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COMPARATIVE STUDY ON YIELD PERFORMANCE OF UPLAND COTTON (*Gossypium hirsutum L*) IN BANGLADESH

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ABSTRACT

An experiment was carried out with five advanced lines (BC-051, BC-0165, BC-0406, JA/2000/526 and BC-0342) and two commercial check varieties (CB-9 and CB-10) to observe the yield potentiality and response to different environment and to select the best line. This experiment was laid out at four locations (Rangpur, Dinajpur, Gazipur and Jessore) during the year 2009-10. Randomized complete block design was used as experimental design with 4 (four) replications. The unit plot size was 10m × 3.6 m (4 rows). The plant spacing was 0.90m between the lines and 0.45m between the plants. Among the treatments significant difference was found in number of vegetative branches per plant, secondary fruiting branches per plant, days to first flowering and other traits showed statistically similar results. The highest amount of seed cotton and lint was produced by JA/2000/526 which was (2109kg ha^{-1}) and 711kg/ha, respectively.

Key words: *Cotton lines, cotton varieties, lint, seed cotton and yield potential.*

INTRODUCTION

Bangladesh has glorious historical reference of growing super fine quality of cotton. Cotton is called silver cash crop of Bangladesh. As a major and leading natural fiber crop in the world, cotton has a potentially broad genetic base reflected in the collection of *Gossypium* species and selection of the best one. World cotton demand is lagging a bit behind production. After a surge in the mid 1990's world cotton consumption has been rather flat. But long term potential for cotton demand remains large (Lange, 2008). The fundamental way to realize the target of high yield and good quality was to adjust the time of flowering and boll position to coincide with local climatic and ecological conditions. High yield and fibre quality are obtained by the optimum combination of boll weight and boll number (Tan, 1993). In cotton, shorter plant height, lowest number of days to flower and boll split, are desirable (Alam *et al*., 1996). Boll number and boll weight interacted to affect lint yield, indicating that balanced selection for boll weight and boll number is needed in high yielding line development (Wu *et al.,* 2004). Boll weight and seed cotton yield is positively correlated (Alfaqeih *et al.,* 2002). The Cotton Research Center Rangpur and the Regional Cotton Research, Training and Seed Multiplication Farm, Jagodishpur, Jessore selected some promising line under variety development program. These lines were already tested through genotypes evaluation and preliminary yield trial in the succeeding year. As a final step of that work BC-051, BC-165, BC-0406, JA/2000/5526, and BC-0342, needs to test with the existing cultivar for better selection and to observe multi-location adaptability.

MATERIALS AND METHODS

The Experiments was conducted at four Cotton Research Farms of Cotton Development Board located at Rangpur, Dinajpur, Gazipur and Jessore during the year 2009-10.Five advanced lines encoded BC-051, BC-0165, BC-0406 JA/2000/526, and BC-0342, were included in this experiment. CB-9 and CB-10 was taken as local control. The experiment covered the time from last week of July 2009 to last week of February 2010. The trial was set within 24 July to 7 August -2009 at different locations. Randomized complete block design with four replications was followed. The unit plot size was 10m × 3.6 m (4 rows). The plant spacing was 0.90m between the lines and 0.45m between the plants. Two or three water soaked and Asataf treated seeds were sown hill^{-1} during planting time, but after final thinning one seedlings hill^{-1} was allowed to grow. Green manuring (Sunhemp) and decomposed cow dung at the rate of 3000 kg ha^{-1} were applied before final land preparation. All chemical fertilizers except three fourth of urea and one third of MOP were applied in the sowing time. The rest amount of urea was applied in three equal installments as side dressing at the time of 3rd, 6th and 9th week after sowing date. At the last side dressing of N, 37.5 kg ha^{-1} K were also applied. At drought condition irrigation was given in all locations.

Data on vegetative branches plant^{-1}, main stem node number of first fruiting branch, primary fruiting branches plant^{-1}, secondary fruiting branches plant^{-1}, days to first flowering, days to first boll split, plant height at harvest, number of bolls plant^{-1}, single boll weight, yield plot^{-1} were recorded .

In all cases data were collected from 10 randomized selected plants of middle two rows of each plot to avoid boarder effect. Mean data was used for statistical analysis.

RESULTS AND DISCUSSION

Mean data of different yield attributes collected from Rangpur is shown in the Table 1. The treatments showed significantly different in days to first flowering, days to first boll split, plant height, number of bolls plant^{-1}, single boll weight and seed cotton yield (Table 1). No significant difference was found for number of vegetative branches plant^{-1}, and other traits. The highest yield was given by CB-10 (1477 kg ha^{-1}). At Sreepur farm only the seed cotton yield showed significant difference and other traits were statistically similar. The highest yield was given by JA/2000/526(2348 kg ha^{-1}) which was followed by BC-0406 (2207 kg ha^{-1}).BC-0342 showed the highest GOT% (36.55%). Data of Jagodishpur revealed that the treatment showed significant difference in number of vegetative branches plant^{-1}, number of primary fruiting braches plant^{-1}, number of secondary fruiting braches plant^{-1}, days to first flowering, number of bolls plant^{-1}, single boll weight and seed cotton yield (Table 1). Three tested treatments showed better performance over control in seed cotton yield.JA/2000/526 has given the highest yield (1914 kg ha^{-1}).

Mean data of Dinajpur presented in the Table 4 showed that the treatments were statistically similar result in number of vegetative braches plants^{-1}, number of primary fruiting branches plant^{-1}, secondary fruiting branches plant^{-1}, days to first boll split, and number of boll plant^{-1} except plant height. The tested three treatments showed higher yield potentiality over control. JA/2000/526 produced the highest seed cotton (2718 kg ha^{-1}). Mean data of four locations has been presented through Table 5. From the Table 5 it was seen that the treatments showed significant difference in vegetative branches plant^{-1}, secondary fruiting branches plant^{-1}, and days to 1st flowering. The main yield contributing traits such as sympodia plant^{-1}, number of bolls plant^{-1} and single boll weight showed insignificant result.

In the case of seed cotton yield, the highest amount of seed cotton was produced by JA/2000/526 (2109 kg ha^{-1}) which was followed by BC-0165, and BC-0406. The lowest yield was recorded in CB-9(1706kg ha^{-1}). The medium number sympodia (16.70), medium plant height (102.3cm), 2nd highest boll number (29.12) and the highest boll weight (5.22.gm) enhance the treatment JA/2000/526 to give the highest yield. The treatment JA/2000/526 gave the highest yield in all locations which was the indication of wide adaptability to the environments. At Dinajpur this treatment exceeds 2.5 t ha^{-1}. BC-0342 also showed the highest GOT % (39.05%) and that was followed by CB-10(35.27%). In the case of lint production JA/2000/526 was the best and it produced 22% more lint than CB-9. In the case of 50% span length JA/2000/526 was in second position and its Presley strength was high.

So it may be concluded that the treatment JA/2000/526 produced the highest amount of seed cotton. It also gave the highest amount of lint and produced good quality lint, so JA/2000/526 may be forward to candidate variety trial and the rest treatments need further investigation through advanced yield trials.

Table 1. Mean Performance of the Advanced Lines/ Varieties for Yield Contributing Characters at Rangpur

Variety/ advanced lines	No. of vegetative branch Plant^{-1}	No. of primary fruiting branch plant^{-1}	No. of 2ndary fruiting branch plant^{-1}	Node no. of first fruiting branch (N.F.B)	Days to 1st flowering	Days to 1st boll split	Plant height at harvest (cm)	No. of bolls plant^{-1}	Single boll wt. (g)	Yield (kg ha^{-1})	Yield as % of CB-9
BC-051	2.55	19.05	18.98	6.7	58.75	148.2	148.15	32.15	4.71	1268	122
BC-0165	2.25	18.78	14.65	6.43	60.25	147.5	145.75	27.60	5.21	1291	124
BC-0406	2.40	19.98	16.45	6.78	59.00	147.2	149.53	27.63	5.27	1120	107
JA/2000/526	2.40	17.28	14.65	6.45	57.25	145.0	133.10	32.15	5.69	1456	140
BC-0342	2.33	18.43	16.70	6.70	57.75	146.0	158.43	35.93	4.69	1237	119
CB-9	2.78	18.13	19.03	7.30	62.25	152.2	140.60	25.10	5.33	1042	100
CB-10	1.8	16.98	10.95	6.45	55.75	146.0	125.08	27.13	5.58	1477	142
LS	ns	ns	ns	ns	**	**	**	**	**	**	
%CV	14.92	7.12	24.62	5.04	5.87	1.27	6.39	11.11	7.02	0.37	

*Note: ** = Significant at 1% level and ns = Not-significant*

Table 2. Mean performance of the advanced lines/ varieties for yield contributing characters at Sreepur

Variety/ advanced lines	No. of vegetative branch Plant^{-1}	No. of primary fruiting branch Plant^{-1}	No. of 2ndary fruiting branch Plant^{-1}	Node no. of first fruiting branch (N.F.B)	Plant height at harvest (cm)	No. of bolls plant^{-1}	Single boll weight (g)	Yield (kg ha^{-1})	Yield as % of CB-9
BC-051	1.42	12.67	4.35	8.22	98.85	19.30	4.47	2025	98
BC-0165	1.45	12.47	5.10	8.32	93.05	19.10	4.45	2015	97
BC-0406	1.47	14.10	4.82	8.05	97.97	19.87	4.27	2207	106
JA/2000/526	1.32	13.00	4.77	7.77	87.55	20.41	4.72	2348	113
BC-0342	1.27	13.22	4.27	7.72	90.90	19.85	4.07	1897	91
CB-9	1.13	12.85	4.82	7.95	84.22	19.75	4.47	2075	100
CB-10	1.42	13.32	4.97	7.62	93.10	19.90	4.07	1955	94
Level of sig.	ns	ns	ns	ns	ns	ns	ns	*	
%CV	11.75	6.56	14.17	4.41	9.14	7.86	12.64	10.84	

*Note: ** = Significant at 1% level and ns = Not-significant*

Table 3. Mean performance of the advanced lines/ varieties for yield contributing characters at Jogodishpur

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Variety/ advanced lines	No. of vegetative branch Plant^{-1}	Node no. of first fruiting branch (N.F.B)	No. of primary fruiting branch plant^{-1}	No. of 2ndary fruiting branch Plant^{-1}	Days to 1st flowering	Days to 1st boll split	Plant height at harvest (cm)	No. of bolls plant^{-1}	Single boll wt. (g)	Yield (kg ha^{-1})	Yield as % of CB-9
BC-051	1.25	5.83	15.85	7.68	54.00	127.25	106.00	34.5	4.35	1686	96
BC-0165	1.65	6.28	18.60	9.78	54.00	128.75	125.25	34.5	4.03	1680	111
BC-0406	1.58	6.28	16.70	9.33	54.75	131.00	115.25	33.75	4.18	1487	99
JA/2000/526	1.53	6.30	17.38	8.48	52.75	130.50	107.50	35.00	4.28	1914	127
BC-0342	0.75	5.88	15.33	5.45	50.50	128.25	103.25	55.5	3.90	1893	125
CB-9	2.28	6.65	16.30	12.75	58.25	127.50	116.75	32.5	4.45	1509	100
CB-10	1.13	6.03	15.70	6.50	52.00	129.25	109.00	33.25	4.13	1624	108
Level of sig.	**	ns	**	**	**	ns	ns	**	**	**	
%CV	14.95	5.19	5.237	15.36	2.89	1.79	7.75	4.1	1.33	0.32	

*Note: ** = Significant at 1% level and ns = Not-significant*

Table 4. Mean performance of the advanced lines/ varieties for yield contributing characters at Sadarpur

Variety/ advanced lines	No. of vegetative branch Plant^{-1}	No. of primary fruiting branch plant^{-1}	No. of 2ndary fruiting branch Plant^{-1}	Node no. of first fruiting branch (N.F.B)	Days to 1st flowering	Days to 1st boll split	Plant height at harvest (cm)	No. of bolls plant^{-1}	Single boll wt. (g)	Yield (kg ha^{-1})	Yield as % of CB-9
BC-051	3.50	6.93	20.95	12.65	58.75	136.00	87.23	25.60	5.45	2145	98
BC-0165	3.00	6.68	18.75	14.05	61.25	138.75	98.90	26.90	5.45	2629	120
BC-0406	3.52	6.83	21.65	13.85	60.25	140.25	86.10	27.98	5.25	2332	106
A/2000/526	3.30	7.00	19.15	13.40	54.25	136.00	81.20	28.90	6.20	2718	124
BC-0342	3.30	6.88	19.53	13.05	61.50	141.00	99.52	25.78	6.03	1974	90
CB-9	3.37	7.48	25.08	12.97	62.00	145.50	86.28	24.03	5.53	2197	100
CB-10	2.59	6.80	16.00	13.30	54.00	133.50	74.43	25.83	6.38	2582	118
LS	ns	ns	ns	Ns	ns	ns	**	ns	ns	ns	
%CV	16.37	8.51	20.74	12.8	10.67	6.15	8.84	13.78	11.39	3.6	

*Note: ** = Significant at 1% level and ns = Not-significant*

Table 5. Mean performance for different agronomic traits of four locations

Variety/ advanced lines	No. of veg. branch Plant^{-1}	No. of primary fruiting branch plant^{-1}	No. of 2ndary fruiting branch Plant^{-1}	Node no. of first fruiting branch (N.F.B)	Days to 1st flowering	Days to 1st boll split	Plant ht. at harvest (cm)	No. of bolls plant^{-1}	Single boll wt. (g)	Yield (kg ha^{-1})	Yield as % of CB-9
BC-051	2.18	6.92	17.13	10.91	56.88	137.43	110.05	27.89	4.75	1731	101
BC-0165	2.09	6.93	17.15	10.89	58.13	138.56	125.73	26.92	4.79	1904	112
BC-0406	2.24	6.98	18.11	11.11	58.00	140.87	112.21	27.31	4.74	1787	105
JA/2000/526	2.14	6.87	16.70	10.32	54.13	135.75	102.34	29.12	5.22	2109	124
BC-0342	1.91	6.79	16.63	9.86	56.13	138.87	113.03	34.27	4.67	1750	103
CB-9	2.39	7.34	18.09	12.39	60.63	142.12	106.96	25.35	4.95	1706	100
CB-10	1.73	6.72	15.50	8.93	53.94	137.68	100.40	27.03	5.04	1910	112
LS	**	ns	ns	**	**	ns	ns	ns	ns	ns	
%CV	15.64	3.22	9.14	17.03	2.56	2.24	6.73	14.42	5.42	8.90	

*Note: ** = Significant at 1% level and ns = Not-significant*

Table 6. Combined mean of ginning and lint characteristics of the advanced lines at four locations

Variety/ advanced lines	Yield (kg ha^{-1})	G.O.T (%)	Yield of lint (kg ha^{-1})	Yield of lint as % of CB-9	Seed index (g)	Lint index (g)	Fuzz grade	50% Span length (inch)	2.5 % span length (inch)	Micronaire value	Presly strength (PSI)
BC-051	1731	33.04	572	98	10.00	4.43	8	0.39	1.05	4.4	84.02
BC-0165	1904	30.40	579	100	10.00	4.36	8	0.40	1.04	4.4	85.41
BC-0406	1787	32.92	588	101	9.50	4.88	7	0.38	1.07	4.0	85.09
JA/2000/526	2109	33.72	711	122	9.00	4.68	6	0.39	1.10	4.4	84.73
BC-0342	1750	39.05	683	118	9.40	4.25	8	0.37	1.07	4.0	82.02
CB-9	1706	34.07	581	100	10.00	4.81	7	0.47	1.07	4.1	81.82
CB-10	1910	35.27	674	116	9.00	5.00	7	0.31	1.07	3.9	83.62

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