occur some varieties which have possibilities to ripe for 60-80 days. Millet among other field crops is also the highest resistant crop to sudden drought. In fact, on the data of scientific literature, the transpiration coefficient of millet accounts for 200-250.



Photo 41. Davronov Abdusattor, a peasant of the farm of Usman Nasir, Ok-oltin district, Syrdaria region is cultivating millet as the succession crop.

Answer the questions:

1. What species variety of millet produce grain fitting for feeding?
2. On the base of what a classification of millet plants is realized?
3. Since of what time millet is grown in Uzbekistan?
4. What farm-valuable characteristics and properties have millet?

Glossary: belongs to genus-относится к роду- туркумга таллуқли; fodder importance-кормовое значение-ем аҳамияти; commonly spread-повсеместно распространённый-кенг тарқалган; picking out-выделяется-ажратилади; ear-колос-бошоқ; spike-колос-бошоқ; flower glume-цветочная чешуя- гул қипиғи; make up classification-составлять классификацию -классификация тузиш; fastening-закрепление-мустаҳкамлаш; sweeping away-уносит ветром-шамолда кўчириш; destruction of ravines-разрушение оврагов-жарликларнинг бузилиши; succession crop-повторная культура-такрорий экин; groats-крупа - бўтқа; taste and nutritional properties-вкусовые и питательные свойства-там ва тўйимлилик хусусияти; alcohol and starch-спирт и крахмал-спир ва крахмал; can be rapidly converted into-может быть быстро превращено-тезда нимагадир айлантирилиш ; forage-фураж-хашак; swine and poultry breeding-свиноводство

и птицеводство- чўчкачилик ва паррандачилик; peasant- крестьян-деҳқон;
region-местность-худуд; by the way of scattering-путем разбрасывания-сочма
усулда; has made ridges- делал нарезки-ариқ олиш; experience of the peasant-
опыт крестьянина-деҳқоннинг тажрибаси; anticipated-ожидаемый-
кутилаётган; easily withstand- легко переносит-ўта чидамли; occur some-
встречаются некоторые-баъзи бир учрайдиган; sudden drought- неожиданная
засуха-кутилмаганда содир бўлган қурғоқчилик.

18-practical training.

Study of variety characteristics and signs of zoned millet.

Millet has more than 50 varieties. Eight of them are fodder-forage varieties and are grown in the independent commonwealth countries (ICC). In last years the varieties resistant to smut which was considered one of dangerous diseases of millet were bred by home breeders. Among them such varieties of millet as Saratovskaya 6, Saratovskaya 10, Saratovskaya 12, Kipelskaya 92, Kharkovskaya 86, Solnechnaya, Barnaulskaya 80 and Orlovskaya dwarf and others. The large size of grain, high output of groats, high features of consumption are being recognized as a particular indexes of these varieties.

The purpose of the training. The students master information related to variety's characteristics and variety signs of millet varieties.

Necessary materials. All tables and placards dedicated to the plants of millet, internet source, literature and copy of the state register of varieties for the current years.

The variety of **Saratovskoye 6**. It was released in South-Eastern scientific-research institute. The authors are: Ilin V.A., Gorbunov A.A., Zholotukhin E.N., Kojemyakina Yu.Ya., Rasskazova O.S. and UngerFukht I.P. (photo 42).



Photo 42. **The variety of Saratovskaya 6 and its grains**

The variety was developed through crossing of Sanguineum 7 and Saratovskaya 3 varieties. It belongs to the subspecies of Sanguineum: panicle is compact, the length is 19-22 cm, without antocyan spot. The grain is red colored, rounded shape, large, weight of 1000 grains is equal to 8.2-8.9 g.

The leaves are elongated lanceolate, in middle length and width.

Hairiness of leaves is in a middle rate.

The height of the plants is on average of 83-108 cm. The stock is resistant to the lodging, it is firm.

The variety of Saratovskaya 6 is an early ripening variety, the vegetation period make up 80-87 days. Entering to the group of steppe- povolge it has been adopted to the conditions of really dried regions.

Properly accumulates winter-spring soil moisture. It has not reaction to the precipitation of the second half of the year.

By the arising of the 2 race of smut this variety has lost its resistance, consequently it is recommended to treat the seeds prior to planting.

The quality of grains and groats producing from it are characterized by stability in spite of a long time or differences of soil and also climatic conditions of cultivation. Therefor by the state commision of Russian Federation this variety has been recognized as the standard for the grains of millet.

The high index of earliness, resistance to drought and a fine quality of grain have made it possible to enlarge areas planted by varieties, which occupies more than 250 thousand hectares. The productivity per every hectare on average made 1.7-3.2 tonn.

1-task. By using internet source write down the characteristics of Saratovskaya 10 variety in your working notebook as the supplementary information.

Saratovskaya 12 variety. This variety was also released at the same Scientific-research institute. The authors are: Zholotukhin E.N., Tikhonov N.P., Lyzneva L.N., Tugisheva Kh.I. and Ilin V.A., by the method of selection from hybrids of the varieties of Sanguineum 8-88 and Saratovskaya 853 (photo 43).



Photo 43. **The variety of Saratovskaya 12 and its penicle and grains.**

The variety is peculiar to subspecies of Sanguineum which has dense penicle at middle length of 19-22 cm, it has not antocion spots. The grains are red colored,

circle, an average size of 8.6-9.4 g. The penicle is narrow and the main stock of penicle coupled.

The bush of the variety has a middle height (85-110 cm), the stock is resistant to lodging.

Hairiness of the leaves is middle, alongated-lancet shape, green with a middle wideness.

The variety of Saratovskaya 12 involves in the group of early ripening varieties. Vegetation period has 83-89 days. This variety is also adopted to the drought. Also has not reaction to precipitation in the second half of the year. The ripening of grains and drying of stocks take place simltaneously in the conditions of South-eastern regions of Russia. In the results of that the crop harvest is carried out at the same time and at the tolerant expences.

Cereal prepared from millet grain, is tasty and nutritive.

High quality grain, harvested from every hectare, accounts for 2.0-3.7 tonns.

Uzbekistan has not its home made variety. Regionized variety Sarattovskaya 853 developed in 1933 has still grown here. This variety was released from Saratov experimental station. The variety has been regionized for irrigating and rain fed farming in the republic. It involves to subspecies of yellow millet and on color to small groups.

The variety resistant to drought, the penicles are large, short and densed, a little bended. Grain shading is unconsidarable. Vegetation period has 60-105 days, depending on the conditions of cultivation. The productivity in the conditions of rain fed is equal to 0.4-0.6 and in the conditions of irrigation is 2.5 -3.0 tonns (photo 44).



Photo 44. The variety of Saratovskaya 853 and its grains

2-task. By using grains of millet and laboratory herbariums of millet fulfil characteristics of Saratovskaya 853 variety. And also by means of literature and state register for last years present the characteristics of another new millet varieties which have been regionized.

Variety signs of millet plants are:

- shape of plant stocks;
- the shape and hairiness of leaves;
- shape of panicle and bend rate;
- the shape and grain color.

Answer the questions:

1. What does millet variety Saratovskaya 853 differ from other varieties?
2. On what features is millet valued?
3. What fodder varieties of millet do you know?

Glossary: commonwealth countries-страны содружества- хамдўстлик мамлакатлари; smut- головня-занг; dangerous and destruction-опасный и губительный-хавfli ва халокатли; dwarf-карлик-пакана; consumption- потребление- озикланиш; groats-крупa-ёрма; current years-в настоящем-хозирги вақт; by crossing-путем скрещивания-чатиштириш орқали; panicle-метелка-рўвағ; hairiness-опушение-туклилиги; dried regions-засушливые регионы-курғоқ худудлар; properly assimilate- хорошее усвоение- етарлича озикланиш; precipitation-осадки-ёғингарчилик; simultaneously-одновременно-бир вақтда; supplementary-дополнительно-қўшимча; resistant to lodging-устойчив к полеганию- ётиб қолишга чидамлик; peculiar to- свойственно чему- либо-нимагадир хос; narrow-узкий-тор; main stock- главный стебель-бош поя; deposits-запасы-жамғарма;

19-practical training.
Study of variety and economically valuable signs of regionized varieties of chick pea.

Chick pea has a special value among bean bearing crops and it is used in various aims of national economy. In most cases it is used as food products. In particular, light colored grain variety species are grown for producing food staffs (photo 45), and dark colored grain ones for feeding of agricultural animals.



Photo 45. Chick pea grains are being used for food purposes

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

Necessary training aids. Various kinds of herbariums of chick pea plant and its seeds, summaries of students on manufacturing practices, internet source and other training and visual aids.

Plant height, shape of canopy, shape of stem, complication of leaf, hairiness, arrangement order, state of leaf stalk, shape and number of stipules, arrangement of leaves, color, generative parts of flower, shape of beans, size, length, disposition of the first bean, the number of grains in bean, color and size, hairiness, shape of grains, color and sizes are the **variety signs** of chick pea varieties (photo 46).

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



Photo 46. Variety of chick pea Zimistony and its stalk, leaves, bean and flowers.

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.

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 will not develop in beans. The varieties of steppe group and particularly Kubanskiy are breeding materials which is 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.

Fitness to mechanical harvesting of crops is another preferable farm valuable sign for 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.

Zimistony, Lazzat, Uzbekistan 32 and Ulduz varieties are included in state register for growing on the territory of Uzbekistan.

Zimistony variety (photo 46), was developed by the method of selecting in the progeny of hybrids from crossing of varieties: Dushanbinskiy 78 и Tadjikskiy 10 at the scientific –research institute of crop farming. The author of this variety is K.Pirakhmedov.

The variety was included in the state register in 1976 for planting in rain fed areas of Kashkadaiya region.

The variety includes into Turkistanico-Albesence group. The stalk is straight standing, the top part extended, the height is 25-27 см, the leaves are ellips shaped dentate, dark-green, the size is middle. The flower is separetly standing, white. The bean romb shaped, nose like, strongly- haired, with one, two, sometime three grains in a bean. The grain is pair headed, pale-rose colored, weight of 1000 grain is 170.0-176.0 gs. Productivity, according to the data of strain testing plot in 2004 was equal to 0.7 ton per hectare in the rain fed condition. In favorable climate conditions were reached up to 1.4 ton.

The variety is the middle ripening, with vegetation period 77-81 days. Resistant to ascochitos didease, on food value it takes place in the range of valuable varieties (protein content is 26.6-27.2%).

Questions and tasks to firm adopted knowledge:

- 1.How does the outlook of chick pea differ from other bean bearing plants?
- 2.Are there any differences between grains of chick pea and other bean crops?
- 3.What variety signs are needed for?
- 4.Prepare a summary on the variety and farm-valuable characteristics one of planting varieties which was not analyzed in the text of training.

Glossary: a special value- особая ценность- алохида қиммати; for various purposes of national economy- для различных целей народной экономики- халқ хўжалигининг турли мақсадларида; in most cases- в большинстве случаев- кўп холларда; training and visual aids-учебные и наглядные пособия- ўқиш ва деворий манбалар; manufacturing practices- производственные практики- ишлаб чиқариш амалиёти; stipules-прилистники- япроқчалар; advantage - преимущество- афзаллик; consuming demand-потребительское требование- истеъмол талаби; many opportunities-много возможностей- кўп имкониятлар; industrial manufacturers-производители перерабатывающей промышленности-

саноат ишлаб чиқарувчилари; everywhere reigning-повсюду царствующий-
хамма жойда хукм сурувчи; inverse correlation-обратная корреляция- тескари
корреляция; arising of cold- возникновение холода- совуқ тушиши; which
maintains-которой сохраняет- асровчи; unfortunately- к сожалению- афсуски;
nutritiousness- питательность- озиқабоплиги; does not give in- не уступает-
қолшмайди; severely infected by- сильно зараженный- оғир касалланган;
which essential- который необходимо- керакли; separately standing-одинокий- -
ёлғиз; strongly haired- обильно опущенный- ўта тукли; favorable temperature-
благоприятная погода- яши об-хаво; food value- питательность-
озуқабоплиги;

20-practical training.

Study of variety and farm valuable signs of regionized mungbean (*Phaseolus Pip*) varieties.

The purpose of the training. To teach the students about variety and farm valuable signs of regionized mungbean varieties.

Necessary training aids. Herbariums, seeds of mungbean, literatures, internet source and visual aids.

Mungbean grains are one of the main products in nations consumption as delicate product (it contains 24-28% albumin, 2-4% starch, fat and various vitamins) for food (photo 47). Hey and its hask also used in feeding of agricultural animals. Consequently, this crop is grown by the farms as major, and as second crop after harvesting of fall-winter crops.



Photo 47. Mungbean grains

Shape, hairiness, branch number, height and getting up grips with stalks; shape, size, state of leaf stalk, hairiness of leaf; size, color, flower number in the flower cluster; shape of bean, size, presence and absence of noses, color in mature, number of grains in bean; size of grain, shape and weight of 1000 grains are **variety signs** of mungbean varieties.

On a large scale scientific-research works are carried out in a range of scientific-research institutes and local experimental plots on the direction of breeding and seed production of mungbean (photo 48). Mungbean possesses by special biological features. It involves into the group of warm responsible plants. The seeds germinate at the highest temperature of 20-25°C. Vegetation period in the dependence of established temperature conditions of the year accounts for 80 to 110 days.

In Uzbekistan mungbean is grown mainly in the conditions of irrigation.



Photo 48. The scientific-research collaborators of the department of introduction and quarantine of Plant growing scientific-research institute (clockwise): Ruzieva M., Khasanova M., Pirnazarov J., Abdullaev S., Isakova S. are carried out a phenological inspection of the world samples accepted in 2015.

Farm valuable signs of mungbean are considered the planting possibilities of mungbean in fields to plant under forage and cereal crops. Among varieties there is such variety as Zilola which is especially marked by its remarkable possibility in the economy of irrigation water. The varieties of mungbean are the second crops after all principal crops. That is why, owing to the tuber bacteria developed at the root system, mungbean accumulates of atmospheric nitrogen into the texture of soil in the size of 50-100 kg per hectare.

1-task. Recall scientific-research establishments on plant breeding and seed production by using materials of teaching and production practices and formulate information about the establishments at which breeding and seed production of mungbean works are implemented.

The researches of local breeders of scientific-research institutes in Uzbekistan have resulted in the releasing of registered varieties as BHP 628, Pobeda 104, Zilola, Marjon, Kakhrabo, Navroz, Radost and Turon.

Pobeda 104 variety. This variety was created by the scientists of the department of biology and soil science of Tashkent state university. The height of plant is 30-50 cm, leaves are large, the flowers are yellow-golden. Beans are elongated, covered with black thrones. Beans have 10-15 grains. The weight of

1000 grains is equal to 70-80 g. Vegetation period in spring planting of lasts to 80-100 days and in summer term it requires to mature about 75-90 days (photo 49).



Photo 49. **Plants of Pobeda 104 variety.**

2-task. Prepare characteristics and farm valuable signs of the varieties of mungbean: Zilola, Marjon, Kakhrabo, Navroz, Radost and Turon by using literature and internet source.

Questions according with the theme of the training:

1. When and in what conditions is planted mungbean?
2. What farm valuable signs does mungbean possess by?
3. What variety signs of mungbean do you know?
4. What for the variety signs of mungbean are needed?

Glossary: preferable item- предпочитаемая -қимматли нарса; in the nations consumption- в народном потреблении- халк таъминотида; as delicate product- как изысканная продукция- севимли махсулот; hey and its hask- сено и ее мякина- пичан ва унинг уни; inalienably used- неотъемлемо используется- доимо ишлатиладиган; on a large scale- в большом масштабе- кенг миқёсда; biological features- биологические особенности- биологик хусусияти; mainly- главным образом- асосан; collaborators- сотрудники- ходимлар; principal crop- основная культура- асосий экин; summer term- летний срок- ёзги мухлат; by means of- посредством- ёрдамида;

21-laboratory training.

Study of species diversity and farm-valuable signs of soya.

According to the data of literature, the growing of soya in Uzbekistan was begun since 1930. It was spread from China and the countries of Far East (photo 49).



Photo 49. **Plantation of soya Orzu variety**

The purpose of the training. The students independently, using the laboratory possibilities study species diversity of soya and its farm valuable characteristics.

Necessary training items. The maps of the origin centers of cultural crops, literature, lecture summaries, internet source, placards of soya pictures, herbariums of soya plant, different grains of soya and laboratory devices and scales.

Soya belongs to the family of Fabacea, and genus of Glycine L. Common soya belongs to the species of G.soya. Genus Glycine on the opinion of N.I.Korsakov depending on the origin centers is divided into three subgenus (Abdukadirov D.T.,2007).

1. Glycine L. – the representatives originated from the center of Eastern Africa.
2. Leptoceamus (Benth) F. Herm. –the representatives of the center of Australia.

3. Soya (Moench) F Herm- the representatives developed in the Southern, Eastern Asia. Cultivating species of *Glycine hispida* Moench is included in this sub genus (Vinogradov B.I. and others, 1987).

1-task. Gather the information about the farm and selection-valuable characteristics of above mentioned representatives of sub genus.

The cultural soya is divided into 3 sub species:

1)japanese sub species- seeds are very enlarged, weight of 1000 grains is 250-520 g., like boll or circled, lightly flattened out, enlarged flowers.

2)manjure sub species –seeds are oval, seldom boll liked, middle sized, weight of 1000 grain is 120-150 g, smaller grains, stalk thick and straight, leaves are coarse.

3)chines sub species- seeds are flat, small, weight of 1000 grains is 70-130 g, flowers are small, the stalk is thin, it is inclined to waving and lodging, leaves are thin.

2-task. Make a wide information about soya's sub species, varieties and their farm valuable characteristics.

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 50).



Photo 50. **The grains 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.

One of the farm-valuable sign of soya is it's a palatable taste. 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 51).

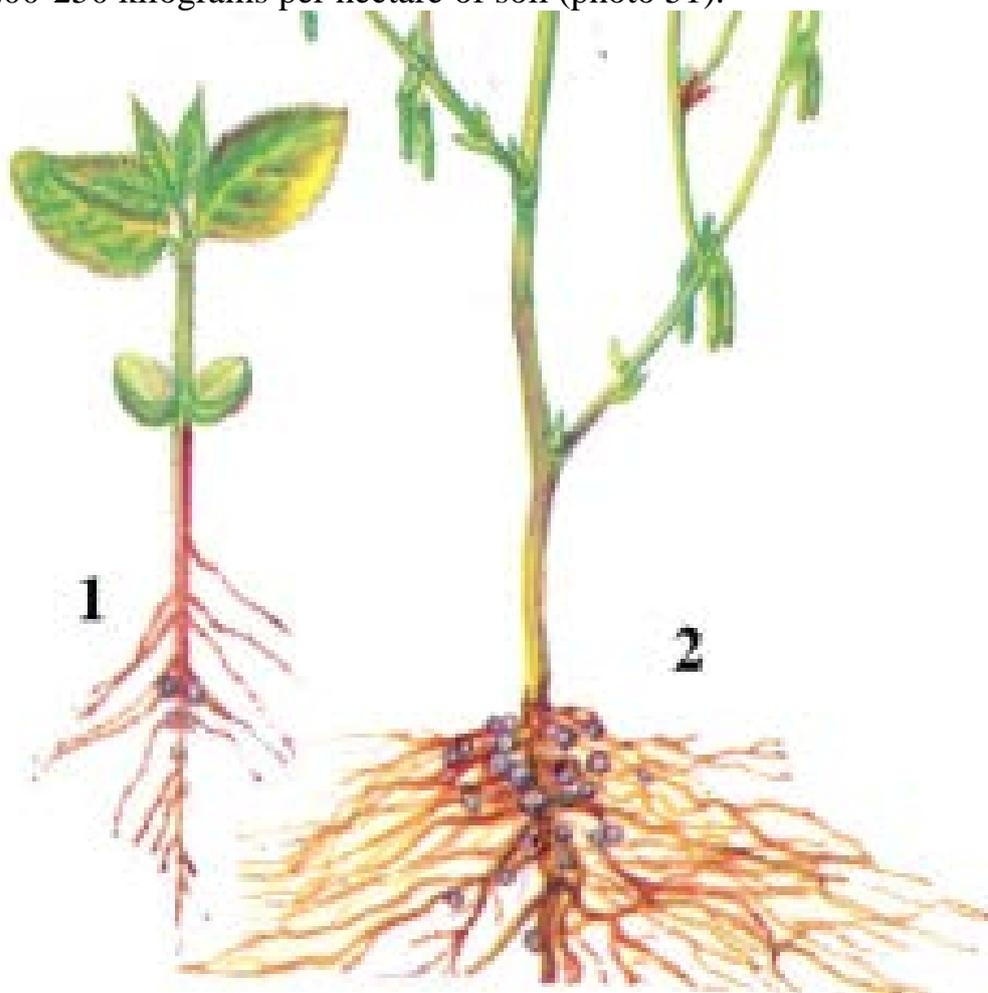


Photo 51. The tubers on the roots of soya plant (1-on the seedling; 2-on the roots of developed plant).

Questions concerning to the theme:

1. How does soya differ from other field crops?
2. What geographic latitudes have been occupied by the species diversity of soya?
3. What farm-valuable characteristics of soya are consist of?

Glossary: it has invaded from-вторгся из-кириб келган; laboratory possibilities-лабораторные возможности-лаборатория имкониятлари; laboratory devices-лабораторные приборы-лаборатория асбоблари; the representatives-представители-намоёндалари; ancient crop-древняя культура-узок экилаётган; irreplaceable amino acids-незаменимые аминокислоты-алмаштириб бўлмас аминокислоталар; 2 fold-2 кратный-2 марта; saturated-насыщенный- тўйдирилган; tuber bacteria-клубеньковые бактерии-тугунак бактериялар; coarse-грубый-қўпол.

22-practical training.

Study of characteristics and variety signs of zoned soya varieties.

We determined that soya among other field crops occupies the largest area in the world (see materials of 21-lab training). 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 decreases with frequent arising 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 9).

Table 9

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 purpose of the training. To teach the students variety signs and characteristics of soya varieties developed and regionized in Uzbekistan is the aim of the training.

Necessary teaching materials. Literature, internet source, teaching and visual tables and placards, herbariums of soya plants, its varieties and seeds.

The adopted to local conditions varieties such as Dustlik, Uzbekskiy 2, Uzbekskiy 6, Orzu (photo 49), have been created by the scientists of some educational and scientific –research institutes of Uzbekistan and registered in state register for growing.

The characteristics of Dustlik variety. It has been created at the Uzbek institute of rice growing, by the method of individual selection from the plants'

sample № 4706 of the VIR. The authors of this variety are: Saltas M., Burkina O.B., Bekmatova T. This variety was recommended to growing in the irrigated fields of Andijan, Namanghan, Ferghana, Bukhara, Tashkent, Samarkand and Sirdariya regions of Uzbekistan since 1984.

The height of this plants' variety reaches to 130 cm, stalk, woods and beans covered with hairiness (photo 52). Sides of the leaf is whole, the top is sharp, foliage is 45-



Photo 52. Stalk and beans of the variety of **Dustlik**

-55%. The flowers are small and white. Beans acquire brown color at maturity period and have 3-4 grains. The grains are egg shaped, yellow, weight of 1000 grains is 170.3 g.

According to the data of 1996-1998 at trial plot of Tashkent region it has yielded by 2.6 ton is of grain per hectare.

The variety includes to the group of mid-early varieties and has the vegetation period of 160-165 days.

Albumin content in the structure of grain is equal to 16.0-38.0%, the amount of fat is 20%, slightly infected by bacteriosis disease (have a look at the leaf surface, photo 50).

1-task. Copy independently the characteristics of Uzbekskiy 2, Uzbekskiy 6 and Orzu varieties from the literature.

The variety signs of the regionized varieties of soya are:

1. Color of flowers- white, yellow and others.
2. Color of plants hairiness- white or yellow.

3. Shape of grain- circled, prolonged, egg shaped with nose.
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' end- colorless, brown and black.
7. Size, color and shape of leaves.
8. Height and shape of plants.

Questions and tasks on theme:

1. By what signs do soya varieties differ from each other?
2. How are grouped soya varieties on their vegetation periods?
3. Do you know names of the establishments which have created the varieties of soya?
4. Analyse the latest internet information about the soya varieties and make up a new summary on them.
5. Select from them some varieties which are suitable to our growing conditions and consumption demands.

Glossary: has occupied the largest area-занял большую площадь- катта ерни эгаллаган; natural selection-естественный отбор- табиий танлам; planted area-посевная площадь- экилган ер; eastern latitude-восточная долгота- шарқий кенглик; dwarf plants-карликовые растения-пакана ўсимликлар; at the sum- в сумме- умумий миқдорида; foliage- облиственность-барглилиги; trial plot- испытательной участок -синов участкаси; attributes to- относится к- тегишли нимагадир; albumin content- содержание белка-оқсил миқдори;

23-laboratory training.

Study of species diversities and farm valuable characteristics of common bean.

The purpose of the training. To teach students to the species diversities of common bean plants and farm valuable characteristics of growing species diversities of common bean.

Necessary teaching items. The map of origin of cultural plants. Herbariums of common bean and its different seeds, lab scales, rulers and pencils, erasers.

Species diversity of common bean. The plants of common bean enter to the family of Fabaceae, to the genus of Phaseolus. There are more than 200 species diversities of common bean and only 20 species of them are employed for planting. All other species grow in wild nature (photo 53).



Photo 53. **Wild common bean which is used as the selection accession.**

The species of common bean depending on the origin are divided into two geographic groups: American and Asian groups.

Beans of species entering to American group are large, flat, tip of abdomen is extended and have nose. The bean has a few grains but they big. The wide species of this group are wide-spread:

-common bean (*Phaseolus vulgaris* L.) – the stalk is straight or climbing, bean with 3-5 grains. Weight of 1000 grain is 200-400 g., grains have various colors (from white to dark-brown);

- multi flower bean (*Phaseolus multiflorus* or *Phaseolus coccineus* L.) – the high stalk, climbing, flowers are white and red, the grains are large: 700-1200 g.;
- bean with sharp end leaves (*Phaseolus acutifolius* Auzay)- the stalk is canopy, grains are flat, the grains are relatively small, weight of 1000 grains is 100-140 g., resistant to drought;
- pamolovy or moony bean (*Phaseolus lunatus* L.) –plants are canopy, wide-flat beans have 2-3 grains, sooner dissilient ones.

1-task. Find countries and geographic latitudes of seeding of above listed species from internet and inter them to the blank copies of maps of cultivating plant origins.

Plants' beans of Asian group are cylindrical, without nose, multi seed, small, weight of 1000 seeds is only 30-60 g. Among them mungbean is widespread (*Phaseolus aureus* Roxb), also called as Asian mungbean.

Mainly, common bean is grown on the vast areas. It was originated from tropic America. For a long time it has been grown on the fields of state of Peru and later transferred to Europe and Russia. Currently it has become the very spreading crop in Turkmenistan.

2-task. Enter the photos and species of mungbean and common bean differing from each other species' signs by means of internet and literature.

Farm valuable characteristics of common bean. Common bean among field crops is considered as a valuable food plant. Seeds and green beans of plants are used by population (photo 53), both in fresh and canned state.



Photo 53. **Green beans and seeds {grains} of common bean.**

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.

Adventure 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 55). The plants of common bean are resistant to drought, easily withstand to drought at the time of budding.



Photo 55. Professor N.KH. Khalilov and scientific collaborator P.KH.Bobomirzaev examine the root tubers.

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

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

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 is made up 27 million hectares with productivity 3-3.5 tons per hectare.

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 areas where the Lucerne is not sowing and thereby it provides continuous provision of forage for animals.

Questions concerning the theme:

- 1.What do you know about varieties of common bean?
- 2.Where is located the native land of common bean?
- 3.How do species of common bean differ from each other ?

4. What farm valuable signs has common bean?

5. How does common bean response to soil?

Glossary: are employed for planting-используется для посева- экиш учун
фойдаланади; wild nature- дикая природа-ёввойи табиат; flat-плоский-ясси;
tip of abdomen-кончик брюха-таглик охири; straight stalk-прямостоящий
стебель-тик поя; sanору-куст-туп; climbing-вьющийся-ўрмалаб ўсувчи;
excellent property –великолепное свойство-ажойиб хусусияти; dissilient ones-
лопающиеся- ёрилувчи; neutral response- без отзыва-бефарк; throughout all the
regions-по всему региону-хамма худудларда; selection accession-
селекционные источники-селекция ашёси; budding-образование бутона-шона
шакланиши; stoma of leaves-устьице листа- барг оғизчаси; water security-водо
обеспеченность- сув таъминоти; permits to economy-позволяет беречь-
икдисод қилиш; retain-сохранять- асрайди; nutritious fodder-питательный
фураж-озиқали хашак; continues provision-бесперывная поставка-доимий
таъминот.

24-practical training.

Study of characteristics of varieties and variety signs of common bean.

According to the scientific data, selection works with the plants of common bean were found in Russia by the scientist of S.I. Jegalov in 1920. At presently, a range of scientific-research establishments (SRE or SRI) are dealing with selection of this crop. In consequence of this activity, various varieties of common bean were evolved to produce grain and on the direction of vegetable. Here, the results of scientists from Samarkand Agricultural Institute: H.KH.Khalilov, P.Kh.Bobomirzaev, Zh.B.Islamova and N.O.Ravshanova are deserved a special attention (photo 54).



Photo 54. **Experimental plot of scientists at Samarkand AI.**

The purpose of the training. At this training, the students master characteristics of plants of varieties and variety signs of common bean.

Necessary items. The placards devoted to varieties and plants of common bean, literature, internet source, copy of state register for agricultural crops varieties for the last years.

Currently, at the experimental plot of agricultural scientific research institutes we can see such varieties and variety kinds of common bean as: Molotovskaya belaya, Krasnodarskaya 5, Sijelenskaya 8, Makhranuly, Oltin, Rabot, K 93/02, Korolevskiy 1/13, Nulifar 1/12, Oltin soch 1/11, Osiyo 1.14 and others.

Rabot variety of common bean. Variety was released by the scientists of Samarkand AI: H.KH.Khalilov, Zh.B.Islamova and N.O.Ravshanova. Variety belongs to beans family and *Phaseolus vulgaris* L. species and was developed by the method of individual selection of plants from strain K-93/02 (photo 55) with the successive mass selection.

Form of plant is a shrub with height 55-70 cm, green. The leaves of plants are wide, green, foliage is middle, hairless. The flowers have middle size, formed 1-2 flowers formed on every scape, white colored. Beans are middle size, width is 1.1, length is 13.8 cm. The grains have an oval shape, red and red-variegated, smooth and glistening.

Variety is early ripening, vegetation period is equal to 70-79 days. The beans are developed at all parts of plants (setting of 40 to 70), middle productive,

productivity at the period of technical maturity makes up 2.1-2.5 ton/ha. (photo 56). Weight of 1000 seeds (or grains) is 488-502 g.



Photo 55. Selection material of plants of common bean strain K-93/02

Matured grains are used for preparing of foods. The grains are larger than grains of vegetable bean. A grain comprises 28% of albumin, 4.5% of fat. Grains are dietetic, and used for prepare various foods and salads.

The variety fits to plant in climatic and soils conditions of all regions of Uzbekistan and to get high quality seeds.

Thanks to existing of bacterial nitrogen tubers at roots of plants the soil fertility is improved.

1-task. Collect the characteristics of above mentioned varieties and variety kinds by using internet and literature.

Variety signs of common bean are:

- form of leaf, color and hairiness;
- form of shrub and height;

- form of flowers and size;
- form of beans, color, amount of grain (or seed);
- size of grains (seeds), shape and color.



Photo 56. **Plants of Rabot variety of common bean**

Questions and tasks concerning to the theme:

1. What SRI of Uzbekistan the scientists carry out of scientific researches on plants of common bean?
2. Do any other common bean varieties exist, except presented at the text of training?
3. What do you know about the common bean varieties have created by the method of biotechnology?
4. As a supplementary information cite the characteristics of foreign common bean varieties developed by the method of gene engineering.

Glossary: are dealing with-занимаются-билан шуғулланади; in consequence of-в результате-натижасида; with the successive-с последующим-навбати билан; strain-линия-тизма; foliage-облиственность-барглилиги; on every scape-на каждом черешке-хар бир бандда; red-variegated-красно-пестрый-қизил ола; fits to plant-годен к посеву-экишга ярокли; foreign-зарубежные-чет эл; supplementary-дополнительный-қўшимча;

25-laboratory training.
Study of variety diversity and farm valuable characteristics of buckwheat.

Buckwheat refers to valuable grain crops. Buckwheat was not grown in the republics of Middle Asia until national independence. Grain of buckwheat is imported to Uzbekistan from Russia and other European countries.

Native land of buckwheat is considered mountain districts of India and Nepal, where its cultivation has begun 4 thousand years ago.

Buckwheat has come into Russia from Greece (photo 57), that is why it is called as “Grechka”, in this way received the name Greece groats (buckwheat groats).



Photo 57. **Distribution of buckwheat.**

According to some reports, there are scientific projects on realization of growing practices and even implementation of selection and seed production of buckwheat by the researchers of Samarkand Agricultural Institute.

The purpose of the training. The students become acquainted with variety diversity and farm valuable characteristics of buckwheat plants.

Necessary teaching items. Literature on buckwheat, pictures, blank copies of centers of cultural crop origin, the seeds of buckwheat and internet source.

Buckwheat belongs to the buckwheat family (Polygonaceae), uniting with genus *Fagopyrum* Gaertn.

The varieties of buckwheat which were grown in European parts of Commonwealth of Independent States (CIS) belonged to one ordinary or cultural-

type *F.sagittatum* Gilib. In fact, except this type there also occurs another type- tatarskaya buckwheat- *F.tataricum*.

Ordinary buckwheat is divided into two groups- *alata* and *aptera*. Differences between ordinary and tatarskaya buckwheat are presented in the table of 10.

Table 10

Differences between common and tatarskaya buckwheat (Data by Vinogradova B.I. and others.,1987)

Plant organs	Ordinary buckwheat	Tatarskaya buckwheat
Cluster	Compact cluster, getting shield shape on the top.	Friable cluster on all branches
Flower	Comparably large, white, light-rose or red demorph, good notable, with perfume odor.	Small, green-yellow, odorless, pistils inconsiderably differ from stamens on length.
Fruits	Comparably large, triple edged, with distinct edges and smooth ribs.	Small, triple edges, weakly distinct. Edges are wrinkled, with drill in the middle part, ribs are blunt

1-task. Collect information about work implemented by the specialists and scientists of Uzbekistan in adaptation of buckwheat to local conditions, using literature.

Farm valuable characteristics of buckwheat. Buckwheat is an unique goats and honey plant. From its grain manufactures groats and valuable flour used as the food product. In favorable years of cultivation every hectare of its plantation gives 80-100 kilograms of honey with magnificent perfume. Availability of 2-3 bee colonies per hectare provides the increasing of planting seeds production for 70%. It is also a preferable crop to follow the principal crops (photo 58). Husk and other



Photo 58. **Economical importance of buckwheat**

residues of grain, also hay and chaff remaining after processing are used to feed agricultural animals. In some countries of east, like Japan, its husk is used to prepare household articles of social demand such as pillows.

Buckwheat grains are rich to the following nutritious substances:

- fat 3%;
- sugar 2.5%;
- ashes 2.5%;
- albumin 15%;
- starch 75%;
- calorie able per 100 gram is 307 ccal;
- digestibility up to 78%.

From ashes of buckwheat potash is manufactured. Vitamin PP is produced from its leaves and flowers. Beside, there is rutin, phenolcarbon acid and phlavanoid substances in the composition of leaves and flowers.

Gruel prepared from buckwheat has medical properties and useful to people's health and was recommended to people suffering from atherosclerosis, hypertension, heart- vessel diseases, obesity, diabite and having problems with digestion of foods.

Question concerning to this train:

- 1.What another variety diversities of buckwheat are exist, find from internet?
- 2.What does common buckwheat differ from tatarskaya?
3. How can you characterize alata and aptera groups of ordinary buckwheat?
- 4.What farm –valuable properties has buckwheat?

Glossary: has penetrated- проникнул-кириб елган; groats-крупка-ёрма; become acquainted-ознакомиться-танишадилар; ordinary or cultural-обыкновенный или культурный-оддий ёки маданий; occurs other- встречается другой-бошқаси учрайди; cluster-соцветие-гул шингил; shield shaped-щитообразный-қалқонсимон; friable-рыхлый-тарқоқ; good notable-хорошо заметный-яхши сезиладиган; odor-запах-хид; pistils-рыльца-оналиги; stamens-тычинки-чагчилар; triple edged-трехгранный-уч қиррали; distinct edge-отчетливая гран-сезиларли қирра; smooth rib-гладкое ребро-силлиқ бўртма; weakly-слабый-кучсиз; wrinkled-морщинистый-ғадир будир; furrow-борозда-арик; flour-мука-ун; bee colonies-ульи-асалари уялари; husk-лузги-ўсимлик қолдиғи; hay and chaff-солома и мякина-сомон ва тўппони; pillows-подушки-ёстиклар; nutritious substances-питательные вещества-озик моддалар; consists of the following-состоит из следующего-қуйидагиларни ташкил этади; ashes-зола-кул; digestibility-перевариваемость-хазм бўлиш; gruel-каша-бўтқа; medical properties-лечебные свойства-даволовчи хусусиятлари; in regard to-по отношению к-нимагадир нисбатан; suffering from-страдающие от-нимадандир азият чекиш.

26-practical training.
Study of characteristics and variety signs of buckwheat.

The purpose of the training. The students have to master the characteristics and variety signs of planting varieties of buckwheat at the training lesson.

Necessary items for training. Herbariums of buckwheat plants, buckwheat grains, literature, lecture summery, internet source, papers and pencils.

Buckwheat is the most important groats and honey bearing plant (photo 50).



Photo 50. **Products manufacturing from buckwheat plants.**

Creation of intensive type varieties with large, stable and high content of albumin and fat, thin peel grains was the major direction in buckwheat breeding (Remeslo V.N., 1978). Such kind of varieties have to be resistant to lodging and shading. As well as fit to sowing in early spring, late autumn (cuttings and pasture) to fallow in the conditions of rain fed and irrigation with various vegetation periods for different soil and temperature conditions.

In general, buckwheat grain is imported to our republic from Russian federation. Extensively growing varieties at the present time are: Agidel, Aromat, Disayn, Ballada, Batir, Bolshevik 4, Devyatka, Демитра, ДIALOG, Dikul, Dojdik, Esen, Isumrud, Inzerskaya, Kazanka, Kazanskaya 3 and others.

Russian breeders G.E.Martinenko and others (2010) carried out interesting researches for study characteristics of planted buckwheat varieties. As it was shown at the results of research the varieties are heavily differentiate on

productivity. Dikul, Dialog and Disayn varieties have become the superior productive ones, correspondingly: 4.36; 4.42 и 4.12 ton/га.

Dikul variety. According to the area of its plantation (102656 hectares in 2009) it ranks the first in Russian federation. It makes up 20% of total area of all plantations under buckwheat varieties.

The variety was developed at the Russian SRI of grain –cereal and groats crops. The authors are: N.V.Fesenko and G.E.Martinenko. The variety is the result of selection by the method of incorporation of complicated hybrid population having small leaves, large flower clusters, harvest potential of bumper crop and quality of the grain. It is high productive, dwarf, able to produce permanent grains of good quality. The variety adapted to intensive technology of planting. It fits to mechanical harvesting of crop and reprocessing. The grain is intended to consumption. Technological indexes of grain are presented in table 11.

Table 11.

Technological quality of the grain of Dikul variety (Data by Martinenko G.E., and others. 2010).

Sign	On average	Minimal and maximal indexes
Weight of 1000 grains, g.	28.0	27.6.....29.5
Groats output, total %.	74.5	72.4.....76.4
Kernel output, %	65.4	62.5.....67.9
Size of groats, %	50.3	42.1.....59.3

On morphological features this variety belongs to species diversity of alata. The height of plant is determinate type, the amount of internodes in the zone of branching more than an average one. The largest leaf on the bush is short, relation of length to width is 1:1. The length of the longest flower cluster on the stalk is more than average one. Color of buds and flowers is light- rose. Weight of 1000 grains is on average 27-31 g. The time of blooming completion and maturity is moderate (photo 60).

On economic and biological properties this variety is distinguished by its middle ripening, high productivity and dwarfness. It is specially stands out for its stable, quality grain and good indexes. Grain output from flower clusters is high, it ripens for a relatively short time, resistant to lodging caused by the effect of rain and winds.

Dikul variety has a high index of harvest, responsive to fertilizer. It reduces the expenses to crop harvesting up to 12-20%. The harvest, depending on the year is conducted by straight mechanical combining. Maximal productivity is 4.36 ton per hectare. Vegetation period (from germination to the period of economical maturation) ranges from 64 to 76 days.

1-task. Present the characteristics of Dialog and Disayn varieties by means of internet and lecture summary.

Variety signs of buckwheat plants:

-height of plants;

- number of internodes;
- form and size of flower clusters;
- color of flower and its size;



Photo 60. Outlook of plants and flowers of the variety Dikul

- form of leaf and size;
- form of grain and state of grain shell;
- speed of ripening;
- firmness of stalk and its color.

Questions concerning to the training:

- 1.What national economic importance has buckwheat plants?
- 2.Do you know what kind of works are major in buckwheat breeding?
- 3.What technological indexes of buckwheat grain consist of?
- 4.How farm properties of Dikul variety are characterized?
- 5.Do Dialog and Disayn varieties differ from Dikul variety?

Glossary: groats and honey-крупa и мёд-ёрма ва асал; thin peel-тонкая кожура-юпка пўст; cuttings and pasture-укоcы и пастбища-ўрим ва яйлов; fallow-пар-анғиз; heavily differentiate-сильно отличаются-кучли фарқланадилар; flower clusters-кисти цветов-гул шингиллари; it ranks the first-считается первым-биринчи саналади; intended to consumption-предназначено для употребления-овқат учун; morphological features-морфологические особенности-морфологик томонлари; determinate type-определенный тип-аниқ типи; buds-бутоны-шоналар; completion of blooming-завершение цветения-гуллашнинг тугаши;

dwarfness-карликовость- паканалик; stands out-выделяется-ажралиб туради; output-выход-чиқим; incorporation-объединение-бирлашиш; relatively-относительно-нисбатан; responsive to-отзывчив к-талабгор; caused by-вызван с-сабабидан; the expenses to-затраты на-сарф харажат; straight-прямой-тўғридан тўғри; bumper crop-большой урожай-юқори ҳосил; internodes-междуузлия-бўғин орлиғи; grain shell-скорлупа зерна-дон пўчоғи; national economic-народная экономика-халқ хўжалиғи; kind-вид-хили; major-главный-бошловчи;

27-laboratory training.
Study of variety diversities and farm valuable characteristics of safflower.

The purpose of the training. The students study the variety diversity and farm valuable characteristics of safflower at class time.

Necessary teaching aids. Safflower herbariums, seeds of safflower, placards, literature, lecture summaries, internet source, blank copies of maps on world continents, pencils and erasers.

Safflower deserves the respect of people and is grown from the oldest time as oil (photo 61) and forage crop. It is resistant to drought and owing to it is planted in the rain fed areas. It insures more oil than sunflower in the conditions of drought. Safflower is a plant species which is more adopted to mechanical cultivation.



Photo 61. **The oil produced from safflower**

Safflower belongs to family aster's Asteraceae, genus *Cartamus* L. It is known 19 species of this crop and only one of them *C.tinctorins* is considered as cultural.

1-task. By means of internet mark the places of origin and regions of distribution of 18 remained wild species on the blank maps and prepare report about the origin centers of safflower.

Cultural species of safflower is grown on rain fed lands of Central Asia and the Caucasus. Safflower is considered as one of important and perspective crop for dry land agriculture. There are a range of local types of grown species. Their differences are shown in table 12.

The varieties of the cultural species can be divided into two groups. The forms with compact bushes, branches grow in a compressed form to the main stalk are included to the first group and the forms of plants with spread branches to the second group.

2-task. Prepare placards depicting the native lands and outlook of plants from these two groups of safflower.

Table 12

Important signs of growing types of safflower (Data by Vinogradova B.I. and others, 1987).

Signs	Types			
	Turkmen	Pamir	Caucasus	Armenian
Plant height, cm	55...70	70...80	70...80	70...90
Number of heads	30...50	50...80	20...40	50...80
Leaves: form	Lancet	Lancet- ellips	Lancet- ellips	Oval- lancet
edge availability of thorns	Toothy With thorns	Toothy With thorns	Whole Without thorns	Toothy With thorns
Color: buds flower wilted flower	Yellow The same Orange	Yellow The same Orange	Red Orange Red	Yellow The same Orange

Farm valuable signs of safflower. Safflower is planted for the sake of a plant oil. Remaining parts after producing of oil are fit for using as hay to animals. From the type of safflower with red flower plants are extracted (table 12).

The area planted to safflower on the direction of oil extraction is widening. The oil of safflower is also used as the oil of other oil plants. The oil of safflower is no way inferior to oil of sunflower. The scientists are employed of some forms of safflower plants as real initial materials for selection of fodder varieties (photo 62).



Photo 62. **The importance of safflower to animals and birds**

The seeds of safflower are grains for feeding home birds, particularly to hens.

At the time of wilting, the petals turn into dark red and from them dye is produced, photo 63). Output of oil from the seeds of safflower makes up 30-35%.



Photo 63. **Dye produced from the flowers of safflower**

Roots of safflower have penetrated deeply into the soil, that is why, it highly resistant to drought. It is able to grow in the places where badly grow sunflower and sesame and it is also able to compensate the demand to these oils. In wild forms safflower are grown in our steppe and hills. The productivity of safflower in the conditions of rain fed is for 40-60% exceeded than yield of sunflower. Consequently, safflower at many cases gives sufficient yield in the result of cheaper agronomic practices.

Answer the questions relating to the top subject:

1. How do plants of cultivating species of safflower are distinguished?
2. Does safflower possess an advantage in comparison with sunflower and sesame?
3. On what account safflower is cheaply grown?
4. What is the importance of safflower for animals?

Glossary: deserves to the respect-заслуживает почтения-хурмат қозонади; forage crop-кормовая культура-хашак экини; owing to it-благодаря этому-сабабли; insures more oil-обеспечивает больше масла-куп мой таъминлаши; blank copies-пустые экземпляры-бўш нусхалари; dry land agriculture-засушливое земледелие-лалми деҳқончилик; a range of-ряд чего либо-қатор нимадир; for the sake of-ради чего либо-сабабли; by means of-с помощью чего либо-нима эвазига; compact bushes-сжатые кусты-зич туплар; compressed to-плотнее к-қисилиб нимагадир; main stalk-главный стебель-бош поя; spread branches-раскидистые ветки-тарқоқ шохлар; edge-край-чети; availability of thorns-наличие шипов-тиканли; is extracted paints-выделить краски-буёқ ажратилади; is no way inferior to-ни в чем не уступает чему либо-хеч қолишмайди; penetrated deeply-проникать глубоко-чуқур кириш; sufficient yield-достаточный урожай-етарли ҳосил; cheaper-дешевле-арзонроқ.

28-practical training.

Study of characteristics and variety signs of zoned varieties of safflower.

The local populations and varieties of safflower exist and are grown since far past in the republics of Central Asia. Many of them have thorns on the leaves, flowers and baskets. They distinguished out with bright yellow color of flowers and high yield. Most of them are cultivated in the south of Kazakhstan and Tadjikstan (photo 64).



Photo 64. Outlook of leaves and flowers of safflower with thorns.

The purpose of the training. The students learn the characteristics and variety signs of safflower at the training.

Necessary teaching items. The literature dedicated to safflower plants, summaries, herbariums and placards, internet source, copies of the state register for the recent years.

On the literary data, historical varieties of safflower, as Tashkentskiy 51, Donskaya 291 were grown in our regions. They were grown in the second half of the last century. And later, the planted areas of a new variety Millutinskaya 114 have enlarged. Millutinskaya 114 was grown mainly in the rain fed soils of Kashkadariya, Samarkand and Tashkent regions. The areas planted to safflower were disposed in the southern districts of Kazakhstan and Tadjikistan.

1-task. By means of internet study the characteristics of safflower varieties of neighbouring republics and from them record which are fit as the initial material to evolve the indigenous varieties.

Safflower of Millutinskaya 114 variety. This variety was developed in the Gallaaral branch of scientific –research institute of grain industry. Ya.G.Mamot is its author. The Egyptian sample was the initial material for its creation.

Plants of this variety have not thorns, the plants are of smooth type, height attains from 54 to 70 cm (photo 65).



hoto 65. **Plantation of Millutinskaya 114 variety**

The bush of the variety is relatively compact, the branches are placed closely to the main stalk. The number of branches makes 5-7 units. The fruit baskets are large, circled shaped. Diameter of baskets is differentiated on the shape, from 2.4 to 2.7 cm. At the time of vegetation, every plant is able to develop from 7 to 8 fruit baskets.

The leaves are green, the forms of leaves disposed on the lower branches are lancet shaped, while the leaves developed on the upper branches are egg shaped. All the leaves on the bush have not thorns. The compact shape of the bush has made it possible to maintain the crop and conduct one picking by the harvester.

The flowers of the plants are rose, and at the time of wilting they turn into dark-red color (photo 65). Red dye is produced from the flowers of safflower. Accordingly to the calculations of the scientists, from every hectare of plantation it is possible to pick about 50 kilograms of wilted petals. The shape of seeds is long – flat, the cavity of seed is filled, the number of seeds in every basket makes from 22 to 40 (photo 66). Weight of 1000 seeds ranges from 39 to 48 gramms depending on the conditions of locality and place of dispose, on the bush. Weight of 1000 seeds in the conditions of Kazakhstan attains up from 50 to 75 grams. The index of oil output differs from 53 to 58%.

The variety is middle ripening, from germination of seeds to blooming it requires 66-82 days. Depending on the place of cultivation, the period of full ripening made from 93 to 117 days. The variety is highly resistant to drought. It is also resistant to safflower weevil which is dangerous in regard to seed's kernel.

2-task. Define the varieties of safflower zoned for the recent years from the copies of state register which available in the class room. Prepare the report about the characteristics of such varieties from internet or corresponding literature.



Changing of flowers color in maturation process



Forming of seeds in the basket of the plant

Photo 66. **Development of flower baskets and seeds of safflower.**

The variety signs of safflower plants:

- height of plants;
- form of bush's branching;
- presence or absence of thorns;
- form and color of leaf;
- size and color of flowers;
- form of baskets;
- color, form and fullness of seeds.

Answer the questions concerning to the top subject:

1. Where and at how many hectares safflower are planted in Uzbekistan?
2. What scientific-research organizations are dealing with selection and seed reproduction of safflower in Uzbekistan?
3. What varieties of safflower have been registered for planting in the state register of Uzbekistan?

Glossary: thorns-шипы-тиканлар; baskets-корзинки-саватчалар; dedicated to-посвященный к -унга бағишланган; summaries- конспекты-конспеклар; recent years-недавно-яқин йилларда; literary data-литературные

данные-адабиёт маълумотлари; disposed-расположенный-жойлашган; neighbouring-соседствующий- қўшни; do note –отметьте-белгилаш; to evolve –развивать-ривожлантириш; indigenous varieties-местные сорта-махаллий навлар; branch- здесь, филиал-филиали; relatively compact-относительно сжатый-нисбатан зич; permittance-разрешение-имкон; dye-краска-буёқ; wilted petals-увядшие лепестки-сўлиган тожи барглар; longed – flat-удлиненно-плоские-узун-ялпоқ; cavity-полость-ичи; plumpness-полнота-тўлиқлиги; top subject-здесь, тема-мавзу;

29-practical training.

Study of variety and farm valuable signs of ambary

Ambary is a kind of plant with fiber of high productivity. Technical oil is produced from the seeds of ambary (photo 67).



Photo 67. **Fiber and technical oil manufactured from the plants of ambary**

The purpose of the training. The students learn the variety and farm – valuable signs of varieties of ambary plant.

Necessary materials. Herbariums of ambary, placards, seeds of the varieties of ambary, technical scales for determination of 1000 seeds' weight, literature, copies of state registers, pencils and erasers, lecture summaries, internet source.

Variety signs of plants. In correspondence with state register for planting of zoned varieties on the territories of Uzbekistan we can see that Uzbekskiy 1574, Uzbekskiy 1503, Kubanskiy 333, Kubanskiy 3876 and other varieties are currently grown. The variety signs of the plants are:

- height of plants and shape;
- hairiness of stalk;
- branching and height of branching;
- place of bolls on the stalk, size and shape;
- size and shape of leaves;
- color and size of flowers.

Farm valuable signs of varieties. Dried stalks of plants contain 16-18% of valuable fiber. The fiber is distinguished by its elasticity, strength and high hygroscopic nature. The fiber of ambary is extensively used in the production of strings and robs. The seeds contain up to 20% of technical oil. The seed oil of ambary is used in leather, soap and paint manufacturing industry (photo 67). Residual haulm after reprocessing is used for feeding of agricultural animals. In the conditions of irrigation it attains to gain a bumper crop (150-250 c/ha) of stalk (photo 68) and seeds (6-12 c/ha).

Ambary is cutting at the time of boll formation to get fiber. By cutting late the quality of getting fiber becomes worse. For getting seeds, the cutting is

executed by the appearing of the first boll on the majority of plants. Stalks of ambary is har-



Photo 68. Stalk and seed harvest of ambary

vested by means of special hay cutting combines or JK-2.1. Harvesting is implemented by cutting stalks of 5 cm height from the ground. Depending on the stalk height, they are grading and binding in the bundles with diameter of 10-12 cm.

After thrashing of stalks, the extracted fiber is transferred to fiber making plants.

Uzbekiskiy 1574 variety. The variety was developed at the Uzbek experimental station of bast fiber crops. The method of individual selection from hybrid 658 x Kubanskiy -333 was employed in getting this variety. This variety was grown in Uzbekistan since 1965 (photo 69). It has strong stalk, straight standing, weak hairiness, the height is 320-330 cm. Bolls are of middle size and



Photo 69. Plants of Uzbekiskiy 1574 variety.

are setting on the top half of stalk. The color of flowers is lilac (photo 67). The variety is middle ripening. Vegetation period from germination up to technical (for stalks) maturity is equal to 120-115 days. An average productivity of stalks is 63.5, and yield of fiber is 33.2 c/ha.

The variety is resistant to the fungus diseases and agricultural pest.

Technological indexes of the fiber are: fiber output from stalk- 23%, rupture strength 20.6 kgs.

Questions and tasks to the top subject:

1. What the variety signs of plants are studied for?
2. What state does ambary rank today?
3. What social importance does ambary have?
4. Define the varieties of ambary included in the state register for the recent years.
5. Prepare the report about species diversity of ambary.
6. Determine the weight of 1000 seeds of variety.

Glossary: is currently grown-высеваемый в настоящее время-хозир экилаётган; dried stalks-засушенные стебли- куритилган поялар; strings and robs-шпагаты и верёвки-ип ва арқонлар; residual haulm-остаточная ботва- колган похол; thrashing of stalks-обмолот стеблей-пояларни янчиш; are grading and binding-сортируются и связываются-саралйдилар ва боғлайдилар; in the bundles-в связках-боғламларда; is transferred to-передается к- юборилада; bast fiber crops-лубяные культуры-толали экинлар; strong stalk- сильный стебель-кучли поя; straight standing-прямо стоящий-тик турувчи; lilac -сиреневый цвет-сирен рангли; fungus disease –грибковая болезнь- замбуруғ касалиги; and agricultural pest- и сельскохозяйственный вредитель- ва кишлоқ хужалиги зараркундаси; fiber output-выход волокна-тола чиқиши; rupture strength-разрывная сила-узилиш кучи;.

30-laboratory training.

Study of variety diversity and farm valuable signs of Lucerne.

The purpose of the training. The students at the class firm their knowledge on plant diversities of Lucerne which have spread in nature and in agricultural production as well as with their farm valuable signs at the class.

Necessary materials to carry out the training. The maps of origin centers of cultivated crops and their blank copies, herbariums of Lucerne varieties, literature, lecture summaries, laboratory scales for weighing the seeds, pencils and erasers.

Lucerne is a perennial crop and it belongs to species of *Medicago L.* and family *Fabaceae*.

The territories of Central Asia and Europe are considered as the first native land of Lucerne. That is why, a reach genefond of Lucerne is spread in these areas. Australia is considered as the second center of origin and a lot of annual species belonging to two subgenus of Lucerne are occurred here.

Variety diversities of Lucerne. There are about 50 species of Lucerne. They have annual and perennial cultural and wild variety diversities (photo 70).



Photo 70. Plants of wild Lucerne occurring in the plain areas of Europe.

According to the classification which has been worked out by the scientists P.A.Lubenez, the species *Medicago Falcago* (Rchb), Grossh. belonging to perennial subgenus are used in the production. The representatives of these species are established a genome line of polyploidy ($2n=16, 32$ and 48) and extensively employed in the selection.

The varieties of tetraploid species ($2n=32$) are mostly cultivated in the production, and the following types are included in them: blue Lucerne *M.sativa L.*

(photo 71), yellow lucerne *M.falcate* L., hybrid lucerne *M.media* L., greenish lucerne *M.colrule* L., chnel lucerne *M.lupulina* L.

1-task. Define the distinguishing signs of varieties on above listed species and their sowing areas as well as prepare the report about them by using literature, blank copies of maps and internet.



Photo 71. The varieties of plants belonging to the species of blue and yellow Lucerne.

Farm valuable signs of Lucerne. Lucerne is the most valuable crop among perennial fodder grasses. Its importance in the national and agricultural industry is explained by numerous various products gained from Lucerne. Green feeding mass, hey, breaket, vitamin flour and other kinds of forages are produced for livestock production (photo 73).



Photo 72. The variety of products taken from Lucerne 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 13).

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. 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.

Table13.

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

2-task. State data from your lecture materials about the importance of Lucerne in enhancing possibilities of soil fertility and productivity of other crops in the rotation as above presented table.

Answer the questions concerning to the top subject:

1. What diversities of Lucerne are cultivated in Uzbekistan?
2. How many kilograms of nitrogen does three year Lucerne accumulate in the soil?
3. Do the wild species of Lucerne grow in Uzbekistan?

Glossary: a perennial crop-многолетняя культура-кўп йиллик экин; first native land-первичная родина-бирламчи ватани; genefond-генофонд-ген манбаи; annual species-однолетние виды- бир йиллик турлари; is occurred here-встречается здесь-шу ерда учрайдиган; are existed-существуют-бор; worked out-разработана-ишлаб чиқилган; genome lines- геномный ряд-геном қатори; extensively employed-широко используется- кенг фойдаланади; are mostly cultivated-в основном возделывается-кўп экилган; fodder grasses-кормовые травы-хашак ўтлар; livestock production-животноводство-чорвачилик; are easily digested-легко перевариваются-енгил хазм бўладиган; all year round-круглый год-йил давомида; tubers disposed-расположенные клубенки-жойлашган тугунақлар; fertility of soil-плодородие почвы -тупроқ унумдорлиги; radically increase-коренным образом увеличивается -бутунлай оширади; due to-благодаря-туфайли; drought and salinity-засуха и засоление-курфоқ ва туз; food value-питательность-тўйимлиги; its enhancing-его улучшение-унинг яхшиланиши; rotation-севооборот-алмашлаб экиш.

31-practical training.

Study of characteristics and variety signs of zoned varieties of Lucerne.

Lucerne is a kind of plants, which deserves great attention of people. All growing varieties of Lucerne in agriculture have been created by indigenous breeders in the result of their scientific –research activities. Today, a lot of varieties are included into the state register and are grown in all soil and climatic region conditions of the republic. Most of them owing to their high resistance to diseases and pests, they extensively spread even in neighboring countries.

The purpose of the training. According to the topic of training, the students master the characteristics and variety signs of zoned varieties of Lucerne.

Necessary items to conduct training. Herbariums of Lucerne plant varieties, seeds, literature, copies of state register, internet source and placards.

The varieties included into the state register for planting in the territory of the republic are: Aridnaya, Baygul, Karakalpakskaya 15, Tashkentskaya 1, Tashkentskaya 1728, Tashkentskaya 2009, Tashkentskaya 3192, Khivinskaya mestnaya, Khorezmskaya 2 and others.

Tashkentskaya 2009 variety. This variety was developed at the SRI of selection, seed production and production technologies of cotton plant by the inter mutual crossing of some varieties. The authors of this variety are: M.A.Burnasheva, T.Rashidov, B.G.Sobirov, Kh.Abdullaev and S.R.Sadikkhadjaev (photo 73).



Photo 73. Plantation of Lucerne of Tashkentskaya 2009 variety.

The variety was included into the state register in 1991, after many successfully executed tests at the state trial plots and regionized for sowing on irrigating lands of Andijan, Bukhara, Syrdaria and Tashkent regions.

This variety unsteady, belongs to the species of blue hybrid. The canopy of the plant is straight standing, or slightly branching, grows in spreading state.

Bushiness is low. Height of the stalk is 60-120 cm, it is well branching. The leaves are ellipse shaped, less haired, upper part of the leaves are toothed (photo

74). Cluster of flower is cylindrical. Bract is green, beans are middle sized, spiral, 4 facets, greenish, at the time of mature is yellow-brown. Foliage of bush is 45.0-47.5%



Photo 74. The leaves, cluster and beans of plants

On observations carried out at trial plots it was shown that the average productivity of hey in the conditions of irrigation made 20.0 ton per hectare. The productivity of seeds per hectare on average made 0.5-0.6 ton/ha.

Albumin in forage is equal to 16.9%. The variety is resistant to agricultural pests and diseases.

Baygul variety. The variety was developed at the Uzbek SRI of grain industry. It was created by the breeders D.P.Baygulov, R.A.Aliev, N.A.Danilov by crossing of China's early ripening and Sloven varieties.

In 1995 it was included into the state register for planting on the rain fed lands of Djizzakh region (photo 75).

According to the literature data, the variety belongs to sowing species of Lucerne. The bush of the variety is straightly growing. Medium branching. The height of the main stalk attains up to 105 cm, average uneven, less hairy. Leaf in the form of contrary spear, smooth, less hairy. Surface of leaves covered with waxy spots. Petals of the flower are blue. Beans are middle sized, spiral, at the time of maturity they are brown, the seeds are heart liked, typic-yellow color. Weight of 1000 seeds is 1.8-2.4 g. An average yield of hey is 5.7ton. Albumin content in the dried substances is equal to 1.4%, cellulose -34.0%.

Vegetation period, from germination of the seeds, the first cutting lasts to 86 day. The variety resistant to drought and cold. The variety also resistant to diseases and pests.

1-task. The students by dividing to groups of two-three men will prepare report on the characteristics of varieties: Aridnaya, Karakalpakskaya 15, Tashkentskaya 1, Tashkentskaya 1728, Nashkentskaya 3192, Khivinskaya mestnaya, khorezmskaya 2 with pictures of Lucerne.

Variety signs of Lucerne plants:

-height of plants, form of branching, state of height;

- extent of hairiness of stalks and branches;



Photo 75. **Plantation and seeds of Baygul variety.**

- size of leaves, color and coggedness;
- color of flower, size of flower bract and color;
- form of cluster, size and spiral form;
- color of matured bean;
- size of seed, form and color.

Answer the questions:

- 1.What differences have the varieties of Lucerne in their origin?
- 2.what kind of responses have local varieties in regard to soil conditions?
- 3.What response have varieties to climatic conditions?
- 4.In what varies of morphology do varieties consist of?
- 5.What organization is the head of selection and seed production of varieties?

Glossary: indigenous-местный-махаллий; owing to-благодаря-туфайли; wide spread-широко распространенный -кенг тарқалган;SRI –НИИ-ИТИ; state trial plot-государственный испытательный участок-давлат синов участкаси; spreading –раскидистый-тарқок; расеме-соцветие-шингил гул; foliage of bush-облиственность куста-тупнинг барглилиги; uneven-неровный-қўпол; opposite spear-копье наоборот-тескари наштар ; waxu spots-восковые пятна-мумё доғли; cellulose-клетчатка-клетчатка; extent of hairiness-степень опушенности-туклилик даражаси; cogged-зубчатый-тишли.

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