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# LINEAR GROWTH OF PLANTS AND SOME MORPHOLOGICAL FEATURES OF CORN

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**Abstract:**
The carried out quantitative accounts of the influence of the studied forms and norms of phosphorus-containing fertilizers on the morphological characteristics of corn show that the highest indicators for the linear growth of plants, the height of the laying of the cob and the diameter of the stem at the 2nd internode were provided with the introduction of phosphorus fertilizers of the polyphosphate type, both unwashed and and in washed out typical serozem.

**Keywords**: corn, soil, plants, unwashed, washed off, fertilizers, phosphorus, forms, norms, growth.

## INTRODUCTION

The world pays special attention to the development of agricultural technology for the cultivation of agricultural crops, taking into account their biological characteristics, soil and climatic conditions while meeting the needs of the population with food, industry - raw materials and animal husbandry - feed. Maize (Zea mays L.) ranks third in terms of area in the world after wheat and rice, in the group of fodder crops it ranks first.

In the world, when growing corn as a main and secondary crop, by improving the phosphorus nutrition system, the balance of nutrients in the soil is optimized, a high grain yield and green mass is obtained, the population is provided with food, industry with raw materials and animal husbandry with complete (nutrient) feed. In this direction, scientific research is relevant to study the effect of the use of new fertilizers developed on the basis of phosphorites together with nitrogen and potassium mineral fertilizers on the growth, development and yield of corn, as well as the development of an optimal technology for their application.

In the Republic of Uzbekistan for 2018, when placing crops for corn, as a valuable grain and fodder crop, 138.5 thousand hectares of land will be allocated and for the first time it is planned to obtain 1210.9 thousand tons of corn grain. At present, in the Republic, the average yield of corn for grain is 35-45 q/ha.

Based on this, in agriculture, especially in the development of grain growing, ensuring the fulfillment of the tasks of fully providing high-quality feed for livestock, poultry and fish farming through the development of corn production is of great importance.

## Material and Methods

The studies found that manure, clay and trace elements used separately and together increased the yield of winter wheat on medium eroded soil by 16.4-64.2% in all years, and on average over three years - by 20.6-58%. ,8%. It is characteristic that the “clay + manure” option was quite effective in all the years of the experiments, because it provided a more balanced plant nutrition than pure manure. The increase in the yield of winter wheat on average over 3 years in this variant was 57.4%. Similar studies were carried out in Bulgaria [1; pp. 98-103, 8; pp. 65-69, 10; pp. 20-27, 11; pp. 182-186, 12; pp. 67-69].

In the studies of Stevenson C.R et al. [9;p-6-10], I.Zh.Sulaimonov et al. [5;p-234-243, 6; P.13-17], A.O.Khabibullaev [7; 7-12 pp] studied the effect of fertilizer and the type of crop rotation on the elements of productivity and the quality of corn grain. The yield of dry matter per 1 ha was 15.9 tons when 40 tons of manure + N100P100 was applied in a 2-year crop rotation and increased to 19.2 tons when the same fertilizers were applied in a 3-year crop rotation. In a six-field crop rotation, it most effectively responds to the application of a full mineral fertilizer.

In the experiments of V.B. Khomukov [7; p-18], fertilizers significantly influenced the increase in the yield of corn compared to the control. In all years of experience with hybrids Kamilla, RIK-300, the largest increase in yield (1.20-1.33 t/ha) was obtained in the variant of the ZhKU dose according to N + P + K (N120P90K40). The results of the experiment allow us to conclude that in the foothill zone of Kabardino-Balkaria, as in its other zones, the use of HCS is preferable to the use of mineral fertilizers (in this case, for example, nitro-ammophos).

Field experiments were laid according to the guidelines for conducting field experiments with fertilizer on eroded soils and agrochemical mapping, as well as those developed by the NIHI Union.

The research program covered the study of the growth, development and productivity of corn when applying various forms and rates of phosphorus fertilizers.

Ammonium nitrate (N - 34.6%), urea (N - 46%), ammophos (N - 11-12%, P2O5 - 44%), liquid complex fertilizer (LCF) grade 8:24:0 were used as fertilizers. based on orthophosphoric acids, ZhKU brand 10:34:0 based on polyphosphoric acids, potassium chloride (K2O - 58-60%), PFA.

Influence of phosphate fertilizers on the productivity and grain quality of corn hybrid Korasuv-350AMV. The studies were carried out in 1998-2001. with zoned corn hybrid Korasuv-350AMV on eroded and non-washed soils. The experience was laid in 4-fold repetition, with the area of the plot: total - 112 sq.m. and accounting - 86 sq.m. The task of the study was to establish the influence of the norms and forms of phosphate fertilizers on the yield and quality of corn grain.

Phenological observations, records and biometric measurements were carried out according to the "Methodological recommendations for conducting field experiments with corn" and "Methods of field experiments for the study of agricultural practices for the cultivation of corn" [3; p-290].

Records and observations on the formation of the fruiting organ - corn cob by the method of biological control of plant development [4; C-225].

The determination of the assimilation surface of the leaves was carried out by a linear method by multiplying the maximum width of the leaf by its length and by a factor of 0.75.

Yield data in field experiments were processed by the method of dispersion and correlation analysis according to B.A. Dospekhov [2; C-416].

The calculation of the economic efficiency of the used forms and norms of fertilizers was carried out on the basis of existing standards.

**Results**

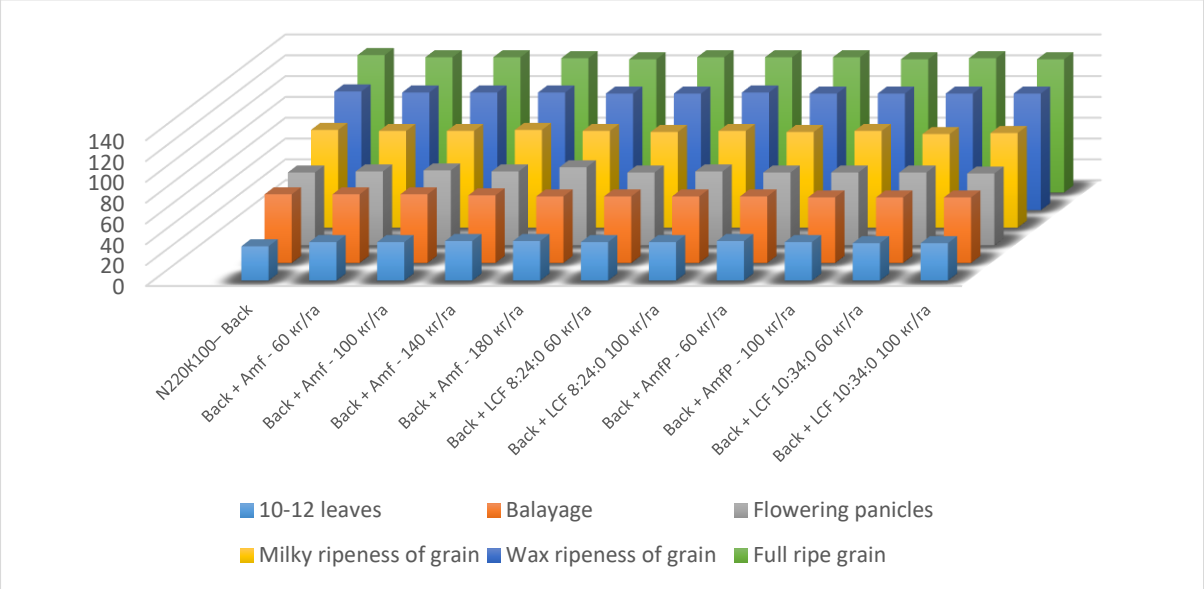


Fig.1. Duration of interphase and vegetative periods of maize development on eroded typical gray soils against the background of 10-15 mg/kg P2O5. Unwashed soil, days.

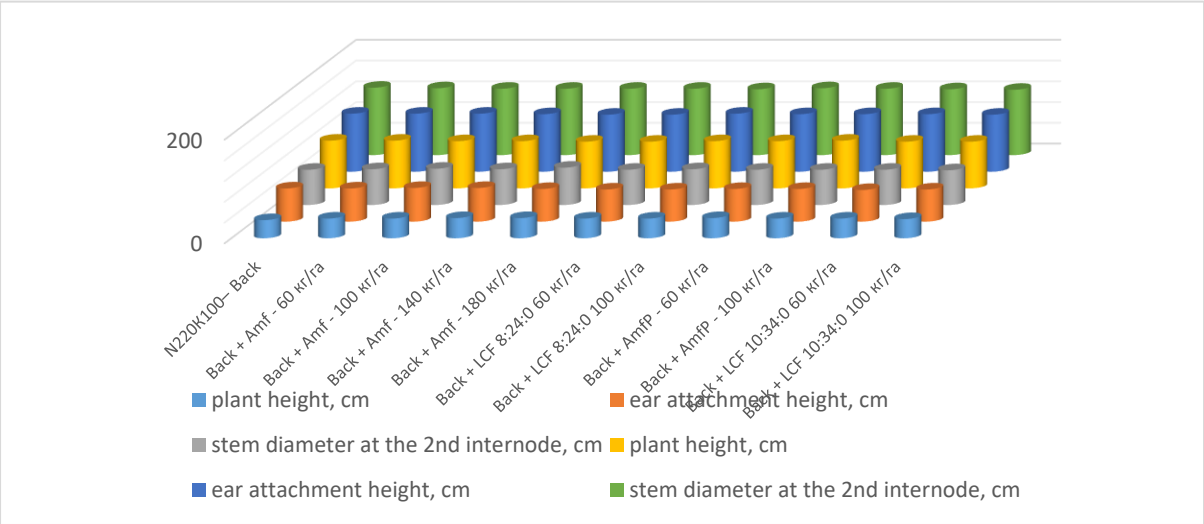


Fig.2. Duration of interphase and vegetative periods of development of corn on eroded gray soils against the background of 10-15 mg/kg P2O5. Washed away soil, days

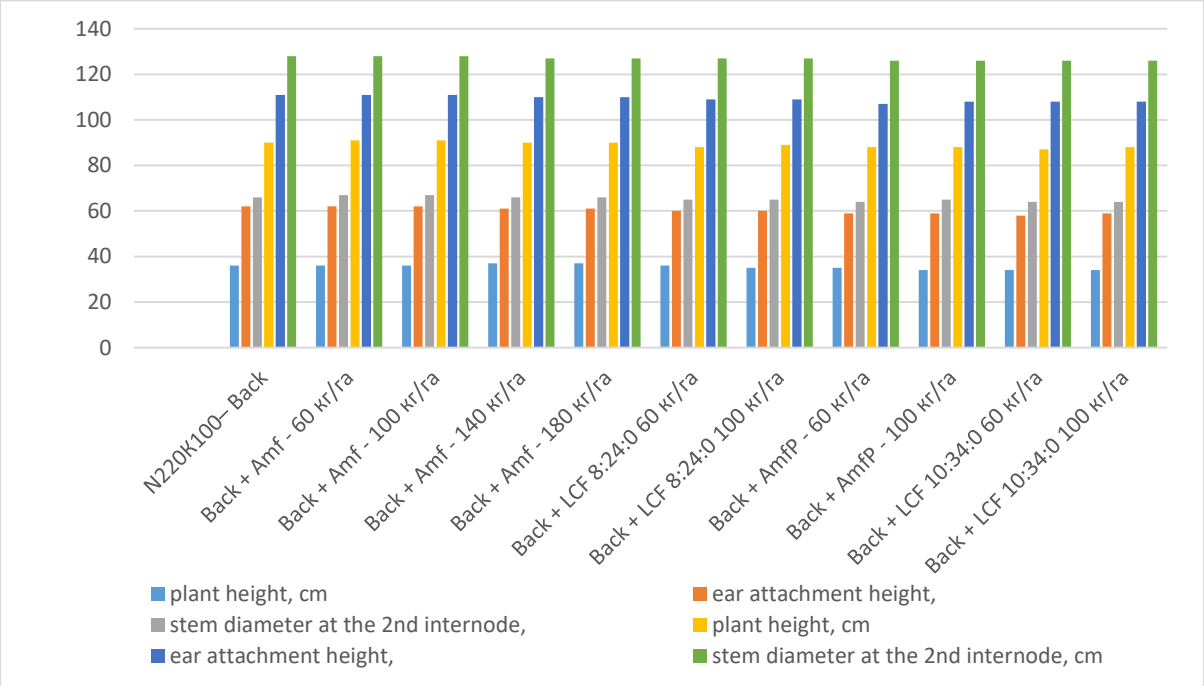


Fig.3. Duration of interphase and vegetative periods of maize development on eroded typical gray soils against the background of 30-35 mg/kg P2O5. Unwashed soil, days

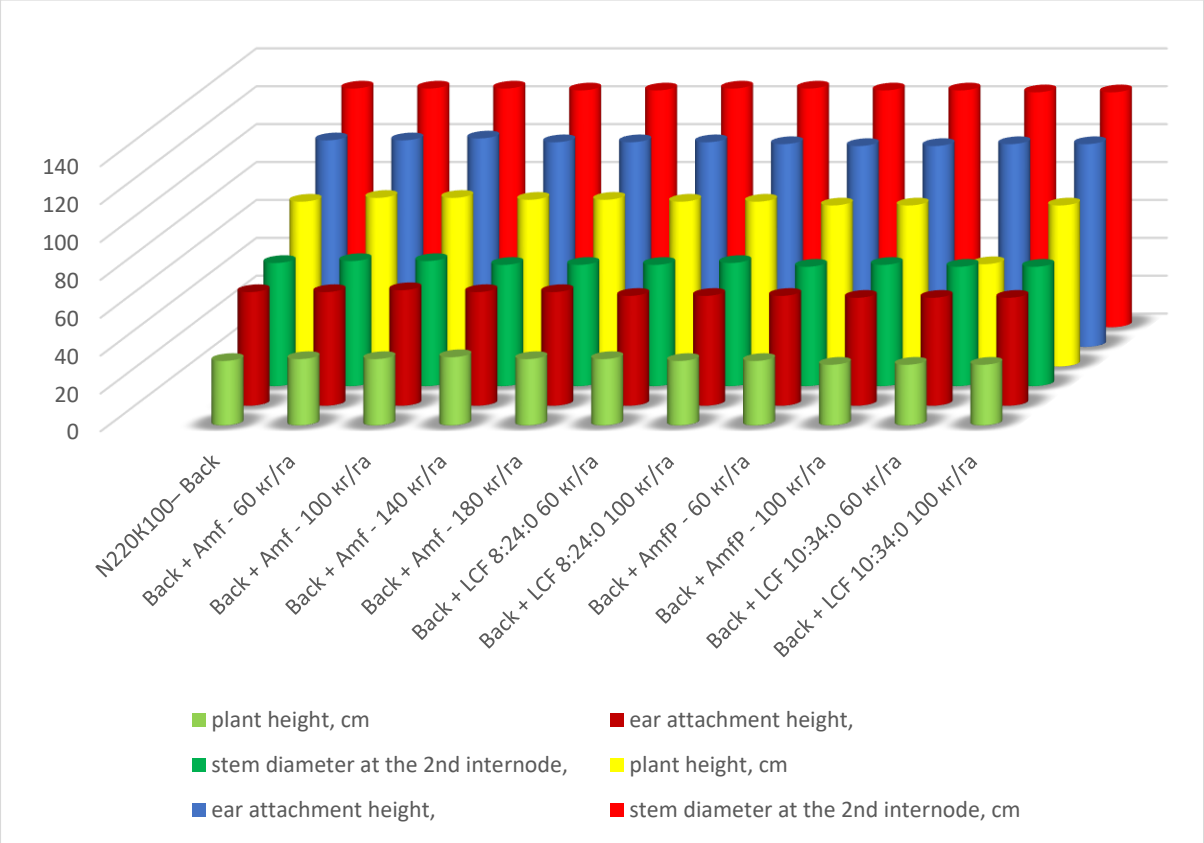


Fig.4. Duration of interphase and vegetative periods of maize development on eroded typical gray soils against the background of 30-35 mg/kg P2O5. Washed away soil, days.

Table 1 Morphological indicators of corn depending on the form and norm of phosphorus-containing fertilizers on eroded typical gray soils, 1989-1993. (10-15 mg/kg P2O5)

| № | Options | Unwashed soil | | | Washed away soil | | |
|---|---|---|---|---|---|---|---|
| | | plant height, cm | ear attachment height, cm | stem diameter at the 2nd internode, cm | plant height, cm | ear attachment height, cm | stem diameter at the 2nd internode, cm |
| 1 | $N_{220}K_{100}$– Back | 250,6±2,3 | 127,1±0,8 | 2,3±0,3 | 248,4±2,8 | 125,6±1,2 | 2,0±0,8 |
| 2 | Back + Amf - 60 кг/га | 264,7±2,7 | 136,1±1,1 | 2,8±0,4 | 261,8±3,3 | 134,3±1,4 | 2,5±0,6 |
| 3 | Back + Amf - 100 кг/га | 270,9±3,6 | 142,8±1,7 | 3,1±0,4 | 268,5±4,1 | 140,7±1,6 | 2,8±0,7 |
| 4 | Back + Amf - 140 кг/га | 274,0±4,4 | 145,6±1,3 | 3,4±0,6 | 271,3±5,3 | 143,2±1,7 | 3,2±0,4 |
| 5 | Back + Amf - 180 кг/га | 275,5±5,1 | 147,4±1,5 | 3,5±0,6 | 274,6±4,9 | 146,5±1,5 | 3,4±0,5 |
| 6 | Back + LCF 8:24:0 60 кг/га | 265,5±3,8 | 138,2±1,2 | 2,9±0,3 | 263,2±3,7 | 135,8±1,2 | 2,7±0,9 |
| 7 | Back + LCF 8:24:0 100 кг/га | 273,0±4,6 | 144,5±1,8 | 3,3±0,4 | 270,7±4,2 | 142,6±1,6 | 3,1±0,8 |
| 8 | Back + AmfP - 60 кг/га | 267,1±3,5 | 138,8±1,0 | 3,0±0,3 | 265,5±3,6 | 136,9±1,3 | 2,8±0,6 |
| 9 | Back + AmfP - 100 кг/га | 274,1±4,2 | 145,8±1,4 | 3,5±0,5 | 270,3±4,3 | 144,2±1,7 | 3,3±0,5 |
| 10 | Back + LCF 10:34:0 60 кг/га | 267,5±2,9 | 139,9±0,9 | 3,1±0,4 | 265,6±3,9 | 138,1±1,4 | 2,9±0,3 |
| 11 | Back + LCF 10:34:0 100 кг/га | 274,7±3,8 | 146,7±1,6 | 3,5±0,7 | 271,8±5,2 | 145,7±1,6 | 3,3±0,6 |

**Note:** Unwashed soil /Washed away soil

Table 2 Morphological indicators of corn depending on the form and norm of phosphorus-containing fertilizers on eroded typical gray soils, 1989-1993. (30-35 mg/kg P2O5)

| № | Options | Несмытая почва | | | Смытая почва | | |
|---|---|---|---|---|---|---|---|
| | | высота растений, см | высота прикрепления початков, см | диаметр стебля на 2-м междоузлии, см | высота растений, см | высота прикрепления початков, см | диаметр стебля на 2-м междоузлии, см |
| 1 | $N_{220}K_{100}$– Back | 263,8±2,6 | 136,1±1,2 | 2,9±0,3 | 261,5±3,2 | 135,7±1,3 | 2,0±0,4 |
| 2 | Back + Amf - 60 кг/га | 269,7±2,4 | 141,4±1,4 | 3,2±0,4 | 268,3±3,5 | 140,4±0,9 | 3,0±0,3 |
| 3 | Back + Amf - 100 кг/га | 273,8±3,1 | 145,3±1,5 | 3,5±0,7 | 271,7±4,1 | 143,6±1,1 | 3,2±0,4 |
| 4 | Back + Amf - 140 кг/га | 276,2±3,6 | 147,8±1,4 | 3,7±0,6 | 274,5±4,6 | 146,2±1,5 | 3,5±0,5 |
| 5 | Back + Amf - 180 кг/га | 277,7±3,4 | 150,0±1,7 | 3,8±0,5 | 276,6±4,2 | 148,5±1,7 | 3,5±0,5 |
| 6 | Back + LCF 8:24:0 60 кг/га | 270,0±2,8 | 143,0±1,2 | 3,2±0,6 | 268,4±3,3 | 140,7±1,4 | 3,0±0,3 |
| 7 | Back + LCF 8:24:0 100 кг/га | 274,7±3,3 | 147,3±1,3 | 3,5±0,4 | 271,8±3,8 | 145,6±1,6 | 3,1±0,4 |
| 8 | Back + Amf - 60 кг/га | 272,2±3,5 | 143,5±1,5 | 3,3±0,5 | 270,5±4,4 | 141,9±1,3 | 3,0±0,5 |
| 9 | Back + AmfP - 100 кг/га | 276,3±4,2 | 147,9±1,4 | 3,6±0,5 | 275,1±5,2 | 145,3±1,5 | 3,2±0,6 |
| 10 | Back + LCF 10:34:0 60 кг/га | 273,3±3,9 | 144,2±1,2 | 3,5±0,6 | 270,7±4,7 | 143,6±1,2 | 3,3±0,4 |
| 11 | Back + LCF 10:34:0 100 кг/га | 277,2±5,1 | 149,0±1,6 | 3,8±0,5 | 276,8±5,6 | 147,5±1,4 | 3,5±0,7 |

Note: Unwashed soil /Washed away soil

**Discussion**

In our experiments, we took into account the height of plants, the laying of the cob, the diameter of the stem, and determined their variability when cultivating corn on eroded typical gray earth soils with different phosphate backgrounds and applying different forms and norms of phosphorus-containing fertilizers (tables 1, 2).

Thus, the linear growth of plants was the most intensive against the average background of soil availability with phosphates (30-35 mg/kg P2O5), where the maximum indicators were obtained for this morphological trait (Fig: 3.4). Of the applied fertilizers against the background of 10-15 mg/kg P2O5 at the lowest dose - 60 kg/ha, a positive effect on the growth process is provided by the application of polyphosphate-type fertilizers.

It should be noted that with an increase in the dose of P2O5, on a low background, with the introduction of ammophos, an increase in plant height is provided up to a dose of 140 kg/ha on the unwashed part of the slope. The application of fertilizers obtained on the basis of polyphosphoric acids at a dose of 100-60 kg/ha P2O5 on the unwashed part of the slope and at a dose of 100 kg/ha P2O5 on the washed-out part of the slope provides plant height at the level of application of 140-180 kg/ha P2O5 in the form of ammophos.

On average, over the years of testing, the linear growth of plants tended to increase in comparison with the background variant on non-washed soil (10-15 mg/kg P2O5) for orthophosphate type fertilizers by 24.9 cm and (30-35 mg/kg P2O5) against the background - 13.9 cm, on the washed-out part of the slopes, 25.2-15.1 cm, and for polyphosphate type fertilizers by 24.1-13.4 cm. ha P2O5 in all studied soils. It should be noted that the linear growth of plants, against different backgrounds of soil availability with phosphates, both when applying fertilizers at a rate of 60 kg/ha P2O5, and when applying fertilizers at a rate of 100 kg/ha P2O5, develops differently.

So, if against a very low background (10-15 mg/kg P2O5) the linear growth of plants on non-washed soil was 20.3 cm on average for the studied variants, and 20.1 cm on washed-off soil, then on average (30-35 mg/ kg P2O5) background, respectively: 10.0 and 10.2. Consequently, on a background provided with phosphates, the linear growth of plants is less than on a very low phosphate background. This makes it possible to apply phosphorus fertilizers at a rate of 60 kg/ha P2O5 on an average background (30-35 mg/kg P2O5) on non-washed and washed-off soils, and on a low (10-15 mg/kg P2O5) non-washed and washed-off soils at a rate of 100 kg/ha P2O5 (rice: 1.2).

The studied norms and forms of phosphorus fertilizers had a certain influence on the height of the cob laying and the diameter of the plant stem. So, with an increase in the rate of fertilizer application, the height of the cob laying and the diameter of the stem at the 2nd internode increased along with the increase in plant height.

On average, according to the experiment, the height of the cob laying and the diameter of the stem on a very low background (10-15 mg/kg P2O5) amounted to 142.6 and 3.2 cm, respectively, on the unwashed soil, 140.8 and 3.0 cm on the washed-out soil, and on average (30-35 mg/kg P2O5) in unwashed soil - 142.9 and 3.5 cm, washed away - 144.3 and 3.2 cm.

Various fertilizer backgrounds studied in the experiments had a different effect on the morphological characteristics of corn plants.

**Conclusion**

Thus, the carried out quantitative accounts of the influence of the studied forms and norms of phosphorus-containing fertilizers on the morphological characteristics of corn show that the highest indicators for the linear growth of plants, the height of the ear laying and the diameter of the stem at the 2nd internode were provided when applying phosphorus fertilizers of the polyphosphate type as unwashed, and in washed out typical serozem. At the same time, the effectiveness of these fertilizers is most effective on a background with a low supply of phosphates, while on an average phosphate background, the effect of fertilizers is not so high, but it is still higher than on a very low background. The above allows us to conclude that in order to achieve the highest rates for the studied traits, it is more expedient to use fertilizers of the polyphosphate type, while the rate of fertilizers must be differentiated depending on the level of soil supply with phosphates and the degree of soil washout.

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