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EFFECT OF DIFFERENT LIGHT INTENSITIES ON GROWTH PERFORMANCE OF SOYBEAN VARIETIES

ARVIND KUMAR AND BRAJ KISHOR*

Post Graduate Studies & Research Centre
Department of Botany, T. N. B. College,
BHAGALPUR (BIHAR)
*P. G. Department of Biotechnology,
(T. M. Bhagalpur University, BHAGALPUR-812007)
Author's Email: brajkishor58@gmail.com

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ABSTRACT

Comparative performance of two varieties of Soybean [*Glycine max* (L.) Merrill] viz. RAUS-5 and JS-335 were studied with respect to plant height, branch number/plant, and leaf area, dry weight of plant, RGR, LAR, NAR, SLA and shoot/root ratio. RAUS-5 appeared better performing in a variety of light conditions.

Figure : 00 References : 09 Table : 01

KEY WORDS : Growth performance, Light intensities, Soybean.

Introduction

Light affects the growth and morphogenic behaviour of plants in manifold ways. There are several reports of photomorphogenic response under different light intensities[4]. Effect of photoperiod on dry matter distribution within the plant has been reported by different workers[1,3,8,9]. The growth of the plant is affected by the total amount of light available from the sun in a particular habitat.

In the present investigation the effect of different light intensities on the two varieties of Soybean *viz*. RAUS-5 and JS-335 were studied. The effects were analysed in terms of plant height, branch number/plant, leaf area, dry weight of plant, RGR, LAR, NAR, SLA and shoot/root ratio.

The following derived growth parameters were calculated as :-

(i) Relative Growth Rate (RGR) $= \frac{\log_e W_2 - \log_e W_1}{(t_2 - t_1)}$

Where,

W_1 and W_2 are total plant dry weight at the time t_1 and t_2 respectively and t_2-t_1 is 7 days (one week).

(ii) Net Assimilation Rate(NAR)

$$= \frac{(W_2 - W_1)(\log_e L_2 - \log_e L_1)}{(t_2 - t_1)(L_2 - L_1)}$$

Where,

L_1 and L_2 are total leaf area and W_1 and W_2 are total plant dry weight at times t_1 and t_2 respectively.

(iii) Leaf Area Ratio (LAR) $= \frac{\text{Total leaf Area}}{\text{Total Plant dry Wt.}}$

(iv) Specific Leaf area (SLA) $= \frac{\text{Total Leaf Area}}{\text{Total Leaf dry Wt.}}$

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(v) Shoot/Root Ratio (S/R ratio)

$$= \frac{\text{Total dry Wt. of Shoot}}{\text{Total dry Wt. of Root}}$$

Material and Methods

Seeds of the two varieties of Soybean *viz.* RAUS-5 and JS-335 were sown in earthen pots on 1st June, 2014. Pots were watered everyday to their full capacity. White muslin cloth and mosquito net were used to cover bamboo tents under which artificial shading on plants were created. Three light regimes were:

S-I - Full light under natural day condition (100%)

S-II - Light under netted cloth cover (90%)

S-III - Light under muslin cloth cover (70%)

Harvesting was done after 50 days during which three plants were taken from each of the 3 light regimes, with their intact roots. The adhering soil particles were washed with fine jet of water. Root, stem and leaves were separated with scissors. Outline of leaves were drawn on a graph paper and their area were found out. Plant parts (Root, stem and leaves) were dried separately in butter bags at 80 °C in an oven for 48 hours and stored in desiccators before weighing.

Results and Discussion

As seen in Table-1, shading caused elongation of the main stem in all the two varieties but there were lesser branches in the shaded condition. The numbers of leaves were higher in SI in RAUS-5 while it was higher in SIII in case of JS-335. The contrasting effect of light and shade in general was in consonance with earlier

TABLE-1 : Records of growth attributes of two varieties of [*Glycine max* (L.) Merrill] in response to different light conditions.

Growth Attributes	Varieties	Light Regimes		
		S-I	S-II	S-III
Plant Height (cm)	RAUS-5	337.15	295.15	448.85
	JS-335	310.05	348.80	465.30
Branch Number/ plant	RAUS-5	15.0	19.0	12.0
	JS-335	22.5	15.5	11.5
Leaf Area (cm^2)	RAUS-5	5282.955	4781.585	3876.660
	JS-335	4821.245	4636.870	4212.770
Plant Dry Weight (mg)	RAUS-5	42.758	33.943	22.387
	JS-335	40.814	33.194	20.530
RGR (mg/mg/week)	RAUS-5	3.8313	3.9943	3.3277
	JS-335	4.0560	3.8790	3.1253
NAR (mg/cm^2/week)	RAUS-5	0.0255	0.0246	0.0179
	JS-335	0.0277	0.0214	0.0133
LAR (cm^2/mg)	RAUS-5	910.061	988.565	1144.182
	JS-335	873.798	1042.243	1383.027
SLA (cm^2/mg)	RAUS-5	2252.665	2528.629	9261.893
	JS-335	2205.014	2602.626	3693.520
S/R Ratio	RAUS-5	7.359	10.720	15.119
	JS-335	6.851	10.493	15.213

observations[2].

The dry matter accumulation was maximum in full light which diminished with shading. RAUS-5 had maximum dry weight and JS-335 had the minimum one. Comparatively RAUS-5 appeared better performing in a variety of light condition. The dry matter accumulation pattern has generally been reported to be more in the natural light for many plants[5-7].

The increase in leaf area was maximum in full light in the two varieties. Overall RAUS-5 had the maximum leaf area while JS-335 had the minimum one. In RAUS-5 and JS-335 leaf area were minimum in SIII. The decrease in leaf area in RAUS-5 and JS-335 with reduction of light from 90% to 70% showed its non-adaptability to shading. In general the leaf area decreased with shading in all the two varieties.

The relative growth rate (RGR) was maximum in SI in case of JS-335 while it was maximum in SII in case of RAUS-5. In both varieties it was minimum in SIII. RGR in general decreased with shading. The net assimilation rate (NAR) was maximum in full sunlight and minimum in SIII in both varieties.

The leaf area ratio (LAR) increased with reduction in light, being maximum in S-III for the two varieties. In general, the common feature of higher LAR with reduction in light was reflected for all the varieties as reported by other workers[2]. Under 70% light JS-335 had higher LAR which was indicative of its having more survival value over the two.

The shoot/root ratio increased with shading being maximum in SIII for both the two varieties. This feature is of significance with regard to shade tolerance. JS-335 and RAUS-5 had maximum S/R ratio in 70% light.

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