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**EFFECTS OF SEEDING PERIODS AND STANDARDS OF PEA VARIETY  
"ZUMRAD" ON PRODUCTIVITY AND GRAIN YIELD INDICATORS.**

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**Abstract.** This article presents the results of a scientific study on the effect of planting seed periods and norms on the productivity indicators of pea plants in the conditions of meadow-grey soils in the Andijan region. The grain yield in the first term was 35,8 s/ha, and the grain yield indicators in the second term were 32,8 s/ha. In the third term, the yield was higher by 6,3 s/ha compared to the first term. Also, in option 5 planted in the second period (90x30x9-1) scheme, the grain yield is 34,3 s/ha, 3,0 s/ha higher than the 5th option in the first period, and 6,3 s/ha higher than the 5th option in the third period. Information on having an indicator is provided.

**Keywords:** plant, variety, pea, period, norm, pods, number of grains, weight of grains, number of pods, weight of 1000 grains, productivity.

**Relevance of the topic.** According to the Food and Agriculture Organisation of the United Nations (FAO), based on the data on pea plants worldwide and in the territory of our country (2020), 10,2 million hectares are planted, of which 8 million hectares correspond to the contribution of the Indian state. This indicator makes up more than 78% of the world's cultivated pea area. In our country, pea planting areas, dryland, and irrigated areas are on average 4-5 thousand hectares, that is, pea crops are being planted and taken care of on 0,04-0,05 percent of the land. In Uzbekistan, the average yield is 8-10 s/ha from dry land and 20-25 s/ha from irrigated lands.

Ensuring food security in our country, developing a modern science-based farming system in agriculture, and developing and improving the most important agrotechnological factors that determine the fate of grain crops grown simultaneously

with various microbiological processes taking place in the soil remain urgent issues today.

Among the leguminous crops, the symbiotic bacteria living together in the roots of the pea plant are capable of assimilating molecular nitrogen from the atmosphere, making a great contribution to the improvement of the amount of organic matter in the soil and the water-physical properties of the soil, as well as to the increase of soil fertility.

K.K.Paliwal, S.R.Ramgiri, M.S.Lallar say that in the pea crop, the number of pods per plant, the number of grains per pod, the weight of 1000 grains, and the weight of grains per plant have a positive effect on the increase in yield indicators and the improvement of grain quality indicators. Also, the weight of 1000 grains of peas grown on irrigated lands is 10-11 g higher than that of those grown on dry lands [4].

According to F.B. Jabborov, schemes of planting "Malxotra", "Yulduz", "Polvon" and "O'zbekistanskiy-32" varieties (60x3-1; 60x6-1; 60x9-1) of peas in the irrigated lands of the Kashkadarya region, affect plant growth, and in its observations on the impact on development indicators, it states that it was observed that the number of pods formed in the plant and the number of grains in the pod increased as the number of stems in the row increased [5; 1527-1535 p].

I.Xamdamov, S.Mustanov, G.Suvonova, M.Djumayev stated that the formation of generative organs in pea varieties is influenced by different planting schemes. In the (60x9-1) planting scheme, the total number of buds formed in one plant was 76,8, flowers 73,2, pods 68,1, and stored pods 63,9, proportionally, in the (60x6-1) planting scheme, buds were 73,1, flowers were 68,7, pods were 64,2, and stored pods were 60,0. The number of buds produced in the scheme (60x9-1) was 3,7 more than the number of buds in the planting scheme (60x6-1), the number of flowers was 4,5, the number of pods was 4,5, and the number of preserved pods was 7,2. It was observed that it was more per grain [6;31-p].

M.Tursunova, G.Alikulov stated that the formation of grain yield elements in peas depends on the morphological and biological characteristics of the variety. When drought-resistant varieties are planted, during the phase of pod formation, highly drought-resistant varieties retain crop elements and have the opportunity to harvest [7; 860-871p.].

I.X.Xamdamov, N.J.Xodjayeva, and S.B.Mustanov stated that peas were planted in early periods in the conditions of irrigated grey soils in the foothills region of the Samarkand region plant growth, and the effect on development and productivity was studied. In this case, when it was planted on February 20, it had the highest productivity indicators, and 25,9 centners of grain were obtained from the "Yulduz" variety and 23,4 centners from the "Milyutin-6" variety per hectare [8; 123-137-p].

**Research methodology and style.** In field experiments, phenological observation and calculation of pea crops were carried out based on the manuals "Methods of Conducting Field Experiments Dala tajribalarini o'tkazish uslublari" (2007) and phenological observations "Metodika Gosudarstvennogo sortoispitaniya selskoxozyaystvennix kultur" (1989), and statistical analysis of the results was carried out based on B.A. Dospehov's "Metodika polevogo opita" (1985) method [1,2,3].

**The purpose of the study:** The purpose of this study is to study the effects of seeding periods, standards, and different planting methods on the growth, development, yield, and grain quality of peas under irrigated soils.

**Research results:** In 2022-2023, field experiments were conducted at the Research Institute of Cereals and Legumes in order to study the effect of seeding periods and norms on the growth, development, formation of crop elements, and grain yield of peas.

In the field experiment, the "Zumrad" variety of peas was planted in three different periods (20.11; 20.02; 10.03), and at different planting rates, the following

schemes (60x5-1, 60x7.5-1, 60x10-1, and 90x30x6-1, 90x30x9-1, 90x30x12 -1) were studied.

Our field experiment consists of 18 options and 4 returns, the total area of each option is 240 m<sup>2</sup>, the area of consideration is 120 m<sup>2</sup>, and the total area of the experiment is 1,72 hectares. In the placement of the experiment, the row spacing is 60 cm and 90 cm wide and consists of different planting schemes. One row between 60 cm rows and two-row planting methods between 90 cm rows were used.

According to the data in Table 1, as a result of research carried out in 2022-2023, in terms of sowing dates of the pea variety "Zumrad", among the options planted with 60 cm between the rows in the first period, the productivity indicators were the highest in option 3 planted in the scheme (60x10-1). The average number of pods per bush is 49,5 grains, the average number of grains per bush is 59,3 grains, the average weight of grains per bush is 24,2 g, and the average weight of 1000 grains average was 407 g. In the 2nd option, planted between the rows (60x7,5-1), the number of pods per plant is 41,4 on average, the number of grains per plant is 49,5 on average, the weight of grain per plant is the average of 19,9 g, and the average weight of 1000 grains is 402 g. In the first variant, planted between the rows (60x5-1), the number of pods per plant is 28,9 units on average, the number of grains per plant is 31,8 units on average, and the weight of grains per plant was found that the average weight was 12,6 g, and the average weight of 1000 grains was 396 g.

Among the options planted with a row spacing of 90 cm, the 6th option planted in the scheme (90x30x12-1) has the highest indicators, the average number of pods per plant is 49,2 units, the number of grains per plant is 59,3 units, the average weight of grains per plant is 23,9 g, and the weight of 1000 grains the average was 403 g. In the 5th variant planted with row spacing (90x30x9-1), the average number of pods per plant was 39,7 units, the number of grains per plant was 47,6 units, the weight of grains per plant the average was 18,8 g, the average weight of 1000 grains was 396 g. In the 4th variant, planted between the rows (90x30x6-1), the number of pods per plant is 25,8 units on average, the number of grains per plant is 28,5 units on average,

the weight of grain per plant is it was found that the average weight was 11,2 g, and the average weight of 1000 grains was 392 g.

In the first period, among the options planted at 60 cm between the rows, productivity indicators in option 3 planted in the scheme (60x10-1), compared to option 2 planted in the scheme (60x7,5-1), the number of pods per plant is 8,1 on average, the number of grains per plant is 9,8 on average, the weight of grain per plant is 4,3 g on average, 1000 grain weight on average 5,0 g and compared to option 1 planted in the scheme between the rows (60x5-1), the number of pods per bush is on average 20,6 pieces, the number of grains per bush is 27,5 pieces on average, grains per bush, it was found that the average weight was 11,6 g, and the weight of 1000 grains was 11,0 g on average.

Among the options planted in the first term, 90 cm double row has the highest indicators in option 6 planted in the scheme (90x30x12-1), compared to option 5 planted in the scheme (90x30x9-1), the number of pods per plant is 9,5 on average, the number of grains per plant is 11,7 on average, the weight of grain per plant is 5,2 g on average, 1000 grain weight on average 7,0 g and compared to the 4th option planted in the scheme (90x30x6-1), the number of pods per plant is 234 units on average, the number of grains per plant is 30,8 units on average, the weight of grains per plant 12,7 g on average, 1000 grain weight on average 11,0 g was found to have higher indicators.

According to the results of the analysis of seed sowing dates and standards, the options planted in the first period had higher productivity indicators compared to the options planted in the second and third periods. In the first period, among the options planted in the row width of 60 cm, the 3rd option planted in the scheme (60x10-1) has the highest indicator. In the second term compared to the 3rd option planted in the scheme (60x10-1), the number of pods per plant is 1,0 units on average, the number of grains per plant is 1,0 units on average, the weight of grains per plant is 0,6 g on average, 1000 grain weight on average 2,0 g and in the third term compared to the 3rd option planted in the scheme (60x10-1), the number of pods per bush was

on average 9,2 pieces, the number of grains per bush was 11,0 pieces on average, grains per bush weight was higher by 5,0 g on average, and the weight of 1000 grains was higher by 9,0 g on average, the 2nd variant planted in the scheme between the rows (60x7.5-1) compared to the second term, the number of pods per plant is 8,9 on average, the number of grains per plant is 10,6 on average, one plant is the weight of grains per plant is 4,8 g on average, the weight of 1000 grains is 8,0 g on average, in the third term, compared to the 2nd option, the number of pods per bush is on average 17,0 grains, the number of grains per bush is 20,4 grains on average, the weight of grains per bush is 8,9 g on average ha, it was found that the average weight of 1000 grains was higher by 16,0 g. Also, compared to the first period, the number of pods per bush of option 1 planted in the scheme between the rows (60x5-1) increased to 20,6 on average, and the number of grains per bush on average was 27,5, the average grain weight of one plant is 11,7 g, the average weight of 1000 grains is 11,0 g, in the third period compared to the 1st option, the average number of pods per plant is 26,2 units, and the number of grains per plant is 33,7 units on average. It was observed that the grain weight of one plant was 14,3 g on average, and the weight of 1000 grains was 21,0 g.

Among the options with 90 cm row spacing, option 6 planted in the scheme (90x30x12-1) in the first term has the highest index, in the second term compared to the 6th option planted in the scheme (90x30x12-1), the number of pods per bush is on average 0,1 pieces, the number of grains per bush is 0,3 pieces on average, the weight of grains per bush 0,3 g on average, 1000 grain weight on average 3,0 g and in the third term compared to the 6th option planted in the scheme (90x30x12-1), the number of pods per plant is 9,5 on average, the number of grains per plant is 11,6 on average, the number of grains per plant is weight by 5,1 g on average if the weight of 1000 grains was higher by 10,0 g on average. In the second term, compared to the 5th option planted in the scheme between rows (90x30x9-1), the number of pods per bush is on average 10,1 pieces, the number of grains per bush is 12,6 pieces on average, and the average grain weight is 5,6 g,



**Table 1**

**Effects of planting seed periods and norms on the formation of pea crop elements and grain yield.**

**2022-2023 years**

| Options               | The theoretical planting thickness is 1,000 bushels/ha | The number of pods in one plant, pcs. |           |         | The average number of grains per plant, pcs. |           |         | Grain weight per plant, g. |           |         | Weight of 1000 grains, g. |           |         | Productivity, s/ha. |           |                  |
|-----------------------|--|---------------------------------------|-----------|---------|--|-----------|---------|----------------------------|-----------|---------|---------------------------|-----------|---------|---------------------|-----------|------------------|
|                       |  | 2022 year                             | 2023 year | average | 2022 year                                    | 2023 year | average | 2022 year                  | 2023 year | average | 2022 year                 | 2023 year | average | 2022 year           | 2023 year | two-year average |
| <b>Term 1 (20.11)</b> |  |                                       |           |         |  |           |         |                            |           |         |                           |           |         |                     |           |                  |
| 1                     | 333  | 29,3                                  | 28,5      | 28,9    | 32,2   | 31,4      | 31,8    | 12,8                       | 12,4      | 12,6    | 397                       | 395       | 396     | 29,1                | 28,0      | 28,6             |
| 2                     | 222  | 41,7                                  | 41,0      | 41,4    | 49,9   | 49,0      | 49,5    | 20,1                       | 19,6      | 19,9    | 403                       | 400       | 402     | 30,2                | 29,4      | 29,8             |
| 3                     | 166  | 50,0                                  | 48,9      | 49,5    | 60,0   | 58,6      | 59,3    | 24,5                       | 23,8      | 24,2    | 408                       | 406       | 407     | 27,6                | 26,7      | 27,2             |
| 4                     | 370  | 26,0                                  | 25,5      | 25,8    | 28,8   | 28,2      | 28,5    | 11,3                       | 11,0      | 11,2    | 392                       | 391       | 392     | 29,0                | 27,8      | 28,4             |
| 5                     | 247  | 40,2                                  | 39,2      | 39,7    | 48,2   | 47,0      | 47,6    | 19,1                       | 18,5      | 18,8    | 397                       | 394       | 396     | 31,9                | 30,7      | 31,3             |
| 6                     | 185  | 49,0                                  | 49,3      | 49,2    | 59,4   | 59,1      | 59,3    | 24,0                       | 23,7      | 23,9    | 404                       | 401       | 403     | 30,2                | 29,7      | 30,0             |
| <b>Term 2 (20.02)</b> |  |                                       |           |         |  |           |         |                            |           |         |                           |           |         |                     |           |                  |
| 1                     | 333  | 28,8                                  | 28,4      | 28,6    | 31,7   | 31,3      | 31,5    | 12,5                       | 12,3      | 12,4    | 395                       | 394       | 395     | 31,7                | 31,0      | 31,4             |
| 2                     | 222  | 40,7                                  | 40,4      | 40,6    | 48,9   | 48,4      | 48,7    | 19,6                       | 19,2      | 19,4    | 400                       | 397       | 399     | 33,2                | 32,4      | 32,8             |
| 3                     | 166  | 48,5                                  | 48,5      | 48,5    | 58,2   | 58,4      | 58,3    | 23,6                       | 23,6      | 23,6    | 406                       | 404       | 405     | 30,0                | 29,4      | 29,7             |
| 4                     | 370  | 25,5                                  | 25,3      | 25,4    | 28,2   | 27,9      | 28,1    | 11,0                       | 10,8      | 10,9    | 390                       | 388       | 389     | 31,0                | 30,5      | 30,8             |
| 5                     | 247  | 39,0                                  | 39,1      | 39,1    | 46,6   | 46,7      | 46,7    | 18,4                       | 18,3      | 18,4    | 395                       | 393       | 394     | 34,2                | 34,3      | 34,3             |
| 6                     | 185  | 49,0                                  | 49,2      | 49,1    | 58,9   | 59,0      | 59,0    | 23,6                       | 23,5      | 23,6    | 401                       | 398       | 400     | 32,8                | 32,5      | 32,7             |
| <b>Term 3 (5.03)</b>  |  |                                       |           |         |  |           |         |                            |           |         |                           |           |         |                     |           |                  |
| 1                     | 333  | 23,0                                  | 23,5      | 23,3    | 25,4   | 25,7      | 25,6    | 9,9                        | 9,8       | 9,9     | 390                       | 382       | 386     | 25,9                | 25,1      | 25,5             |
| 2                     | 222  | 32,8                                  | 32,1      | 32,5    | 39,4   | 38,4      | 38,9    | 15,5                       | 15,0      | 15,3    | 393                       | 389       | 391     | 27,0                | 25,9      | 26,5             |
| 3                     | 166  | 40,8                                  | 39,7      | 40,3    | 49,0   | 47,6      | 48,3    | 19,6                       | 18,8      | 19,2    | 400                       | 395       | 398     | 25,5                | 24,3      | 24,9             |
| 4                     | 370  | 21,9                                  | 21,6      | 21,8    | 24,1   | 23,9      | 24,0    | 9,3                        | 9,2       | 9,3     | 387                       | 386       | 387     | 27,1                | 26,4      | 26,8             |
| 5                     | 247  | 31,0                                  | 31,8      | 31,4    | 37,3   | 38,1      | 37,7    | 14,6                       | 14,6      | 14,6    | 392                       | 383       | 388     | 28,2                | 27,8      | 28,0             |
| 6                     | 185  | 39,7                                  | 39,7      | 39,7    | 47,8   | 47,6      | 47,7    | 18,9                       | 18,6      | 18,8    | 395                       | 391       | 393     | 27,5                | 26,6      | 27,1             |

average weight of 1000 grains is 8.0 g and in the third term (90x30x9-1) compared to the 5th option planted in the scheme, the number of pods per bush is on average 17,8 pieces, the number of grains per bush is 21,6 pieces on average, the number of grains per bush is average weight is 9,3 g, average weight of 1000 grains is 15,0 g and the second period planted in the scheme between the rows (90x30x6-1) compared to the 4th option, the number of pods per bush is on average 23,8 grains, the number of grains per bush is 31,2 grains on average, one bush is average grain weight per plant is 13,0 g, average weight of 1000 grains is 14,0 g and in the third term (90x30x6-1) compared to the 4th option planted in the scheme, the number of pods per plant is 27,4 on average, the number of grains per plant is 35,3 on average, the number of grains per plant is it was found that the average weight was 14,6 g, and the average weight of 1000 grains was 16,0 g. Productivity indicators according to seeding periods and standards, the first period among options planted 60 cm between rows (60x10-1) in option 3 and among options planted 90 cm between rows (90x30x12-1) 6. If it is observed that the options have the highest values, grain yield indicators are observed in the variants planted in the second term, compared to the options planted in the first and third periods, which had a higher rate.

Among the options planted in the second period, high yield indicators were achieved in option 2, planted with 60 cm spacing (60x7.5-1) and in option 5, planted with 90 cm spacing between rows (90x30x9-1). In the second period, in option 2, planted between the rows (60x7.5-1), the two-year average grain yield was 32,8 s/ha. It was 31.4 s/ha in option 1 planted in the scheme (60x5-1) and 29,7 s/ha in option 3 planted in the scheme (60x10-1). In the second term, in the 2nd option, the grain yield was 1.4 s/ha higher than the 1st option and 3,1 s/ha higher than the 3rd option. Among the options with 90 cm row spacing, the second period (90x30x9-1) in option 5, which was planted in the second period (90x30x9-1), achieved a higher grain yield of 34,3 s/h, in the 4th variant planted in the scheme between the rows (90x30x6-1) grain yield was 30,8 s/ha and in the 6th variant

planted in the scheme (90x30x12-1) grain yield was 32,7 s/ha. In the second period, it was found that the grain yield in the 5th option was 3,5 s/ha higher than the 4th option and 1,6 s/ha higher than the 6th option.

According to the results of the conducted research, in terms of planting dates, the options planted in the second period have higher indicators compared to the options planted in the first period, the second period in option 1 is 2,8 s/ha compared to the first period in option 1 and the third term is 5,9 s/ha compared to option 1, the second period in option 2 is 3,0 s/ha compared to the first period in option 2 and the third term is 6,3 s/ha compared to the 2nd option, the second period in the 3rd option, the first period is 2,5 s/ha compared to the 3rd option, and the third term was found to be 4,8 s/ha compared to the 3rd option. Also, in the double-row scheme of 90 cm between the rows, the second period in the 4th option, the first period is 2,4 s/ha compared to the 4th option, and the third term by 4,0 s/ha compared to option 4, the second term by option 5, the first term by 3.0 s/ha compared to option 5 and the third period had a higher rate of 6,3 s/h compared to the 5th option, the second period in the 6th option, the first period is 2,7 s/ha compared to the 6th option and in the third period, compared to the 6th option, a higher grain yield of 5,6 s/h was achieved.

**Conclusion.** In conclusion, it can be said that the number of pods in one plant, the number of grains, the weight of grains, and the weight of 1000 grains (60x5-1, 60x7,5 -1) and (90x30x9-1, 90x30x6-1) were preferred over the options planted in all three periods, the variants planted in the first term had higher indicators compared to the variants planted in the second and third terms. Productivity indicators are higher in options planted in the second period. Among the seeding standards, among the options planted in the 60 cm scheme (60x7,5-1), high indicators were achieved in option 2, planted in the 90 cm spacing between the rows (90x30x9-1). In the second term of the scheme (60x7,5-1) planted in the 2nd option, the grain yield was 32,8 s/ha, the first term was 3,0 s/ha compared to the 2nd option and the third term had 6,3 s/h higher indicators compared to the 2nd

option. In option 5 planted in the second-period scheme (90x30x9-1), the grain yield is 34,3 s/ha, the first term is 3,0 s/ha compared to the 5th option and as a result of our scientific research, it was determined that the third period had a higher rate of 6,3 s/h compared to the 5th option.

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