

AGROECOLOGICAL SIGNIFICANCE OF CULTIVATION OF ESSENTIAL OIL CROPS IN THE CONDITIONS OF CLIMATE CHANGE IN THE ZONE OF THE SOUTHERN STEPPE OF UKRAINE

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Abstract. In modern economic and climatic conditions, it is advisable to expand the area under essential oil plants, in particular, to grow them as lower crops in the Southern Steppe zone of Ukraine. Research methods are field and laboratory. It was established that lavender plants of the third year of cultivation were characterized by sufficiently high frost resistance – 82.7–98.1%. The yield of three-year-old lavender plants was 6.6–7.6 t/ha. The mass share of essential oil in the plant material was 2.30–2.32%. Conditional collection of essential oil ranged from 127.36 to 142.34 kg/ha depending on the variety and research options. Frost resistance of peppermint plants was 92.5–96.1%. The yield of green mass in the second year of cultivation ranged from 9.9 to 22.3 t/ha, depending on the variety. Conditional collection of essential oil was 41.8–75.9 kg/ha.

Keywords: English lavender, peppermint, frost resistance, productivity, conditional collection of essential oil.

Essential oil crops are types of plants grown for the production of essential oil. Essential oil is a mixture of carbohydrates of various degrees of saturation, alcohols, phenols, ethers, aldehydes, ketones and organic acids. Essential oils are used in the perfumery and cosmetic, pharmaceutical, food, soap making, canning and other industries. Essential oils accumulate in fruits, seeds, leaves, flowers, rhizomes and other plant organs [1, 2]. In Ukraine, the most common essential oil crops are: coriander, anise, fennel, cumin, peppermint, rose essential oil, lavender, clary sage.

The current state of the essential oil industry requires the expansion of areas under essential oils, in particular, in the area of the Southern Steppe of Ukraine. The relevance of the expansion of areas for the cultivation of essential oil crops is due to the demand for natural essential oils on the international market, their antimicrobial properties, as well as climate changes [3].

Currently, the most important factors influencing the technologies of growing agricultural crops are global climate changes, resource potential of soils and ecological and economic conditions. In modern conditions, the main consequences of climate change for agriculture are an increase in the growing season of plants, extreme conditions of the winter and early spring periods, and droughts in the southern region.

In the conditions of climate change, research on the introduction and development of technologies for growing new crops with high adaptation potential, in particular, essential oil crops, are relevant. Also, many essential oil crops are biennial or perennial plants, which has an important soil protection value, as the plant cover

resists wind and water erosion, suppresses the germination of weeds, and activates the soil microflora. In today's economic and ecological conditions, it is expedient to expand the area under ether-bearing plants, in particular, to grow them as niche crops in the Southern Steppe zone of Ukraine.

The aim of the research was to study the morpho-biological features, yield and quality of plant material of essential oil crops of the family Lamiaceae Lindl. in the conditions of the Southern Steppe of Ukraine.

Essential oil cultures of the family Lamiaceae Lindl served as the material for the research english lavender *Lavandula angustifolia* Mill. and peppermint *Mentha piperita* L. The research was conducted according to the generally accepted method of field research [5].

English lavender contains 1–2.5% essential oil in the inflorescences. Essential oil and lavender flowers are widely used in the perfumery and cosmetic, pharmaceutical, food industry and other industries. The main components of lavender essential oil are linalool alcohol (10–20%) and its acetic ester linalyl acetate (30–50%), as well as geraniol, nerol, limonene, furfural, bergamotene, myrcene and other compounds. Lavender essential oil or its components are used to create compositions of perfumes, colognes, industrial synthesis of fragrant substances, in the manufacture of cosmetic and hygiene products [2, 4].

Frost resistance was one of the main criteria used to assess the possibility of introducing lavender into the Southern Steppe zone. Lavender plants of the third year of cultivation were characterized by fairly high frost resistance in these conditions - 82.7–98.1%. Lavender yield in the third year of cultivation was 6.6 t/ha in the Stepova variety, 7.6 t/ha in the Syneva variety, and 6.0 t/ha in the Vdala variety. The mass share of essential oil in plant raw materials was 2.30–2.32%. Conditional collection of essential oil ranged from 127.36 to 142.34 kg/ha, depending on the variety and variants of the experiment.

Mint is grown for the production of essential oil, as well as for the use of leaf mass in medicine. Peppermint oil contains menthol (41–92%), menthone (9–25%), limonene and other substances. Essential oil is contained in all above-ground organs of the plant: leaves (from 2 to 4%), inflorescences (4–6%), stems (up to 0.3% of the mass of dry matter). The entire aerial part of plants in a wilted state or dry leaves are used as raw materials. Peppermint oil and its processing products are used in the perfumery and cosmetic, food, pharmaceutical, soap-making and other industries. Menthol is obtained from the oil, which is contained in many medicines as a disinfectant and anti-inflammatory agent. The leaves are used in medicine, for pickling vegetables, for flavoring drinks, sauces, confectionery and alcoholic products [1].

The frost resistance of peppermint plants under experimental conditions was also high – 92.5–96.1%. The yield of green mass in the second year of cultivation of the Zagrava and Udaychanka varieties ranged from 9.9 to 22.3 t/ha, depending on the variety and treatment with biological preparations. Conditional collection of essential oil was 41.8–75.9 kg/ha.

Thus, on the basis of the conducted experimental studies, it was established that narrow-leaved lavender and peppermint plants were characterized by sufficiently high frost resistance, yield and quality of plant material. The obtained results indicate the

prospects of growing these crops in the Southern Steppe zone of Ukraine under the conditions of climate change.

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Анотація. У сучасних економічних та кліматичних умовах доцільним є розширення площ під ефіроолійними рослинами, зокрема вирощування їх як нішевих культур у зоні Південного Степу України. Методи проведення досліджень – польові та лабораторні. Установлено, що рослини лаванди третього року вирощування характеризувалися достатньо високою морозостійкістю – 82,7–98,1 %. Урожайність трирічних рослин лаванди становила 6,6–7,6 т/га. Масова частка ефірної олії у рослинній сировині становила 2,30–2,32%. Умовний збір ефірної олії коливався у межах 127,36–142,34 кг/га залежно від сорту та варіантів досліду. Морозостійкість рослин м'ята перцевої становила 92,5–96,1%. Урожайність зеленої маси на другий рік вирощування коливалася у межах 9,9–22,3 т/га залежно від сорту. Умовний збір ефірної олії становив 41,8–75,9 кг/га.

Ключові слова: лаванда вузьколиста, м'ята перцева, морозостійкість, урожайність, умовний збір ефірної олії.

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DEVELOPMENT OF ELECTROCOAGULATION INSTALLATION FOR WATER PURIFICATION

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Abstract. In this work, the existing methods of wastewater treatment are considered, and a technological scheme of wastewater treatment by the electrocoagulation method is proposed, with a study of the dependence of work parameters on changes in technological parameters.