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INFLUENCE OF PLANTING SCHEMES ON THE PHOTOSYNTHETIC ACTIVITY OF FINE FIBER COTTON VARIETIES

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Abstract
The results of the study show that the Leaf index has changed significantly depending on the planting scheme and the genetic characteristics of the variety. The 76x9, 9x1, and 60x12, 5x1 planting schemes were found to be effective in further developing the leaf surface and optimizing the photosynthetic process. Guzor and Marvarid varieties have the highest LAI in the flowering and harvest phases, and have shown high potential in increasing yields. Planting schemes 76x9, 9x1 and 60x12, 5x1 created favorable conditions for the maximum formation of leaves. During the fruiting period, the high content of LAI had a positive effect on the photosynthetic ability and yield of the plant.

Keywords: Cotton, fine fiber cotton varieties, number of leaf, level of leaf, dry matter, flowering.

Introduction

There is not enough attention has been paid to the use of the selective capabilities of local fine fiber cotton varieties in the creation of early maturaty of fine fiber cotton varieties, which provide high-quality fiber, are resistant to existing biotic and abiotic stress factors.

Decree of the President of the Republic of Uzbekistan No. PQ-170 dated March 18, 2022 "On measures to improve the system of implementation of fine fiber cotton varieties in Surkhandarya region on a scientific basis" and No. PQ-206 dated January 28, 2022 "Addition on further development of seed production of agricultural crops The tasks of creating new fine fiber cotton varieties are defined in the decisions on measures. Each fine fiber cotton varieties has a different response to the planting scheme and plant ranges due to its unique hereditary characteristics [4].

Leaf index or leaf surface index – LAI (leaf area index – LAI) (m2/m2) the indicator is an important measure when creating optimal conditions for the photosynthetic process, determining the level of use of light and nutrients. Cotton LAI defines its role in capturing the light spectrum and optimizing photosynthetic processes.

Studies note a close relationship between leaf surface index – LAI and yield of plants. In particular, a crop with a favorable leaf surface in the area unit allows you to increase the efficiency of photosynthesis and eventually achieve high yields [5]. Increased leaf index increases the carbon uptake of the plant during harvest stages, which is a major factor in high yields, especially in cotton.

D.J.Bocquet, M.B.Coco [6] said, that the effects of leaf surface in growth and development phases, including the effects on photosynthetic potential. According to the scientist, the leaf surface and its photosynthetic activity have a positive effect on the later stages of growth. Especially conveniently sized leaves play an important role in growth and high yield.

The leaves are the main organ of the plant and are important in photosynthesis, transpiration, gas

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exchange, and the distribution of organic matter. Leaves also play a large role in environmental adaptation processes. By understanding their physiological importance, it is possible to increase productivity in agriculture and solve environmental problems.

In field experiments carried out in the conditions of taircular soils of the kashkadarya region, it was found that in the phase 2-3 leafs release after germination of the plant, the leaf level was 39,7-51,5 sm2/plant in the cotton varieties bred in a 90x8,3x1 scheme, the smallest leaf surface was in the Surkhan-14 (control) variety – 39,7 sm2/plant and the largest leaf surface was in the Guzor variety – 51,5 sm2/plant.

In planting schemes with a wide range of plants (76x9,9x1; 60x12,5x1), it was noted that since plants used moisture and nutrients effectively, the leaf level in cotton varieties under these conditions was significantly larger than in the 90x8,3x1 (control) planting scheme, that is, in accordance with planting schemes (50,9-52,8 and 56,1-60,1 sm2/plant).

It was noted that the number of leaves produced during the budding phase of the plant was 8,4-11,9 pieces in experimental variants, with a surface area of 189,7-232,6 sm2/plant. In the experiment, the smallest indicator was found in the Surkhan-14 (control) variety (189,7 sm2/plant), in the 90x8,3x1 (control) planting scheme, the highest in the 60x12,5x1 planting scheme, in the Buston variety (232,6 sm2/plant).

In biometric measurements conducted during the flowering phase, the number of leaves was found to be 16,3-25,9 on average in varieties and planting schemes, with a surface area of 1004,8-1085,9 sm2/plant. Even in this phase, the smallest indicator was found to be in the Surkhan-14 (control) variety (1004,8 sm2/plant) in the 90x8,3x1 (control) planting scheme, the highest in the 60x12,5x1 planting scheme was found to be in the cultivated Buston variety (1085,9 sm2/plant), while in the rest of the variants the indicators were in intermediate positions.

Biometric measurements conducted during the harvest phase found that the leaf count averaged 23,5-35,9 pieces, with a surface area of 2206,7-2777,2 sm2/plant.

It is noteworthy that while the Surkhan-14 (control) variety is strongly susceptible to the planting scheme, The Buston variety has been found to be hardly

Table 1 The number of leaves, levels and accumulation of dry matter in a per plant of fine fiber cotton varieties (2022-2024 yy.).

№	Planting scheme	Varieties	2-3 leaves		Budding			Flowering			Fruiting time		
			level of leaf, sm^2	dry matter, g	number of leaves, piece	level of leaf, sm^2	dry matter, g	number of leaves, piece	level of leaf, sm^2	dry matter, g	number of leaves, piece	level of leaf, sm^2	dry matter, g
1	90x8,3x1 (control)	Surxon-14 (control)	39,7	0,137	8,4	189,7	3,22	16,3	1004,8	17,53	23,5	2206,7	54,4
2		Marvarid	44,0	0,143	9,2	194,5	3,45	17,5	1009,1	20,39	26,7	2225,1	65,7
3		Guzor	51,5	0,157	11,3	230,6	4,42	24,4	1077,9	25,80	35,3	2744,3	86,4
4		Buston	46,6	0,146	9,8	207,1	3,81	20,0	1038,5	21,89	27,7	2556,0	65,5
5	76x9,9x1	Surxon-14 (control)	51,3	0,151	10,5	218,4	4,07	21,6	1054,0	24,14	30,6	2632,0	71,9
6		Marvarid	52,8	0,155	11,2	229,4	4,39	23,9	1070,9	27,29	34,6	2738,7	87,5
7		Guzor	51,4	0,153	11,6	230,7	4,31	24,6	1079,3	24,81	35,4	2745,6	77,8
8		Buston	50,9	0,148	10,0	214,4	4,00	20,9	1044,4	23,98	28,8	2602,1	76,9
9	60x12,5x1	Surxon-14 (control)	56,1	0,151	10,8	220,9	4,14	22,7	1063,1	25,14	32,0	2644,3	78,8
10		Marvarid	60,1	0,156	11,3	230,5	4,45	24,2	1073,7	26,94	34,9	2743,2	87,0
11		Guzor	59,2	0,156	11,7	232,1	4,40	25,5	1079,8	25,90	36,1	2766,2	80,8
12		Buston	61,2	0,156	11,9	232,6	4,42	25,9	1085,9	25,43	35,9	2777,2	80,4

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susceptible to the planting scheme. For example,when the Surkhan-14 (control) variety was bred in the 90x8,3x1 (control) planting scheme,the number of leaves and their surface were 23,5 pieces and 2206,7 sm^2/plant, respectively, in the 76x9,9x1 planting scheme, it was noted that the indicators were 30,6 pieces and 2632,0 sm^2/plant, and in the 60x12,5x1 planting scheme, respectively, 32,0 pieces and 2644,3 sm^2/plant. In the case of the Buston variety, in each of the three planting schemes, the number of leaves was determined to be 35,3; 35,4; 35,9, respectively, and their surface area was 2744,3; 2745,6; 2777,2 sm^2/plant. And Marvarid and Guzor varieties were taken into account that they were in intermediate places (Table 1).

The planting scheme has a significant impact on leaf index values. For example, in thickly planted plants, the leaves settle densely, which leads to an increase in total LAI. But too thick planting can cause problems in the supply of sunlight to the leaves [7].

Research on various cotton varieties suggests a change in leaf index. Factors such as the morphological characteristics of the variety, leaf shape and size affect LAI values.

The higher leaf index during the harvest stage has a positive effect on productivity, with increased photosynthesis being a major factor. Especially in the process of harvesting, it is considered optimal to obtain a high and high-quality harvest, since the LAI is 3,3-3,5 m^2/m^2 [6].

The leaf index for all varieties in the 2-3 leafs phase of the plant was found to be small, and regardless of planting schemes, the LAI was found to be in the range of 0,06-0,08 m^2/m^2. With a higher LAI (0,08 m^2/m^2) in the 60x12,5x1 planting scheme in all varieties,it showed a higher indicator than in other planting schemes, which is explained by the fact that in this planting scheme, plants have slightly more feeding area at the initial growth stage than in other planting schemes. Because the Leaf index in this phase is small, plants cannot fully absorb light, so photosynthetic net productivity is also at a relatively low level (Table 2).

It was noted that during the budding phase of the plant, the LAI in all varieties increased significantly, or almost 4-5 times more than in the 2-3 chinbarg phase. The difference in planting scheme and varieties is evident, The varieties Marvarid (76x9,9x1; 60x12,5x1), Guzor (in all schemes) and Buston (60x12,5x1) showed the highest LAI values with an indicator of 0,30 m^2/m^2. The high content of LAI indicates that these varieties have produced the most effective leaf surface during the shoning phase. Even in all varieties in the 60x12,5x1 planting scheme, the LAI received values of 0,29-0,30 m^2/m^2. These results show that the shonation phase depends on the intensity of the Leaf expansion and the photosynthetic process, and that this planting scheme has created favorable conditions for effective leaf expansion. This condition is explained by the fact that the plants have a comfortable feeding area.

Table 2 Leaf index of fine fiber cotton varieties, m^2/m^2 (2022-2024 yy.)

№	Planting scheme	Varieties	2-3 leaves	Budding	Flowering	Fruiting time
1	90x8,3x1 (control)	Surxon-14 (control)	0,06	0,25	1,27	2,80
2		Marvarid	0,06	0,25	1,26	2,79
3		Guzor	0,06	0,30	1,36	3,45
4		Buston	0,06	0,27	1,30	3,20
5	76x9,9x1	Surxon-14 (control)	0,07	0,29	1,34	3,34
6		Marvarid	0,07	0,30	1,35	3,45
7		Guzor	0,06	0,30	1,36	3,46
8		Buston	0,07	0,28	1,31	3,33
9	60x12,5x1	Surxon-14 (control)	0,07	0,29	1,33	3,37
10		Marvarid	0,08	0,30	1,34	3,41
11		Guzor	0,08	0,30	1,35	3,46
12		Buston	0,08	0,30	1,36	3,46

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During the flowering phase, the LAI was found to be even higher. For all varieties studied in this phase, LAI was in the 1,26-1,36 m^2/m^2 range,with slightly higher rates recorded in the 76x9,9x1, and 60x12,5x1 planting schemes. The Guzor and Marvarid varieties were characterized by LAI indicators of 1,36 and 1,35 m^2/m^2, respectively, during this phase, indicating that the varieties in question produced relatively more leaves during the flowering phase. This is due to the increased photosynthetic process during the flowering period, and during the flowering period, the leaves retain more light. These planting schemes make it possible to maximize the efficiency of the leaf surface. During the flowering period, the degree of leaf expansion and light absorption is high, which provides the basis for the yield of the plant, since through leaves of favorable sizes, the process of photosynthesis is accelerated, and the growth process of the plant is also increased.

During the harvest period, LAI had the maximum values. For all varieties, LAI values are high, during which the process of photosynthesis is especially intensified. In the Guzor variety, the highest (3,45-3,46 m^2/m^2) result was recorded in all planting schemes. Also, the Buston and Marvarid varieties also showed high LAI (3,33-3,45 m^2/m^2) values in the 76x9,9x1, and 60x12,5x1 planting schemes, indicating that these varieties produce a strong leaf during the harvest period and produce a correspondingly high yield. While the 90x8,3x1 (control) planting scheme records a relatively lower LAI (2,80 m^2/m^2) in the Surkhan-14 (control) variety, compared to other varieties, these indicators correspond to its specific characteristics. In this planting scheme, The Pearl variety was found to have the lowest LAI (2,79 m^2/m^2) values.

In conclusion, the results of the study show that the Leaf index has changed significantly depending on the planting scheme and the genetic characteristics of the variety. The 76x9,9x1, and 60x12,5x1 planting schemes were found to be effective in further developing the leaf surface and optimizing the photosynthetic process. Guzor and Marvarid varieties have the highest LAI in the flowering and harvest phases, and have shown high potential in increasing yields. The planting scheme and the LAI of the varieties directly affected the effectiveness of photosynthesis, increased leaf levels and the overall yield of the plant. Planting schemes 76x9,9x1 and 60x12,5x1 created favorable conditions for the maximum formation of leaves. During the fruiting period, the high content of LAI had a positive effect on the photosynthetic ability and yield of the plant. This was especially evident in the Marvarid and Guzor varieties planted in the 76x9,9x1 scheme, and in the Guzor and buston varieties planted in the 60x12,5x1 scheme.

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