The influence of humic preparations on soil fertility and the yield of pea (*Pisum sativum* L.)

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In a field experiment conducted during 2021–2023, the effects of the humic preparations "BIO-Don" and "Potassium Humate" on the yield of pea and soil fertility indicators were studied. The humic preparations were applied foliarly during the pod formation period as a tank mixture with an insecticide. Statistical processing and principal component analysis were performed using STATISTICA 12 software.

It was established that humic preparations affect the abundance of rhizosphere microorganisms differently. While BIO-Don promotes the growth of heterotrophs and decreases the activity of bacteria that grow on mineral forms of nitrogen, Potassium Humate promotes the growth of micromycetes more strongly. An increase in the number of microorganisms in the rhizosphere zone of plants indicates their activation by root exudates of plants treated with humic preparations, which in turn affects the water stability of structural aggregates and the availability of nutrients. Principal component analysis showed that yield correlates with the quantity of available phosphorus and potassium, water stability of the structure, and the number of micromycetes in the soil.

The correlation is considered strong. Presumably, the role of micromycetes in this association is due to their ability to secrete organic acids into the environment, which in turn promotes the conversion of sparingly soluble phosphates into available forms. The possibility of such a conversion following treatment of plants with humic preparations was demonstrated in study [1]. Micromycetes also contribute to the maceration of dead organic tissues and the decomposition of organic substances, thereby influencing soil structure formation [2].

The quantity of actinomycetes and bacteria absorbing organic and mineral nitrogen in the rhizosphere zone affects soil fertility indicators, especially, nitrate nitrogen content. The correlation with ammonium nitrogen is weaker, possibly due to its stronger association with the soil adsorption complex. The correlation of humus content with the indicated parameters is weaker and likely more indirect, as this parameter is more stable; nonetheless, a moderate correlation was shown.

Thus, foliar treatment with humic preparations contributes to an increase in the yield of peas, which is primarily due to the conversion of poorly available forms of phosphorus into available ones and the improvement of the structural state of the soil. Micromycetes of the rhizosphere zone play a leading role in these processes.

References

1. Dubinina M. N., Bezuglova O. S. The effect of a humic preparation on the fractional-group composition of phosphates in ordinary carbonate chernozem // Proceedings of Higher Education Institutions. North Caucasus Region. Natural Sciences. 2022. No. 1 (213). P. 38–48.

2. Zinchenko M. K., Fedulova I. D., Sharkevich V. V. The complex of micromycetes and actinomycetes in agroecological monitoring of gray forest soil of agrolandscapes // Vladimirsky Zemledelets. 2019. No. 3(89). P. 15–19. DOI 10.24411/2225–2584–2019–10073.