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Shift in Flowering Pattern and Pod Setting Responses of Pigeon Pea [*Cajanus cajan* (L.) Millsp.] to Exogenous Applications of Some Phenolics

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Pigeon pea [*Cajanus cajan* (L.) Millsp. cv. AL-15] was given foliar spray treatments with mono- and diphenols at 70 and 77 DAS. Initiation of flowering was significantly hastened with all the monophenols tried. Flowering increased during the early span (80 to 100 DAS) with all the phenolic compounds. Monophenols increased the number of pods/plant significantly as compared with control; which also caused an increase in the setting %, though number of seeds/pod and 100 seed weight remained unaffected. Diphenols were less effective in improving these attributes.

Key words : Foliar spray, Flowering, Diphenols, Monophenols, pod setting, *Cajanus cajan*

Introduction

Pigeon pea [*Cajanus cajan* (L.) Millsp.] has indeterminate growth leading to overlap of growth and development of vegetative organs and reproductive sinks. Clearly, it causes interorgan competition for photosynthates and other metabolites. This causes low fruiting efficiency, e.g. failure of pods to set seeds, low partitioning coefficient and poor harvest index; consequently, the overall yield and seed quality are lowered. Several intrinsic causes contribute towards low yields and these include abscission of flowers (Huff & Dyling 1980, Sheldrake) and immature pods, defective fertilization (Sinha 1977); inadequate supply of materials to developing embryos (Brum & Betts 1984); poor size of sinks (Dyling et al.1986), etc. In some pulses, successful attempts have led to the checking of the abscission of the potential sinks with phenolics so that more number of flowers leading to pod setting could be initiated (Malik et al. 1986a, Singh et al.1986). phenolics are increasingly being shown as regulators of plant growth (Malik et al. 1986b, Kefeli & Dashek 1984).

The present study reports the flowering responses and subsequent pod formation in *Cajanus* with six phenolic compounds (3 mono; and 3 diphenols).

Materials and Methods

Healthy uniform seeds of Pigeon pea [*Cajanus Cajan* (L.) Millsp. cv.AL-15] were sown in the PAU field area on 6.6.1986 in RBD (4 replicates each) in a plot size of 3m × 1.6m. The crop was raised according to recommended management practices and was harvested on 25.10.1986. The foliar spray applications were given with each of the phenolic compounds (Salicylic acid, H-acid, 1,2,4-acid, caffeic acid, RD-Brown and Resorcinol) at 100 μg/m1 concentration at the rate of 500 l/ha with a foot sprayer. Sprays were given 70 and 77 days after sowing (DAS). Flowering behaviour was recorded as follows:

Flower Initiation: It was taken as DAS for appearance of first flower bud in a plot; average of four replications was expressed as days taken to flower initiation.

Number of flowers/plant: Number of flowers were counted for 5 plants (selected randomly) in each plot 85, 95, 100, 105, 110, 115 and 120 DAS. The total of these values was taken as total number of flowers/plant. Cumulative flowers/plant up to 95 DAS were also recorded. This was taken to compute the flowering during early phase.

Number of pods/plant: The mean value (for 5 plants) of pods/plant was counted at the time of harvest.

SETTING PERCENTAGE: $\dfrac{\text{Number of pod}}{\text{Number of flowers}} \times 100$

Number of seeds/pod: Twenty-five pods per plot were selected randomly at the time of harvest. Seeds were counted and average values were taken as number of seeds/pod.

100 Seed weight: 100 seeds were counted from each plot randomly and weight of these was taken in g.

Results

Flowering Behaviour: Flowering in control plants began 82 DAS and continued up to about 120 DAS Table 1 shows the data on the mean number of flowers produced per plant with different phenolic compounds. Compared with control, all the monophenols and one of the diphenols—Caffeic acid, significantly reduced the days taken to flower initiation. However, with monophenols up to 95 DAS, number of flowers significantly increased over the control. Total number of flowers also increased significantly over the control with the monophenols.

Pod Setting and Seed Yield: Table 2 depicts data on number of pods/plant, setting %, number of seeds/pod and 100-seed weight. All the tested monophenols increased significantly number of pods/plant over the control. Setting % was also higher than control with these treatments; increase was significant with 1,2,4-acid and SA. The number of seeds/pod and 100-seed weight did not change significantly with any of treatments indicating that phenolics may manipulate the number of sinks but not the size of sinks markedly. Interestingly, the monophenols recorded a slight increase in the number of seeds/pod as compared with control.

Discussion

Our studies bring out that foliar spraying of pigeon pea

Table 1 *Effect of foliar sprays certain phenolic compounds on the flowering behaviour of pigeon pea (Cajanua cajan (L.) Mills. c.v. AL-15*

	Days for flower initiatio	Number of flower plant Days								Total No. of flower/ plant DAS	No. of flowers/plat upto 95 days
		85	90	95	100	105	110	115	120		
Control (C)	82.0	40	50	96	90	45	25	4	1	351	386
Water (W)	81.5	42	54	120	126	36	19	2	1	399	216
Salicylic acid (SA)	77.5	70	74	156	54	27	0	0	537	300	
H-acid	78.0	55	50	65	192	135	66	1	1	543	312
1,2,4-acid	75.5	60	70	150	186	45	10	1	0	522	300
Caffeic acid (CA)	78.0	55	50	126	120	39	23	1	0	414	231
RD-Brown	79.0	49	53	120	126	45	28	2	0	423	222
Resorcinol (Res)	79.5	46	57	114	129	39	23	2	1	411	219
C.D. at 5%	3.3	17.	17.3	53.4	50.1	N.S.	N.S.	N.S.	N.S.	163.5	75.0

Table 2 *Effect of foliar sprays ofcertain compounds on number of pods/plant, setting%, number of seeds/pod and 100 seed wt. (g) in pigeon pea (Cajanus cajan (L.) Millsp.)*

	Number of pods/plant	Setting %	Number of seeds/pod	100 seed wt. (g)
Control	105	29.9	3.55	7.30
Water	108	27.1	3.50	7.25
SA	183	34.1	3.75	7.25
H-acid	174	32.0	3.65	7.15
1,2,4-acid	186	35.6	3.60	7.20
Ca	120	29.0	3.65	7.15
RD-Brown	123	29.1	3.65	7.20
Res.	114	27.7	3.55	7.35
C.D. at 5%	63.3	4.1	N.S.	N.S.

seedlings with monophenols caused early flowering, enhanced total number of flowers per plant and increased pod set.

Floral induction exhibited by GA_3 and SA in *Impatiens balsamina* was the result of increased mobilization of reserve food materials during transformation of vegetative meristems to reproductive phase (Nanda and Kumar 1977). Cleland (1985) examined chemical control of flowering in LDP *Lemna gibba* G_3 and showed that SA exerted its effects where flowering was limited by factors other than day length.

From our investigation, the role of monophenols in causing shift towards early flowering is evident. Shedrake (1979) has proposed a hydrodynamic model for *Cajanus cajan* suggesting that earlier formed flowers lead to successful pod formation, whereas later formed flowers experience inter-and intra-organ competition for photosynthates and nutrients between flowers and immature pods associated with pod shedding and pod filling, a process primarily determined by nutrients and endogenous plant hormonal balance (Cooper & Henry 1973). The actual mechanism underlying phenolic involvement in flowering is unknown (Kefeli 1985) but once more number of flowers leading to pod setting are initiated in pigeon pea during early flowering span, when the vegetative growth is profuse, the inter—and intra-flower and pod competitions could be minimized (Sheldrake & Narayanan 1979, Singh et al.1985). Upretty et al. (1979) proposed that efficiency of biomass conversion increased if flowers appeared much earlier in *Vigna unguiculata*. Delay of 5 to 15 days caused heavy loss to bioconversion efficiency leading to low crop yield. Though the dynamics of total biomass have not been studied yet the available data point towards a trend which tempts us to postulate that if flower number could be increased during the early span it would lead to increased pod-filling period, thereby giving higher yields.

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