



PROCEEDINGS OF UZBEKISTAN-CHINA INTERNATIONAL SYMPOSIUM ON "CURRENT ISSUES IN THE CULTIVATION AND UTILIZATION OF MEDICINAL PLANTS"



Tashkent, June 18-19, 2026

<https://doi.org/10.5281/zenodo.21356314>

“DORIVOR O‘SIMLIKLARNI YETISHTIRISH VA ULARDAN FOYDALANISHNING DOLZARB MASALALARI” MAVZUSIDAGI O‘ZBEKISTON – XITOIY XALQARO SIMPOZIUM DASTURI

SIMPOZIUM HAQIDA

“Dorivor o‘simliklarni yetishtirish va ulardan foydalanishning dolzarb masalalariga bag‘ishlangan O‘zbekiston – Xitoy xalqaro simpoziumi” – turli ilmiy maktablar va yosh olimlar o‘rtasida tajriba almashinuvini yo‘lga qo‘yish, mavjud tizimli muammolarning fundamental va amaliy yechimlarini ishlab chiqish hamda yangi qo‘shma transchegaraviy ilmiy loyihalarni shakllantirish uchun nufuzli integratsiya maydoni bo‘lib xizmat qiladi.

Xalqaro simpoziumni o‘tkazishdan ko‘zlangan bosh maqsad – O‘zbekiston va Xitoy Xalq Respublikasining dorivor o‘simliklarni yetishtirish, xomashyoni chuqur qayta ishlash, fitokimyo, biotexnologiya, agrotexnologiya, oziq-ovqat xavfsizligi, an‘anaviy tibbiyot va xalq tabobati sohalaridagi yetakchi olimlari, tadqiqotchilari hamda brend ishlab chiqaruvchilari (biznes sektori) o‘rtasidagi integratsiyani sifat jihatidan yangi bosqichga ko‘tarishga xizmat qiluvchi yuqori texnologik xalqaro platforma yaratishdan iboratdir.

Simpoziumning ustuvor konseptual vazifasi – dorivor o‘simliklar fito-industriyasida xomashyo yetishtirishdan tayyor yuqori qiymatli mahsulot ishlab chiqarishgacha bo‘lgan vertikal integratsiyani, ya‘ni «Urug‘dan – Bozorgacha» (Seed-to-Market) to‘liq qiymat zanjiri tamoyilini tizimli shakllantirish va ilmiy asoslashdan iboratdir.

SIMPOZIUM TASHKILOTCHILARI:

- ✓ O‘zbekiston Respublikasi Oliy ta‘lim, fan va innovatsiyalar vazirligi;
- ✓ «O‘zkimyo sanoat» aksiyadorlik jamiyati (Toshkent, O‘zbekiston);
- ✓ Toshkent kimyo-texnologiya instituti (Toshkent, O‘zbekiston);
- ✓ Dorivor o‘simliklarni yetishtirish va qayta ishlash ilmiy-ishlab chiqarish markazi (Toshkent, O‘zbekiston);
- ✓ Shandun texnologiya universiteti (Zibo, Shandun, Xitoy);
- ✓ Silu texnologiya universiteti (Shandong fanlar akademiyasi, Jinan, Shandong, Xitoy);
- ✓ Shandun Fanlar akademiyasi, Ekologiya instituti (Silu texnologiya universiteti, Jinan, Xitoy);
- ✓ Nankin agrar universiteti (College of Plant Protection, Nankin, Xitoy);
- ✓ Nankay universiteti (School of Life Sciences, Tyanszin, Xitoy);
- ✓ Shimoliy-G‘arbiy qishloq va o‘rmon xo‘jaligi universiteti (Yanlin, Xitoy);
- ✓ Toshkent davlat agrar universiteti (Toshkent, O‘zbekiston);
- ✓ «Soil EcoBiotechnology» Xitoy-O‘zbekiston qo‘shma laboratoriyasi (Xitoy-O‘zbekiston).

HAMKOR TASHKILOTLAR

- ✓ O‘zbekiston Respublikasi Oliy Majlisi Senati Fan, ta‘lim va sog‘liqni saqlash masalalari qo‘mitasi;
- ✓ O‘zbekiston Respublikasi Fanlar Akademiyasi;
- ✓ O‘zbekiston oziq-ovqat sanoati uyushmasi;
- ✓ “O‘zyog‘moysanoat” uyushmasi;
- ✓ O‘zbekiston xalq tabobati assotsiatsiyasi;
- ✓ “SHANAZ” MChJ;
- ✓ “Health Line” MChJ;
- ✓ “Zuma Pharma” MChJ;

XALQARO TASHKILOTLAR:

- ✓ D.I.Mendeleyev nomidagi Rossiya kimyo-texnologiya universiteti;
- ✓ M.Auezov nomidagi Janubiy Qozog‘iston universiteti;
- ✓ “Respublika mikroorganizmlar kolleksiyasi” MCHJ (Qozog‘iston);
- ✓ Integral universiteti (Hindiston);
- ✓ Obuda universiteti (Vengriya);
- ✓ Jianshi universiteti (Xitoy).

- ✓ “Laxisam Pharmaceuticals” MChJ;
- ✓ “Bayan Medical” MChJ.

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1. **Usmonov Botir Shukurillayevich** – TKTI rektori, professor – rais;
2. **Raximov Farxad Xushbakovich** – TKTI prorektori, professor – rais o‘rinbosari;
3. **Karabayev Dilshod Timurovich** – TKTI professori – simpozium kotibi;
4. **Safarov Toir Tursunovich** – TKTI prorektori, professor;
5. **Qodirov Bobiromon Bekmurodovich** – TKTI prorektori, professor;
6. **Boborajabov Baxodir Nasriddinovich** – TKTI prorektori, dotsent;
7. **Ziyadullayev Odiljon Egamberdiyevich** – TKTI prorektori, professor;
8. **Kamolov Azizbek Baxtiyor o‘g‘li** – TKTI bo‘lim boshlig‘i, dotsent;
9. **Buxorov Shuxrat Buriyevich** –TKTI dekani, professor;
10. **Normatov Anvar Mirzayevich** – TKTI dekani, professor;
11. **Xo‘jamshukurov Nortoqi Abdixalikovich** – TKTI professori, «Soil EcoBiotechnology» Xitoy-O‘zbekiston qo‘shma laboratoriyasi mudiri;
12. **Nazarov G‘olib Abdushukurovich** – TKTI "Biotexnologiya" kafedrasi mudiri, dotsent;
13. **Babaxanova Zebo Abdullayevna** – TKTI professori;
14. **Toshmammedov Mugrajiddin Saloxovich** – TKTI professori;
15. **Serkayev Qamar Pardayevich** – TKTI professori;
16. **Izbasarov Baxrom Ergashevich** – Dorivor o‘simliklarni yetishtirish va qayta ishlash ilmiy-ishlab chiqarish markazi bosh direktori, professor;
17. **Bo‘riyev Hasan Chutbayevich** – Toshkent davlat agrar universiteti professori;
18. **Fangling Du** – Shandun texnologiya universiteti Partiya qo‘mitasi kotibi o‘rinbosari, professor (Xitoy);
19. **Yemin Guo** – Shandun texnologiya universiteti, Sabzavotlar xavfsizligi va sifatini nazorat qilish, muhandislik tadqiqot markazi direktori, professor (Xitoy);
20. **Xia Sun** – Shandong Texnologiya Universiteti, Shandong provicaial muhandislik tadqiqot markazi katta ilmiy xodimi, professor (Xitoy);
21. **Xiao Wang** – Kimyo va farmatsiya fakulteti direktori, Silu texnologiya universiteti, professor (Xitoy);
22. **Shanshan Wang** – Kimyo va farmatsiya fakulteti partiya kotibi o‘rinbosari, Silu texnologiya universiteti, professor (Xitoy);
23. **Wei Liu** – Shandong tahlil va sinov markazi direktori o‘rinbosari, Kimyo va farmatsiya fakulteti, Silu texnologiya universiteti, professor (Xitoy);
24. **Wei Liu** – Shandong tahlil va sinov markazi ilmiy xodimi, Silu texnologiya universiteti, dotsent (Xitoy);
25. **Jinqian Yu** – Sili texnologiya universiteti (Shandun Fanlar akademiyasi), Shandong Tahlil va Sinov Markazi katta ilmiy xodimi, dotsent (Xitoy);
26. **Jin-Hua Xiao** – Nankay universiteti professori (Xitoy);
27. **Jishun Li** – Shandun fanlar akademiyasi, Ekologiya instituti, Atrof-muhit mikroorganizmlari tadqiqot guruhi va «Soil EcoBiotechnology» Xitoy-O‘zbekiston qo‘shma laboratoriyasi direktori, professor (Silu texnologiya universiteti, Xitoy);
28. **Yanli Wei** – Shandun fanlar akademiyasi, Ekologiya instituti bosh ilmiy xodimi, professor (Silu texnologiya universiteti, Xitoy);
29. **Fajun Chen** – Nankin agrar universiteti professori (Xitoy);
30. **Kedelbayev Baxitjan** – M.Avezov nomidagi Janubiy Qozog‘iston tadqiqot universiteti professori;
31. **Temirxanov Aslan** - Respublika Mikroorganizmlar To‘plami (Qozog‘iston), professor;
32. **Nurbekova Jadirassin** - Yevroosiyo Milliy Universiteti dotsenti (Qozog‘iston);
33. **Farooqui Alvina** – Integral universiteti, Biomuhandislik kafedrasi mudiri, professor (Hindiston);

34. **Mukesh Kumar Awasthi** – Shimoliy-Gʻarbiy qishloq va oʻrmon xoʻjaligi universiteti dotsenti (Xitoy);
35. **Viktor Machtcherine** – Drezden Texnika Universiteti, Qurilish Materiallari Instituti direktori (Germaniya).

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Simpozium shoʻbalari

1-shoʻba. Dorivor oʻsimliklar bioxilma-xilligi, genofondi va zamonaviy agrotexnologiyalari

Rais: Dorivor oʻsimliklarni yetishtirish va qayta ishlash ilmiy-ishlab chiqarish markazi bosh direktori, professor **B.E.Izbasarov**.

Hamrais: “Biotexnologiya” kafedrası mudiri, dotsent **Gʻ.A.Nazarov**.

Kotib: “Biotexnologiya” kafedrası katta oʻqituvchisi **X.O.Abdullayev**.

2-shoʻba. Dorivor oʻsimliklar fitokimyosi, biotransformatsiyasi va xomashyoni chuqur qayta ishlash

Rais: Silu texnologiya universiteti (SDAS), Kimyo va farmatsiya fakulteti partiya kotibi oʻrinbosari, professor **Shanshan Van** (Xitoy);

Hamrais: “Oziq-ovqat va parfyumeriya-kosmetika mahsulotlari texnologiyasi” kafedrası mudiri, t.f.d., professor **A.T.Ruziboyev**.

Kotib: “Biotexnologiya” kafedrası katta oʻqituvchisi **A.Sh.Otajonov**.

3-shoʻba. Farmakologiya, tibbiyot va oziq-ovqat sanoatida dorivor oʻsimliklardan foydalanishning dolzarb masalalari

Rais: Shandun texnologiya universiteti Partiya kotibi, professor **Fangling Du** (Xitoy);

Hamrais: OʻzR FA akademik O.Sodiqov nomidagi “Bioorganik kimyo” instituti yetakchi ilmiy xodimi, k.f.n., k.i.x. **U.J.Ishimov**.

Kotib: “Biotexnologiya” kafedrası katta oʻqituvchisi **D.Sh.Matchanova**.

4-shoʻba. Fito-industriya iqtisodiyoti, marketing va xalqaro hamkorlik istiqbollari

Rais: Nankay universiteti professori **Jin-Hua Xiao** (Xitoy);

Hamrais: “Biotexnologiya” kafedrası professori, t.f.d., prof. **S.S.Ravshanov**.

Kotib: “Biotexnologiya” kafedrası katta oʻqituvchisi **F.B.Abdullayeva**.

Simpozium moderatorlari:

Pulatov Khayrulla Lutpullaevich - TKTI, «Sanoat ekologiyasi va yashil texnologiyalar» kafedrası professori;

Salijonova Shahnozaxon Dilmurodovna - TKTI, «Oziq-ovqat va parfyumeriya-kosmetika mahsulotlari texnologiyasi» kafedrası dotsenti, DSc.

Simpozium shakli

Simpozium turli xil formatlarni oʻz ichiga oladi, jumladan, ochilish marosimidan soʻng yalpi (planar), asosiy va taklif etilgan maʼruzalar tinglanadi. Parallel shoʻba majlislarida maʼruzalar taqdimoti boʻlib oʻtadi, poster maʼruzalar esa vorkshop (amaliy seminar) davomida namoyish etiladi. Simpozium gibril (ham offlayn, ham onlayn) formatda oʻtkaziladi.

Link for online participation:

<https://voovmeeting.com/dm/s4yb4fw9VBHJ>

#Tencent Meeting : 859-0871-0474

Rasmiy til

Simpoziumning rasmiy tillari oʻzbek va ingliz tillari hisoblanadi.

Muhim sanalar

18/06/2026 Tabrik so‘zi + Ochilish marosimi + Asosiy ma’ruzalar + Sho‘ba yig‘ilishlari
19/06/2026 Asosiy ma’ruzalar + Sho‘ba yig‘ilishlari + Yopilish marosimi + Toshkent bo‘ylab
ekskursiya (ixtiyoriy va to‘lov asosida*)

***So‘rovlar yoki bekor qilish to‘g‘risidagi bildirishnomalar quyidagi manzilga yuborilishi lozim:**

e-mail: kdtinfo659@gmail.com; *Telegram:* [@KDT0803](https://www.t.me/KDT0803)

PROGRAM

OF THE UZBEKISTAN-CHINA INTERNATIONAL SYMPOSIUM ON "CURRENT ISSUES IN THE CULTIVATION AND UTILIZATION OF MEDICINAL PLANTS"

ABOUT THE SYMPOSIUM

The Uzbekistan–China International Symposium on "Current Issues in the Cultivation and Utilization of Medicinal Plants" serves as a prestigious integration platform for establishing experience exchange between various scientific schools and young scientists, developing fundamental and practical solutions to existing systemic problems, and forming new joint transboundary scientific projects.

The main objective of the international symposium is to create a high-tech international platform that serves to elevate the integration between leading scientists, researchers, and brand manufacturers (the business sector) of Uzbekistan and the People's Republic of China in the fields of medicinal plant cultivation, advanced raw material processing, phytochemistry, biotechnology, agrotechnology, food safety, traditional medicine, and folk medicine to a qualitatively new level.

The priority conceptual task of the symposium is to systematically form and scientifically substantiate the vertical integration in the medicinal plant phyto-industry from raw material cultivation to the production of ready high-value products, specifically the complete value chain principle: "Seed-to-Market".

SYMPOSIUM ORGANIZERS:

- Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan;
- "Uzkimyosanoat" Joint-Stock Company (Tashkent, Uzbekistan);
- Tashkent Institute of Chemical Technology (Tashkent, Uzbekistan);
- Scientific and Production Center for the Cultivation and Processing of Medicinal Plants (Tashkent, Uzbekistan);
- Shandong University of Technology (Zibo, Shandong, China);
- Qilu University of Technology (Shandong Academy of Sciences), Faculty of Chemistry and Pharmacy, Shandong Analysis and Test Center (Jinan, Shandong, China);
- Institute of Ecology, Shandong Academy of Sciences (Qilu University of Technology, Jinan, China);
- Nanjing Agricultural University (College of Plant Protection, Nanjing, China);
- Nankai University (School of Life Sciences, Tianjin, China);
- Northwest A&F University (College of Natural Resources and Environment, Yangling, China);
- Tashkent State Agrarian University (Tashkent, Uzbekistan);
- Uzbek–Chinese Joint Laboratory of "Soil Eco Biotechnology" (Uzbekistan- China).

PARTNER ORGANIZATIONS

- ✓ Committee on Science, Education and Health of the Senate of the Oliy Majlis of the Republic of Uzbekistan;
- ✓ Academy of Sciences of the Republic of Uzbekistan;
- ✓ Uzbekistan Food Industry Association;
- ✓ "Uzyogmoysanoat" Association;
- ✓ The association of traditional medicine of Uzbekistan;
- ✓ "SHANAZ" LLC;
- ✓ "Health Line" LLC;

INTERNATIONAL ORGANIZATIONS

- ✓ Dresden University of Technology (Germany);
- ✓ Mendelev University of Chemical Technology of Russia;
- ✓ M.Auezov South Kazakhstan University;
- ✓ "Republican Collection of Microorganisms" LLP (Kazakhstan);
- ✓ Integral University Lucknow, India;
- ✓ Óbuda University, Hungary;
- ✓ Jiangsu University (China).

- ✓ “Zuma Pharma” LLC;
- ✓ “Laxisam Pharmaceuticals” LLC;
- ✓ “Bayan Medical” LLC.

Scientific Committee Members of the Uzbekistan–China International Symposium on "Current Issues in the Cultivation and Utilization of Medicinal Plants"

1. **Botir Usmonov** – Rector of TICT, Professor – Chairman;
2. **Farxad Raximov** – Vice-Rector of TICT, Professor – Vice-Chairman;
3. **Dilshod Karabayev** – Professor of TICT, – Symposium Secretary;
4. **Toir Safarov** – Vice-Rector of TICT, Professor;
5. **Bobiromon Kodirov** – Vice-Rector of TICT, Professor;
6. **Baxodir Boborajabov** – Vice-Rector of TICT, Professor;
7. **Odiljon Ziyadullayev** – Vice-Rector of TICT, Professor;
8. **Azizbek Kamolov** – Head of Department at TICT, Associate Professor;
9. **Shuxrat Buxorov** – Dean of the Faculty at TICT, Professor;
10. **Anvar Normatov** – Dean of the Faculty TICT, professor;
11. **Nortoji Khujamshukurov** – Professor at the TICT, Head of the Uzbek–Chinese Joint Laboratory of "Soil EcoBiotechnology", professor;
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13. **Mugrajitdin Toshmuxammedov** – Professor of TICT;
14. **Zebo Babaxanova** – Professor at the TICT;
15. **Qamar Serkaev** - Professor at the TICT;
16. **Baxrom Izbasarov** – Director General of the Scientific and Production Center for the Cultivation and Processing of Medicinal Plants, Professor;
17. **Hasan Bo'riyev** - Professor at the Tashkent State Agrarian University;
18. **Fangling Du** – Deputy Secretary of the Party Committee of Shandong University of Technology, Professor (China);
19. **Yemin Guo** – Director of the Engineering Research Center for Vegetable Safety and Quality Control at Shandong University of Technology, Professor (China);
20. **Xia Sun** – Senior Researcher at the School of Agricultural Engineering and Food Science and the Shandong Provincial Engineering Research Center, Shandong University of Technology, Professor (China);
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22. **Shanshan Wang** – Deputy Party Secretary of the Faculty of Chemistry and Pharmacy, Qilu University of Technology, professor (SDAS, China);
23. **Wei Liu** - Deputy Director of Shandong Analysis and Test Center, Faculty of Chemistry and Pharmacy, Qilu University of Technology, professor (SDAS, China);
24. **Wei Liu** – Researcher at Shandong Analysis and Test Center, Qilu University of Technology, Associate Professor (SDAS, China);
25. **Jinqian Yu** – Senior Researcher at Shandong Analysis and Test Center, Qilu University of Technology, Associate Professor, (SDAS, China);
26. **Jin-Hua Xiao** – Professor at the Nankai University (China);
27. **Jishun Li** – Director of the Environmental Microbiology Research Group at the Institute of Ecology, Shandong Academy of Sciences (Qilu University of Technology) and Director of the Uzbek–Chinese Joint Laboratory of "Soil EcoBiotechnology", Professor (China);
28. **Yanli Wei** – Chief Researcher at the Institute of Ecology, Shandong Academy of Sciences, professor (Qilu University of Technology, China);

29. **Fajun Chen** – Professor at the Nanjing Agricultural University (China);
30. **Bakhytzhan Kedelbaev** – Professor at the M.Auezov South Kazakhstan Research University;
31. **Aslan Temirkhanov** – Scientific Secretary, Republican Collection of Microorganisms (Kazakhstan);
32. **Zhadyrassyn Nurbekova** - Associate professor, L.N.Gumilyov ENU (Kazakhstan);
33. **Farooqui Alvina** - Head Department of Bioengineering, Integral University, professor (India);
34. **Mukesh Kumar Awasthi** - Associate Professor, Northwest A&F University (China);
35. **Viktor Mechtcherine** – Director of the Institute of Construction Materials, Technische Universität Dresden (Germany).

Organizing Committee Members of the Uzbekistan–China International Symposium on "Current Issues in the Cultivation and Utilization of Medicinal Plants"

Scientific Sessions

Session 1. Biodiversity, Gene Pool, and Modern Agrotechnologies of Medicinal Plants

Chair: Professor **B.E.Izbasarov** – Director General of the Scientific and Production Center for the Cultivation and Processing of Medicinal Plants (Uzbekistan);

Co-Chair: Associate Professor **G'.A. Nazarov** – Head of the Department of Biotechnology, TICT (Uzbekistan);

Secretary: **X.O.Abdullayev** – Senior Lecturer at the Department of Biotechnology, TICT (Uzbekistan);

Session 2. Phytochemistry, Biotransformation, and Advanced Processing of Medicinal Plant Raw Materials

Chair: Professor **Shanshan Wang** - Deputy Party Secretary of the Faculty of Chemistry and Pharmacy, Qilu University of Technology (SDAS, China);

Co-Chair: Professor **A.T.Ruziboyev** – Head of the Department of Food and Perfume-Cosmetic Products Technology, professor, TICT, (Uzbekistan);

Secretary: **A.Sh.Otajonov** – Senior Lecturer at the Department of Biotechnology, TICT (Uzbekistan);

Session 3. Current Issues in the Utilization of Medicinal Plants in Pharmacology, Medicine, and the Food Industry

Chair: Professor **Fangling Du** – Party Secretary of Shandong University of Technology (China);

Co-Chair: Dr. **U.J.Ishimov** – Leading Researcher at the Institute of Bioorganic Chemistry named after Academician O.Sadikov of the Academy of Sciences of the Republic of Uzbekistan, PhD (Uzbekistan);

Secretary: Dr. **D.Sh.Matchanova** – Senior Lecturer at the Department of Biotechnology, TICT (Uzbekistan);

Session 4. Economics of Phyto-Industry, Marketing, and Prospects for International Cooperation

Chair: Professor **Jin-Hua Xiao** – Professor of Nankai University (China);

Co-Chair: Professor **S.S.Ravshanov** – Professor of the Department of Biotechnology, TICT (Uzbekistan);

Secretary: **F.B.Abdullayeva** – Senior Lecturer at the Department of Biotechnology, TICT (Uzbekistan);

Symposium Moderators

Khayrulla Pulatov - Professor of the Department of Industrial Ecology and Green Technologies, TICT.

Shakhnozakhon Salijonova - Associate Professor of the Department of Technology of Food and Perfumery-Cosmetic Products, DSc, TICT.

SYMPOSIUM FORMAT

The symposium will feature a diverse range of formats, including an opening ceremony followed by plenary, keynote, and invited lectures. Parallel sessions will host oral presentations, while poster presentations will be exhibited throughout the workshop. The symposium will be conducted in a hybrid (both offline and online) format. **Link for online participation:** <https://voovmeeting.com/dm/s4yb4fw9VBHJ> #Tencent Meeting : 859-0871-0474

Official Languages

Uzbek and English is used as the official language at the symposium.

Important dates

18/06/2026 Welcome + Opening ceremony + Keynote lectures + Parallel sessions
19/06/2026 Keynote lectures + Parallel sessions + Closing ceremony + *Excursion in Tashkent
(*optional and pay fee*)

***Inquiry or cancellation should be sent to:** e-mail: kdtinfo659@gmail.com; Telegram: [@KDT0803](https://www.t.me/KDT0803)

Ildizlanish bosqichida esa $\frac{1}{2}$ MS + IBA (0,5 mg/L) muhitida 100 % ildizlanish qayd etildi. Oʻrtacha ildiz soni $5,2 \pm 0,7$ ni tashkil etdi. IBA ning yuqori samaradorligi uning oʻsimlik toʻqimalarida barqarorligi va ildiz primordiyalarining shakllanishini ragʻbatlantirishi bilan bogʻliq [5].

Olingan natijalar Senna tora uchun optimal mikrokoʻpaytirish va ildizlanish sharoitlarini aniqlash imkonini berdi hamda dorivor oʻsimliklarni sanoat miqyosida koʻpaytirish uchun muhim ilmiy asos yaratdi.

Xulosa. Tadqiqot natijalari Senna tora L. oʻsimligini in vitro sharoitida samarali mikrokonal koʻpaytirish mumkinligini koʻrsatdi. Garmonsiz MS muhiti urugʻlarning maksimal unuvchanligini taʼminladi, MS + BAP (1,0 mg/L) + kinetin (0,5 mg/L) kombinatsiyasi regeneratsiya uchun, $\frac{1}{2}$ MS + IBA (0,5 mg/L) muhiti esa ildizlanish uchun optimal variant sifatida aniqlandi. Ishlab chiqilgan texnologiya dorivor oʻsimliklarni genetik jihatdan barqaror holda tez koʻpaytirish va bioresurslarni saqlashda amaliy ahamiyatga ega.

Foydalanilgan adabiyotlar

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PHYTOCHEMICAL-MEDIATED NANOMATERIALS FOR OPTICAL SENSING APPLICATIONS: EMERGING TRENDS AND FUTURE PROSPECTS

Sobia Siddiqui*, Tahmeena Khan

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Abstract. Phytochemical-mediated synthesis offers a sustainable and eco-friendly way to produce nanomaterials (NMs) with better optical properties. Plant-based biomolecules such as polyphenols, flavonoids, proteins, and polysaccharides naturally help reduce and stabilize nanoparticles, resulting in more stable products and less environmental harm. These green NMs have strong optical properties, making them useful for sensing. This review highlights recent progress in the use of phytochemical-based NMs for optical sensing, such as colorimetric, fluorescence, and optical fiber methods. These approaches enable sensitive and selective detection of biomolecules, metal ions, and pollutants, with rapid results and low cost. Despite progress, challenges

such as differences among plant extracts, reproducibility issues, and production limits persist. Still, advances in green nanotechnology are likely to make portable, real-time sensing devices possible for environmental and medical uses.

Keywords: Phytochemicals; Green Synthesis; Nanomaterials; Optical Sensing; Fluorescence Sensing; Colorimetric Sensing.

Introduction : Nanomaterials (NMs) have distinctive properties such as high surface area, tunable surface chemistry, strong catalytic activity, and notable optical properties. These qualities have led to their use in areas such as environmental cleanup, medicine, energy storage, and sensing technologies [1]. Traditional methods for making NMs often use toxic chemicals, require a lot of energy, and are costly, raising environmental and safety concerns [2-4]. Green nanotechnology offers a more sustainable way to make NMs. Plant-based phytochemicals like flavonoids, terpenoids, polyphenols, and alkaloids help reduce metal ions and stabilize nanoparticles. These natural molecules act as reducing, capping, and stabilizing agents, eliminating the need for harmful chemicals and enabling control of nanoparticle size, shape, and stability [5]. NMs made through phytochemical methods show unique optical, electronic, and surface properties, making them highly useful for sensing[1]. Optical sensing has become popular because it is sensitive, fast, non-destructive, and applicable to healthcare, environmental monitoring, and food safety. This review examines recent progress in phytochemical-based NMs and their emerging applications in optical sensing.

Research Methodology : The literature for this review was collected and examined to understand the role of phytochemical-mediated nanomaterials in optical sensing applications. The scope of the study includes green synthesis approaches, NM types, and their applications in optical sensing platforms. Research articles were collected mainly from Scopus and Google Scholar, and preference was given to recent publications reporting the synthesis of nanomaterials from a plant extracts and their applications in optical sensing , also the selected studies were compared based on the type of nanomaterial synthesized, plant source used for the synthesis, sensing strategy, target analyte, and analytical parameters, with special emphasis on colorimetric, fluorescence-based, and optical fiber-based sensing techniques.

Results and Discussion: Phytochemical-mediated synthesis offers an eco-friendly route for fabricating nanomaterials using plant-derived biomolecules as reducing and stabilizing agents while imparting desirable optical properties. Haridas et al. reported *Coffee arabica* leaf extract-mediated AgNPs for the colorimetric detection of L-cysteine with a 0.1 nM detection limit [6]. Babu and Doble developed a carbon–gold nanocomposite for fluorescence-based As(III) detection with a linear range of 5–800 ppb[7]. Gangal et al. integrated plant oil-synthesized AgNPs into enzyme-functionalized optical fibers for sensitive detection of ascorbic acid [8]. Tagad et al. used locust bean gum-stabilized AgNPs in optical fiber sensors for H₂O₂, achieving a sensing limit of 0.01 mM [9]. These studies highlight the versatility, tunable optical properties, and eco-friendly synthesis of phytochemical-mediated nanomaterials. Despite reproducibility

challenges stemming from plant extract variability, these methods show strong potential as low-cost, portable, and real-time optical sensing platforms.

Conclusion: Phytochemical-mediated nanomaterials provide a sustainable and effective way to develop optical sensing materials. Their unique optical properties and eco-friendly production enable the detection of biomolecules, heavy metals, and pollutants with high sensitivity. Using these materials in sensing systems shows great promise for ecological monitoring and biomedical applications. There are challenges with reproducibility and scaling up practical, portable, and real-time sensing technologies.

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