Exploring Novel Cropping Options for Pigeonpea in Chittagong District, Bangladesh. III. Population Response of Short-Duration Pigeonpea in Hilly Areas

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Short-duration pigeonpea can produce grain yields of up to 1 t ha^{-1} when grown in the rainy season in hilly areas of Chittagong district, (see Part II of this paper, in this issue). However, plant populations used for these evaluations were 10 or 15 plants m^{-2}. Such populations may be suboptimal for short-duration pigeonpea of determinate growth habit (Chauhan 1990). We therefore measured response of a short-duration pigeonpea genotype, ICPL 151, to plant population in a hilly area of the Regional Agricultural Research Station, Hathazari, Chittagong district, Bangladesh.

A randomized complete block experiment was sown on 4 Jul 1991, during a break in the monsoon rains which usually peak in Jul. A randomized complete block design with three replications was used. Using an interrow spacing of 50 cm, treatments comprised intra-row spacings of 5, 10, 20, 30, 40, and 80 cm; giving plant populations of 40, 20, 10, 6.6, 5, and 2.5 plants m^{-2}. Plot size consisted of 6 rows each 4-m long. A basal dressing of 13 kg P ha^{-1} as triple superphosphate and 10 kg S ha^{-1} as gypsum was applied and incorporated after soil tillage. Urea was topdressed at the rate of 20 kg N ha^{-1} at 18 days after sowing (DAS). *Rhizobium* inoculum was not applied. Seeds of ICPL 151 were drilled at 2–3 seeds $hill^{-1}$ and emergent seedlings progressively thinned to one per hill, and thus the required population in each treatment. Plots were maintained weed free and well drained to avoid standing water during heavy rain. Dimecron® was sprayed at fortnightly intervals from flower initiation to late podding in an attempt to control pod borers. Matured pods were harvested in two hand pickings and harvesting was completed in the first week of Jan 1992.

As explained in Part II of this paper (in this issue), excessive rainfall during first flush flowering, and inability to control attack by *Maruca testulalis* then, distorted crop phenology such that harvested grain yield was the result of a subsequent reproductive flush. Final plant height was maximum at 6.6–20 plants m^{-2}, with significant reduction in plant height at the densest and sparsest populations. Dry mass and branching of individual plants increased as population decreased, indicating the extent of plant compensatory effects to reduced plant density. Pods $plant^{-1}$ increased but pods $unit\text{-}area^{-1}$ decreased as plant population reduced. This resulted in increasing grain yields as population increased, with maximum yields approaching 2 t ha^{-1} at populations of 20 and 40 plants m^{-2} (Table 1).

The present results show that prior evaluations of short-duration determinate pigeonpea at this site (see Part II of this paper) were conducted at suboptimal plant population, and that a yield potential of around 2 t ha^{-1} exists if an optimum plant population is used. However, optimum plant population in pigeonpea is very much dependent on potential for aerial biomass production, which is strongly influenced by sowing date in relation to the longest day (Chauhan 1990). Thus with an earlier sowing than in the present study a lower population may

Table 1. Response of growth and yield parameters of short-duration pigeonpea genotype ICPL 151 to plant population in a hilly area at Hathazari, Chittagong district, Bangladesh, 1991/92.

Plant population (plants m^{-2})	Final plant height (cm)	Above-ground plant dry mass (g $plant^{-1}$)	Branches $plant^{-1}$	Pods $plant^{-1}$	Pods m^{-2}	Grain yield (t ha^{-1})
40	117 bc[1]	16.4 c	5.7 b	29 e	1030 b	1.86 a
20	131 a	34.8 b	9.7 a	48 d	1078 ab	1.88 a
10	136 a	44.2 ab	8.7 a	61 c	838 bc	1.21 b
6.6	127 ab	49.6 a	9.3 a	79 b	720 c	1.24 b
5	117 bc	51.4 a	8.7 a	91 b	641 cd	1.02 b
2.5	111 c	51.9 a	11.0 a	106 a	439 d	0.44 c

1. Means not followed by a common letter differ significantly at $P = 0.05$, according to Duncan's Multiple Range Test.

be optimum and with a later sowing higher populations may be optimum; this would require experimental validation for this site. Nevertheless, the present results show that promising yield levels of sole-cropped short-duration pigeonpea can be obtained in this region provided an appropriate plant population is used.

Reference

Chauhan, Y.S. 1990. Pigeonpea: Optimum agronomic management. Pages 257–278 *in* The Pigeonpea (Nene, Y.L., Hall, S.D., and Sheila, V.K., eds.). Wallingford, Oxon, UK: CAB International.

Pathology

Newly Developed Extra-Short-Duration and Short-Duration Pigeonpea Lines with Combined Resistance to Wilt and Sterility Mosaic, ICRISAT Asia Center

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Wilt and sterility mosaic, are two of the major diseases that affect pigeonpea in South and Southeast Asia. Extra-short-duration and short-duration pigeonpea lines with combined resistance to both diseases have been developed at ICRISAT (Table 1). The development of

Table 1. Sterility mosaic (SM) and wilt resistant extra-short-duration and short-duration pigeonpea lines developed at ICRISAT Asia Center, Patancheru, India.

ICPL	Wilt (%) (3 yr mean)[1]	Sterility mosaic (3 yr mean)[1]	Growth habit	100-seed mass (g)	Seed color	Days to flower	Dry matter ($t\ ha^{-1}$)	Plant height (cm)
90008	23.0	9.8	DT	9.5	B	68	119	128
90014	24.0	6.7	DT	9.5	C	69	119	116
90002	26.0	7.6	DT	9.1	C	70	117	126
87105	15.8	3.3	DT	12.5	C	70	-	125
90016	21.7	11.9	DT	11.9	LB	75	126	155
90018	5.0	8.0	DT	12.1	C	75	127	130
91045	18.3	13.0	NDT	9.0	B	77	128	165
93180	16.8	4.7	DT	11.1	B	79	129	133
93185	15.8	1.6	NDT	9.1	B	80	130	143
90026	14.1	7.9	DT	14.4	C	81	129	146
90027	18.0	8.3	DT	12.6	C	82	132	142
90028	19.6	5.0	DT	13.9	LB	83	135	142
93179	8.4	4.5	DT	10.1	C	83	130	160
93177	7.1	1.2	DT	10.0	C	84	133	160
90029	9.3	7.2	DT	14.7	DB	85	132	147
93176	7.9	10.4	DT	10.8	C	85	135	138
93175	3.4	4.1	DT	9.6	C	86	135	150
93178	15.5	10.0	DT	9.9	B	87	137	145
93181	5.5	16.7	NDT	9.4	C	87	138	190
93183	15.4	15.3	NDT	14.3	C	88	140	175
93186	17.0	3.9	NDT	10.2	B	89	140	200
93182	14.4	8.0	NDT	8.5	C	90	140	173
93184	19.0	16.2	NDT	11.3	B	91	142	175
83024	14.3	7.8	DT	18.3	DB	100	156	130
UPAS 120	38.8	98.0	NDT	7.0	B	64	-	150
ICPL 87	7.1	57.9	DT	10.1	B	70	-	120
Controls								
ICP 2376 (Wilt)	100.0	0.0						
ICP 8863 (SM)	0.0	100.0						

1. Mean of 1992–94 seasons' data from wilt and sterility mosaic disease nursery

DT = Determinate; NDT = Nondeterminate; DB = Dark brown; C = Cream; B = Brown; LB = Light brown.