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HUZURIDAGI ILMY DARAJALAR BERUVCHI PhD.03/2025.27.12.Fil.06.05
RAQAMLI ILMY KENGASH**

MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETI

ADAMBAYEVA FERUZA RUSTAMBEKOVNA

**INGLIZ VA O‘ZBEK TILLARIDA BIOTEXNOLOGIYAGA OID
TERMINLARNING STRUKTUR-SEMANTIK VA KOGNITIV
XUSUSIYATLARI**

10.00.06 – Qiyosiy adabiyotshunoslik, chog‘ishtirma tilshunoslik va tarjimashunoslik

**FILOLOGIYA FANLARI BO‘YICHA FALSAFA DOKTORI (PhD) DISSERTATSIYASI
AVTOREFERATI**

Urganch-2026

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Sciences**

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Dissertatsiya mavzusining dolzarbligi va zaruriyati. Jahon tilshunosligida chog'ishtirma tadqiqotlar negizida biotexnologiyaga oid terminlarni ilmiy mezonlar asosida tavsiflash, mavzuiy chegaralarini belgilash, tizimlashtirish hamda qo'llanish me'yorlarini aniqlashtirish masalalarini tadqiq etishga e'tibor kuchaymoqda. Ayniqsa, biotexnologiya terminlarining lisoniy tabiatini o'rganishda an'anaviy terminologiya tamoyillari bilan bir qatorda, kognitiv-semantik yondashuv asosida ma'no hosil bo'lish mexanizmlarini ochib berish, terminlar shakllanishiga ta'sir etuvchi lingvistik va ekstralingvistik omillarni aniqlash muhim ahamiyat kasb etadi.

Dunyo tilshunosligida biotexnologiyaga oid terminlarni qiyosiy-tipologik jihatdan tahlil qilish ularning shakllanishiga ta'sir etuvchi ilmiy-texnologik va ijtimoiy omillarni hamda turli tillardagi terminlar o'rtasidagi o'xshashlik va tafovutlarni aniqlash imkonini beradi. Jumladan, biotexnologiya sohasiga oid terminlarning ilmiy-nazariy asoslarini, struktur-semantik va kognitiv xususiyatlarini chog'ishtirma-tipologik aspektida o'rganish, ularning yuzaga kelishini belgilovchi omillarni aniqlash, murakkab, izoh talab qiluvchi terminlarning mazmun-mohiyatini ochib berish va ularni tarjima qilish tamoyillarini ishlab chiqish bugungi terminologik tadqiqotlarning istiqbolli yo'nalishlaridan biri hisoblanadi.

Mamlakatimizda globallashtirish jarayonlari sharoitida ilm-fan, ta'lim va ishlab chiqarish integratsiyasini ta'minlash nuqtayi nazaridan biotexnologiya terminologiyasini o'rganish, ilmiy tushunchalarning aniq va izchil talqinini shakllantirish, standartlashtirilgan terminlar tizimini yaratish hamda milliy terminologiya fondini boyitish kabi masalalarning muhimligi ushbu sohada tadqiqotlar olib borilishining zaruratini belgilaydi. Chet tillardan kirib kelayotgan yangi terminlarni tartibga solish, muqobil variantlarini iste'mol uchun tavsiya etish, o'zbek tilining ichki imkoniyatlari asosida o'zlashtirish hamda "...davlat tilidan xorijiy tillarga va xorijiy tillardan davlat tiliga professional tarjima qilish uslubiyotlarini yaratish"¹ bugungi kunda tilshunoslik va tarjimashunoslik oldida turgan ustuvor vazifalardan biri hisoblanadi. Bu borada ingliz va o'zbek tillarida biotexnologiyaga oid terminlarni chog'ishtirma tilshunoslik doirasida o'rganish muhim amaliy ahamiyat kasb etadi.

O'zbekiston Respublikasi Prezidentining 2019-yil 8-oktyabrdagi PF-5847-sonli "O'zbekiston Respublikasining 2030-yilgacha oliy ta'lim tizimini rivojlantirish konsepsiyasini tasdiqlash to'g'risida"gi, 2022-yil 28-yanvardagi PF-60-son "2022-2026-yillarga mo'ljallangan Yangi O'zbekistonning taraqqiyot strategiyasi to'g'risida"gi Farmonlari, 2020-yil 25-noyabrdagi PQ-4899-sonli "Biotexnologiyalarni rivojlantirish va mamlakatning biologik xavfsizligini ta'minlash tizimini takomillashtirish bo'yicha kompleks chora-tadbirlar to'g'risida"gi, 2021-yil 19-maydagi PQ-5117-sonli "O'zbekiston Respublikasida xorijiy tillarni o'rganishni ommalashtirish faoliyatini sifat jihatidan yangi bosqichga olib chiqish chora-

¹ Ўзбекистон Республикаси Президенти Шавкат Мирзиёевнинг 2021 йил 19 майдаги "Ўзбекистон Республикасида хорижий тилларни ўрганишни оммалаштириш фаолиятини сифат жиҳатидан янги босқичга олиб чиқиш чора-тадбирлари тўғрисида"ги ПҚ-5117-сон Қарори // <https://lex.uz/docs/5426736>

tadbirlari to‘g‘risida’gi Qarorlari hamda mazkur faoliyatga tegishli boshqa me‘yoriy-huquqiy hujjatlarda belgilangan vazifalarni amalga oshirishda ushbu tadqiqot ishi muayyan darajada xizmat qiladi.

Tadqiqotning Respublika fan va texnologiyalari rivojlanishining ustuvor yo‘nalishlariga mosligi. Mazkur tadqiqot Respublika fan va texnologiyalar taraqqiyotining I. “Axborotlashgan jamiyat va demokratik davlatni ijtimoiy, huquqiy, iqtisodiy, madaniy, ma‘naviy-ma‘rifiy rivojlantirishda innovatsion g‘oyalar tizimini shakllantirish va ularni amalga oshirish yo‘llari” ustuvor yo‘nalishiga muvofiq bajarilgan.

Muammoning o‘rganilganlik darajasi. Jahon tilshunosligida terminlarning shakllanishi va struktur-semantik xususiyatlarini o‘rganish bo‘yicha bir qator tadqiqotlar olib borilgan. Xususan, E. Vyuster, H.Felber, J.C.Sager, P.Sandrini, S.E.Rayt, G.Budin, M.T. Kabre, S.I.Landau, M.C.Baker, M.Fernandez-Parra, D.S.Lotte, G.O.Vinokur, A.A.Reformatskiy, L.S.Barxudarov, S.V.Grinev-Grinevich, V.M.Leychik kabi olimlar² tomonidan terminshunoslikning nazariy asoslari, terminlarning shakllanish jarayoni, ularning struktur xususiyatlari, standartlashtirish va me‘yorlashtirish masalalari hamda tarjima tamoyillari ilmiy-nazariy jihatdan chuqur tadqiq etilgan.

O‘zbek tilshunosligida esa A.Hojiyev, H.Dadaboyev, S.Usmonov, R.Doniyorov, N.Qosimov, E.Begmatov, A.P.Madvaliyev, G‘.M. Ismailov, X.D. Paluanova, X.A.Sarimsokov³ va boshqalarning ilmiy ishlari milliy terminologiya tizimining taraqqiyotiga sezilarli hissa qo‘shgan.

Biotexnologiyaga oid terminlarning global miqyosda standartlashtirilishi FAO (Food and Agriculture Organization of the United Nations – Birlashgan Millatlar Tashkilotining Oziq-ovqat va qishloq xo‘jaligi tashkiloti) tomonidan tuzilgan

² Wüster E. Internationale Sprachnormung in der Technik, besonders in der Elektrotechnik. – Bonn: Bouvier, 1970. – 507 p.; Felber H. Terminology Manual. – Paris: Unesco and Infoterm, 1984. – 426 p.; Sager J.C. Language engineering and translation: Consequences of automation. – Amsterdam, Philadelphia: John Benjamins Publishing Company, 1994. – 345 p.; Sandrini P. Terminologiearbeit im Recht: Deskriptiver, begriffsorientierter Ansatz vom Standpunkt des Übersetzers. – Wien: Termnet, 1996. –291 p.; Wright S.E., Budin G. Handbook of Terminology Management. – Amsterdam, Philadelphia: John Benjamins Publishing, 1997. – 370 p.; Cabré M.T. Terminology: Theory, Methods and Applications. – Amsterdam: John Benjamins Publishing Company, 1999. – 260 p.; Landau S.I. Dictionaries: The Art and Craft of Lexicography. – Cambridge: Cambridge University Press, 2001. – 496 p.; Baker M.C. Case: Its Principles and Its Parameters. – Cambridge: 2015. – 336 p.; Fernández-Parra M. Terminology Management for Translators. – London: Routledge, Cambridge University Press, 2025. – 316 p.; Лотте Д. С. Основы построения научно-технической терминологии – Москва: 1961. – 158 с.; Vinokur G.O. The Russian Language: A Brief History. – Cambridge University Press, 2010. – 160 p.; Реформатский А.А. Введение в языкознание: учебник для вузов. – Москва: Аспект-Пресс, 2001. – 536 с.; Бархударов Л.С. Язык и перевод. Вопросы общей и частной теории перевода. – Москва: 1975. –238 с.; Гринеv-Гринеvич С.В. Терминоведение. – Москва: Академия, 2008. –304 с.; Лейчик В.М. Терминоведение: предмет, методы, структура. – Москва: 2009. –256 с.;

³ Ҳожиёв А. Термин танлаш мезонлари. – Тошкент: Фан, 1996. – 128 б.; Dadaboyev H. O‘zbek terminologiyasi. – Toshkent, 2019. – 117 б.; Усмонов С. Ўзбек терминологиясининг баъзи масалалари. – Тошкент, 1968. –118 б.; Дониёров Р. Ўзбек тили техник терминологиясининг айрим масалалари. – Тошкент: Фан, 1977. – 162 б.; Қосимов Н. Ўзбек тили илмий техникавий терминологияси масалалари. – Тошкент, 1985. – 124 б.; Бегматов Э. Ҳозирги ўзбек адабий тилининг лексик қатламлари. – Тошкент: Фан, 1985 –201 б.; Мадвалиев А.П. Ўзбек тили изоҳли луғатларида сўзларга этимологик маълумот бериш масаласи // Ўзбек тили ва адабиёти. – Тошкент, 2009. – №3. – Б. 35-43; Исмаилов Ғ.М. Ўзбек тили терминологик тизимларида семантик усулда термин ҳосил бўлиши. ф.ф.н. дисс. автореф. – Тошкент, 2011. -26 б.; Paluanova X. Ingliz, o‘zbek, rus va qoraqalpoq tillarida ekologik terminlarning derivatsion-semantik prinsiplari. f.f.d. diss... – Toshkent, 2016. –230 б.; Sarimsokov X.A. Ingliz va o‘zbek tillaridagi sport sharhlari leksikasining lingvistik xususiyatlari. Avtoref. filol. fan. dok. diss... – Toshkent, 2024. – 61 б.

“Glossary of Biotechnology and Genetic Engineering”⁴ lugʻatida aks etgan boʻlib,⁵ unda terminlarning ilmiy talqinlari va qoʻllanish doirasi aniq belgilangan. G.Plappert⁵ genetika korpusi asosida olib borilgan izlanishlari natijasida biotexnologik birliklarning ilmiy matnlarda qoʻllanishi, frazeologik birikish xususiyatlari va kontekstual moslashuvini tushuntirib bergan.

Biotexnologiya terminlarining struktur-semantik xususiyatlarini oʻrganishga bagʻishlangan tadqiqotlar orasida T.A.Kudinovaning⁶ ishlari alohida oʻrin tutadi. Uning izlanishlarida ingliz va rus tillaridagi koʻp komponentli biotexnologik terminlarning tarkibiy modellarini aniqlash, ularning semantik tuzilishi, komponentlararo munosabat va morfologik-derivatsion xususiyatlari atroflicha tahlil qilingan. S.L.Vasilyeva, Z.Gainutdinova, A.Muxtarova, A.Sirotn, E.Mishak, L.Ritikova va L.Rogachlarning⁷ tadqiqot ishlari biotexnologiya terminlarining shakllanishida yunon-lotin affikslarining qoʻllanilishi, terminlarning tarkibiy modellari hamda tarjima tamoyillarini yoritishga bagʻishlangan. O.S.Voyevodina⁸ esa ingliz tilidagi biotexnologiyaga oid terminlarni tizimlashtirish va oʻqitilishiga oid amaliy yondashuvlarni taklif qilgan.

Tilshunoslikda anʻanaviy strukturaviy yondashuvdan farqli ravishda antroposentrik paradigma tilni inson tafakkuri va idroki bilan bogʻliq dinamik tizim sifatida talqin qiladi. Kognitiv lingvistika esa til birliklarining konseptual asoslari, maʼno shakllanishi va mental modellar orqali bilimning ifodalanishini oʻrganadi. Ushbu yondashuvning asosiy metodologiyasi “The Cambridge Handbook of Cognitive Linguistics”da⁹ konseptualizatsiya, metafora, freym, blending va kognitiv grammatika kabi tushunchalar yagona kognitiv metodologiya sifatida izohlangan. Kognitiv tilshunoslikning ushbu nazariy tamoyillari maxsus leksik qatlamlarni, jumladan, terminlarni oʻrganishda ham faol qoʻllanilmoqda. R.Temmerman¹⁰ terminologiyani ijtimoiy-kognitiv jarayon sifatida talqin qilib, semasiologik va onomasiologik yondashuvlarning uygʻun qoʻllanishi, shuningdek sinonimiya va

⁴ Zaid A., Hughes H., Porceddu E., Nicolas F. Glossary of biotechnology and genetic engineering. – Rome: Food and Agriculture Organization of the United Nations, 1999. – 250p.

⁵ Plappert G.L. Phraseology and Epistemology in Scientific Writing: A Corpus-Driven Approach: PhD thesis. University of Birmingham. – Birmingham: 2012. – 298 p.

⁶ Кудинова Т. А. Структурно-семантические особенности многокомпонентных терминов в подязыке биотехнологий (на материале русского и английского языков): автореф. дисс. ... к.ф.н. – Орел, 2006. – 24 с.

⁷ Васильева С. Л. Морфологические особенности однокомпонентных терминов сферы биотехнологий в русском и английском языках // Филологические науки. Вопросы теории и практики. – Тамбов: Грамота, 2015. – С. 50–52.; Gainutdinova A.Z., Mukhtarova A.D. Structural and semantic features of multicomponent terms in the field of biotechnology // Eurasian Journal of Biosciences. – 2019. Vol.13, Is.2.–P.1463-1466.; Syrotn A. Multi-component English terms of biotechnology sphere // Cogito. Multidisciplinary Research Journal. – 2017. Vol. 9, P.78–86.; Сиротин А. С. Типы структурных моделей англоязычных терминов-словосочетаний сферы биотехнологии // Studia Humanitatis. – 2020. – № 3. – С. 15.; Myshak, E. Morphological peculiarities of English one-component terms of biotechnologies // Cogito. – 2017. – № 3. – P. 64–71.; Rytikova L. Features of the formation of biotechnological terminology in English // Agrarian Science and Education. – 2008. № 3–4. – P. 122–126.; Rohach L. Semantic phenomena characterizing English terminology of biotechnology // Modern Studies in Foreign Philology. – 2019. Vol. 17. – P. 112–120.

⁸ Воеводина О. С. Методика обучения иноязычной терминологии студентов вуза по направлению подготовки «Биотехнология»: автореф. дис. ... канд. пед. наук. – Нижний Новгород: НГЛУ, 2013. – 24 с.

⁹ Dancygier B. The Cambridge Handbook of Cognitive Linguistics Cambridge: Cambridge University Press, 2017. – 840 p. DOI: 10.1017/9781316339732.

¹⁰ Temmerman R. Towards New Ways of Terminology Description: The Sociocognitive Approach. – Amsterdam: J. Benjamins Publishing Company, 2000. – P. 97.

polisemiya kabi hodisalarning ilmiy til tizimidagi funksional rolga e'tibor qaratgan. M.Tereza Kabre¹¹ terminologiyani lingvistik, kognitiv va ijtimoiy omillar bilan bog'liq murakkab tizim sifatida izohlagan. E. I. Golovanova¹² terminlarni konseptual bilimni kodlovchi mental modellarning lingvistik ifodasi sifatida tahlil qilsa, P. Faber¹³ maxsus soha tilida freym, metafora va konseptual tuzilmalarga asoslangan kognitiv modellashtirishning ahamiyatini ko'rsatib bergan.

Shuni alohida ta'kidlash kerakki, o'zbek tilida biotexnologiyaga oid terminlarni tadqiq qilishga bag'ishlangan tadqiqotlar olib borilmagan, shu bilan birga, ingliz va o'zbek tillaridagi biotexnologik terminlarning struktur-semantik va kognitiv xususiyatlarini qiyosiy chog'ishtirma tadqiqi amalga oshirilmagan bo'lib, ushbu tadqiqot ishi mazkur bo'shliqni to'ldirishga qaratilgan.

Dissertatsiyaning tadqiqot bajarilgan oliy ta'lim muassasasining ilmiy-tadqiqot ishlari rejalari bilan bog'liqligi. Mirzo Ulug'bek nomidagi O'zbekiston Milliy universiteti "Qiyosiy tilshunoslik" kafedrasining "Turli tizimli tillarning tipologik va chog'ishtirma xususiyatlari" mavzusidagi ilmiy tadqiqot ishlari rejasi doirasida bajarilgan.

Tadqiqotning maqsadi ingliz va o'zbek tillaridagi biotexnologiyaga oid terminlarning struktur-semantik va kognitiv xususiyatlarini ochib berishdan iborat.

Tadqiqotning vazifalari:

biotexnologiyaga oid terminlarning shakllanishiga ta'sir qiluvchi lingvistik va ekstralingvistik omillarni tahlil qilish hamda terminlarning xalqaro va milliy manbalar asosidagi geterogenligini ilmiy jihatdan tavsiflash;

sohaga oid ingliz va o'zbek tillaridagi terminlarning struktur xususiyatlarini chog'ishtirma tahlil qilish, ular o'rtasidagi leksik-semantik munosabatlarni aniqlash;

terminlar shakllanishining tarkibiy modellarini tasniflash hamda eponimik birliklarning shakllanish va qo'llanish xususiyatlarini o'rganish;

chog'ishtirilayotgan tillarda biotexnologiyaga oid terminlarni kognitiv asosda kategoriyalash hamda terminlar shakllanishida ishtirok etuvchi metaforik modellarni aniqlash;

freym modeli asosida ingliz va o'zbek tillaridagi biotexnologiyaga oid terminlar o'rtasidagi ierarxik va konseptual munosabatlarni tavsiflash;

ingliz va o'zbek tillaridagi biotexnologiyaga oid terminlarning tarkibiy komponentlarini aniqlash, ularni turlarga ajratish va terminlarning tizimlilik xususiyatlarini ochib beruvchi statistik tahlil ishlab chiqish.

Tadqiqot obyekti sifatida ingliz va o'zbek tillaridagi terminologik lug'atlarda, ilmiy va o'quv-metodik matnlar, biotexnologiya sohasiga oid normativ-huquqiy hujjatlar hamda internet manbalarida qo'llanilgan terminlar majmuasi tanlangan.

Tadqiqotning predmetini biotexnologiya sohasiga oid terminlarning struktur-semantik va kognitiv xususiyatlari tashkil etadi.

Tadqiqotning usullari. Tadqiqot mavzusini yoritishda terminlarning struktur va

¹¹ Cabré M.T. Terminology: Theory, Methods and Applications. – Amsterdam: John Benjamins Publishing Company, 1999. – 260 p.

¹² Голованова Е.И. Введение в когнитивное терминоведение. 4-е изд., стер. – Москва: Наука, 2024. – 224 с.

¹³ Faber P. A Cognitive Linguistics View of Terminology and Specialized Language. – Berlin: De Gruyter Mouton, 2012. – <https://doi.org/10.1515/9783110277203> – P.3-29

chog'ishtirma tahlil, mavzuiy tasniflash, statistik tahlil, freym tahlil, konseptual xaritalash va metaforik modellashtirish, diaxron va sinxron tahlil usullaridan foydalanilgan.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat:

ingliz va o'zbek tillari biotexnologiya terminologiyasining biologiya, genetika, mikrobiologiya, tibbiyot, kimyo, muhandislik va axborot texnologiyalari kabi fanlar kesishmasida xalqaro, o'zlashma va kalkalangan birliklar asosida shakllangan geterogen tizimi aniqlanib, leksik birliklarning tarixiy-etimologik jihatlari, o'zlashtirilish jarayonida xalqaro terminlarning qabul qiluvchi til tizimiga semantik va kognitiv jihatdan moslashuvi hamda barqarorlashuvi qiyosiy-chog'ishtirma aspektda nazariy va amaliy jihatdan ochib berilgan;

chog'ishtirilayotgan tillarda biotexnologiyaga oid terminlarning morfologik (affiksatsiya, konversiya), morfologik-sintaktik (kompozitsiya, blending, abbreviatsiya), sintaktik, semantik va leksik-semantik usullar orqali yasalishi, murakkab ilmiy tushunchalarni ifodalashi hamda tarkibida eponimik birliklarning qo'llanilishi sababli ingliz tilida morfologik-sintaktik model, o'zbek tilida esa leksik-semantik o'zlashtirish va ko'p komponentli sintaktik termin birikmalarining ustunlik qilishi struktur hamda statistik tahlil asosida aniqlangan;

ingliz va o'zbek tillari biotexnologiya terminologiyasida sinonimiya, antonimiya, polisemiya va giper-giponimiya kabi paradigmatic munosabatlar ilmiy tushunchalarning turli semantik belgilar asosida nomlanishi natijasida yuzaga kelishi hamda ularning har ikkala tilda biotexnologiyaga oid terminlar tizimini boyitishdagi samaradorligi isbotlangan;

ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning konseptual kategoriyalari aniqlanib, biotexnologiya freymi hamda uning subfreym va slotlari o'rtasidagi ierarxik-konseptual munosabatlar ochib berilgan, shuningdek, terminlar tarkibidagi metaforik birliklarning to'rtta manba soha (inson dunyosi, texnika va predmetlar, tabiat hodisalari va jismlari, harbiy soha) asosida shakllanishi hamda har ikkala tilda voqelanishidagi o'xshashlik va farqlar misollar orqali dalillangan.

Tadqiqot ishining amaliy natijalari quyidagilardan iborat:

ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning shakllanishi (o'zlashgan termin, tub termin, yasama termin)ni, struktur-semantik va kognitiv xususiyatlarini chog'ishtirma aspektda o'rganish bo'yicha amaliy tavsiyalar ishlab chiqilgan;

chog'ishtirilayotgan tillarda biotexnologiya sohasiga oid terminlarning lingvistik va ekstralingvistik omillar ta'sirida, xalqaro, o'zlashma va kalkalangan birliklar asosida shakllanishi, rivojlanish tendensiyalariga doir ilmiy xulosalar biotexnologiya sohasi bo'yicha yaratiladigan izohli lug'at, o'quv qo'llanma va darsliklarning mukammalashuviga xizmat qilishi asoslangan;

tadqiqotning ilmiy asoslari, qo'llangan metodologik yondashuvlar va lisoniy tahlilning zamonaviy usullari, shuningdek, olingan natijalarning tadqiqot konsepsiyasiga to'liq mosligi hamda belgilangan vazifalarning izchil yechilishi olingan natijalarning ishonchligini ta'minlaydi.

Tadqiqot natijalarining ishonchligi muammoning aniq qo'yilganligi, chiqarilgan xulosalarning struktur-semantik, chog'ishtirma, tasniflash, kognitiv,

freym, metaforik va statistik tahlillar bilan asoslanganligi, nazariy ma'lumotlarning ishonchli ilmiy manbalardan olinganligi, amaliy tavsiyalarning ta'lim jarayoni va terminologik faoliyatda sinovdan o'tganligi hamda olingan natijalarning vakolatli tashkilotlar tomonidan tasdiqlanganligi bilan izohlanadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Tadqiqot natijalarining ilmiy ahamiyati shundaki, ingliz va o'zbek tillari materiallari asosida olib borilgan izlanishlar biotexnologiya terminlarining til tizimidagi o'ziga xos mavqeyini ochib beradi, qiyosiy terminologiya yo'nalishining ilmiy-tadqiqot tamoyillarini yanada boyitadi va dissertatsiyada keltirilgan chog'ishtirilayotgan tillardagi biotexnologiya terminlari yuzasidan bildirilgan ilmiy xulosalar va umumlashtirishlar boshqa terminologik tizimlarni o'rganishda ilmiy-nazariy manba sifatida xizmat qiladi.

Tadqiqot natijalarining amaliy ahamiyati tadqiqot materiallari va xulosalaridan biotexnologiyaga oid terminlarning o'ziga xos xususiyatlari, tilshunoslik, terminshunoslik, terminografiya, leksikologiya, leksikografiya kabi fanlar bo'yicha o'quv qo'llanma, darslik, majmualar tayyorlashda, ikki tilli izohli biotexnologiyaga oid terminlar lug'atlarini yaratishda amaliy manba sifatida foydalanish mumkinligi bilan izohlanadi.

Tadqiqot natijalarining joriy qilinishi. Ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning struktur-semantik va kognitiv xususiyatlarini tadqiq etish bo'yicha olingan ilmiy natijalar asosida:

ingliz va o'zbek tillari biotexnologiya terminologiyasining biologiya, genetika, mikrobiologiya, tibbiyot, kimyo, muhandislik va axborot texnologiyalari kabi fanlar kesishmasida xalqaro, o'zlashma va kalkalangan birliklar asosida shakllangan geterogen tizimi aniqlanib, leksik birliklarning tarixiy-etimologik jihatlari, o'zlashtirilish jarayonida xalqaro terminlarning qabul qiluvchi til tizimiga semantik va kognitiv jihatdan moslashuvi hamda barqarorlashuvi qiyosiy-chog'ishtirma aspektda nazariy va amaliy jihatdan ochib berilganligi bilan bog'liq xulosalaridan Yevropa Ittifoqining 2023-2025-yillarga mo'ljallangan Erasmus+ dasturining ERASMUS-EDU-2022-101082242 raqamli "12-PLEDGE (Innovative and interdisciplinary Programmes in Bio-medical Engineering to Leverage and Exploit the Digital Growth programme for students' employability in Uz)" nomli loyihasi doirasida foydalanilgan (Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti Urganch filialining 2025-yil 7-apreldagi 430-sonli ma'lumotnomasi). Natijada "Biotibbiyot muhandisligi" ta'lim yo'nalishi o'quv dasturlarining ilmiy-nazariy asoslari boyitilgan, biotexnologik terminlarni tarjima qilishning metodik tamoyillari amaliy jihatdan mustahkamlangan;

chog'ishtirilayotgan tillarda biotexnologiyaga oid terminlarning morfologik (affiksatsiya, konversiya), morfologik-sintaktik (kompozitsiya, blending, abbreviatsiya), sintaktik, semantik va leksik-semantik usullar orqali yasalishi, murakkab ilmiy tushunchalarni ifodalashi hamda tarkibida eponimik birliklarning qo'llanilishi sababli ingliz tilida morfologik-sintaktik model, o'zbek tilida esa leksik-semantik o'zlashtirish va ko'p komponentli sintaktik termin birikmalarining ustunlik qilishi struktur hamda statistik tahlil asosida aniqlangani haqidagi xulosalardan Yevropa Ittifoqining 2023-2025 yillarga mo'ljallangan Erasmus+ ECAMPUZ – European World Talent Camp for Uzbekistan Scientists in Food Science and

Technology – ERASMUS-EDU-2022-CBHE nomli grant loyihada foydalanilgan (Toshkent kimyo-texnologiya institutining 2025-yil 21-apreldagi 1/06-1231-sonli ma'lumotnomasi). Natijada "Oziq-ovqat fanlari va texnologiyasi" bo'yicha ilg'or kurslar uchun tayyorlangan o'quv materiallari ilmiy-nazariy jihatdan boyitilgan, dasturlar mazmuni xalqaro tajriba asosida yangilangan, shuningdek "Biotexnologiya" va "Oziq-ovqat xavfsizligi" kurslarida terminlarni tarjima qilishga doir metodik yondashuvlar takomillashtirilgan;

ingliz va o'zbek tillari biotexnologiya terminologiyasida sinonimiya, antonimiya, polisemiya va giper-giponimiya kabi paradigmatic munosabatlar ilmiy tushunchalarning turli semantik belgilar asosida nomlanishi natijasida yuzaga kelishi hamda ularning har ikkala tilda biotexnologiyaga oid terminlar tizimini boyitishdagi samaradorligiga doir yangiliklaridan ERASMUS+ dasturining 598340-EPP-1-2018-1-ES-EPPKA2-CBHE-JP University Cooperation Framework for Knowledge Transfer in Central Asia and China (UNICAC) grant loyihasi doirasida foydalanilgan (Mirzo Ulug'bek nomidagi O'zbekiston Milliy universitetining 2025-yil 24-apreldagi 04/11-5371-sonli ma'lumotnomasi). Natijada magistratura talabalari uchun mo'ljallangan o'quv materiallarini nazariy jihatdan takomillashtirishga samarali manba bo'lib xizmat qilgan;

ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning konseptual kategoriyalari aniqlanib, biotexnologiya freymi hamda uning subfreym va slotlari o'rtasidagi ierarxik-konseptual munosabatlar ochib berilgan, shuningdek, terminlar tarkibidagi metaforik birliklarning to'rtta manba soha (inson dunyosi, texnika va predmetlar, tabiat hodisalari va jismlari, harbiy soha) asosida shakllanishi hamda har ikkala tilda voqelanishidagi o'xshashlik va farqlar misollar orqali dalillanganligi haqidagi xulosalaridan "Xorazm viloyat teleradiokanali" orqali efirga uzatilgan "Najot bilimda", "Salomatlik sirlari" va "Agroolam" ko'rsatuvlari ssenariysini yozishda foydalanilgan (Xorazm teleradiokompaniyasining 2025-yil 9-apreldagi 319-sonli ma'lumotnomasi). Natijada teleko'rsatuvlarning ilmiy mazmuni sifat jihatdan yuksalishi barobarida, murakkab biotexnologik tushunchalarni keng auditoriyaga sodda, ravon va ilmiy asoslangan shaklda yetkazishga erishilgan.

Tadqiqot natijalarining aprobatsiyasi. Mazkur tadqiqot natijalari 14 ta ilmiy amaliy anjumanda, shu jumladan, 12 ta xalqaro va 2 ta respublika konferensiyasida muhokamadan o'tkazilgan.

Tadqiqot natijalarining e'lon qilinganligi. Dissertatsiya mavzusi yuzasidan 27 ta ilmiy ish, jumladan, O'zbekiston Respublikasi Oliy attestatsiya komissiyasining asosiy ilmiy natijalarni chop etish tavsiya etilgan ilmiy nashrlarda 12 ta maqola (10 tasi respublika va 2 tasi xorijiy jurnallarda) nashr etilgan, hamda 1 ta EHM uchun yaratilgan dasturiy vosita uchun qayd qilish guvohnomasi olingan.

Dissertatsiyaning tuzilishi va hajmi. Dissertatsiya kirish, uchta bob, xulosa va foydalanilgan adabiyotlar ro'yxatidan iborat bo'lib, 146 sahifani tashkil etadi.

DISSERTATSIYANING ASOSIY MAZMUNI

Kirish qismida mavzuning dolzarbligi asoslangan, tadqiqotning maqsad va vazifalari, obyekti va predmeti tavsiflangan, respublika fan va texnologiyalari rivojlanishining ustuvor yoʻnalishlariga mosligi koʻrsatilgan, ilmiy yangiligi va amaliy natijalari bayon qilingan, olingan natijalarning ilmiy va amaliy ahamiyati ochib berilgan, natijalarni amaliyotga joriy qilish, nashr etilgan ishlar va dissertatsiya tuzilishi boʻyicha maʼlumotlar keltirilgan.

Dissertatsiyaning **“Biotexnologiyaga oid terminlarni oʻrganishning ilmiy-nazariy asoslari”** deb nomlanuvchi birinchi bobi toʻrt fasldan iborat. Birinchi fasl **“Terminologiya tilshunoslikning tadqiqot obyekti sifatida”** deb nomlangan boʻlib, unda terminologiyaning tarixiy shakllanishi, nazariy tamoyillari, *“termin”*, *“terminologiya”*, *“termin tizimi”* tushunchalarining farqlari, terminning asosiy belgilari hamda termin yaratishning asosiy usullari haqida maʼlumot berilgan.

Terminologiyaning mustaqil ilmiy fan sifatida shakllanishi XX asr boshlarida E.Vyuster¹⁴ ishlari bilan izohlanib, u terminlarning aniqligi, unifikatsiyasi va xalqaro ilmiy-texnik hamkorlikdagi ahamiyatini asoslab berdi. Vyuster tomonidan ilgari surilgan ushbu tamoyillar keyinchalik ISO (International Organization for Standardization) faoliyatida oʻz aksini topib, terminologiyaning global miqyosda tartibga solinishiga zamin yaratdi. D.S.Lotte¹⁵ texnik termin tizimlari uchun nazariy asos yaratdi, G.O.Vinokur¹⁶ terminlarning lingvistik mohiyatini ochib berdi, A.A.Reformatskiy¹⁷ tomonidan yaratilgan *“Terminologiya”* boʻlimini oʻz ichiga olgan darslik esa ushbu yoʻnalishning mustaqil ilmiy fan sifatida shakllanishini mustahkamladi.

Terminologiyadagi munozarali masalalardan biri bu termin va umumisteʼmoldagi soʻzlar orasidagi chegarani aniqlashdir. Leksik qatlam orasida doimiy terminologizatsiya (terminlashuv) va determinologizatsiya (terminlik xususiyatini yoʻqotish) jarayonlari sababli tilshunoslar bu ikki leksik qatlam oʻrtasidagi chegarani aniqlash mushkul deb hisoblaydilar. Terminologizatsiya – umumisteʼmol leksikaga oid soʻzning terminga aylanishi¹⁸ boʻlib, biror-bir soha leksikasiga oid terminlarning aksariyati shu yoʻl bilan lisoniy bosqichga koʻtariladi. E.I.Dibrovaning fikriga koʻra, terminologik tizim uch usul orqali shakllanadi: morfologik derivatsiya, semantik derivatsiya va boshqa tillardan soʻzlarni oʻzlashtirish orqali¹⁹. Terminologik derivatsiya affiksatsiya, qoʻshma soʻzlar yasash, konversiya, abbreviatsiya, sintaktik modellash, semantik koʻchish va oʻzlashtirish kabi usullarni oʻz ichiga oladi. Ushbu tadqiqotda ishida esa termin yaratishning morfologik, morfologik-sintaktik, sintaktik, semantik va leksik-semantik usullari

¹⁴ Wüster E. Internationale Sprachnormung in der Technik. – Berlin: VDI-Verlag, 1931. – P.18.

¹⁵ Лотте Д. С. Основы построения научно-технической терминологии. — М.: ОНТИ, 1961. – 112 с.

¹⁶ Винокур Г.О. О некоторых явлениях словообразования в русской технической терминологии // Труды Московского института истории, философии и литературы. – Москва, 1939. – С.3-54.

¹⁷ Реформатский А.А. Что такое терминология. // Вопросы языкознания. – Москва, 1961. – С. 49.

¹⁸ Сайфуллаева Р.Р., Менглиев Б.Р., Бокиева Г.Х., Курбонова М.М., Юнусова. З.К., Абузалова М.К. Ҳозирги ўзбек адабий тили. – Тошкент, 2009. – Б.116.

¹⁹ Диброва Е.И. Современный русский язык. Теория. Анализ языковых единиц. Учебник для студ. Высш. Учеб. Заведений: в 2 ч. – М.: Академия, 2002. – 540 с.

asosiy yondashuvlar sifatida qoʻllanildi.

Bobning ikkinchi fasli **“Terminlarni oʻrganishda kognitiv yondashuv”** deb nomlanib, ushbu faslda antroposentrik paradigma va kognitiv tilshunoslikning shakllanishi, tilni inson tafakkuri va konseptual tizimi bilan bogʻliq holda talqin etish gʻoyalari tahlil qilinib, L.Yu.Buyanova, E.I.Golovanova, P.Faber, V.F.Novodranova, M.Minskiy, J.Lakoff, M.Jonson, L.P.Grunina va boshqa olimlar²⁰ qarashlari asosida kognitiv terminologiyaning mazmuni ochib berilgan.

Kognitiv terminologiya terminlarning faqat til tizimidagi funksiyasi bilan cheklanmay, ularni konseptualizatsiya, kategoriyalash, freym modellashtirish, metaforizatsiya va kognitiv derivatsiya kabi jarayonlar orqali ilmiy bilimlarni aks ettiruvchi konseptual birliklar sifatida talqin qiladi. Kognitiv yondashuv terminlarni oʻrganishda kognitiv-semantik, kognitiv-grammatik hamda lingvomadaniy yondashuvlarga tayangan holda amalga oshiriladi. Kognitiv yondashuv doirasida terminlarning yoʻnaltiruvchi, tizimlashtiruvchi va modellashtiruvchi funksiyalari ularning ilmiy bilimni qayd etish va tartibga solishdagi kognitiv rolini belgilaydi. Ushbu yondashuv terminlarni inson ongidagi konseptual tuzilmalarning lingvistik ifodasi sifatida talqin etib, ularning shakllanishi va tizimliliigi kognitiv mexanizmlar bilan bogʻliqligini ochib beradi.

Shuningdek, faslda konseptualizatsiya va kategoriyalash, freym modellashtirish, metaforizatsiya hamda tillararo oʻzlashtirish kabi asosiy kognitiv mexanizmlarning terminologiya tadqiqotlaridagi oʻrni batafsil yoritilib, ushbu jarayonlarning terminlarning shakllanishi, mazmuniy tuzilishi va konseptual tizimdagi oʻrnini belgilashdagi ahamiyati asoslab berilgan.

Bobning **“Biotexnologiyaga oid terminlarning shakllanishida ekstralingvistik va lingvistik omillar”** nomli uchinchi faslida biotexnologiya terminologiyasining tarkib topishi va evolyutsiyasiga taʼsir qiluvchi tashqi va ichki omillar tizimli ravishda tahlil qilingan.

Ekstralingvistik omillar sifatida biotexnologiyaning qadimgi, klassik va zamonaviy bosqichlari, ilmiy-texnik taraqqiyot, COVID-19 kabi global jarayonlar, fanlararo integratsiya, xalqaro hamkorlik hamda biotexnologik amaliyotlarga nisbatan jamiyatning axloqiy-ijtimoiy munosabati koʻrib chiqildi. Biotexnologiya terminologiyasining tarixiy shakllanishi uch bosqichda namoyon boʻlib, qadimgi bosqichda *“fermentatsiya”* va *“yeast”(xamirturush)* kabi amaliy jarayonlarni ifodalovchi birliklar yuzaga kelgan; klassik davrda genetika fanining shakllanishi bilan *“gen”* va *“allel”* kabi asosiy terminlar ilmiy muomalaga kiritilgan; zamonaviy bosqich esa *DNKning qoʻsh spiral modeli*, *“kodon”*, *“PCR”(polimeraza zanjir reaksiyasi)*, *“GMO”(genetik jihatdan oʻzgartirilgan organizmlar)* va *“CRISPR”*

²⁰ Буянова Л.Ю. Терминологическая деривация в языке науки: когнитивность, семиотичность, функциональность: монография. – Москва: Наука, 2014. – 256 с.; Голованова Е.И. Введение в когнитивное терминоведение: учеб. пособие. – Москва: НАУКА, 2011. – 225 с.; Faber Pamela. A Cognitive Linguistics View of Terminology and Specialized Language. – Berlin, Boston: De Gruyter Mouton, 2012. –324p.; Новодранова В.Ф. Когнитивные науки и терминология // НТТ. – 2000. – № 2. – С. 69.; Минский, М. Фреймы для представления знаний / пер. с англ. О. Н. Гринбаума; под ред. Ф. М. Кулакова. – Москва: Энергия, 1979. – С. 5.; Lakoff G., Johnson M. Metaphors We Live By. – Chicago: University of Chicago Press. 1980. – 242 p.; Грунина Л.П., Широколобова А.Г. Когнитивный аспект исследования терминов // Филологические науки. Вопросы теории и практики. – 2010. – № 1 (5). – С.97.

(*genom tahriri tizimi*) singari yadro terminlarning paydo bo'lishi va keng qo'llanishi bilan xarakterlanadi. Xususan, pandemiya davrida, "RT-PCR" (*real vaqtli PCR*), "mRNA vaccine" (*xabarchi RNK vaktsinasi*), "genomic surveillance" (*genom kuzatuvi*), "spike protein" (*spayk oqsili*) va "viral load" (*virus yuklamasi*) kabi biotexnologik terminlarning keskin faollashuvi biotexnologiya terminologiyasining global ilmiy-texnik jarayonlarga tezkor moslashuvchi dinamik tizim ekanligini ko'rsatdi. Lingvistik omillarga biotexnologiyaga oid o'zlashma terminlarning diaxron va sinxron rivojlanishi, ularning fonetik-morfologik moslashuvi, kalkalash, abbreviatsiya va affiksatsiya kabi usullar orqali shakllanishi hamda terminlarning semantik dinamikasini belgilovchi jarayonlar kiradi.

Bobning "***Biotexnologiyaga oid terminlarning geterogenlik xususiyati***" deb nomlangan to'rtinchi faslida biotexnologiya terminologiyasining fanlararo, ko'p manbali va murakkab tuzilishi nazariy hamda amaliy jihatdan asoslab berilgan.

Biotexnologiya terminologiyasi kimyo, biologiya, biokimyo, mikrobiologiya, molekulyar genetika, tibbiyot, farmakologiya, muhandislik, axborot texnologiyalari, ekologiya va qishloq xo'jaligi kabi turli sohalarning kesishgan nuqtasida rivojlanishi natijasida ko'p manbali va geterogen tizim sifatida shakllangan. Biotexnologiyaga oid terminologiya tizimi umumilmiy, kasbiy va maxsus birliklar majmuasi bo'lib, tirik organizmlar va biologik jarayonlarning ishlab chiqarish amaliyotida qo'llanishi bilan bog'liq bilimlarni verbal shaklda ifodalovchi leksik birliklardir.

Tadqiqot ishimizda biotexnologiya terminologiyasi S.G.Kazarina²¹ tomonidan taklif etilgan gomogen, geterogen, filiatson va kontaminatsion modellarga tayanilgan holda asosan geterogen turga mansub ekanligi, ya'ni uning shakllanishida zoologiya va botanika (*callus – kallus, hybrid – gibrid*), umumbiologiya (*organism – organizm, species – tur*), tibbiyot va farmakologiya (*biopsy – biopsiya, antigen – antitanacha*), kimyo va fizika (*enzyme – ferment, diffusion – diffuziya*), genetika (*gene – gen, GMO – genetik jihatdan o'zgartirilgan organizm*), muhandislik (*bioreactor – bioreaktor, process – jarayon*), axborot texnologiyalari (*bioinformatics – bioinformatika, database – ma'lumotlar bazasi*), ekologiya va qishloq xo'jaligi (*biodiversity – biologik xilma-xillik, biopesticides – biopestitsidlar*) kabi sohalardan olingan terminlar faol ishtirok etishi aniqlandi.

Dissertatsiyaning "***Ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning struktur-semantik xususiyatlari***" deb nomlangan ikkinchi bobning birinchi fasli "***Chog'ishtirilayotgan tillarda biotexnologiyaga oid terminlarning struktur tahlili***"da ingliz va o'zbek tillaridagi biotexnologiyaga oid terminlarning struktur xususiyatlari qiyosiy tahlil qilinib, terminlarning bir komponentli va ko'p komponentli turlari, ularning yasalish mexanizmlari hamda ikki til o'rtasidagi umumiylik va farqlar aniqlangan.

Tadqiqot uchun ingliz tilidagi 1180 ta, o'zbek tilidagi 1100 ta termin tanlandi. Ingliz va o'zbek tillaridagi biotexnologiya terminlarining struktur xususiyatlarini qiyosiy tahlili ularni bir va ko'p komponentli terminlarga ajratishga imkon berdi. Bir komponentli terminlar tarkibida tub terminlarning ulushi ingliz tilida 29 %, o'zbek

²¹Казарина С.Г. Типологические характеристики отраслевых терминологий. –Краснодар: Кубан, 1998. -С.276.

tilida 38 %ni, yasama birliklar ulushi esa mos ravishda 60 % va 49 %ni tashkil etishini ko'rsatdi. Yasama birliklar asosan prefix va suffikslar orqali yuzaga keladi (ingliz: *re-*, *de-*, *trans-*, *anti-*, *bio-*; *-ion/-tion*, *-ity*, *-ing*; o'zbek: *bio-*, *anti-*, *trans-*; *-lik*, *-ma*, *-chi*, *-siz*). Ingliz tilidagi defisli shakllar (*cell-free*, *single-use*) o'zbekchada ko'pincha yasama yoki so'z birikmasi ko'rinishida beriladi (*hujayrasiz*, *bir martalik*). Har ikki til terminologiyasida lotin-yunon manbalariga tayanuvchi xalqaro affikslar faol qo'llaniladi.

Ingliz tilidagi biotexnologiya terminologiyasini boyituvchi usullardan biri blending (teleskopiya) usuli bo'lib, unda ikkita asos birlashtirilishi natijasida yangi termin hosil bo'ladi. Genetik modifikatsiya, sintetik biologiya va bioinformatika yo'nalishlaridagi innovatsiyalar natijasida yuzaga kelayotgan yangi obyekt va jarayonlarni nomlashda blending faol qo'llanib, murakkab tushunchalarni ixcham va aniq ifodalashga xizmat qiladi. Biotexnologiyaga oid teleskopik usul yordamida yasalgan terminlar O.A.Xrushevaning²² tasnifiga asoslanib 4 guruhga ajratildi: yangi organizmlar (masalan, *liger*, *broccoflower*), texnologik qurilmalar (*bioprinter*, *genechip*), fanlararo integratsiya mahsullari (*bionics*, *neurotech*) hamda murakkab kimyoviy birikmalar (*chlorofluorocarbon*). O'zbek tilida bunday terminlar bevosita transliteratsiya, transkripsiya yoki kalkalash usullari bilan o'zlashgan, ayrimlari esa izohlovchi birikmalar yordamida ifodalangan: *bionics-bionika*, *liger-liger*(*sheryo'lbars gibridi*), *broccoflower* – *gulkaram-karam* yoki *yashil gulkaram*.

Ingliz va o'zbek tillaridagi biotexnologiya terminologiyasini tahlil qilish natijalari shuni ko'rsatadiki, ushbu sohada ko'p komponentli termin birliklari ustunlik qiladi. Xususan, 750 ta ingliz ko'p komponentli terminlar (KKT) ni tahlil qilish natijasida quyidagi natijalarga erishildi: 355 ta (47,3%) ikki komponentli: (N+N: *cell envelope*, *gene therapy*; A+N: *anabolic enzyme*, *monoclonal antibody*; Ved+N: *activated enzyme*, *mutated cell*; Ving+N: *flanking region*, *living cell*), 310 ta (41,3%) uch komponentli; (N+N+N: *food additive industry*; A+N+N: *horizontal gene transfer*; Ved+N+N: *spent sulfite liquor*), 69 ta (9,2%) to'rt komponentli, 8 ta (1,1%) besh komponentli, 5 (0,7%) olti komponentli va 3 ta (0,4%) yetti komponentli. O'zbek tilida esa 710 ta KKT tahlil qilindi, ularning asosiy qismini ikki komponentli terminlar tashkil etadi – 345 ta (48,6%). Keyingi o'rinda uch komponentli terminlar turib, ular 290 ta (40,8%)ni tashkil etadi. To'rt komponentli terminlar soni 52 ta bo'lib, jami birliklarning 7,3 foizini qamrab oladi. Shuningdek, besh komponentli terminlar 12 ta (1,7%), olti komponentlilar 7 ta (1,0%) va yetti komponentlilar esa atigi 4 ta (0,6%) ni tashkil etdi. Ikki komponentli terminlar asosan Ot+Ot (*gen oqimi*, *embrion kulturasi*), Sifat+Ot (*kimyoviy mutagen*, *virusli vaksina*), Sifatdosh+Ot (*faollashtirilgan ferment*, *denaturatsiyalangan oqsil*), Ot+Harakat nomi (*genni klonlash*) kabi modellarga mansub bo'lib, ingliz tilidagi gerundiy shakllari odatda fe'ning harakat nomi orqali ifodalanadi. Terminlarning katta qismi o'zbek tiliga kalkalash (*primary tissue* – *birlamchi to'qima*), yarim kalka (*secondary immune response* – *ikkilamchi immun javob*), transliteratsiya yoki transkripsiya (*aerobic*

²² Хрущева О.А. Дискурсивные особенности блендов // Приоритетные направления развития современной науки: материалы Международной заочной научно-практической конференции. – Чебоксары: НИИ педагогики и психологии, 2010. – С. 44

bacteria – aerob bakteriyalar) orqali o‘zlashgani kuzatildi.

Uch va undan ortiq komponentli terminlarning ikki komponentli modellardan bosqichma-bosqich kengayish hisobiga shakllanishi aniqlandi. Ingliz tilida eng keng tarqalgan modellar A+N+N (*horizontal gene transfer*), N+N+N (*food additive industry*), Ved+N+N (*water jacketed incubator*), Adv+Ved+N (*genetically modified organism*), o‘zbek tilida esa Ot+Ot+Ot (*polimeraza zanjiri reaksiyasi*), Sifat+Ot+Ot (*tarmoqli ildiz kulturasi*), Sifat+Sifat+Ot (*shartli halokatli mutatsiya*) kabi tuzilmalar hisoblanadi.

Besh, olti va yetti komponentli terminlar murakkab ilmiy tushunchalarni ifodalashda qo‘llanadi: *somatic cell nuclear transfer technique* (5 komponentli), *bone marrow mesenchymal stem cell transplantation* (6 komponentli), *Real-Time Quantitative Reverse Transcription Polymerase Chain Reaction* (7 komponentli). O‘zbek tilida ham shunga o‘xshash modellarga duch kelinadi: *bir zanjirli nuklein kislotasi, genetik jihatdan o‘zgartirilgan organizm, qishloq xo‘jaligi hayvonlarining genetik resurslarini boshqarish*.

Ingliz tili biotexnologiya terminologiyasida DNA, PCR kabi qisqartmalar mustaqil termin sifatida ishlatiladi, o‘zbek tilida esa ular izohlovchi birliklar bilan birga qo‘llanilib (DNK namunasi, PCR tahlili), xalqaro standart shaklning saqlanishini ta’minlaydi.

Biotexnologiya terminlarini tuzilishiga ko‘ra o‘ziga xos xususiyatlarini tahlil qilish, bu terminologik tizimda abbreviaturalarning o‘rni va ahamiyati beqiyos ekanligini ko‘rsatdi. Sohadagi ilmiy tushunchalarning murakkabligi sababli terminlarning asosiy qismini ko‘p komponentli terminlar tashkil qiladi. O‘zbek tiliga biotexnologik terminlar asosan ingliz tilidan, ma’lum bir qismi rus tili orqali o‘zlashganligi sababli o‘zlashma birliklar o‘zbek terminologiyasi shakllanishining asosiy omiliga aylangan. Qisqartmalar bo‘yicha esa ingliz tili terminlarning miqdori va xilma-xilligi bilan yetakchilik qiladi.

Bobning ikkinchi **“Ingliz va o‘zbek tillarida biotexnologiya terminologiyasida leksik-semantik munosabatlar”** deb nomlangan faslida biotexnologiya terminlari tizimidagi paradigmatic bog‘lanishlar – sinonimiya, antonimiya, polisemiya hamda giper–giponimik munosabatlar ingliz va o‘zbek tillari misolida qiyosiy tahlil qilingan.

Sinonimik terminologik birliklar bir necha mezonlar asosida tasniflanadi. Avvalo, sinonimlik darajasi terminlar o‘rtasidagi ma’no yaqinligini belgilab, mutlaq sinonimlar to‘liq semantik moslikni, nisbiy sinonimlar esa qisman farqlanuvchi ma’no o‘zaro bog‘lanishini ifodalaydi. Ikkinchi mezon – strukturaviy tip, ya’ni sinonimlarning bir komponentli, ko‘p komponentli yoki qisqartmalar asosida shakllanishi bilan tavsiflanadi. Uchinchisi – kontekstual qo‘llanilish, bunda sinonim terminlarning rasmiy ilmiy nutqda, amaliy muhokamalarda yoki turli funksional vaziyatlarda qo‘llanishi ularning mazmuniy va stilistik farqlanishini belgilaydi. Masalan, ingliz tilida *ascorbic acid – vitamin C, autocatalytic reaction – autocatalysis* kabi mutlaq sinonimlar mavjud. O‘zbek tilida esa *protein – oqsil, ferment – enzim* singari sinonimlar uchraydi. Nisbiy sinonimlar esa mazmunan yaqin, lekin qo‘llanish sohasi yoki konnotativ belgilari bilan farqlanadi: *biotechnology – genetic engineering*, o‘zbekchada esa *antikor – antitana*. Shuningdek, shakliy-strukturaviy variantlar ham sinonimiyaning shakllanishiga ta’sir ko‘rsatadi. Tahlillar

grafik (*bioengineering – bio-engineering*), affiksial (*fertilize – fertilise; DNK gibrizlanishi – gibrizatsiyasi*) hamda qisqa-to'liq shakl variantlari (*genetically modified organism – GMO*) mavjudligini ko'rsatdi. Bu variantlilik turli normativ an'analar, tarjima uslublari va xalqaro terminologik standartlarning ta'siri bilan izohlanadi.

Biotexnologiya terminologiyasidagi antonimik munosabatlarni tahlil qilish natijasida mazkur birliklarning muayyan semantik mezonlar asosida shakllanishi aniqlandi. Xususan, **joylashuvi bo'yicha** *intracellular – extracellular* (hujayra ichidagi – hujayra tashqarisidagi), *in vivo – in vitro* (tirik organizmda – sun'iy sharoitda); **miqdori bo'yicha** *monogenic – multigenic* (bitta genli – ko'p genli), *haploid cell – diploid cell* (gaploid hujayra – diploid hujayra); **funksiyasi bo'yicha** *activation – inactivation* (faollashish – faolsizlanish), *anabolism – catabolism* (anabolizm – katabolizm); **belgi-xususiyati bo'yicha** *hydrophilic – hydrophobic* (gidrofil – gidrofob), *acidic – basic* (kislotali – asosli); **tarkibi bo'yicha** *saturated fatty acid – unsaturated fatty acid* (to'yingan yog' kislota – to'yingan yog' kislota); **o'lchami bo'yicha** *micromolecule – macromolecule* (mikromolekula – makromolekula) kabi antonim juftliklar terminologik tizimda qarama-qarshi konseptlarni belgilashda faol qo'llanadi. Shuni ta'kidlash lozimki, ayrim antonimik birliklar muayyan kontekstga ko'ra bir nechta semantik toifaga mansub bo'lishi mumkin, biotexnologiya sohasining uzluksiz rivojlanishi esa yangi kashfiyot va tushunchalar negizida yangi antonimik munosabatlarning shakllanishiga zamin yaratmoqda.

Semantika nuqtai nazaridan eng muhim paradigmatic munosabatlar qatoriga kiruvchi yana bir muhim munosabat giper-giponimik munosabatdir. Giponimlarni asosiy xususiyatlari quyidagilarda namoyon bo'ladi:

1. Giponim bir tomonlama implikasiya tamoyili asosida aniqlanadi, ya'ni giponimni giperonim bilan almashtirish har doim mumkin, chunki bu turning jinsga bo'ysunishi hisoblanadi, lekin aksincha almashtirish har doim ham mumkin bo'lavermaydi;

2. Giponimning ma'nosi semantik jihatdan murakkabroq va boyroq bo'lib, u tasvirlaydigan predmetlar sinfi esa torroqdir;

3. Kogiponimlar o'rtasidagi semantik munosabatlar bir sinf elementlari o'rtasidagi munosabatlardir. Giponimlar giperonimning ma'nosini o'z ichiga oladi va bir-biriga qo'shimcha differensial semalar orqali qarama-qarshi qo'yiladi.

Tahlillar natijasida ingliz va o'zbek tillaridagi biotexnologiya terminologiyasida giper-giponimik munosabatlarning oltita asosiy turi aniqlandi. Jumladan, **umumiy tushuncha-tur tushuncha** munosabatida *GMO – GM plants, GM animals, GM microorganisms* (*GMO – GM o'simliklar, GM hayvonlar, GM mikroorganizmlar*); *cell – somatic cell, germ cell, stem cell* (*hujayra – somatik hujayra, jinsiy hujayra, ildiz hujayra*) kabi birliklar kuzatildi. **Sinf-sinf a'zosi** tipidagi munosabatlarda *virus – DNA virus, RNA virus* (*virus – DNK virusi, RNK virusi*), *protein – transport protein, structural protein* (*oqsil – tashuvchi oqsil, strukturaviy oqsil*) juftliklari namoyon bo'ladi. **Parametr-parametr tashuvchisi** munosabatida *protein synthesis – ribosome, mRNA, tRNA* (*oqsil sintezi – ribosoma, xabarchi RNK, tashuvchi RNK*) kabi tizimlar aniqlandi. **Jarayon-obyekt** aloqasida *fermentation – sugar, glucose –*

ethanol, CO₂ (fermentatsiya jarayoni – shakar, glyukoza – etanol, karbonat anhidrid) ko‘rinishlari qayd etildi. **Munosabat–munosabat a‘zolari** turida *genetic transformation – host organism, transgene (genetik transformatsiya – xost organizm, transgen)* kabi birliklar mavjud. **Xususiyat–obyekt** munosabatida esa *pluripotency – stem cells (pluripotentlik – ildiz hujayralar)* juftligi uchraydi.

Tizimli tahlil giponimik aloqalarning ikki, uch va to‘rt bosqichli qatlamlarda namoyon bo‘lishini ko‘rsatdi. Masalan, *cloning (klonlash)* termini *reproductive cloning, therapeutic cloning, gene cloning (reproduktiv klonlash, terapevtik klonlash, gen klonlash)* kabi uch bosqichli, *gene (gen)* termini esa *structural gene, regulatory gene, oncogene (strukturaviy gen, regulyator gen, onkogen)* kabi to‘rt bosqichli zanjirlarni hosil qiladi. Ushbu natijalar biotexnologik terminologiyada giper–giponimik munosabatlar ilmiy tushunchalarni tabaqalashtirish va tizimlashtirishning muhim semantik vositasi ekanini tasdiqladi.

O‘rganishlarimiz natijasida “*vector*”, “*transformation*”, “*expression*”, “*culture*”, “*signal*” kabi terminlar turli ilmiy sohalarida parallel qo‘llanayotgan bo‘lsa-da, umumiy semantik yadroni saqlab qolishini aniqladik. Shu bois mazkur birliklarni omonimiya emas, tizimlararo polisemiya hodisasi sifatida talqin qildik.

Bobning navbatdagi “**Biotexnologiyaga oid eponimlarning o‘ziga xos xususiyatlari**” faslida atoqli otlardan hosil bo‘lgan maxsus nomlar – eponimlar biotexnologiya terminologiyasining alohida qatlami sifatida tahlil qilindi.

Eponimlar ilmiy-texnik taraqqiyot bosqichlarini hamda tarixiy-madaniy ma’lumotlarni o‘zida aks ettiruvchi, ilmiy nutqda muhim kognitiv vazifani bajaruvchi maxsus terminologik birliklar hisoblanadi²³. Eponim atamasi aslida haqiqiy yoki afsonaviy shaxs, qahramon, shahar, daryo, tog‘ kabi geografik obyekt, shuningdek, xalq yoki davr nomi bilan bog‘liq atoqli otlardan hosil bo‘lgan birlikni anglatadi. Ilmiy terminologiyada esa eponim muayyan hodisa, tuzilma, usul yoki tushunchani birinchi bo‘lib kashf etgan, tavsiflagan yoki ilmiy muomalaga kiritgan shaxs nomi bilan bog‘langan termin sifatida talqin etiladi²⁴.

A.Ziyodullayevning ta’kidlashicha, eponimlar umumiste’mol so‘zlardan semantik jihatdan maxsus tushunchalarni ifodalashi hamda funksional jihatdan asosan professional nutqda qo‘llanilishi bilan farqlanadi²⁵. Shu sababli eponimik birliklar tor semantik maydonga ega bo‘lib, yuqori darajadagi aniqlik va terminologik ixtisoslashuv bilan tavsiflanadi.

Tadqiqot davomida ingliz tilida biotexnologiyaga oid matnlar asosida 107 ta eponim termin aniqlanib, ularning ko‘pchiligi tibbiyot, genetika, mikrobiologiya, kimyo va hujayra biologiyasi sohalaridan biotexnologiya tizimiga o‘zlashgani ma’lum bo‘ldi. Kelib chiqish manbasiga ko‘ra eponimlar antroponimlardan (*Donnan effect – Donnan effekti, Krebs cycle – Krebs sikli*), toponimlardan (*Edinburgh 76 virus – Edinburg 76 virusi*), brend nomlaridan (*Gibco cells – Gibco hujayralari*), mifologik nomlardan (*Chimera – Ximera, Hydra cells – Gidra hujayralari*) hosil

²³ Belopolsky A. A. Terms-eponyms in the composition of neurological terminologies. // Bulletin of SNO DONNU. Social sciences and humanities (Philology). - 2022. - P.202

²⁴ Ziyodullayev A.R. Thematic classification of eponyms // Scientific reports of Bukhara state university. 2022. – P.71.

²⁵ Ziyodullayev A. R. Ingliz va o‘zbek tilida eponimlarning lingvokognitiv hamda lingvokulturologik xususiyatlari: Filol. fan. bo‘yicha falsafa doktori (PhD) dissertatsiyasi avtoreferati. – Buxoro, 2024. – B.11.

bo'lad. Semantik jihatdan ular yetti asosiy guruhga ajratildi: DNK va RNK tuzilishiga oid birliklar (*Watson–Crick model – Uotson–Krik modeli, Okazaki fragment – Okazaki fragmenti*); hujayra va genetik muhandislik usullariga oid terminlar (*Gram staining – Gram bo'yash usuli, Southern blotting – Sauzern blottash*); genetikaning asosiy qonunlariga oid eponimlar (*Mendel's Laws – Mendel qonunlari, Hardy–Weinberg equilibrium – Hardi–Vaynberg muvozanati*); laboratoriya asboblari va jihozlarini bildiruvchi terminlar (*Petri dish – Petri kosasi, Pasteur pipette – Paster pipetkasi*); biotexnologiyaning etik tushunchalari (*Belmont Report – Belmont hisoboti*); o'lchov birliklari (*centiMorgan – sentimorgan, Roentgen – rentgen*); shuningdek, asosiy biotexnologik obyekt va jarayonlarni ifodalovchi eponimlar (*Barr body – Barr tanachasi, Langerhans cell – Langerhans hujayrasi*).

Biotexnologiya eponimlarining struktur xususiyatlari ularning sodda va ko'p komponentli shakllarda namoyon bo'lishi bilan tavsiflanadi. Tadqiqot natijalari ikki komponentli modelning ustunligini ko'rsatdi, ya'ni eponim terminlar ko'pincha Atoqli ot + Turdosh ot tuzilmasi asosida shakllanadi: masalan, *Petri dish – Petri kosasi, Mendel's Laws – Mendel qonunlari*. Eponimlarning yana bir muhim struktur ko'rinishi bir nechta olim nomi ishtirok etgan chiziqcha bilan bog'langan birliklardir. Bunday terminlar ilmiy kashfiyotlarning jamoaviy xarakterini aks ettiradi va biotexnologiya matnlarida keng qo'llanadi: *Watson–Crick model – Uotson–Krik modeli, Krebs–Kornberg cycle – Krebs–Kornberg sikli, Hardy–Weinberg equilibrium – Hardi–Vaynberg muvozanati*.

O'zbek tilida biotexnologiya eponimlari asosan asl shaklini saqlagan holda o'zlashadi, ayrimlari esa yarim kalka yoki izohlovchi birikma tarzida beriladi (*Gram bo'yash usuli, qo'sh spiral modeli*). Tahlilga tortilgan misollardan o'zbek tilidagi ko'plab terminlarda variantlilik mavjudligi aniqlandi (*Golji apparati / Golji kompleksi, pasterizatsiya / pasterlash, Valden inversiyasi / Valden almashinuvi, Inbriding koeffitsiyenti / qarindoshlik koeffitsiyenti*). Bu xilma-xillik, bir tomondan, terminlarning rus va ingliz tillari orqali turlicha kirib kelgani bilan, ikkinchi tomondan, o'zbek tilining milliyashtirish jarayonlari bilan bog'liq.

Biotexnologiyaga oid eponim terminlarining quyidagi o'ziga xos xususiyatlarini keltirib o'tish mumkin: eponimlar tarkibida atoqli ot bo'lgani sababli odatda bosh harf bilan yoziladi, biroq metonimizatsiya natijasida umumiy ilmiy termin sifatida kichik harfda qo'llanishi mumkin (*pasteurization – pasterizatsiya*); ular tilda tejamkorlikni ta'minlaydi; eponimlarning xalqaro xususiyati ularning turli tillarda deyarli bir xil shaklda qo'llanishiga imkon beradi; eponimlar motivatsion xarakterga ega bo'lib, ilmiy kashfiyotlar mualliflari nomi bilan bog'langan tarixiy-kognitiv ma'noni saqlaydi (*Mendel's Laws – Mendel qonunlari*).

Keltirib o'tilgan tahlillarimiz biotexnologiyada eponimlarning shakllanishi va qo'llanilishi murakkab, ko'p qirrali hamda interdisiplinar jarayon ekanini ko'rsatdi. Ushbu eponimlar turli sohalardan o'zlashib, biotexnologiyaning tarixiy rivoji, ilmiy maktablari va konseptual xususiyatlarini aks ettirgan. Ingliz va o'zbek tillari materiallari asosida aniqlangan ularning struktur, semantik va funksional jihatlari bu qatlamning terminologik tizimda mustahkam o'rin egallaganini tasdiqladi. O'zbek tilida uchraydigan variantlilik terminlar tizimi to'liq standartlashmaganini ko'rsatdi hamda yagona norma zarur degan xulosaga keldik. Eponimlar ilmiy muloqotda

aniqlikni, tejamkorlikni va motivatsiyalilikni ta'minlaydi, terminologiyaning xalqaro darajada uyg'un qo'llanilishiga xizmat qiladi va ular biotexnologiya terminologiyasida faqat nom beruvchi birlik sifatida emas, balki ilmiy tafakkur, tarixiy xotira va kognitiv jarayonlarni bog'lovchi muhim lingvistik qatlam sifatida alohida ahamiyat kasb etadi.

Dissertatsiyaning uchinchi bobi "**Ingliz va o'zbek tillarida biotexnologiyaga oid terminlarning kognitiv xususiyatlari**" deb nomlanib, uning ilk fasli "**Chog'ishtirilayotgan tillarda biotexnologiyaga oid terminlar o'zlashtirilishining kognitiv jihatlari**"ni tadqiq qilishga bag'ishlanadi.

Ma'lumki, boshqa tillardan so'z o'zlashtirish biotexnologiya kabi ilmiy sohalar terminologiyasi shakllanishining muhim manbalaridan hisoblanadi. O'zlashuv jarayoni oddiy leksema almashinuvidan iborat bo'lmay, balki donor va retsipiyent tillarning konseptual makonlari o'rtasidagi o'zaro ta'sir natijasida shakllanadigan murakkab kognitiv jarayon sifatida namoyon bo'ladi. Bu jarayonda fonetik va morfologik moslashuv bilan bir qatorda konseptual qayta talqin, semantik torayish yoki kengayish, shuningdek metaforik profilizatsiya kabi o'zgarishlarning yuzaga chiqishi kuzatiladi. Donor tildagi konsept retsipiyent til konseptosferasiga to'liq ko'chmaydi: uning ayrim belgilari markazlashadi, boshqalari esa periferiyaga suriladi. Masalan, ingliz tilidagi *fermentation* konsepti o'zbek tiliga *fermentatsiya* shaklida o'zlashar ekan, uning semantik tarkibida ma'no torayishi kuzatiladi: ingliz tilidagi "*kimyoviy parchalanish, gaz chiqishi, energiya ajralishi, qaynash*" kabi keng qamrovli xususiyatlar o'zbek tilida asosan "*fermentlar ta'siridagi achish/bijg'ish jarayoni*" bilan cheklanadi. Bu holat donor va retsipiyent tillar konseptual makonlari o'rtasidagi kognitiv moslashuvni ko'rsatadi.

O'zlashgan terminlar o'zbek biotexnologik nutqida yangi konseptual maydonlarni shakllantiradi. Masalan, "*gen*" va "*klon*" terminlari atrofida *genetika, gen muhandisligi, gen tahriri; klonlash, reproduktiv klonlash, terapevtik klonlash* kabi paradigmatic tizimlar vujudga kelgan. Bu terminlar bitta konseptual asos atrofida birlashib, tilning ilmiy-kasbiy konseptosferasini kengaytiradi.

Biotexnologiya terminologiyasida konseptual moslashuv terminlarning nafaqat semantik strukturasi, balki ularning tarkibidagi termin elementlarida ham namoyon bo'ladi. Masalan, "*bio-*" formanti konseptual marker sifatida yuzlab hosila birliklarning shakllanishiga asos bo'lib, *bioreaktor, biomahsulot, bioinformatika, biomarker* kabi paradigmatic tizimni yaratadi. Bunday birliklar yagona "*bio-*" konsepti atrofida semantik jihatdan birlashib, biotexnologik konseptosferaning shakllanishiga xizmat qiladi.

O'zlashuvning shakllanish mexanizmlarida moddiy o'zlashma (*gen, klon, biosensor*) va kalkalash (*cell culture* → *hujayra madaniyati; stem cell* → *ildiz hujayra*) asosiy turlar sifatida faol namoyon bo'ladi. Murakkab birikmalarda semantik kalkalash ham kuzatiladi (*vector* → *genetik tashuvchi, platforma* → *ma'lumotlar muhiti*). Ba'zan aralash, ya'ni gibrid shakllar ham yuzaga keladi: *bioyoqilg'i, biotibbiyot* kabi terminlarda xalqaro va milliy unsurlar birlashadi.

O'zbek biotexnologik terminologiyasida manbaviy jihatdan lotin va yunon qatlamlari yetakchi o'rin egallaydi (*virus, ferment, gen, gormon*), ingliz tili esa zamonaviy terminlarning asosiy donor tiliga aylangan bo'lib, ko'p hollarda rus tili

vositachiligida o'zlashuv jarayoni kechadi (*protein, intron, klon*). Shuningdek, fransuz (*kodon, jelatin*), nemis (*shtamm, kraxmal*), arab (*hujayra, nasl*), malay (*agar-agar*) kabi boshqa tillardan ham o'zlashmalar kuzatildi. Ularning turli lisoniy qatlamlar orqali o'zbek tiliga kirib kelishi milliy terminologiyada ko'p qatlamli, xalqaro darajada tushunarli ilmiy makon shakllanishiga imkon yaratadi.

Mazkur bobning navbatdagi ***“Ingliz va o'zbek tillarida biotexnologiya terminlarining kognitiv-kategoriyaviy tasnifi va freym modeli”*** deb nomlangan faslida biotexnologiyaga oid terminlarning konseptual kategoriyalari aniqlanib, freym modeli asosida tizimlashtirilgan.

Ma'lumki, “kategoriya” tushunchasi o'ta keng ma'noda talqin qilinadi va unda voqelik predmet-hodisalarning eng umumiy va muhim sifatlari, xususiyatlari, aloqalari va munosabatlari o'z aksini topadi²⁶. Terminologiyada kategoriyalash mental kategoriyalar bilan uzviy bog'liq bo'lib, u ilmiy bilishning natijasi ham, uni shakllantirish vositasi ham sanaladi. Kategoriyalar voqelik hodisalarining umumlashtirilgan modeli, kategoriyalash esa bu umumlashtirishni aks ettiruvchi konseptual-lingvistik jarayon sifatida qaraladi.

Biotexnologiyaga oid terminlarni kategoriyalash jarayoni tadqiqotimizda E.Roschning prototip nazariyasiga²⁷ tayangan holda izohlandi. Mazkur nazariya doirasida kategoriya qat'iy chegaralangan struktura emas, balki markazida eng tipik a'zolar (prototiplar), periferiyasida esa kamroq tipik vakillar joylashgan tizim sifatida talqin qilinadi. Prototiplar kategoriyaning kognitiv markazini tashkil etib, boshqa terminlar ular bilan semantik va funksional umumiylik asosida bog'lanadi. Masalan, *“biologik obyektlar”* kategoriyasining *markazida cell (hujayra), gene (gen), protein (oqsil)* kabi bazaviy terminlar prototip sifatida namoyon bo'ladi.

Tadqiqot davomida biotexnologiyaga oid 1200 ga yaqin termin tahlil qilinib, ular 11 ta konseptual kategoriya – *biologik obyektlar, moddalar, jarayonlar, xususiyatlar, makon, texnologiya, apparatura, qiymatlar va o'lchov birliklari, mahsulotlar, fan va sanoat tarmoqlari hamda ijrochilar* – bo'yicha tizimlashtirildi.

Tahlil natijalariga ko'ra terminologik maydonning asosiy qismini *“biologik obyektlar”* kategoriyasi ingliz tilida 25,2%, o'zbek tilida 24%ni egallaydi. Shuningdek, terminlarning sezilarli qismi *“moddalar”* (12,2 % / 16 %) va *“jarayonlar”* (12,1 % / 14 %) kategoriyalariga to'g'ri keladi. *“Mahsulotlar”* (10,2 % / 9,5 %) kategoriyasi ham har ikki tilda biotexnologik leksikaning muhim qismini tashkil etadi.

Biotexnologiya terminologiyasining kognitiv asoslarini aniqlash maqsadida freym modellashtirish yondashuvini qo'llab tadqiqotlar olib bordik va olingan natijalar asosida *“Biotexnologiya”* freymi ishlab chiqildi. Ushbu model terminlarning mazmuniy tuzilishini ochish, ular o'rtasidagi semantik-iyerarxik munosabatlarni tartibga solish imkonini berdi. Freym tarkibida to'rt asosiy subfreym ajratildi: *“Research Area/Tadqiqot sohasi”*, *“Subjects/Subyektlar”*, *“Processes and Methods/Jarayon va metodlar”* hamda *“Objects/Obyektlar”*. Har bir subfreym

²⁶ Сафаров Ш. Когнитив тилшунослик. - Жиззах: Сангзор нашриёти, 2006. -Б.14

²⁷ Rosch, E. Principles of Categorization // Cognition and Categorization / Eds. E. Rosch, B. Lloyd. – Hillsdale: Lawrence Erlbaum, 1978. – P. 27–48.

tegishli terminlar guruhini birlashtirib, biotexnologiya konseptosferasining alohida semantik qatlamlarini aks ettiradi. “*Research Area*” biotexnologiyaning ilmiy-amaliy yo‘nalishlarini, “*Subjects*” soha subyektlari – mutaxassis va tashkilotlarni, “*Processes and Methods*” biologik hamda texnologik jarayonlarni, “*Objects*” esa boshlang‘ich obyektlar va natijaviy mahsulotlarni ifodalovchi terminlarni qamrab olishi aniqlandi.

Ingliz va o‘zbek tillarida biotexnologiya terminlari freymi to‘rt asosiy subfreym asosida chog‘ishtirildi. Mazkur subfreymning konseptual tuzilishi har ikki tilda umumiy bo‘lsa-da, morfologik ifodasi, yasaliş modellari va struktur shaklida sezilarli farqlar mavjud. Ingliz tili analitik tuzilishga ega bo‘lib, affikslar yordaamida yasalgan va qisqartmalarga boy terminlar ustunlik qilsa, o‘zbek tilida esa o‘zlashmalar va atributiv birikmalar faol qo‘llaniladi. Har ikki til terminologiyasida biologik obyektlar markaziy konsept sifatida namoyon bo‘ladi, jarayon va metod terminlari esa ilmiy-amaliy faoliyatning kognitiv modellari sifatida shakllangan. Yuqorida berilgan kategoriyalar biotexnologiya terminologiyasida terminlarni tizimlashtirish, ularning sohaga mansubligini aniqlash, mazmunini izohlash va obyekt–jarayon munosabatlarini belgilashga xizmat qiladi. Freymli modellashtirish esa ushbu kategoriyalarni yagona konseptual tizimga birlashtirib, terminlar o‘rtasidagi ierarxik va semantik bog‘lanishlarni aniq ko‘rsatib beradi.

Bobning uchinchi fasli “*Metaforizatsiya biotexnologiyaga oid terminlar shakllanishining kognitiv mexanizmi sifatida*” deb nomlanib, unda biotexnologiya terminlarining shakllanishida metaforizatsiyaning o‘rni, konseptual metafora nazariyasi, hamda metaforaning nafaqat nominativ vosita, balki ilmiy bilishning muhim kognitiv mexanizmi ekanligi yoritilgan.

Metaforizatsiya biotexnologiya terminologiyasida murakkab biologik va molekulyar jarayonlarni inson tajribasiga yaqin konseptual modellar orqali anglash va nomlash imkonini beruvchi muhim kognitiv mexanizm hisoblanadi. U yangi ilmiy tushunchalarni mavjud leksik birliklar asosida ma‘no ko‘chishi yo‘li bilan ifodalab, abstrakt hodisalarni vizuallashtirish, tizimlashtirish hamda ilmiy muomalaga kiritishni ta‘minlaydi. Mazkur jarayonning ichki mexanizmi E. A. Lapina²⁸ tomonidan bosqichma-bosqich kechadigan kognitiv faoliyat sifatida izohlangan. Unga ko‘ra, dastlab nominatsiya qilinayotgan obyekt yoki hodisaning eng muhim belgisi ajratib olinadi va mazkur belgi bilan semantik jihatdan yaqin bo‘lgan umumtil birligi tanlanadi. Keyingi bosqichda tanlangan birlikning ma‘nosi obyekt mohiyatiga muvofiq ravishda qayta talqin qilinib, semantik jihatdan mustahkamlanadi.

Mazkur tadqiqot doirasida ma‘lum manba sohaga oid leksemaning metaforik qayta talqini natijasida biotexnologik terminologik tizimga integratsiyalashgan metaforik birliklar tahlilga tortildi. Biotexnologiya terminlari shakllanishida metaforizatsiya markaziy kognitiv mexanizm ekanini ko‘rsatdi, bunda ma‘no manba sohadan → maqsad sohaga ko‘chadi. Biotexnologiya sohasi terminlari tarkibidagi metaforik birliklar asosan quyidagi to‘rtta manba sohasiga mansubligi aniqlandi: **Inson dunyosi** (*mother plant – ona o‘simlik, daughter cells – qiz hujayralari,*

²⁸ Лапина Е.А. Метафоризация как способ терминообразования в микроэлектронике: автореф. дис. ... канд. филол. наук. – Москва, 1986. – С.9.

multigene family – multigen oilasi, *competent cell* –kompetent hujayra, *DNA fingerprint* – DNK barmoq izi, *reporter gene* – reportyor gen, *messenger RNA* – xabarchi RNK); **Texnika va predmetlar dunyosi** (*gene shears*–gen qaychi, *replication fork*–replikatsiya vilkasi, *sieve cell*–elak hujayrasi, *cell wall*–hujayra devori, *gene bank*–gen banki); **Tabiat hodisalari va jismlari dunyosi** (*gene flow* – gen oqimi, *genetic drift* – genetik drift (*siljish*), *phylogenetic tree* – filogenetik daraxt, *genomic island* – genom oroli, *epidemic wave* – epidemik to‘lqin) va **Harbiy soha** (*killer cell*–qotil hujayra, *gene gun*–gen quroli, *target cell*–nishon-hujayra, *microprojectile bombardment* –mikro-snaryadlar bilan ombardimon qilish, *antibiotic attack*–antibiotik hujumi).

Biotexnologiya tarmoqlarini konseptual farqlashda rang nomlariga asoslangan metaforik tizim faol qo‘llanadi. P.Kafarski taklif etgan rang modeli²⁹ bo‘yicha: *White biotechnology* (*Oq biotexnologiya*) – sanoat jarayonlari, *Red biotechnology* (*Qizil biotexnologiya*) – tibbiy jarayonlarda qo‘llaniladigan biotexnologiya, *Green biotechnology* (*Yashil biotexnologiya*) – qishloq xo‘jaligi jarayonlarida qo‘llaniladigan biotexnologiya, *Blue biotechnology* (*Moviy biotexnologiya*) – suv va okean) – dengiz ekotizimlari va *Yellow biotechnology* (*Sariq biotexnologiya*) –ozuq-ovqat biotexnologiyasiga ajratiladi. Rang metaforalari biotexnologiyaning ko‘p tarmoqliligini ifodalovchi va tizimlashtiruvchi konseptual marker sifatida xizmat qiladi.

Ushbu tadqiqot doirasida aniqlangan biotexnologiya terminologiyasida keng qo‘llanadigan konseptual metaforalar tahlili shuni ko‘rsatdiki, sohada ilmiy tushunchalar ko‘pincha inson tajribasiga yaqin manba sohalar orqali konseptuallashtiriladi. Eng faol modellardan biri CELL IS A HUMAN/HUJAYRA – INSON metaforasidir. Ushbu modelda hujayra inson kabi idrok etuvchi va harakat qiluvchi subyekt sifatida talqin qilinadi: *cell suicide*, *cell communication*, *cell defense*, *killer cells* kabi terminlar aynan shu antropomorf xaritalashning namunasidir. Ingliz tilidagi *sniffing other cells*, *shaking hands*, *stressed-out cell* kabi birliklar hujayraga ijtimoiy va hissiy fazilat yuklaydi; o‘zbek ilmiy nutqida esa jarayonlar ko‘proq neytral: *o‘zaro aloqa qiladi*, *signal qabul qiladi*, *rivojlanish yo‘nalishini belgilaydi*.Ikkinchi keng tarqalgan model – CELL IS A FACTORY/HUJAYRA – ZAVOD – metaforasidir. Ingliz tilidagi *chemical factory*, *cellular machinery*, *producing biological products*, *repairing damage* kabi birliklar hujayrani murakkab texnologik tizim sifatida ko‘rsatadi. O‘zbek tilida ham “oqsil sintezi”, “energiya ishlab chiqarish” kabi ifodalar mavjud bo‘lsa-da, texnologik metaforizatsiya darajasi ancha cheklangan.

Gen termini bilan bog‘liq metaforalar orasida GENES ARE INFORMATION / GENLAR – AXBOROT hamda GENES ARE PROGRAMS / SOFTWARE / GENLAR–DASTUR modellari ajralib turadi. Ingliz tilidagi *misspelling in genes*, *detect and fix mutation*, *encoded information* kabi birliklar genlarni matn yoki kod sifatida talqin qiladi. O‘zbek tilida esa ushbu model “*genni o‘chirish*”, “*gen kiritish*” kabi neytral texnik birliklar orqali ifodalanib, metaforaning emotsional komponenti

²⁹ Kafarski P. Rainbow code of biotechnology. - Chemik 2012. -P. 6.

nisbatan sustligi kuzatildi.

DNK ning konseptuallashuviga doir DNA IS A TEXT / DNK – MATN metaforasi *genetic alphabet, spelling mistakes, write/read DNA* kabi terminlarda yaqqol namoyon bo‘ladi. O‘zbek tilida bu jarayon asosan texnik tusda: *DNKni tahrirlash, gen kiritish, genni o‘chirish*. Shuningdek, DNA IS A DATABASE / DNK –MA’LUMOTLAR BAZASI modeli ingliz tilida *robust storage medium, long-term data retention* kabi birliklar orqali, o‘zbek tilida esa *DNK nasliy informatsiya xazinasi* kabi iboralar orqali ifodalanadi.

PATHOGENS ARE ENEMIES/ATTACKERS / PATOGENLAR – DUSHMANLAR/BOSQINCHILAR modeli biotexnologiya diskursining markaziy metaforalaridan biridir. Ingliz tilida *invading pathogen, pathogen attack, hijacks the cellular processes, immune surveillance* kabi birliklar patogenlarni *dushman, bosqinchi* sifatida talqin qiladi. O‘zbek tilida ham: *virus hujum qilganda, kurash, ayyor viruslar, himoyalanih* kabi birliklar harbiy xaritalashni saqlagan holda, tasviriy ifoda bilan namoyon bo‘ladi.

Ingliz va o‘zbek tillarining chog‘ishtirma tahlili shuni ko‘rsatadiki, ingliz tilida metaforalar ilmiy nutqning standartlashgan komponenti sifatida faol qo‘llanadi, o‘zbek tilida esa ular ko‘proq kontekstual, tasviriy va funksional shakllarda namoyon bo‘ladi. Har ikki tildagi metaforik birliklarning voqelanish darajasi farq qilsa-da, metaforaning asosiy vazifasi saqlanib qoladi.

XULOSA

1. Terminologiya zamonaviy tilshunoslikning fanlararo yoʻnalishi boʻlib, maxsus sohalardagi ilmiy tushunchalarni ifodalovchi terminlar tizimini, ularning shakllanishi, tizimlashuvi hamda umumisteʼmol leksikasi bilan munosabatini oʻrganadi va ilmiy muloqotning aniqligi hamda standartligini taʼminlaydi. Shu nuqtayi nazardan, kognitiv yondashuv terminlarni konseptualizatsiya, kategoriyalash, freym modellashtirish va metaforizatsiya jarayonlarida shakllanadigan kognitiv birlik sifatida talqin qilib, ingliz va oʻzbek tillaridagi biotexnologiya terminlarining mazmuni hamda tarjimasini tahlil qilish uchun mustahkam nazariy asos boʻlib xizmat qiladi.

2. Biotexnologiya terminologiyasining shakllanishi ekstralingvistik (fanlararo integratsiya, yangi texnologiyalar va ilmiy kashfiyotlar) hamda lingvistik omillar (kalkalash, oʻzlashma terminlar, abbreviatsiya, derivatsiya va tarjima) taʼsirida kechadigan dinamik jarayon boʻlib, sohaning geterogen terminologik tizimini shakllantiruvchi asosiy manba hisoblanadi. Ushbu jarayon qadimgi, klassik va zamonaviy biotexnologiya davrlarida rivojlanib, biologiya, genetika, mikrobiologiya, tibbiyot, kimyo, muhandislik va axborot texnologiyalari kabi fanlar kesishmasida koʻp manbali va murakkab tizim sifatida namoyon boʻladi.

3. Ingliz va oʻzbek tillarida biotexnologiya terminlarining tuzilishida tub, affiksial va kompozit modellar qoʻllansa-da, eng ustun qatlamni aynan koʻp komponentli atamalar tashkil etadi, ilmiy mazmunning murakkabligi sabab sintaktik shakldagi birliklar va ularning qisqartma variantlari ikki tilda ham keng qoʻllaniladi. Ingliz tilida blending va konversiya kabi soʻz yasash usullari faol boʻlsa, oʻzbek tilida bunday modellar deyarli uchramaydi, yangi terminlar asosan sintaktik birliklar, kalkalash va oʻzlashma orqali shakllanadi.

4. Biotexnologiya terminlarining sinonimiya, antonimiya, polisemiya hamda giper-giponimik munosabatlar asosida shakllanishi terminologik tizimning paradigmatic yaxlitligini taʼminlaydi.

5. Ingliz tili biotexnologiya terminologiyasida eponimlar barqaror va meʼyorlashgan tizim sifatida shakllangan boʻlib, ularning yasashida affiksatsiya, semantik kengayish va konversiya kabi modellar faol qoʻllaniladi. Oʻzbek tilida esa eponimlar asosan oʻzlashma shaklida va baʼzan variantlilikni namoyon etadi, yangi eponim birliklar esa odatda kalkalash yoki moslashtirish orqali shakllanadi. Eponimlar kelib chiqish manbalariga koʻra antroponimlar, toponimlar, brend yoki kompaniya nomlari hamda mifologik nomlarga asoslangan guruhlarga boʻlinadi.

6. Ingliz tilidan oʻzbek tiliga biotexnologiya terminlarining oʻzlashuvi fonetik-morfologik moslashuv, konseptual talqin va semantik integratsiyani oʻz ichiga olgan murakkab kognitiv jarayon boʻlib oʻzbek ilmiy nutqida yangi terminologik paradigmalarining shakllanishiga xizmat qiladi.

7. Biotexnologiya terminlari prototip nazariyasi asosida 11 ta konseptual kategoriya (*makon, moddalar, biologik obyektlar, xususiyatlar, jarayonlar, qiymatlar va oʻlchov birliklari, texnologiya, jihoz, mahsulotlar, fan va sanoat tarmoqlari hamda ijrochilar*)ga ajratildi: bunda tizim markazida “*biologik obyektlar*”

kategoriasi asosiy o‘rinni egallab, “*jarayonlar*”, “*texnologiyalar*”, “*xususiyatlar*”, “*moddalar va mahsulotlar*” kabi kategoriyalar periferiyada joylashadi.

8. Freym–subfreym–slot tamoyiliga asoslanib “*Biotexnologiya*” freymi ishlab chiqildi va u tadqiqot sohasi, subyektlar, jarayonlar, metodlar hamda obyektlarning o‘zaro bog‘langan konseptual tuzilmasini aks ettiradi. Ushbu model biotexnologik terminlarning ichki tizimi, ularning ilmiy va funksional munosabatlari bir butun konseptual makonda qanday tartiblanishini ko‘rsatuvchi universal kognitiv tuzilma sifatida baholandi.

9. Biotexnologiya terminologiyasida metaforizatsiya murakkab ilmiy tushunchalarni inson ongiga tanish konseptlar orqali tushuntirishga xizmat qiladi. Metaforik birliklar asosan *inson dunyosi, texnika va predmetlar, tabiat hodisalari va jismlari* hamda *harbiy konseptlar* kabi to‘rtta manba soha asosida shakllanib, biotexnologik terminlarning motivatsiyasi, semantik aniqligi va konseptual tuzilishini belgilaydi.

10. Ingliz va o‘zbek tillarining biotexnologik diskursida metaforalar umumiy konseptual modellar asosida shakllansa-da, ularning lisoniy voqelanish darajasi farq qiladi: ingliz tilida ular terminologiyaning barqaror va me‘yorlashgan elementi sifatida qo‘llansa, o‘zbek tilida ko‘proq kontekstga bog‘liq va funksional shaklda namoyon bo‘ladi. Shunga qaramay, har ikki tilda ham metaforizatsiya biotexnologik bilimlarni konseptuallashtirish va ilmiy tushunchalar o‘rtasidagi bog‘lanishlarni yoritishda muhim vosita bo‘lib xizmat qiladi.

**SCIENTIFIC COUNCIL AWARDING SCIENTIFIC DEGREES
PhD.03/2025.27.12.Fil.06.05 AT URGENCH STATE UNIVERSITY
NAMED AFTER ABU RAYHAN BIRUNI**

**NATIONAL UNIVERSITY OF UZBEKISTAN NAMED AFTER MIRZO
ULUGBEK**

ADAMBAEVA FERUZA RUSTAMBEKOVNA

**STRUCTURAL-SEMANTIC AND COGNITIVE PROPERTIES OF
BIOTECHNOLOGY TERMS IN THE ENGLISH AND UZBEK LANGUAGES**

10.00.06 – Comparative Literature, Contrastive Linguistics and Translation Studies

**DISSERTATION ABSTRACT
of the doctor of philosophy (PhD) in philological sciences**

Urgench – 2026

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INTRODUCTION (abstract of PhD thesis)

The relevance and necessity of the dissertation topic. In world linguistics, on the basis of comparative studies, increasing attention is being paid to the study of the issues of describing biotechnology terms based on scientific criteria, defining thematic boundaries, systematization, and clarifying the norms of application. In particular, in studying the linguistic nature of biotechnology terms, along with the principles of traditional terminology, it is important to reveal the mechanisms of meaning formation based on a cognitive-semantic approach, and to identify linguistic and extralinguistic factors influencing the formation of terms.

In world linguistics, the comparative-typological analysis of biotechnology-related terms allows for identifying scientific-technological and social factors influencing their formation, as well as similarities and differences among terms in different languages. In particular, studying the scientific and theoretical foundations, structural-semantic and cognitive properties of terms related to the field of biotechnology from a comparative-typological perspective, identifying the factors determining their occurrence, revealing the meaning and essence of complex, explanatory terms, and developing principles for their translation are among the promising areas of current terminological research.

In the context of globalization processes in our country, the importance of issues such as the study of biotechnology terminology, the formation of a clear and consistent interpretation of scientific concepts, the creation of a standardized terminology system, and the enrichment of the national terminology fund from the point of view of ensuring the integration of science, education, and production determines the need for research in this area. Regulating newly introduced terms entering from foreign languages, recommending alternative equivalents for practical use, adapting them on the basis of the internal resources of the Uzbek language, and developing methodologies for professional translation "...from the state language into foreign languages and from foreign languages into the state language"³⁰ constitute one of the priority tasks currently facing linguistics and translation studies. In this regard, the study of biotechnology-related terminology in English and Uzbek within the framework of comparative linguistics is of significant practical importance.

This research contributes, to a certain extent, to the implementation of the tasks outlined in the Decrees of the President of the Republic of Uzbekistan: No. PD-5847 of October 8, 2019 "On Approval of the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030", No. PD-60 of January 28, 2022 "On the Development Strategy of the New Uzbekistan for 2022-2026", Resolution No. PR-4899 of November 25, 2020 "On Comprehensive Measures for the Development of Biotechnology and the Improvement of the System for Ensuring the Country's Biological Security", Resolution No. PR-5117 of May 19, 2021 "On Measures to bring the promotion of Foreign Language Learning in the Republic of

³⁰ Ўзбекистон Республикаси Президенти Шавкат Мирзиёевнинг 2021 йил 19 майдаги "Ўзбекистон Республикасида хорижий тилларни ўрганишни оммалаштириш фаолиятини сифат жиҳатидан янги bosқичга олиб чиқиш чора-тадбирлари тўғрисида"ги ПҚ-5117-сон Қарори // <https://lex.uz/docs/5426736>

Uzbekistan to a Qualitatively New Level” as well as other regulatory legal documents related to this sphere of activity.

Compliance of the research with the priorities of the republic’s science and technology development. This research has been carried out in accordance with Priority Area I of the national priorities for the development of science and technology of the Republic, namely: “Formation and implementation of a system of innovative ideas for the social, legal, economic, cultural, spiritual, and educational development of an information-oriented society and a democratic state”.

The level of study of the problem. In world linguistics, a number of studies have been conducted on the formation and structural-semantic features of terms. In particular, the theoretical foundations of terminology, the processes of term formation, their structural characteristics, issues of standardization and normalization, as well as principles of translation have been thoroughly examined from a scientific and theoretical perspective by such scholars as E. Wüster, H. Felber, J. C. Sager, P. Sandrini, S. E. Wright, G. Budin, M. T. Cabré, S. I. Landau, M. C. Baker, M. Fernández-Parra, D. S. Lotte, G. O. Vinokur, A. A. Reformatskiy, L. S. Barkhudarov, S. V. Grinev-Grinevich, and V. M. Leichik³¹.

In Uzbek linguistics, the scholarly works of A. Hojiev, H. Dadaboyev, S. Usmonov, R. Doniyorov, N. Qosimov, E. Begmatov, A. P. Madvaliyev, G. M. Ismailov, X. D. Paluanova, X. A. Sarimsakov³² and others have made a significant contribution to the development of the national terminological system.

The global standardization of biotechnology-related terminology is reflected in the “Glossary of Biotechnology and Genetic Engineering”³³ compiled by the Food

³¹ Wüster E. Internationale Sprachnormung in der Technik, besonders in der Elektrotechnik. – Bonn: Bouvier, 1970. – 507 p.; Felber H. Terminology Manual. – Paris: Unesco and Infoterm, 1984. – 426 p.; Sager J.C. Language engineering and translation: Consequences of automation. – Amsterdam, Philadelphia: John Benjamins Publishing Company, 1994. – 345 p.; Sandrini P. Terminologiarbeit im Recht: Deskriptiver, begriffsorientierter Ansatz vom Standpunkt des Übersetzers. – Wien: Termnet, 1996. – 291 p.; Wright S.E., Budin G. Handbook of Terminology Management. – Amsterdam, Philadelphia: John Benjamins Publishing, 1997. – 370 p.; Cabré M.T. Terminology: Theory, Methods and Applications. – Amsterdam: John Benjamins Publishing Company, 1999. – 260 p.; Landau S.I. Dictionaries: The Art and Craft of Lexicography. – Cambridge: Cambridge University Press, 2001. – 496 p.; Baker M.C. Case: Its Principles and Its Parameters. – Cambridge: 2015. – 336 p.; Fernández-Parra M. Terminology Management for Translators. – London: Routledge, Cambridge University Press, 2025. – 316 p.; Лотте Д. С. Основы построения научно-технической терминологии – Москва: 1961. – 158 с.; Vinokur G.O. The Russian Language: A Brief History. – Cambridge University Press, 2010. – 160 p.; 74. Реформатский А.А. Введение в языкознание: учебник для вузов. – Москва: Аспект-Пресс, 2001. – 536 с.; Бархударов Л.С. Язык и перевод. Вопросы общей и частной теории перевода. – Москва: 1975. – 238 с.; Гринев-Гринеvич С.В. Терминоведение. – Москва: Академия, 2008. – 304 с.; Лейчик В.М. Терминоведение: предмет, методы, структура. – Москва: 2009. – 256 с.;

³² Хожиев А. Термин танлаш мезонлари. – Тошкент: Фан, 1996. – 128 б.; Dadaboyev H. O‘zbek terminologiyasi. – Toshkent, 2019. – 117 b.; Усмонов С. Ўзбек терминологиясининг баъзи масалалари. – Тошкент, 1968. – 118 б.; Дониёров Р. Ўзбек тили техник терминологиясининг айрим масалалари. – Тошкент: Фан, 1977. – 162 б.; Қосимов Н. Ўзбек тили илмий техникавий терминологияси масалалари. – Тошкент, 1985. – 124 б.; Бегматов Э. Ҳозирги ўзбек адабий тилининг лексик қатламлари. – Тошкент: Фан, 1985 – 201 б.; Мадвалиев А.П. Ўзбек тили изоҳли луғатларида сўзларга этимологик маълумот бериш масаласи // Ўзбек тили ва адабиёти. – Тошкент, 2009. – №3. – Б. 35-43; Исмаилов Ғ.М. Ўзбек тили терминологик тизимларида семантик усулда термин ҳосил бўлиши. ф.ф.н. дисс. автореф. – Тошкент, 2011. – 26 б.; Paluanova X. Ingliz, o‘zbek, rus va qoraqalpoq tillarida ekologik terminlarning derivatsion-semantik prinsiplari. f.f.d. diss... – Toshkent, 2016. – 230 b.; Sarimsokov X.A. Ingliz va o‘zbek tillaridagi sport sharhlari leksikasining lingvistik xususiyatlari. Avtoref. filol. fan. dok. diss... – Toshkent, 2024. – 61 b.

³³ Zaid A., Hughes H., Porceddu E., Nicolas F. Glossary of biotechnology and genetic engineering. – Rome: Food and Agriculture Organization of the United Nations, 1999. – 250p.

and Agriculture Organization of the United Nations (FAO), in which the scientific definitions of terms and their scope of application are clearly specified. Based on research conducted on a genetics corpus, G. Plappert³⁴ has explained the use of biotechnological units in scientific texts, their phraseological combinability, and their contextual adaptation.

Among the studies devoted to the structural-semantic features of biotechnology terminology, the works of T. A. Kudinova³⁵ occupy a particular place. In her research, the structural models of multi-component biotechnological terms in English and Russian are identified, and their semantic structure, inter-component relations, as well as morphological and derivational features are comprehensively analyzed. The research works of S.L. Vasilyeva, Z. Gainutdinova, A. Mukhtarova, A. Sirotin, E. Myshak, L. Ritikova, and L. Rogach³⁶ are devoted to the elucidation of the use of Greek–Latin affixes in the formation of biotechnology terminology, the structural models of terms, and the principles of their translation. O. S. Voyevodina³⁷ in turn, has proposed practical approaches to the systematization and teaching of biotechnology-related terminology in English.

In contrast to the traditional structural approach in linguistics, the anthropocentric paradigm interprets language as a dynamic system closely connected with human cognition and perception. Cognitive linguistics, in turn, studies the conceptual foundations of linguistic units, the processes of meaning formation, and the representation of knowledge through mental models. The principal methodology of this approach is presented in “The Cambridge Handbook of Cognitive Linguistics”³⁸, where such concepts as conceptualization, metaphor, frame, blending, and cognitive grammar are interpreted within a unified cognitive methodological framework. These theoretical principles of cognitive linguistics are also actively applied in the study of specialized lexical layers, including terminology. R. Temmerman³⁹ interprets terminology as a socio-cognitive process, emphasizing the integrated application of semasiological and onomasiological approaches, as well as

³⁴ Plappert G.L. *Phraseology and Epistemology in Scientific Writing: A Corpus-Driven Approach*: PhD thesis. University of Birmingham. – Birmingham: 2012. – 298 p.

³⁵ Кудинова Т. А. Структурно-семантические особенности многокомпонентных терминов в подязыке биотехнологий (на материале русского и английского языков): автореф. дисс. ... к.ф.н. – Орел, 2006. – 24 с.

³⁶ Васильева С. Л. Морфологические особенности однокомпонентных терминов сферы биотехнологий в русском и английском языках // *Филологические науки. Вопросы теории и практики*. – Тамбов: Грамота, 2015. – С. 50–52.; Gainutdinova A.Z., Mukhtarova A.D. Structural and semantic features of multicomponent terms in the field of biotechnology // *Eurasian Journal of Biosciences*. – 2019. Vol.13, Is.2.–P.1463-1466.; Syrotin A. Multi-component English terms of biotechnology sphere // *Cogito. Multidisciplinary Research Journal*. – 2017. Vol. 9, P.78–86.; Sirotin A. С. Типы структурных моделей англоязычных терминов-словосочетаний сферы биотехнологии // *Studia Humanitatis*. – 2020. – № 3. – С. 15.; Myshak, E. Morphological peculiarities of English one-component terms of biotechnologies // *Cogito*. – 2017. – № 3. – P. 64–71.; Rytikova L. Features of the formation of biotechnological terminology in English // *Agrarian Science and Education*. – 2008. № 3–4. – P. 122–126.; Rogach L. Semantic phenomena characterizing English terminology of biotechnology // *Modern Studies in Foreign Philology*. – 2019. Vol. 17. – P. 112–120.

³⁷ Воеводина О. С. Методика обучения иноязычной терминологии студентов вуза по направлению подготовки «Биотехнология»: автореф. дис. ... канд. пед. наук. – Нижний Новгород: НГЛУ, 2013. – 24 с.

³⁸ Dancygier B. *The Cambridge Handbook of Cognitive Linguistics* Cambridge: Cambridge University Press, 2017. – 840 p. DOI: 10.1017/9781316339732.

³⁹ Temmerman R. *Towards New Ways of Terminology Description: The Sociocognitive Approach*. – Amsterdam: J. Benjamins Publishing Company, 2000. –P. 97.

highlighting the functional role of phenomena such as synonymy and polysemy within the system of scientific language. M. Teresa Cabré⁴⁰ interprets terminology as a complex system associated with linguistic, cognitive, and social factors. E. I. Golovanova⁴¹ analyzes terms as linguistic expressions of mental models that encode conceptual knowledge, while Pamela Faber⁴² demonstrates the significance of cognitive modelling based on frames, metaphors, and conceptual structures in languages for special purposes.

It should be particularly emphasized that no comprehensive studies have been conducted in Uzbek devoted specifically to the investigation of biotechnology terminology. Moreover, a comparative analysis of the structural-semantic and cognitive properties of biotechnological terms in English and Uzbek has not yet been undertaken. The present research is therefore aimed at filling this gap.

The connection of the dissertation topic with the scientific research work of the higher education institution where the dissertation was carried out. The work was carried out within the framework of the research plan of the Department of “Comparative Linguistics” at the National University of Uzbekistan named after Mirzo Ulugbek, on the topic “Typological and Comparative Characteristics of Languages of Different Systems”.

The aim of the research is to reveal the structural-semantic and cognitive properties of biotechnology-related terms in English and Uzbek.

The tasks of the research are:

to analyze the linguistic and extralinguistic factors influencing the formation of biotechnology-related terminology and to provide a scientific description of the heterogeneity of terms based on international and national sources;

to conduct a comparative analysis of the structural features of field-specific terms in English and Uzbek and to identify the lexical-semantic relationships between them;

to classify the structural models of term formation and examine the formation and use of eponymic units;

to categorize biotechnology-related terms in the compared languages on a cognitive basis and to identify the metaphorical models involved in their formation;

to describe the hierarchical and conceptual relationships among biotechnology-related terms in English and Uzbek on the basis of the frame model;

to identify the structural components of biotechnology-related terms in English and Uzbek, classify them into types, and develop a statistical analysis revealing the systemic properties of the terminology.

The object of the research is the corpus of terms used in terminological dictionaries in English and Uzbek, scientific and instructional-methodological texts, regulatory legal documents related to the field of biotechnology, as well as Internet sources.

⁴⁰ Cabré M.T. Terminology: Theory, Methods and Applications. – Amsterdam: John Benjamins Publishing Company, 1999. – 260 p.

⁴¹ Голованова Е.И. Введение в когнитивное терминоведение. 4-е изд., стер. – Москва: Наука, 2024. – 224 с.

⁴² Faber P. A Cognitive Linguistics View of Terminology and Specialized Language. – Berlin, Boston: De Gruyter Mouton, 2012. – P.3-29

The subject of the research is the structural-semantic and cognitive properties of terms related to the field of biotechnology.

Research methods. In elucidating the research topic, the following methods were employed: structural and comparative analysis of terms, thematic classification, statistical analysis, frame analysis, conceptual mapping and metaphorical modeling, as well as diachronic and synchronic methods of analysis.

The scientific novelty of the research is as follows:

English and Uzbek biotechnology terminology system has been identified as a heterogeneous system, formed at the intersection of disciplines such as biology, genetics, microbiology, medicine, chemistry, engineering, and information technologies, based on international, borrowed, and calqued units. The historical-etymological aspects of lexical units, the semantic and cognitive adaptation of international terms to the recipient language system during the borrowing process, and their stabilization have been theoretically and practically revealed in a comparative-contrastive aspect;

it was identified based on structural and statistical analysis that in the languages being compared, biotechnology terms are formed through morphological (affixation, conversion), morphological-syntactic (composition, blending, abbreviation), syntactic, semantic and lexical-semantic methods, express complex scientific concepts, and use eponymous units in their structure. Therefore, the morphological-syntactic model prevails in English, while lexical-semantic borrowing and multi-component syntactic term combinations prevail in Uzbek;

in English and Uzbek biotechnology terminology, paradigmatic relations such as synonymy, antonymy, polysemy, and hypernymy-hyponymy arise as a result of naming scientific concepts on the basis of different semantic features, and their effectiveness in enriching the biotechnology terminology system in both languages have been substantiated;

the conceptual categories of biotechnology terms in English and Uzbek have been identified, the hierarchical conceptual relations between the biotechnology frame and its subframes and slots have been revealed, and the formation of metaphorical units within terms on the basis of four source domains (the human world, technology and objects, natural phenomena and objects, and the military domain), as well as the similarities and differences in their realization in both languages, have been demonstrated through examples.

The practical results of the research work are as follows:

Practical recommendations have been developed for the comparative study of the formation of biotechnology-related terms (borrowed terms, root terms, and derived terms) and their structural-semantic and cognitive features in English and Uzbek;

it has been substantiated that the scientific conclusions regarding the formation of biotechnology-related terms in the compared languages under the influence of linguistic and extralinguistic factors and on the basis of international, borrowed, and calqued units, as well as their development tendencies, contribute to the improvement of explanatory dictionaries, teaching manuals, and textbooks created in the field of biotechnology;

the scientific foundations of the research, the applied methodological approaches, and the modern methods of linguistic analysis, as well as the full alignment of the obtained results with the research concept and the consistent resolution of the defined tasks, ensure the reliability of the results.

The reliability of the research results is ensured by the precise formulation of the problem, the substantiation of the conclusions through structural-semantic, comparative, classificatory, cognitive, frame-based, metaphorical, and statistical analyses, the use of theoretical data derived from reliable scholarly sources, the testing of practical recommendations within the educational process and terminological practice, and the validation of the findings by authorized institutions.

Scientific and practical significance of the research results. The scientific significance of the research results lies in the fact that the studies conducted on the basis of English and Uzbek language materials reveal the specific position of biotechnology terms within the language system, further enrich the scientific research principles of comparative terminology, and that the scientific conclusions and generalizations presented in the dissertation regarding biotechnology terms in the compared languages serve as a scientific and theoretical source for the study of other terminological systems.

The practical significance of the research results is explained by the fact that the research materials and conclusions can be used as a practical resource in the preparation of manuals, textbooks, collections in disciplines such as linguistics, terminology, terminography, lexicology, lexicography, and in the creation of bilingual explanatory dictionaries of biotechnology terms.

The implementation of research results. Based on the scientific results obtained from the study of the structural-semantic and cognitive properties of biotechnology terms in English and Uzbek:

the conclusions related to the identification of the heterogeneous system of English and Uzbek biotechnology terminology, formed at the intersection of disciplines such as biology, genetics, microbiology, medicine, chemistry, engineering, and information technologies on the basis of international, borrowed, and calqued units, as well as the historical-etymological aspects of lexical units and the semantic and cognitive adaptation and stabilization of international terms within the recipient language system during the borrowing process, revealed from both theoretical and practical comparative perspectives, have been used within the framework of the European Union's Erasmus+ Programme for 2023-2025, project No. ERASMUS-EDU-2022-101082242, entitled "12-PLEDGE (Innovative and Interdisciplinary Programmes in Bio-medical Engineering to Leverage and Exploit the Digital Growth Programme for Students' Employability in Uzbekistan)" (Reference No. 430 dated April 7, 2025, Urgench Branch of Tashkent University of Information Technologies named after Muhammad al-Khwarizmi). As a result, the scientific-theoretical foundations of the Biomedical Engineering educational curriculum have been enriched, and the methodological principles for translating biotechnological terminology have been practically strengthened;

the conclusions regarding the formation of biotechnology-related terms in the compared languages through morphological (affixation, conversion), morpho-

syntactic (composition, blending, abbreviation), syntactic, semantic, and lexico-semantic methods, their expression of complex scientific concepts, and the use of eponymic units in their structure, as a result of which the predominance of the morpho-syntactic model in English and lexico-semantic borrowing and multi-component syntactic term combinations in Uzbek was identified on the basis of structural and statistical analysis, were used in the European Union's Erasmus+ grant project for 2023–2025 entitled “ECAMPUZ – European World Talent Camp for Uzbekistan Scientists in Food Science and Technology” (ERASMUS-EDU-2022-CBHE) (Reference No. 1/06-1231 dated April 21, 2025, Tashkent Institute of Chemical Technology). As a result, the educational materials prepared for advanced courses in Food Science and Technology have been enriched from a scientific and theoretical perspective, the content of the programs has been updated based on international experience, and methodological approaches to the translation of terminology in Biotechnology and Food Safety courses have been improved;

the findings concerning the emergence of paradigmatic relations such as synonymy, antonymy, polysemy, and hypernymy-hyponymy in the biotechnology terminology of English and Uzbek as a result of the naming of scientific concepts on the basis of different semantic features, as well as their effectiveness in enriching the system of biotechnology-related terms in both languages, were used within the framework of the ERASMUS+ Programme grant project 598340-EPP-1-2018-1-ES-EPPKA2-CBHE-JP “University Cooperation Framework for Knowledge Transfer in Central Asia and China (UNICAC)” (Reference No. 04/11-5371 dated April 24, 2025, National University of Uzbekistan named after Mirzo Ulugbek). As a result, the research has served as an effective theoretical resource for improving instructional materials intended for master's degree students;

the conclusions regarding the identification of the conceptual categories of biotechnology-related terms in English and Uzbek, the elucidation of the hierarchical conceptual relations between the biotechnology frame and its subframes and slots, as well as the substantiation through examples of the formation of metaphorical units within terms on the basis of four source domains (the human world, technology and objects, natural phenomena and bodies, and the military sphere) and the similarities and differences in their realization in both languages, were used in writing the scripts of the programmes “Najot bilimda”, “Salomatlik sirlari”, and “Agroolam”, broadcast by the Khorezm Regional Television and Radio Company (Reference No. 319 dated April 9, 2025). As a result, alongside the qualitative improvement of the scientific content of television programs, complex biotechnology concepts have been successfully conveyed to a wide audience in a clear, fluent, and scientifically grounded manner.

Approval of research results. The results of this research were discussed at 14 scientific and practical conferences, including 12 international and 2 national conferences.

Publication of research results. A total of 27 scientific works have been published on the topic of the dissertation, including 12 articles in scientific journals recommended by the Higher Attestation Commission of the Republic of Uzbekistan for the publication of principal research results (10 in national journals and 2 in

foreign journals), as well as one certificate of registration obtained for a software product developed for electronic computing machines.

The structure and scope of the dissertation. The dissertation consists of an introduction, three chapters, the conclusion, and a list of references, with a total volume of 146 pages.

MAIN CONTENT OF THE DISSERTATION

The **Introduction** substantiates the relevance of the research, outlines its aims and tasks as well as the object and subject of the study, indicates its alignment with the priority directions of scientific and technological development in the Republic, presents the scientific novelty and practical results, reveals the theoretical and practical significance of the findings, and provides information on the implementation of the results, published works, and the structure of the dissertation.

The first chapter of the dissertation titled **“Scientific-theoretical foundations of studying biotechnology terms”** consists of four sections. The first section is called **“Terminology as an object of linguistic research”** and provides an overview of the historical development of terminology, its theoretical principles, the distinctions between the concepts *“term”*, *“terminology”*, and *“terminological system”*, the key features of terms, and the main methods of term formation.

The emergence of terminology as an independent scientific discipline is associated with the works of E. Wüster⁴³ in the early XXth century, who substantiated the importance of terminological accuracy, unification, and its role in international scientific and technical cooperation. The principles proposed by Wüster were later reflected in the activities of standardization bodies such as ISO (International Organization for Standardization), laying the foundation for the global regulation of terminology. D.S. Lotte⁴⁴ laid the theoretical foundations for technical terminological systems, G.O. Vinokur elucidated the linguistic nature of terms⁴⁵, and the textbook by A.A. Reformatskiy⁴⁶, which included a section entitled *“Terminology”* consolidated the establishment of this field as an independent scientific discipline.

One of the debated issues in terminology studies is determining the boundary between terms and words in general usage. Due to the constant processes of *terminologization* (the transformation of a common word into a term) and *determinologization* (the loss of a term’s specialized status), linguists note that distinguishing between these two lexical layers is often difficult. Terminologization refers to the process by which a word from general vocabulary becomes a term, and the majority of domain-specific terms enter the linguistic system through this mechanism⁴⁷. According to E.I. Dibrova, a terminological system is formed through three main mechanisms: morphological derivation, semantic derivation, and the

⁴³ Wüster E. *Internationale Sprachnormung in der Technik*. – Berlin: VDI-Verlag, 1931. – P.18.

⁴⁴ Лотте Д. С. Основы построения научно-технической терминологии. — М.: ОНТИ, 1961. – 112 с.

⁴⁵ Винокур Г.О. О некоторых явлениях словообразования в русской технической терминологии // Труды Московского института истории, философии и литературы. – Москва, 1939. – С.3-54.

⁴⁶ Реформатский А.А. Что такое терминология. // Вопросы языкознания. – Москва, 1961. – С. 49.

⁴⁷ Сайфуллаева Р.Р., Менглиев Б.Р., Бокиева Г.Х., Курбонова М.М., Юнусова. З.К., Абузалова М.К. Ҳозирги ўзбек адабий тили. – Тошкент, 2009. – Б.116.

borrowing of words from other languages⁴⁸. Terminological derivation includes such processes as affixation, compounding, conversion, abbreviation, syntactic modelling, semantic shift, and borrowing. In this research, the principal approaches employed in term formation are morphological, morphological-syntactic, syntactic, semantic, and lexico-semantic.

The second section of the chapter, titled *“The cognitive approach to the study of terms”*, analyzes the emergence of the anthropocentric paradigm and cognitive linguistics, as well as the ideas that interpret language in relation to human cognition and the conceptual system. Drawing on the views of L. Yu. Buyanova, E. I. Golovanova, P. Faber, V. F. Novodranova, M. Minsky, G. Lakoff, M. Johnson, L. P. Grunina, and other scholars⁴⁹ the content of cognitive terminology is revealed. Cognitive terminology does not limit itself to the function of terms only within the language system, but interprets them as conceptual units that reflect scientific knowledge through such processes as conceptualization, categorization, frame modelling, metaphorization, and cognitive derivation. The cognitive approach in terminology relies on cognitive-semantic, cognitive-grammatical, and linguocultural frameworks. Within the cognitive approach, the guiding, systematizing, and modelling functions of terms determine their cognitive role in recording and organizing scientific knowledge. This approach interprets terms as linguistic representations of conceptual structures in human cognition and reveals that their formation and systematic organization are directly connected with cognitive mechanisms.

In addition, the chapter provides a detailed explanation of the role of such key cognitive mechanisms in terminology research as conceptualization and categorization, frame modelling, metaphorization and interlingual acquisition, and justifies the importance of these processes in determining the formation, content structure and place of terms in the conceptual system.

In the third section of the chapter titled *“Extralinguistic and linguistic factors in the formation of biotechnology terms”* the external and internal factors influencing the formation and evolution of biotechnology terminology are systematically analyzed.

As extralinguistic factors, the ancient, classical, and modern stages of biotechnology, scientific-technical progress, global processes such as COVID-19, interdisciplinary integration, international cooperation, and the ethical-social attitude of society towards biotechnological practices are examined. The historical formation

⁴⁸ Диброва Е.И. Современный русский язык. Теория. Анализ языковых единиц. Учебник для студ. Высш. Учеб. Заведений: в 2 ч. – М.: Академия, 2002. – 540 с.

⁴⁹ Буянова Л.Ю. Терминологическая деривация в языке науки: когнитивность, семиотичность, функциональность: монография. – Москва: Наука, 2014. – 256 с.; Голованова Е.И. Введение в когнитивное терминоведение: учеб. пособие. – Москва: Наука, 2011. – 225 с.; Faber Pamela. A Cognitive Linguistics View of Terminology and Specialized Language. – Berlin, Boston: De Gruyter Mouton, 2012. – 324p.; Новодранова В.Ф. Когнитивные науки и терминология // НТТ. – 2000. – № 2. – С. 69.; Минский, М. Фреймы для представления знаний / пер. с англ. О. Н. Гринбаума; под ред. Ф. М. Кулакова. – Москва: Энергия, 1979. – С. 5.; Lakoff G., Johnson M. *Metaphors We Live By*. – Chicago: University of Chicago Press. 1980. – 242 p.; Грунина Л.П., Широколобова А.Г. Когнитивный аспект исследования терминов // Филологические науки. Вопросы теории и практики. – 2010. – № 1 (5). – С.97.

of biotechnology terminology is manifested in three stages: in the ancient stage, units denoting practical processes such as “*fermentation*” and “*yeast*” emerged; during the classical period, with the establishment of the science of genetics, fundamental terms such as “*gene*” and “*allele*” entered scientific usage; the modern stage, in turn, is characterized by the emergence and widespread adoption of core terms such as the *double-helix model of DNA*, “*codon*”, “*PCR*” (*polimeraza zanjir reaksiyasi*), “*GMO*” (*genetik jihatdan o‘zgartirilgan organizmlar*), and “*CRISPR*” (*genom tahriri tizimi*). In particular, during the pandemic, the sharp increase in the usage of biotechnological terms such as “*RT-PCR*” (*real vaqtli PZR*), “*mRNA vaccine*” (*xabarchi RNK vaksinasi*), “*genomic surveillance*” (*genom kuzatuvi*), “*spike protein*” (*spayk oqsili*), and “*viral load*” (*virus yuklamasi*) demonstrated that biotechnology terminology is a dynamic system capable of rapidly adapting to global scientific and technological developments. Linguistic factors include the diachronic and synchronic development of borrowed biotechnology terms, their phonetic-morphological adaptation, formation through methods such as calquing, abbreviation, and affixation, as well as the processes determining their semantic dynamics.

In the fourth section of the chapter, entitled “***The heterogeneous nature of biotechnology terms***”, the interdisciplinary, multi-sourced, and complex structure of biotechnological terminology is theoretically and practically substantiated.

Biotechnology terminology has emerged as a multi-sourced and heterogeneous system as a result of its development at the intersection of various fields such as biology, chemistry, biochemistry, microbiology, molecular genetics, medicine, pharmacology, engineering, information technologies, ecology, and agriculture. The terminological system of biotechnology represents a set of general scientific, professional, and domain-specific units and is interpreted as lexical items that verbally express knowledge related to the application of living organisms and biological processes in industrial practice.

In our research, based on the filiational, contaminational, heterogeneous, and homogeneous models proposed by S.G.Kazarina⁵⁰, it was determined that biotechnology terminology predominantly belongs to the heterogeneous type, that is, terms borrowed from fields such as zoology and botany (*callus – kallus, hybrid – gibril*), general biology (*organism – organizm, species – tur*), medicine and pharmacology (*biopsy – biopsiya, antigen – antitanacha*), chemistry and physics (*enzyme – ferment, diffusion – diffuziya*), genetics (*gene – gen, GMO – genetik jihatdan o‘zgartirilgan organizm*), engineering (*bioreactor – bioreaktor, process – jarayon*), information technology (*bioinformatics – bioinformatika, database – ma’lumotlar bazasi*), ecology and agriculture (*biodiversity – biologik xilma-xillik, biopesticides – biopestitsidlar*) actively participate in its formation.

In the first section of the second chapter, entitled “**Structural-semantic features of biotechnology terms in English and Uzbek**”, the subsection “***Structural analysis of biotechnology terms in the compared languages***” provides a comparative examination of the structural characteristics of biotechnology-related

⁵⁰Казарина С.Г. Типологические характеристики отраслевых терминологий. –Краснодар: Кубан, 1998. -С.276.

terms in English and Uzbek. The analysis identifies one-component and multi-component term types, their formation mechanisms, and the similarities and differences between the two languages.

For the purposes of the study, 1180 English and 1100 Uzbek terms were selected. The comparative analysis of the structural features of biotechnology terms in English and Uzbek made it possible to classify them into two main groups: one-component and multi-component terms. The analysis showed that among one-component terms, the share of basic (root) terms is 29% in English and 38% in Uzbek, while derived units account for 60% and 49%, respectively. Derived units are mainly formed through prefixes and suffixes (English: re-, de-, trans-, anti-, bio-, -ion/-tion, -ity, -ing; Uzbek: bio-, anti-, trans-, -lik, -ma, -chi, -siz). Hyphenated forms in English (*cell-free*, *single-use*) are typically rendered in Uzbek in the form of derived words or word combinations (*hujayrasiz*, *bir martalik*). In both languages, the active use of international prefixes and suffixes based on Latin and Greek sources was identified.

One of the productive mechanisms enriching biotechnology terminology in English is blending (telescope formation), in which a new term is created by merging two bases. Blending is actively used to name newly emerging objects and processes resulting from innovations in genetic modification, synthetic biology, and bioinformatics, serving to express complex concepts in a concise and precise manner. In biotechnology terminology, terms formed through blending are divided into four groups based on O.A. Khrusheva's⁵¹ classification: new organisms (*liger*, *broccoflower*), technological devices (*bioprinter*, *genechip*), products of interdisciplinary integration (*bionics*, *neurotech*), and complex chemical compounds (*chlorofluorocarbon*).

In Uzbek, such terms have been adopted through direct transliteration, transcription, or calquing, while some are rendered using descriptive phrases: *bionics* – *bionika*, *liger* – *liger* (*sher-yo'lbars gibridi*), *broccoflower* – *gulkaram-karam* or *yashil gulkaram*.

The analysis of biotechnology terminology in English and Uzbek shows that multi-component terms predominate in this field. In particular, the examination of 750 English multi-component terms (MCTs) yielded the following results: 355 (47.3%) are two-component: (N+N: *cell envelope*, *gene therapy*; A+N: *anabolic enzyme*, *monoclonal antibody*; Ved+N: *activated enzyme*, *mutated cell*; Ving+N: *flanking region*, *living cell*), 310 (41.3%) are three-component; (N+N+N: *food additive industry*; A+N+N: *horizontal gene transfer*; Ved+N+N: *spent sulfite liquor*), 69 (9.2%) are four-component, 8 (1.1%) are five-component, 5 (0.7%) are six-component, and 3 (0.4%) are seven-component.

In Uzbek, 710 MCTs were analyzed, with the majority consisting of two-component terms – 345 units (48.6%). These are followed by three-component terms, totaling 290 units (40.8%). Four-component terms amount to 52 units (7.3%), while five-component terms constitute 12 units (1.7%), six-component terms – 7 units

⁵¹ Хрущева О.А. Дискурсивные особенности блендов // Приоритетные направления развития современной науки: материалы Международной заочной научно-практической конференции. – Чебоксары: НИИ педагогики и психологии, 2010. – С. 44

(1.0%), and seven-component terms – only 4 units (0.6%). Two-component terms are mainly represented by the following structural models: Noun+Noun (*gen oqimi, embrion kulturasi*), Adjective+Noun (*kimyoviy mutagen, virusli vaksina*), Participle+Noun (*faollashtirilgan ferment, denaturatsiyalangan oqsil*), Noun+Verbal Noun (*genni klonlash*). Gerundial forms in English are typically rendered in Uzbek through verbal noun constructions. A significant portion of the terms were adopted into Uzbek through calquing (*primary tissue – birlamchi to‘qima*), semi-calque (*secondary immune response – ikkilamchi immun javob*), transliteration or transcription (*aerobic bacteria – aerob bakteriyalar*).

The formation of three- and multi-component terms usually occurs through the gradual expansion from two-component models. One of the most common structural patterns in English is A+N+N (*horizontal gene transfer*), N+N+N (*food additive industry*), Ved+N+N (*water jacketed incubator*), Adv+Ved+N (*genetically modified organism*), while in Uzbek the structures such as Noun+Noun+Noun (*polimeraza zanjiri reaksiyasi*), Adjective+Noun+Noun (*tarmoqli ildiz kulturasi*), Adjective+Adjective+Noun (*shartli halokatli mutatsiya*) are observed.

The five-, six-, and seven-component terms are used to express complex scientific concepts: *somatic cell nuclear transfer technique* (5 components), *bone marrow mesenchymal stem cell transplantation* (6 components), *Real-Time Quantitative Reverse Transcription Polymerase Chain Reaction* (7 components). Similar structural patterns are also found in Uzbek: *bir zanjirli nuklein kislotasi, genetik jihatdan o‘zgartirilgan organizm, qishloq xo‘jaligi hayvonlarining genetik resurslarini boshqarish*.

Among biotechnology terms, abbreviations in English (*DNA, PCR*) constitute the central layer of terminology, while in Uzbek they are used with explanatory units (*DNK namunasi, PCR tahlili*), which ensures the preservation of the international standard form.

The analysis of biotechnology terminology according to its structural features has demonstrated that abbreviations occupy an exceptionally significant place within this terminological system. Due to the complexity of scientific concepts in the field, the majority of terms consist of multi-component constructions. Since biotechnological terms in the Uzbek language have been primarily borrowed from English, with a certain portion adopted through Russian, loan units have become a key factor in the formation of Uzbek terminology. In terms of abbreviations, English holds a leading position in both the quantity and diversity of terms.

In the second section of the chapter, called **“Lexical-semantic relations in biotechnology terminology in English and Uzbek,”** the paradigmatic relations within the system of biotechnology terms – synonymy, antonymy, polysemy, and hypernym–hyponym relations – are comparatively analyzed on the basis of English and Uzbek.

Synonymous terminological units are classified by several criteria. The first is the degree of synonymy: absolute synonyms denote full semantic equivalence, while relative synonyms show partial similarity with certain semantic or functional differences. The second is structural type – whether the synonyms are single-component terms, multi-component terms, or abbreviations. The third is contextual

usage, as different scientific or practical contexts determine their semantic and stylistic variation. For example, in English, absolute synonyms include *ascorbic acid* – *vitamin C* and *autocatalytic reaction* – *autocatalysis*. In Uzbek, similar cases include *protein* – *oqsil*, *ferment* – *enzim*. Relative synonyms, on the other hand, are semantically close but differ in their field of usage or connotative features: *biotechnology* – *genetic engineering*, and in Uzbek *antikor* – *antitana*. Structural-formal variants also contribute to the formation of synonymy. The analysis shows the presence of graphic variants (*bioengineering* – *bio-engineering*), affixal variants (*fertilize* – *fertilise*; *DNK gibridlanishi* – *gibridizatsiyasi*), and short-full form variants (*genetically modified organism* – *GMO*). Such variation is explained by differences in normative traditions, translation practices, and the influence of international terminological standards.

In the analysis of antonymic relations within biotechnology terminology, it was determined that such oppositions are formed on the basis of several semantic principles: **spatial contrast** (*intracellular* – *extracellular*, *hujayra ichidagi* – *hujayra tashqarisidagi*, *in vivo* – *in vitro*, *tirik organizmda* – *sun'iy sharoitda*), **quantity** (*monogenic* – *multigenic*, *bitta genli* – *ko'p genli*; *haploid cell* – *diploid cell*, *gaploid hujayra* – *diploid hujayra*), **function** (*activation* – *inactivation*, *faollashish* – *faolsizlanish*; *anabolism* – *catabolism*, *anabolizm* – *katabolizm*), **property** (*hydrophilic* – *hydrophobic*, *gidrofil* – *gidrofob*; *acidic* – *basic*, *kislotali* – *asosli*), **composition** (*saturated fatty acid* – *unsaturated fatty acid*, *to'yingan yog' kislotasi* – *to'yinmagan yog' kislotasi*) and **size** (*micromolecule* – *macromolecule*, *mikromolekula* – *makromolekula*), all of which actively function in the terminological system to denote contrasting scientific concepts. It should be noted that some antonyms may belong to several categories depending on the specific context. In addition, the field of biotechnology is constantly developing, which leads to the emergence of new antonymic relations based on new discoveries and concepts.

From the perspective of semantics, another important relation included among the most significant paradigmatic relations is the hypernym-hyponym relation. The main characteristics of hyponyms are manifested in the following:

1. Hyponyms are determined based on the principle of one-way implication: a hyponym can always be replaced by its hypernym because the species is subordinate to the genus, whereas the reverse substitution is not always possible;
2. The meaning of a hyponym is semantically richer and more specific, while the class of objects it denotes is narrower;
3. Semantic relations between co-hyponyms represent relationships among elements of the same class. Hyponyms include the meaning of the hypernym and are contrasted with one another through additional differential semantic features.

In particular, within the **general concept–subordinate concept** relationship, pairs such as *GMO* – *GM plants*, *GM animals*, *GM microorganisms* (*GMO* – *GM o'simliklar*, *GM hayvonlar*, *GM mikroorganizmlar*) and *cell* – *somatic cell*, *germ cell*, *stem cell* (*hujayra* – *somatik hujayra*, *jinsiy hujayra*, *ildiz hujayra*) were observed. In the **class–class member** relationship, examples include *virus* – *DNA virus*, *RNA virus* (*virus* – *DNK virusi*, *RNK virusi*) and *protein* – *transport protein*, *structural protein* (*oqsil* – *tashuvchi oqsil*, *strukturaviy oqsil*). Within the **parameter–parameter**

carrier relationship, systems such as *protein synthesis – ribosome, mRNA, tRNA* (*oqsil sintezi – ribosoma, xabarchi RNK, tashuvchi RNK*) were identified. In the **process–object** relationship, forms such as *fermentation – sugar, glucose – ethanol, CO₂* (*fermentatsiya jarayoni – shakar, glyukoza – etanol, karbonat anhidrid*) were recorded. In the **relationship–relationship component** type, units like *genetic transformation – host organism, transgene* (*genetik transformatsiya – xost organism, transgen*) appear. Finally, in the **attribute–object** relationship, the pair *pluripotency–stem cells* (*pluripotentlik–ildiz hujayralar*) is found.

Systematic analysis showed that hyponymic relations appear at two-, three-, and four-level layers. For example, the term *cloning* (*klonlash*) forms a three-level chain such as *reproductive cloning, therapeutic cloning, gene cloning* (*reproduktiv klonlash, terapevtik klonlash, gen klonlash*), while the term *gene* (*gen*) forms four-level chains such as *structural gene, regulatory gene, oncogene* (*strukturaviy gen, regulyator gen, onkogen*). These results confirm that hyper–hyponymic relations in biotechnological terminology are an important semantic means of differentiating and systematizing scientific concepts.

Our analysis revealed that terms such as “*vector*,” “*transformation*,” “*expression*,” “*culture*,” and “*signal*” are used in parallel across different scientific fields while preserving a common semantic core; therefore, we interpret them not as cases of homonymy but as instances of intersystem polysemy.

In the subsequent section, “*The specific features of eponyms related to biotechnology*”, proper names used as specialized terms – eponyms – are examined as a distinct lexical layer within biotechnology terminology.

Eponyms are specialized terminological units that reflect the stages of scientific and technological development as well as historical and cultural information, and they perform an important cognitive function in scientific discourse⁵². The word *eponym* refers to a unit derived from a proper noun associated with a real or mythical person, a hero, a geographical entity such as a city, river, mountain, as well as the name of a people or a historical period. In scientific usage⁵³, however, an eponym is interpreted as a term linked to the name of the person who first discovered or described a particular phenomenon, structure, method, or concept.

According to A. Ziyodullayev, eponyms differ from commonly used words in that, semantically, they express specialized concepts, and functionally, they are primarily employed in professional discourse⁵⁴. Therefore, eponymic units possess a narrow semantic field and are characterized by a high degree of precision and terminological specialization.

In the course of the research, 107 eponymous terms were identified based on English biotechnological texts, and it was found that most of them entered the biotechnology system from the fields of medicine, genetics, microbiology, chemistry, and cell biology. According to the source of origin, eponyms are formed from

⁵² Belopolsky A. A. Terms-eponyms in the composition of neurological terminologies. // Bulletin of SNO DONNU. Social sciences and humanities (Philology). - 2022. - P.202

⁵³ Ziyodullayev A.R. Thematic classification of eponyms // Scientific reports of Bukhara state university. 2022. – P.71.

⁵⁴ Ziyodullayev A. R. Ingliz va o‘zbek tilida eponimlarning lingvokognitiv hamda lingvokulturologik xususiyatlari: Filol. fan. bo‘yicha falsafa doktori (PhD) dissertatsiyasi avtoreferati. – Buxoro, 2024. – B.11.

anthroponyms (*Donnan effect – Donnan effekti, Krebs cycle – Krebs sikli*), toponyms (*Edinburgh 76 virus – Edinburg 76 virusi*), brand names (*Gibco cells – Gibco hujayralari*), and mythological names (*Chimera – Ximera, Hydra cells – Gidra hujayralari*). From a semantic perspective, they fall into seven main groups: units related to the structure of DNA and RNA (*Watson–Crick model – Uotson–Krik modeli, Okazaki fragment – Okazaki fragmenti*); terms related to cell and genetic engineering techniques (*Gram staining – Gram bo‘yash usuli, Southern blotting – Sauzern blottash*); eponyms related to the fundamental laws of genetics (*Mendel’s Laws–Mendel qonunlari, Hardy–Weinberg equilibrium–Hardi–Vaynberg muvozanati*); terms indicating laboratory instruments and equipment (*Petri dish – Petri kosasi, Pasteur pipette–Paster pipetkasi*); ethical concepts of biotechnology (*Belmont Report–Belmont hisoboti*); units of measurement (*centiMorgan – sentimorgan, Roentgen – rentgen*); and eponyms denoting key biotechnological objects and processes (*Barr body – Barr tanachasi, Langerhans cell – Langerhans hujayrasi*).

The structural features of biotechnology eponyms are characterized by their manifestation in both simple and multi-component forms. The findings of the research indicate the predominance of the two-component model, in which eponymous terms are most often formed on the basis of a proper name + common noun structure: for example, *Petri dish – Petri kosasi, Mendel’s Laws – Mendel qonunlari*. Another important structural form of eponyms consists of hyphenated units involving the names of multiple scientists. Such terms reflect the collective nature of scientific discoveries and are widely used in biotechnological texts: *Watson–Crick model – Uotson–Krik modeli, Krebs–Kornberg cycle – Krebs–Kornberg sikli, Hardy–Weinberg equilibrium – Hardi–Vaynberg muvozanati*.

In the Uzbek language, biotechnological eponyms are generally adopted while preserving their original form, whereas some are rendered through partial calques or explanatory phrases (*Gram bo‘yash usuli, qo‘sh spiral modeli*). The analyzed data revealed that many Uzbek terms exhibit variant forms, such as (*Golji apparati / Golji kompleksi, pasterizatsiya / pasterlash, Valden inversiyasi / Valden almashinuvi, Inbriding koeffitsiyenti / qarindoshlik koeffitsiyenti*). This variation is partly due to the introduction of terms through Russian and English in different forms, and partly to ongoing nationalization processes in Uzbek.

The following specific features of biotechnology-related eponymous terms can be identified: since eponyms contain a proper noun, they are typically written with a capital letter, but as a result of metonymization they may be used in lowercase as a general scientific term (*pasteurization – pasterizatsiya*); they ensure linguistic economy; the international nature of eponyms allows them to be used in nearly identical forms across different languages; eponyms possess a motivational character and preserve the historical-cognitive meaning associated with the names of the authors of scientific discoveries (*Mendel’s Laws – Mendel qonunlari*).

Our analysis has shown that the formation and use of eponyms in biotechnology is a complex, multifaceted and interdisciplinary process. These eponyms are borrowed from various fields and reflect the historical development of biotechnology, scientific schools and conceptual features. Their structural, semantic and functional

aspects, determined on the basis of materials from English and Uzbek languages, confirmed the strong position of this layer in the terminological system. The variability observed in Uzbek-language usage indicates that the system of terms has not yet been fully standardized, leading to the conclusion that a unified norm is necessary. Eponyms provide clarity, economy and motivation in scientific communication, serve the harmonious functioning of terminology at the international level, and they are of particular importance in biotechnology terminology not only as a naming unit, but also as an important linguistic layer connecting scientific thinking, historical memory and cognitive processes.

The third chapter of the dissertation, titled **“Cognitive features of biotechnology-related terms in English and Uzbek,”** opens with a section devoted to the study of **“Cognitive aspects of borrowing biotechnology terms in the compared languages”**.

It is well known that borrowing from other languages is one of the main sources of the development of terminology in fields such as biotechnology. Borrowing is not a simple transfer of lexical items; rather, it represents a complex cognitive process shaped by the interaction between the conceptual spaces of the donor and recipient languages. During this process, along with phonetic and morphological adaptation, phenomena such as conceptual reinterpretation, semantic narrowing or broadening, and metaphorical profiling may occur. The borrowed concept does not enter the recipient language unchanged: some of its features become central, while others shift to the periphery of meaning. For example, when the English concept “*fermentation*” is borrowed into Uzbek in the form “*fermentatsiya*”, semantic narrowing is observed in its content: the broad characteristics in English, such as “*chemical decomposition, gas release, energy emission, boiling*” are limited in Uzbek mostly to “*the process of souring/fermenting under the influence of enzymes*”. This phenomenon illustrates the cognitive adaptation that takes place between the conceptual spaces of the donor and recipient languages.

Borrowed terms form a new conceptual domain in Uzbek biotechnological discourse. For example, around the terms “*gen*” and “*klon*” there have emerged paradigmatic systems such as *genetika, gen muhandisligi, gen tahriri; klonlash, reproduktiv klonlash, terapevtik klonlash*. These terms cluster around a shared conceptual foundation, thereby broadening the scientific and professional conceptual domain of the language.

Conceptual adaptation in biotechnology terminology is manifested not only in the semantic structure of terms, but also in the term elements contained within them.

For example, the element “*bio-*” serves as a conceptual marker and forms the basis for the creation of hundreds of derivative units, generating a paradigmatic system such as *bioreaktor, biomahsulot, bioinformatika, biomarker*. These units converge semantically around the single concept “*bio-*” and contribute to the formation of the biotechnological conceptual sphere.

In the mechanisms of terminological borrowing, material borrowing (*gen, klon, biosensor*) and calquing (*cell culture* → *hujayra madaniyati; stem cell* → *ildiz hujayra*) appear as the dominant types. Semantic calquing is also observed in more complex units (*vector* → *genetik tashuvchi, platforma* → *ma'lumotlar muhiti*).

Sometimes mixed, that is, hybrid forms also emerge: in terms such as *bioyoqilg'i*, *biotibbiyot*, international and native elements are combined.

In Uzbek biotechnological terminology, the Latin and Greek layers occupy a leading position (e.g., *virus*, *ferment*, *gen*, *gormon*), while English has become the primary donor language for modern terms, and in many cases the borrowing process takes place through the mediation of Russian (*protein*, *intron*, *klon*). In addition, borrowings from other languages such as French (*kodon*, *jelatin*), German (*shtamm*, *kraxmal*), Arabic (*hujayra*, *nasl*), and Malay (*agar-agar*) were also observed. The entry of these terms into Uzbek through various linguistic layers contributes to the formation of a multilayered and internationally comprehensible scientific space within the national terminology system.

In the subsequent section of this chapter, under the title “*The cognitive-categorical classification and frame model of biotechnology terms in English and Uzbek*”, the conceptual categories of biotechnology terms are identified and systematized on the basis of the frame model.

It is well known that the concept of “category” is interpreted in a very broad sense, reflecting the most general and essential properties, features, connections, and relations of objects and phenomena of reality⁵⁵. In terminology, categorization is closely linked to mental categories, serving both as an outcome of scientific cognition and as a tool for shaping it. Categories represent a generalized model of real-world phenomena, while categorization is viewed as a conceptual-linguistic process that reflects the mechanisms of such generalization.

The process of categorizing biotechnology-related terms in our research is explained with reference to E. Rosch's prototype theory⁵⁶. Within this framework, a category is not interpreted as a rigid, strictly delimited structure, but rather as a system in which the most typical members (prototypes) occupy the center, while less typical representatives occupy the periphery. Prototypes constitute the cognitive core of the category, and other terms are connected to them on the basis of semantic and functional commonality. For example, at the center of the category “*biological objects*,” basic terms such as *cell* (*hujayra*), *gene* (*gen*), *protein* (*oqsil*) appear as prototypes.

In the course of the research, approximately 1200 biotechnology-related terms were analyzed and systematized into 11 conceptual categories – *biological objects*, *substances*, *processes*, *properties*, *space*, *technology*, *apparatus/equipment*, *values and measurement units*, *products*, *branches of science and industry*, and *agents (performers)*.

According to the results of the analysis, the largest portion of the terminological field is occupied by the category “*biological objects*”, which constitutes 25.2% in English and 24% in Uzbek. A substantial number of terms also fall under the categories “*substances*” (12.2% / 16%) and “*processes*” (12.1% / 14%). The category “*products*” (10.2% / 9.5%) likewise represents an important segment of the

⁵⁵ Сафаров Ш. Когнитив тилшунослик. - Жиззах: Сангзор нашриёти, - 2006. -Б.14

⁵⁶ Rosch, E. Principles of Categorization // Cognition and Categorization / Eds. E. Rosch, B. Lloyd. – Hillsdale: Lawrence Erlbaum, 1978. – P. 27–48.

biotechnological lexicon in both languages.

To identify the cognitive foundations of biotechnology terminology, a frame modelling approach was applied, and a “Biotechnology” frame was developed. This model made it possible to reveal the semantic structure of the terms and to systematize the semantic and hierarchical relationships between them.

Within the frame, four main subframes were identified: “*Research Area/Tadqiqot sohasi*,” “*Subjects/Subyektlar*,” “*Processes and Methods/Jarayon va metodlar*,” and “*Objects/Obyektlar*”. Each subframe organizes related terms and reflects specific semantic layers within the biotechnology domain. It was determined that the “*Research Area*” subframe covers the scientific and practical domains of biotechnology; the “*Subjects*” subframe includes the actors in the field, specialists and institutions; the “*Processes and Methods*” subframe encompasses biological and technological processes; and the “*Objects*” subframe contains terms denoting initial biological entities as well as resulting products.

The biotechnology terminology frame in English and Uzbek was compared across four core subframes. Although their conceptual structure is largely similar, notable differences were found in morphological realization, word-formation patterns, and structural configurations. English, as an analytic language, shows a high frequency of affixed forms and abbreviations, whereas Uzbek relies mainly on adapted borrowings and attributive constructions. In both systems, terms denoting biological objects serve as central concepts, while terms related to processes and methods shape the cognitive models of scientific and practical activity. These categories help systematize biotechnology terminology, determine the domain affiliation of terms, clarify their semantic content, and specify object–process relations. Frame-based modelling integrates them into a unified conceptual system, providing a clear representation of the hierarchical and semantic relationships among terms.

The third section of the chapter, entitled “*Metaphorization as a cognitive mechanism in the formation of biotechnology terms*”, discusses the role of metaphorization in the development of biotechnology terminology, the principles of conceptual metaphor theory, and the view that metaphor serves not only as a naming device but also as a key cognitive mechanism in scientific understanding.

Metaphorization constitutes an important cognitive mechanism in biotechnology terminology, enabling the comprehension and naming of complex biological and molecular processes through conceptual models that are closer to human experience. By expressing new scientific concepts through semantic transfer based on existing lexical units, it facilitates the visualization, systematization, and integration of abstract phenomena into scientific discourse. The internal mechanism of this process has been interpreted by E. A. Lapina as a step-by-step cognitive activity⁵⁷. According to this approach, the most salient feature of the object or phenomenon being nominated is first identified, and a general-language unit that is semantically close to this feature is selected. At the subsequent stage, the meaning of the chosen unit is

⁵⁷ Лапина Е.А. Метафоризация как способ терминообразования в микроэлектронике: автореф. дис. ... канд. филол. наук. – Москва, 1986. – С.9.

reinterpreted in accordance with the essence of the object and is semantically consolidated.

This research analyzed metaphorical units that entered the biotechnological terminological system through the metaphorical reinterpretation of source-domain lexemes. The findings show that metaphorization functions as a key cognitive mechanism in the formation of biotechnology terms, enabling the transfer of meaning from the source domain to the target domain. The metaphorical units identified in biotechnology terminology predominantly derive from four main source domains: **The Human World** (*mother plant – ona o‘simlik, daughter cells – qiz hujayralari, multigene family, DNA fingerprint – DNK barmoq izi, reporter gene – reportyor gen, messenger RNA – xabarchi RNK*); **The World of Technology and Artifacts** (*gene shears – gen qaychi, replication fork – replikatsiya vilkasi, sieve cell – elak hujayrasi, cell wall – hujayra devori, gene bank – gen banki*); **The World of Natural Phenomena and Objects** (*gene flow – gen oqimi, genetic drift – genetik drift (siljish), phylogenetic tree – filogenetik daraxt, genomic island – genom oroli, epidemic wave – epidemik to‘lqin*); and **The Military Domain** (*killer cell – qotil hujayra, gene gun – gen quroli, target cell – nishon-hujayra, microprojectile bombardment – mikro-snaryadlar bilan bombardimon qilish, antibiotic attack – antibiotik hujumi*).

In distinguishing the conceptual branches of biotechnology, a color-based metaphorical system is actively employed. According to the color model proposed by P. Kafarski⁵⁸, biotechnology is categorized as follows: *White biotechnology (Oq biotexnologiya)* – industrial processes; *Red biotechnology (Qizil biotexnologiya)* – biotechnology used in medical processes; *Green biotechnology (Yashil biotexnologiya)* – biotechnology used in agricultural processes; *Blue biotechnology (Moviy biotexnologiya)* – water and ocean (marine ecosystems); *Yellow biotechnology (Sariq biotexnologiya)* – food biotechnology. Color metaphors function as conceptual markers, serving to systematize the multidisciplinary and multibranch nature of biotechnology.

The analysis of common conceptual metaphors shows that biotechnological concepts are often conceptualized through source domains familiar to human experience. One of the most productive models is the CELL IS A HUMAN/HUJAYRA – INSON metaphor. Within this model, the cell is interpreted as a human-like agent capable of perception and action: *cell suicide, cell communication, cell defense, killer cells* are examples of this anthropomorphic mapping. English expressions like *sniffing other cells, shaking hands, stressed-out cell* attribute social and emotional qualities to the cell; while in Uzbek scientific discourse the processes are expressed in a more neutral manner: *o‘zaro aloqa qiladi, signal qabul qiladi, rivojlanish yo‘nalishini belgilaydi*. The second widespread model is the CELL IS A FACTORY/HUJAYRA – ZAVOD metaphor. Units in English such as *chemical factory, cellular machinery, producing biological products, repairing damage* conceptualize the cell as a complex technological system. In Uzbek, expressions like “*oqsil sintezi*” (*protein synthesis*) and “*energiya ishlab*

⁵⁸ Kafarski P. Rainbow code of biotechnology. - *Chemik* 2012. -P. 6.

chiqarish” (*energy production*) are also found; however, the degree of technological metaphorization is considerably more limited.

Among metaphors associated with the term *gene*, the models GENES ARE INFORMATION/GENLAR – AXBOROT and GENES ARE PROGRAMS / SOFTWARE/GENLAR – DASTURLAR are particularly prominent. English expressions such as *misspelling in genes*, *detect and fix mutation*, and *encoded information* conceptualize genes as text or code. In Uzbek, however, this model is mainly expressed through more neutral technical units such as *genni o‘chirish* (*deleting a gene*) and *gen kiritish* (*inserting a gene*), where the emotional component is markedly weaker.

The metaphor DNA IS A TEXT/DNK – MATN related to the conceptualization of DNA is clearly manifested in terms such as *genetic alphabet*, *spelling mistakes*, *write/read DNA*. In Uzbek, this process is mostly technical in nature: *DNKni tahrirlash* and others. Similarly, the DNA IS A DATABASE/DNK – MA’LUMOTLAR BAZASI model is represented in English through expressions like *a robust long-term storage medium*, whereas in Uzbek, it is interpreted through expressions such as *DNK nasliy informatsiya xazinasini*.

The model PATHOGENS ARE ENEMIES / ATTACKERS/PATOGENLAR – DUSHMANLAR/BOSQINCHILAR is one of the central metaphors of biotechnology discourse. In English, units such as *invading pathogen*, *pathogen attack*, *hijacks the cellular processes*, *immune surveillance* interpret pathogens as enemies or invaders. In Uzbek as well, expressions like *virus hujum qilganda*, *kurash*, *ayyor viruslar*, and *himoyalani* maintain the military-style mapping, though they are realized through more figurative forms.

A comparative analysis of the English and Uzbek languages demonstrates that in English, metaphors function actively as standardized components of scientific discourse, whereas in Uzbek they tend to manifest more frequently in contextual, descriptive, and functional forms. Although the degree of actualization of metaphorical units differs in the two languages, the fundamental function of metaphor remains preserved.

CONCLUSION

1. Terminology is an interdisciplinary branch of modern linguistics that studies the system of terms representing scientific concepts in specialized fields, their formation, systematization, and their relation to general vocabulary, ensuring accuracy and standardization in scientific communication. From this perspective, the cognitive approach interprets terms as cognitive units formed in the processes of conceptualization, categorization, frame modelling, and metaphorization, serving as a solid theoretical basis for analyzing the meanings and translations of biotechnology terms in English and Uzbek.

2. The formation of biotechnology terminology is a dynamic process influenced by extralinguistic factors (interdisciplinary integration, new technologies, and scientific discoveries) as well as linguistic factors (calquing, borrowed terms, abbreviation, derivation, and translation), and it constitutes the main source shaping

the heterogeneous terminological system of the field. This process has developed across the ancient, classical, and modern periods of biotechnology, manifesting as a multi-sourced and complex system at the intersection of disciplines such as biology, genetics, microbiology, medicine, chemistry, engineering, and information technologies.

3. Although root, affixal, and compound models are used in the formation of biotechnology terms in English and Uzbek, the most dominant layer consists of multi-component terms, and due to the complexity of scientific meaning, syntactic units and their abbreviated forms are widely used in both languages. Word-formation methods such as blending and conversion are actively employed in English, whereas such models are rarely found in Uzbek, with new terms mainly formed through syntactic units, calquing, and borrowing.

4. The formation of biotechnology terms based on synonymy, antonymy, polysemy, and hypernym-hyponym relations ensures the paradigmatic integrity of the terminological system.

5. In English biotechnology terminology, eponyms have developed as a stable and standardized system, with affixation, semantic extension, and conversion actively used in their formation. In Uzbek, eponyms mainly appear in borrowed forms and sometimes exhibit variability, while new eponymous units are usually formed through calquing or adaptation. According to their sources, eponyms are classified into groups based on anthroponyms, toponyms, brand or company names, and mythological names.

6. The adaptation of biotechnology terms from English into Uzbek is a complex cognitive process that involves phonetic-morphological adjustment, conceptual interpretation, and semantic integration, and it contributes to the formation of new terminological paradigms in Uzbek scientific discourse.

7. Based on prototype theory, biotechnology terms have been divided into eleven conceptual categories (*space, substances*

, *biological objects, properties, processes, values and units of measurement, technology, equipment, products, scientific and industrial fields, and agents*), with the category of “*biological objects*” occupying the central position in the system, while categories such as “*processes*”, “*technologies*”, “*properties*” and “*substances and products*” are located at the periphery.

8. Based on the frame–subframe–slot principle, the “Biotechnology” frame was developed, reflecting the interconnected conceptual structure of the research field, subjects, processes, methods, and objects. This model was evaluated as a universal cognitive structure demonstrating how the internal system of biotechnology terms and their scientific and functional relations are organized within a unified conceptual space.

9. In biotechnology terminology, metaphorization serves to explain complex scientific concepts to the human mind through familiar concepts. Metaphorical units are primarily formed on the basis of four source domains – *the human world, technology and objects, natural phenomena and bodies, and military concepts*– and determine the motivation, semantic precision, and conceptual structure of biotechnology terms.

10. Although metaphors in the biotechnology discourse of English and Uzbek are formed on the basis of common conceptual models, their linguistic realization differs: in English, they function as stable and standardized elements of terminology, whereas in Uzbek, they are mostly context-dependent and manifest in a functional form. Nevertheless, in both languages, metaphorization serves as an important tool for conceptualizing biotechnological knowledge and elucidating the connections between scientific concepts.

**НАУЧНЫЙ СОВЕТ PhD.03/2025.27.12.Fil.06.05 ПО ПРИСУЖДЕНИЮ
УЧЕНОЙ СТЕПЕНИ ПРИ УРГЕНЧСКОМ ГОСУДАРСТВЕННОМ
УНИВЕРСИТЕТЕ ИМЕНИ АБУ РАЙХАНА БЕРУНИ**

**НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ УЗБЕКИСТАНА ИМЕНИ МИРЗО
УЛУГБЕКА**

АДАМБАЕВА ФЕРУЗА РУСТАМБЕКОВНА

**СТРУКТУРНО-СЕМАНТИЧЕСКИЕ И КОГНИТИВНЫЕ
ОСОБЕННОСТИ ТЕРМИНОВ ПО БИОТЕХНОЛОГИИ В
АНГЛИЙСКОМ И УЗБЕКСКОМ ЯЗЫКАХ**

**10.00.06 – Сравнительное литературоведение, сопоставительное языкознание и
переводоведение**

**АВТОРЕФЕРАТ
диссертации доктора философии (PhD) по филологическим наукам**

Ургенч – 2026

Тема диссертационной работы доктора философии (PhD) по филологическим наукам зарегистрирована в Высшей аттестационной комиссии при Министерстве высшего образования, науки и инноваций Республики Узбекистан под номером B2025.2.PhD/Phil2515.

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С диссертацией можно ознакомиться в Информационно-ресурсном центре Ургенчского государственного университета имени Абу Райхана Беруни (зарегистрирована под номером 9-974). (Адрес: 220100, город Ургенч, улица Х. Алимджана, дом 14. Тел.: (+99862) 224-67-00; e-mail: arm@urdu.uz)

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ВВЕДЕНИЕ (аннотация диссертации доктора философии (PhD))

Цель исследования заключается в выявлении структурно-семантических и когнитивных особенностей терминов, относящихся к биотехнологии, в английском и узбекском языках.

Объектом исследования является корпус терминов, используемых в терминологических словарях на английском и узбекском языках, научных и учебно-методических текстах, нормативно-правовых документах, относящихся к сфере биотехнологии, а также интернет-источниках.

Научная новизна исследования заключается в следующем:

выявлена гетерогенная система биотехнологической терминологии английского и узбекского языков, сформированная на основе международных, заимствованных и калькированных единиц на стыке таких дисциплин, как биология, генетика, микробиология, медицина, химия, инженерия и информационные технологии, в сравнительно-сопоставительном аспекте теоретически и практически раскрыты историко-этимологические аспекты лексических единиц, семантическая и когнитивная адаптация и стабилизация международных терминов в системе принимающего языка в процессе заимствования;

в результате структурно-статистического анализа было установлено, что в сравниваемых языках термины, относящиеся к биотехнологии, формируются морфологическими (аффиксация, конверсия), морфолого-синтаксическими (композиция, блендинг, сокращение), синтаксическими, семантическими и лексико-семантическими методами, выражают сложные научные понятия и используют в своей структуре эпонимические единицы, и в результате в английском языке преобладает морфолого-синтаксическая модель, тогда как в узбекском языке доминируют лексико-семантическое заимствование и многокомпонентные синтаксические терминологические сочетания;

доказано, что в английской и узбекской биотехнологической терминологии парадигматические отношения, такие как синонимия, антонимия, полисемия и гипер-гипонимия, возникают в результате наименования научных понятий на основе различных семантических признаков, и их эффективность в обогащении системы биотехнологических терминов в обоих языках подтверждена;

концептуальные категории терминов, связанных с биотехнологией, в английском и узбекском языках были определены, выявлены иерархико-концептуальные отношения между фреймом биотехнологии и его субфреймами и слотами, а также показано формирование метафорических единиц внутри терминов на основе четырёх исходных областей (мир человека, техника и предметы, природные явления и объекты, военная сфера), а также продемонстрированы сходства и различия в их реализации в обоих языках на примерах.

Внедрение результатов исследования. На основе выводов, полученных в ходе изучения структурно-семантических и когнитивных особенностей биотехнологических терминов в английском и узбекском языках:

выводы, полученные в результате сопоставительного анализа биотехнологической терминологии английского и узбекского языков в диахроническом и синхроническом аспектах – с выявлением её гетерогенной системы, формируемой на стыке таких дисциплин, как биология, генетика, микробиология, медицина, химия, инженерное дело и информационные технологии, на основе международных, заимствованных и калькированных единиц, а также с учётом историко-этимологических особенностей лексических единиц и семантически-когнитивной адаптации и стабилизации международных терминов в процессе их освоения были использованы в рамках программы Европейского союза Erasmus+ на 2023–2025 годы, проект № ERASMUS-EDU-2022-101082242 «12-PLEDGE (Innovative and Interdisciplinary Programmes in Bio-medical Engineering to Leverage and Exploit the Digital Growth Programme for Students' Employability in Uzbekistan)» (справка № 430 от 7 апреля 2025 года, Ургенчский филиал Ташкентского университета информационных технологий имени Мухаммада ал-Хорезми). В результате были обогащены научно-теоретические основы образовательной программы по направлению «Биомедицинская инженерия», а также практически укреплены методические принципы перевода биотехнологической терминологии;

выводы о формировании терминов, связанных с биотехнологией, в сопоставляемых языках морфологическими (аффиксация, конверсия), морфолого-синтаксическими (композиция, блендинг, аббревиация), синтаксическими, семантическими и лексико-семантическими методами, об их способности выражать сложные научные концепции и о применении эпонимических единиц в структуре терминов, а также о преобладании морфолого-синтаксической модели в английском языке и лексико-семантического заимствования с многокомпонентными синтаксическими терминологическими сочетаниями в узбекском языке, были использованы в рамках грантового проекта Европейского союза Erasmus+ на 2023–2025 годы «ECAMPUZ – European World Talent Camp for Uzbekistan Scientists in Food Science and Technology» (ERASMUS-EDU-2022-CBHE) (справка № 1/06-1231 от 21 апреля 2025 года, Ташкентский химико-технологический институт). В результате учебные материалы для продвинутых курсов по направлению «Пищевая наука и технологии» были обогащены в научно-теоретическом аспекте, содержание программ обновлено с учётом международного опыта, а также усовершенствованы методические подходы к переводу терминологии в курсах «Биотехнология» и «Безопасность пищевых продуктов»;

научные результаты о парадигматических отношениях, таких как синонимия, антонимия, полисемия и гиперо-гипонимия в терминологии биотехнологии английского и узбекского языков, возникающих в результате наименования научных понятий на основе различных семантических признаков, а также об их эффективности в обогащении системы биотехнологических терминов в обоих языках были использованы в рамках грантового проекта программы ERASMUS+ 598340-EPP-1-2018-1-ES-EPPKA2-CBHE-JP «University Cooperation Framework for Knowledge Transfer in Central Asia and China (UNICAC)» (справка № 04/11-5371 от 24 апреля 2025 года,

Национальный университет Узбекистана имени Мирзо Улугбека). В результате данное исследование послужило эффективным теоретическим ресурсом для совершенствования учебно-методических материалов, предназначенных для магистрантов;

научные выводы о выявлении концептуальных категорий терминов, связанных с биотехнологией, в английском и узбекском языках, о раскрытии иерархико-концептуальных отношений между фреймом биотехнологии и его субфреймами и слотами, а также о формировании метафорических единиц внутри терминов на основе четырёх исходных областей (мир человека, техника и предметы, природные явления и объекты, военная сфера) и демонстрации сходств и различий их реализации в обоих языках через примеры, были использованы при подготовке сценариев телевизионных программ «Najot bilimda», «Salomatlik sirlari» и «Agroolam», транслируемых Хорезмской областной телерадиокомпанией (справка № 319 от 9 апреля 2025 года). В результате повысилось качество научного содержания телепрограмм, и сложные биотехнологические концепты были донесены до широкой аудитории ясно, плавно и на научной основе.

Апробация результатов исследования. Результаты данного исследования были обсуждены на 14 научно-практических конференциях, в том числе на 12 международных и 2 республиканских конференциях.

Публикация результатов исследования. По теме диссертации опубликовано 27 научных работ, в том числе 12 статей в научных изданиях, рекомендованных Высшей аттестационной комиссией Республики Узбекистан для публикации основных научных результатов (10 в республиканских и 2 в зарубежных журналах), а также получено свидетельство о регистрации одного программного средства, разработанного для электронных вычислительных машин.

Структура и объем диссертации. Диссертация состоит из введения, трех глав, заключения и списка использованной литературы, общий объем составляет 146 страниц.

E'LON QILINGAN ISHLAR RO'YXATI
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