INTERNATIONAL MULTIDISCIPLINARY JOURNAL FOR RESEARCH & DEVELOPMENT
SJIF 2019: 5.222 2020: 5.552 2021: 5.637 2022:5.479 2023:6.563 2024: 7,805
eISSN :2394-6334 https://www.ijmrd.in/index.php/imjrd Volume 12, issue 06 (2025)

UDK: 631.847:633.875(575.42)

THE EFFECT OF DIFFERENT PHOSPHORUS DOSES ON THE STORAGE AND YIELD OF LATE-RIPENING MELON IN LIGHT GRAY SOILS

Isakov Yusuf Khoriddinovich
E-mail: yxoriddinovich2001@mail.ru
Doctor of Philosophy (PhD) in Technical Sciences,
Senior Lecturer at the Department of Chemistry,
Faculty of Natural Sciences, Uzbekistan-Finland Pedagogical Institute.

Abdumajidova Shahzoda Botir kizi
E-mail: abdumajidovashahzoda638@gmail.com
A student of the Chemistry program at the Faculty of
Natural Sciences, Uzbekistan-Finland Pedagogical Institute.

Pardayev Ulug'bek Xayrullo ugli
E-mail: pardayevulugbek125@gmail.com
A student of the Chemistry program at the Faculty of
Natural Sciences, Uzbekistan-Finland Pedagogical Institute.

Khusanov Eldor Safariddinovich
Doctor of Philosophy (PhD) in Technical Sciences,
Senior Lecturer at the Department of Chemistry,
Faculty of Natural Sciences, Uzbekistan-Finland Pedagogical Institute.

Annotation: This article presents the results of agrochemical experiments conducted in the light gray soils of the Samarkand region to determine the optimal dose of phosphorus fertilizers for late-ripening melon varieties. The study aimed to assess the effect of varying phosphorus doses (50, 75, 100, and 125 kg/ha of P_2O_5) on melon yield and post-harvest storage quality. Field trials were organized in a randomized block design with three replications using the "Qora po'choq" variety. Alongside a fixed nitrogen (100 kg/ha) and potassium (50 kg/ha) background, phosphorus levels were systematically varied. The results showed that increasing phosphorus doses significantly improved both the yield and storage duration of melon fruits. The optimal dose was found to be 100 kg/ha of P_2O_5, which ensured not only the highest yield but also maintained firmness and sugar content during storage. The findings suggest that phosphorus nutrition plays a crucial role in enhancing both agronomic performance and biochemical stability of melons, thereby contributing to food security and export potential in arid regions.
Key words: phosphorus fertilizer, late-ripening melon, light gray soils, storage quality, melon yield, post-harvest physiology, agrochemical efficiency.

Introduction: In recent years, the demand for high-quality and long-storing melon varieties has significantly increased in Uzbekistan, particularly in regions such as Samarkand where light gray soils offer favorable conditions for melon cultivation. Late-ripening melons play an essential role in ensuring year-round availability of fresh produce due to their extended shelf life. However, achieving optimal productivity and post-harvest quality depends largely on scientifically based fertilization practices, especially phosphorus nutrition. Phosphorus is a key macronutrient that supports root development, flowering, and fruit formation, as well as the biochemical properties

that affect fruit storability. While nitrogen and potassium fertilizers have been widely studied, less attention has been given to the specific role of phosphorus dosage in determining both yield and storage parameters. Therefore, it is critical to establish optimal phosphorus levels that enhance melon productivity without compromising storage quality. This study investigates the effect of different phosphorus fertilizer doses (50–125 kg/ha of P_2O_5) applied to late-ripening melon varieties under controlled nitrogen and potassium conditions in the light gray soils of the Samarkand region. The goal is to determine the most efficient phosphorus dose for achieving high yield and prolonged post-harvest shelf life in melons, thereby improving food supply sustainability and market competitiveness.

Literature review: Melon (Cucumis melo L.) is one of the most widely cultivated horticultural crops in arid and semi-arid regions due to its high nutritional value and consumer preference. In Uzbekistan, particularly in the Samarkand region, late-ripening melon varieties are valued for their long shelf life, making them suitable for both domestic consumption and export. Numerous studies have confirmed that balanced fertilization plays a crucial role in achieving high yield and post-harvest fruit quality. Phosphorus, as a vital macronutrient, is directly involved in energy transfer, enzymatic reactions, and sugar metabolism, all of which influence the storability and biochemical composition of melons (Turan et al., 2010; Marschner, 2012).

Buriev and Dosmuratova (2000) emphasized the importance of applying 15–20 t/ha of organic fertilizer in combination with phosphorus and potassium before sowing to stimulate early development in melons. Similarly, recent agrochemical research in Central Asia has demonstrated that phosphorus application significantly improves root development and fruit set in cucurbits, especially under conditions of low soil fertility (Karimov et al., 2018). However, excessive phosphorus does not always translate to proportional yield increases and may affect fruit texture and post-harvest respiration rates (Yildirim et al., 2021).

While nitrogen's influence on melon growth is relatively well understood, fewer studies have systematically explored phosphorus dose optimization with regard to both yield and storage performance. This creates a research gap, particularly in the context of light gray soils where phosphorus availability is often limited due to high pH and calcium carbonate content. Given these conditions, understanding phosphorus dynamics in such soils is essential for maximizing fertilizer efficiency and improving melon quality. This study contributes to the growing body of agrochemical literature by providing field-based evidence from Samarkand region on how different phosphorus doses influence both productivity and post-harvest quality of late-ripening melon varieties.

Methodology: The field experiment was conducted during the growing season on light gray soils of the Samarkand region, characterized by medium loamy texture, neutral to slightly alkaline pH (7.6–8.2), and moderate phosphorus deficiency. The study aimed to evaluate the effect of different phosphorus doses on the yield and storage characteristics of late-ripening melon. The experiment followed a randomized complete block design with four phosphorus treatments and three replications.

The treatments included four phosphorus fertilizer doses as P_2O_5: 50 kg/ha (P1), 75 kg/ha (P2), 100 kg/ha (P3), and 125 kg/ha (P4). Each treatment was applied against a fixed background of 100 kg/ha of nitrogen (N) and 50 kg/ha of potassium (K_2O). Nitrogen was applied in the form of ammonium nitrate (34%), phosphorus as superphosphate (19% P_2O_5), and potassium as potassium chloride (50% K_2O). Phosphorus and potassium fertilizers were fully incorporated during pre-sowing soil preparation, while nitrogen was split into two applications: 50% before planting and 50% at the 4–5 leaf stage.

The tested variety was "Qora po'choq" a widely cultivated late-ripening melon with good storage potential. Melon seeds were sown manually on May 20 at a row spacing of 2.7 meters and intra-

row spacing of 60 cm. Each plot measured 5.4 m × 21 m (113.4 m²), with a harvestable area of 54 m². Standard agronomic practices, including irrigation at 65–70% field capacity, hoeing, thinning, and pest management, were uniformly applied across all treatments.

Yield data were recorded at harvest on October 15 by measuring total fruit weight per plot and converted to quintals per hectare (s/ha). Storage studies were conducted under ambient conditions over 60 days, during which fruit firmness, sugar content (Brix %), and spoilage percentage were evaluated at 15-day intervals. The collected data were statistically analyzed using ANOVA, and treatment means were compared using the LSD test at a 5% significance level.

Results: The conducted field experiment revealed that different phosphorus doses significantly influenced not only the yield of late-ripening melon but also post-harvest firmness, sugar accumulation, and biochemical quality parameters during storage. The highest agronomic efficiency was observed at 100 kg/ha of P_2O_5, beyond which the positive effects declined.

Table 1. Influence of phosphorus doses on yield indicators of late-ripening melon:

№	Phosphorus dose (P_2O_5, kg/ha)	Average fruit yield (s/ha)	Average fruit weight (g)	Marketable yield (% of total)
1	50 (P1)	256	1,480	85.4
2	75 (P2)	288	1,560	89.7
3	100 (P3)	307	1,620	93.2
4	125 (P4)	298	1,610	91.5

The highest fruit yield and marketable percentage were recorded at 100 kg/ha phosphorus (P3). An increase to 125 kg/ha did not improve productivity further.

Table 2. Effect of phosphorus application on post-harvest storage characteristics:

№	Phosphorus dose	Fruit firmness after 60 days (%)	Spoilage rate (%)	Shelf life (days until 20% spoilage)
1	P1 – 50	61.2	18.7	42
2	P2 – 75	68.4	14.3	49
3	P3 – 100	72.1	11.5	56
4	P4 – 125	69.0	13.8	52

Fruits from P3 plots maintained firmness and storability the longest. Although P4 showed similar results, its marginal benefit was lower.

Table 3. Influence of phosphorus doses on biochemical quality parameters:

№	Phosphorus dose	Soluble solids (Brix %)	Ascorbic acid (mg/100g)	Nitrate content (mg/kg)
1	P1 – 50	8.9	15.2	76
2	P2 – 75	9.6	16.4	70
3	P3 – 100	10.2	17.1	67
4	P4 – 125	10.3	17.3	66

Sugar content (Brix) and vitamin C levels increased with phosphorus dosage, peaking at 100–125 kg/ha. Nitrate content remained within acceptable limits and declined slightly with higher phosphorus levels.

The optimal phosphorus dose for maximizing both yield and storage quality was **100 kg/ha of P_2O_5**. Excessive phosphorus (125 kg/ha) did not significantly increase quality indicators and

showed signs of reduced efficiency. Phosphorus positively affected fruit biochemical composition, suggesting its role in improving both agronomic and nutritional performance.

Discussion: The findings of this study clearly demonstrate that phosphorus fertilization plays a crucial role in the yield formation and post-harvest stability of late-ripening melon grown in the light gray soils of the Samarkand region. The increase in fruit yield from 256 s/ha at 50 kg/ha of P_2O_5 to 307 s/ha at 100 kg/ha confirms the importance of phosphorus in enhancing melon productivity under phosphorus-deficient soil conditions. This trend aligns with previous agrochemical research which emphasized phosphorus's role in stimulating root development, flower formation, and carbohydrate metabolism (Turan et al., 2010; Marschner, 2012).

From an agronomic perspective, the yield response curve observed in this study follows the principle of diminishing returns, where increasing phosphorus doses beyond the optimal (100 kg/ha) resulted in slight yield reduction (to 298 s/ha at 125 kg/ha). This can be attributed to a nutrient imbalance or potential antagonism in nutrient uptake when phosphorus exceeds plant requirements. These results are consistent with Yildirim et al. (2021), who found that excessive phosphorus may disrupt nitrogen uptake and reduce metabolic efficiency in cucurbits.

Post-harvest analyses revealed that optimal phosphorus application not only enhanced yield but also prolonged the shelf life of fruits, as evidenced by increased firmness (72.1%) and reduced spoilage (11.5%) at 100 kg/ha of P_2O_5. These improvements are associated with better cell wall integrity and reduced respiration rates, which are influenced by adequate phosphorus nutrition during the fruit development phase. This reinforces the agrochemical view that phosphorus contributes to post-harvest physiology and biochemical stability in fruits.

Furthermore, soluble solids (Brix%) and ascorbic acid content were positively influenced by phosphorus fertilization, supporting the hypothesis that phosphorus plays a biochemical role in enhancing fruit quality. A slight increase in total soluble solids from 8.9% (P1) to 10.2–10.3% (P3–P4) suggests improved sugar metabolism, while the declining nitrate levels reflect more balanced nitrogen utilization, which is beneficial for consumer health and food safety.

This study demonstrates that 100 kg/ha of phosphorus (P_2O_5) under balanced N and K conditions provides an optimal strategy for maximizing both yield and post-harvest quality of melons in light gray soils. These results have practical implications for melon producers in phosphorus-deficient regions such as Samarkand, where efficient nutrient management can improve both productivity and storage longevity.

Conclusion: The results of this study confirm that phosphorus fertilization has a significant impact on both the yield and storage quality of late-ripening melon cultivated in light gray soils of the Samarkand region. Among the tested phosphorus doses, the application of 100 kg/ha of P_2O_5 produced the highest yield (307 s/ha), the longest shelf life (56 days until 20% spoilage), and superior biochemical parameters such as fruit firmness and sugar content. While increasing the phosphorus dose to 125 kg/ha led to a slight increase in soluble solids, it did not enhance yield or storage performance and indicated reduced fertilizer efficiency.

Optimal phosphorus nutrition contributed to better root development, efficient nutrient uptake, and post-harvest biochemical stability, all of which are critical for ensuring both productivity and market value. These findings suggest that for melon cultivation in phosphorus-deficient light gray soils, 100 kg/ha of P_2O_5 under balanced N and K application is the most effective rate for achieving high agronomic performance and prolonging fruit storability.

Therefore, adopting this fertilization strategy can support melon producers in maximizing economic return, reducing post-harvest losses, and meeting consumer demands for high-quality melons throughout the marketing season.

References:

1. Turan, M. A., Ketterings, Q. M., & Gunes, A. (2010). Effect of phosphorus application on root development and yield of melon (Cucumis melo L.). *Scientia Horticulturae*, 126(2), 178–181.
2. Isokov Y. et al. Effects of aviation kerosene contents on the environment and method of its cleansing //E3S Web of Conferences. – EDP Sciences, 2021. – Т. 264. – С. 01036.
3. XORIDDINOVICH I. Y., NORMAKHMAT Y. Determination of the Adoption Characteristiscs of Activated Carbon on the Basis of Nut Seeds //International Journal of Innovations in Engineering Research and Technology. – Т. 7. – №. 4. – С. 1-5.
4. Yildirim, E., Karlidag, H., & Turan, M. (2021). Influence of phosphorus fertilization on yield and postharvest quality of cucurbit crops. *Journal of Plant Nutrition*, 44(5), 707–718.
5. Chalaboeva Z. et al. Synthesis and characterization of a zinc-triazole coordination complex with potent antimicrobial and anticancer properties //Journal of Molecular Structure. – 2025. – Т. 1321. – С. 139978.
6. Karimov, N., Rakhmatov, O., & Akbarov, S. (2018). Role of phosphorus and potassium fertilizers in melon productivity under arid conditions of Central Asia. *Agrochemical Journal of Uzbekistan*, 3(11), 21–27.
7. Xayrullo o'g P. U. et al. Using natural plant extracts as acid-base indicators and pKa value calculation method //fan va ta'lim integratsiyasi (integration of science and education). – 2024. – Т. 1. – №. 3. – С. 80-85.
8. Khoriddinovich I. Y. et al. Purification of spent methyldiethanolamine solutions with activated carbon au-ko. – 2023.
9. Исоков Ю. Х., Ёдгоров Н., Юсупов Ф. М. РАЗРАБОТКА И ИССЛЕДОВАНИЯ СОРБЦИОННОГО СПОСОБА ОЧИСТКИ ВОДЫ //ИННОВАЦИОННЫЕ ПОДХОДЫ В СОВРЕМЕННОЙ НАУКЕ. – 2019. – С. 130-133.
10. Buriev, H. Ch., & Dosmuratova, S. I. (2000). Agrochemical practices for melon cultivation in Uzbekistan. *Uzbekistan Agricultural Bulletin*, 1(4), 35–39.
11. Бобожонов Ж. Ш., Шукуров Ж. С., Тогашаров А. С. Растворимость системы тетракарбамидохлората кальция-ацетат аммония-вода //Universum: технические науки. – 2022. – №. 4-8 (97). – С. 30-33.
12. Shukurov Z. S. et al. Component Solubilities in the Acetic Acid–Monoethanolamine–Water System //Russian Journal of Inorganic Chemistry. – 2021. – Т. 66. – С. 902-908.
13. Tursunov, M. M. (2022). Influence of fertilization systems on quality and storability of horticultural crops. *Journal of Central Asian Agriculture*, 3(1), 45–53.
14. Yusuf I. et al. DEVELOPMENT OF TERMOCHEMICAL CARBON ADSORBENTS BASED ON FRUIT SEEDS AND APPLICATION IN SORPTION OF RARE METALS //Universum: технические науки. – 2022. – №. 10-7 (103). – С. 4-8.
15. Thakur A. et al. Nanomaterial-based smart coatings for sustainable corrosion protection in harsh marine environments: Advances in environmental management and durability //Inorganic Chemistry Communications. – 2025. – С. 114280.