

EFFECT OF SPACING AND FERTILIZERS (N & K) ON THE INCIDENCE OF COTTON DISEASES

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Influence of spacing and nutrition on the incidence of cotton diseases was assessed. The plants raised with the wider spacings of 90 X 30 cm were found to record significantly less incidence of *Alternaria* leaf spot, grey mildew and boll rot diseases than the plants raised with closer spacings of 60 X 30 and 75 X 30 cm. There was linear increase in *Alternaria* leaf spot incidence with increase in N levels and decrease in K levels but there was not much variation on the incidence of grey mildew and boll rot due to N and K levels.

Cotton diseases assume serious proportions when environmental conditions are congenial for their development. Host nutrition and plant population are the important ecological factors that affect the development of crop diseases (Kaur *et al.*, 1984). Excess or deficiency of nutrients may affect the general vitality of the cotton plant. Plant distribution and population will alter the humidity, temperature and the other environmental factors in the crop canopy. The present study was taken up to find out the effect of spacing and fertilizers (N & K) on the diseases of cotton.

MATERIALS AND METHODS

A field experiment was conducted in Cotton Breeding Station, Tamil Nadu Agricultural University, Coimbatore. Three spacings viz. 60 X 30, 75 X 30 and 90 X 30 cm, three N levels 40, 80 and 120 kg N/ha and three K levels 20, 40 and 60 kg N/ha were tried in a split plot design replicated thrice with the variety MCU 9. The main plot treatments consisted of nine combination treatments of three N and K levels.

The full dose of K and 50% N were applied basally and the rest of 50% N was applied during square formation stage. The *Alternaria* leaf spot, grey mildew and boll rot incidences were observed in the trial.

The *Alternaria* leaf spot and grey mildew incidences were recorded by following the score chart of grade 1-5. The boll rot incidence was recorded by counting the number of total bolls affected bolls, total locules and affected locules. The percentage disease index was worked out for all three diseases.

RESULTS AND DISCUSSION

The results revealed that *Alternaria* leaf spot incidence was significantly reduced in the plants raised with the wider spacing of 90 X 30 cm (22.8%) than the plants raised with optimum and closer spacings of 75 X 30 and 60 X 30 cm respectively (Table 1). The disease incidence significantly increased with increase in N levels and decreased with increase in K levels. N 120 K 20 recorded maximum incidence of 39.4%. The treatments N 40 K 60 and N 80 K 60 significantly recorded

Table 1. Effect on *Alternaria* leaf spot incidence (PDI) spacing x Fertilizer (N & K) levels

Fertilizer levels	Spacing			Mean
	S ₁ 60 x 30 cm	S ₂ 75 x 30 cm	S ₃ 90 x 30 cm	
N 40 K 20	32.4 (34.7)	27.8 (31.8)	19.3 (26.0)	25.9 (30.6)
N 40 K 40	30.5 (33.5)	32.4 (34.7)	27.9 (31.9)	30.5 (33.4)
N 40 K 60	29.3 (32.8)	24.0 (29.3)	14.5 (22.4)	22.3 (28.2)
N 80 K 20	40.0 (39.2)	37.2 (37.6)	27.9 (31.9)	34.9 (36.2)
N 80 K 40	35.4 (36.5)	20.7 (27.0)	22.3 (28.2)	25.9 (30.6)
N 80 K 60	30.5 (33.5)	22.6 (28.3)	16.6 (24.0)	22.9 (28.6)
N 120 K 20	42.0 (40.4)	43.9 (41.5)	32.4 (34.7)	39.4 (38.9)
N 120 K 40	42.0 (40.4)	37.2 (37.6)	26.1 (30.7)	34.9 (36.2)
N 120 K 60	40.0 (39.2)	24.5 (29.7)	20.3 (26.8)	27.9 (31.9)
Mean	36.7 (36.7)	29.6 (33.0)	22.8 (28.5)	

(Figures in parentheses are transformed values).

Spacing	SE	CD
Fertilizer levels	0.5	2.0
Interaction	1.2	3.3
	2.1	NS

lesser incidence of 22.3 and 22.9% respectively.

Grey mildew incidence was found to be low with wider spacing (16.6%) and optimum spacing (20.5%) and there was no significant variation between the two treatments (Table 2). The incidence was significantly high in closer spacing (26.1%). Between nitrogen levels there was no significant variation in incidence. Increase in K levels reduced grey mildew incidence irrespective of N levels. The treatment N 120 K 20 significantly recorded the maximum incidence of 26.6% as

against N 40 K 60 and N 80 K 60 which recorded the minimum incidence of 15.8 and 14.9% respectively.

The results indicated that there was significant variation in boll rot incidence due to different spacings (Table 3). The wider spacing reduced boll rot incidence (16.6/8.3% - Boll/locule) when compared to optimum (22.6/11.4%) and closer spacing (31.4/16.6%). There was only slight variation in incidence due to different N and K levels. The treatment N 40 K 60 and N 80 K 40 recorded the lesser incidence of 20.0/10.5% and 20.1/

Table 2. Effect on grey mildew disease incidence (PDI) Spacing x Fertilizer (N & K Levels)

Fertilizer levels	Spacing			Mean
	S ₁ 60 x 30 cm	S ₂ 75 x 30 cm	S ₃ 90 x 30 cm	
N 40 K 20	24.8 (29.9)	22.5 (28.3)	20.5 (26.9)	22.6 (28.4)
N 40 K 40	23.2 (28.8)	17.7 (24.9)	21.9 (27.9)	20.9 (27.2)
N 40 K 60	21.2 (27.4)	16.6 (24.0)	10.4 (18.8)	15.8 (23.4)
N 80 K 20	27.1 (31.4)	22.5 (28.3)	21.9 (27.9)	23.8 (29.2)
N 80 K 40	25.7 (30.5)	21.5 (27.6)	12.6 (20.8)	19.6 (26.3)
N 80 K 60	17.5 (24.7)	28.3 (22.5)	12.6 (20.8)	14.9 (22.7)
N 120 K 20	27.1 (38.0)	31.7 (34.3)	21.3 (27.5)	26.6 (32.3)
N 120 K 40	22.5 (31.4)	22.5 (28.3)	17.5 (24.7)	22.3 (28.2)
N 120 K 60	25.1 (28.3)	15.9 (23.5)	13.1 (21.2)	16.9 (24.3)
Mean	25.1 (30.1)	20.5 (26.9)	16.6 (24.1)	

(Figures in parentheses are transformed values)

	SE	CD
Spacing	1.1	4.2
Fertilizer levels	1.3	3.6
Interaction	2.2	NS

10.5% respectively. The interaction between treatments with regard to boll rot incidence was found to be significant. The treatment N 40 K 40 recorded the least incidence of 13.9/7.1% in 90 x 30 cm spacing whereas the treatment N 120 K 40 recorded the maximum incidence of 47.2/20% in 60 x 30 cm spacing.

These studies indicated that the cotton crop when raised with a closer spacing of 60 x 30 cm recorded maximum incidence of all diseases. It is well known that the pathogens are air borne and the environmental factors have profound effect on the incidence

of diseases. Hence the proximity of the plants by the adoption of closer spacing provides a favourable micro-climate for the spread and development of diseases (Venkatachalam *et al.*, 1979). Iruthayaraj *et al.* (1979) reported that higher N levels increased cotton diseases and K levels decreased the incidence. Sharma and Chauhan (1987) reported that the *Alternaria* leaf spot incidence was found to be high at 120 kg N/ha with closer spacing and the present results are also in agreement with the previous work. In addition, the present study also indicated the severity of grey mildew and boll rot at increased N levels.

Table 3. Effect on the incidence of boll rot disease Spacing x Fertilizer (N&K) levels

Fertilizer levels	Spacing							
	60 X 30 cm		75 X 30 cm		90 X 30 cm		Mean	
	B	L	B	L	B	L	B	L
N 40 K 20	23.1 (28.7)	12.4 (20.6)	18.8 (25.7)	10.3 (18.7)	12.1 (20.4)	6.4 (14.6)	17.9 (25.0)	9.6 (18.0)
N 40 K 40	33.7 (35.5)	16.7 (24.1)	24.4 (29.8)	12.4 (20.6)	13.9 (21.9)	7.1 (15.4)	23.5 (29.0)	11.7 (20.0)
N 40 K 60	24.5 (29.7)	14.4 (22.3)	19.6 (26.3)	10.0 (18.4)	16.3 (23.8)	7.7 (16.1)	20.0 (26.6)	10.5 (18.9)
N 80 K 20	34.4 (35.9)	16.6 (24.0)	25.3 (30.2)	12.3 (20.5)	24.7 (29.8)	12.4 (20.6)	27.6 (31.7)	13.7 (21.7)
N 80 K 40	24.8 (29.9)	14.9 (22.7)	21.7 (27.8)	10.1 (18.5)	14.1 (22.1)	7.1 (15.5)	20.1 (26.6)	10.5 (18.9)
N 80 K 60	32.7 (34.9)	19.9 (26.5)	19.3 (26.1)	9.3 (17.8)	14.0 (22.0)	7.4 (15.8)	21.6 (27.7)	11.8 (20.1)
N 120 K 20	47.2 (43.4)	20.0 (26.6)	24.7 (29.8)	14.3 (22.2)	15.9 (23.5)	7.7 (16.1)	28.6 (32.3)	13.6 (21.6)
N 120 K 40	32.6 (34.8)	14.3 (22.2)	24.7 (29.8)	12.7 (20.9)	19.0 (25.9)	10.0 (18.4)	25.3 (30.2)	12.3 (20.5)
N 120 K 60	32.7 (34.9)	20.0 (26.6)	24.8 (29.9)	11.7 (20.0)	19.8 (26.4)	9.4 (17.9)	25.6 (30.4)	13.4 (21.5)
Mean	31.4 (34.1)	16.6 (24.0)	22.6 (28.4)	11.4 (19.7)	16.6 (24.0)	8.3 (16.7)		

Figures in parentheses are transformed values.

B : Incidence-Boll basis %	SE	L : Incidence-Locule basis %	CD
Boll basis			
Spacing	: 0.7		(2.7)
Fertilizer levels	: 1.1		(3.0)
Interaction	: 1.8		(5.2)
Locule basis			
Spacing	: 0.1		(0.5)
Fertilizer levels	: 0.5		(1.4)
Interaction	: 0.9		(2.4)

The effect of potassium in reducing the disease incidence was reported by several workers (Mukerjee, 1976; Rao et al., 1980) and Sharma and Chauhan, 1987). The present results showed that the disease incidence could be reduced with higher levels of potassium which seemed to balance the effect of higher levels of nitrogen. Since the aforesaid diseases are responsible for lower yields in cotton, the adaptation of the above cultural practices to regulate the plant density and host nutrition are very much important to reduce the severity of diseases.

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