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# The Influence of Spraying and Fertilizer Rate on the Structural Indicators of Soft Wheat Varieties in the Mountainous Areas of Guba Region

## Abstract

The article mentions different productivity indicators of sowing, fertilizer and without fertilizer. From the results of the research, it is seen that the influence of cultivation factors on the productivity indicators of plants is different and depends on the number of plant stems in a single area, the mass of grain, etc. depends on factors. Changes in fertilizer rates have a significant impact on the productivity of small crop rate variations.

***Keywords:*** *fertilizer norms, soft wheat, productivity, Gobustan, Viktoriya*

## Introduction

The food produced from wheat (*Triticum aestivum* L.) is the second largest crop in the world (FAO & WFP, 2015) and human food demand is predicted to double by 2050 (Singh, Kaur, & Majithia, 2015). It is cultivated in wide areas around the world.

The correct determination of cultivation factors plays an important role in increasing the structural elements of the wheat plant and at the same time grain yield, depending on the biological characteristics of the variety, external conditions, cultivation agrotechnics, soil characteristics. Nutrients, humidity, etc. per unit area since it is divided according to the number of plants there, it is necessary to arrange the number of plants in such a way that moisture, nutrients, etc. be sufficiently provided with (Gulyanov, 2003).

**Research**

The productivity of each variety depends on the number of fertile stems in a single field during harvesting, the density of the spike, the mass of grain in one spike, the number, the mass of 1000 grains (Fatullayev & Mammadov, 2007).

An increase in the number of grains per spike significantly improves the yield potential of the wheat plant. Wheat ears consist of spikelets that form reproductive structures. The number of grains and the weight of 1000 grains in wheat depend on both genetic and environmental influences (Reynolds et al., 2009).

Plant density is an important factor affecting growth and yield formation in wheat (Bustos et al., 2013; Miralles & Slafer, 1995). In wheat, the number of spikes varies at different planting densities (Miralles & Slafer, 1995).

In addition, the application of different fertilizer rates causes significant differences in yield and yield components of common wheat genotypes, which is a logical consequence of the effect of fertilizer rates on the physiological characteristics of plants. R. K. Heydarova notes that because winter wheat germ absorbs nutrients from the early stages of vegetation, it is important to provide nutrients from the early stages of development (Heydarova, 2007). Also, late application of

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additional fertilizers to winter wheat is one of the factors that lowers productivity (Huseynov, A., Huseynov, N., & Mammadova, 2019).

Cultivation of 2-3 varieties in each zone is an important condition to ensure the productivity and good grain quality of winter wheat. In order to reduce the yield loss, it is advisable to cultivate varieties that grow relatively quickly, are resistant to winter and drought, and have different requirements for fertilizers and sowing time in the same farm. Instead of separate varieties, varieties that complement each other, have maximum and stable productivity over the years, and are adapted to local conditions should be used (Miralles & Slafer, 1995).

**The Object and Methodology of the Study**

In 2023-2024, the Gobustan and Fatima varieties of the Scientific Research Institute of Agriculture and the Victoria variety of the Russian Scientific Research Institute were used. The experiment was conducted in the village of Digah, Guba region.

Field experiments were conducted in 3 replicates of 72 $m^2$. The field experiment was set up in the following scheme.

1. Sowing norms
1. 4.0 million sprouted grains per hectare
2. 4.5 million sprouted grains per hectare
3. 5.0 million sprouted grains per hectare

2. Fertilizer norms
1. without fertilizer
2. $N_{90}P_{60}K_{60}$
3. $N_{120}P_{90}K_{60}$

**Analysis and Discussions**

Before the conducted research, a soil analysis was conducted and the amount of nutrients in the soil was evaluated. The average pH of the soils we studied ranges from 7.8 to 7.9, which means that the area is considered to be slightly alkaline.

**Table 1.**
**Main agrochemical analysis indicators of soil samples brought from Digah village, Guba region**

| No | Depth cm | pH in water | $CaCO_3$ % | Soil organic matter % | Total Nitrogen % | Active phosphorus ($P_2O_5$) | Exchangeable potassium ($K_2O$) |
|---|---|---|---|---|---|---|---|
| | | | | | | kg/mg | |
| 1 | 0-30 | 7.93 | 5.7 | 2.45 | 0.18 | 4.6 | 368.5 |
| 2 | 0-30 | 7.93 | 5.5 | 2.49 | 0.19 | 5.4 | 379 |
| 3 | 0-30 | 7.88 | 5.25 | 2.47 | 0.19 | 4.6 | 363.5 |
| 4 | 0-30 | 7.81 | 5.55 | 2.47 | 0.18 | 5.2 | 343.5 |
| 5 | 0-30 | 7.91 | 5.7 | 2.53 | 0.18 | 4.7 | 363.5 |

According to the amount of calcium carbonate, the soil is considered medium carbonate. Soil fertility is determined by water retention, good quality plowing and the thickness of the humus layer. The amount of soil organic matter varies between 2.5-2.6 % on average at the depth of 0-30 cm from the soils we studied. Such soils are considered of average quality. During the vegetation period of the plant, the provision of basic nutrients in easily assimilated forms (easily hydrolyzable

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nitrogen, mobile phosphorus and exchangeable potassium), determination of fertilizer norms is determined by the stock of easily assimilated basic nutrients in the soil. In the areas of our study, 4.0-5.5 mg of activated phosphorus (P2O5) and 350-400 mg of exchangeable potassium are averaged in 1 kg of soil at a depth of 0-30 cm. The soil is very poorly provided with active phosphorus, because the amount of active phosphorus is considered very poorly provided when the amount of active phosphorus is less than 10 mg per 1 kg of soil. Potassium is provided at an average level. The mentioned evaluations are Azerb. MEA was recommended by the opinions of the Institute of Soil Science and Agrochemistry, Agricultural Research Institute and various decisions of the Scientific Council.

The results of our research reflect the effect of plant productivity on the background of fertilizer and plant density. Thus, it was determined that the level of productivity depends on the number of plants and productive stems located in a single area, the mass of grain produced by those plants, the height of plants and other structural elements. Some sources indicate that the plant density is the main factor for the productivity of the plants included in the agricultural (Duvick et al., 2004). By correctly determining the cultivation factors, it is possible to increase the productivity and economic efficiency of soft wheat varieties against the background of suitable fertilizer norms.

Effect of plant density and different fertilizer rates on structural elements of soft wheat cultivars.

**Table 2.**
**No fertilizer (control)**

| Varieties | Sprinkle norm million per hectare | 1 $m^2$ out total biomas (gr) | The height of the plant (cm) | The number of productive stems per 1$m^2$ (number) | The length of the spikes (cm) | Number of grains in 1 spike | | The mass of the grain from 1 $m^2$ | Grain yield cent s\|ha |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | number | Mass of grain (g) | | |
| Gobustan | 4,5 | 1344,6 | 90,6 | 313,3 | 8,8 | 39.2 | 0,78 | 244,1 | 24,4 |
| | 5,0 | 1374,6 | 88,8 | 326,2 | 8,8 | 36.2 | 0,74 | 241,4 | 24,1 |
| | 5,5 | 1419,2 | 78,2 | 345,5 | 8,7 | 31.1 | 0,69 | 238,4 | 23,8 |
| Fatima | 4.5 | 1352.2 | 91.2 | 317.2 | 7.7 | 38.2 | 0.76 | 241.1 | 24.1 |
| | 5.0 | 1361.2 | 90.2 | 332.3 | 7.6 | 38.1 | 0.74 | 245.7 | 24.6 |
| | 5.5 | 1366.4 | 87.6 | 345.6 | 7.2 | 37.3 | 0.68 | 234.6 | 23.5 |
| Victoria | 4.5 | 1412.2 | 93.3 | 301.6 | 8.1 | 35.5 | 0.66 | 198.7 | 19.9 |
| | 5.0 | 1422.6 | 90.2 | 311.7 | 7.8 | 34.4 | 0.64 | 199.0 | 19.9 |
| | 5.5 | 1451.2 | 88.5 | 346.2 | 7.7 | 34.5 | 0.58 | 200.7 | 20.1 |

**Table 3.**
**$N_{90}P_{60}K_{60}$**

| Varieties | Sprinkle Norm million per hectare number | 1 $m^2$ out total biomass (gr) | The height of the plant (cm) | The number of productive stems per 1 $m^2$ (number) | The length of the spikes (cm) | Number of grains in 1 spike | | The mass of the grain from 1 $m^2$ | Grain yield cents/ha |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | number | Mass of grain (g) | | |
| Gobustan | 4.5 | 1456.2 | 94.6 | 323.3 | 11.1 | 40.4 | 1.28 | 413.4 | 41.3 |
| | 5.0 | 1486.6 | 93.1 | 341.2 | 10.1 | 39.6 | 1.21 | 412.6 | 41.3 |
| | 5.5 | 1502.2 | 93.1 | 368.2 | 10.1 | 33.3 | 1.16 | 426.9 | 42.7 |
| Fatima | 4.5 | 1406.2 | 92.2 | 303.2 | 11.2 | 38.8 | 1.28 | 387.8 | 38.8 |
| | 5.0 | 1422.2 | 92.0 | 331.3 | 11.3 | 37.2 | 1.21 | 400.5 | 40.1 |
| | 5.5 | 1462.4 | 92.0 | 345.6 | 11.1 | 36.6 | 1.17 | 403.6 | 40.4 |
| Victoria | 4.5 | 1509.2 | 94.3 | 313.6 | 11.2 | 37.1 | 1.18 | 369.3 | 36.9 |
| | 5.0 | 1525.2 | 94.2 | 321.2 | 10.8 | 36.2 | 1.15 | 364.6 | 36.5 |
| | 5.5 | 1576.3 | 93.5 | 352.2 | 10.6 | 35.4 | 1.13 | 397.7 | 39.8 |

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**Table 4.**
**$N_{120}P_{90}K_{60}$**

| Varieties | Sprinkle Norm million per hectare number | 1 $m^2$ out total biomass (gr) | The height of the plant (cm) | The number of productive stems per 1 $m^2$ (number) | The length of the spikes (cm) | Number of grains in 1 spike | | The mass of the grain from 1 $m^2$ | Grain yield cents/ha |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | number | Mass of grain (g) | | |
| Gobustan | 4.5 | 1516.6 | 102.1 | 355.2 | 13.6 | 44.4 | 1.34 | 475.7 | 47.6 |
| | 5.0 | 1619.2 | 96.2 | 375.6 | 13.2 | 40.4 | 1.31 | 491.3 | 49.1 |
| | 5.5 | 1645.6 | 98.8 | 386.2 | 13.1 | 39.6 | 1.29 | 498.1 | 49.8 |
| Fatima | 4.5 | 1475.5 | 98.2 | 318.8 | 12.8 | 40.0 | 1.31 | 417.3 | 41.7 |
| | 5.0 | 1512.2 | 96.7 | 326.2 | 12.8 | 39.6 | 1.28 | 417.3 | 41.7 |
| | 5.5 | 1566.6 | 95.4 | 341.2 | 12.6 | 39.6 | 1.25 | 426.5 | 42.6 |
| Victoria | 4.5 | 1598.2 | 98.9 | 332.5 | 12.8 | 38.8 | 1.23 | 408.4 | 40.8 |
| | 5.0 | 1613.7 | 98.6 | 338.5 | 12.4 | 37.8 | 1.21 | 409.0 | 40.9 |
| | 5.5 | 1617.2 | 97.2 | 356.6 | 12.3 | 37.1 | 1.21 | 430.1 | 43.0 |

The influence of cultivation factors on structural indicators of winter wheat varieties is reflected in tables 2,3 and 4.11 %, 22 % increase in sowing rate in all 3 soft wheat varieties, 2 %-3.1 % in Gobustan variety, 1.1-3.9 % in Fatima soft wheat variety, 1.0-4.4 % in Victoria wheat variety in wheat varieties selected as research material of the total biomass of $1m^2$ caused. Although a shortening of plant heights was observed in all three varieties, the number of productive stems per unit area increased by 5.5-10.8 % in the Gobustan soft wheat variety, 9.2-13.8 % in the Fatima wheat variety, and 2.5-12.4 % in the Victoria soft wheat variety. A decrease in the number of grains in one spike and the mass of the grain is observed if the planting material is too much. The grain yield of soft wheat varieties in the direction of increasing the sowing rate in the control variant without fertilizer was 24.4 centners in the calculation of 4.5 million grains in Gobustan soft wheat variety, 24.1 centners in the norm of 5 million sowings, and 23.8 centners in the norm of 5.5 million sowings. In other soft wheat varieties, Fatima variety had 24.1 centners, 24.6 centners, 23.5 centners, and Victoria soft wheat variety had 19.9 centners, 19.9 centners, 20.1 centners. In the assimilation of nutrients in the soil, the sowing rate in the Gobustan soft wheat variety has already decreased, in the Fatima variety, the highest result is in the variant with the 5 million sowing rate, and in the Victoria variety, the increase in the sowing rate has not made a significant difference in productivity.

11 % and 22 % increase of planting material in N90P60K60 variety resulted in 70 % higher yield of Gobustan soft wheat variety at 4.5 million planting rates compared to the control variant. Thus, in the control variant, the yield was 24.4 centners at the rate of 4.5 million plantings, while the yield at the rate of N90P60K60 fertilizer was 41.3 centners. This increase was 71 % and 79 % at 5.0 million and 5.5 million sowing rates, respectively. In other soft wheat varieties, this increase was 62 %, 61.3 %, and 72 %, respectively, in the rates of 4.5 million, 5 million, and 5.5 million seeds in Fatima, and in the Victoria soft wheat variety, these indicators were 85 %, 83 %, and 98 %.

Certain increases in spike elements were observed in the N120P90K60 variant. If we compare the yield indicators of 4.5 million, 5 million and 5.5 million plantings in the Gobustan soft wheat variety, respectively, 95 % in the norm of 4.5 million seed material compared to controls, 15 % in comparison with the N90P60K60 variety, these figures are 103.7 %, 18.9 % in the norm of 5 million plantings, and at the rate of 5.5 million plantings, these indicators change to 109.2 %, 16.6 %, respectively. The corresponding increases in other cultivars can be compared in Table 3 and Table 4.

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## Conclusion

The results of the research show that the influence of cultivation factors on the productivity indicators of plants is different and depends on the number of plant stems in a single area, the mass of grain, etc. depends on factors. Changes in fertilizer rates have a significant impact on the productivity of small crop rate variations.

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