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# VARIATION OF GRAIN WEIGHT - EAR$^{-1}$ AND - PLANT$^{-1}$ AND 1000–GRAIN WEIGHT TRAITS OF WINTER WHEAT (*TRITICUM AESTIVUM* L.) VARIETIES UNDER THE EFFECT OF DIFFERENT TREATMENTS.

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## ABSTRACT

This study was carried out to investigate the variation of traits; grain weight ear$^{-1}$, grain weight plant$^{-1}$ and 1000–grain weight in three winter varieties namely Batko, Diya and Krasnodarskaya 99 under the influence of the growth regulator, Furolan and mineral fertilizer. The grain weight ear$^{-1}$ is one of the basic traits of which one could determine with high accuracy productivity or yield of the experimental variant or plot of any of winter wheat variety. Grain weight plant$^{-1}$ or productivity as it may called, is one of the basic traits of winter wheat varieties, which determines yield. The 1000–grain weight is one of the basic quantitative traits, characterizing yield of the variety, seed and its technological qualities. In the variant treated with mineral fertilizers and growth regulator the grain weight ear$^{-1}$ obtained was 1.31 g which was 0.12 g more than control ($LSD_{05}$-variant = 0.01). Similar pattern was observed in the experimental variants of other varieties. The effect of factor C (growth regulator) during the formation of 1000–grain weight formed 5.0%. Furolan influenced the process of the formation of grains of winter wheat varieties during the last stages organogenesis.

**KEYWORDS:** Wheat varieties; mineral fertilizer; Furolan; Grain Weight - Ear$^{-1}$ and - Plant$^{-1}$; 1000–Grain Weight.

## 1.0 INTRODUCTION

The mass of 1,000 grains or thousand kernels weight (TKW) is the weight of air-dried and undamaged grains. It is used as one of the parameters for assessing the quality of grain. Grains with higher TKW have better milling quality and ensure better emergence. The mass of 1,000 grains as a final component of grain yield depends on many components that develop in the previous phases of ontogenesis. Because there is a over-production of most plant organs in each phase of wheat plant growth, it is possible that mass of 1,000 grains could be influenced by agro-ecological conditions and agro-technical measures such as date and quality of sowing, mineral fertilizers and irrigation. TKW depends on the variety and varies widely (Raut and Khorgade, 1989; Sarkar et al, 1988). Unfavourable conditions during the growth of wheat plant can be partly compensated by creating favourable conditions that will increase mass of 1,000 grains (Cook and Veseth, 1991; Bauer et al., 1983).

Nelson et al. (1988) proved a strong positive correlation of top leaf area, internodes and spike with grain mass and concluded that the selection for higher size of these parts of wheat plant is a selection for grain mass increase. In agroecological conditions of Serbia and in varieties, cultivated there the mass of 1,000 grains ranges from 33-45 g, 38 g on average (Protic and Jankovic, 1999; Hassan and Saad, 1996.).

## 2.0 MATERIALS AND METHODS

The field work was carried out in the experimental farms of All-Russian Rice Research Institute, Belozerny, Krasnodar, Russia from 2007 to 2009. The laboratory tests were performed in the same Research institute. (variation of traits; grain weight ear$^{-1}$, grain weight plant$^{-1}$ and 1000–grain weight in three winter varieties namely Batko, Diya and Krasnodarskaya 99) In this study, the variation pattern of the following traits; grain weight ear$^{-1}$, grain weight plant$^{-1}$ and 1000–grain weight in three winter varieties namely Batko, Diya and Krasnodarskaya 99 under the influence of two treatments of mineral fertilizers and Furolan was investigated according to the following scheme: $N_{50}P_{90}K_{40}$ for the basic soil treatment plus $N_{60}$ – top-dressing in spring and $N_{30}$ − foliar top-dressing during the ear formation phase.

Winter wheat varieties were sown according to the fertilized variants at the end of September. The experimental plot was 3 m x 8 m = 24 m$^2$ in three replicates. The plots were completely randomized. The seeds were sown at 5 million grains per hectare. The precursor plant was winter barley.

During the elongation phase, towards the time of harvest, the winter wheat plants were sprayed (at the rate of 300 $dm^3$/hectare) with 5 g/hectare dose of Furolan (growth regulator) in water solution with the aid of dosimeter device.

After the harvesting of each variant and replicates of the field experiment separately in portions, the grains were cleared of physical impurity by the sorting machine. Productivity in terms of grain weight per plot of the area studied which varied on the average from 9 kg to 13 kg was determined. From each plot samples of 1 kg, grains were taken for determination of humidity. Yield was calculated taking into account; 14% grain humidity. Furthermore, from each plot samples of 2kg, grains were taken for determination of grain sizes. For this purpose portions of grains of 2kg were subjected to sorting in laboratory sieve with apertures of 20 x 24 and 20 x 28 mm. For each grain-size, there were two: large and small, weighed on electrical scales. From the results of weighing obtained the grain output was determined.

## 3.0 RESULTS AND DISCUSSION

### 3.1. Grain weight ear$^{-1}$

The grain weight ear$^{-1}$ is one of the basic traits by which one could determine with high accuracy productivity or yield of the experimental plot of any winter wheat variety. Product of grain weight ear$^{-1}$ and number of productive stalks per $m^2$ equals to yield. Thus, Grain yield can be expressed as the product of three variables (yield components): Grain yield = (number of heads) x (kernels per head) x (kernel weight).

In multi-factorial experiment of Batko variety the grain weight ear$^{-1}$ varied from 1.19 g (control) to 1.31 g (mineral fertilizers + growth regulator). The difference between these extreme variants was 0.12 g ($LSD_{05}$-variant = 0.01). By application of only Furolan the grain weight ear$^{-1}$ formed was 1.23 g which was 0.04 g more than the control ($LSD_{05}$-variant = 0.01). Treatment of winter wheat plants with Furolan solution at harvest output phase showed significant increase of grain weight ear$^{-1}$. Application of only mineral fertilizers showed the grain weight ear$^{-1}$ of Batko variety to be 1.27 g which was 0.08 g more than control. Mineral fertilizers significantly increased the grain weight ear$^{-1}$ (Table 1).

**Table 1: Data on variation of grain weight ear$^{-1}$ trait of winter wheat varieties based on various doses of mineral fertilizers and growth regulator, grams (2007-2009).**

| Variety (factor A) | Dose of Mineral fertilizers, kg added per hectare (factor B) | Growth regulator (factor C) | Average for: | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Variants | A | B | C | AB | AC | BC |
| Bat'ko | Control | control | 1.23 | | | | | 1.17 | 1.15 |
| | | Furolan | 1.23 | | 1.17 | | 1.21 | 1.23 | 1.19 |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring + $N_{30}$ at spike formation | control | 1.27 | 1.25 | | | | | 1.22 |
| | | Furolan | 1.31 | | 1.24 | | 1.29 | | 1.25 |
| Deya | Control | control | 1.12 | | | | | 1.15 | |
| | | Furolan | 1.16 | | | | 1.14 | 1.18 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 1.18 | 1.17 | | | | | |
| | | Furolan | 1.20 | | | | 1.19 | | |
| Krasnodar-skaya 99 | Control | control | 1.14 | | | | | 1.17 | |
| | | Furolan | 1.18 | | | 1.18 | 1.16 | 1.21 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 1.20 | 1.19 | | | | | |
| | | Furolan | 1.25 | | | 1.18 | 1.23 | | |
| $LSD_{05}$ | | | **0.01** | **0.01** | **0.02** | **0.01** | **0.01** | **0.01** | **0.02** |

In the variant treated with mineral fertilizers and growth regulator the grain weight ear$^{-1}$ obtained was 1.31 g which was 0.12 g more than control ($LSD_{05}$-variant = 0.01). Similar pattern was observed in the experimental variants of other varieties.

For the factor A (variety) grain weight ear$^{-1}$ of varieties studied varied in the following sequence: 1.17 g (Deya); 1.19 g (Krasnodarskaya 99) and 1.25 g (Bat'ko), ($LSD_{05}$-factor A = 0.01). The best variety on the account of this trait under the influence of mineral fertilizers and growth regulator on the average seemed to be Bat'ko which formed grain weight ear$^{-1}$ of 1.25 g.

For the factor B (mineral fertilizers) the grain weight ear$^{-1}$ varied from 1.17 g (control) to 1.24 g (mineral fertilizers). The difference between these variants was 0.07 g ($LSD_{05}$-factor B = 0.02). Differences in grain weight ear$^{-1}$ among the fertilized variants were significant.

For the factor C (growth regulator) the grain weight ear$^{-1}$ on the average varied from 1.18 g (without treatment) to 1.22 g (treated with Furolan). The difference between these variants in grain weight ear$^{-1}$ was 0.04 g ($LSD_{05}$-factor C = 0.01). Treatment of varieties of winter wheat plants with growth regulator, Furolan significantly increased grain weight ear$^{-1}$.

The analysis of interaction of factors A and B showed that the grain weight ear$^{-1}$ of all winter wheat varieties under the influence of mineral fertilizers significantly increased respectively as follows: by 0.08 g (Bat'ko); 0.05 g (Deya) and 0.07 g (Krasnodarskaya 99). The varieties studied responded moderately to mineral fertilizers during the formation of grain weight ear$^{-1}$. Accordingly they had the following indices of responsiveness: 1.07; 1.04 and 1.06.

The analysis of interaction of factors A and C showed that the grain weight ear$^{-1}$ in varieties on application of growth regulator, Furolan increased thus: 0.06 g (in Bat'ko); 0.03 (in Deya) and 0.04 g (in Krasnodarskaya 99). Application of growth regulator, Furolan significantly increased the grain weight ear$^{-1}$ ($LSD_{05}$-interaction AC = 0.01). However, the varieties investigated showed weak response to growth regulator during the formation of grain weight ear$^{-1}$. They had respectively the following indexes of responsiveness: 1.05(in Bat'ko); 1.03(in Deya) and 1.03(in Krasnodarskaya 99).

The results analysis of the interaction of factors B and C showed that the grain weight ear$^{-1}$ for the variants varied from 1.15 g (control) to 1.25 g (mineral fertilizers plus Furolan). In the integrated study of mineral fertilizers and growth regulator it was observed that Furolan increased the grain weight ear$^{-1}$ by 0.04 g in comparison with control. Only mineral fertilizers alone increased the grain weight ear$^{-1}$ on the average by 0.07 g in relation to control. The variant with combined application of mineral fertilizers and Furolan increased grain weight ear$^{-1}$ on the average by 0.1 g ($LSD_{05}$-interaction BC = 0.02). All increases with application of mineral fertilizers and growth regulator were statistically significant (Kaushik et al., 1996; Dorofeev and Korovina, 1979).

In our study the application of mineral fertilizers and growth regulator significantly increased the grain weight ear$^{-1}$ in all the variants investigated.

By means of the three-factorial dispersion analysis of the trait grain weight ear$^{-1}$, it was established that the influence of the general variation during its formation was 34.4%. The effect of experimental variants was 31.3% while effect of the factor A (variety) was 15.6%. This influence of genotypes of varieties investigated during formation of grain weight ear$^{-1}$ was moderate.

The influence of factor B (doses of mineral fertilizers) during the formation grain weight ear$^{-1}$ was 13.5%. Mineral fertilizers were almost equivalent in influence to that of genotypes of varieties on the formation of grain weight ear$^{-1}$. The effect of the factor C (growth regulator) during the formation of grain weight ear$^{-1}$ was weak at 5.1%. However, Furolan influenced basically the size, maturity and 1000− grain weight.

Thus, the total effect of variable factors during the formation of grain weight ear$^{-1}$ amounted to 65.6%. This effect is significant in improving yield in wheat plants.

### 3.2 Grains weight plant$^{-1}$

Grain weight plant$^{-1}$ or productivity as it may called, is one of the basic traits of winter wheat varieties, which determines yield. It depends on the productive bushiness and grain weight ear$^{-1}$**.** These are highly correlated traits. The phenotypic correlation is estimated between the values of traits as follows: productive bushiness and grain weight ear$^{-1}$ (r = 0.76); productive bushiness and grain weight plant$^{-1}$ (r = 0.95).

The analysis of grain weight plant$^{-1}$ in multi-factorial experiment showed that in Bat'ko variety it varied on the average from 1.98 g (control) to 2.36 g (mineral fertilizers and growth regulator). The difference between the extreme variants was 0.38 g ($LSD_{05}$-variant = 0.59). The increase in grain weight plant$^{-1}$ in winter wheat varieties under the influence of mineral fertilizers and growth regulator was insignificant. Only the tendency to increase in grain weight plant$^{-1}$ was observed. Similar trend was observed in other winter wheat varieties (Table 2).

For factor A (variety) of winter wheat varieties varied in the following sequence: 1.84 g (Deya); 1.94 g (Krasnodarskaya 99) and 1.96 g (Bat'ko). In spite of the fact that between the varieties there were differences in grain weight plant$^{-1}$, but they were insignificant ($LSD_{05}$-factor A = 0.30).

**Table 2: Data on variation of grain weight plant$^{-1}$ trait of winter wheat varieties depending on doses of mineral fertilizers and growth regulator, grams (2007-2009).**

| Variety (factor A) | Dose of Mineral fertilizers, kg added per hectare (factor B) | Growth regulator (factor C) | Average for: | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Variants | A | B | C | AB | AC | BC |
| Bat'ko | Control | control | 1.98 | | | | | | 1.83 |
| | | Furolan | 2.00 | | 1.84 | | 1.99 | 1.73 | 1.92 |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring + $N_{30}$ at spike formation | control | 2.15 | 1.96 | | | | | 2.06 |
| | | Furolan | 2.36 | | 1.95 | | 2.02 | 2.18 | 2.13 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Deya | Control | control | 1.68 | | | | | | |
| | | Furolan | 1.86 | | | | 1.77 | 1.79 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 1.89 | 1.84 | | | | | |
| | | Furolan | 1.92 | | | | 1.91 | 1.89 | |
| Krasnodar-skaya 99 | Control | control | 1.82 | | | | | | |
| | | Furolan | 1.89 | | | | 1.86 | 1.87 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 1.92 | 1.94 | | 1.80 | | | |
| | | Furolan | 2.12 | | | 2.03 | 2.02 | 2.00 | |
| $LSD_{05}$ | | | **0.59** | **0.30** | **0.24** | **0.24** | **0.42** | **0.42** | **0.34** |

For factor B (mineral fertilizers) on the grain weight plant$^{-1}$ the variation from 1.84 g (control) to 1.95 g (variant with combined application) was observed. The difference between variants in grain weight plant$^{-1}$ was 0.11 g ($LSD_{05}$-factor B = 0.24). These differences were insignificant.

For factor C (growth regulator) the grain weight plant$^{-1}$ varied from 1.80 g (without treatment) to 2.03 g (plants treated with growth regulator, Furolan). Difference in grain weight plant$^{-1}$ between variants was 0.23. They were not significant and within the LSD limits. The growth regulator, Furolan showed stimulating effect during the formation of grain weight plant$^{-1}$.

The analysis of interaction of factors A and B showed that the fertilized variants increased grain weight plant$^{-1}$ in winter wheat varieties. The following increase in grain weight plant$^{-1}$ with application of mineral fertilizers was observed: by 0.03 g (Bat'ko); 0.14 g (Deya) and 0.16 g (Krasnodarskaya 99), ($LSD_{05}$-interaction AB = 0.42). The increase obtained in grain weight plant$^{-1}$ in winter wheat varieties was statistically insignificant. Mineral fertilizers showed only stimulating effect.

Interaction of factors A and C showed that after the treatment of plants of winter wheat varieties by growth regulator, Furolan an increase in grain weight plant$^{-1}$ in comparison with control was observed. Only Bat'ko variety showed significant increase in grain weight plant$^{-1}$ in comparison with control. The difference between the variants was 0.45g ($LSD_{05}$-interaction AC = 0.42). Other varieties showed insignificant increase in grain weight plant$^{-1}$ in comparison with control. The increase in Bat'ko variety of grain weight plant$^{-1}$ was significant. This could be explained as a good response to mineral fertilizers during the formation of grain weight plant$^{-1}$. Its responsiveness index was good at 1.26.

The analysis of results of interaction of factors B and C showed that there was a tendency to increase in grain weight plant$^{-1}$ under the influence of doses of mineral fertilizers and growth regulator. The difference between the extreme variants in the interaction B and C on grain weight plant$^{-1}$ was 0.3 g ($LSD_{05}$-interaction BC = 0.34). Thus, the interaction of factors: mineral fertilizers and growth regulator led to increase in grain weight plant$^{-1}$. But it was statistically insignificant.

By means of the three-factorial dispersion analysis it was established that the influence of the general variation during the formation of grain weight plant$^{-1}$ was 32.0%. The effect of experimental variants 25.9%. The effect of the factor A (variety) was 15.3%. This was average the value of the influence of genotypes of varieties on the productivity of the plant (Cherepanov, 1995; Konovalov, 1990). The influence of the factor B (doses of mineral fertilizers) during the formation of grain weight plant$^{-1}$ was 15.0%. This was a significant effect on the formation of the quantity of trait. The effect of the factor C (growth regulator) on the formation of grain weight plant$^{-1}$ was 10.7%. The growth regulator, Furolan was capable of increasing the size of grain and 1000–grain weight 5.8.

### 3.3 1000– grain weight

The 1000–grain weight is one of the basic quantitative traits, which characterize yield of any variety or seed and represent its technological quality. It is a stable high-quality trait. It is weakly subjected to ecological or modification variation and shows considerable hybridization variability (State Register of Breeding, Russian Federation, 2004). Damage of plants by pests and diseases, drought conditions, dry winds during the time of ripening and maturity of grains, flooding of stalks, etc. leads to reduction of 1000–grain weight, causing weakening of grains. All these negative factors influence 1000–grain weight. The trait of 1000–grain weight is firmly connected with such characteristics of plants of winter wheat varieties, as grain quantity ear$^{-1}$ (r = 0.57), grain weight plant$^{-1}$ (r = 0.79) and grain weight plant$^{-1}$ (r = 0.77). Particularly, two traits are clearly interconnected: 1000–grain weight and grain number ear$^{-1}$ (r = 0.57). The determination factor (square of correlation coefficient) is equal to 0.32. It means that the trait 1000–grain weight and grain number ear$^{-1}$ in 32% of cases are controlled by the genotype of varieties and in 68% of cases of their value depends on ecological and external factors. (Table 2).

**Table 3: Data on variation of 1000–grain weight trait of winter wheat varieties depending on doses of mineral fertilizers and growth regulator, grams (2007-2009).**

| Variety (factor A) | Dose of Mineral fertilizers, kg added per hectare (factor B) | Growth regulator (factor C) | Average for: | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Variants | A | B | C | AB | AC | BC |
| Bat'ko | Control | control | 38.6 | | 38.5 | | 39.0 | | 38.3 |
| | | Furolan | 39.3 | | | | | 39.0 | 38.6 |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring + $N_{30}$ at spike formation | control | 39.4 | 39.3 | 39.1 | | 39.6 | | 38.9 |
| | | Furolan | 39.9 | | | | | 39.6 | 39.3 |
| Deya | Control | control | 38.5 | | | | 38.6 | | |
| | | Furolan | 38.7 | | | | | 38.7 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 38.9 | 38.9 | | | 39.1 | | |
| | | Furolan | 39.3 | | | | | 39.0 | |
| Krasnodar-skaya 99 | Control | control | 37.8 | | | | 37.9 | | |
| | | Furolan | 37.9 | | | 38.6 | | 37.9 | |
| | $N_{50}P_{90}K_{40}$ + $N_{60}$ in the spring+ $N_{30}$ at spike formation | control | 38.3 | 38.2 | | | 38.5 | | |
| | | Furolan | 38.6 | | | 38.9 | | 38.5 | |
| $LSD_{05}$ | | | **0.15** | **0.08** | **0.06** | **0.06** | **0.11** | **0.11** | **0.09** |

By means of the three-factorial dispersion analysis of the trait of 1000–grain weight the variation of winter wheat varieties under the influence of doses of mineral fertilizers and growth regulator, Furolan was determined. The analysis showed that experimental variants of Bat'ko variety the 1000–grain weight varied from 38.6 g (control) to 39.9 g (mineral fertilizers and growth regulator). The difference between extreme variants was 1.3 g ($LSD_{05}$-var. = 0.15). Application of mineral fertilizers and growth regulator showed significant increase in the 1000–grain weight. By application of only growth regulator the 1000–grain weight of Bat'ko variety increased by 0.7 g ($LSD_{05}$-var. = 0.15). Application of only mineral fertilizers the 1000–grain weight formed was 39.4 g which was 0.8 g more than control. The 1000–grain weight by utilization of combined application (of mineral fertilizer and growth regulator) on this variant formed was 39.9 g which was 1.3 g more than the control. Similar trend was observed in other varieties. The following conclusion could be made from these results: after the application of mineral fertilizers and growth regulator significant increase in 1000–grain weight in all experimental variants was observed. It means that to obtain mature and large seeds of winter wheat variety mineral fertilizers and growth regulator, Furolan should be expediently used in the seed crops.

The analysis of results of interaction of factors A and B on 1000–grain weight showed that in Bat'ko variety it varied from 39.0 g (control) to 39.6 g (variant with mineral fertilizers). By application of mineral fertilizers the 1000–grain weight increased by 0.6 g in comparison with control ($LSD_{05}$-interact. AB = 0.11). Statistically significant increase of 1000–grain weight in Bat'ko variety with application of mineral fertilizers was observed.

In Deya's variety from interaction of factors A and B significant increase in 1000–grain weight of 0.5g was obtained.

In Krasnodarskaya 99 1000–grain weight increased by 0.6 g after application of mineral fertilizers.

Thus, interaction of factors A and B showed significant increase in 1000–grain weight in all varieties of winter wheat.

The analysis of results of interaction of factors A and C during the formation of 1000–grain weight showed that it was significantly increased in all varieties of winter wheat after utilization of Furolan during cultivation of seeds. In Bat'ko variety by application of growth regulator the 1000–grain weight increased by 0.6 g ($LSD_{05}$-interact. AC = 0.11). In other grades significant increase in 1000–grain weight was also obtained. The growth substance of Furolan had significant influence on the enlargement and largeness of seeds of winter wheat varieties. It was expedient to apply it on seed crops of winter varieties during the production of conditioned seeds.

The effect of interaction of factors B and C showed significant increase in 1000–grain weight on the average for all experimental variants.

By means of the three-factorial dispersion analysis it was established that the influence the general variation during formation of 1000–grain weight formed 34.4%. The effect of experimental variants during the formation of 1000–grain weight amounted to 30.8%. The effect of the factor A (variety) during the formation of large seeds formed 15.1%. This was the average value of the effect of genotypes during the formation of 1000–grain weight. This confirmed that the 1000–grain weight related more to high-quality trait than to ecological predisposition.

The influence of the factor B (mineral fertilizers) during the formation of 1000–grain weight formed 14.6%. Mineral fertilizers throughout all the stages of organogenesis and subsequent ripening and formation of seeds play an important role in the cultivation of winter wheat varieties. The effect of factor C (growth regulator) during the formation of 1000–grain weight formed was 5.0%. The growth regulator, Furolan during the last stages organogenesis influenced the process of the formation of grains of winter wheat varieties.

## 4.0 CONCLUSION

The grain weight ear$^{-1}$ is one of the basic traits by which one could determine with high accuracy productivity or yield of the experimental plot of any winter wheat variety. The analysis of interaction of factors A and B showed that the grain weight ear$^{-1}$ of all winter wheat varieties under the influence of mineral fertilizers significantly increased respectively as follows: by 0.08 g (Bat'ko); 0.05 g (Deya) and 0.07 g (Krasnodarskaya 99). The varieties studied responded moderately to mineral fertilizers during the formation of grain weight ear$^{-1}$. The 1000–grain weight is one of the basic quantitative traits, which characterize yield of any variety or seed and represent its technological quality. It was found out in this study the growth substance of Furolan had significant influence on the enlargement and largeness of seeds of winter wheat varieties. It was expedient to apply it on seed crops of winter varieties during the production of conditioned seeds.

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