JOURNALS & BOOKS

ACADEMIC SCIENCE PUBLISHING

ОСНОВНОЙ ОРГАНИЗАТОР

ACADEMIC SCIENCE PUBLISHING

«НОВЫЕ НАУЧНЫЕ ГОРИЗОНТЫ - 2026»

МЕЖДУНАРОДНАЯ НАУЧНО-ПРАКТИЧЕСКАЯ КОНФЕРЕНЦИЯ

30 июля 2026 года | Ташкент • Лондон



ИНДЕКСАЦИЯ МАТЕРИАЛОВ КОНФЕРЕНЦИИ:

zenodo | OpenAIRE

academscience.com

Academic Research Publisher (United Kingdom)

UniScience journal (Republic of Uzbekistan)

Hamroh books (Uzbekistan)

****

Сборник материалов международной научно-практической конференции

«НОВЫЕ НАУЧНЫЕ ГОРИЗОНТЫ - 2026»

Ташкент, Лондон

30-июль, 2026

****

Новые научные горизонты – 2026 // Сборник материалов международной научно-практической конференции, 30-июль, 2026. Ташкент.

Члены редакционной коллегии конференции

Temnova L.V. - DSc, Professor (Moscow, Russia); **Sagatbayev Y.N.** - PhD, professor (Astana, Kazakhstan); **Duyshenaliev CH.D.** - DSc, Professor (Bishkek, Kyrgyzstan); **Pashkov S.V.** - PhD, professor (Petropavlovsk, Kazakhstan); **Khakimov K.A.** - PhD, docent (Tashkent, Uzbekistan); **Melekoglu M.** - DSc, professor (Eskisehir, Turkey); **Jurayev J**. - PhD, docent (Samarkand, Uzbekistan); **Azimov S.** -PhD, docent (Tashkent, Uzbekistan); **Shonazarov J**. -PhD, docent (Qarshi, Uzbekistan); **Gapparov B**. - Docent, (Jizzakh, Uzbekistan); **Qo'shayev T**. - Teacher, (Termiz, Uzbekistan); **Arifxodjayeva L**. - Teacher, (Tashkent, Uzbekstan)

Цель мероприятия заключается в обсуждении современных исследований, проводимых в различных научных направлениях, налаживании обмена новыми научными идеями, а также поддержке научной деятельности, соответствующей мировым инновационным процессам.

В рамках конференции учёные, исследователи, молодые учёные и практикующие специалисты получат возможность представить результаты своих научных исследований, обменяться научными идеями и расширить международное сотрудничество.

Основной целью данной международной научно-практической конференции является обобщение результатов современных исследований, проводимых в различных научных областях, а также укрепление интеграции науки и практики на основе передовых научных подходов.

Авторы несут полную ответственность за достоверность и надёжность содержания, сведений, фактов и статистических данных, приведённых в статьях.

The proceedings of the International Scientific-Practical Conference have been discussed by the Scientific-Technical Council of the international publisher **„Academic Research Publisher"** (London, United Kingdom) and recommended for publication (July 29, 2026, Protocol No. 27).

EFFECTS OF CULTIVATION CONDITIONS ON VOLATILE COMPOUND ACCUMULATION IN PIMPINELLA ANISUM L.: RESULTS OF GC-MS ANALYSIS

Akhrorova Barnokhon Komoliddin qizi

Tashkent Institute of Irrigation and Agricultural Mechanization Engineers National Research University, Tashkent, Uzbekistan

E-mail: bakhrorova@icloud.com

ORCID: 0009-0004-8014-7471

Annotatsiya. *Pimpinella anisum L. ning farmakologik va tijorat qiymati asosan uning efir moyi tarkibi bilan belgilanadi, unda trans-anetol ustunlik qiladi, shuningdek estragol, anisaldegid, limonen va metilxavikol mavjud. Tadqiqotda substrat turi (tuproq, kokos tolasi), sug'orish rejimi va mineral oziqlantirish (bor bilan boyitilgan kaltsiy nitrat, 17N+32CaO+1B) ning issiqxona sharoitida yetishtirilgan anisning uchuvchan birikmalar profiliga ta'siri gaz xromato-mass-spektrometriya (GC-MS) usulida, Agilent 8860/5977 tizimi va HP-5 kapillyar kolonkasi yordamida o'rganildi. Birikmalar NIST/EPA/NIH spektral kutubxonasi asosida aniqlandi, variantlar o'rtasida nisbiy pik maydonlari solishtirildi. Trans-anetol barcha variantlarda ustuvor komponent bo'lib qoldi, kaltsiy va bor bilan oziqlantirilgan tuproq substratida uning nisbiy miqdori yuqoriroq bo'lib, bu fenilpropanoid biosintezga rag'batlantiruvchi ta'sirni ko'rsatadi. Kokos tolasi substrati bir qator monoterpenlar va kislorodli aromatik birikmalarning barqarorroq to'planishini ta'minladi, bu yaxshiroq havo almashinuvi va namlik balansi bilan bog'liq. O'rtacha sug'orish hajmi (150 ml) aromatik birikmalarning eng barqaror to'planishi bilan bog'liq bo'ldi. Natijalar substrat, sug'orish rejimi va mineral oziqlantirish birgalikda anis efir moyining*

fitokimyoviy sifatini shakllantirishini ko'rsatadi, bu O'zbekistonda issiqxona sharoitida sifatli dorivor xomashyo olish uchun muhim ahamiyatga ega.

Kalit so'zlar: *Pimpinella anisum, efir moyi, trans-anetol, GC-MS, uchuvchan birikmalar, issiqxona yetishtirish, mineral oziqlantirish, fitokimyo.*

Аннотация. *Фармакологическая и коммерческая ценность Pimpinella anisum L. в значительной степени определяется составом эфирного масла, в котором преобладает транс-анетол наряду с эстраголом, анисовым альдегидом, лимоненом и метилхавиколом. В работе изучено влияние типа субстрата (почва, кокосовый койр), режима полива и минерального питания (нитрат кальция с бором, 17N+32CaO+1B) на профиль летучих соединений аниса, выращенного в тепличных условиях, методом газовой хромато-масс-спектрометрии (ГХ-МС) на приборе Agilent 8860/5977 с капиллярной колонкой HP-5. Соединения идентифицировали по библиотеке спектров NIST/EPA/NIH, сравнивались относительные площади пиков между вариантами опыта. Транс-анетол оставался доминирующим компонентом во всех вариантах, с более высоким относительным содержанием в почвенном субстрате при минеральной подкормке кальцием и бором, что указывает на стимулирующее влияние на биосинтез фенилпропаноидов. Кокосовый койр обеспечивал более стабильное накопление ряда монотерпенов и кислородсодержащих ароматических соединений, что связано с лучшей аэрацией и балансом влажности. Умеренный объём полива (150 мл) сопровождался наиболее стабильным накоплением ароматических соединений. Результаты показывают, что субстрат, режим полива и минеральное питание совместно формируют фитохимическое качество эфирного масла аниса, что важно для получения качественного лекарственного сырья в тепличных условиях Узбекистана.*

Ключевые слова: *Pimpinella anisum, эфирное масло, транс-анетол, ГХ-МС, летучие соединения, тепличное выращивание, минеральное питание, фитохимия.*

Abstract. *The pharmacological and commercial value of Pimpinella anisum L. is largely determined by its essential oil composition, dominated by trans-anethole together with estragole, anisaldehyde, limonene, and methyl chavicol. This study examined how substrate type (soil, coconut coir), irrigation regime, and mineral nutrition (calcium nitrate with boron, 17N+32CaO+1B) affect the volatile compound profile of anise grown under greenhouse conditions, using gas chromatography-mass spectrometry (GC-MS) with an Agilent 8860/5977 system and an HP-5 capillary column. Compounds were identified against the NIST/EPA/NIH spectral library, and relative peak areas were compared among treatments. Trans-anethole remained the dominant constituent in all treatments, with higher relative content in soil substrate supplemented with calcium and boron, suggesting a stimulatory effect on phenylpropanoid biosynthesis. Coconut coir substrate supported more stable accumulation of several monoterpenes and oxygenated aromatic compounds, linked to better aeration and moisture balance. A moderate irrigation volume (150 ml) was associated with the most stable aromatic compound accumulation. These findings indicate that substrate, irrigation, and mineral nutrition jointly shape the phytochemical quality of anise essential oil, providing guidance for producing improved medicinal raw material under greenhouse conditions in Uzbekistan.*

Keywords: *Pimpinella anisum, essential oil, trans-anethole, GC-MS, volatile compounds, greenhouse cultivation, mineral nutrition, phytochemistry.*

Background

The pharmacological and commercial value of Pimpinella anisum L. is primarily determined by the composition of its essential oil, whose principal constituent is trans-anethole (up to 80–90% of total oil composition), along with estragole, anisaldehyde,

limonene, and methyl chavicol. Because the biosynthesis of volatile compounds is sensitive to cultivation conditions, studying the effects of substrate, irrigation, and mineral nutrition on the phytochemical profile of anise is relevant for improving the quality of medicinal raw material.

Aim of the Study

To evaluate the effects of substrate type (soil, coconut coir), irrigation regime, and mineral nutrition (calcium nitrate with boron, 17N+32CaO+1B) on the qualitative and relative quantitative composition of volatile compounds in Pimpinella anisum L. using gas chromatography–mass spectrometry (GC-MS).

Materials and Methods

Aerial plant material was collected at physiological maturity from plants grown in a greenhouse at the Institute of Fundamental and Applied Research, TIIAME, under different experimental treatments (2 substrates × 2 mineral nutrition variants × 4 irrigation volumes). Volatile compounds were extracted by maceration in ethanol for 24 hours, followed by evaporation of the extract. Analysis was performed using an Agilent 8860/5977 GC-MS system with an HP-5 capillary column (30 m × 0.25 mm, film thickness 0.25 μm) in electron ionization mode (70 eV). Compounds were identified using the NIST/EPA/NIH mass spectral library. The obtained data were interpreted as relative peak areas reflecting comparative differences in the volatile fraction composition among treatments, rather than absolute metabolite concentrations.

Results and Discussion

In all experimental treatments, trans-anethole was the dominant constituent of the volatile fraction — the principal aroma-forming and pharmacologically important component of anise essential oil, responsible for its antioxidant and antimicrobial activity as well as commercial quality. Its relative content was higher in plants grown in soil substrate with mineral supplementation, suggesting a stimulatory effect of calcium and boron on phenylpropanoid biosynthesis.

Alongside trans-anethole, several compounds with variable content were identified — limonene, linalool, estragole, anisaldehyde, and methyl chavicol. Coconut coir substrate showed more stable accumulation of several monoterpenes and oxygenated aromatic compounds, associated with better aeration, more balanced moisture retention, and consequently more stable physiological conditions in the rhizosphere compared with soil substrate.

Application of calcium nitrate with boron in soil substrate promoted relatively higher accumulation of several aroma-forming compounds compared with the control. Calcium contributes to cell membrane stability and stress tolerance, while boron participates in carbohydrate transport and reproductive organ formation, which may indirectly affect metabolic activity and volatile compound biosynthesis. A moderate irrigation regime (150 ml), providing balanced moisture availability in the root zone, was associated with more stable physiological activity and accumulation of aromatic compounds compared with insufficient (50 ml) or excessive (200 ml) irrigation.

Conclusion

GC-MS analysis showed that the volatile compound composition of Pimpinella anisum L. is determined not only by genetic characteristics but also by a complex of agrotechnical factors — substrate type, irrigation regime, and mineral nutrition level. The combination of coconut coir substrate with calcium nitrate–boron nutrition provided the most stable accumulation of biologically active aromatic compounds, suggesting this combination as a promising approach for obtaining anise raw material of improved phytochemical quality under greenhouse conditions in Uzbekistan.

References

1. Ahmad, R., & Khan, S. (2020). Influence of cultivation conditions on secondary metabolites in aromatic plants. Phytochemistry Reviews, 19, 987–1005.

2. Al-Khateeb, S., & Al-Khatib, M. (2018). Phytochemistry and medicinal properties of Pimpinella anisum L. Journal of Medicinal Plants Research, 12(5), 123–135.

3. Basak, S., & Karmakar, S. (2021). Hydroponic cultivation and essential oil yield in anise. Sustainable Agriculture Reviews, 45, 89–110.