The Andhra Agric. J 56(3):350-352, 2009

Chlorophyll Content and Seed Yield of Blackgram Genotypes

K Renuka Devi, G Rama Rao and K B Reddy
Department of Plant Physiology, S.V. Agricultural College,Tirupati 517502, Andhra Pradesh

ABSTRACT

A field experiment was conducted during Rabi 2007-08 to study the chlorophyll content and seed yield of blackgram genotypes which revealed that among the blackgram genotypes, LBG 735 recorded maximum chlorophyll a, chlorophyll b, total chlorophyll, SPAD Chlorophyll Meter Reading (SCMR), seed yield and yield components compared to other genotypes WBG 26 recorded the lowest values for the above parameters.

Key words : Blackgram, Chlorophyll Content, SCMR, Seed Yield

.

In southern zone of Andhra Pradesh mainly Nellore and Prakasam districts, blackgram is grown in early Rabi (October) under dry land conditions. The low productivity of blackgram is attributed to the mid and terminal moisture stress often encountered due to irregular or failure of North – East monsoon. Moisture stress at flowering and poding stages reduce seed yield and harvest index significantly .Under such conditions identification of genotypes with high dry matter, chlorophyll content and water use efficiency is necessary either for recommending to farmers or breeding for drought tolerant cultivars. SCMR is an indication of leaf nitrogen and SLN (Specific Leaf Nitrogen) determines the differences in WUE. Hence, it is visualized that SCMR could reflect the differences in WUE. SCMR is known to be related to leaf nitrogen content in several crops (Uzik and Zofa Zova, 2000 and Veeraputhiran *et al.,* 2001). Reddy *et al.,* (2003) reported that significant negative correlation between SCMR and SLA while the correlation between SCMR and total chlorophyll and SCMR and seed yield were positive in groundnut genotypes. In groundnut plants stressed from 42-80 DAS, total chlorophyll content of leaves was reduced under simulated drought compared to adequately irrigated conditions (Babitha and Reddy, 2001). Hence, present investigation was conducted to study the chlorophyll content and seed yield of blackgram genotypes grown under natural conditions.

MATERIAL AND METHODS

A field experiment was conducted in wetland farm of S.V.Agricultural College, Tirupati in randomized block design with 15 genotypes replicated thrice during Rabi 2007-08. Treatments consists of fifteen cultivars of blackgram (LBG 17, LBG 20, LBG 402, LBG 611, LBG 623, LBG 645, LBG 648, LBG 685, LBG 734, LBG 735, LBG 741, LBG 749, LBG 752, T9 and WBG 26) obtained from RARS, Lam were used for the study. The plot size was 4×2 m and crop was sown with a spacing of 30×10 cm. Recommended dose of fertilizers were applied.

Need based life irrigation was given. Prophylactic measures were taken for protecting the crop from diseases and pests. Chlorophyll a, b, total chlorophyll was determined at 15, 30, 45, 60, 75 DAS by DMSO method SCMR values were recorded with SPAD chlorophyll meter at 15, 30,45, 60, 75 DAS .The data on seed yield and yield components were recorded at the time of harvest.

RESULTS AND DISCUSSION

Chlorophyll a, chlorophyll b and total chlorophyll content gradually increased up to 60 days after sowing in all the cultivars and later it decreased (Table1). The decreased chlorophyll a, b and total chlorophyll after 60 days might be due to senescence and ageing of leaves. Significant differences were observed among cultivars for chlorophyll a, b and total chlorophyll at all stages of crop growth. Among the cultivars, LBG 735 recorded significantly highest chlorophyll a, (1.141 mg $g^{-1}$of tissue) chlorophyll b, (0.510 mg g^{-1} of tissue) and total chlorophyll (0.362 mg g^{-1} of tissue) at 60 DAS and it was on par with LBG 17, LBG 685 and LBG 645. However, lowest chlorophyll a, (0.821 mg g^{-1} of tissue) chlorophyll b, (0.340 mg g^{-1} of tissue) and total chlorophyll (0.268 mg g^{-1} of tissue) was recorded in WBG 26.The high chlorophyll content a,b and total chlorophyll in LBG 735 might be due to high specific leaf nitrogen. The genotypes with high Rubisco and low SLA may have high WUE. Bindu Madhava *et al.,* (2003) revealed that strong association between SLN and WUE in peanut can

Table 1. Chlorophyll content and SCMR values of blackgram cultivars grown under field conditions

Cultivars	Chlorophyll a (mg g^{-1} of fresh weight of tissue)			Chlorophyll b (mg g^{-1} of fresh weight of tissue)			Total Chlorophyll (mg g^{-1} of fresh weight of tissue)			SCMR		
	30 DAS	60 DAS	75 DAS	30 DAS	60 DAS	75 DAS	30 DAS	60 DAS	75 DAS	30 DAS	60 DAS	75 DAS
LBG 17	1.110	1.131	0.990	0.400	0.500	0.430	0.303	0.344	0.172	38.5	49.3	43.0
LBG 20	0.890	0.913	0.800	0.300	0.400	0.330	0.261	0.304	0.151	35.2	45.4	38.0
LBG 402	0.950	0.975	0.862	0.335	0.435	0.365	0.282	0.315	0.158	36.5	46.6	40.5
LBG 611	0.990	1.010	0.900	0.340	0.440	0.370	0.284	0.317	0.160	37.0	47.0	41.0
LBG 623	0.920	0.942	0.830	0.310	0.410	0.340	0.271	0.305	0.152	35.3	45.5	38.5
LBG 645	0.998	1.072	0.970	0.370	0.470	0.400	0.293	0.335	0.167	37.5	48.0	42.0
LBG 648	0.995	1.061	0.950	0.355	0.455	0.385	0.284	0.326	0.163	37.8	47.5	41.5
LBG 685	1.050	0.092	0.980	0.390	0.490	0.420	0.296	0.340	0.170	35.0	48.5	42.5
LBG 734	0.850	0.871	0.760	0.290	0.390	0.320	0.252	0.296	0.148	34.5	44.5	37.5
LBG 735	1.120	1.141	0.995	0.411	0.510	0.441	0.320	0.362	0.181	39.5	49.7	43.7
LBG 741	0.940	0.963	0.850	0.320	0.420	0.350	0.278	0.310	0.155	36.0	45.8	39.5
LBG 749	0.840	0.855	0.750	0.280	0.380	0.310	0.251	0.294	0.147	34.0	44.4	36.0
LBG 752	0.820	0.842	0.730	0.265	0.365	0.295	0.242	0.285	0.142	33.5	44.3	35.5
T9	0.810	0.834	0.720	0.255	0.355	0.295	0.237	0.281	0.135	33.5	43.0	33.7
WBG 26	0.800	0.821	0.708	0.240	0.340	0.270	0.221	0.268	0.130	33.0	43.0	33.7
SEm±	0.026	0.022	0.021	0.023	0.022	0.022	0.013	0.014	0.007	1.10	0.97	1.06
CD(0.05)	0.077	0.065	0.062	0.067	0.064	0.064	0.040	0.043	0.021	3.30	2.83	3.09

Table 2 . Yield and yield components of blackgram cultivars grown under field conditions

Cultivars	No.of pods/ plant	No.of seeds/ plant	Test weight(g) (100 seed)	Seed yield (kg/ha)	Harvest index (%)
LBG 17	26.0	7.1	5.0	1615	42.70
LBG 20	19.0	6.3	4.2	1320	39.55
LBG 402	22.3	6.6	4.5	1410	39.21
LBG 611	22.1	6.7	4.6	1510	40.37
LBG 623	19.3	6.4	4.3	1350	39.28
LBG 645	24.1	6.9	4.8	1580	40.80
LBG 648	23.1	6.8	4.7	1560	39.45
LBG 685	25.3	7.0	4.9	1602	38.46
LBG 734	18.0	6.4	4.1	1360	39.45
LBG 735	27.1	7.2	5.1	1650	44.79
LBG 741	20.5	6.5	4.4	1380	38.45
LBG 749	17.5	6.1	4.0	1280	38.40
LBG 752	16.5	6.0	3.9	1250	38.13
T9	15.8	5.9	3.8	1235	38.50
WBG 26	15.0	5.8	3.7	1210	38.05
SEm±	1.41	0.19	0.11	77.23	0.50
CD (0.05)	4.09	0.57	0.32	223.88	1.50

largely attributed to the dependence of WUE on intrinsic mesophyll efficiency. Leaf nitrogen status is often reflected through leaf chlorophyll content and such association has been shown in several crops such as groundnut (Bindhu Madhava, *et al* 2003) and Cotton (Veeraputhiran *et al.,* 2001).

SPAD chlorophyll meter reading (SCMR) is an index of leaf nitrogen status. Since SLN determines the differences in WUE, it can be visualized that SCMR could reflect well the differences in WUE. The SCMR values increased up to 60 DAS in all the cultivars and later it decreased (Table 1). Genotypic variability for SCMR was observed ranging from 33.0 to 49.7 among cultivars. There was significant difference between the cultivars for SCMR values at all stages of crop growth. The decreasing of SCMR values after 60 DAS is mainly due to decrease of chlorophyll content as the age of the crop advances. Among the cultivars tested, LBG 735 recorded significantly highest SCMR (49.7) and lowest SCMR values were recorded in WBG 26 at 60 DAS (33.0). The highest SCMR value in LBG 735 can be ascribed to the maintenance of higher chlorophyll content in the leaf Sudhakar *et al.,* (2006) reported that significant positive relation between SCMR and seed yield in greengram under moisture stress indicating that SCMR could be used as a screening tool for pod yield under drought condition.

Yield in crop plants is the ultimate expression of many yield attributes which are dependent on each other. There was significant difference between cultivars for number of pods per plant, number of seeds per pod, test weight and seed yield (Table 2), Among the cultivars tested LBG 735 recorded significantly highest seed yield (1650 kg ha^{-1}) and lowest seed yield was recorded in WBG 26 (1210 kg ha^{-1}). The higher seed yield in LBG 735 might be due to more chlorophyll a, b, total and higher SCMR and there by increased yield components and yield. Incidentally, the cultivar has highest dry matter, SCMR and lower SLA, which are most desirable traits looked in any cultivar. Similar results were reported by Bindhu Madhava *et al.,* (2003) in groundnut. Sudhakar *et al.,* (2006) reported that there was a positive relationship between SCMR and seed yield in greengram.

Harvest index reflects the physiological capacity of a crop to mobilize and translocate photosynthates to organs having economic value. There was significant difference between cultivars for harvest index. LBG 735 recorded significantly higher H.I (44.79%) and lower H.I was recorded in WBG 26 of 38.05 percent. The higher H.I in LBG 735 might be due to better partitioning of assimilates to sink. Babitha and Reddy (2001) observed high H.I and high WUE in TAG 24, KGS 768 and Somanath groundnut cultivars even under moisture stress conditions. The present field study revealed that among the cultivars tested, LBG 735 recorded maximum chlorophyll a, b, total chlorophyll, SCMR, harvest index and seed yield in black gram.

LETERATURE CITED

Babitha M and Reddy PV 2001. Physiological traits related to water use efficiency in groundnut under stress and non-stress conditions. Journal of Research ANGRAU 29: 9-15.

Bindu Madhava H, Shashashayee N and Udaya Kumar M 2003. Use of SPAD chlorophyll meter to assess transpiration efficiency of peanut. Breeding of drought resistant peanut, ACIAR Proceedings No. 112:3-9.

Reddy P V, Ashalatha M, Vasanthi R P, Sujatha D and Vijay Lakshmi M 2003. Evaluation of trait based and empherical selections for drought resistance at Tirupati, A.P. India. Breeding of drought resistant Peanut, ACIAR Proceedings No. 112:37-42.

Sudhakar P, Latha P, Babitha M, Prasanthi L and Reddy P V 2006. Physiological traits contributing to grain yields under drought in black gram and green gram. Indian Journal of Plant Physiology 11: 391-396.

Uzik M and Zofa Zova A 2000. Chlorophyll and nitrogen content in leaves of winter wheat at different genotype and fertilizer. Rostilina Vyrobha 46: 237-244.

Veeraputhiran R, Kandasamy O S and Chandra Sekhar N 2001. Standardization of chlorophyll meter reading for summer irrigated hybrid cotton. Madras Agricultural Journal 88: 144-146.

(Received on 05.05.2009 and revised on 30.06.2009)