



PHOSPHORUS FERTILIZER AND CORN YIELD

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ABSTRACT

The increase in corn yield is directly related to mineral fertilizers, including phosphorus. Increasing the rates of phosphorus fertilizers in the absence of phosphorus soils leads to an increase in the amount of feed due to an increase in feed units. An increase in the phosphorus norm to 100 kg/ha P₂O₅ ensured an increase in the indicated norms of indicators by 6.4-8.5 and 3.3-3.0%, respectively, when applying 140 kg/ha P₂O₅ - by 10.6-12.1 and 5.4-5.2%, and when applying 180 kg/ha P₂O₅ - by 12.8-16.1 and 6.5-6.3%.

Key words

corn, fertilizer, phosphorus, orthophosphate, crop, yield.

Introduction: The world pays special attention to the development of agricultural technology for cultivating crops, taking into account their biological characteristics, soil and climatic conditions while meeting the needs of the population with food, industry with raw materials and livestock with feed. Corn (*Zeamays L.*) ranks third in area in the world after wheat and rice, and first in the group of forage crops.

Literature review

Currently, the main strategy for the development of agricultural production throughout the world remains a rational system of fertilizer use. Among a wide range of issues related to the use of mineral fertilizers, the most important are the economic and environmental aspects of their use, because increasing productivity through the use of fertilizers is justified only if they do not reduce the profitability of production or product quality [1; p.9-11].

One of the ways to increase the fertility of eroded soils and reduce energy and water costs in agriculture in Uzbekistan is to improve the range of mineral fertilizers [5; p.221-223].

After the winter wheat repeated sowing of beet crops will have a positive effect on the size of the soil and serve to increase its productivity. Although this crop, which has been studied in practice, yields relatively good results, it is

important to select the optimal sowing standards for all repeated crops [7; p.122-126].

It is generally accepted that with a normal harvest in the dry above-ground mass of the plant, the share of the vegetative part (leaves, stem, panicle, stem with stem and involucre) on average accounts for 55-60% and the share of grain is 40-45%, and in the total mass of grain and the rod share of the rod is 15-18%. However, these average ratios change greatly during the formation of the plant under the influence of environmental factors and agricultural practices and, in particular, the nutritional regime of corn [8; p.140-144].

In our studies, we verified that mineral fertilizers, mainly nitrogen fertilizers, are of great importance for the growth and high yield of sugar beet. For sugar beets in the form of sodium nitrate (NaNO_3), $\text{N}_{200}\text{R}_{150}\text{K}_{200}$ kg/ha normal is effective [6; p.12].

Research Methodology

Phenological observations, records and biometric measurements were carried out in accordance with the "Methodological recommendations for conducting field experiments with corn" and "Methodology for field experiments for studying agrotechnical techniques for cultivating corn" [2; p-278, 3; p-278].

Accounts and observations on the formation of the fruiting organ - the corn cob using the method of biological control of plant development [4; p-290].

Table I

Corn grain yield, yield of feed units and digestible protein (t/ha), background 10-15 mg/kg P_2O_5

	Options	grain est	yield of feed units	digestible protein
1	$\text{N}_{220}\text{K}_{100}$ - Background	5,35	7,17	0,42
2	Background + Frame - 60 kg/ha	6,07	8,13	0,47
3	Background + Frame - 100 kg/ha	6,73	9,02	0,52
4	Background + Frame - 140 kg/ha	7,16	9,59	0,56
5	Background + Frame - 180 kg/ha	7,34	9,84	0,57
6	Background + XCS 8:24:0 60 kg/ha	6,17	8,27	0,48
7	Background + XCS 8:24:0 100 kg/ha	6,92	9,27	0,54
8	Background + PFA - 60 kg/ha	6,63	8,88	0,52
9	Background + PFA - 100 kg/ha	7,28	9,76	0,57
1	Background + XCS 10:34:0 60 kg/ha	6,74	9,03	0,53
1	Background + XCS 10:34:0 100 kg/ha	7,36	9,86	0,57

HCP₀₅ 0,09...0,12 t/ha 0,10-0,13 t/ha

Thus, on average for the years and the studied slope options, the application of phosphorus fertilizers ensured an increase in the grain yield structure of corn

grown on a very low background in terms of P_2O_5 content in the soil, in comparison with the nitrogen-potassium option - along the length of the cob by 4.7 cm, the diameter of the cob was 1.2 cm, there were 11.4 more grains in the row, the number of rows of grains in the cob was by 1.5 pcs., which increased the number of grains in the cob by an average of 264.1 pcs. The weight of one cob and the weight of 1000 grains also increased and were greater than the control by 26.4 and 24.2 g, respectively, and the grain yield after threshing the cobs increased by 4.5%.

Analysis and results

Increasing doses of phosphorus fertilizers applied in the experiment in the form of ammophos increased the yield structure indicators, but the intensity of their increase was not the same. For example, such indicators as the length of the cob and the weight of 1000 grains at a rate of 60 kg/ha P_2O_5 on average in the experiments are 22.4 and 231.0. An increase in the phosphorus norm to 100 kg/ha P_2O_5 ensured an increase in the indicated norms of indicators by 6.4-8.5 and 3.3-3.0%, respectively, when applying 140 kg/ha P_2O_5 - by 10.6-12.1 and 5.4-5.2%, and when applying 180 kg/ha P_2O_5 - by 12.8-16.1 and 6.5-6.3%.

Consequently, with an increase in the norms of phosphorus fertilizers, their effectiveness, at doses increased to 140-180 kg/ha, increases comparatively. The above allows us to conclude that excessive rates of phosphorus fertilizers do not entail a corresponding increase in the yield structure indicators.

Various forms of phosphorus fertilizers had a noticeable effect on the structure of corn grain yield. The most effective, on average, according to experience, were polyphosphorus fertilizers. At the same application rates of P_2O_5 , the efficiency of ammonium polyphosphate and liquid complex fertilizer 10:34:0 was higher than orthophosphorus fertilizers, ammophos and liquid complex fertilizer 8:24:0, on average in terms of cob size 5.9-5.7%, quantity grains per cob - by 11.8-11.7, the weight of one cob and the weight of 1000 grains, respectively - by 1.8-1.3 and 1.5-1.6%.

Thus, the application of polyphosphate fertilizers ensured an increase in the structure of corn grain yield, while their liquid forms were more effective than solid forms in the year of application.

In our experiments, phosphorus fertilizers had a noticeable effect on the formation of corn grain yield, the yield of feed units and digestible protein per hectare of crops.

Cultivation of corn on eroded typical gray soils of different P_2O_5 content contributed to the formation of different yields.

The forms of phosphorus fertilizers studied in the experiments ensured the formation of different grain yields. Thus, when polyphosphate type fertilizers (PFA and ZhKU 10:34:0) were added to the soil, the corn grain yield at a low background

(10-15 mg/kg P₂O₅) increased in comparison with the use of orthophosphates (Pam and ZhKU 8:24:0) on average by 0.39 t/ha.

Liquid complex fertilizers had a certain positive effect on the formation of grain yield. On average over the years of research, the increase in grain yield from liquid forms of orthophosphorus fertilizers is 0.19 t/ha, which is within the experimental error and is unreliable. Consequently, solid and liquid forms of phosphorus fertilizers based on orthophosphoric acid, when applied at equivalent rates, provided relatively identical results in their effect on the formation of corn grain yield.

The highest yields of feed units and digestible protein per hectare of crops, as well as the largest increases in corn grain yield, were provided by polyphosphate-type phosphorus fertilizers - PFA and ZhKU 10:34:0. The yield of feed units and digestible protein from the use of these fertilizers increased in comparison with the control option by 1.71 and 1.86 t/ha, respectively, and in comparison with options with the application of orthophosphorus type fertilizers (Ram and ZhKU 8:24:0) by respectively 0.31 and 0.50 t/ha; 0.72 and 0.76 t/ha.

A reliable increase in yield in the experiment from orthoforms at a phosphate level of 30-35 mg/kg is observed only up to a dose of 100 kg/ha P₂O₅; a further increase in the dose of ammophos (140-180 kg/ha P₂O₅) does not provide a reliable increase in yield.

On soils with a phosphate supply level of 30-35 mg/kg P₂O₅, a more significant increase in yield from polyphosphate forms of fertilizers is also observed. At the same time, the application of 60 kg/ha of P₂O₅ in the form of PFA and liquid fertilizers 10:34:0 gives a yield at the level of application of 100-140 kg/ha of P₂O₅ in the form of ammophos. A similar pattern is observed in the yield of feed units and digestible protein (Table 1).

Thus, the presented results of taking into account the yield of corn grain, the yield of feed units and digestible protein per hectare of crops on eroded typical sierozem soils allow us to draw a conclusion about the positive effect of polyphosphate type phosphorus fertilizers in comparison with orthophosphors, including ammophos. The results obtained confirm the feasibility and necessity of producing phosphorus fertilizers of the polyphosphate type, since they, at lower doses applied to corn crops (P60-100), provide a significant increase in grain yield, compared to the same doses in the form of ammophos.

The most effective and fast-acting factor contributing to increasing the yield and quality of corn grain on eroded typical gray soils is mineral fertilizers and, in particular, phosphorus fertilizers.



The highest rates of grain yield, yield of feed units and digestible protein were provided by PFA and ZHKU 10:34:0 fertilizers when applied at a rate of 60 and 100 kg/ha P₂O₅, respectively.

It should be noted that the application of 100 kg/ha of polyphosphoric fertilizers on the washed away part of the slope was more effective than the application of ammophos at rates of 140 and 180 kg/ha P₂O₅

The research results made it possible to establish both a number of general patterns and some features of changes in the quality of corn grain associated with the introduction of various forms and rates of phosphorus fertilizers for corn grown on eroded typical gray soils on different backgrounds of soil P₂O₅ supply.

The data obtained in the experiments confirmed the well-known pattern of reverse accumulation of protein and starch in the grain; on fertilized varieties, less starch was found in the grain and vice versa. Calculations have shown that the difference in protein and starch content is small, but this slight change in protein content is associated with a decrease in the amount of starch. The decrease in starch content in corn grain after the addition of PFA and liquid fertilizers 10:34:0 on typical gray soil can obviously be explained by the fact that protein synthesis is accompanied by increased oxidation of carbohydrates, which releases the energy necessary to activate amino acids used for protein synthesis.

The increase in protein content in variants with the application of phosphorus fertilizers and especially PFA and ZhKU 10:34:0 relative to the control was 2.2 and 3.8%, respectively, and in relation to fertilizers based on orthophosphoric acids - ammophos and ZhKU 8:24 :0 polyphosphate type fertilizers provided an increase in the protein content in corn grain by 0.5-0.6% against a very low background and, respectively, by 2.4-2.6 and 0.5-0.6%. Since corn has a high calorie content (high protein and fat content), it is a valuable food crop.

Conclusion/Recommendations

Thus, the application of phosphorus fertilizers in the form of polyphosphates ensured a higher quality corn grain yield. No increase in nitrate content was detected in corn grain and green mass, i.e. The resulting products are environmentally friendly and can be used for food purposes and animal feed.

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