

The Influence of Soil Mulching and Minimal Tillage on the Degree of Correlation Bonds between the Quantitative Indicators of Cotton and Wheat

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Abstract: The article analyzes the effect of soil mulching and minimal processing on the degree of correlation bonds between the quantitative indicators of cotton and wheat. The following research work was carried out in the conditions of irrigation gray-meadow soils of Mirzachul Oasis. It was used as mulch (dung, straw, cotton cotton stem, licorice waste), the results showed that the degree of correlation bonds between the quantitative indicators of the plant of cotton and wheat was found to be influenced by minimal tillage and mulching methods.

Keywords: correlation, gray-meadow, cotton, wheat, mulch, minimal tprocessing, control, dung, straw of wheat, cotton stem, licorice waste.

Introduction

The effect of mulching on the growth, development and productivity of agricultural crops (cotton, wheat) with minimal tillage on irrigated soils in Uzbekistan has been studied in separate studies. In our study, mulching and minimum tillage technologies were used together on the irrigated soils of the Mirzachul oasis [4,5].

In recent years, the advent of modern information technology has further increased the application of correlation analysis, including statistical methods, to biological research. As a result, it was found that under the influence of the external environment there are corresponding changes in the system of interactions between the quantitative characteristics of plants [1,2,3].

Plant quantitative indicators are to be considered the strongest variables. The more dependent a character is on an external factor, the higher its degree of variability [2,3].

O. Kh. Yunusov, T. Kh. Kuliev, Z.U. Abdikulov analyzed the variability and interdependence of the quantitative indicators of corn in saline soils. For statistical analysis of the data, a special program SPSS-17 was used. Using this program, statistical indicators were calculated (arithmetic mean and its error, coefficients of variation (cv,%), correlation (r), determination (r^2) [9].

In turn, mulching and minimal processing are external factors. The main purpose of applying correlation analysis is to determine the effect of external factors on the level of interrelationships between quantitative indicators.

Object and methods of research

In the conditions of irrigated gray-meadow soils of Mirzachul oasis, field experiments were carried out on minimal tillage and mulching with various organic substances of 8 options: control options 1 and 5; mulched with 2 and 6 licorice residues; 3 and 7 mulched with straw and cotton stems; options 4 and 8 are mulched with dung. Cotton and wheat from agricultural crops were planted in experimental variants.

In addition to studying the effect of mulching and minimal processing on soil properties, its effect on the degree of correlation between cotton and wheat quantitative indicators was also studied [5,6].

The analyzes were performed using the mathematical-statistical method SPSS-2014.

The results obtained and their analysis

In the experiment, the height of the cotton variety was 77,2 cm in the control variant, 83,2 cm in the mulched variant, 81,1 cm in the mulched variant with straw and 85,5 cm in the mulched

variant with dung. These data show that the plant height varies in the cross section of the options and can be seen in Table 1.

Mulching and minimal tillage methods had a positive effect on plant growth. As a result, the average plant height was 8.0 cm higher than the control option. Similar results were recorded for other quantitative indicators studied. In particular, the number of combs averaged 11.44 in the control variant and 12.99 in the dung-mulched variant.

Table 1
Influence of mulching and minimal tillage on the quantitative indicators of cotton plant

N o	Statistical indicators	Plant height, cm	Quantity of buds, pc	Monopodial branches, pc	Sympodial (yield) branches, pc	Quantity of pods, pc	Weight of one pod, gr	Harvest , c/ha
1								
1	Average indicator	77,20 ±1,06	11,44 ±0,26	0,68 ±0,02	8,48 ±0,05	11,81 ±0,22	5,35 ±0,34	28,96 ±0,35
2	Minimum	72,50	10,40	0,60	8,20	11,10	5,20	26,80
3	Maximum	82,50	13,30	0,80	8,70	13,00	5,50	30,20
2								
1	Average indicator	81,13 ±0,35	12,20 ±0,12	0,77 ±0,03	11,55 ±0,17	12,48 ±0,19	5,41 ±0,04	31,97 ±0,25
2	Minimum	79,20	11,70	0,60	10,70	11,70	5,20	30,80
3	Maximum	82,30	12,70	0,90	12,20	13,30	5,60	33,60
3								
1	Average indicator	83,28 ±0,55	12,60 ±0,24	0,93 ±0,05	11,70 ±0,17	13,29 ±0,19	5,49 ±0,03	32,67 ±0,28
2	Minimum	81,50	11,60	0,70	10,80	12,20	5,30	31,50
3	Maximum	86,20	13,60	1,10	12,70	14,30	5,60	33,70
4								
1	Average indicator	85,58 ±0,27	12,99 ±0,09	0,86 ±0,02	12,16 ±0,17	13,64 ±0,27	5,54 ±0,03	33,75 ±0,31
2	Minimum	84,30	12,50	0,80	11,40	12,70	5,40	32,70
3	Maximum	86,60	13,40	0,90	12,80	14,60	5,70	35,50

Note* - the numbers represent the plant indicators, the lines between them the correlation coefficient.

The results showed that the level of correlation bonds between the quantitative indicators of the cotton plant was affected by minimal tillage and mulching methods (Fig. 1).

From the data in the figure, it was found that there was a moderate correlation bond between the plant height (1) and the number of stems (2) in the control. A strong correlation bond was found in the performance of all mulched and minimal tillage variants.

In mulched variants, plant height was also found to be higher than in the control variant, and it was natural for tall plants to have a large number of ponds and monopodial (3), sympodial (4)

branches, which in turn led to higher pod weight (6) and harvest (7).

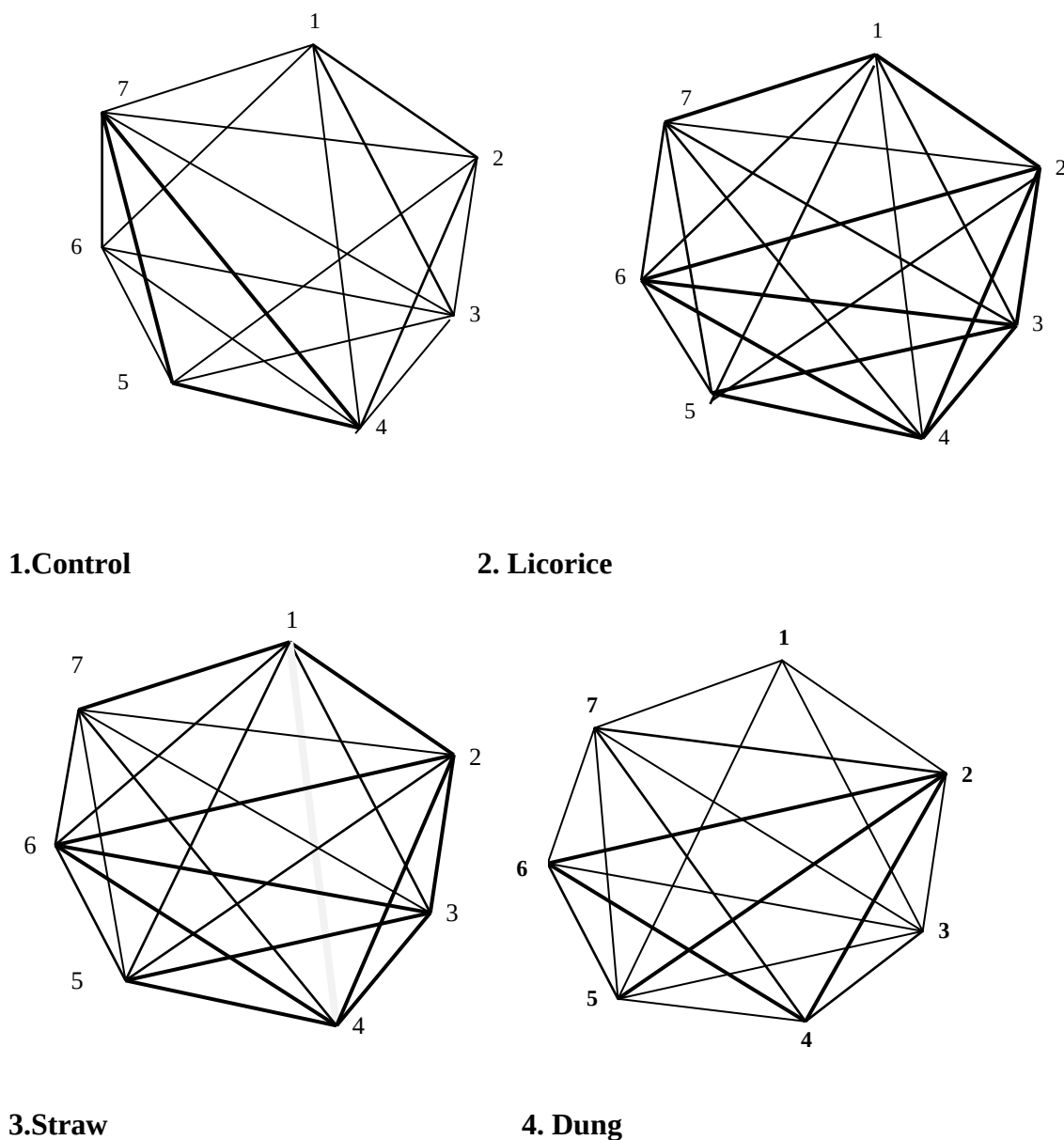


Fig. 1. Influence of mulching and minimal tillage on the quantitative indicators of cotton plant

Note: Here the numbers represent the characters, the lines represent the degree of correlation between them. In this case 1- plant height, cm; Number of cells 2, pieces; 3 Number of monopodial branches, pcs; 4 Sympodial (yield) number of branches, pcs; Number of 5 pods, pcs; 6 pod weight (single), g; Yield 7, c/ha

$$-r=0,3-0,5; \quad r=0,5-0,7; \quad r=\geq 0,7$$

In the control, a strong correlation bond was observed between the sympodial yield branch (4), the number of stems (5), and the yield (7). This indicates that the yield depends primarily on the yield branch, the weight of the stem and its quantity. Appropriate changes occurred at the level

of the correlation bond between quantitative characters when cotton was studied in the mulch variant with licorice. It was noted that productivity (7) was strongly dependent on all the studied indicators. In particular, it was noted that indicators such as plant height (1), monopodial (3), sympodial yield branches (4), number of stems (5) and stem weight (6) were highly correlated with productivity (Fig. 1).

In conclusion, experimental options had a strong impact on the growth and development of cotton. As a result, there were corresponding changes in the level of correlations between quantitative indicators of cotton. In the control variant, the yield depended more on the number of stem and pods, while mulching and minimal processing had a strong effect on cotton yield on plant height, sympodial, monopodial branches, number of stems and its weight.

Hence, it was found that the level of correlation between the quantitative characteristics of cotton increased as a result of mulching and minimal processing compared to the control option. As a result of mulching and minimal processing, all yield elements had a strong effect on the yield of cotton.

Variation in the quantitative characteristics of winter wheat under the influence of mulching and minimal tillage was noted (Table 2). In the control variant, the average yield was 41.0 c/ha, in the variant mulched with licorice waste 48.5 c/ha, in the variant mulched with cotton stems 45.1 c/ha and in the variant mulched with dung 51.4 c/ha yields were 4.1–10.4 c/ha higher than in the control variant. Not only was there a change in other indicators of productivity.

Table 2

Influence of mulching and minimal tillage on quantitative indicators of winter wheat crop

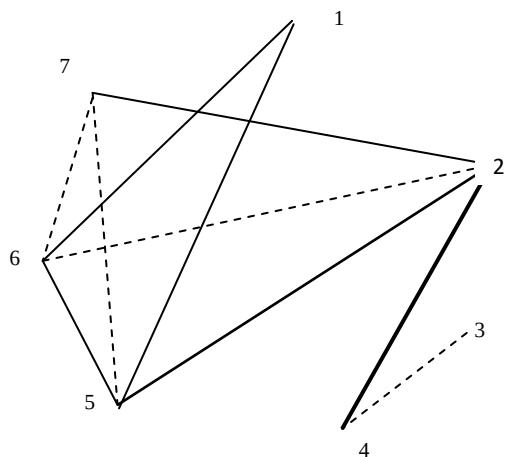
N o	Statistical indicators	Quantity of productiv e stalks per 1m ² , pc	Weight of wheat in one crop, g	Length of ear, cm	Productivi ty of straw, c/ha	Product ivity of wheat, c/ha	Heught of plant, cm	Weight of 1000 pc wheat, g
5								
1	Average indicator	313,80 ±1,74	1,55 ±0,01	9,70 ±0,03	27,90 ±0,80	41,16 ±0,68	98,12 ±0,48	42,43 ±0,32
2	Minimum	305,00	1,53	9,50	24,40	37,50	95,60	41,20
3	Maximum	323,00	1,58	9,90	31,20	44,20	101,10	44,10
6								
1	Average indicator	351,00 ±6,79	1,58 ±0,01	9,76 ±0,04	30,79 ±0,39	45,14 ±0,38	99,05 ±0,26	45,00 ±0,11
2	Minimum	315,00	1,56	9,60	29,30	43,60	97,60	44,00
3	Maximum	372,00	1,61	10,10	32,50	46,80	100,20	46,00
7								
1	Average indicator	403,50 ±5,32	1,58 ±0,01	9,81 ±0,02	33,78 ±0,38	48,40 ±0,44	102,46 ±0,52	46,24 ±0,41

2	Minimum	385,00	1,56	9,70	32,20	46,50	98,80	44,50
3	Maximum	428,00	1,61	9,90	35,60	50,30	105,20	47,60
8								
1	Average indicator	426,30 $\pm 9,88$	1,64 $\pm 0,01$	10,21 $\pm 0,06$	35,13 $\pm 0,63$	50,66 $\pm 0,79$	103,6 $\pm 0,68$	48,72 $\pm 0,35$
2	Minimum	359,00	1,60	9,80	31,30	44,60	98,20	46,00
3	Maximum	454,00	1,68	10,50	38,30	53,40	106,00	49,90

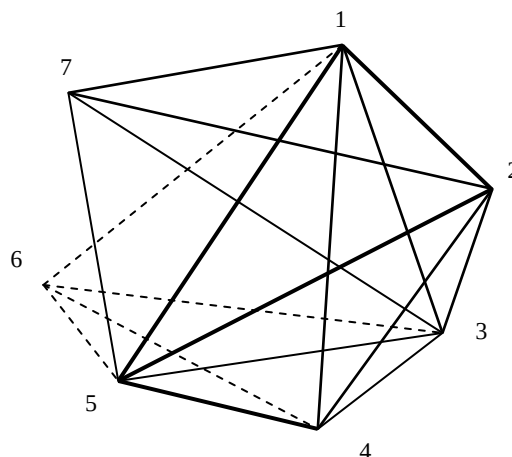
The number of productive stems was 313.8 in the control variant and 426.3 in the mulched variant. This means that the number of productive stems using mulching has increased.

Cotton-like results were recorded in winter wheat. As a result of mulching and minimal tillage, a change in the level of correlation bonds between quantitative characteristics of winter wheat was observed. This can be clearly seen from the data in Figure 2. In the control variant, it was noted that the grain yield (5) depends on the weight of the whet (2). Of course, the yield was also affected by the number of productive stems (1). However, its effect was weak relative to the weight of the grain. The large number of productive stalks (2) resulted in a low grain weight of 1000 grains. This is because there is an inverse correlation between these indicators.

In the mulch variant with licorice, changes in the level of correlation bonds between the quantitative characteristics of winter wheat were observed. This can be determined by comparing the data obtained in the control option (Figure 2).



5. Control



6. Licorice

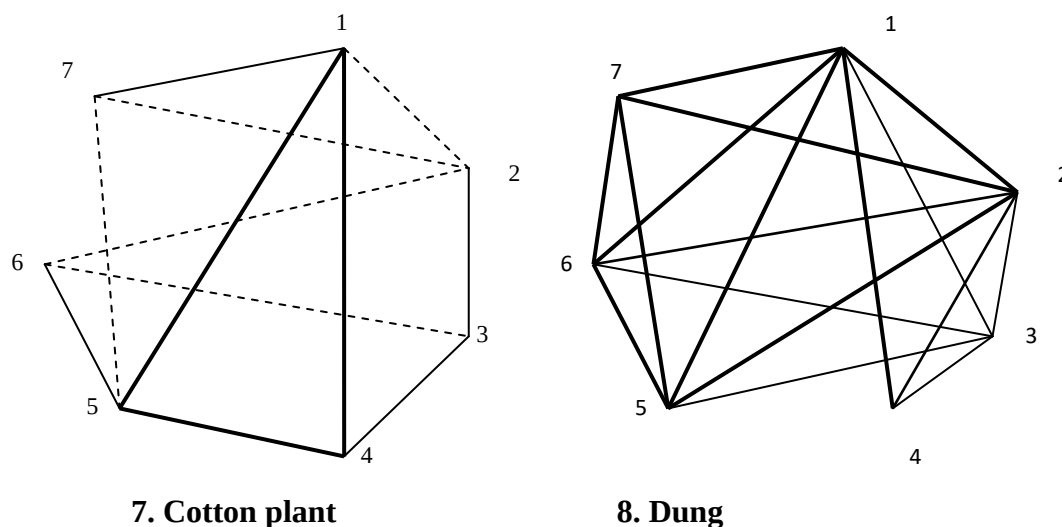


Figure 2. Effect of mulching and minimal tillage on the level of correlation bonds between quantitative indicators of winter wheat crop

Note: Here the numbers represent the characters, the lines represent the degree of correlation between them. In this case, the number of productive stems per 1-1 m², pcs; 2 grain weight in a single wheat, g; 3 grain length, cm; 4 straw yield, c/ha; 5 grain yield, c/ha; 6 plant height, cm; 7-1000 grain weight, g

~~$r=0,3-0,5$~~ ; ~~$r=0,5-0,7$~~ ; ~~$r=>0,7$~~ ; — $r=>0,7$; - - - $r=0,3-0,5$; . . . $r=0,5-0,7$

In the control variant, an unrealistic correlation was observed between the number of productive stalks (1) and the grain weight in the grain (2). A moderate ($r=>0,5$) correlation between these values was noted in the mulch variant with licorice waste. A similar result was noted between the straw yield (4) and the grain yield (5) in the straw-mulched variant. It was noted that the level of correlation between these indicators increased in the mulched variant with licorice waste.

In the mulched version with cotton stems, a strong correlation was observed between the number of productive stalks (1), straw (4) and grain (5) yields. In the dung-mulched variant, an increase in the level of correlation bonds between all quantitative markers was noted. This indicates that many factors have affected the yield of winter wheat.

In general, it was found that the level of correlation between the quantitative characteristics of winter wheat was influenced by mulching and minimal tillage methods. In the control variant, it was noted that the yield of winter wheat varieties depends more on the weight of ear in the grain. This is because high correlations were noted between these indicators.

As a result of mulching and minimal tillage, the degree of correlation between most quantitative characters increased. This indicates that mulching methods have affected the system of correlations between quantitative characteristics of winter wheat and have undergone appropriate changes. In particular, it was noted that the level of correlation between quantitative markers in

the dung-mulched variant increased compared to other variants and controls.

Conclusion

In conclusion, as a result of mulching and minimal tillage, the level of correlations between quantitative indicators of the organism has increased. Such correlations can be explained by the fact that the yield of winter wheat depends on more complex and more external factors.

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