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EFFECT OF WATER AND LIGHT STRESS AND FOLIAR APPLICATION OF AUXINS ON FLOWER ABSCISSION AND SEED YIELD OF PIGEONPEA

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ABSTRACT

A field experiment to study the effect of water and light stresses imposed at flowering stage and foliar application of auxins on flower abscission and yield of pigeonpea short duration cv. ICPL- 288 indicated a significant increase of 5 and 8 per cent of flower drop with concomitant decrease of 28 and 42 per cent seed yield with water and light stresses respectively. In general, foliar application of NAA 20 ppm enhanced pods plant^{-1} and reduced the flower drop to an extent of 15 per cent and resulted in an increased seed yield by 23% over control plants indicating a favourable impact of NAA nutrition on seed yield of pigeonpea.

KEY WORDS : Water stress, light stress, flower shedding, NAA nutrition, seed yield

Adverse effects of water stress and light stress on yield of pigeonpea are well documented. The use of auxins to overcome flower abscission was found successful in chillies following appropriate agronomic practices (Singh and Murthy, 1984). This paper reports the effects of water and light stresses on flower abscission and yield and to alleviate the effect of above stresses by foliar application of auxins.

MATERIALS AND METHODS

A field experiment was conducted at wetland farm during post rainy season of 1990 at Sri Venkateswara Agricultural College, Tirupati, A.P. (13°N, 79°E). The experiment was laid in split plot design with three replications. Seeds were dibbled with 45 x 20 cm spacing. The soils are sandy loam having 10.08 per cent moisture at field capacity and 3.51 per cent moisture at permanent wilting point by weight. Water stress was created by withholding irrigation and light stress by providing muslin cloth chambers which allows 50 per cent light. The crop receiving irrigation served as control. The above treatments were imposed at 50 per cent flowering (80 days after sowing (DAS)) onwards and continued until harvest (120 DAS). The foliar sprays of NAA 20 ppm and water were given at 10 days interval from 80 to 120 DAS. The cultural practices recommended for the region were followed. The data on five randomly selected healthy plants tagged before onset of reproductive phase were recorded. Flower production and shed and pod formation plant^{-1}PT, were computed at the time of harvest by counting number of pods and number of scars left over by the dropped flowers. The percentages of flower drop was calculated as per plant basis. The crop at maturity was harvested from one m^{-2} area for recording total dry matter production (TDMP) and final yield data and its attributes.

RESULTS AND DISCUSSION

The total number of flowers produced plant^{-1} at maturity with water and light stresses was 11 and 33 per cent less than that of non- stressed plants respectively (Table 1). However, the number of flowers shed plant^{-1} was more with nonstress but the percentage of flower drop increased with water and light stressed plants. Interestingly, it was 5 and 8 per cent more flower drop with water and light stressed plants compared to non-stressed plants which is correlated with decreased yield under stressed plants. In addition, the total number of pods formed plant^{-1} and fruit set percentage at maturity were significantly higher with non-stress compared to water and light stress conditions. The magnitude of reduction in pods formed plant^{-1} was 28 and 48 per cent and fruit set 42 and 21 per cent with water and light stresses respectively compared to non-stressed plants. This was mainly due to decrease in soil moisture at flowering shortened the flowering period and decreased markedly the production of flowers and increased the flower drop, while under light stress it may be due to deficiencu of photosynthate production. These results are in consonance with the findings of Hang

Table 1. Reproductive efficiency of pigeonpea at maturity as influenced by water and light stresses and PGR treatment (Mean of 5 plants and expressed on plant^{-1} basis)

Treatment	Number of flowers formed	Number of flowers shed	Flower drop (%)	Number of pods formed	% of fruit set
Main treatment					
Non-stress	238.5	175.8	73.7	62.7	26.3
Water stress	211.9	163.3	77.1	48.6	22.9
Light stress	159.2	126.4	79.4	32.8	20.6
CD at 5%	5.6	6.1	1.9	4.1	1.9
Sub-treatment					
No spray (control)	196.8	158.8	80.7	38.0	19.3
Water spray	197.8	158.9	80.3	38.9	19.7
NAA 20 ppm spray	214.9	147.8	68.8	67.1	31.2
CD at 5%	8.1	8.3	1.4	2.7	1.4

et al. (1984) in groundnut. The foliar application of NAA (20 ppm) had significantly increased the total number of flowers formed plant^{-1} at maturity (9%) and pods formed plant^{-1} (76%) while it decreased the flowers shed (7%) and flower drop (15%) compared to no spray plants (control). The reduction in flower shedding might be due to probable improved water relations and harmonal balance which resulted increased formation and retention of flowers by NAA application. It supports the conclusion of Anuradha (1988) in green gram and Prasad and Rao (1990) in sesame who reported that foliar application of NAA under light and water stresses decreased the flower drop and increased the number of pods. The interaction between stress and plant growth regulator (PGR) treatments was found to be non-significant for most of the characters studied.

Water and light stresses significantly reduced the seed yield to an extent of 28 and 42 per cent respectively over non-stressed plants (Table 2). This is due to reduction in pod number m^{-2}, pod weight and 100-seed weight which ultimately resulted in decreased seed yield ; however seed number pod^{-1} was least affected. The harvest index reduced to an extent of 20 and 38 per cent due to water and light stresses respectively over nonstress. Foliar application of NAA significantly increased the seed yield by 23.2 per cent over control (no spray) plants. The increase in seed yield was associated primarily with increase in number of pods plant^{-1} (17%) which inturn was partly due to increased weight (4%) and number (6%) and partly due to low flower shedding percentage. These findings supported the views expressed by Pujari (1987) in pigeonpea.

From the correlation coefficient (Table 3), it is revealed that among the yield components, the number of pods m^{-2} had highly significant positive correlation with seed yield under all the situations. This relationship was expected because pod number strongly influences the seed yield in pigeonpea. Further, the 100- seed weight is positively correlated with seed yield under non-stress and water stress, but under light stress no such association was observed. The disappearance of significant association may be explained in view of the fact that under light stress the TDMP and

Table 2. Seed yield and its components of pigeonpea as influenced by water and light stresses and PGR treatment

Treatment	Seed yield (kg ha^{-1})	Pod dry weight (g m^{-2})	No. of pods m^{-2}	100-seed weight (g)	Number of seeds pod^{-1}	Harvest index (%)
Main treatment						
Non-stress	1590	216	703	8.7	4.10	37.1
Water stress	1140	163	532	8.3	3.89	29.7
Light stress	920	119	347	7.9	3.78	23.0
CD at 5%	130	6	28	0.1	NS	2.5
Sub-treatment						
No spray (control)	1120	156	490	8.2	3.84	28.4
Water spray	1140	161	503	8.2	3.87	28.9
NAA 20 ppm spray	1380	182	588	8.5	4.05	32.6
CD at 5%	60	7	19	0.1	0.13	2.6

Table 3. Correlation coefficients for various physiological and yield determining characters in pigeonpea cv ICPL 288 subjected to water and light stresses and PGR treatment

Character	Control (Non-stress)	Water stress	Light stress
Total dry matter production m^{-2}	0.8444**	0.8042**	0.6714*
No. of flowers formed pl^{-1}	0.1828	0.1901	0.2849
No. of flowers shed pl^{-1}	-0.7624*	-0.8146**	-0.8041**
% of flower shedding	-0.6933*	-0.6815*	-0.6876*
No. of pods m^{-2}	0.8712**	0.8349**	0.8766**
Number of seeds pod^{-1}	0.6866*	0.6953*	0.6782*
100-seed weight	0.6853*	0.6955*	0.6581

* Significant at 5% level
** Significant at 1% level

partitioning to reproductive parts is decreased resulting low seed weight. In addition, the number of flowers formed had no significant correlation, however the number of flowers shed was found to have strong negative relationship with water and light stress conditions and negative correlation with seed yield under nonstressed conditions. From the foregoing discussion it is suggested that increased seed yield interms of increased pod number and weight and decreased seed yield due to increased pod number and weight and decreased seed yield due to increased shedding of flowers especially under stress conditions. Hence the foliar application of NAA (20 ppm) which can enhance the number of pods with concomitant decrease of flower shedding is the most effective in enhancing the yield of pigeonpea.

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COMBINING ABILITY FOR GRAIN TRAITS IN RICE

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ABSTRACT

Combining ability studies in rice for grain traits revealed additive gene action for 100 grain weight, grain length, breadth and thickness. Based on the *per se* performance and *gca* effects, ADT 39 and Improved White Ponni were the best parents for improvement of grain traits besides grain yield. ADT 39/Pusa Basmati 1 and Improved White Ponni/Pusa Basmati 1 are suitable for recombination breeding, while IR 50/Pusa Basmati 1 may be exploited for heterosis breeding.

KEY WORDS : Rice, grain quality, combining ability

For a systematic breeding programme, it is essential to identify the parents and crosses for further genetic improvement. Combining ability of the parents gives useful genetic information regarding the selection of parents in terms of the performance of their hybrids. Eventhough many studies have been made on the combining abi for yield and component traits in rice, informa on the combining ability for grain traits is limi Hence, an attempt was made to study combining ability of grain characters through l x Tester analysis.