Journal of Crop and Weed, 5(2): 90-91 (2009)

Productivity of rabi pigeonpea (*Cajunus cajan* L. Milsp.) as influenced by scheduling of irrigation

T.K.BASU[1] AND S.R.BANDYOPADHYAY[2]

[1]Department of Agronomy and [2]Department of Plant Pathology
Bidhan Chandra Krishi Viswavidyalaya, Mohanpur-741252, Nadia, West Bengal.

ABSTRACT

A field experiment was conducted at the Instructional Farm, Jaguli, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal during winter seasons for three consecutive years to study the effect of irrigation at different physiological growth stages like branching (B), flowering (F) and pod formation (P) stages and their different combinations on the yield components and yield of pigeonpea. Yield and yield components were significantly influenced by the application of irrigation. Three irrigations applied one each at branching, flowering and pod formation stages produced the highest seed yield; but it was at par with two irrigations applied at branching and flowering stages during all the three years. Irrigation at branching and flowering was found essential for higher seed production in pigeonpea grown during winter months. Single irrigation at flowering stage produced maximum seed yield .The increase in seed yield over control (rainfed) was 772 Kg.ha^{-1} with irrigation at B+F+P, 703 Kg.ha^{-1} at B+F and 548 Kg.ha^{-1} at F stages.

Key words : Irrigation, productivity and rabi pigeonpea,

In traditional agriculture, legumes are essential components because of their ability to enrich soil nitrogen status, effectiveness in improving soil structure, qualitative increase in micro-organism population. Pigeonpea (*Cajanus cajan* (L) Milsp.) occupies an important place in India in production among the legume crops . The crop is generally grown during the *Kharif* season in our country. But it can be grown as a *rabi* crop in areas with mild and short winter like West Bengal (Roy Sharma et. al. , 1980). Cultivation of this legume as a rabi crop not only shows high yield potentiality but also reduces duration, thereby resulting less damage due to disease and pest infestation .

Pigeonpea has such character that even in drought year, it is capable of producing some yield (Pathak ,1970). Increase in growth and productivity of the crop due to application of irrigation water in the winter season have been indicated. Singh (1980) has established the possibility of growing pigeonpea during the winter season. Proper water management of pigeonpea in the dry season is very important. However, differential sensitivity of growth stages to irrigation has led to the concept of critical stages. Thus, an attempt has been made to study the influence of irrigation on the piegeonpea crop during winter season.

MATERIALS AND METHODS

The experiment was carried out at the Instructional Farm, B.C.K.V, Jaguli, Nadia. The soil of the experimental field was slightly acidic to neutral in pH (6.8) and mediums in available N, P_2O_5 and K_2O The pigeonpea variety taken for the experimental was B- 105. The variety was high yielding , dwarf and short duration, evolved from Pulse and Oilseed Research Station. Berhampore, West Bengal and recommended for cultivation in this state. In all the three years the seeds were sown on the 1st week of December and the crop was harvested on the 1st week of June. The experiment was laid out in a randomized block design with three replicantions and eight treatments. The treatments were the combinations of irrigations applied to the crop at three different physiological stages of growth viz. branching (B), flowering (F) and pod formation (P) stage. The experiment was carried out in medium high situation and the soil of the field was clay loam in texture with 0.06% total N, 40 Kg. ha^{-1} of P_2O_5 and 225 Kg. ha^{-1} of available K_20. The plot had good irrigation and drainage facilities. Seeds were sown in lines 30 cm apart and the plant to plant distance was maintained at 20 cm.. 20 Kg. N ha^{-1} , 50 Kg P_2O_5 ha^{-1} and 50 Kg K_20 ha^{-1} were applied as basal fertilizer. Weed growth was checked through hand weeding.

RESULTS AND DISCUSSION

Number of pods plant^{-1}

Effect of irrigation on number of pods per plant was significant (Table-1). Early irrigation showed significant increase in pod numbers over rainfed condition whereas late one applied at pod formation stage failed to do so. Three irrigations applied at all the three stages produced highest pod number among all the treatment combinations. The effect of different treatments on the number of pods per plant was significantly different in different years. This conforms with observations recorded by Patel and Patel (1995).

E mail : tkbasubckv@gmail.com

Number of seed pod^{-1}

Levels of irrigation established a significant effect on the number of seed per pod. Two irrigations at branching and flowering stages improved the number of seeds per pod over single irrigation levels. But further increase in number of irrigation to three did not increase the number significantly. Patel and Patel (1995) reported improvement of seeds pod^{-1} by application of irrigation.

Test weight

Test weight refers to thousand seed weight. Significant increase in test weight of pigeonpea with application of irrigation water was observed . Improvement in the soil moisture storage due to irrigation helped the plant to absorb more nutrient from soil which resulted in the improvement of thousand seed weight. Three irrigations (B+F+P) produced the highest test weight which was at per with that obtained from two irrigations (F+P) during the three years and also in the pooled data. Similar favorable effect of irrigation on test weight of pigeonpea was recorded by Patel and Patel (1995).

Seed yield

Irrigation treatment significantly increased seed yield of pigeonpea over unirrigated control. Rainfed treatment gave the lowest seed yield mainly because of the lowest yield attributing character of pigeonpea. Reduction in the supply of soil moisture under rainfed condition reduced the yield attributes which was reflected in the yield of pigeonpea. Increasing the soil moisture storage through irrigation significantly improved the number of pods per plant, number of seeds per pod and test weight. As a result seed yield was the maximum with three irrigations applied at three stages (B+F+P). Devoid of irrigation at P stage did not decrease the seed yields as compared to that obtained under three irrigations. It indicated that irrigations at branching and flowering stages were necessary for higher seed production of pigeonpea during winter months. Withholding irrigation at branching stage reduced seed yield to a greater extent (16.00 %) as compared to the yield reduction (14.00 %) in which irrigation was not applied during flowering stage. From this result it is observed that the critical stages for irrigation were branching and flowering in case of winter pigeonpea. Bhan and Khan (1979), Patel and Patel (1995), Gajera *et. al.* (1998), Venugopal and Rao (1999) also reported an increase in the seed yield of pigeonpea due to irrigation over unirrigated control through improvement in yield attributing characters.

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Table 1 : Effect of irrigation at different stages of growth in yield components and seed yield

Irrigation at stage (S)	No. of pods plant^{-1}				No. of seeds pod^{-1}				Weight of thousand seeds (g)				Seed yield (kg/ha^{-1})			
	Year			Pooled	Year			Pooled	Year			Pooled	Year			Pooled
	1st	2nd	3rd		1st	2nd	3rd		1st	2nd	3rd		1st	2nd	3rd	
Branching (B)	180.00	175.33	183.66	170.66	5.83	5.66	5.78	5.78	128.10	123.36	140.66	130.71	2248	2143	2243	2217
Flowering (F)	187.66	183.00	192.33	187.66	5.88	5.85	5.91	5.87	129.63	124.63	148.93	134.40	2581	2353	2526	2487
Pod formation (P)	165.33	157.00	169.00	163.77	5.45	5.83	5.83	5.57	120.76	120.76	132.00	126.38	2165	1920	2122	2069
B+F	200.33	193.00	201.33	198.22	6.16	6.10	6.01	6.09	132.00	127.06	151.53	136.86	2660	2663	2602	2642
B+P	181.33	176.00	184.33	180.55	5.90	5.76	5.93	5.86	130.06	125.33	138.86	131.42	2415	2083	2497	2331
F+P	191.00	184.66	194.00	189.88	5.96	5.90	5.96	5.94	135.23	131.30	141.76	136.08	2335	1976	2521	2277
B+F+P	207.33	201.66	206.66	205.22	6.33	6.18	6.00	6.17	137.30	133.90	157.76	142.98	2568	2690	2745	2711
Rainfed (control)	162.66	155.33	167.66	161.88	5.41	5.26	5.85	5.51	125.36	119.80	127.36	124.71	2093	1810	1916	1939
SEm (±)	**1.69**	**2.98**	**1.32**	**1.22**	**0.04**	**0.09**	**0.04**	**0.03**	**0.91**	**1.07**	**1.52**	**4.22**	**220**	**411**	**312**	**177**
LSD(0.05)	**5.14**	**9.04**	**4.02**	**3.51**	**0.11**	**0.25**	**0.13**	**0.10**	**2.75**	**3.25**	**4.62**	**12.19**	**728**	**1356**	**1031**	**618**