

Productivity of upland cotton (*Gossypium hirsutum*) genotypes under different levels of nitrogen and spacing

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ABSTRACT

An experiment was conducted during 1988 and 1989 to evaluate the productivity of different plant types of upland cotton (*Gossypium hirsutum* L.) under various levels of nitrogen and spacing. Among 3 varieties ('H 777', 'Pusa 31' and 'Pusa N 3'), 'Pusa 31' had the maximum leaf area, boll number, boll weight and seed-cotton yield. Spacing of 60 cm $\times$ 20 cm gave more leaf area, bolls and boll weight and seed-cotton yield. Nitrogen application significantly influenced the seed-cotton yield.

Introduction of new improved varieties with high yield potential and fertilizer responsiveness has increased the yield of cotton (*Gossypium* sp.). Management factors like optimum sowing time, proper spacing and adequate manuring etc. augment the yield further. Therefore, determination of optimum level of nitrogen and plant spacing for new high-yielding varieties of upland cotton (*G. hirsutum* L.) becomes imperative for getting higher yield and also to avoid excessive use and loss of costly input like N. With the above objectives in view, the present study was undertaken.

MATERIALS AND METHODS

The field experiment was conducted during the rainy seasons (*kharij*) of 1988 and 1989 at New Delhi. The soil was sandy loam with pH 7.8, low in organic carbon (0.34%) and medium in available P (13 kg/ha) and exchangeable K (143 kg/ha). The treatment combinations comprised 3 nitrogen levels (0, 40 and 80 kg/ha), 3 spacings (60 cm $\times$ 10 cm, 60 cm $\times$ 20 cm and 60 cm $\times$ 30 cm) and

3 cotton varieties ['H 777' (tall, monopodial, late maturing, with small boll and medium-fibre quality), 'Pusa 31' (semi-dwarf, sympodial, medium maturing, with big boll and superior-medium fibre quality) and 'Pusa N 3' (dwarf, sympodial, early maturing, with big boll and superior-medium fibre quality)]. The design adopted was F³-confounding with 2 replications. The crop was sown in second and third week of June in 1988 and 1989 respectively. The crop was fertilized with 0, 40, 80 kg N/ha, and with 40 kg each of P₂O₅ and K₂O/ha. Half of the total N was applied at square-formation and the other half at the flower-initiation stage of upland cotton.

RESULTS AND DISCUSSION

Yield attributes

Plant height differed significantly due to varieties (Table 1). 'H 777' recorded the maximum plant height and 'Pusa N 3' the minimum. Spacing did not alter the plant height. Application of 80 kg N/ha increased the plant height significantly compared with

Table 1. Effect of variety, spacing and nitrogen on growth and yield parameters of upland cotton

Treatment	Plant height (cm)		Leaf area (cm ²)		Bolls/plant		Boll weight (g)	
	1988	1989	1988	1989	1988	1989	1988	1989
<i>Variety</i>								
'H 777'	82.9	85.6	44.6	44.9	17.6	29.1	3.9	4.0
'Pusa 31'	78.5	80.4	45.5	45.8	18.9	22.8	4.4	4.8
'Pusa N 3'	72.3	74.5	45.4	45.7	17.3	22.8	4.2	4.6
CD (P = 0.05)	5.63	6.00	NS	NS	0.53	0.54	0.02	0.02
<i>Spacing (cm)</i>								
60 × 10	75.2	77.0	45.4	46.0	16.8	18.7	3.9	4.2
60 × 20	78.5	78.3	46.9	48.4	17.3	20.9	3.9	4.5
60 × 30	79.8	77.9	43.2	47.6	17.6	19.6	4.0	4.6
CD (0.05)	NS	NS	NS	NS	0.53	0.54	0.02	0.02
<i>N (kg/ha)</i>								
0	73.0	75.3	44.0	45.0	16.2	18.0	3.8	4.2
40	81.2	79.8	44.3	49.3	18.3	25.2	4.1	4.7
80	84.4	86.3	46.3	50.7	17.2	24.9	4.2	4.8
CD (P = 0.05)	5.63	6.00	NS	2.5	0.53	0.54	0.02	0.02

Table 2. Effect of variety, spacing and nitrogen on seed-cotton yield and quality of upland cotton

Treatment	Seed cotton (q/ha)		Ginning outturn (%)		Seed index		Lint index	
	1989	1990	1989	1990	1989	1990	1989	1990
<i>Variety</i>								
'H 777'	13.9	18.0	33.2	34.0	9.0	9.7	4.5	5.0
'Pusa 31'	16.8	21.1	34.0	33.6	9.6	9.9	4.6	5.0
'Pusa N 3'	15.8	19.2	35.0	35.2	10.0	10.2	5.4	5.5
CD (P = 0.05)	0.53	0.88	1.42	1.50	0.34	0.36	0.21	0.20
<i>Spacing (cm)</i>								
60 × 10	14.9	18.7	34.1	34.2	9.0	10.0	4.6	5.2
60 × 20	15.9	20.4	34.4	34.8	9.4	10.3	4.9	5.5
60 × 30	15.9	19.6	34.3	34.6	9.5	10.5	4.9	5.6
CD (P = 0.05)	0.53	0.88	NS	NS	NS	NS	0.21	0.20
<i>N (kg/ha)</i>								
0	12.8	15.5	34.2	34.0	9.0	10.1	4.7	5.2
40	16.6	21.6	34.5	34.9	9.8	10.8	5.2	5.7
80	18.2	22.6	34.5	34.9	10.0	10.9	5.3	5.8
CD (P = 0.05)	0.53	0.88	NS	NS	0.34	0.36	0.21	0.20

the control, though other levels of N were at par.

Leaf area did not differ due to varieties, however, 'H 777' recorded the lowest leaf area. Though plant spacing also did not influence the leaf area, 60 cm × 20 cm spacing recorded more leaf area in both the years. Nitrogen application significantly increased the leaf area in 1990 only. N @ 80 kg/ha increased the leaf area significantly compared with the control, though the other levels of N were at par with each other.

'Pusa 31' produced significantly more bolls/plant than 'H 777' in both the years. Wider spacings produced significantly more number of bolls/plant than closer spacing (60 cm × 10 cm). The number of bolls/plant increased by 40 kg N/ha over the control. Further increase in level of N did not increase the bolls/plant.

Boll weight differed significantly due to different varieties. 'Pusa 31' produced significantly heavy bolls than 'H 777'. Wider spacing also produced significantly heavier bolls than the other 2 spacings. Nitrogen @ 80 kg/ha gave the maximum boll weight.

Yield

'Pusa 31' gave significantly higher seed-cotton yield than 'H 777' (Table 2). Next

best was 'Pusa N 3'. More leaf area, more bolls/plant and higher boll weight might have contributed for higher seed-cotton yield. Among spacings, 60 cm × 30 cm and 60 cm × 20 cm were at par with each other for seed-cotton yield and were significantly superior to 60 cm × 10 cm spacing. Closer spacing reduced the seed-cotton yield. The results confirm the findings of Brar and Singh (1978). During both the years N proved consistently effective. Linear response of N application up to 80 kg/ha was obtained during both the years. This is in agreement with the results of Kairon *et al.* (1980). The yield was positively correlated with leaf area.

'Pusa N 3' showed higher ginning out-turn, seed index and lint index, whereas 'H 777' the lowest. Different spacings did not show any influence on ginning (%) and seed index, but affected the lint. Application of N significantly influenced the seed index and lint index positively.

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