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PHOTOPERIODIC INDUCTION OF FLOWERING IN HORSEGRAM (*Macrotyloma uniflorum* L. VERDIC)

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Horsegram is a cold-weather crop, generally grown during November and December season in Tamil Nadu. This implies that the crop is probably sensitive to photoperiodism. Since the yield improvement is being planned on the basis of specific breeding programmes, basic information is needed regarding the photoperiodic sensitivity of this crop. Four cultivars viz., CO 1, CODB 2, CODB 5 and CODB 6 were subjected to eight hour photoperiod along with the control which was placed under normal environmental conditions available during the period of experimentation. After ten days of short day treatment, the crop responded, showing floral initiation. The control plants did not flower at that enviromental conditions. The plant normally, requires short day condition for floral initiation but further development of flowers could take place under day neutral condition. There is a positive correlation between the flowering nodes and the leaves.

The concept of photoperiodism was understood by the experimental evidences of Garner and Allard (1920) Thereafter, photoperiodic response in number of cultivated crops had been investigated and the plants were classified into different categories (Borthwick and Parker, 1939); James and Smith, 1969 and Vince-Prune, 1975). The place of horsegram in the photoperiodic classification is yet to be identified due to lack of basic information. In dryland farming, horsegram commands its prominance both for its grain and for its forage. The crop is normally grown under cold-weather season in South India. In Tamil Nadu, it ranks first among the cultivated pulses as regards its area of distribution. The nutritive value of this grain legume is on par with other pulse crops (Anon. 1952). In order to understand the photosensitivity of this crop in relation to its yield response, a study was undertaken with two distinct photoperiodic cycles to evaluate the response of four promising horsegram cultivars. The experiments were carried out during August 1984.

MATERIAL AND METHODS

The study was undertaken in the glasshouse of Department of Crop Physiology, Tamil Nadu Agricultural University, Coimbatore. Four promising cultivars of horsegram viz , CO 1, CODB 2, CODB 5, and CODB 6 were grown in earthern pots (8 x 8 cm.). Each cultivar was grown in 20 pots. The pots were filled with soil, farmyard manuer and sand (5:1:1:). A fertilizer dose of 25:50 NP per ha was applied initially, three seedlinges were grown in each pot but prior to the induction of photoperiodic cycles, only one healthy seedling was maintained. Forty days old plants were selected for giving treatments viz., (a) normal

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photoperiodic cycle of 12.30 hours of daylight existing in the month of August (Control) and (b) eight hours day length followed by 16 hours darkness (short day treament). The normal photoperiod treatments were made available by keeping the pots in open condition in the glasshouse. The 16 hours darkness (short day treatment) was induced by keeping the pots in dark room from 4 pm to 8 am daily for 10 days from the commencement of the experment. After the termination of treatment, all the plants were allowed to grow under normal conditions. The following observatinos recorded included plant height, number of leaves, branches, nodes and flowering nodes. The correlation matrix among the different growth parameters was worked out according to Panseand Sukhatme (1954).

RESULTS AND DISCUSSION

The mean performance of the cultivars for all the growth parameters is presented in Table 1. The data revealed that the plant height was increased markedly in all the horsegram cultivars which received eight hour photoperiod The percentage increase in height over the control plants ranged from 9.94 to 33.26 among different horsegram cultivars. The increase in height was mainly due to short photoperiod and it could be attributed to 'etiolation effect by extra darkness imposed' (Mohr, 1979). A similar increase in height was observed in mesta (*Hibiscus cannabinus L.*) under short day treatment (Kumaraperumal *et al.*, 1971). The number of branches and nodes were also markedly increased by the short day treatment irrespective of cultivars. This might probably be attributed to the stimulatory effect exerted by the extra dark period imposed on these cultivars. This indicated that the short day treatment could be conducive for the growth and development of the horsegram plants.

There was also an increase in leaf number by the short day treatment in all the cultivars. This was invariably due to the number of branches and nodes which were found to increase by the above treatment. Besides, it was interesting to note that the eight hour photoperiod induced the flower initiation as well as increased the number of flowering nodes while there was on such response under the normal photoperiod. This characteristic feature confirmed that horsegram should strictly be a short day plant. The plants were kept under normal photoperiod condition after initiation of the flowering nodes and it was noticed that the plants continued to initiate flowering nodes. This clearly indicated that horsegram required short day situation only for the floral initiation but further development of flower was maintained even under normal conditions. Hence the horsegram belongs to the group of plants (Vince Prune, 1975) which require specific short days in their early stage for floral initiation. Further growth and development occurred under day neutral conditions in the case of *Kalanchoe blossfeldiana* (Bunsow, 1961).

Attempts were also made to work out a correlation matrix between the growth parameters obtained from short day treated plants (Table II). It was found that the number of flowering nodes was positively correlated with the number of nodes and leaves. This confirmed that leaves are the primary

Table 1. Effect of Photoperiod on Horsegram cultivars

Growth parameters	CO 1		CODB 2		CODB 5		CODB 6	
	a	b	a	b	a	b	a	b
Height of the plant cm	13.08 (9.5—15.0)	17.43 (12.5—21.5)	22.94 (17.5—32.5)	25.22 (18.0—35.0)	14.00 (10.0—19.5)	18.25 (13.5—29.5)	19.10 (8.00—29.4)	22.50 (18.5—34.00)
Number of leaves	21.00 (14—29)	30.3 (23—35)	34.25 (29—44)	37.00 (29—47)	30.00 (20—41)	34.25 (26—44)	34.33 (14—50)	42.5 (29—59)
Number of branches	NIL	1.29 (1—2)	1.25 (1—3)	2.78 (1—6)	1.33 (Nil—4)	2.25 (1—4)	1.22 (Nil—3)	2.50 (1—5)
Number of nodes	7.33 (5—10)	10.43 (8—12)	11.75 (10—15)	12.67 (10—16)	10.33 (7—4)	11.75 (9—15)	11.78 (5—18)	14.5 (10—20)
Flowering nodes	NIL	4.86 (3—7)	NIL	5.89 (3—9)	NIL	5.25 (4—8)	NIL	7.25 (4—11)
Percentage of flowering nodes	NIL	46.60	—	46.49	—	44.68	—	50.00

a = normal photoperiod b = 8 hr. photoperiod Range noted in the bracket

Table 2. Correlation matrix of different growth parameters of short day treated plants.

Growth parameters	Plant height	Number of leaves	Number of branches	Number of nodes	Number of flowering nodes
Flowering nodes	0.6447	0.9825*	0.6460	0.9820*	—
Number of nodes	0.6954	0.9999**	0.7669	—	—
Number of branches	0.8450	0.7666	—	—	—
Number of leaves	0.6947	—	—	—	—
Plant height	—	—	—	—	—

*P = 0.05
**P = 0.01

pre-requisites for flowering (Chailakhyan 1961). More number of leaves under short day treatment increased the sensitivity of the photoperiodic system and it resulted in producing more number of flowering nodes (Bidwell, 1979).

The study clearly brought out that horsegram is a short day plant as far as the initiation of flowering nodes is concerned Further growth and develolment of flowers continued even under normal conditions (day neutra-environment) Under short day conditions the cultivars exhibited etiolation effect associated with stimulation of vegetative and flowering characters. The positive corrleation of flowering nodes between number of leaves and nodes brought out the relationship of these growth attributes for floral initiation in this crop.

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