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The Effect of Application of Different Doses of Acid Mixture Seed Coating Method on Cotton (*Gossypium hirsutum* L.) Yield and Fiber Technological Characteristics

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Abstract: This study was carried out to determine the effects of different rates of seed coating of an organic acid mixture (citric acid, glutamate, and proline) on the yield and technological characteristics of cotton (*Gossypium hirsutum* L.). Before seeding, cotton seeds were coated with an organic acid mixture product [0.75% citric acid, 0.25% glutamate, 0.25% proline, and 98.75 inert ingredients (water)], in six different doses (500, 1000, 1500, 2000, and 2500 cc) to compare with control (uncoated). Seed cotton yield, fiber yield, plant height, number of monopodial branches, number of sympodial branches, number of nodes of the first fruiting branch, number of bolls per plant, boll weight, boll seed cotton weight, first picking percentage, 100 seeds weight, fiber fineness, fiber length, fiber strength, fiber elongation, fiber uniformity ratio, short fiber index, fiber yellowness (+ b), fiber reflectance (Rd) and spinning consistency index (SCI) values were examined. The results of statistical analysis indicated that there were significant differences between treatments in terms of seed cotton yield, fiber yield, boll weight, boll seed cotton weight, first picking percentage, and the number of nodes of the first fruiting branch, while there was a non-significant association in terms of other examined observations and fiber technological characteristics. The highest seed cotton yield was obtained from 1500 cc application doses as 5073.80 kg ha^{-1} which was 19,78% (838.00 kg ha^{-1}) higher than that of the control (4235.80 kg ha^{-1}). In conclusion in light of the information obtained from this study, a remarkable increase in yield was obtained as a result of coating the cotton seeds with the product containing organic acid mixtures (citric acid, glutamate, and proline) at different doses. For this reason, it was concluded that it may be recommended to cover the seeds with the aforementioned mixtures before sowing.

Keywords: Cotton; yield; citric acid; glutamate; proline; quality.

1. Introduction

In cotton farming, in sowing with good seed-soil contact, water uptake of the seed is rapid within 30 minutes following sowing and the seed becomes completely saturated with water within 4-5 hours [1,2]. Water swells the tissues of the seed and initiates cell growth and division. Thus, within 2-3 days, rootlets emerge from the micropyle and move deeper into the soil [3,2].

Root emergence is followed by elongation of the hypocotyl. The hypocotyl elongates and forms an arc that begins to push the soil upward. The folded cotyledon leaves open after they come to the soil surface and reveal the growth point, epicotyl, and apical bud [4,2]. After the pods open, they produce chlorophyll and begin vegetative growth. Cotton is a plant that tends to balance its above-ground and below-ground organs [5,2].

Restricting root growth for any reason in the early stages of cotton development reduces fiber yield and quality by reducing water and nutrient uptake.

The cotton plant is very sensitive during this period from planting to the soil surface. The cotton plant, which has successfully emerged to the soil surface, can give the highest yield if other agronomic processes are applied adequately and climatic conditions are suitable.

Organic acid-mixed seed coating products are used in corn, soybean, canola, paddy, wheat, barley, and cotton. Studies have shown that organic acid mixed seed coating products; stimulate the energy reserve of the seed for a fast and healthy start, accelerate germination, emergence, and establishment of the plant roof, and force the seed for a faster start, helping to prevent diseases that reduce the yield potential by suppressing the plants in the early period, It shows that it has a higher tolerance to the nutrient, increases nutrient uptake and utilization, facilitates carbon fixation and increases nitrogen utilization by plants, triggers plants to benefit from more nitrogen and improves plant health to reveal yield potential.

It is known that more than 200,000 substances are produced in plants, fungi, and microorganisms and they can be grouped as primary and secondary metabolites. Primary metabolites are synthesized by all organisms and are vital for vital processes such as growth and development, and contain proteins, lipids, and carbohydrates. Secondary metabolites are known to produce low (<1%) dry weight compared to primary metabolites and are specific for certain organs or developmental stages.

Proline, citric acid, and glutamate in the mixture used in this study are primary metabolites and their effects on plants can be summarized as follows.

Proline is one of the most studied osmoprotectants in plants. In 1954, Kemble and McPherson [6] described proline accumulation in wilting ryegrass (*Lolium perenne*), and since then, it has been the focus of many studies. Proline functions as a molecular chaperone (each of the stabilizing protein classes that facilitate protein binding), ensuring the integrity of the protein. It also contributes to the continuity of the redox balance by acting as a single oxygen extinguisher. However, tolerance to abiotic stress factors depends on the species, concentration, phenological time at the time of application, and application system. There are many studies on the administration of proline under abiotic stress conditions. Proline application dose is the most important first step to improving yield in agriculture. It has been reported that proline applications cause structural and ultrastructural changes in the context of abiotic stress.

The citric acid (SA) is the starting intermediate of the tricarboxylic acid cycle (TCA).

This molecule is a mild antioxidant that provides easier uptake of metals such as Copper (Cu), Lead (Pb), and aluminum by plants. Problems caused by salinity can be improved by the application of this antioxidant. For example, in calcareous soils (high concentration $CaCO_3$), the application of SA to the irrigation water of tomato plants increased the uptake and assimilation of Zn, Na, Ca, and N in leaves, and Mn, Na, Mg, and P in fruits [7].

Glutamate is a protein amino acid known as a neurotransmitter. It plays a very important role in the development and growth of plants. Today, it has been revealed that Glutamate has a signaling role. Under normal conditions, Glutamate functions in seed germination, root architecture, pollen germination, and pollen tube growth. Under stress conditions, it contributes to the adaptation process of plants by triggering positive stimulating effects in the healing of wounds, resistance to pathogens, response and adaptation processes to abiotic stresses (such as salinity, cold, heat, and drought), and in the long term, both of biotic and abiotic stresses [8].

This study was carried out to determine the effect of acid mixed seed coating method applied at different doses on yield and technological properties of cotton (*Gossypium hirsutum* L.).

2. Materials and Methods

The research was conducted in the Siirt University Agriculture Faculty's experimental area in 2018 according to the randomized complete blocks design with 4 replications. BA-440 cotton variety was planted as material. The aim of this study was to examine the effect of coating cottonseed with the organic acid-containing product at different rates on yield and fiber technological properties.

The area where the experiment was conducted was processed deeply with a plow in the fall and out-covered with a cultivator in the spring, and it was made suitable for planting by pulling the cultivator 3 times. Soil analyzes were made by taking soil samples from the experimental area. The results of the analysis are given in Table 1.

Table 1. Soil characteristics of the experimental area.

Soil characteristics	Value
Clay, %	43.51
Sand, %	47.99
Silt, %	8.49
pH	6.89
EC, mS cm^{-1}	463.00
Lime, %	0.50
Organic matter, %	1.02
Available phosphorus, kg P_2O_5 da^{-1}	2.20
Available potassium, kg K_2O da^{-1}	86.00

A total of 140 kg ha^{-1} N and 80 kg ha^{-1} P_2O_5 were given to the experiment. During planting, 80 kg ha^{-1} N and 80 kg ha^{-1} P_2O_5 20-20-0 compose fertilizer was applied to the band with a seeder, and the remaining 60 kg ha^{-1} N is in the form of 33% ammonium nitrate during the squaring period/before the first irrigation has been applied. In the experiment, sowing was done on May 4, 2018, with a seeder. At the sowing, each plot was formed from 4 rows of 6 m in length. During sowing, the distance between rows was 0,70 m, and the distance inter rows was created as 15 cm by thinning. Before sowing, cotton seeds were covered with 6 different doses of Organic Acid Containing Product (Take Off ST) together with the control (uncoated) subject. Take-off ST was applied to 1-ton seed with different doses (500, 1000, 1500, 2000, 2500 cc).

Applications
1) Control
2) 500 cc
3) 1000 cc
4) 1500 cc
5) 2000 cc
6) 2500 cc

All required operations in the experiment were carried out when necessary and on time. During the experiment, 3 times hand and 2 machine hoes were made and pest controls were made at regular intervals and no pesticide control was applied because it was not needed. The experiment was irrigated by drip irrigation method. Irrigation was started before the flowering period and completed at 10% boll opening period. Harvesting operations were done manually and completed two times. The first-hand harvest was carried out during the 60% boll opening period, and the remaining cotton was collected at the second harvest.

At harvest, two rows in the middle of the plots were harvested. The first-hand harvest was made on October 4, and the second harvest was made on November 5, 2018. The climate data of the year in which the experiment was carried out are given in Table 2 in comparison with the long years. It is observed that the average temperature values, minimum and maximum temperatures of 2018 are above many years, it is seen that the highest precipitation with 146.8 mm is in May, which is over long years, and there is no precipitation between June and September.

Table 2. Climatical values of the experimental year and long-term periods.

Month	Year	Average Temp (°C)	Maximum Temp (°C)	Minimum Temp (°C)	Relative Humidity (%)	Rainfall (mm)
April	2018	16.80	22.70	11.30	47.60	60.80
	Long Term	13.80	19.30	9.10	50.40	104.30
May	2018	19.80	25.70	14.90	59.10	146.80
	Long Term	19.30	25.20	13.50	41.50	62.0
June	2018	27.40	33.40	21.00	31.70	3.00
	Long Term	26.00	32.10	18.90	24.10	8.70
July	2018	32.30	38.70	25.40	20.10	0.60
	Long Term	30.60	36.90	23.40	18.10	1.60
August	2018	32.10	38.60	25.50	21.40	1.60
	Long Term	30.00	37.00	23.10	17.20	1.00
September	2018	27.90	34.50	21.50	22.50	0.0
	Long Term	25.00	32.30	18.70	24.00	5.20
October	2018	20.40	26.20	15.60	46.30	134.00
	Long Term	17.90	24.50	12.70	45.30	50.90
November	2018	16.60	24.30	10.0	42.90	96.00
	Long Term	10.20	15.40	6.30	57.10	55.60

Source: Turkish State Meteorological Service

Examined Agronomic Properties and Determination Methods

Plant height, number of monopodial branches, number of fruiting branches, number of a node of the first fruiting branch, and number of bolls were counted in randomly selected 10 plants from each plot, and 50 bolls were taken in the 1st position between 1st and 5th fruit branches from each plot were counted. The boll weight, boll seed cotton weight, 100 seed weight, and ginning percentage were determined. Seed cotton yield and fiber yield values were obtained by weighing the product obtained from each parcel and dividing the parcel yield by kg ha^{-1}.

Laboratory analyzes

Fiber analyzes were determined in the fiber quality laboratory of the GAP International Agricultural Research and Training Center with the help of the HVI 1000 instrument.

Statistical Analysis

The results obtained from the research were evaluated with the JUMP 7.0 statistical program, and the LSD $_{(0.05)}$ test was used to compare the averages.

3. Results and Discussion

Seed Cotton Yield (kg ha^{-1})

It is seen from Table 3 that the average values of the seed cotton yield vary between 3228.20 and 5073.80 kg ha^{-1} depending on the applications, there are statistical differences at the 1% significance level between the applications, and the general average of the experiment is 4141.40 kg ha^{-1}. While the lowest seed cotton yield was obtained from 2500 cc application as 3228.20 kg ha^{-1}, the highest seed cotton yield was obtained from 1500 cc application as 5073.80 kg ha^{-1}. This application was followed by the 3rd (1000 cc), 2nd (500 cc), and control applications with a yield of 4532.50 kg ha^{-1}, 4400.60 kg ha^{-1}, and 4235.80 kg ha^{-1}, respectively. It has been determined that these applications share the same statistical group. When the applications were evaluated, the highest seed cotton yield was obtained from the subject to which 1500 cc organic acid content product was applied. The findings obtained from this study were similar to the results obtained by [9-15].

Table 3. Average values for the investigated agronomic properties.

Treatment	SCY	FY	PH	NMB	NSB	NNFFB
1. Control	4235.80 b	1762.10 c	77.78	1.13	12.20	5.33 c
2. 500 cc	4400.60 b	1909.50 bc	79.90	1.61	11.18	5.69 bc
3. 1000 cc	4532.50 b	1934.10 b	79.30	1.38	11.21	5.93 abc
4. 1500 cc	5073.80 a	2167.80 a	74.73	1.76	10.45	6.25 ab
5. 2000 cc	3377.60 c	1441.90 d	76.06	1.68	10.86	6.45 a
6. 2500 cc	3228.20 c	1391.20 d	79.44	1.59	12.26	5.41 c
Mean	**4141.40**	**1767.70**	**77.86**	**1.52**	**11.36**	**5.84**
CV (%)	**5.26**	**5.73**	**8.06**	**28.28**	**10.53**	**8.03**
LSD (0.05)	**32.84****	**15.28****	**ns**	**ns**	**ns**	**0.70***

*, **; Significant at $p \leq 0.05$ and $p \leq 0.01$, respectively

SCY: Seed Cotton Yield (kg ha^{-1}), FY: Fiber Yield (kg ha^{-1}), PH: Plant height (cm), NMB: Number of monopodial branches (number plant^{-1}), NSB: Number of sympodial branches (number plant^{-1}), NNFFB: Number of a node of the first fruiting branch (number plant^{-1})

Fiber Yield (kg ha^{-1})

The fiber cotton yield varied between 1391.20 and 2167.80 kg ha^{-1}; it was determined that there were statistical differences at the 1% significance level between the applications and the general average of the experiment was 1767.70 kg ha^{-1}. While the lowest fiber yield was obtained from the 6th application (2500 cc) with 1391.20 kg ha^{-1}, the highest fiber yield was obtained from the 4th application (1500 cc) with 2167.80 kg ha^{-1}. This application was followed by 3, 2, and control applications, respectively. When the applications were evaluated, it was seen that the highest fiber yield was obtained from the subject where 1500 cc organic acid content product was applied. Ghourab [9], Ronde et al. [10], Gebaly et al. [11], Yang et al. [16], Hassan, and Hussein [15] have obtained results consistent with the data obtained from this study.

Plant Height (cm)

It is seen that the plant height values vary between 74.73 and 79.90 cm depending on the applications, but the differences between the applications are statistically insignificant. Gebaly et al. [11] obtained positive and important results in plant height in their study. The reason why there was no difference between the applications in this study may be due to the plant material used and the environment in which the research was conducted.

Number of Monopodial Branches (number plant^{-1})

It is seen that the average values of the number of monopodial branches depending on the applications vary between 1.13 and 1.76 number plant^{-1}, but the differences between the applications were statistically non-significant. While the minimum value was obtained from the control application with 1.13 number plants^{-1}, the maximum value was determined in the application of 1500 cc with 1.76 number plants^{-1}.

Number of Fruiting Branches (number plant^{-1})

The average values regarding the number of fruit branches varied between 10.45 and 12.26 number of plant^{-1}; it is seen that the general average of the experiment is 11.36 number plant^{-1}. In terms of the number of fruit branches, the 1500 cc application gave the lowest value (10.45 number plant^{-1}), while the highest value was obtained from 2500 cc (12.26 number plant^{-1}); however, it can be observed that the differences between the applications are statistically insignificant. Gebaly et al. [11] reported that the treatments were statistically significant. The results obtained do not coincide with the findings of the aforementioned researchers. This may be due to the plant material used, the environmental conditions, and the climate in which the experiment was conducted.

Number of Nodes of First Fruiting Branch (number plant^{-1})

It can be seen from Table 3 that the average values of the number of nodes of the first fruit branch vary between 5.33 and 6.45 (number plant^{-1}) depending on the applications; It is seen that there are statistical differences at the 5% significance level between the applications and the general average of the experiment is 5.84 (number plant^{-1}). It was observed that the lowest number of nodes of the first fruit branch was obtained from application no. 1 (control) with 5.33 (number plant^{-1}), while the highest number of nodes of the first fruit branch was obtained from the application no. 5 with 6.45 (number plant^{-1}). It was determined that this application was followed by applications 4, 3, and 2, respectively. When the applications were evaluated, it was determined that the maximum number of nodes of the first fruit branch was obtained from the subject to which the product containing 2000 cc organic acid content was applied. The number of nodes of the first fruit branch is an important criterion in earliness, the difference between the applications in terms of the aforementioned feature can be taken into account, especially in regions where autumn precipitation falls early.

Number of Bolls (number plant^{-1})

The average values of the number of bolls varied between 12.10 and 14.92 number plant^{-1}; it is seen that the general average of the experiment is 13.75 number plant^{-1} (Table 4). In terms of the number of bolls, the 2500 cc application had the lowest value (12.10 number plant^{-1}) and the 1500 cc application had the highest value (14.92 number plant^{-1}); however, it was seen that the differences between the applications were statistically insignificant. Gebaly et al. [11] reported that they obtained statistical differences in terms of this feature.

Boll Weight (g)

The average values of the boll weight varied between 7.50 and 8.56 g; it is seen that the general average of the experiment was 7.86 g. It can be observed that the applications of 2000 and 2500 cc had the lowest value (7.50 g) in the boll weight, while the application of 1500 cc showed the highest value (8.56 g). The results of Gebaly et al. [11] show parallelism with the results obtained.

Boll Seed Cotton Weight (g)

It was found that the seed cotton weight of the boll varied between 4.88 and 6.04 g; it is seen that the general average of the data is 5.26 g. It can be observed that the lowest value (4.88 g) was obtained in terms of boll seed cotton weight in the 2500 cc application, while the 1500 cc application showed the highest value (6.04 g). Boll seed cotton weight is statistically significant in the study, as the seed cotton yield, and fiber yield as well. Similar results were obtained by many previous researchers [9, 10, 11, 12, 13, 14, 15]. Therefore, using seed coating in cotton production may be emphasized. Another remarkable issue is that the highest value is obtained from the application of 1500 cc as in the seed cotton yield, which may mean that this dose can be used in further studies.

100 Seed Weight (g)

The average values of 100 seed weights changed between 8.69 and 9.20 g; it can be observed from Table 4 that the general mean of the trial was 9.03 g. In the 1500 cc application, the lowest value was obtained for 100 seed weight, while the highest values were obtained from 500 and 2500 cc applications (9.20 g); however, it can be observed that the differences between the applications are statistically insignificant.

Table 4. Average values for the investigated properties.

Treatment	BN	BW	BSCW	100 SW	FPP	GP
1. Control	13.58	7.73 bc	5.12 d	9.15	88.05 a	41.60
2. 500 cc	14.08	7.86 b	5.26 c	9.20	89.33 a	43.40
3. 1000 cc	14.34	8.00 b	5.40 b	9.14	91.03 a	42.70
4. 1500 cc	14.92	8.56 a	6.04 a	8.69	81.15 b	42.70
5. 2000 cc	13.53	7.50 c	4.89 e	8.80	91.35 a	42.70
6. 2500 cc	12.10	7.50 c	4.88 e	9.20	90.93 a	43.10
Mean	**13.75**	**7.86**	**5.26**	**9.03**	**88.64**	**42.70**
CV (%)	**10.98**	**2.81**	**0.44**	**5.79**	**2.64**	**0.95**
LSD $_{(0.05)}$	**ns**	**0.33****	**0.03****	**ns**	**3.53****	**ns**

"*, **; Significant at $p\leq 0.05$ and $p\leq 0.01$, respectively

BN: Boll number (number plant^{-1}), BW: Boll weight (g), BSCW: Boll seed cotton weight (g), 100 SW: 100 seed weight (g), FPP: First Picking Percentage (%), GP: Ginning percentage (%)

First Picking Percentage (%)

In the study, the highest value in terms of first picking percentage, which is an important earliness criterion, was obtained from the 2000 cc application. Similar results were also found in the node number of the first fruit branch. When the study is evaluated from this aspect, the fact that the highest value in terms of both the first picking percentage and the node number of the first fruit branch was obtained from the 2000 cc application gives the impression that this application should be considered in terms of improving earliness criteria. Hassan and Hussein [15] reported that the date of the first bloom was statistically significant in their study. The result of this study is in harmony with previous studies in this respect.

Ginning Percentage (%)

Means values of ginning outturn ranged from 41.60% to 43.40%; the control application had the lowest value (41.60%) in terms of gin efficiency, while the 500 cc application had the highest value (43.40%); however, the differences between applications are statistically non-significant (Table 4). Gebaly et al. [11] reported that they obtained important results in terms of this feature. The results obtained do not coincide with the findings of Gebaly et al. [11]. This may be due to the plant material used, the environmental conditions, and the climate in which the experiment was conducted.

Fiber Fineness (micronaire)

It is seen that the fiber fineness values vary between 4.56 and 4.94 micronaires depending on the applications, and the differences between the applications are statistically insignificant. It is seen that the lowest value was obtained from the 2000 cc application with a value of 4.56 micronaires, while the highest value was obtained from the 500 cc application with a value of 4.94 micronaires.

Fiber Length (mm)

Average values of fiber length varied between 27.38 and 28.13 mm; the general average of the trial was 27.70 mm, the 500 cc application had the lowest value (27.38 mm) of the fiber length, and the control application showed the highest value (28.13 mm); however, it can be observed that the differences between the applications are statistically not significant.

Table 5. Average values for the investigated fiber quality traits.

Treatment	FF	FL	FS	FE	FU	SFI	RD	+b	SCI
1. Control	4.69	28.13	32.45	6.07	84.12	7.62	78.30	8.52	143.00
2. 500 cc	4.94	27.64	31.20	6.10	83.32	8.00	77.97	8.55	131.75
3. 1000 cc	4.73	27.83	33.82	5.92	83.90	7.30	78.30	8.20	144.75
4. 1500 cc	4.69	27.38	32.45	5.92	83.70	7.32	78.20	8.60	139.25
5. 2000 cc	4.56	27.65	32.62	5.72	83.72	8.10	78.20	8.57	141.25
6. 2500 cc	4.64	27.58	33.47	5.85	84.10	7.12	78.60	8.35	145.25
Mean	**4.70**	**27.70**	**32.66**	**5.93**	**83.81**	**7.57**	**78.26**	**xx**	**140.87**
CV (%)	**5.45**	**2.51**	**6.73**	**3.93**	**1.18**	**17.92**	**1.96**	**4.94**	**5.58**
LSD $_{(0.05)}$	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**

"*, **; Significant at $p\leq 0.05$ and $p\leq 0.01$, respectively

FF: Fiber fineness (mic.), FL: Fiber length (mm), FS: Fiber strength (g tex^{-1}), FE: Fiber elongation (%), FU: Fiber üniformity (%), SFI: Short fiber index (%), RD: Fiber reflectance, +b: Fiber yellowness, SCI: "Spinning consistency index

Fiber Strength (g tex^{-1})

The average values of fiber strength varied between 31.20 and 33.82 g tex^{-1}; 500 cc application had the lowest value (31.20 g tex^{-1}) in terms of fiber strength, while the highest value was obtained from 1000 cc application (33.82 g tex^{-1}); It can be observed that the differences among the applications are statistically non-significant.

Fiber Elongation (%)

The average values of fiber elongation ranged from 5.72% to 6.10%; The application of 2000 cc had the lowest value (5.72%) in terms of fiber elongation, and the highest result was obtained from the application of 500 cc (6.10%); however, it can be observed that the differences between the applications are statistically insignificant.

Fiber Uniformity (%)

The mean values of the fiber uniformity index varied between 83.32% and 84.12%; The 500 cc application had the minimum value (83.32%) in terms of the uniformity index, while the control application showed the maximum value (84.12%); however, it can be observed that the differences between the applications are statistically insignificant.

Short Fiber Index (%)

The average values of the short fiber index varied between 7.12% and 8.10%; The 2500 cc application gave the lowest value (7.30%) in terms of short fiber ratio, and the highest value (8.10%) was obtained from the 2000 cc application; however, it can be observed that the differences between treatments are statistically insignificant.

Fiber Reflectance (Rd)

The average values of the fiber brightness (Rd) value varied between 77.97 and 78.60; the overall mean of the trial was 78.26; 500 cc application showed the lowest value (77.97 Rd) in fiber brightness value, while the 2500 cc application showed the maximum value (78.60); however, it can be observed that the differences between applications are statistically insignificant.

Fiber yellowness (+b)

The mean values of the fiber yellowness value varied between 8.20 and 8.60; the 1000 cc application had the lowest fiber yellowness value (8.20), while the 1500 cc application gave the highest value (8.60); however, it can be observed that the differences between treatments are statistically insignificant.

Spinning Consistency Index (SCI)

The average values of the spinning consistency index changed between 131.75 and 145.25; the general mean of the trial was 140.87, the 500 cc application gave the lowest value of the spinning consistency index (131.75), and the maximum value was obtained from the 2500 cc application (145.25); It can be observed that the differences between the applications are statistically insignificant. Fiber quality characteristics were not found to be statistically significant in the study. The results obtained are in parallel with those Gebaly et al., [11] who reported that the applications did not have a statistically significant effect on the fiber quality characteristics.

4. Conclusion

When the results obtained are evaluated; there are statistically significant differences between the applications in terms of seed cotton yield, fiber yield, boll weight, boll seed cotton weight, first picking percentage, and the number of nodes of the first fruiting branch. It was determined that the difference between the applications was not significant in terms of the plant height, number of monopodial branches, number of sympodial branches, number of the boll, 100 seed weight, and fiber quality parameters. It was determined that the coating of cotton seeds with organic acid mixtures did not affect the fiber quality properties. In the study, it was determined that the highest values in terms of seed cotton yield, fiber yield, boll weight, and boll seed cotton weight were obtained from a 1500 cc application, and it was concluded that this application was the most appropriate. In the study, the highest value in terms of seed cotton yield was obtained from a 1500 cc application (5073.80 kg ha^{-1}). Compared to the control application (4235.80 kg ha^{-1}), a yield increase of 19.78% (838.00 kg ha^{-1}) was achieved. In the light of the information obtained from this study, it was determined that as a result of coating the cotton seeds with the product containing organic acid mixtures (citric acid, glutamate, and proline) at different doses, 1500 cc application provided a remarkable yield increase in the seed cotton yield. For this reason, it is beneficial to carry out studies on the coating of cotton seeds with organic acid-mixed products to reduce the use of chemical fertilizers.

Conflicts of Interest: The authors declare no conflict of interest

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