The impact of various mulch materials on the development and maturation of watermelon

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Abstract. In this article, we present information that is based on scientific research regarding the changes that occur in the growth parameters of the watermelon plant when it is grown using various types of mulching materials. The results of our study, aimed at examining the impact of various types of mulching materials (including transparent and black) on the development parameters of watermelon plants, indicate a significant influence of this research on the development parameters of the watermelons plant. The mulching materials had varying effects on several characteristics of the plants, including the quantity of additional branches on the base of the stem, the overall length of the primary stem, the overall quantity and area of coverage of leaves, the quantity of curls on the stem, and the weight of both the fruit and the plant. When we analyzed based on the types of mulch, the growth parameters of plant were higher (The number of leaves was 534 pieces, the total leaf surface of the plant was 2642 dm^2 in the "Shirin" variety, and in the "Sharq Ne'mati" variety, these indicators were 556 pieces, 2892 dm^2, respectively, in the hybrid "Dolby F1" the number of leaves 524 pieces and the leaf surface was 2996 dm^2) in this option of the mulch with black polyethylene film.

1 Introduction

The climate has been undergoing significant shifts in recent years, which has led to an increase in the need for water. Additionally, the occurrence of black frosts in early spring, which are more often than usual, has also contributed to the challenges that our producers are experiencing when it comes to the growing of watermelon plants. Taking all of this into consideration necessitates the deployment of agronomic methods such as mulching in order to manage weeds, pests, and diseases [4, 5, 11]. Mulching also helps regulate the temperature of the soil and the amount of moisture it contains.

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It is known that the growth of plants and the increase in yield occurs as a result of the balance of soil temperature, in which there are differences between night and day temperatures, and the use of mulching practices has a great effect on increasing yield, early harvest, reducing fruit defects, reducing water evaporation from the soil, and preventing the growth of weeds. Maintaining soil temperature accelerates the germination of plant seeds, and also makes it possible to grow early crops by planting crops from seedlings in early spring [1, 6, 5].

The effectiveness of preventing weed growth, controlling soil temperature, and reducing the number of insects in growing vegetables and melons crops depends on the type of mulching material used [8].

Both the early stem development and the overall production of watermelon are increased by the use of polyethylene mulch. On a number of different crops, including tomato and squash, researchers have investigated how the color of the mulch affects the yield [7]. However, there is a lack of sufficient research on the effects of various forms of mulching and colors of mulch material on the development parameters and yields of watermelon plants [9]. Hence, recognizing the significance of mulch in the growing process of diverse vegetable crops, we undertook these investigations to examine the impact of various mulch materials on the development and progress of watermelon plants [12-18].

2 Materials and Methods.

During the years 2021-2022, field experiments were conducted at the "Center for Innovative Developments and Consultations in Agriculture" DUK experimental farm and Research Institute of Plant Genetic Resources. This experimental farm, where the research was conducted, is located in Tashkent region. Therefore, its climate is sharply continental like this region. The soil of the experimental field is a typical gray soil that has been irrigated for a long time and has an agro-irrigation horizon that is not very thick (less than 0.5 m).

Experiments were conducted in 3 ways, i.e., control (without mulch), black mulch, white mulch, in a randomized block (reversible) method with four replications.

It was decided to sow watermelon seedlings in furrows that were 2.50+0.70 cm:2x0.50 cm across. For our trials, we utilized polyethylene sheets that were both white and black in color, with a width of 140 centimeters and a thickness of 0.02 centimeters. This particular size of polyethylene film is the ideal size for mulching double furrows that are 70 centimeters in width.

The following factors were investigated: the temperature of the soil (using a soil thermometer), the number of seedlings, phenological observations and biometric measurements, the duration and number of irrigations (using V.E. Kabaev's zuldar method), the amount of yield, the weight of the leaf surface and stem, the weight of the root, the chemical composition of watermelon fruit, and the degree to which the crop was economically efficient.

The research is based on methodological manuals "Methodology of conducting experiments in vegetable growing, cultivation and potato growing" [3], and "Experimental technique in vegetable growing and melon growing" [11] was carried out. The statistical analysis of the research results was carried out based on the dispersion method shown by B.A. Dospehov “Methodology of field experience” [2] using Microsoft Excel program.

3 Results and Discussion

During the course of our investigation into the impact of various mulch materials on the development parameters of watermelon plants, we discovered that the various types of mulch materials had a variety of effects on the development parameters of watermelon plants. These growth parameters included the overall length of the primary stem, the overall quantity and area of coverage of leaves, the quantity of curls on the stem, and the weight of both the fruit and the plant.

Application of black polyethylene, a type of mulching material, resulted in a substantial rise in the quantity of branches each stem, the overall length of the primary stem, and the the quantity of curls per stem. Additionally, it led to a rise in the weight of both the fruits and the plant, when compared to the regulate and white mulch alternatives (Table 1).

When compared to the other research alternatives, the control option demonstrated the least amount of growth. Because mulching reduces the amount of water that evaporates from the soil and ensures that there is sufficient moisture in the soil near the root zone, growth parameters are increased as a result of mulching. A better absorption of nutrients for optimal plant growth and development was achieved as a result of the availability and extended retention of moisture in mulched land. This led to increased growth parameters of plants in mulched land in comparison to the control, which was land that did not contain any mulch.

Table 1. The impact of various mulching materials on the development parameters of watermelon plants

Options	Varieties and hybrid	Total quantity of additional branches, pcs	Length of primary stem, cm	The quantity of curls, pcs	Quantity of leaves, pcs	Leaf surface, dm^2	Fruit weight, kg	Plant weight, kg
No mulch	Shirin	6±1,5	210±3,0	3,6±	510±60	2597±75	5±2,4	1,19±0,20
	Sharq Ne'mati	7±1,4	223±3,5	3,7±	527±54	2826±82	7±3,5	1,28±0,22
	Dolby F1	7±1,7	265±3,6	4,4±	502±46	2930±90	8±3,1	1,63±0,28
Black mulch	Shirin	8±1,5	236±3,8	3,9±	534±56	2642±67	5±2,1	1,49±0,21
	Sharq Ne'mati	9±1,4	247±3,5	4,1±	556±49	2892±79	8±3,3	1,53±0,20
	Dolby F1	9±1,7	292±4,2	4,7±	524±61	2996±83	9±3,0	1,90±0,26
White mulch	Shirin	6±1,6	223±2,9	3,8±	523±59	2632±69	5±2,3	1,33±0,20
	Sharq Ne'mati	8±1,5	232±3,1	3,9±	541±51	2857±75	8±3,1	1,42±0,25
	Dolby F1	8±1,7	276±3,7	4,5±	512±47	2971±85	9±2,8	1,75±0,23

The variations in soil temperature that occur beneath polyethylene film mulch may be related to a variety of factors, including the buildup of heat during the day and the loss of heat during the night, as well as the various ways of heating and the transmission of heat to the soil.

When we analyzed the results observed in our research options by varieties and hybrids, the length of the main stem of the "Shirin" variety treated with black mulch was 236 cm, 247 cm in the "Sharq Ne'mati" variety, 292 cm in the "Dolbi F1" hybrid, and in the "Shirin" variety with white mulch was 223 cm, 232 cm in "Sharq Ne'mati" variety, 277 cm in "Dolby F1" hybrid. If we compare with the control, the main stem length of the "Shirin" variety in the black mulch option is 26 cm higher compared to the control option, 13 cm higher compared to the white mulch option, 24 cm higher compared to the control, 15 cm higher compared to the white mulch option in the "Sharq Ne'mati" variety, 27 cm higher

compared to the control, 16 cm higher than the white mulch option in the Dolby F1 hybrid (Table 1).

On the basis of these factors, the main stem length of watermelon was found to be at its shortest when it was treated with black mulch, while the control option was found to have the longest main stem length.

Due to the increased nutrient uptake that occurs as a result of favorable soil moisture and the decreased soil moisture evaporation rate that occurs as a result of mulching the soil surface in watermelon rows, the stem length that is significantly longer is the result of black mulch.

When compared to other types of mulching materials, it was discovered that mulching with black polyethylene film had a substantially greater impact on stem length. When compared to other mulches, this mulch consistently enhanced the rate of germination. It's possible that this was on account of the good soil temperature and moisture conditions, as well as the significant reduction in the number of pests and illnesses that were brought about by the black mulch.

The average weight of watermelon fruits, measured in kilograms, was dramatically boosted by the use of this black mulching material. When compared to the white mulch and control alternatives, the variety that was mulched with black polyethylene film had the highest average fruit weight. This was the case.

It is clear that the use of black mulch results in favorable conditions that are conducive to the achievement of high fruit weight. As a result of the favorable hydrothermal regime of the soil and the fully weed-free environment, plants that were grown in polyethylene black mulch produced larger fruit and a greater yield per bush.

Also, black mulch caused an increase in the number of leaves on the plant, thereby increasing the total leaf surface of the plant. In this variant, the number of leaves in the "Shirin" variety was 534, and the total leaf surface of the plant was 2642 dm^2. In the "Sharq Ne'mati" variety, these indicators were 556 pieces, 2892 dm^2, and in the hybrid "Dolby F1" 524 pieces, 2996 dm^2, respectively. Comparing these results to the white mulch and the control option, we can see that both total leaf count and total leaf surface were higher.

When all of the indications are taken into consideration, it can be said that the watermelon plants that were grown on mulched soil had greater growth characteristics than the control option. The indicators of the plants that were grown in the black polyethylene film mulch option were the greatest, according to the analysis that was conducted based on the different forms of mulch. As a consequence of this, the overall productivity of the plant was significantly higher than that of the other available choices. In general, the use of black mulching material results in the creation of a soil climate that is suitable for watermelon plants. Additionally, it considerably lowers the amount of water that evaporates from the soil and the number of weeds that are present. Through the utilization of this mulching technique, our farmers are able to acquire goods that are kind to the environment and high yields while simultaneously watching the varying conditions of the climate [19-25].

4 Conclusion

We got to the conclusion that the utilization of white and black mulching materials is advantageous for farmers and homesteaders as a consequence of the findings of our research that was undertaken to investigate the impact of various mulching materials on the growth and development of the watermelon plant.

The availability of mulching material and other priority factors should be taken into consideration before farmers decide to employ black mulch, despite the fact that it is more effective than other types of mulch. At the same time, the type of mulch that was black had a substantial impact on the amount of weight that was gained by watermelon fruits in

comparison to the control and white mulch alternatives. In light of this, we are able to draw the conclusion that the use of black mulching material results in an increase in the overall yield.

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