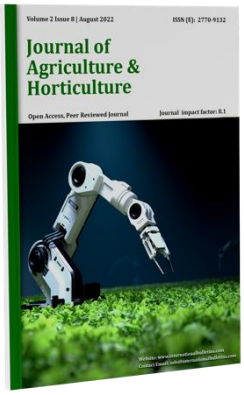

THE ROLE OF POTASSIUM FERTILIZERS IN THE LIFE OF SUNFLOWER AND ITS RELEVANCE

Muradov Shokhrukh Shapoatovich
Gmail: shoxruxmurodov1995@gmail.com
https://orcid.org/0009-0000-1334-3465
A second-year basic doctoral student at Termez state university of engineering and agrotechnology
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Abstract: This article provides information on the importance and relevance of potash fertilizers in sunflower cultivation. The sunflower plant absorbs more potassium than other nutrients, and the causes and solutions for this are analyzed in foreign and local literature.

Keywords: Potash fertilizers, sunflower, typical gray soils, options and alternatives.

Introduction: Sunflower (Helianthus annuus L.) is one of the technical crops rich in oil and protein, with high economic importance. The role of mineral fertilizers, in particular potassium fertilizers, in increasing the yield and quality of products is incomparable. The physiological role of the potassium element is of great importance in determining the yield and quality indicators of sunflower growth.

In the Republic of Uzbekistan, in January-August 2023, a total of 28.0 thousand tons of sunflower oil were produced by large enterprises, which increased by 34.0% compared to the corresponding period of 2022. In August 2023, 6.2 thousand tons of sunflower were produced by large enterprises. In the Republic of Uzbekistan, in January-June 2024, 72.9 thousand tons of vegetable oil were produced by large enterprises. This production volume increased by 18.2% compared to the corresponding period in 2023. In June 2024, 3.1 thousand tons of vegetable oil were produced by large enterprises.

Sunflower is a potassium-loving crop. It is necessary for intensive oil production in seeds. The high accumulation of potassium in sunflower plants largely determines its high drought resistance. Active absorption of water by the roots and movement of sap occur as a result of the accumulation of osmotically active potassium ions in the xylem vessels as a result of the operation of ion pumps. The high content of potassium in cells increases the hydration of cytoplasmic proteins and the resistance of plant tissues to dehydration. The accumulation of potassium in growing cells is especially important for plants to ensure the necessary level of turgor even in the event of insufficient moisture. To produce 1 ton of seeds, sunflower absorbs 50-60 kg of nitrogen, 20-25 kg of phosphorus and 100-120 kg of potassium. [А.Х. Шеуджен, Т.Н. Бондарева, С.В. Кизинек; 183-b]

In experiments by LI Shu-tian et al., compared with the control without potassium, potassium application increased seed yield by an average of 406 kg/ha for oil sunflower and 294 kg/ha for edible sunflower. Potassium also increased the 1000-grain weight and kernel speed of oil and sunflower. Potassium fertilization improved the content of oil, oleic acid, and linolenic acid in oil sunflower seeds and increased the content of oil, total unsaturated fatty acids, and protein in edible sunflower seeds.[LI Shu-tian; 2802–2812-b].

Potassium (K), one of the three essential nutrients, is absorbed by plants in greater quantities than any other element; [Bukhsh; 179-184-p.]

Potassium plays an important role as a macronutrient in the growth and sustainable yield of plants. [Pettigrew, W.T; p. 670-681-p.]

From the experimental results of Tonima Tahera, it is known that potassium has little effect on the growth, yield and yield characteristics of sunflower. The soil composition of the coastal region is rich in potassium. However, the effect of potassium on sunflower is not very large, but the yield of sunflower was better at 60 kg K ha-1, if most parameters were more or less similar, than the no-potassium treatment (K0). Because the K level is not recommended in the coastal soil of southwest Bangladesh. Based on the results of this experiment, it can be suggested that the use of 60 kg K ha-1 for sunflower cultivation in the southwestern coast of Bangladesh would be a promising practice. [Tonima Tahera; 56-b]

Main part

The importance of potassium in the growth of sunflower plants is very high. It activates the photosynthesis process, normalizes the osmotic pressure of cell fluid, accelerates oil accumulation and increases resistance to diseases. In practice, the most commonly used potassium fertilizers for sunflowers are potassium chloride (KCl) and potassium sulfate (K_2SO_4). The following is a scientific description of the effects, advantages and disadvantages of these two types of fertilizers on the plant.

1. Effects of potassium chloride (KCl)

Potassium chloride is the cheapest and most common type of potassium fertilizer, containing up to 55–60% K_2O equivalent potassium. It is quickly absorbed into the soil and easily absorbed by the plant. The positive effects of KCl on sunflower crops are as follows:

- Increases yield and accelerates full ripening of seeds.
- Improves the efficiency of plant water use, increases drought tolerance.
- Increases the intensity of photosynthesis and accelerates the accumulation of nutrients in leaves.

However, due to the presence of chlorine ions in KCl, when applied in high quantities (more than 300–350 kg/ha), chlorine accumulation is observed in the soil. This can in some cases reduce the quality of oil in sunflower seeds. Therefore, it is necessary to strictly adhere to scientifically based standards when applying KCl.

Experimental results: In field experiments conducted in Uzbekistan, when applying KCl, the yield increased by an average of 20–25% compared to the control option, and the oil content increased by 1.5–2%.

2. Effects of Potassium Sulfate (K_2SO_4)

Potassium sulfate is a non-chlorine potassium fertilizer containing 50–52% K_2O and 17–18% S (sulfur). Sulfur is very important as an additional nutrient for oilseed crops. The effects of K_2SO_4 on sunflower are as follows:

- Increases the amount and quality of oil in oilseed crops.
- Increases the amount of linoleic acid in seeds, which increases the biological value of the product.
- Helps maintain crop yields in drought conditions.
- Due to the absence of chlorine ions, the risk of negative effects on the soil and plants is low.

The sulfur content actively participates in fat synthesis and protein metabolism. Therefore, in areas where K_2SO_4 is applied, not only the yield but also the quality of the product improves.

Research methods and object. The research was conducted in the soil-climatic conditions of Surkhandarya region. The field experiment was set up and conducted based on generally accepted methods. The field experiment consisted of 12 variants and 4 rotations, and the variants were placed in the plots in a sequential manner. The width of one plot is 5.6 meters, the length is 40 meters, the total area is 224 m2, of which the calculation area is 112 m2. There are 8 rows in one plot, of which 2 rows from the two edges are 4 rows of protection, and 4 rows in the middle are calculation rows. The row spacing is 70 cm. The object of the research was sunflower. Biometric measurements and phenological observations were carried out using generally accepted methods for this crop..

Research results and their analysis. The results of the research show that in the control variant, where potassium and other fertilizers were not applied, the amount of mobile nutrients in the soil is very low, and in these conditions, the level of plant nutrition was observed to be low and unbalanced. As a result, the growth rate of sunflower seedlings was very slow. This indicates that under natural conditions, the amount of mobile nutrients in the soil is not sufficient for the nutrition of the sunflower plant, and this plant is demanding on a high concentration of mobile nutrients in the soil in its initial phases. Against the background of the experiment, the application of nitrogen and phosphorus fertilizers had a significant positive effect on the growth and dry matter accumulation of sunflower seedlings. In this variant, compared to the control variant where no fertilizer was applied, the plant height and the number of leaves per plant increased significantly, and the plants became relatively strong. This indicates that nitrogen and phosphorus nutrition play an important role in the life of the sunflower plant. The application of potassium fertilizers in the form of potassium sulfate and potassium chloride in various rates against the background of nitrogen and phosphorus fertilizers had a positive effect on the growth and accumulation of dry matter in the initial phases of the sunflower plant. In this case, the height and number of leaves of the sunflower plant increased. This was also reflected in the mass of dry matter. The increase in the accumulation of dry matter in various organs of the

sunflower plant is also associated with the acceleration of the photosynthesis process in the plant.

Thus, increasing the amount of exchangeable and water-soluble potassium in the soil due to potassium fertilizers improves the potassium nutrition of the sunflower plant in the initial stages of development and enhances the photosynthesis process in it. As a result, the growth and development of the sunflower plant accelerates at the initial stage, reaching its main stages faster and more powerful. This leads to a high and early-formed yield. In this case, increasing the rate of potassium fertilizers against the background of nitrogen and phosphorus fertilizers had a positive effect on the height, number of leaves and dry matter accumulation of the sunflower plant. This indicates that the sunflower plant is very demanding on potassium nutrition even in its initial stages and it is necessary to significantly increase the potassium regime of the soil during this period. It was found that the application of potassium fertilizers in the form of potassium chloride and potassium sulfate has different effects on the growth and development of sunflower plants in their initial phases. It was noted that the effect of potassium sulfate fertilizer is relatively stronger. This may be due to the fact that when potassium sulfate is applied, the sulfur nutrition of sunflower plants also improves. Under such conditions, the nitrogen nutrition of the plant also improves. Because improving sulfur nutrition has a positive effect on nitrogen absorption. This further improves potassium nutrition. When potassium chloride is applied, an increase in chloride ions in the soil can have a negative effect on the plant. Because chloride ions in high concentrations have a negative effect on the plant to a certain extent. Field observations show that when K_2SO_4 was applied, the dynamics of potassium in the soil, the development of vegetative and generative organs of the plant, and the yield were higher than with KCl, and the oil content increased by an average of 1–1.5%.

Conclusion

Both fertilizers increase yield, but K_2SO_4 is superior in improving oil quality. KCl is more economical and convenient to apply on large areas. The optimal strategy is to apply KCl as the main fertilizer and K_2SO_4 during the growing season to improve quality. Also, determining fertilizer rates based on soil analysis and timely application will further increase yield.

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