EFFECT OF APPLICATION OF MICRONUTRIENTS ON THE LINT QUALITY PARAMETERS OF COTTON

Lubna Bashir Rajput[1], Arfan Ahmed Gilal[1], Ghulam Hussain Abro[1], M. I. Mastoi[2], Jam Ghulam Murtaza Sahito[3] And Imtiaz Ahmed Nizamani[4]

[1]Department of Entomology, Sindh Agriculture University Tandojam

[2]National IPM Programme, DPEP, NARC, Park Road Islamabad, Pakistan.

[3]Department Agricultural Economics, Faculty Agricultural Social Sciences, Sindh Agriculture University Tandojam, Sindh, Pakistan.

[4]Department of Plant Protection, Sindh Agriculture University Tandojam

Corresponding Author: Lubna Bashir Rajput

Email:lubnabashirrajput@yahoo.com, 0300-3085043

***ABSTRACT*:** *Laboratory studies were carried out to analyse the effects of application of micronutrient (M1) Agro-feed, (M2) Dawn and (M3) Power on lint quality characters of cotton. Cotton was harvested three times and lint of every picking was analysed separately. The tests determined under laboratory conditions were: seed index, micronaire, fibre maturity, staple length, fibre strength, and GOT % age and seed germination. Results showed that there was no significant effect of micronutrient on lint quality characters such as fibre maturity, staple length, seed index, GOT and seed germination, but micronaire and fibre strength were significantly affected. The highest value of micronaire was recorded in T1 in which fruiting bodies and leaves were not removed and micronutrients were not applied but fibre strength was the least in T1. However, the time of harvesting significantly (P<0.001) affected almost all parameters of lint quality mentioned above as the highest values were obtained for the first picking followed by second and third pickings. The highest values of lint quality characters were recorded on first harvest of crop.*

Keywords: Micronutrients, cotton, lint quality, mirconaire

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crops worldwide because of the good fiber quality, high yield, and high adaptability. It provides raw material not only to our ginning factories and rapidly expanding textile industries, but also to oil mills which provide edible oil. The role of cotton in the economic development is significant in both agriculture and industrial sectors [1]. There is a dire need for the enhancement of production and yield per hectare in order to satisfy the requirements of rampant increasing population in Pakistan. Among other measures or steps to be taken, to boost up the yield and production of cotton the application of micronutrients would ensure increased production and yield of cotton to a great extent. Many studies reported that foliar application of micronutrients increased the number of fruiting branches, internodes and bolls/plant [2, 3, 4]. However, no effect was observed on seed cotton yield and boll weight Seed index, lint percentage, earliness of harvest, lint fineness and strength, seed oil and protein content were not affected by the treatments. Rehab *et al*. [5] reported that Folifertil comprised 22% N, 21% P, 17% and small amounts of Mg, Mo, Mn, B, Fe, Cu, S, Zn, seed cotton yield was increased by all N fertilizers. There was no significant effect of N source or application method, but Folifertil always gave slightly higher yields than urea. Another research on to determine the effects of N, P, K, Zn, S, Ca, Mg, and B fertilizers on cotton lint yield and fibre suggested that first square significantly increased cotton lint yield (by up to 34%) and fibre strength (by 4%) first square and hence, gave the highest cotton yields [6]. Knowles *et al*. [7] reported that applications of phosphorus, zinc, iron, sulphur, calcium, magnesium or boron did not increased cotton lint yield and fibre strength compared with unfertilized plots. However, foliar applied potassium significantly increased cotton lint yield. Research also suggested the higher growth and lint quality parameters of cotton when supplied with micro- and macro nutrients along with bio-regulators and amino acids [4].

No systemic research work is reported in literature on the effects of micronutrients on lint quality characteristics of cotton in Sindh, Pakistan. Therefore, in order to determine the effects of micronutrients on lint quality characteristics of cotton the present study was carried out at Cotton Section, Agriculture Research Institute, Tandojam. Such studies will be helpful in enhancing the lint quality characteristics of cotton crop.

MATERIALS AND METHODS

The field experiment on effect of use of micronutrients on cotton plant damage compensation and cotton lint quality characteristics was conducted in the field of Cotton Section, Agricultural Research Institute (ARI), Tandojam. Cotton variety (CRIS -134) was sown. Three micronutrients tested were: Agro feed (M1), Dawn (M2) and Power (M3). Micronutrients were applied after 80, 95 and 101 days of sowing of the crop. Cotton plant damage was simulated by artificially removing cotton leaves and fruiting bodies.

Method of artificial leaf removal

Before application of micronutrients cotton plant and fruiting bodies (i.e. flower buds, flowers and bolls) were removed artificially to simulate pest damage. Total leaves and fruiting bodies of 10 plants were counted at random and average number of leaves and fruiting bodies were calculated on the basis of that average, the leaves and fruiting bodies of whole treatments plot were removed. Two control treatments were maintained, one natural control in which no leaves and fruiting bodies were removed and no application of micronutrients was made and another control in which leaves and fruiting bodies were not removed but application of micronutrients were carried out. Different treatments were arranged as:

T1 = Natural control.

T2 =10 percent leaves + fruiting bodies removed.

T3 = 20 percent leaves + fruiting bodies removed.
T4 = 30 percent leaves + fruiting bodies removed.
T5 = 40 percent leaves + fruiting bodies removed.
T6 = 50 percent leaves + fruiting bodies removed.
T7 = treated control, in which plant growth regulators were applied.

Collection of Samples

Micronutrients experiment lint samples for different treatments were collected separately. Samples were properly labelled and stored before carrying out lint quality tests. Cotton was harvested (picked) two times and lint of every picking was analysed separately. Before analysis samples were cleaned and trash was separated out. The present study on lint quality characteristics were conducted under laboratory conditions at Fibre Technology Laboratory, ARI, Tandojam. After weighing the samples, ginning was carried out for the separation of the lint and seeds from seed cotton on ginning machine, at Cotton Section, ARI, Tandojam. After ginning, weight of both seeds and lint of each sample was recorded separately. The tests conducted under laboratory conditions were: Seed Index, Micronaire, Fibre maturity, Staple Length, Fibre Strength, Ginning Out Turn and Seed Germination.

RESULT

1. Seed index

There was no significant effect of damage simulation (removal of fruiting bodies and leaves), and application of micronutrients on seed index of cotton. However, time of harvesting (picking) significantly ($F=301.7$; $DF=2, 52$; $P<0.0001$) affected the seed index. The highest seed index was recorded of the first harvesting followed by second and third harvesting.

2. Micronaire

Significantly ($F=3.47$; $DF=5, 52$; $P<0.006$) higher micronaire value of cotton was recorded for T1 in which fruiting bodies and leaves were not removed and micronutrients were not applied. Similarly, time of harvesting also significantly ($F=6.42$; $DF=2, 52$; $P<0.0032$) affected the micronaire of cotton fibre. The highest micronaire value was obtained of cotton lint of third harvesting followed by second and first harvesting.

3. Fibre maturity

No significant effect of either damage simulation or application of micronutrients was recorded on fibre maturity of cotton in the present study. However, time of harvesting significantly ($F=3.94$; $DF=2, 52$; $P=0.025$) affected the maturity. The highest maturity was recorded for the third picking followed by first and second.

4. Staple length

The staple length of cotton fibre in present study varied from 29.72 to 33.35 mm in different treatments. There was no significant effect of damage simulation and application of micronutrients on staple length. However, the time of application significantly ($F=72.85$; $DF=2.52$; $P<0.0001$) affected staple length. The highest staple length was recorded from first harvesting (33.35 mm) followed by second and third picking with staple length of 33.29 and 31.15 mm, respectively.

5. Fibre strength

Significantly ($F=5.89$; $DF=2, 52$; $P<0.001$) the least (77.58) fibre strength was recorded of cotton lint of control plot compared with micronutrients applied treatments. The time of harvesting also significantly affected the fibre strength. The highest fibre strength of cotton fibre was recorded from second picking followed by first and third

6. GOT

The GOT of cotton of the present study is indicated that damage simulation and application of micronutrients had no significant effect; whereas, the time of harvesting significantly ($F=166.43$; $DF=2, 52$ $P<0.001$) affected the GOT. The highest GOT (39.95) was obtained from third harvesting followed second and first with 37.91 and 35.91 percent GOT, respectively.

7. Seed germination

There was no significant effect of different treatments on seed germination. However, time of harvesting significantly ($F=416.34$; $DF=2.52$; $P<0.001$) affected the seed germination. The highest seed germination was recorded from seeds of first harvesting (84.89%) followed by second and third 74.77 and 56.1% germination, respectively.

DISCUSSION

In the present study, use of micronutrients had no significant effect on seed index, fibre maturity, staple length, GOT and seed germination. However, fibre strength and micronaire was significantly affected by the application of micronutrients in present study. The time of harvesting significantly affected all the lint quality characters under present study. Ismail and Abdel [2] also reported that foliar application of mixture of Fe, Zn and Mn did not affect the seed index, lint percentage, lint fineness and strength. Studies on foliar application of Cu and Mn on lint percentage and fibre properties also found no significant effect [8]. However, some other research reported positive effect of trace element fertilizers via foliar applications on staple length of lint [9]. Significant effect of application of amino acids, bioregulators and growth retardant “proheadione-Ca” in combination of various micro- and macro nutrients has been reported on the various growth and lint quality parameters of cotton [4]. Positive effects on cotton yield and its lint quality with the application of different concentrations of micro and macro nutrients has also been reported by Wright et al. [10] and Abro et al. [11].

Table: - 1 Effect of artificial damage simulation, micronutrients and time of picking on seed index, micronaire value, fibre maturity, staple length, ginning out turn and seed germination of cotton

	Micronutrients	Treatments	Seed Index (%)	Micronaire Value (µg/inch)	Fibre Maturity (%)	Staple Length (mm)	Fibre Strength (0001bs/sq inch)	Ginning Out Turn (%)	Seed Germination (%)
PICKING 1	Agro feed (M1)	T1	8.18	4.6	87.7	31.87	80.33	31.94	84.0
		T2	8.22	4.3	87.1	32.86	80.77	33.45	84.0
		T3	8.23	4.4	87.5	31.94	83.72	33.68	81.7
		T4	8.04	4.5	87.0	30.84	79.74	32.12	86.3
		T5	7.92	4.3	87.1	32.02	82.37	32.79	87.0
		T6	8.63	4.5	88.0	31.94	79.33	33.27	86.3
		T7	7.78	4.5	87.8	31.80	84.67	35.91	84.3
	Dawn (M2)	T1	8.52	4.8	87.5	31.22	77.84	32.33	86.0
		T2	8.43	4.4	87.8	31.95	80.46	32.96	88.7
		T3	8.06	4.4	87.8	32.07	85.52	33.66	80.0
		T4	7.39	4.5	87.5	31.72	80.82	33.40	90.0
		T5	7.91	4.4	88.1	30.98	79.74	32.08	78.3
		T6	7.98	4.6	87.2	31.40	80.76	32.96	78.7
		T7	8.68	4.7	87.3	31.84	83.56	33.53	87.0
	Power (M3)	T1	8.30	4.6	88.0	31.61	80.60	33.35	88.7
		T2	7.97	4.5	87.2	33.35	82.33	34.00	88.6
		T3	8.17	4.4	87.1	32.63	85.40	30.09	89.7
		T4	8.09	4.3	86.5	31.9	84.76	33.29	82.0
		T5	7.44	4.4	87.3	32.32	84.64	32.85	89.7
		T6	7.35	4.6	87.4	32.00	80.05	33.88	79.0
		T7	8.25	4.6	87.4	32.05	78.64	32.02	82.7
PICKING 2	Agro feed (M1)	T1	7.87	4.7	87.9	31.62	78.26	34.05	74.7
		T2	7.10	4.2	85.4	32.56	80.38	33.50	74.0
		T3	7.84	4.6	88.5	32.20	81.59	31.24	71.7
		T4	7.95	4.6	87.2	32.42	79.60	33.47	76.3
		T5	6.98	4.5	87.6	32.01	84.25	33.56	76.3
		T6	7.33	4.4	86.9	31.73	85.14	33.92	75.7
		T7	7.58	4.5	86.9	32.62	81.67	34.91	72.3
	Dawn (M2)	T1	7.38	4.6	87.5	31.91	79.72	33.44	74.0
		T2	7.16	4.3	85.6	31.69	80.51	33.91	76.0
		T3	7.28	4.4	87.5	31.91	81.59	37.49	70.7
		T4	7.59	4.5	87.5	32.72	80.39	34.03	72.3
		T5	7.80	4.6	87.4	33.29	84.12	33.45	70.0
		T6	7.44	4.8	87.5	32.98	82.87	33.58	74.0
		T7	8.07	4.8	88.8	31.68	81.80	34.37	76.7
	Power (M3)	T1	7.49	4.5	87.4	32.54	77.58	33.78	78.7
		T2	7.53	4.4	86.6	32.58	79.99	34.43	77.0
		T3	7.48	4.5	87.4	32.31	92.09	34.89	75.7
		T4	7.37	4.5	86.9	31.93	81.14	34.66	78.7
		T5	6.95	4.5	87.3	32.15	81.14	37.36	85.0
		T6	7.50	4.3	86.4	32.48	82.30	34.50	72.0
		T7	8.20	4.8	88.9	32.12	81.15	32.98	73.3
	Agro feed (M1)	T1	7.87	4.7	87.9	31.62	78.26	34.05	74.7
		T2	7.10	4.2	85.4	32.56	80.38	33.50	74.0
		T3	7.84	4.6	88.5	32.20	81.59	31.24	71.7
		T4	7.95	4.6	87.2	32.42	79.60	33.47	76.3
		T5	6.98	4.5	87.6	32.01	84.25	33.56	76.3
		T6	7.33	4.4	86.9	31.73	85.14	33.92	75.7
		T7	7.58	4.5	86.9	32.62	81.67	34.91	72.3
PICKING 3	Agro feed (M1)	T1	6.10	4.5	87.6	30.45	79.87	37.66	64.0
		T2	5.55	4.5	89.2	29.83	79.30	38.07	60.3
		T3	5.96	4.7	88.6	30.19	81.29	39.52	54.7
		T4	5.96	4.6	87.5	30.61	79.24	39.42	58.7
		T5	5.98	4.8	88.7	30.95	79.13	39.26	53.3
		T6	8.89	4.5	88.4	30.47	80.14	38.17	58.3
		T7	5.62	4.6	87.9	30.84	79.30	38.47	57.3
	Dawn (M2)	T1	6.04	4.6	88.5	30.46	78.89	37.70	56.0
		T2	5.93	4.5	87.6	30.05	80.21	39.08	54.0
		T3	5.84	4.5	85.6	30.89	83.18	38.75	53.3
		T4	8.97	4.7	88.4	31.07	80.66	39.31	57.7
		T5	6.13	4.6	87.9	31.03	81.58	38.52	57.3
		T6	5.61	4.6	87.0	30.27	79.62	37.33	54.7
		T7	6.08	4.5	87.9	30.27	79.35	39.00	54.0
	Power (M3)	T1	6.33	4.6	87.7	29.97	79.72	38.08	64.0
		T2	5.69	4.6	86.6	30.23	80.45	39.52	58.0
		T3	5.82	4.6	87.4	29.72	82.96	39.27	53.7
		T4	5.92	4.7	87.8	30.73	79.61	35.83	51.3
		T5	5.90	4.8	88.7	31.06	80.49	40.07	48.3
		T6	5.88	4.7	87.3	30.61	79.79	39.12	53.3
		T7	5.94	4.9	88.9	31.15	79.95	39.95	55.3

CONCLUSION

There was no significant effect of damage simulation (removal of fruiting bodies and leaves) and application of micronutrient on seed index, fibre maturity, and staple length GOT and seed germination but micronaire and fibre strength were significantly affected by the use of micronutrients. However, the time of harvesting (picking) significantly affected lint quality characters.

REFERENCES

[1] Anon. (2006). Economic Survey of Pakistan. Government of Pakistan, Finance Division, Economic Advisors' Wing, Islamabad.

[2] Ismail, M.S. and M.H. Al-Abdel. (1990). Response of Giza 80 Egyptian cotton variety to spraying with mixture of Fe, Zn and Mn. Assiut J. of Agric. Sci. 21 (1): 33-41.

[3] Gomaa, M.A. Response of cotton plant to phosphatic and zinc fertilization. Annals of Agricultural Sciences, Moshtohor. 29 (3): 1051-1061.

[4] Ibrahim, M.E., M.A. Bekheta, A. El-Moursi and N.A. Gaafar. (2009). Effect of arginine, prohexadione-Ca, some macro and micro-nutrients on grwoth, yield and fiber quality of cotton plants. World J. Agric. Sci. 5: 863-870.

[5] Rehab, F.T., M.A. Gomaa, M.G. Nasseem and G.A. Darwesh. (1991). Studies on the effect of foliar and soil applications of some commercial fertilizers on yield and some fiber properties of the cotton. I- The effect of foliar and soil application of urea and Folifertil fertilizers on growth, yield and yield component of the cotton plant. Annals Agric. Sci. Moshtohor. 29 (3): 1061-1071.

[6] Knowles, T.C., B.W. Hipp and W.C. Langston. (1993). Cotton responses to fertilizer and drip irrigation in the Texas Blackland. Proceedings, Beltwide Cotton Conferences, 10-14 January 1993, New Orleans, Louisiana, USA. 1993, 1360-1363.

[7] Knowles, T.C., B.W. Hipp and W.C. Langston. (1995). Nitrogen fertilizer timing and foliar potassium fertilization of Texas Blackland cotton. 1995 Proc. Beltwide Cotton Conf., San Antonio, TX, USA, Jan.4-7, 1995. Vol.2, 1324-1374.

[8] Sawan, Z.M., M.H. Mahmoud and O.A. Momtaz. (1997). Influence of nitrogen fertilization and foliar application of plant growth retardants and zinc on quantitative and qualitative properties of Egyptian cotton (*Gosypium hirsutum* L. var. Giza-75). J. Agric. Food Chem. 45 (8): 3331-3336.

[9] Lei, H.M., Y.L. Wang, Z.Q. Fan, Q.S.Lu, T.A. Shao. (1994). The mechanism in yield increase of cotton sprayed with special trace fertilizers. China-Cottons. 21 (6): 13.

[10] Wright, S.D., D. Munk, DJ Minier, R. Vargas, BL, Weir, B. Roberts and M Jr. (1995). Effect of aminofol, Biol-set plus Ca and Zn on California, Cotton Proc. Beltwide Cotton Conf., 2: 1374-1376.

[11] Abro, H. G., TS Syed, MA, Anar and MS Zhang. (2004). Effect of application of plant growth regulators and micronutrients on insect pest infestation and yield component of cotton. J. Entomol. 1(1):12-16.