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EFFECTS OF MULCHING, FERTILIZERS AND RAINFED IRRIGATION ON THE YIELD OF NATIVE AND INTRODUCED WINTER WHEAT CULTIVARS UNDER PIVOT IRRIGATION FARMING METHOD IN DESERT AND DRY CLIMATES

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Abstract. The soil without plant cover dries quickly, which leads to the loss of humus. As a result, one often have to irrigate and fertilize the soil. This can be eliminated by mulching. In the control (Topkapi) variant, the yield was 4.26 t/hec. The yield of the Kirmizigul variety 8.7 t/hec, the Murov-2 variety 7.50 t/hec, the Aran-2 variety 7.00 t/hec, the Maurizio variety 8.75 t/hec, the Balaton variety 8.50 t/hec, the Gallio variety 7.00 t/hec, the Gaudio variety 7.25 t/hec. A higher yield was observed in the varieties Kyrmyzygul, Maurizio and Balaton. Compared to the control, the yield of the Maurizio variety was 8.75 t/hec, the yield increase was 4.49 t/hec, or 105.3%; the yield of the Kyrmyzygyul variety was 8.75 t/hec, the yield increase was 4.49 t/hec or 105.3%, the yield of the Balaton variety was 8.50 t/hec, the yield increase was 4.24 t/hec or 99.5 %.

Keywords: *mulching, introduced cereal varieties, fertilizers, rainfed irrigation, productivity, yield increase in quintal, yield increase in percent.*

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1. Introduction

In recent years, the measures implemented in the direction of the development of entrepreneurship in our country, the implemented state programs are among the factors that show the dynamism of the socio-economic development of the country. Today, entrepreneurs in Azerbaijan receive moral, political, and economic support from the state. The opening of new plants, factories and other production facilities in the regions not only eliminates the problem of unemployment, but also reveals the mechanisms of the correct use of the potential of the regions.

In accordance with the instructions of the head of state, the creation of large and modern enterprises, which are financed through preferential loans, are projects based on the application of modern technologies and serve to meet the demand for quality food products of the country's population, is of particular importance.

In accordance with the task of President Ilham Aliyev on accelerating the development of the non-oil sector, applying intensive technologies in the agricultural sector. The scale of creation of modern enterprises in our country has expanded. This has had a strong impact on promoting the development of entrepreneurship in the agrarian field, producing competitive agricultural products, increasing export potential and employment (Aliyev, 2019).

The global climate changes occurring in the world, the rapid increase in population has led to an increasing day by day demand for food products, especially grains and cereal products.

The wheat plant is one of the important food plants that constitute the main food of people in most countries of the world, and the production of wheat grains by each country at least according to its needs is one of the important factors that ensure the stability of its economy. In the last 30 years, the production of wheat grain in the world has increased twice to 600 mln. exceeded the tone level. According to the official data of FAO, in 2017, the total production of wheat grain worldwide was 695,613.2 thousand tons, and the average yield was 3.2 tons. However, as a result of the year-by-year population growth in the world, the correspondingly increased demand for wheat grain is still not at a level that can be fully met, and many countries meet their demand for this crop at least partially through imports. Even though wheat plant is considered a strategic product in Azerbaijan as a priority plant, its production is not at the level corresponding to the demand of the population, and approximately one million tons of wheat grains are imported into the country every year. In recent years, in order to eliminate the problems in this field, the state has consistently implemented a number of fundamental measures and made important decisions. Among them, the Law of the Republic of Azerbaijan on Breeding Achievements (1996), the Law of the Republic of Azerbaijan on Seed Production (1999), the Law of the Republic of Azerbaijan on Grain Production (2000), the Law on Phytosanitary (2006), etc. such a measure is appropriate. In 2008, adopted in 2008, the "State Program on the reliable supply of food products to the population in the Republic of Azerbaijan in 2008-2015" as a target for the year 2015, the cultivation of cereal crops in the country is 900 thousand hectares, the productivity is 32.0 s/ha and 2.8 mln of the total production. The strategy for delivering tons is aimed at this goal. The total positive temperature from seeding to full maturity is 1850-2200 ^{0}C.

Winter wheat is quite heat-tolerant and drought-resistant, but winter hardiness is less than that of winter rye. However, at excessively high temperatures (above 40 ^{0}C), lack of moisture and dry winds, the normal course of the photosynthesis process is disrupted; transpiration increases, plant growth slows down, and as a result, good seed filling deteriorates.

Winter wheat makes better use of autumn and winter precipitation, and consumes significantly more moisture than spring wheat. This is due to the fact that its vegetation period is longer and it forms more dry mass products. The use of moisture during the vegetation period is not uniform and depends on the age of the plant, height and intensity of development, plant density, temperature, development of the root system and the amount of moisture in the soil (Rzayev & Seyidov, 2019, pp. 72-76).

Winter wheat grows better in conditions where the soil is sufficiently moist. Plants require very little moisture during seed germination and emergence. At the time of germination, when the moisture in the 10 cm layer of the soil is 10 mm, the outputs are taken equally. As the height and development of the plant increases, the demand for moisture increases. For wheat to sprout normally in autumn, it is necessary to have 30 mm of moisture in a 20 cm layer of soil. In this case, the bushing is fast. Winter wheat requires a greater amount of annual water use (70%) from the start of tuber emergence in spring to heading, and 20% from flowering to wax maturity. The crisis period of winter wheat due to its relation to humidity is the tube emergence and spike phase. During this period, when there is a lack of moisture, the formation of the leaf surface and the growth of the plant stop, this disrupts the differentiation of generative organs, a large number of barless flowers are formed, the total mass of dry matter accumulates and the plant grows. The height is low, which leads to less collection of the product (Ibrahimov *et al*., 2019, pp. 16-21).

The tube emergence phase of winter wheat (stages IV-VII of ontogenesis) begins 25-35 days after the formation of spring ears, and it is considered favorable for the temperature to be +15-16 0C. Heading (VIII stage) begins 30-35 days after stem extension. Flowering of wheat (IX stage) begins 2-3 days after heading and lasts up to a week. The formation, filling and ripening of the grain (stages X-XII) lasts 30-35 days, depending on the characteristics of the variety and weather conditions. +18-22 ^{o}C during spike and flowering, and +22-25 ^{o}C is considered a favorable temperature for the ripening period (Hummetov & Alasgarova, 2020, pp. 142-151).

The researcher determined some physiological parameters of hard and soft wheat genotypes - plant greenness phenotype, plant temperature and leaf area index. The stay-green phenotype is mainly associated with late heading, which is more reduced under drought stress conditions in soft wheats. It has been determined that the cooler genotype of the genotype under drought stress is related to gas exchange and leaf area index (Huseynov, 2019, pp.37-44).

As a result of their research, the dynamics of changes in various morphological parameters because of drought in wheat genotypes that differ according to their ripening period were determined. According to the results of the study, drought stress caused a certain increase in the intensity of photosynthesis and transpiration, the permeability of the stomata, and the concentration of CO_2 in intercellular areas in the leaves of different layers of hard and soft wheat genotypes (Thalaee & Hasanova, 2010, pp.14-15).

As a research object, the amount of proline in the leaves of wild wheat T. beoeticum, T. urartu, T. araricum species taken from the experimental field was determined after being subjected to drought and salt stress for 3 days in laboratory conditions. Based on the obtained results, it was determined that T. urartu samples are more resistant to stress factors (Ibrahimov, 2019, pp.6-12).

S.K. Hajiyeva's research paper presents the results of comparing the heights of 113 soft and durum wheat hybrid lines of the fourth generation (F4) stabilized in Absheron under irrigation conditions with the parents. Hybrid lines were selected and grouped according to the specified characteristic, and valuable combinations were determined according to this characteristic (Mehdiyev & Abdullayev, 2020, pp. 51-55).

When there is a lack of moisture at the time of flowering and grain filling, the grains become small and yield decreases. At the beginning of spring vegetation, thanks to autumn, winter and spring rains, the soil is moistened at a depth of 50-80 cm, but in rainy years it reaches 50-200 cm, which creates favorable conditions for providing moisture. The root system of winter wheat reaches a depth of 1.5-2.0 m, it uses water not only from the layer fed by the roots, but from the deeper layers of the soil. When there is excess moisture, the growth rate of winter wheat decreases. Especially in late autumn and early spring, its crops are sometimes destroyed. In addition, the air regime is disturbed; the conditions of mineral nutrition and microbiological processes deteriorate. When dampness continues for a long time, the vegetation period of the plant is extended; the root system is in danger of rotting, resistance to dormancy decreases, productivity, and grain quality decrease (Huseynov, 2019, pp. 60-64).

70-75% of field moisture content in the 0-60 cm layer of the soil is favorable for plant development. The transpiration coefficient is 400-500. During the vegetation period, water consumption is 300-400 m^3.

Winter wheat is a plant with high demand for nutrients and soil. Soils with a strong humus layer, high content of nutrients and good water-physical properties are more suitable for wheat. Fertile soils with light granulometric content are more favorable for

plants. Since soils with heavy granulometric content are considered less favorable, it is possible to create good conditions by giving them organic and mineral fertilizers. At the same time, the soil should be free of weeds. For plant development, the soil reaction should be close to neutral (pH=6.0-7.5), the amount of humus should be 2.0-2.5%, the amount of phosphorus and potassium should not be less than 150 mg per 1 kg of soil according to Kirsanov (Hummatov & Alasgarova, 2020, pp. 93-103; Mehdiyev & Abdullayev, 2020, pp. 30-34).

The demand for mineral nutrients of the wheat plant depends on their permissible limit in the soil, the intensity of plant development and the strength of the root system, weather conditions and other factors. The decrease in growth intensity of the winter wheat plant is closely related to the lack of mineral nutrients (nitrogen, phosphorus, potassium and trace elements).

One of the most important elements for plant nutrition is nitrogen, it reacts to the development of the vegetative mass, increases the amount of protein and gluten in the grain and affects the formation of the product. It is included in the composition of simple and complex proteins, amino acids, chlorophyll, several vitamins and enzymes. The lack of nitrogen, as well as its excess, has a negative effect on the growth and development of the wheat plant and ultimately leads to a decrease in yield. If there is a lack of nitrogen, the rate of accumulation of dry matter decreases, the formation of the leaf surface deteriorates; the leaves turn light green and fall prematurely. Lack of nitrogen has a negative effect on the formation of structural elements of the product. Thus, the productive harvest, the grains in the spike and its mass, the mass of 1000 grains, the amount of protein and gluten in the grain, the technological nature and the quality of baking deteriorate (Seyidaliyev, 2016).

2. Results and discussion

Soil without vegetation dries out quickly, which leads to loss of humus. As a result, we have to water and fertilize the soil often. This can be avoided by mulching. Advantages of mulching: 1. Improves soil structure, prevents soil erosion and leaching of minerals from the soil; 2. Protects the soil from drying out (retains moisture); 3. Stabilizes soil temperature; 4. Prevents weeds; 5. Mulch made of organic material fertilizes the soil, is an additional source of food for soil organisms, and increases the amount of humus in the soil. Suitable materials for mulching: Rotten manure and compost (perhaps immature) are some of the best materials for mulching, especially for plants that absorb humus intensively (corn, root vegetables, cucumbers, cabbage, pumpkins, tomatoes, etc.); Mowing residues (straw, sedge bark, stems and remains of harvested plants) are excellent mulches. Diseased plant residues must be carefully selected! Legume residues are especially good; Freshly cut grass - should be slightly wilted to prevent rotting or fungal diseases. Do not mulch with freshly cut grass in rainy weather! Harvested plants must be seedless! Khazal - do not forget the warning of the previous paragraph. In addition, mulching with this material in windy weather or in a windy area is generally trivial. But most importantly, the leaves of most plants increase acidity in the soil. Such mulch is useful for berries, some ornamental plants and fruit trees. Mulching with leaves of plants (willow rose, black bengota, castor) or phytoncides (eucalyptus, laurel, chestnut, juniper, acacia, walnut, cypress) containing substances toxic to other plants and microorganisms should not be done; Old bags, cardboard - main disadvantages: 1) does not fertilize the soil; 2) a stone or other heavy object should be placed on it to protect it from the wind;

Black cellophane or ruberoid - does not fertilize the soil and, most importantly, it is expensive (cellophane cracks and tears after a year).

The six basic rules of mulching are: Before mulching, the soil should be loosened; Before mulching with mowing residues, cut branches and other similar material, they should be slightly crushed. The smaller the residue, the faster it decomposes and fertilizes the soil. When mulching with green material, it should be used with a thin layer and frequent renewal. When mulching with dry material in a dry climate (it can be laid with a thick layer), it is necessary to moisten it (preferably with liquid fertilizers); When carrying out the measure, take care not to leave the cultivated plant under the mulch; Mulch should not contain weed seeds, pests, diseases and toxic substances.

Protecting the roots of plants from heating and freezing, preventing weeds from growing at the bottom, keeping the soil constantly moist, gathering beneficial organisms for the plant under the laid grass - these are all the benefits of mulch. The higher the mulch, the more fruitful the plant. Only those who make it know the benefits of mulch made from sacks, stones, bark, wood shavings, wood, grass and other materials.

Table 1. Effect of mulching, fertilizers and rainfed irrigation on yield of native and introduced winter wheat cultivars

№	Varieties	The country of origin of the variety	The yield obtained from the plot of the experiment, t	Yield, t/hec	Yield increase, t/hec	Yield increase, %
1	Topgapı-control	Azerbaijan	0.520	4.26	-	-
2	Gyrmizigul	Azerbaijan	0.700	8.75	4.49	105.3
3	Murov-2	Azerbaijan	0.600	7.50	3.24	76
4	Aran	Azerbaijan	0.560	7.00	2.74	64.3
5	Maurizio	Austria	0.700	8.75	4.49	105.3
6	Balaton	Austria	0.680	8.50	4.24	99.5
7	Gallio	Austria	0.560	7.00	2.74	64.3
8	Gaudio	Austria	0.580	7.25	2.99	70.2

It can be seen from the table that the yield in the Control (Topgapı) variant was 4.26 t/ha. The productivity of the Red rose variety was 8.7 t/ha, the yield increase was 4.47 t\ha and 105.3%. In Murov 2 variety, productivity was 7.50 t/ha, yield increase was 4.49 t\ha and 76%. Productivity in Aran 2 variety was 7.00 t/ha, yield increase was 2.74 t\ha and 105.3%. Productivity in Maurizio variety was 8.75 t/ha, yield increase was 4.49 t\ha and 64.3%. Productivity in Balaton variety was 8.50 t/ha, yield increase was 4.24 t\ha and 99.5%. The productivity of the Gallio variety was 7.00 t/ha, the yield increase was 2.74 t\ha and 64.3%. Productivity in Gaudio variety was 7.25 t/ha, yield increase was 2.99 t\ha and 70.2%. Higher productivity was found in Balaton varieties Gyrmizigul and Maurizio. Compared to the control option, yield increase Maurizio 8.7 t/ha, yield increase 4.47 t\ha and 105.3%; 8.75 t/ha, yield increase was 4.49 t\ha and 8.50 t/ha, yield increase was 4.24 t\ha.

3. Conclusion

Protecting the roots of plants from heating and freezing, preventing weeds from growing at the bottom, keeping the soil constantly moist, gathering beneficial organisms for the plant under the laid grass - these are all the benefits of mulch. The higher the mulch, the more fruitful the plant. Only those who make it know the benefits of mulch made from sacks, stones, bark, wood shavings, wood, grass and other materials. In the control (Topkapi) variant, the yield was 4.26 t/ha. The productivity of the Red rose variety is 8.7 t/ha, the productivity of the Murov-2 variety is 7.50 t/ha, the productivity of the Aran 2 variety is 7.00 t/ha, the productivity of the Maurizio variety is 8.75 t/ha, the productivity of the Balaton variety is 8.50 t/ha, the productivity of the Gallio variety is 7.00 t/ha, The productivity of Gaudio variety was 7.25 t/ha. Higher productivity was found in Balaton varieties Gyrmizigul and Maurizio. Compared to the control option, yield increase Maurizio 8.7 t/ha, yield increase 4.47 t\ha and 105.3%; 8.75 t/ha, yield increase was 4.49 t\ha and 8.50 t/ha, yield increase was 4.24 t\ha.

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