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Green Manure Crops Effects On Cotton Growth, Development And Productivity At Different Terms

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Abstract:
If in the control-green manure without crop experiment variants, the plant height was 80.6-79.1 cm, the yield horn was 14.2-14.1 pieces, the average joint spacing of the main stem was 4.1-4.3 cm, the main stem thickness was 1.78-1.76 cm, when green manure crops were applied, the agronomic soil properties and characteristics were positive for the plant, coordinated the cotton growth and development, the plants were found to be relatively vigorous and healthy growing and developing. This pattern was repeated in all experimental years, and the data were observed in an analogous manner.

When green manure crops were applied in summer and autumn, the cotton verticillium wilt incidence was reduced. This condition was observed throughout the growth period. This, barley acted like rapeseed. For example, in the summer control-green manure cropless variant, 4.9% of cotton plants were infected with verticillium wilt on July 15, 9.3% on August 1, and 13.3% on August 15, pea variant 4.5; 8.1; 12.4%, 3.8; 7.2; 11.8% in the chick-pea variant, respectively, raps variant 2.4; 5.1; 8.3%, barley variant was 2.7; 5.3; 8.9%.

In particular, in the fall, the control-green manure without crop variant was 5.8% on July 15, 10.2% on August 1, and 14.8% on August 15, while the pea variant was 5.28.9; 13.1%, respectively; chick-pea variant was 4.8; 8.6; 12.1%, raps variant was 2.6; 5.3; 8.6%, and 3.0; 5.8; 9.3% in the barley variant.

In the control-green manure cropless experiment variant, the yield was 35.1s/ha, while in the green manure management variant 5.5-8.6 s/ha was obtained. In the experiment, the highest yield (43.7 s/ha) and the most reliable additional yield (8.6 s/ha) were obtained in the raps planted variant as a green manure crop, 42.8; 40.8 and 40.6 s/ha yields were observed in barley, chick-pea and pea variants planted as green manure crops, respectively.

Keywords: different periods, summer, autumn, green manure crops, cotton, growth, development, verticillium wilt, yield

1. INTRODUCTION

The plants growth and development is one of the most important processes in their life and it depends on the plant type, navigation, growing conditions and applied technological measures. Therefore, the cotton growth and development also depends on the

soil and area climatic conditions where it is grown, as well as the applied agro-technological measures.

If in the control-green manure cropless experiment variant, the number of twigs harvested on July 1 averaged 9.5-9.3 per cotton bush, under the green manure crops influence, the average number of branches increased from 9.8-9.6 to 11.1-11.0 per bush. In general, the greater the biomass left in the soil by green manure crop crops, the higher the cotton stalk height and the significant increase in the number of yielding branches [7].

Cotton wilt disease is lowest in rapeseed and barley varieties used as a summer and autumn green manure crop during all periods of the growing season, wilt infestation decreased by 2.5–2.2% and 3.2–2.8% on July 15 compared to the control-green manure cropless variant [4].

Green manure crops such as pea, chick-pea, rapeseed and barley are sown in areas free of grain in summer on July 10 and in autumn on October 10, 22.41-52.92 t/ha of green biomass was produced and the agrophysical soil properties were improved by burying this mass in the ground [2,5].

Green manure crop crops have a positive effect on soil properties, which ultimately leads to an increase in its fertility. Under such conditions, the cultivated crops yield increases and product quality improves. In the experiment, the highest yields (43.7; 41.5 s/ha) and additional yields (8.6 and 8.2 s/ha) were obtained in the rapeseed variant as a green manure crop, 40.8; 42.8 and 38.6; 40.7 s/ha yields were observed in chick-pea and barley varieties planted as green manure crops, respectively[1,3,6,7].

Hence, in the fields where green manure management was applied, the green manure management had a positive effect on the cotton growth, development and yield by negatively affecting the soil Verticullit dahliae Kleb pathogen.

2. RESEARCH METHODS

Conducting field experiments, planting, caring for crops, harvesting and analysis of the generally accepted Uzbek scientific research institute of botany, (1986); the methods of Uzbek cotton research institute (1981, 2007) were used.

In the experiment, a medium-ripe cotton variety “C-8284” included in the State register, a sample of green manure crop stern chick-pea "K-295" (stern nigretum), pea "Asia 2001", soybean "Friendship", autumn rapeseed "Loris" spring “Viking-VNIIMK” and “Temur” varieties of barley were obtained and planted at different times (summer and autumn). All technological measures used in the experimental field were carried out on the basis of the technological map (business plan) adopted on the farm and on the basis of manuals such as «Methodology for state variety testing of agricultural crops» (1971), «Methodology of botanical research institute» (1971) ва «Methodology for conducting field and growing experiments with forage crops» (1983), «Methodology for long-term prognosis of cotton verticillus wilt» (1970), «Mycological and phytopathological research methods» (1937). All technological measures used in the experimental field were carried out on the basis of the technological map (business plan) adopted on the farm and on the basis of manuals such as "Methodology for state variety testing of agricultural crops".

Field experiments were carried out in 4 variants out of 5 variants in the meadow-gray soils conditions of Samarkand region, where the average irrigated, cultivated, mechanically sandy, groundwater level at 3-4 m depth. The surface area of each pile in the experiment was 240 m^2 (length 50 m, width 4.8 m), the calculated area was 120 m^2, and the piles were systematically arranged in a single tier.

Experimental results. The green manure crops effect on the cotton growth and development

The plants growth and development is one of the most important processes in their life and it depends on the plant type, navigation, growing conditions and applied technological measures. Therefore, the cotton growth and development also depends on the soil and climatic conditions of the area where it is grown, as well as the applied agro-technological measures.

When analyzing the phenological observations and biometric measurements results carried out during the cotton growing season in the experimental field, it was found that green manure crop species grown in summer and autumn have a strong impact on plant growth and development.

While it was observed that the cotton height was significantly accelerated at the beginning of the flowering and flowering phases of the growing season (1.VI and 1.VII), later this process slowed down due to an increase in leaf level and dry mass of plants, yield elements.

In observations made in the experimental field on June 1 (2016), the plant stem height varied from 15.8 to 19.5 cm in the control-green manure cropless variant in summer field experiments, with an average of 17.8 cm, while the tallest cotton observed in the rapeseed variant and was found to be 21.7–26.8 cm, with an average of 24.0 cm. Relatively tall plants were observed in the barley variant, with a plant head stem height of 20.1–24.9 cm and an average of 22.5 cm. During this period, the variation coefficient in plant height averaged 9.6–10.3% of the variants, and it was found that it varied insignificantly (Table 1).

Observations on July 1 revealed that the plant height in the control-green manure cropless variant was 27.6-33.5 cm, with an average of 31.0 cm, and 2.8-14.9 cm lower than the plants in the other variants. The same situation was repeated on June 1, with the tallest plants being observed in the rapeseed variant and the relatively tall stem plants in the barley variant. The same pattern was repeated on August 1, when it was noted that the plants in the experimental variants were 7.3–25.5 cm taller than the plants in the variant without the control-green manure crop. It should be noted that the plant head stem variation coefficient was around 10% at the beginning of the growing season and around 5% towards the end of the growing season.

In autumn field experiments, it was found that the main stem height was lower than the results of summer field experiments at all plant height measurement periods.

Analysis of the daily growth dynamics of the plant stem shows that in the period from June 1 to July 1, according to the variants, the plants grew 13.2-21.9 cm, i.e. the stem grew 0.44-0.73 cm per day. At the same time, rapid stem growth was observed in cotton grown in rapeseed and barley planted variants as a green manure crop (Table 1). Among the green manure crops studied, the average daily cotton grown growth in the pea variant was much slower than that the plants in the other variants, differing only 0.08 cm/day from the control-green manure cropless variant.

The above pattern was also observed when analyzing the growth dynamics of the main stem for the period from July 1 to August 1. Cotton stalks grown in the control-green manure cropless variant grew 31.0 cm or 1.23 cm per day during this period, while faster-growing cotton stalks grew 45.9 cm or 1.57 cm per day in the rapeseed variant. The relatively rapid growth of the main stem was observed in cotton grown in barley variant as green manure crop, and it was found in the analysis that it grew 17.6 cm higher or 0.57 cm more per day than cotton in control-green manure crop variant. Although such differences in stem height and growth are primarily related to the amount of biomass produced by crops grown as a green manure crop, as well as the low biomass grown in areas planted with legumes

belonging to the legume family, the advantage of the main stem growth rate over the control-green manure cropless option is explained by the accumulated biological nitrogen.

An analysis of differences in stem growth shows that plant height in autumn field experiments was similar to that in summer experiments at the beginning of the growing season, but their average daily growth was found to be slightly faster in summer field experiments. This is due to the green manure management impact on soil nutrient regime. For example, in summer field experiments, the average daily growth of the main stem at the beginning of the growing season (01.VI) was 0.44-0.73 cm, while in autumn field experiments it was 0.47-0.76 cm. In subsequent periods, the differences were almost imperceptible (Table 1).

A similar situation was observed in the number of fruiting branches, i.e. the longer the plant stem, the more the number of fruiting branches increased.

In the control-green manure cropless variant of the experiment, the number of twigs harvested on July 1 averaged 9.5-9.3 per bush of cotton, under the green manure crop influence, the average number of branches increased from 9.8-9.6 per plant to 11.1-11.0 per plant. In general, it was taken into account that the greater the biomass left in the soil by green manure crop crops, the higher the cotton head stem and the significant increase in the number of yielding branches (Table 2).

According to the phenological observations analysis made on August 1, during this period (during mass flowering and harvesting period) the cotton stalk height was 80.6 cm in the control-green manure cropless variant and the number of fruiting branches per plant was 14.2, while in the rapeseed and barley case, the cotton stalk height was 94.6-86.7 cm, and the number of fruiting branches was 15.3-15.2, respectively. At the same time, the smallest difference in performance was observed in cotton grown in pea and chick-pea variants as a green manure crop.

If on August 1, in the control-green manure cropless option, the number of cotton points averaged 13.5 per plant, as green manure management, it produced the highest cotton score in rapeseed and barley options, with an average of 16.4–16.0 seedlings per bush.

When the observations were made on 1 September, the number of cotton points per plant in all studied variants ranged from 13.5 to 16.4 during the summer field experiment, with significant differences in their opening.

In the control-green manure cropless experiment variant, 13.5 cotton balls per cotton ball were found on 1 September, which 6.1 units (45.2%) were opened, while green manure management averaged 16.4-16.0 cotton points units in rapeseed and barley variants, respectively, which 8.1-7.7 units (49.4)(-48.2%). In the other variants studied, it was taken into account that the cotton points opening was slow.

The cotton score disclosure analysis of the cotton varieties collected in the experimental field on 1 September showed that the cotton score of the cotton grown in the control-green manure cropless variant opened significantly faster than that the cotton in the pea and chick-pea variants as green manure management the cotton points collected in the cotton in the variants were found to be less open than in the other variants.

It should also be noted that the cotton points opening in the autumn field experiments was less than in the summer field experiments. This is explained by their effect on soil nutrients.

In general, positive changes were observed in the growth and development of cotton grown after green manure management when rapeseed and barley were planted in the cotton-grain rotation field in the summer and in the fall in the cotton-free areas and used as green manure crop. These changes were reflected in the fact that the plants were taller, had more productive branches, and improved soil properties.

The morphological structure of the cotton bush depends on the heredity, biological characteristics of each variety, and represents this variety appearance. However, external factors may also partially affect the morphological structure of the cotton bush. In order to obtain high and high-quality cotton, it is important to carry out technological measures, knowing the morphological characteristics of the variety.

The data show that any green manure crop type, whether legume or cauliflower, has a stronger, thicker stem than the control-green manure cropless option. As the plant height increased, the joint spacing lengthened, while the stem thickness increased under the favorable green manure crops influence.

In the control-green manure crop-free experiment variants, the plant height was 80.6-79.1 cm, the yield horn was 14.2-14.1 pieces, the average joint spacing of the main stem was 4.1-4.3 cm, the main stem thickness was 1, 78-1.76 cm, when using green manure crops, the agronomic properties and characteristics of the soil were positive for the plant, coordinated the cotton growth and development, the plants were found to be relatively vigorous and healthy growth and development. This pattern was repeated in all experimental years, and the data were observed in an analogous manner.

Thus, in the cotton-grain rotation fields, rapeseed is planted as a green manure crop in the grain fields emptied in summer and cotton in autumn, and the grown mass is driven into the soil, and their growth and development are optimized only when cotton is grown in these areas, rather, the cotton stalks are strong, the stems are thick, and there is many yielding elements formation possibility in the cotton.

Table 1
The green manure crops effect on the cotton ball height and the average daily growth of the stem (2016)

№	Plant height, cm																Daily growth, cm		
	01.VI				01.VII				01.VIII				01.IX				1. VI - 1. VII	1. VII- 1. VIII	1.VIII-1.IX
	lim	ẍ	t Sx	V, %	lim	ẍ	t Sx	V, %	Lim	ẍ	t Sx	V, %	Lim	ẍ	t Sx	V, %			
Summer green manure management																			
1	15,8-19,5	17,8	1,8	10,2	27,6-33,5	31	3,2	10,3	65,0-73,2	69,1	3,9	5,6	76,0-85,3	80,6	4,4	5,5	0,44	1,23	0,37
2	16,1-20,0	18,2	1,9	10,3	30,1-37,5	33,8	3,5	10,5	72,3-80,6	76,4	4,0	5,3	84,2-93,9	89,2	4,6	5,2	0,52	1,36	0,42
3	16,9-20,7	18,9	1,9	9,8	32,0-39,6	35,7	3,5	9,7	74,2-83,3	78,8	4,3	5,5	87,3-98,4	92,8	5,2	5,6	0,56	1,39	0,45
4	21,7-26,8	24	2,5	10,4	41,2-50,2	45,9	4,4	9,5	90,0-99,6	94,6	4,9	5,2	105,2-117,3	111	5,9	5,3	0,73	1,57	0,53
5	20,1-24,9	22,5	2,2	9,6	37,7-45,7	41,7	4,2	10,1	82,6-91,7	86,7	4,4	5,1	95,4-107,6	101,3	5,8	5,7	0,64	1,45	0,47
Autumn green manure management																			
1	15,2-18,8	16,9	1,8	10,4	27,2-34,3	31	3,0	9,7	63,8-71,7	67,9	3,9	5,8	74,1-83,7	79,1	4,5	5,7	0,47	1,19	0,36

2	16,0-19,8	17,8	1,7	9,8	29,7-36,8	33,3	3,4	10,2	69,3-78,5	73,9	4,4	5,9	81,4-91,8	86,6	4,8	5,6	0,56	1,32	0,41
3	16,4-20,3	18,2	1,9	10,2	30,1-37,5	33,8	3,5	10,3	70,4-79,0	74,7	4,1	5,5	83,2-93,4	88,3	4,6	5,2	0,64	1,3	0,43
4	19,3-24,4	21,9	2,3	10,3	40,2-49,4	44,7	4,4	9,8	87,6-98,5	92,8	5,3	5,7	102,3-114,1	108,6	5,9	5,4	0,76	1,55	0,51
5	17,6-21,8	19,7	1,9	9,7	35,3-43,7	39,5	4,0	10,2	79,2-88,7	83,8	4,4	5,2	92,4-103,2	97,8	5,1	5,2	0,66	1,43	0,45

Table 2 The green manure crops effect on the number of cotton twigs and balls (2016)

№	Number of harvested branches, pcs								Number of cotton balls, pcs								Open cotton ball (01.IX)	
	01.VII				01.VIII				01.VII				01.VIII				number, pcs	weight, %
	lim	ẍ	tSx	V, %	Lim	ẍ	tSx	V, %	Lim	ẍ	tSx	V, %	Lim	ẍ	tSx	V, %		
Summer green manure management																		
1	8,9-10,1	9,5	0,7	7,4	13,4-15,1	14,2	0,7	4,9	7,7-8,9	8,3	0,5	6,0	12,5-14,3	13,5	0,8	5,9	6,1	45,2
2	9,1-10,5	9,8	0,6	6,1	14,0-15,6	14,8	0,7	4,7	9,5-10,9	10,2	0,6	5,9	14,7-16,9	15,8	1,0	6,3	6,6	46,8
3	9,4-11,0	10,2	0,7	6,9	14,1-15,9	15	0,8	5,3	9,6-10,9	10,3	0,6	5,8	14,9-16,8	15,9	0,9	5,7	6,8	47,8
4	10,3-11,9	11,1	0,7	6,3	15,3-16,2	15,3	0,8	5,2	10,0-11,4	10,6	0,7	6,6	15,2-17,4	16,4	0,9	5,5	8,1	49,4
5	10,0-11,4	10,7	0,6	5,6	14,5-16,2	15,2	0,7	4,6	9,7-11,2	10,4	0,6	5,8	15,2-16,9	16	0,8	5,0	7,7	48,2
Autumn green manure management																		
1	8,4-9,9	9,3	0,5	5,4	13,3-15,0	14,1	0,7	5,0	7,1-8,4	7,7	0,5	6,5	12,0-13,8	12,9	0,8	6,2	5,8	45,0
2	8,9-10,3	9,6	0,6	6,3	13,7-15,6	14,6	0,8	5,5	9,0-10,2	9,5	0,6	6,3	14,0-16,2	15,1	0,9	6,0	6	46,7
3	9,4-10,7	10,1	0,5	5,0	14,0-15,6	14,7	0,8	5,4	9,1-10,3	9,5	0,7	7,4	14,3-16,1	15,2	0,8	5,3	6,3	47,4
4	10,3-11,7	11	0,6	5,5	14,6-16,2	15,4	0,7	4,5	9,1-10,4	9,8	0,6	6,1	15,1-16,8	15,7	0,9	5,7	7,7	49,0

5	9,9-11,3	10,6	0,6	5,7	14,4-16,0	15,2	0,7	4,6	9,2-10,4	9,8	0,5	5,1	14,5-16,7	15,6	1,0	6,4	7,4	47,8

Green manure crops effect on cotton bollworm disease

Verticillium wilt or wilt disease is one of the most common cotton diseases.

In our field experiments, a small amount of verticillium wilt was observed in the control-green manure cropless variant. The verticillium wilt disease development has changed over time. In general, by the end of the growing season, due to a decrease in the cotton plant immunity, its verticillium wilt incidence has sharply increased. This was particularly evident in the second half of July and September (Table 3).

Table 3 Green manure management cotton with verticillium wilt effect on morbidity (2016-2018)

№	Experiment options	Plants infected with wilt, %			
		01.VII	15.VII	01.VIII	15.VIII
Summer green manure management					
1	Control-green manure without crops	2,7	4,9	9,3	13,3
2	Pea	2,3	4,5	8,1	12,4
3	Chick-pea	2,2	3,8	7,2	11,8
4	Raps	1,2	2,4	5,1	8,3
5	Barley	1,4	2,7	5,3	8,9
Autumn green manure management					
1	Control-green manure without crops	4,0	5,8	10,2	14,8
2	Pea	2,7	5,2	8,9	13,1
3	Chick-pea	2,4	4,8	8,6	12,1
4	Raps	1,6	2,6	5,3	8,6
5	Barley	1,6	3,0	5,8	9,3

At the beginning of the cotton growing season, verticillium wilt was more resistant to wilt, i.e. less diseased. When green manure crops were used, the cotton incidence with verticillium wilt was reduced. This condition was observed throughout the growth period. This, barley acted like rapeseed. For example, in the control-green manure cropless variant, 4.9% of the cotton plant was infected with verticillium wilt on July 15, 9.3% on August 1, and 13.3% on August 15, while 4.5% in the pea variant was 8.1; 12.4%, 3.8,7.2; 11.8% in the chick-pea variant, respectively, raps variant was 2.4; 5.1; 8.3%, barley variant was 2.7; 5.3; 8.9% (Table 3).

Hence, an increase in the amount of organic matter in the soil reduces the cotton with verticillium wilt incidence. This may be due to the disease-causing antagonists proliferation in the soil and to the complete cotton nutrition. The phytosanitary condition of the soil depends on the amount of organic matter in the soil.

Green manure crops also reduce the cotton verticillium wilt incidence during the autumn planting period. In particular, in the control-green manure cropless variant on July 15

it was 5.8%, on August 1 was 10.2%, on August 15 was 14.8%, in the pea variant it was 5.2%; 8.9; 13.1% respectively, chick-pea variant was 4.8; 8.6; 12.1%, raps variant was 2.6; 5.3; 8.6%, and 3.0; 5.8; 9.3% in the barley variant; (Table 3).

Thus, both summer green manure management and autumn green manure management have a negative impact on the pathogen Verticillium Dahliae Kleb, reducing the incidence of cotton with verticillium wilt.

Hence, an increase in the amount of organic matter in the soil reduces the cotton with verticillium wilt incidence. This situation can be explained by the increase in disease-causing pathogens antagonists in the soil, as well as the complete cotton nutrition. In general, green manure management has a negative effect on the pathogen Verticullit dahliae Kleb in the soil, reducing the cotton verticillium wilt incidence.

Green manure crops effect on cotton yield

An analysis of the data obtained to determine the green manure crop varieties effect on cotton yield in the experiment showed that all green manure crop types tested in the summer crop rotation in the summer and in the cotton field in the fall had a positive effect on yield growth.

In the 1st experiment year, i.e. in 2016, the average yield on the studied options was 33.0-41.7 s/ha in summer green manure management, the highest (41.7 s/ha) and reliable ($ЭКФ_{05}$=3,03s) additional yield (8.7 s/ha) was obtained from the raps planted variant as a green manure crop. The green manure crop tested in the experiment also yielded a reliable supplement from barley, chick-pea and pea planted variants, and the yield was 7.5, respectively, from the control-green manure cropless variant; 6.2 and 5.8 s/ha, respectively. In the experiment, a relatively high barley was observed in the planted variant (Table 4).

Table – 4 Green manure management impact on cotton yield, (2016-2018)

№	Experiment options	Productivity over the years, s/ha			Average productivity, s/ha	In relation to control, ±
		2016	2017	2018		
Summer green manure management						
1	Control-green manure without crops	33,0	35,5	35,1	34,5	
2	Pea	38,8	41,4	40,6	40,3	5,7
3	Chick-pea	39,2	41,6	40,8	40,5	6,0
4	Raps	41,7	43,9	43,7	43,1	8,6
5	Barley	40,5	43,1	42,8	42,1	7,6
	$S_{\bar{x}}\%$	2,5	2,15	2,42		
	$ЭКФ_{05}$	3,03	2,9	3,45		
Autumn green manure management						
1	Control-green manure without crops	31,8	33,6	33,3	32,9	
2	Pea	37,4	39,1	38,6	38,4	5,5
3	Chick-pea	37,8	39,8	39,3	39,0	6,1
4	Raps	39,4	41,5	41,5	40,8	7,9
5	Barley	39	40,9	40,7	40,2	7,3
	$S_{\bar{x}}\%$	2,3	2,07	2,29		
	$ЭКФ_{05}$	2,85	2,77	2,9		

In the control-green manure cropless variant of the field experiment conducted in 2017, the average yield was 35.5 s/ha, while in the variants using green manure management, the yield was 41.4-43.9 s/ha. In this experiment, the highest yield compared to the control-green manure cropless variant was observed in the rapeseed variant as a green manure crop, which provided an additional 8.4 s/ha yield. The lowest yield compared to the control-green manure cropless variant was in the pea-planted variant as a green manure crop, with an additional 6.1 s/ha yield. A convincing supplement was obtained from all the options studied in the experiment($ЭКФ_{05}$=2,9 s) (5,9; 6,1; 7,6 and 8,4 s/ha).

Even in the third year of the experiment, it was found that the yield was high in all variants using green manure crop. In the control-green manure cropless experiment variant, the yield was 35.1 s/ha, while in the green manure management variant 5.5-8.6 s/ha was obtained. In the experiment, the highest yield (43.7 s/ha) and the most reliable additional yield (8.6 s/ha) were obtained in the raps planted variant as a green manure crop, 42.8;40.8 and 40.6 s/ha yields were observed in barley, chick-pea and pea varieties planted as green manure crops, respectively (Table 4).

In summary, in the irrigated meadow-gray soils of Samarkand region, in the short-term cotton-grain rotation field, rapeseed and barley are sown in the summer and cotton-free areas, and their use as a green manure crop increases soil fertility, all its water-physical, improves agrochemical properties. As a result, the plants grow well and produce 8.6-7.3 s/ha more than the control-green manure crop option.

3. CONCLUSIONS AND SUGGESTIONS

In the control-green manure crop-free experiment variants, the plant height was 80.6-79.1 cm, the yield horn was 14.2-14.1 pieces, the average joint spacing of the main stem was 4.1-4.3 cm, the main stem thickness was 1, 78-1.76 cm, when using green manure crops, the agronomic properties and characteristics of the soil were positive for the plant, coordinated the cotton growth and development, the plants were found to be relatively vigorous and healthy growth and development. This pattern was repeated in all experimental years, and the data were observed in an analogous manner.

When green manure crops were applied in summer and autumn, the cotton verticillium wilt incidence was reduced.This condition was observed throughout the growth period. In doing so, barley acted like rapeseed. For example, in the summer control-green manure cropless variant, 4.9% of the cotton crop on July 15, 9.3% on August 1, on 15 August, 13.3% were diagnosed with verticillium wilt, while 4.5 in the pea variant; 8.1; 12.4%, 3.8 in the chick-pea variant, respectively; 7.2; 11.8%, raps variant 2.4; 5.1; 8.3%, barley variant 2.7; 5.3; 8.9%. In particular, in the fall, the control-green manure without crops was 5.8% on July 15, 10.2% on August 1, and 14.8% on August 15, in the pea variant 5.2 according to the above; 8.9; 13.1%, chick-pea variant 4.8; 8.6; 12.1%, raps variant 2.6; 5.3; 8.6%, and 3.0; 5.8; 9.3% in the barley variant

In the control-green manure cropless variant of the experiment, the yield was 35.1 s/ha, while in the green manure management variant 5.5-8.6 s/ha was obtained. In the experiment, the highest yield (43.7 s/ha) and the most reliable additional yield (8.6 s/ha) were obtained in the raps planted variant as a green manure crop, 42.8; 40.8 and 40.6 s/ha yields were observed in barley, chick-pea and pea variants planted as green manure crops, respectively.

In conclusion, in the meadow-gray soils of Samarkand region (for short-crop cotton-crop rotation fields and cotton-free fields in the fall) by sowing peas, chick-pea, barley and rapeseed at different times and using them as green manure crop, it is possible to grow and

develop cotton well, and as a result, compared to the control- green manure crop variant 6.8-8.6 and 5.9 -7.9 s/ha provides additional yield.

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