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**ECONOMIC EFFICIENCY OF BALANCED SCHEMES OF TABLE
POTATO FERTILIZATION WITH MACRO- AND MESOELEMENTS ON
DARK GRAY PODZOLIC SOIL WITH THE USE OF LIQUID
PHOSPHORUS-CONTAINING FERTILIZERS**

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Today's market conditions require producers to reduce the producer cost for growing crops, provided maximum profits. However, modern potato production system should still be based on the latest scientific and technical achievements: varieties of intensive type, the use of high-quality seeds, advanced techniques cultivation, an effective system of fertilizers and plant protection products, as well as a high level of logistics. These techniques and elements of technology must be adapted to individual soil and climatic zones.

One of the important conditions for the selection and application in the growing technology of potatoes in certain agronomic measures is to obtain high yields, maximum net profit and a high level of profitability. The main task to be solved is to obtain from a unit of area the largest number of products of appropriate quality at the lowest cost of labor and money.

Among the agronomic methods for growing table potatoes, fertilizers are one of the most expensive items. Therefore, the use of liquid phosphorus fertilizers in this aspect is one of the most practical techniques. They are characterized by better

mobilizing properties and availability of nutrients for plants, which allow to obtain better results relative to other forms of fertilizers.

However, in addition to the form of fertilizer, in modern conditions of climate instability, the achievement of a balanced nutrition for potatoes not only macronutrients but also mesoelements, which is the reason for low yields of this crop in Ukraine in recent decades. Therefore, technological solutions are relevant that consider the possibility of its initial provision of macro- and mesoelements, which became the basis of our research.

The purpose of the research is to establish the economic efficiency for the schemes of potatoes balanced nutrition with macro- and mesoelements on dark gray podzolic soil in the conditions of the Left-Bank Forest-Steppe of Ukraine with the use of liquid phosphorus fertilizers.

Material and Methods. The field trials were in LLC “Biotech LTD” in Forest-Steppe in Ukraine and were made between 20012 and 2014 by Department of Agrochemistry and the quality of crop products NULES. The harvest area was 40 m², the repetition of the experiment was 3 times. The arrangement of the research plots was systematic in tree replication. The mid-late Mozart variety (originator of HZPC Holland, the Netherlands) was sown for the research. The soil of the experimental site is dark gray podzolic soil. It was characterized by a weakly acidic reaction of the soil solution (5.20), low content of mineral nitrogen (13.4 mg/kg), a high degree of supply of mobile compounds of phosphorus (168 mg/kg) and potassium (174 mg/kg) and medium supply of exchangeable calcium (7.42 mg eq/100 g of soil) and magnesium (1.64 mg eq/100 g of soil). The scheme for fertilization includes 1. Without fertilizers (control), 2. N₁₂₀P₃₅K₁₈₀ (Papp), 3. N₁₂₀P₇₀K₁₈₀ (Papp), 4. N₁₂₀P₁₀₅K₁₈₀ (Papp), 5. N₁₂₀Papp₃₅K₁₈₀Ca₂₁Mg₁₅B_{1,5} (p.Ca,Mg), 6. N₁₂₀Papp₇₀K₁₈₀Ca₂₁ Mg₁₅B_{1,5} (p.Ca,Mg). 7. N₁₂₀Papp₁₀₅K₁₈₀Ca₂₁Mg₁₅B_{1,5} (p.Ca,Mg). The following fertilizers were used in the experiment: ammonium nitrate (DSTU 7370: 2013), APP 11-37 (TU - 2186-627-00209438-01), potassium sulfate (GOST 4145-74), magnesium sulfate, Bosfoliar Boron (B – 21%). Economic efficiency was determined at the prices for 2015-2017.

Research results and discussion. Application of liquid forms of phosphorus fertilizers (APP) is a cost-effective measure. Our research found that the use of liquid phosphorus fertilizers in the rate of P_{35} had a positive effect on economic efficiency.

Conditionally net income at this rate of phosphorus reached 18.2 thousand UAH per ha at a level of profitability of 20.2 %. As the rate of phosphorus fertilizers increased, so did the producer cost, but the efficiency of these fertilizers led to an increase in the yield of table potatoes, which in turn contributed to high profits. With the use of APP 11-37 in the rate of P_{75} conditionally net income amounted to 30.1 thousand UAH/ha (profitability was 33.0 %). The highest indicators were characterized by the variant with the introduction of APP 11-37 in the rate P_{105} against the background of nitrogen-potassium application $N_{120}K_{180}$, where the conditionally net income was 54.4 thousand UAH/ha and the level of profitability was 59 %. While in the control the producer cost for potatoes growing outweighed the cost of the harvest by 19.7 thousand UAH, so there is no profit in this case.

According to the rates of P_{35} with $Ca_{21}Mg_{15}B_{1.5}$, this economic indicator was 1.9 %, according to the rates of P_{70} and P_{105} were 14.8 % and 32.7 %, respectively. However, due to reduced yields, which was due to a decrease in the amount of available phosphorus in the soil, as phosphorus and calcium were applied in one layer, as well as increased producer costs, these options were less profitable compared to options using only NPK.

Conclusions. The use of liquid phosphorus fertilizers in the rate of P_{105} on the background of $N_{120}K_{180}$ showed high economic efficiency for growing table potatoes and allowed to obtain a relatively net profit of 54.4 thousand UAH/ha and a level of profitability of 59 %. The addition of $Ca_{21}Mg_{15}B_{1.5}$ in the start fertilizer scheme provoked an increase in economic indicators relative to control, but a decrease compared to similar variants NPK without these elements. The reason for this is the application of phosphorus and calcium in one layer of dark gray podzolic soil, which provoked their interaction and the formation of trisubstituted phosphates, which, in turn, led to reduced yields of potato tubers. Promising for further study is the different depth of nutrients application in the technology of growing table potatoes.