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INTERACTION EFFECTS OF STAND GEOMETRY AND FERTILITY REGIMES ON THE PRODUCTION POTENTIAL OF NEWLY DEVELOPED UPLAND COTTONS IN NIMAR TRACT OF MADHYA PRADESH

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ABSTRACT

Field studies executed over a period of three years (1980-1981 to 1982-1983) to determine the effects of stand geometry and fertility regimes on the production potential of newly developed upland cottons in Nimar tract of Madha Pradesh revealed that variety 76 IH 20, performed relatively well at the highest plant density (56000 plants ha^{-1}) and interacted efficiently at the maximum fertility rates (80 $kg.ha^{-1}$ N); producing highest seed cotton yield of 1246 $kg.ha^{-1}$ in 1981-1982 and 1130 $kg.ha^{-1}$ in 1982-1983 besides bearing significantly greater number of bolls, synchronized bursting and escaping boll worm damage due to inherent biotic character of early maturity. Local standard Khandwa 2 remained in close proximity with 76 IH 20 but another new genotype KH 33/1146 failed to touch the desired yield levels.

KEYWORDS: Cotton, Plant stand, Plant density, Plant geometry, Nitrogen level.

Nimar tract is considered as the 'Cotton-Bowl' of Madhya Pradesh, contributing to approximately 67 per cent of total production and 52 per cent of total hectarage of the State. Characterised by shallow-light to medium black cotton soils, the region produces good quality medium staple cotton under low input technology. Constraints of fertility, plant protection coupled with poor agro-techniques employed locally however, leads to extremely low yields. Production potential of cotton in marginal and sub-marginal lands, therefore can possibly be explored by introducing more vigorous cultigens, improving management technology and employing the farm energy resources more efficiently. Ensured optimum yields have been manifested by the judicious use of fertilizer (Jain and Jain 1979; Jain *et al.* 1981) and employing non-monetary inputs like population dynamics (Giri and Upadhyay 1980; Jain and Katti 1980 (a,b;) Jain and Jain, 1981). Meagre work was reported on the interaction effects of these two production components on the productivity potential of newly developed cotton strains like 76 IH 20 and KH 33/1146. It was therefore, considered worth while to undertake the present studies.

MATERIALS AND METHODS

A three year field study was executed at the JNKVV Research Farm, Khandwa from 1980-1981 to 1982-1983 on yield potentiality of newly developed upland cotton strains under variable stand geometry and fertility regimes. The soil of the experimental area were characterised by poor N (278 $kg.ha^{-1}$), medium P (22 $kg.ha^{-1}$) and high K (680 $kg.ha^{-1}$) with 0.478 per cent O.C., 0.35 (ds m^{-1}) E.C. and pH ranging between 7.8 to 8.2. The treatments comprised of three *hirsutum* cotton strains (V_1 - Khandwa 2, V_2 - KH 33/1146, V_3 -76 IH 20/Vikram) tested under three stand density (plants ha^{-1}) /geometry (P_1-56000/60 x 30 cm; P_2-37000/60 x 45 cm; P_3 - 28000/60 x 60 cm) and there N regimes (N-0, N-40, N-80 $kg.ha^{-1}$). A split plot design, assigning varieties and plant density in main plots and N levels in the sub-plots, was adopted in three replications. The N as urea was applied in two equal splits, viz; half at basal and remaining half at one month

after sowing. A balanced fertilization was ensured by uniformly applying P_2O_5 @ 40 kg.ha^{-1} and K_2O @ 20 kg.ha^{-1} in the form of superphosphate and muriate of potash respectively along with the basal dose of N fertilizer. All the three genotypes were invariably sown with the onset of monsoon during the second week of June every year of experimentation. Plant protection measures and other agronomic operations were executed as and when necessary to obtain proper growth. In order to determine the yield potentiality of different strains under varialbe stand geometry and fertility regimes, ancillary characters and seed cotton yield were recorded during the crop seasons.

RESULTS AND DISCUSSION

Yield Potentiality of Varieties

Data presented in Table 1 revealed that variety 76 IH 20 out yielded the other two strains viz., KH 33/1146 and Khandwa 2 in all the three years of field study. Versatility of 76 IH 20 was evidently adjudged over KH 33/1146 by a significant rise in seed cotton yield, registered consistantly for two out of three years of experimentation. This increase was, however, to the tune of 15.6 per cent in 1980-1981 and 15.2 per cent in 1981-1982. Although seed cotton yield recorded in 76 IH 20 superseeded that of KH 33/1146, it failed to express similar level of superiority over local standard Khandwa 2 in any one of the three years. Inherent genetic character of heavy pest built-up in KH 33/1146 at the initial stage of crop growth, particularly of jassids (*Amrasca devastatus*) might be the prime cause of its poor performance as reported in entomological trials (Anon. 1981) while superiority of 76 IH 20 was established from the agronomical and breeding trials (Anon. 1981 and 1982), conducted in Madhya Pradesh. Data with respect to the yield attributes of 76 IH 20 (Table 2) invariably exhibited greater values of bolls plant^{-1} and increased boll size, manifesting higher plant^{-1} yield as well as greater production.

Effect of Stand Geometry

Data furnished in Table 1 clearly elucidated a progressive increasing trend on seed cotton yield with the corresponding increment in plant density, though the differences among variable levels of stand geometry were found to be nonsignificant. This trend, however, turned to a reverse order with respect to plant^{-1} yield. Densely sown (56,000 plants ha^{-1}) cotton tended to produce significantly lower yield plant^{-1} in all the three years when compared to thinly sown (either 37,000 or 28,000 plants ha^{-1}) cotton. Even though widely spaced crop (60 x 60 cm or 60 x 45 cm) pushed-up the plant yield indices (Table 1) and boll number (Table 2), such geometrical manipulations failed to substantiate the population deficit in terms of yield as against the close planted (60 x 30 cm). Contrary to this, mean seed cotton yield escalated by about 10 per cent, merely by manuvering the stand geometry within rows and doubling the density subsequently from 28,000 to 56,000 plant ha^{-1}. This was in complete agreement with the number of studies reported earlier; (Jain and Katti 1980 (a,b;) Jain and Jain 1981, Jain *et al.* 1981).

Yield Response to different Fertility Regimes

A distinct and consistant response of supplementing the native fertility by N fertilizers was documented by the rise in seed cotton yield (Table 1) as well as the ancillary characters (Table 2). Highest yield of 1192 kg.ha^{-1} was registered at 80 kg.ha^{-1} N in all the three years. Data in Table 2 also brought out that plant growth associated with boll number and boll size were conspicuously influenced by the N levels. A critical analysis of the data revealed that the impact of additional fertility was though evident on the fruit bearing, it was nevertheless so conspicuent on the fruit development of cotton in any one of the three years. Response of N to seed cotton yield and ancillary characters was reported in the past by number of workers (Jain and Jain, 1979; Jain and Katti, 1980; Jain and Jain, 1981). The interactions effects were found be non significant.

Table 1. Yield potential of different varieties of cotton as influenced by stand geometry and nitrogen levles.

Treatments		plant^{-1} yield (g)			Seed cotton yield (kg.ha^{-1})		
		1980–1981	1981–1982	1982–1983	1980–1981	1981–1982	1982–1983
Varieties							
Khandwa-2	(V_1)	10.0	12.0	14.8	740	907	814
KH 33/1146	(V_2)	9.5	10.0	14.5	681	795	791
76 IH 20	(V_3)	11.3	13.0	15.2	787	916	818
S.E.		0.29	0.30	0.35	21	25	13
C.D. (5%)		0.88	0.90	N.S.	65	75	N.S.
Stand geometry (Plants.ha^{-1})							
56,000	(P_1)	8.7	10.0	12.8	751	898	871
37,000	(P_2)	10.4	11.0	14.8	721	862	796
28,000	(P_3)	11.7	14.0	17.4	730	857	757
S.E.		0.29	0.30	0.35	21	25	13
C.D. (5%)		0.88	0.90	1.07	N.S.	N.S.	N.S.
Nitrogen levles (kg/ha^{-1})							
N–0		6.3	6.0	9.5	456	433	463
N–40		11.0	13.0	16.2	796	992	916
N–80		13.5	16.0	18.2	956	1192	1044
S.E.		0.19	0.40	0.24	13	27	20
C.D. (5%)		0.52	1.00	0.66	36	73	56

Table 2. Growth and yield attributes of cotton as influenced by different treatments

Treatments		Plant height (cm)			Boll.plant^{-1} (No.)			Boll size (g)		
		1980–1981	1981–1982	1982–1983	1980–1981	1981–1982	1982–1983	1980–1981	1981–1982	1982–1983
(a) Varieties										
Khandwa–2	(V_1)	63	81	63	4.0	4.4	5.4	2.5	2.7	2.7
Kh 33/1146	(V_2)	64	82	66	3.9	4.0	5.3	2.4	2.6	2.6
76 III 20	(V_3)	65	79	64	4.5	4.7	5.5	2.5	2.7	2.8
S.E.		0.8	1.2	0.6	0.11	0.12	0.16	0.04	0.05	0.05
C.D. (5%)		2.5	N.S.	1.8	0.34	0.37	N.S.	N.S.	N.S.	N.S.
(b.) Stand geometry (plants.ha^{-1})										
56,000	(P_1)	64	78	63	3.6	3.9	4.7	2.4	2.6	2.7
37,000	(P_2)	64	79	66	4.2	4.1	5.1	2.5	2.6	2.7
28,000	(P_3)	65	85	65	4.7	5.2	6.2	2.5	2.7	3.7
S.E.		0.8	1.2	0.6	0.11	0.12	0.16	0.01	0.05	0.05
(c) Nitrogen levels (kg.ha^{-1})										
N–o		58	60	53	2.6	2.4	3.6	2.4	2.5	2.5
N–40		64	85	67	4.4	4.4	5.8	2.5	2.7	2.7
N–80		71	98	73	5.4	5.9	6.7	3.5	2.7	2.7
S.E.		0.6	1.1	0.5	0.09	0.13	0.18	0.05	0.04	0.04
C.D. (5%)		1.6	3.1	1.3	0.25	0.35	0.52	0.17	0.11	N.S.

N.S. : Not Significant.

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EFFECT OF INTENSITY OF TILLAGE AND WEED CONTROL ON YIELD OF WHEAT UNDER RAINFED CONDITIONS

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ABSTRACT

Experiments with wheat WL 410 were conducted on sandy loam soil under rainfed conditions during *Rabi* 1979-1980 and 1980-1981, using varying number of ploughings in combination with weed control by weedicide and/or interculture. The average grain yield in case of minimum tillage + weed control by weedicide and interculture was better than that obtained by conventional tillage. About 73 per cent reduction in grain yield was observed in case of minimum tillage, when weeds were not controlled. Weed control by interculture was found to be better than the use of weedicide. Net return of Rs. 2035 ha^{-1} in case of minimum tillage (POWIC) was 40 per cent higher than the conventional tillage.

KEYWORDS: Weed Control, Wheat, Weedicide, Economics.