

INFLUENCE OF PHOSPHORIC FERTILIZERS ON THE PHOSPHORIC STATE OF TYPICAL CARBONATE SEROSEM ZARAVSHAN OASIS

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Annotation

This article presents the results of studies on the use of phosphorus-containing fertilizers from Kyzylkum phosphorites on typical old-irrigated serozem soils of the Zerafshan oasis of the Republic of Uzbekistan. The optimal rates of application of Rncfu at the rate of 100-140 kg / ha P₂O₅, contributing to obtaining a stable yield of onion of good quality, have been determined. Equivalent value of new forms of phosphorus-containing fertilizers has been established.

Keywords: Phosphorus, fertilizers, carbonate typical gray soil, mobile phosphorus, coefficient, fertilizers, phosphorus balance, bioenergetic efficiency.

Introduction

An increase in the volume of agricultural production is closely related to an increase in the efficiency of the chemicalization agents used, primarily mineral fertilizers. One of the ways to solve food security is to increase human food products through the effective use of mineral fertilizers and chemicals in agriculture, since now there is an acute issue of increasing food production. According to the opinion and forecasts of many scientists, in the short and long term, fertilizers will remain the main means of active human influence on the dynamics of nutrients in the soil. Increasing agricultural production by expanding the range of mineral fertilizers using local raw materials, using ecological and economically effective forms and rates of fertilizers is an urgent task. For the development of the scientific foundations of the system of application of fertilizers in crop rotations of various specializations, it is important: information about the regularities of the mineral nutrition of each crop, the transformation of nutrients of mineral fertilizers, the responsiveness of plants to nutrients of fertilizers and the effectiveness of fertilizers, depending on the supply of soil with nutrients [4, 5 , 7, 8, 9, 12, 13].

The use of raw materials from phosphorites of the Kyzylkum deposits for the production of phosphorus-containing fertilizers requires a comprehensive study of the obtained fertilizers of a new type, their effect on the dynamics of mobile phosphorus in the soil, the fractional

composition of phosphates, yield and quality of crop production of vegetable crop rotation. The study of agrochemical studies carried out in Uzbekistan on terms, methods, norms, forms of application of mineral and organic fertilizers showed that these data vary within a fairly wide range [10, 11].

The purpose of our research is to study the effect of new forms and norms of phosphorus-containing fertilizers obtained from Kyzylkum phosphorites on the phosphorus state of typical serozem of the Zerafshan oasis of the Republic of Uzbekistan and to determine the optimal norms and forms of phosphorus-containing fertilizers for crops of vegetable crop rotation.

Material and research methods. All field and laboratory studies to study the effect on the phosphorus state of carbonate serozem soils of the Zerafshan oasis and the yield of vegetable crops, norms and forms of phosphorus-containing fertilizers from the phosphorites of the Kyzylkum deposits of the Republic of Uzbekistan. In a field experiment, the norms and forms of phosphorus-containing fertilizers were studied in 8 variants in 4-fold repetition, the arrangement of plots was systematically in 4 tiers. The total area of the plot is 56 m², of which the accounting is 28 m².

In field experiments, phosphorus-containing fertilizers Ram-ammophos were used, with a nitrogen content of 11-12%, total phosphorus - 44-52%, Rncfun-calcium phosphate fertilizer, with a nitrogen content - 6% and phosphorus - 16%, Ps-agro- 31- 41% total phosphorus, 4-7% ammonium nitrogen and 5-11% SO₃. Ammonium nitrate was used as a nitrogen fertilizer, and potassium sulfate was used as a potassium fertilizer. In the experiments, a hybrid of onions, Daytona F1, was sown. All agro-technological measures were carried out according to the technological map of cultivation of a crop for a given region, fertilizers were applied according to the scheme of the experiment.

All field experiments were carried out according to the following methods: "Biological control in agriculture" [6], "Method of physiological research in vegetable growing and melon growing" [2], "Method of field experiment in vegetable growing" [7], "Sabzavotchilik, polizchilik va potato-chilikda tajribalar ytkazish methodology "[1], Statistical processing of the obtained data was carried out according to BP Dospekhov [3], using Microsoft Excel. All agrochemical analyzes of soil and plants were carried out according to standard methods adopted in agrochemistry and soil science, in particular, mobile phosphorus according to Machigin, fractional composition of soil phosphorus according to Chang-Jackson in the Askinazi – Ginzburg version, organic phosphorus according to Metu.

The soils of the field experiment belong to the old irrigated typical sierozem. The parent rock of the carbonate typical sierozem is loess and loess loam formed on deluvial-proluvial deposits. The moisture content of the humus horizon is 35-40 cm with a humus content in the arable horizon of 1.28%. The content of gross nitrogen of phosphorus and potassium, respectively, is 0.09; 0.22; and 2.2%. In terms of the content of mobile phosphorus and potassium, the soils of the experimental plot are classified as poor soils. The soil absorption

capacity is 16.4 mg / eq per 100 g of soil. 76% of the absorption volume falls on calcium ions, 17% - on magnesium, and the rest - on ammonium and potassium ions, in the plow horizon, sodium ions are not found.

Research results. The study of phosphorus-containing fertilizers from Kyzylkum phosphorites on carbonate old-irrigated typical sierozem showed that the effectiveness of fertilizers depends on the norms and forms of fertilizers. When growing onions in a vegetable crop rotation, the content of mobile phosphorus before fertilization ranged from 23.3 to 23.8 mg / kg of soil.

In the phase of bulb formation, the content of mobile phosphorus in the control variant was 22.1 mg / kg P₂O₅, in the variant with nitrogen and potassium - 22.5 mg / kg P₂O₅, in all variants fertilized with phosphorus the content of mobile phosphorus increased. 60 kg / ha to 180 kg / ha, the content of mobile phosphorus increased in relation to the control variant by 10.5 - 29.6 mg / kg P₂O₅. At the same time, a similar trend persists in the phase of lodging of leaves, as well as towards the end of the growing season. By the end of the growing season, in the control variant, the content of mobile phosphorus was 14.1 mg / kg, which is 9.2 mg / kg less than the initial one. The use of a phosphorus-containing fertilizer in the form of Rnkfu also contributed to a decrease in the initial content of mobile phosphorus. However, with an increase in the rate of fertilizers, the content of the residual amount of mobile phosphorus in the soil tends to increase, and at rates of 140 - 180 kg / ha, a decrease in the content of mobile phosphorus below the supply gradation does not allow. Different forms of phosphorus-containing fertilizers at the same application rates of 110 kg / ha showed approximately the same indicators of the content of mobile phosphorus at the end of the growing season of the onion, although Ram ammophos in the growing season period in relation to the other two fertilizers has a positive effect on the content of mobile phosphorus (Fig. 1).

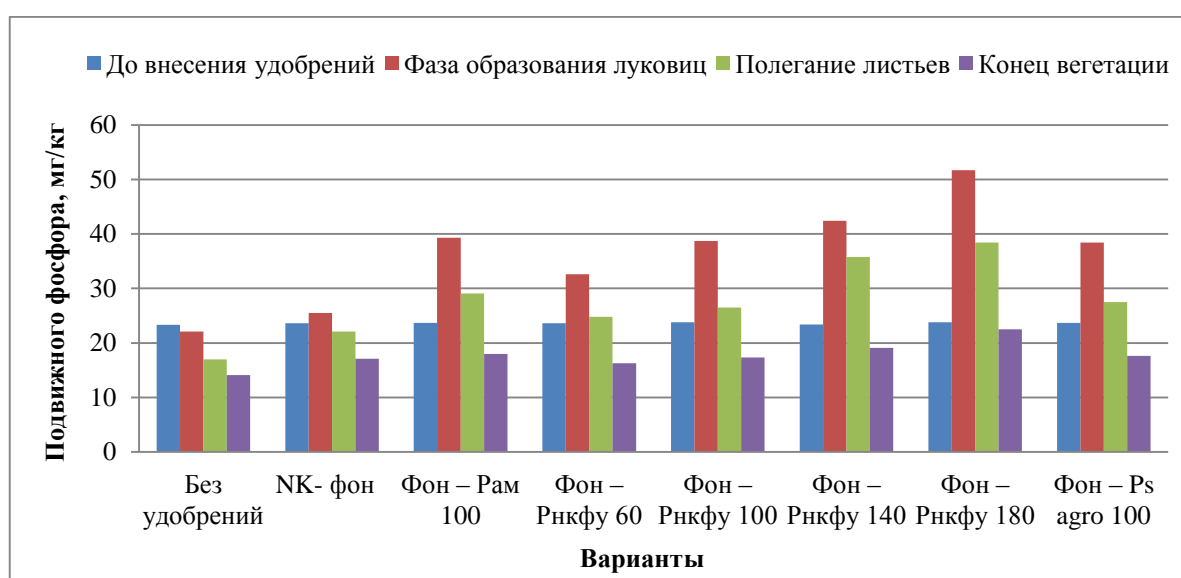


Fig. 1. Influence of phosphorus-containing fertilizers on the content of mobile phosphorus in typical gray soils, mg / kg P₂O₅ according to Machigin.

The dependence of the content of mobile phosphorus in typical carbonate gray soils on the norms of phosphorus-containing fertilizers is straightforward and obeys the equation $y = 0.15 + 23.05x$ with a correlation coefficient $r = 0.98$, which shows a close relationship.

For the most detailed study of the formation of the phosphate state of old-irrigated typical carbonate gray soils of phosphorus-containing fertilizers, we determined the fractional composition of soil phosphorus by the Chang-Jackson method in the Askinazi - Ginzburg variant. Studies have shown that the content of total phosphorus in the original soil was 1615 mg/kg, while the content of mineral phosphates was 83.1% of the total, organic phosphorus - 8.6% (table 1.).

Table 1. Influence of phosphorus-containing fertilizers on the fractional composition of typical carbonate gray soils, mg / kg P₂ O₅

№	Варианты	General phosphorus	Organic phosphorus	Mineral phosphorus	From them				Insoluble the remainder
					Ca-P	Al - P	Fe - P	CaII-P	
1	No fertilizers	1615	140	1343	21	298	89	935	132
2	NK- background	1708	145	1412	32	306	97	985	141
3	Background - Ram 100	1747	151	1466	26	391	88	955	130
4	Background - Rnkfu 60	1718	142	1446	26	395	85	940	130
5	Background - Rnkfu 100	1731	144	1457	29	386	86	956	130
6	Background - Rnkfu 140	1742	144	1471	32	372	85	975	134
7	Background - Rnkfu 180	1750	145	1482	37	365	84	984	135
8	Background - Ps agro 100	1749	142	1481	31	380	87	983	126

The fraction of mineral phosphates in the control variant sotavil 1343 mg / kg, of which loosely bound phosphates of the first fraction 21 mg, aluminophosphates amounted to 298 mg, ferrophosphates - 89 mg and various phosphates - 935 mg.

The results of the analyzes, at the end of the growing season of the onion, showed that on the fertilized variants, almost all variants underwent characteristic changes. The group of loosely bound phosphates increases depending on the rate, as well as on the form of fertilizers. The highest rates of this group of phosphates were noted when Rnkfu was applied at a rate of 180 kg / ha and amounted to 37 mg / kg P₂O₅.

In the fraction of aluminophosphates with an increase in the application rate, the content of the fraction tends to decrease. At the same application rates, in terms of the influence of the fraction of aluminophosphates, Rnkfu and agrophos are inferior to ammophos. The most changed were the fractions of highly basic calcium phosphates, which is the main reserve for the replenishment of mobile and loosely bound soil phosphates.

The study of the balance of phosphorus and the coefficient of the use of phosphorus from fertilizers by onion plants on typical carbonate gray soils showed that with an onion yield of

up to 450 centners per hectare, it carried up to 54.3 kg of phosphorus. The removal of phosphorus from fertilizers was up to 10.6 kg / ha. With the same application rates of phosphorus, lukaphosphorus plants from ammophos were used more and amounted to 9.7 kg / ha. The utilization rate of fertilizers decreases with increasing rates. The highest utilization rate was observed when Rnkfu was applied at a rate of 60 kg / ha and amounted to 14.8%. The utilization rate of phosphorus from ammophos was 12.1%. NKFU and Agrofos on the use of nutrients by plants showed approximately similar results (table 2).

Table 2. Utilization factor and balance of phosphorus in onion growing

№	Options	From soil and fertilizer	From fertilizers	Utilization ratio, %	Phosphorus balance, kg / ha
1	No fertilizers	19,3	-	-	-
2	NK- background	47,7	-	-	-
3	Background - Ram 100	53,4	9,7	14,9	46,6
4	Background - Rnkfu 60	51,2	7,5	21,1	8,8
5	Background - Rnkfu 100	52,6	8,9	14,1	47,4
6	Background - Rnkfu 140	54,0	10,3	11,1	86,0
7	Background - Rnkfu 180	54,3	10,6	8,8	125,7
8	Background - Ps agro 100	52,4	8,7	14,2	47,6

The onion yield in the control variant was 160.5 c / ha, the use of fertilizers without phosphorus provided a yield of 397.2 c / ha. An increase in the rate of phosphorus fertilization from 60 to 180 kg provided a yield of 426.4 - 452.5 centners per hectare, while a significant increase was provided by the use of phosphorus up to 140 kg / ha. A further increase in the dose did not give a reliable increase in yield. Ammophos agrofos and NKFU at the same application rates gave a statistically equivalent increase in yield. The dependence of the yield on the rate of phosphorus fertilizers is linear and obeys an equation of the type $y = 0.22x + 141.9$ with a correlation coefficient $r = 0.96$.

The use of phosphorus-containing fertilizers obtained from the phosphorites of the Kyzylkum deposits on the old-irrigated carbonate typical sierozem of the Zerafshan valley during the cultivation of onion favorably influenced the quality of the product. The dry matter content in the options was 11.2-14.6%. The highest indicator was noted in the control variant and amounted to 14.6%. An increase in the NKFU rate to 100 kg / ha increased the dry matter content in the onion, a further increase in the rate, fertilizers reduced the dry matter content. The content of total sugars did not depend on the rate and form of phosphorus-containing fertilizers and varied within the range of 8.0 - 8.2%. The application of phosphorus-containing fertilizers contributes to an increase in ascorbic acid in the onion by 2.0 - 3.3% in relation to the control (Fig. 2).

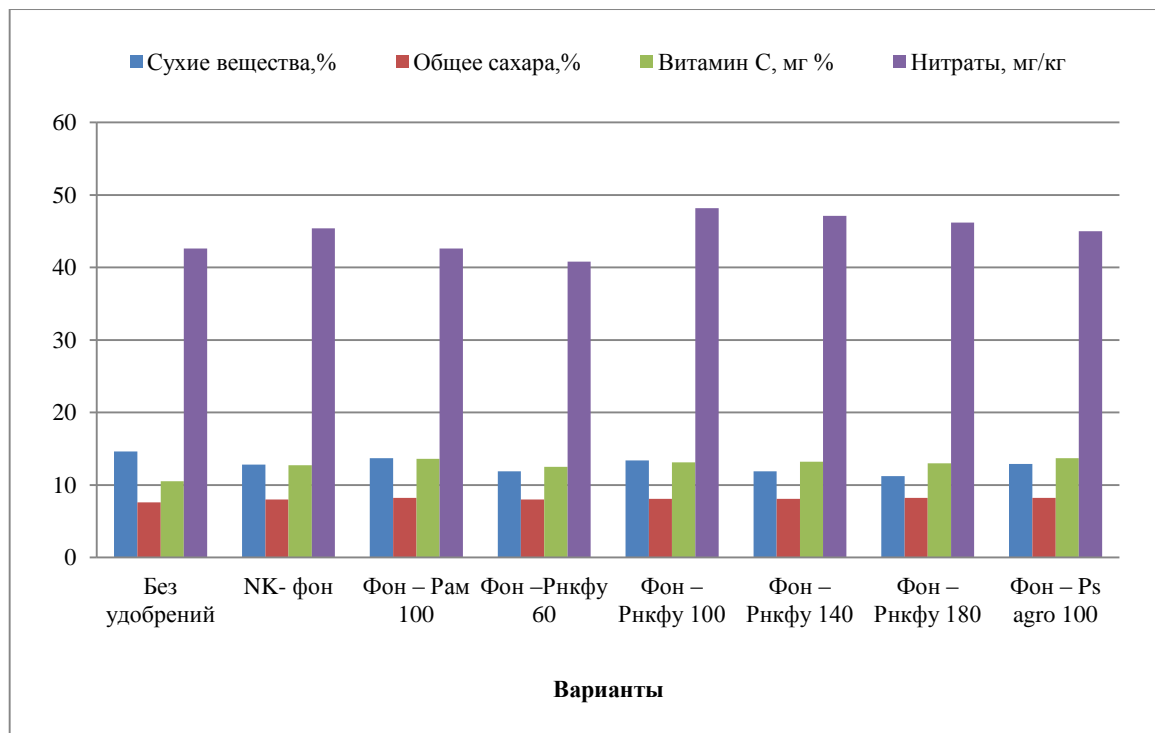


Fig 2. Influence of phosphorus-containing fertilizers on the quality of onions

The study of the economic efficiency of the applied phosphorus-containing fertilizers showed the relative efficiency of these fertilizers. However, with a sharply changing market economy with different structures of management, these indicators are extremely subjective. Therefore, we have calculated the bioenergetic efficiency of the applied phosphorus-containing fertilizers. Calculations of the bioenergetic efficiency of fertilizers have shown that all phosphorus-containing fertilizers are expedient from a bioenergetic point of view. In the background variant, with the use of nitrogen and potash fertilizers, the bioenergy efficiency coefficient is 1.88. Among the applied phosphorus-containing fertilizers, the highest indicator of bioenergy efficiency was noted by Rnkfu 60 and amounted to 1.80. A further increase in the norm contributed to a decrease in the coefficient to 1.53

At the same application rates, ammophos provided a high coefficient of bioenergetic efficiency in relation to RNA and agrophos and amounted to 1.76.

Conclusions. To obtain a high and sustainable yield with good qualities of onion, it is necessary to apply phosphorus-containing fertilizers from the phosphorites of the Kyzylkum deposits on the old-irrigated carbonate typical serozem of the Zerafshan oasis. It is recommended to apply at a rate of 100-140 kg / ha P₂O₅ in the form of Rnkfu. With the same application rates, the new forms of phosphorus-containing fertilizers Rnkfu and Ps –agro are not inferior to ammophos and they can be used as phosphorus fertilizers in growing onions.

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