Indian J. Agron. **38** (1) : 93–96 (March 1993)

Effect of sowing time, cycocel spray and nitrogen fertilization on production potential of upland cotton (*Gossypium hirsutum*)

ISHWAR SINGH AND G. S. CHOUHAN[1]

Agricultural Research Station, Rajasthan Agriculture University, Sumerpur 306 902

Received: December 1991

ABSTRACT

A field experiment was conducted during the rainy seasons of 1989 and 1990 on sandy-loam soil to study the effect of sowing date, cycocel spray and N on yield of upland cotton (*Gossypium hirsutum* L.). Sowing of upland cotton on 1 May significantly reduced the boll-shedding intensity by 26.4 and 42.1% and increased the seed-cotton yield by 1.41 and 3.42 q/ha and net returns by Rs 1,354 and 3,283 compared with that sown on 16 and 31 May respectively. Two foliar sprays of cycocel (at flower initiation and 20 days after) at 80 ppm concentration increased the bolls/plant (5.3%), boll weight (6.2%), N concentration of plant (13.8%), seed-cotton yield (0.82 q/ha) and net returns (Rs 587/ha), but reduced the boll-shedding intensity (32.9%) compared with no spray cycocel. N @ 105 kg/ha significantly decreased the boll-sheeding but increased the growth characters, N concentration of plant, seed-cotton yield and net returns with N @ 75 and 90 kg/ha.

During the last few years shedding of flowers and immature bolls in upland cotton (*Gossypium hirsutum* L.) became a severe problem, resulting in drastic reduction of seed-cotton yield at Sumerpur, Rajasthan. The probable reason seems to be physiological disorders of plant, as no causal organism or nutrient deficiency was traced out. Farmers of this area generally apply low N dose with early sowing (April), due to which flowering and boll initiation concides with higher temperature under delayed monsoon situation.

Foliar spray of cycocel delays sensescence, thus helps in increasing photosynthesis and mobilization of photosynthates to the reproductive sink (Dong and Artica, 1982). Nitrogen fertilization at higher rates also increases its concentration in plant and seed-cotton yield (Giri and Upadhyaya, 1980).

MATERIALS AND METHODS

The field experiment was conducted during the rainy seasons of 1989 and 1990 at Sumerpur, Rajasthan, in split-plot design with 4 replications. There were 18 treatment combinations comprising 3 dates of sowing (1, 16 and 31 May) and 2 cycocel treatments (no cycocel and 2 foliar sprays @ 80 ppm concentration at flower initiation and 20 days after) in main plots and 3 levels of N (75, 90 and 105 kg/ha) in subplots. The soil was sandy loam in texture with pH 7.8, having low organic carbon (0.25%) and available N and medium available P and K. A uniform dose of 35 kg P_2O_5 and 25 kg K_2O/ha was applied, and crop was irrigated

Present address: [1]Renewable Energy Centre, CTAE, Udaipur, Rajasthan 313 001

as per requirement. The net plot size was 15.0 m^2.

Total rainfall received during crop-growth period of upland cotton was 562 and 443 mm in 1989 and 1990 respectively. Total amount of P_2O_5 and K_2O and half dose of N (as per treatment) was drilled at sowing. The remaining half dose of N was top-dressed in 2 splits, at flower initiation and 50% flowering.

RESULTS AND DISCUSSION

Effect of sowing date

Sowing of cotton on 1 May gave the highest plant height, bolls/plant and boll weight during both the years (Table 1). Similarly, intensity of boll-shedding was the lowest, whereas seed-cotton yield was the highest at this sowing date (Table 2). Delay in sowing by every 15 days not only significantly increased the boll-shedding intensity but also decreased the seed-cotton yield. On an average, sowing of cotton on 16 and 31 May reduced the yield by 13.1 and 31.9% respectively compared with that sown on 1 May. Respective decrease in net returns was Rs 1,354 and 3,283/ha.

It seems that favourable environmental conditions coincided at flowering and soil-formation stages might be responsible for the lowest boll-shedding, which inturns gave the maximum yield when the crop was sown on 1 May. This can be supported by inverse correlation coefficient (---0.42) between these. Tomar *et al.* (1989) also reported that early sowing of cotton gave significantly higher seed-cotton yield, boll size and weight than late sowing.

Effect of cycocel spray

Cycocel spray reduced the plant height and increased the number of bolls/plant significantly in 1989. only. This treatment increased the boll weight significantly in 1990 (Table 1). Cycocel spray significantly reduced the boll-shedding intensity by 25.1

Table 1. Effect of sowing date, cycocel spray and nitrogen fertilization on growth and yield characters of upland cotton

Treatment	Plant height (cm)		Bolls/plant		Boll weight (g)	
	1989	1990	1989	1990	1989	1990
Sowing						
1 May	104.9	103.5	32.1	29.8	5.1	4.8
16 May	103.2	95.1	29.3	25.6	4.8	4.1
31 May	98.1	90.3	22.8	20.3	3.2	3.3
CD (P = 0.05)	4.9	4.7	4.6	5.6	1.3	1.1
Cycocel spray						
No cycocel	106.4	99.9	32.7	27.1	5.0	4.7
80 ppm	103.2	97.8	34.8	28.3	5.2	5.1
CD (P = 0.05)	2.4	NS	1.9	NS	NS	0.2
N (kg/ha)						
75	98.3	97.3	20.2	17.1	3.3	3.0
90	101.2	100.9	22.3	25.3	4.2	4.1
105	107.8	102.3	30.4	27.9	5.3	4.8
CD (P = 0.05)	6.4	3.5	4.5	4.9	1.3	1.1

Table 2. Effect of sowing date, cycocel spray and nitrogen fertilization on N concentration of plant, boll-shedding intensity and seed-cotton yield of upland cotton

Treatment	Plant N (%)*		Boll-shedding (%)		Seed-cotton yield (q/ha)			Net returns (mean of 2 season) (Rs/ha)
	1989	1990	1989	1990	1989	1990	Pooled	
Sowing.date								
1 May	2.20	2.17	9.3	11.3	12.18	9.23	10.72	7,291
16 May	2.16	2.13	13.2	14.9	11.59	7.07	9.31	5,937
31 May	2.14	2.10	16.8	18.9	9.12	5.50	7.30	4,008
CD (P = 0.05)	NS	NS	1.0	1.5	1.78	1.81	1.79	
Cycocel spray								
No cycocel	1.98	1.92	16.3	17.2	11.05	10.09	10.56	7,137
80 ppm	2.24	2.20	12.2	10.3	11.93	10.81	11.38	7,724
CD (P = 0.05)	0.05	0.04	2.4	3.0	0.85	0.61	0.72	
N (kg/ha)								
75	1.93	1.89	22.3	20.5	8.11	5.77	6.94	3,558
90	2.14	2.16	14.7	13.2	10.98	6.97	8.97	5,486
105	2.39	2.32	12.1	10.1	15.09	9.06	12.08	8,451
CD (P = 0.05)	0.12	0.08	2.2	2.5	3.40	2.74	3.60	

and 40.1% but increased the N concentration of plant at boll-initiation stage by 13.1 and 14.5% compared with no cycocel during 1989 and 1990 respectively (Table 2). Corresponding increases in seed-cotton yield were 7.9 and 7.1%.

Cycocel is able to increase the fruiting points and yield attributes and ultimately the seed-cotton yield (Perichiappan *et al.*, 1987). Thiagarajan and Ramaswamy (1984) also found that cycocel spray decreased the boll-shedding intensity by 15% but increased the seed-cotton yield by 30% compared with no cycocel treatment.

Effect of N

Application of N @ 105 kg/ha significantly increased the plant height, bolls/plant, boll weight, N concentration and seed-cotton yield compared with N @ 75 kg (present recommendation for the zone) during both the years. Moreover, the treatment significantly increased the plant height, bolls/plant and seed-cotton yield compared with N @ in 1989 and N concentration during both the years. Increasing levels of N from 75 to 105 kg/ha significantly decreased the boll-shedding intensity during both the years in upland cotton.

Adequate availability of N in soil solution may cuase increase in root growth, thereby increasing accumulation of photosynthates. Thus, overall improvement in yield-attributing characters with increasing levels of N might be responsible for higher seed-cotton yield. The results confirm the findings of Tomar *et al.* (1989). Thirumurugan *et al.* (1984) also obtained higher seed-cotton yield with N @ 120 kg/ha to increase in fruiting points, boll number and boll weight of cotton.

REFERENCES

Dong, C. N. and Artica, R. N. 1982. Changes in photosynthesis rate and growth following root treatment of tomato plants with phytohormones. *Photosynthesis Research* **3** : 45–52.

Giri, A. N. and Upadhyaya, U. C. 1980. Pattern of drymatter accumulation, N concentration and uptake of hybrid cotton under different planting pattern and intercropping systems. *Indian Journal of Agronomy* **25** (4) : 614–623.

Perichiappan, Pr. P., Gopalaswamy, N. and Panchanathan, Rm. 1987. Effect of times of fertilizer application and weed management on irrigated cotton. *Madras Agricultural Journal* **75** (8, 9) : 341–345.

Thiagarajan, C. P. and Ramaswamy, K. R. 1984. Influence of foliar application of nutrients and growth regulators on yield and quality of cotton Cv. MCU-9. *Madras Agricultual Journal* **1** (8) : 508–511.

Thirumurugan, V., Kolandaiswamy, S. and Muthukaishnan, P. 1984. Studies on the responses of hybrid cotton CBS-156 to varied spacings and graded levels of nitrogen. *Madras Agricultural Journal* **71** (3) : 195–197.

Tomar, S. P. S., Tomar, S. S. and Jain, V. K. 1989. Effect of sowing dates, nitrogen levels and varieties of hirsutum cotton. *Indian Journal of Agronomy* **34** (3) : 316–317.