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Cevher İlhan CEVHERİ, Ahmet YILMAZ[1]

RESEARCH ON INVESTIGATION CHARACTERISTICS OF SOME COTTON VARIETIES PRODUCED UNDER ORGANIC AND CONVENTIONAL CONDITIONS

SUMMARY

Cotton is the most important raw material for the textile industry in today's world. Cotton is an industrial crop for which the most chemical fertilizers and pesticides are used. The excess chemicals cause pollution of land and water resources, destruction of biodiversity, and therefore deterioration in human health. One of the most discussed topics in today's world is sustainable agriculture. The biggest obstacle for sustainable agriculture is the use of chemicals. The most important issue when it comes to sustainable agriculture is, undoubtedly, organic agriculture. Organic cotton farming does not use chemical inputs, which is most importance in terms of soil, plant and human health. This study was conducted that four organic and inorganic fertilizers application to two cotton varieties under Harran Plain organic farming and conventional conditions. The aim of this study was to determine that the differences between plant characteristics at cotton varieties produced under organic and conventional production systems, and would be useful in further work and help sustainable agriculture in the future.

Keywords: organic agriculture, conventional agriculture, sustainable agriculture, Biodiversity.

INTRODUCTION

Cotton plant is the most important raw material for the textile sector as well as being a strategical plant supporting oil industry with cottonseed product. In the process of cotton production, in order to increase production yield, some catalyzer products are used. These catalyzer products are chemical fertilizers, agricultural contention products which are used for irrigation and agricultural pest control. These products act a crucial part in growing the plant. However, these products have negative effects on the environment, soil and water sources. Chemicals used in agriculture effects on contamination of the soil. Today, one of the most concerned subjects is the protecting the health of soil, plant and human. These three subjects are considered as an inseperable whole.Today, there are various systems for production in agriculture. These are conventional agriculture, good farming practices, organic agriculture and biodynamic agriculture systems.

[1]Cevher İlhan Cevheri (corresponding author: icevheri@harran.edu.tr) Harran University, Akçakale vocational high school, Department of Organic Agriculture, Akçakale, Şanlıurfa, TURKEY; Ahmet Yilmaz Harran University, Agricultural Faculty, Department of Field Crops, Şanlıurfa, TURKEY.
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In the production process, every production systems have their own advantages, but the crucial point is being a system that is not harmful for the environment and protects soil and plant health.

Organic Agriculture is a production system that without chemical input, every stage between production and consumption is controlled and certificated. The aims of the organic agriculture are to provide continuance of sustainable agriculture and to protect the health of plants, animals and people by not contaminating the environment. The history of organical agriculture dates back to 20th century. In 20th century, subcjects as environmental awareness, ozone layer depletion and dangers for earth's future became current issues of world's agenda (Anonymous, 2016).

Various data came in view while analyzing the studies in which the effects of fertilizers on yield used in organic and conventional cotton production systems were analyzed. These studies were summed up as following;

Reddy and his friends (2007), in their studies in which they applied urea, fresh poultry manure and poultry manure compost as three seperate nitrogene supply in order to use poultry residual as N supply in 1994 and 1998 reported that there was a significant increase of cotton yield compared to control, they achieve and 1492 kg ha-1 average fibre yield by applying fresh poultry manure to cotton and 1391 kg ha-1 average fibre yield by urea application. Devraj and his friends (2008), in their study which they proceed in 2001 and 2003 in India searched for the effects of 5 and 10 tonnes of farm manure on cotton yield and nutrition usage and stated that plant height, boll weight and boll number per plant in particular were affected dramatically by organic and inorganic supplies. Ali and his friends (2009), in their study consisted of cotton parcels with farm manure, chicken manure, chemical fertilizer and contol stated that farm manure and chicken manure applications increased the palnt height, fruiting branch number and fibre yield. Akyol (2013), in his study on searching for appropriate dosages of liquid animal manure in cotton production reported that liquid animal manure could be used as top fertilizer in cotton production and as a result it could positive effects on yield in particular, plant height, fruiting branch number and boll number. Lopez and his friends (2014), in Mexico, in their organic cotton production study in which they applied 0-40-80-120 tonnes ha-1 cattle manure and 120-60-0 Kg ha-1 stated that the highest seed cotton yield was obtained from 8 ton ha-1 cattle manure dosage. The aims of our study were to analyze and compare the yield components of two cotton types produced in organic and conventional conditions and to recommend the best method to the producers.

MATERIAL AND METHODS

This study was planned and carried out as four replications and with split plot randomized blocks experiement design at the Harran University Akçakale Vocational High School, organic agriculture conditions in 2014 and 2015. The main plots were formed by ST-468 and BA-119 commercial cotton varieties which are computable with the ecology of the region. The sub-parcels were applied NPK(Chemical fertilizer), Cattle fertilizer, Pigeon fertilizer, microbial

fertilizer (*Bacillus subtilis* and *Paenibacillus azotofixans*) and control (no fertilizer) parcels. In the study, the lenght of the parcels was 12 meters, the width of the parcels was 2.8 meters and there was 3 meters gap among the parcels for fertilizer isolation. Planting was done on 5th May 2014 and 28th April on 2015.

In the experiment ST-468 and BA-119 cotton varieties were used. ST-468 is a semi-early Variety. It has a great adaptation capability and it has perfect yield results. It has hairy leaves. It is convenient for mechanical harvesting. BA-119 has earliness and it has medium height. It is adapted to the region and convenient for the mechanical harvesting. The soil of the experiement area was clayish and loamy with 1.36 % of salt, 26.9 % of lime ($CaCo_3$), 1.11% organic material and 7.82 PH of soil reaction. The studies had been carried out as fixed trial format for two years. The soil was plowed 25 centimeters depth after November and the second plow was done by cultivator in March. When the soil was ready, gobble disk array was constructed and soon after Cattle fertilizer and pigeon fertilizer were mixed with the soil. Cattle fertilizer was applied as 2000 kg ha-1, pigeon fertilizer was applied as 1000 kg ha-1, NPK fertilizer was applied as 200 kg ha-1, Cattle fertilizer+microbial fertilizer was applied 1 lt (mf) 100 lt ha water 0.1ha-1, pigeon fertilizer+microbial fertilizer was applied 1 lt (mf) 100 lt ha water 0.1ha-1 and NPK fertilizer was applied as 200 kg ha-1. Organic fertilizers and NPK fertilizer applications were applied in different parcels and different places with isolation distance at the same climate conditions. Hoeing was done six times against weed by manual and mechanic hoe. Drip irrigation was used in the trial and it was done seven times in total. The mixture of soft soap (3 kg per 100 lt water-1) and spirit (600 g 100 lt water-1) was applied against aphid, thrips, white fly and red spider mite. In addition to this application, Neemazal that is produced from Neem tree was applied with the dosage of 300 cc 100 lt water-1 at the chilly times of the day by covering all the plant's surface according to density of pests three times in total (Cevheri and Yılmaz, 2016). One meter was taken out from both sides of the parcels with different organic and NPK fertilizers and two row in the middle were harvested two times manually in the third week of September and in the middle of October. It is seen that between April and October, known as cotton planting season, the average temperature values of July, September and October in 2015 (0.7, 2.3 and 1.8 °C) were relatively higher than 2014 values according to comparison of temperature values of 2014, 2015 and average temperature values. Variance analysis of the data of the yield and the yield components that were acquired from the experiment were processed according to JUMP statistical programme and significant level of them were classified acoording to LSD test.

RESULTS AND DISCUSSION

Plant Height (cm)

According to average data of two years, it is seen in Table 1 that plant height of varieties varies between 85.23 (ST-468) and 87.13 cm (BA-119) , BA-119 variety has a higher value as 87.13 cm; as a result of fertilizer applications average plant height varies between 82.73 (Control) and 93.16 cm (NPK Fertilizer), the highest plant height was obtained from NPK fertilizer application;

according to typex fertilizer interactions the lowest plant height was obtained from BA-119x Control (81.63 cm) and the highest plant height was obtained from ST-468x Pigeon manure application (94.30 cm).

Table 1. Average values of features that are analyzed according to cotton and fertilizer variety used in the experiement and interactions of the variety-fertilizer

R.F.	Fertilizer Applications	Varieties			R.F	Fertilizer Applications	Varieties		
		ST-468	BA-119	Average			ST-468	BA-119	Average
1	1.Cattle fertilizer	84.58	86.87	85.73B	3	1.Cattle fertilizer	4241.10	4615.80	4428.40B
	2.Pigeon Fertilizer	82.95	89.52	86.23B		2.Pigeon Fertilizer	3930.00	4156.20	4045.40B
	3.NPK Fertilizer	94.30	92.02	93.16A		3.NPK Fertilizer	5350.00	5082.50	5216.20A
	4.Cattle Fertilizer+ Microbial Fertilizer	80.35	85.75	83.05B		4.Cattle Fertilizer+ Microbial Fertilizer	3990.40	4159.00	4074.70B
	5. Pigeon Fertilizer+ Microbial Fertilizer	85.36	87.02	86.19B		5. Pigeon Fertilizer+ Microbial Fertilizer	4098.20	4800.80	4449.50B
	6. control	83.83	81.63	82.73B		6. control	3158.40	2504.50	2830.00C
	Average	85.23B	87.13A	86.18		Average	4128.80	4219.80	4174.30
	%CV:10.88 LSD(Variety): 1.40* LSD(Fertilizer): 6.60* LSD(Variety*Fertilizer): n.s.					%CV:19.34 LSD(Variety): n.s. LSD(Fertilizer): 56** LSD(Variety*Fertilizer): n.s.			
2	1.Cattle fertilizer	11.58	12.21	11.89A	4	1.Cattle fertilizer	30.36	33.29	31.82A
	2.Pigeon Fertilizer	11.31	12.72	12.02A		2.Pigeon Fertilizer	25.57	31.66	28.62BC
	3.NPK Fertilizer	11.44	11.65	11.55A		3.NPK Fertilizer	29.54	32.38	30.96AB
	4.Cattle Fertilizer+ Microbial Fertilizer	9.61	11.21	10.41B		4.Cattle Fertilizer+ Microbial Fertilizer	25.98	29.50	27.74C
	5. Pigeon Fertilizer+ Microbial Fertilizer	10.81	12.20	11.50A		5. Pigeon Fertilizer+ Microbial Fertilizer	27.08	26.58	26.83C
	6. control	10.41	11.79	11.10AB		6. control	19.05	19.91	19.48D
	Average	10.86A	11.96B	11.41		Average	26.26B	28.88A	27.57
	%CV:12.97 LSD(Variety): 0.58** LSD(Fertilizer): 1.04* LSD(Variety*Fertilizer): n.s.					%CV:14.71 LSD(Variety): 1.08** LSD(Fertilizer): 2.85** LSD(Variety*Fertilizer): n.s.			

R.F.: Researched Features. there is not any important difference in the level (*): 0.05; (**): 0.01. 1. Plant Height (cm), 2.Sympodial Branch number per plant (number plant^{-1}), 3.Seed cotton yield (kg ha^{-1}), 4.Boll Number Per Plant (number plant^{-1}).

It is determined that there is a difference (0.05) between the types as statistical significance value, and it is found that fertilizer applications have significance effects (0.05) on plant height. There were differrent effects among NPK, organic (Cattle and pigeon manure) fertilizer applications and control parcels (no fertilizer application) on plant height. According to our researches, from the point of variety and fertilizer interreactions there could'nt be found any significant statistical differences among the applications (Table 1).

Our findings are coherent with the finding of Khaliq and his friends (2006), Reddy and his friends (2007), Gunjal and his friends (2009), Kıvılcım and his friends (2010) who stated that when solemly applied organic materials and effectiand microorganisms did not increase the cotton yield and the yield components, but organic materials, effect and microorganisms, mineral NPK and different combinations of these increased the yield and the yield components. Our findings are coherent with the findings of Bondada and his friends (1996), Phipps and his friends (1997), Karademir and his friends (2006), Satyanarayana and Janavade (2006), Devraj and his friends (2008), Ali and his friends (2009), Yolcu (2009), Shah and his friends (2012), Akyol (2013) who stated that appropriate nitrogen dosages increase the plant height. Plant height is a desirable situation in a certain scale. However, under growing of plant height retards the plant physiologically from passing generatiand period from andgetatiand period, so it is an undesirable situation. According to our findings analyzed plant height is in normal values.

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

According to average data of two years from Table 1, it is determined that fruiting branch number of the types varies between 10.86 (ST-468) and 11,96 (BA-119) ; BA-119 has a higher value with 11,96 number plant^{-1}; as a result of fertilizer applications average fruiting branch number varies between 10,41 number plant^{-1} (Cattle fertilizer + microbial fertilizer) and 12.02 number plant^{-1} (pigeon fertilizer), the highest fruiting branch number was obtained from Pigeon Fertilizer application, according to variety and fertilizer interreaction values, there wasn't any difference between the applications as statistical significance and they were in the same group (Table 1). Our findings are coherent with the findings of Ali and his friends (2009) and Akyol(2013).

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

According to average values from Table 1, It can be said as foolowing; average seed cotton yield of the types varies between 4128.80 kg ha^{-1} (ST-468) and 4219.80 kg ha^{-1} (BA-119); BA-119 types has a higher value 4219.80 kg ha^{-1}; as a result of fertilizer applications average seed cotton yield varies between 2830.00 (Control) and 5216.20 kg ha^{-1} (NPK Fertilizer); the highest seed cotton yield was obtained from NPK fertilizer application; according to varieties fertilizer interreactions values the lowest seed cotton yield value (2504.50 kg ha^{-1}) BA-119 x Control application, the highest seed cotton yield value was obtained from ST-468 x NPK fertilizer (5350 kg ha^{-1}). Any diffecence occured as statistical significance value neither between the types according to seed cotton

yield nor for the varieties fertilizer applications interreactions (Table 1). Fertilizer applications affected the seed cotton yield and the highest value was obtained from chemical fertilizer application (NPK). Pigeon fertilizer+microbial fertilizer and Cattle fertilizer come after NPK fertilizer respectively according to yield values. Our findings are partially or totally coherent with Kumari and his friends (2006) who stated NPK and organic fertilizers application were important effects on cotton yield components, Kısakürek and his friends (2007), who stated conventional production conditions has a higher product increasement compared to organic production, Aydemir (1982) who stated nitrogen increases boll and seed size and fibre yield, Gençer and Oğlakçı(1983) who stated nitrogen increased the seed cotton yield, Bondada and his friends (1996) who stated appropriate nitrogen dosages increase the seed cotton yield of the plant, Phipps and his friends (1997) who stated nitrogen fertilizing increases fibre yield, Anlağan(2001) who stated nitrogen is effectively on plant yield components, Shah and his friends (2012) who stated the highest yield was obtained from the trial by using 50% NPK fertilizer and 50% organic farm fertilizer. In addition our findings are coherent with Reddy and his friends (2007), Ali and his friends (2009) and Lopez and his friends (2014).

Boll Number Per Plant (number plant^{-1})

According to average values of two years from Table 1 it is said that; boll number per plant of the varies between 22.26 (ST-468) and 28.88 number plant^{-1} (BA-119), BA-119 type has a higher value as 28.88 boll number; as a result of fertilizer applications, average boll number per plant varies between 19.48 (Control) and 31.82 a number plant^{-1} (Cattle Fertilizer),The highest number was obtained from Cattle Fertilizer; according to variety and fertilizer interractions values there wasn't a statistically significant difference among the applications and they were in the same group(Table 1). Our findings are totally or partially coherent with the findings of Khaliq and his friends (2006), Kumari and his friends. (2006), Attia and his friends (2008), Devraj and his friends (2008), Gunjal and his friends (2009), Shah and his friends (2012), Ahmed and his friends (2013), Akyol (2013) who stated that when lonely applied organic materials and effective microorganisms didn't increase the yield and the yield components. However application of different combinations of organic materials, effective microorganisms, and mineral NPK increased the yield and the yield components on cotton.

CONLUSIONS

According to our results; under usage of chemicals in conventional conditional result in contamination of the environment, extinction of natural resources and perishing consciousness of sustainable agriculture. As a result of our study, it is determined that the result of usage of NPK fertilizer provides 5216 kg ha^{-1} seed cotton yield, among the varieties the highest seed cotton yield was obtained from BA-119 with 4219.80 kg ha^{-1}.

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