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THE EFFECT OF IRRIGATION METHOD AND ROW SPACING ON YIELD AND ECONOMIC EFFICIENCY OF MUSCAT PUMPKIN (CUCURBITA MOSCHATA) CULTIVATION IN SOUTHERN UKRAINE

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In recent years, Ukraine has witnessed a steady increase in interest in pumpkin cultivation, which can be explained by its low requirements for agrotechnical conditions, high adaptability to different climatic zones, and significant agroeconomic benefits. The crop fits well into crop rotations, serves as a high-quality preceding crop for winter wheat and other cereal crops, promotes soil structure formation, suppresses weeds, and provides other agronomic advantages. According to the results of a field experiment conducted in 2025, the yield of muscat pumpkin fruits significantly depended on the irrigation method and, to a lesser extent, on row spacing. Under sprinkler irrigation, yield increased with wider row spacing, from 27.6 t/ha at 140 cm to 32.3 t/ha at 210 cm. At the same time, under drip irrigation, the highest yield was obtained at a row spacing of 140 cm (37.9 t/ha), whereas widening the spacing to 210 cm reduced the yield to 34.0 t/ha.

A comparison of average values demonstrates the clear advantage of drip irrigation over sprinkler irrigation: the yield increase amounted to 10.3 t/ha at a row spacing of 140 cm and 1.7 t/ha at 210 cm. The effect of row spacing was less pronounced and manifested mainly through its interaction with the irrigation factor. Correlation analysis revealed a strong positive relationship between irrigation method and yield (r = 0.81), indicating the decisive role of the transition from sprinkler to drip irrigation in shaping crop productivity. The correlation between row spacing and yield was weak (r = 0.05), confirming the auxiliary nature of this factor under conditions of controlled water supply.

It should be noted that the economic efficiency of muscat pumpkin cultivation in 2025 depended significantly on the combination of irrigation method and row spacing. Under sprinkler irrigation, a lower production cost of fruits was observed compared to drip irrigation. At a row spacing of 140 cm, the production cost amounted to 3116 UAH/t, whereas its reduction to 2910 UAH/t at a row spacing of 210 cm was accompanied by an increase in profit from 190.5 to 229.3 thousand UAH/ha and an increase in the profitability level from 220 % to 243 %.

It can be concluded that the highest profitability level was ensured by the sprinkler irrigation variant with a row spacing of 210 cm, while the maximum profit per hectare was obtained under drip irrigation with a row spacing of 140 cm.

***Key words:** muscat pumpkin (Cucurbita moschata), row spacing, irrigation method, yield, economic efficiency.*

Шепель А. В. Вплив способу поливу та ширини міжряддя на врожайність і економічну ефективність вирощування гарбуза мускатного (Cucurbita moschata) на півдні України

Останніми роками в Україні спостерігається стале зростання інтересу до вирощування гарбуза, що пояснюється його невибагливістю до агротехнічних умов, високою адаптивністю до різних кліматичних зон та значним агроекономічним ефектом. Культура добре вписується у сівозміну, слугує якісним попередником для озимої пшениці та інших зернових культур, сприяє структуроутворенню ґрунту, пригнічує бур'яни тощо. За результатами проведеного польового досліду у 2025 р. врожайність плодів гарбуза мускатного істотно залежала від способу поливу та в меншій мірі – від ширини міжряддя. За дощування врожайність зростала зі збільшенням міжряддя з 27,6 т/га

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(140 см) до 32,3 т/га (210 см). Водночас за краплинного зрошення максимальна врожайність була отримана при міжрядді 140 см (37,9 т/га), тоді як розширення міжряддя до 210 см знижувало показник до 34,0 т/га. Порівняння середніх значень показує беззаперечну перевагу краплинного зрошення над дощуванням: приріст урожайності становив 10,3 т/га при міжрядді 140 см і 1,7 т/га при 210 см. Вплив ширини міжряддя був менш вираженим і проявлявся переважно у взаємодії з фактором поливу. Кореляційний аналіз показав тісний позитивний зв'язок між способом поливу та врожайністю (r = 0,81), що свідчить про визначальну роль переходу від дощування до краплинного зрошення у формуванні продуктивності культури. Кореляція між шириною міжряддя та врожайністю була слабкою (r = 0,05), що підтверджує допоміжний характер цього чинника за умов контрольованого водозабезпечення. Треба відмітити, що економічна ефективність вирощування гарбуза мускатного у 2025 р. істотно залежала від поєднання способу поливу та ширини міжряддя. При дощуванні спостерігалася нижча собівартість вирощування плодів порівняно з краплинним зрошенням. При міжрядді 140 см собівартість становила 3116 грн/т, тоді як її зменшення до 2910 грн/т при ширині міжряддя 210 см супроводжувалося зростанням прибутку з 190,5 до 229,3 тис. грн/га та підвищенням рівня рентабельності з 220 до 243 %. Треба зробити висновок, що найвищий рівень рентабельності забезпечував варіант дощування з міжряддям 210 см, тоді як максимальний прибуток з гектара був отриманий за краплинного зрошення при міжрядді 140 см.

Ключові слова: *гарбуз мускатний (Cucurbita moschata), ширина міжряддя, спосіб поливу, врожайність, економічна ефективність.*

Problem statement. As of today, the State Register of Ukraine includes several high-yielding pumpkin varieties that have gained a strong reputation among Ukrainian producers for various agronomic purposes. These include *Ukrainskyi Bahatoplidnyi*, *Lel*, *Narodnyi*, *Valok*, *Hamlet*, and *Svitень*, which are characterized as commercially significant varieties, especially in the seed production sector, due to their high seed yield and adaptive properties to growing conditions [1].

The Dnipropetrovsk Research Station of the Institute of Vegetable and Melon Growing of the National Academy of Agrarian Sciences of Ukraine annually submits 2–3 varieties for inclusion in the State Register, which are regularly and successfully registered; thus, continuous renewal and breeding improvement of the varietal assortment are ensured [2]. The director of this research station, V. Zavertaliuk, emphasizes the special importance of the Ukrainian Multifructed (*Ukrainskyi Bahatoplidnyi*) variety, which is characterized by a short vegetation period (95–100 days), high adaptability to different regions of Ukraine, and suitability for small-scale farms, as it does not require complex post-harvest handling and is suitable for cultivation in both the southern and western regions of the country. Similar characteristics are observed in the *Lel* variety, which is distinguished by early maturity; however, to achieve optimal fruit weight, it requires wider row spacing than 70 cm due to its vigorous bush-type growth habit [2].

In particular, among the already recognized and recommended varieties, *Mozoliivskyi 15* should also be highlighted-a mid-season variety characterized by a vegetation period of 118–120 days, high potential yield (60–70 t/ha), and distinctive fruit marking in the form of broad longitudinal broken stripes, which indicates its clear identity and agronomic value [3].

In recent years, Ukraine has experienced a steady increase in interest in pumpkin cultivation, which is explained by the crop's low demands on agrotechnical conditions, high adaptability to various climatic zones, and significant agroeconomic benefits. Pumpkin fits well into crop rotations, serves as a high-quality preceding crop for winter wheat and other cereals, promotes soil structure formation, suppresses weeds, and, according to scientific data, increases the yield of subsequent crops by 0.5–0.6 t/ha compared to sowing after bare fallow. Studies on the effects of fertilizers and growth regulators demonstrate a substantial increase in yield and product quality through the optimization of agrotechnologies. The use of modern fertilization systems (N60-80P80-100K60) ensures an increase in fruit yield by 30–40 % and an increase in seed output by 40–45 %. At the same time, the profitability of hull-less pumpkin production averages 30–35 %, and when high-yielding Ukrainian varieties are used, it can exceed 100–150 %, which confirms the economic feasibility of this crop.

The prospects for pumpkin cultivation in Ukraine are determined by several key directions. First, there is growing demand for seed processing products (oil, protein powders, dietary fiber), which have high added value and significant export potential. Second, the development of organic production is important, as pumpkin is well adapted to cultivation under environmentally friendly technologies, opening access to niche EU markets. Third, the application of innovative agrotechnologies-such as drip irrigation systems, precision fertilizer application, and biostimulants-will allow not only an increase in productivity but also a reduction in environmental pressure. Considering the high food, feed, and processing value, as well as the crop's ability to generate substantial profitability even under the stressful conditions of the Southern Steppe, pumpkin can be regarded as a strategically important niche crop for Ukraine. Its further expansion can strengthen the competitiveness of the agricultural sector and ensure access to international markets with high-quality products.

Analysis of recent studies and publications. For the food industry (commodity/quality evaluation), muscat-type varieties have demonstrated superior organoleptic and technological properties [4]. Methodological recommendations of the Institute of Vegetable and Melon Growing of the NAAS (2023) indicate that seed kernels contain 50–60 % oil; up to 45 % glycerides of linoleic acid and approximately 25 % of oleic acid; potential seed yield is 1,000–1,200 kg/ha, while the practical yield of pumpkin oil is ≥400 kg/ha with an average oil content of 49–52 % [5]. Research conducted at NUFT (Kyiv) has confirmed the nutritional value of pumpkin seed oil and identified cold pressing as optimal for preserving bioactive compounds, with emphasis on the high content of tocopherols and polyunsaturated fatty acids (PUFAs) (linoleic and linolenic) and the sensitivity of oil quality to storage conditions [6]. Ukrainian studies in food technologies demonstrate the feasibility of using pumpkin as a product fortifier (β-carotene, pectins) and as a raw material for carotenoid concentrates and functional oil blends with a balanced omega-6 and omega-3 profile [4].

In the Southern Steppe zone (dark chestnut soils), the highest and most stable yields of table pumpkin varieties were consistently achieved with a row spacing of 140 cm combined with N60P60 fertilization: for the *Yanina* variety 15.5–25.2 t/ha, for *Dolia* 17.3–26.7 t/ha, and for *Rodzynka* 21.0–30.3 t/ha; increasing the fertilization rate to N90P90 resulted in almost no additional yield increase. The recommendation is to cultivate the *Dolia* and *Rodzynka* varieties at 140 cm row spacing with N60P60 to achieve yields of 25–30 t/ha [7]. A generalization of the same data (based on a different publication sample) is also presented in a conference paper of Kherson State Agrarian and Economic University, which reaches the same conclusion-that the combination of 140 cm row spacing and N60P60 fertilization makes it possible to obtain 25–30 t/ha [8]. In their scientific research, O. V. Averchev and N. O. Avercheva paid attention to the cultivation of muscat pumpkin in farm enterprises as one of the promising directions for increasing the efficiency of land resource use [9].

In the Forest-Steppe zone (NUBiP), the highest total yield and adaptability were demonstrated by the *Dyvo* (37.3 t/ha) and *Dolia* (34.5 t/ha) varieties; in terms of provitamin A (carotene) content, *Dyvo* (10.7 mg/100 g) and *Dolia* (8.3 mg/100 g) were distinguished. Their ecological plasticity and stability were confirmed [10]. At the

Dnipropetrovsk Research Station of the Institute of Vegetable and Melon Growing of the NAAS, among 59 *Cucurbita moschata* accessions, sources of increased carotene content were identified; Ukrainian varieties such as *Arabatskyi*, *Yanina*, *Rodzynka*, *Hileia*, *Balzam*, and others were noted as carotene donors. In addition, the hybrid *Romashka F1* was developed, with an average yield of 29.7 t/ha and increased dry matter content and β-carotene levels [11].

Optimization of the sowing pattern for Ukrainian pumpkin varieties is one of the key factors in forming crop productivity. The spatial arrangement of plants determines the level of supply with moisture, nutrients, and light, which directly affects biometric parameters and yield. For table and seed varieties (in particular, *Ukrainskyi Bahatoplidnyi* and hull-less types), it is advisable to use row spacing of 1.4–2.0 m and in-row plant spacing of 0.7–1.0 m, which provides a feeding area of 1.0–2.0 m^2 per plant.

Large-fruited varieties (for example, *Zorianyi* and the large-fruited group of *Ukrainskyi Bahatoplidnyi*) require wider row spacing-2.0-2.5 m with in-row spacing of 1.0–1.5 m, which corresponds to a feeding area of 2.0–3.5 m^2 per plant. For fodder varieties (*Kormovyi 56*, *Kharkivskyi*), the optimal planting pattern is 2.5–3.0 × 1.5–2.0 m, providing a feeding area of 3.5–6.0 m^2. Sowing is carried out mainly by the hill (nest) method, with 3–4 seeds placed per hole followed by thinning to 1–2 plants. On light soils, the seeding depth is 4–6 cm, while on heavy soils it is 3–4 cm.

Plant stand density varies depending on the intended use of the crop: 8–12 thousand plants/ha for table and seed varieties, 5–7 thousand plants/ha for large-fruited varieties, and 3–5 thousand plants/ha for fodder varieties. Under arid conditions of the Southern Steppe, it is recommended to provide a larger feeding area (up to 3.0 m^2 per plant), which helps reduce competition for moisture, whereas in the Forest-Steppe zone a denser plant arrangement is advisable (1.4–1.6 m row spacing for medium-fruited varieties).

A study by Arzani et al. (2023) conducted in Iran showed that plant density significantly affects the yield of oilseed pumpkin (*Cucurbita pepo* var. *styriaca*). The authors found that at a density of 20 thousand plants/ha, seed and oil yields per hectare were significantly higher compared to lower-density treatments, while the yield per individual plant decreased. This made it possible to recommend a plant density of 20 thousand plants/ha to achieve the maximum gross oil yield [12].

Similar results were confirmed by Shrefler et al. (2023) in the United States, who studied table pumpkin forms. It was demonstrated that increasing plant density (above 10 thousand plants/ha) and reducing row spacing led to higher yield per unit area, but decreased average fruit size, which is important for market quality [13].

In Nigeria, Ojo and Adegbite (2021) studied the effects of organic and mineral fertilizers on the productivity of *Cucurbita moschata*. The use of organic fertilizer (cattle manure) resulted in a higher number of fruits and seeds per plant, whereas mineral fertilizers (NPK 20-10-10) promoted an increase in fruit weight. In the best treatments, productivity exceeded 369 seeds and reached up to 4.3 kg of fruits per plant [14].

An important research direction is the study of the impact of oil extraction technologies on oil quality. Zhang et al. (2020) compared cold pressing, microwave pretreatment prior to pressing, and supercritical CO_2 extraction. The highest oil yield (74.9 %) was achieved with supercritical extraction, whereas the highest antioxidant activity was observed in oil obtained after microwave heating. This indicates the possibility of a targeted choice of technology depending on production goals [15]. Similar results were reported by Hu et al. (2021) for *Cucurbita moschata*: the fatty acid profile was characterized by the dominance of linoleic (38–52 %) and oleic (28–37 %) acids, and the extraction method affected the ratio of polyunsaturated to monounsaturated fatty acids as well as antioxidant activity [16].

Important results were obtained by Maskan (2001) and Dutta et al. (2006), who demonstrated that during pumpkin drying, temperature significantly affects carotenoid degradation: microwave vacuum drying allows greater retention of β-carotene compared to convective drying [17, 18]. Studies by Lozano-Alejo et al. (2018) confirmed that during storage of pumpkin powders for 180 days, the best preservation of β-carotene (over 80 %) occurred at low temperatures (7 °C) [19]. In addition, Murkovic et al. (2002) found that thermal processing of fruits (boiling, steaming) can increase the bioavailability of β-carotene by disrupting cell walls and reducing moisture content [20].

A clinical study conducted by Gossell-Williams et al. (2019) in Iran showed that pumpkin seed oil (*Cucurbita pepo*) at a dose of 360 mg twice daily for three months reduced the symptoms of benign prostatic hyperplasia and improved patients' quality of life. Although its efficacy was inferior to that of tamsulosin, the treatment did not cause adverse effects, making it a promising phytotherapeutic agent [21].

Foreign studies confirm the high potential of pumpkin as a multifunctional crop. Agrotechnical practices (plant density, fertilization, irrigation) make it possible to significantly regulate yield and product quality. Processing technologies affect the preservation of bioactive compounds, while modern genetic research opens prospects for the development of high-yielding and disease-resistant varieties. Medical studies demonstrate the pharmacological potential of pumpkin seed products, particularly in the treatment of diseases of the urogenital system. Thus, the findings of international authors (Arzani, Shrefler, Ojo, Zhang, Hu, Maskan, Lozano-Alejo, Montero-Pau, Nascimento, Gossell-Williams, and others) provide a scientific basis for the further implementation of innovations in pumpkin cultivation and utilization technologies in global practice.

Research Objective. The aim of our study was to establish and conduct a field experiment in which the productivity of muscat pumpkin was investigated in 2025. The field experiment was arranged according to a two-factor design and included the following treatments: Factor A-row spacing (140 and 210 cm); Factor B-irrigation method (sprinkler irrigation and drip irrigation). The *Dyvo* variety was sown in the experiment; it was developed at the Institute of Southern Vegetable and Melon Growing of the Ukrainian Academy of Agrarian Sciences (currently the State Enterprise "Research Farm 'Velyki Klyny'" of the Institute of Water Problems and Land Reclamation, Kyiv) and has been included in the State Register of Plant Varieties of Ukraine since 2004.

The variety is zoned for the Forest-Steppe and Steppe regions and is intended for vegetable use. The *Dyvo* variety belongs to the mid-early maturity group. Irrigation was carried out using water from the Inhulets Irrigation System, which is known for its satisfactory irrigation water quality. In 2025, the mineralization of irrigation water during the growing season ranged from 1.5 to 2.0 g/L. In the sprinkler irrigation treatment, watering was performed using a DDA-100 MA sprinkler machine, while drip irrigation was applied using a drip irrigation system composed of components manufactured by various companies.

The aim of our research, commissioned by the private enterprise "Agrofirma Fotiniia" from the Mykolaiv region, was to determine the optimal irrigation method and row spacing for muscat pumpkin cultivation. To achieve this objective, the following tasks were set:

– to assess the effect of the field experiment factors on the productivity of muscat pumpkin fruits of the *Dyvo* variety;

– to analyze the calculated indicators of economic efficiency of crop cultivation in the field experiment;

– to formulate preliminary recommendations for the farm based on one-year experimental data.

Presentation of the main research findings. Despite the high demand for pumpkin products, one of the major challenges for farmers remains access to high-quality seed material. As noted by Makovey Yuliia, producers often face the problem of a "mix" in bags of licensed seed, when instead of uniform seeds they receive admixtures, poorly filled kernels, and seeds of low reproduction classes. Imported hybrids, although more uniform in quality, are too expensive and not always adapted to the climatic conditions of Ukraine, which reduces their effectiveness in practical use [2].

The nutritional value of pumpkin seeds confirms their significant potential in the food and processing industries. The content of the main nutrients in 100 g of the product averages 25–30 g of protein, 46 g of fat, and about 5 g of carbohydrates, providing an energy value of 540–556 kcal. The seeds are characterized by a high concentration of mineral elements: 100 g contains 8.8 mg of iron, 809 mg of potassium, 8 mg of zinc, and 9.5 mg of selenium. The protein complex of the seeds accounts for about 35 % and includes all essential amino acids, ensuring high biological value. The lipid complex is characterized by the presence of essential fatty acids-linoleic, oleic, palmitic, and stearic-as well as Omega-3 and Omega-6 fatty acids, which contribute to the high dietary and preventive value of the seeds.

Products derived from pumpkin seed processing have different nutritional profiles depending on their intended use. Pumpkin seed oil contains up to 99.6 g of fat per 100 g of product, and its energy value reaches 896 kcal, defining it as a concentrated source of plant lipids. Pumpkin seed protein powder is a high-protein product containing 61–63 g of protein with an energy value of 372 kcal, making it promising for use in sports and dietary nutrition. Pumpkin flour is characterized by a content of 39–40 g of protein, 9–10 g of fat, and about 19–21 g of carbohydrates with a caloric value of 334 kcal, which allows it to be considered a functional ingredient in the bakery industry. Pumpkin seed fiber contains 44–46 g of protein, 7–8 g of fat, and 15–16 g of carbohydrates with an energy value of 320 kcal, justifying its use in the production of dietary supplements and health-oriented food products [22].

Thus, the research results confirm the high economic and biochemical efficiency of pumpkin cultivation, as well as the wide possibilities for using its seeds and processed products in both the food and processing industries, which together ensure the crop's competitiveness in domestic and international markets.

The analysis of the data in Table 1 indicates that the yield of muscat pumpkin fruits in 2025 depended significantly on the irrigation method and to a lesser extent on row spacing.

Under sprinkler irrigation, yield increased with wider row spacing, from 27.6 t/ha at 140 cm to 32.3 t/ha at 210 cm, indicating a positive crop response to reduced competition for moisture and nutrients. At the same time, under drip irrigation, the maximum yield was obtained at a row spacing of 140 cm (37.9 t/ha), whereas widening the row spacing to 210 cm reduced yield to 34.0 t/ha, which can be explained by more efficient localized supply of moisture and nutrients to the root zone under denser plant arrangement.

A comparison of the mean values shows a clear advantage of drip irrigation over sprinkler irrigation: the yield increase amounted to 10.3 t/ha at a row spacing of 140 cm and 1.7 t/ha at 210 cm, which exceeds the LSD_{05} value for Factor A (1.62 t/ha) and confirms the statistical significance of the irrigation method effect. The influence of row

Table 1

Yield of muscat pumpkin fruits depending on the irrigation method and row spacing, 2025

Irrigation method – Factor A	Row spacing, cm – Factor B	Fruit yield, t/ha.
Sprinkler irrigation	140	27.6
	210	32.3
Drip irrigation	140	37.9
	210	34.0
LSD_{05}, t/ha	Factor *A* = 1.62	Factor *B* = 1.62

* Compiled by the author

spacing (Factor B) was less pronounced and manifested mainly through its interaction with the irrigation factor; however, the differences between treatments also exceeded the LSD $_{05}$ value (1.62 t/ha) within individual irrigation methods.

Correlation analysis revealed a strong positive relationship between the irrigation method and yield ($r = 0.81$), indicating the decisive role of switching from sprinkler to drip irrigation in the formation of crop productivity. In contrast, the correlation between row spacing and yield was weak ($r = 0.05$), confirming the auxiliary nature of this factor under conditions of controlled water supply. Thus, the main reserve for increasing yield lies in optimizing the water regime, whereas the spatial arrangement of plants should be adjusted with regard to the selected irrigation system. The obtained results make it possible to recommend drip irrigation as a basic component of an intensive technology for muscat pumpkin cultivation under the conditions of the Southern Steppe.

The profitability of pumpkin cultivation under modern agricultural production conditions largely depends on the use of varietal resources and technological approaches. At the same time, the use of modern domestic varieties adapted to the soil and climatic conditions of Ukraine makes it possible to increase this indicator up to 150 %, which makes pumpkin production extremely promising within the vegetable production system.

The analysis of the data in Table 2 indicates that the economic efficiency of muscat pumpkin cultivation in 2025 depended significantly on the combination of the irrigation method and row spacing.

Table 2

Results of calculations of the economic efficiency of muscat pumpkin cultivation depending on the irrigation method and row spacing, 2025

Irrigation method	Row spacing, cm	Cost of fruit production, UAH/t	Profit, thousand UAH/ha	Profitability level, %.
Sprinkler irrigation	140	3116	190,5	220
	210	2910	229,3	243
Drip irrigation	140	3773	236,7	165
	210	3823	210,2	162

* Compiled by the author

Under sprinkler irrigation, lower production costs were observed compared to drip irrigation, which can be explained by lower capital and operating expenditures for irrigation infrastructure. At a row spacing of 140 cm, the cost amounted to 3116 UAH/t, whereas its reduction to 2910 UAH/t at a row spacing of 210 cm was accompanied by an increase in profit from 190.5 to 229.3 thousand UAH/ha and a rise in profitability from 220 % to 243 %. This indicates that under sprinkler irrigation, wider row spacing contributed not only to higher yields but also to the optimization of costs per unit of output.

Under drip irrigation, in contrast, higher production costs were observed (3773–3823 UAH/t), which is due to expenses for the installation and maintenance of the drip irrigation system. At the same time, this method ensured the highest absolute profit, especially at a row spacing of 140 cm (236.7 thousand UAH/ha), which correlates with the maximum yield obtained in this treatment. The profitability level under drip irrigation was lower (162–165 %) compared to sprinkler irrigation; however, it remained economically attractive and confirmed the feasibility of using intensive technologies when the farm's objective is to maximize gross income rather than merely minimize costs.

In summary, it can be concluded that the highest level of profitability was achieved under sprinkler irrigation with a row spacing of 210 cm, whereas the maximum profit per hectare was obtained under drip irrigation with a row spacing of 140 cm. The obtained results confirm that the economic feasibility of muscat pumpkin cultivation is determined not only by yield level but also by the cost structure, and that the optimal combination of agronomic practices should be formed with regard to the strategic objectives of a particular farm.

Conclusions and prospects. The generalization of one-year research results indicates that pumpkin is a highly productive and economically profitable crop for cultivation under the agroclimatic conditions of Ukraine. Owing to the wide diversity of domestic varieties-table, seed, fodder, and hull-less-production can be oriented toward both the domestic market and export.

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