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Morpho-biochemical parameters in blackgram (*Vigna mungo* L. Hepper) genotypes under drought stress condition

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Abstract**—** *The present study carried out with ten blackgram accessions collected from NBPGR regional centre and T-9(Check) from ICAR-CRIDA, Hyderabad. The experiment was conducted in experimental farm, Department of Genetics, Osmania University Hyderabad during Rabi,2021. The ANOVA results revealed that for treatments all the yield,physiological and biochemical parameters were showed significant variability except 100 seed weight. All the yield and physiological parameters were significant for genotype x treatment except number of branches per plant and canopy temperature. The character seed yield (g/pl) was observed under irrigated condition highest by IC436524 and lowest by T-9. Whereas highest seed yield (g/pl) was observed under drought condition by IC426766. It was also observed that the genotype IC426766 28.84% over its control and 37.65% over T-9 under drought condition. The genotype IC426766 also showed higher proline content, RWC, lower MDA, higher SPAD reading and lower canopy temperature under drought condition. Among ten blackgram accession IC 426766 was identified as drought tolerant/resistance based on morphological, physiological and biochemical parameters.*

Keywords**— Blackgram, drought stress, physiological and biochemical parameters.**

I. INTRODUCTION

Blackgram, also known as urdbean (*Vigna mungo* L. Hepper), is one of the major pulses. grain legume having a protein that is quickly absorbed. It is a member of the 2n=22 family Fabacaceace. About 25% of blackgram grain is protein, 56% is carbohydrate, 2% is fat, and 4% four percent vitamins and one percent minerals. Blackgram, or *Vigna mungo* (L.) Hepper, is a common plant that produces 20% of the world's pulses (Saravanakumar *et al.*, 2007). Blackgram is grown on 761.3 thousand hectares of land in India, yielding 678.6 thousand tonnes of output and 891.0 kg ha-1 of productivity.However, a number of environmental stressors, including drought, which lowers yield, have a negative impact on blackgram production (Pandey *et al.*, 2014). Globally, one of the biggest risks to productive agricultural production is soil moisture stress.

Globally, abiotic stressors, particularly drought, significantly reduce crop yields (Vinocur and Atman 2005). It is the main obstacle preventing crops from finishing their life cycle, particularly in light of climate change. The past few decades have seen an increase in the frequency of dry spells during various agricultural growth phases.Plants undergo a variety of morpho-physiological and biochemical reactions in response to drought stress in order to adapt. Stress has varying effects depending on the crop's phenophases, duration, and intensity. The primary criterion in the majority of research evaluating germplasm for drought resistance is seed yield. However, for an effective breeding program identifying characters

promoting drought tolerance is as vital. A moderate loss of water is regarded as drought stress,as it causes stomatal closure and restricts gas exchange. It disrupts the ultrastructure of subcellular organelles and the cell membrane, changing the physiological and biochemical processes (Yordanov *et al.,* 2003). It also disturbs the turgor pressure in cells. It hinders the growth of root cells, reduces nutrient intake, and interferes with photosynthesis, all of which have an impact on plant growth and development (Dhole and Reddy, 2010). Poor grain yield is the result of drought stress's effects on morphological, physiological, and biochemical traits (Baroowa and Gogoi 2012, 2013; Baroowa *et al.,* 2016; Maheswari *et al.,* 2016). Increased severity and duration of drought stress result in a greater loss of chlorophyll content (Kiani *et al.,* 2008). Due to a decrease of cell turgidity, drought stress alters turgor pressure and impacts cell expansion, which hinders plant growth (Mondal *et al.,* 2012). Additionally, it affects the photosynthetic apparatus and reduces the rate of photosynthesis (Manivannan *et al.,* 2007).

II. MATERIALS AND METHODS

Ten blackgram accessions collected from NBPGR regional centre and T-9 (Check) from ICAR-CRIDA, Hyderabad were used for the drought stress study. The experiment was conducted in experimental farm, Department of Genetics, Osmania University Hyderabad during Rabi,2021. The seeds of selected ten genotypes were sown in pots in three replication of two sets, one for control (irrigated) and the other for drought stress study. Both sets were irrigated regularly till flowering stage i.e.; up to 24 days. From next day to induce drought stress in genotypes, water supply will be stopped in one set where as other set (control set) will be watered regularly.Observations were recorded on 33rd day i.e.; after 9 days of inducing drought stress and morphological data was recorded in both irrigated and drought plants .

Estimation of Relative Water Content (RWC)

Fresh leaves were taken and data will be recorded for FW-Fresh leaves weight, DW-Dry Leaves weight, TW-Turgid leaves weight.

The RWC was determined by the equation:

$$RWC\ (\%) = \frac{(FW - DW)}{TW-DW} \times 100$$

FW- Fresh leaves weight

DW- Dry Leaves weight

TW- Turgid leaves weight

Estimation of Proline

Proline accumulation levels in leaf samples will be determined based on “Ninhydrin Reagent” method (Bates et al.1973).

Estimation of MDA:

The malondialdehyde (MDA) content was determined by the thiobarbituric acid (TBA). 3g of leaf sample was collected and ground in a mortar and pestle with liquid nitrogen.The optical density was measured at 532 and 600nm and the concentration of MDA-TBA concentration was calculated.The MDA content was calculated based on the following equation: $6.45 \times (OD532 - OD600) - 0.559 \times OD450$.

SPAD meter

The SPAD meter measures the difference between the transmittance of a red (650 nm) and an infrared (940 nm) light through the leaf, generating a three-digit SPAD value(Uddling et al., 2007. The SPAD- 502Plus measures the absorbance of the leaf in the red and near-infrared regions. Using these two absorbance the meter calculates a numerical SPAD value which is proportional to the amount of chlorophyll present in the leaf.

Canopy temperature

Canopy temperature is often used to indicate vegetative water status and is used in models for estimating transpiration rates and sensible heat transport from vegetation.Canopy temperature is measured remotely by the infrared thermometer (IRT) Normal value of temperature is 70-95°C

Results and discussion:

The analysis of variance (ANOVA) results revealed that for treatments all the yield and yield contributing traits were showed significant variability except pods per plant. All the yield and physiological parameters were significant for genotype x treatment (Table 1). Similar significant variability for the traits was observed under drought condition by Gurumurthy *et al.,* 2019 and Anitha *et al.,* 2015 in blackgram.For physiological parameters it was observed that significant variability were found for all the physiological and biochemical parameters due to treatment and treatment vs genotypes except pods per plant due to treatment.Similar significant variability for the traits was observed under drought condition by Gurumurthy *et al.,* 2019 and Anitha *et al.,* 2015 in blackgram.

Table 1: Analysis of variance for quantitative characters in blackgram under irrigated and drought stress conditions

Source of Variation	DF	MSSQ									
		Characters									
		Pl.ht(cm)	Br./pl	No.of L./pl	Cl./pl	Pods/pl	P. wt/pl(g)	No.of S./pl	S.Y.(g/pl)	100 S. wt	H. wt(g)
Replications	2	1.898	1.488	0.197	6.788	0.545	3.519	406.47	0.446	0.09	0.008
Treatments	1	184.034**	63.641**	29.333**	49.227**	0.136NS	127.769**	90058.242**	717.421**	6.231**	39.301**
Genotypes	10	46.574**	3.754**	15.479**	29.212**	181.882**	25.564**	9572.542**	22.195**	0.645**	11.501**
Treatments *vs* Genotypes	10	7.193**	3.442**	42.533**	22.727**	53.603**	8.805**	681.742*	4.921**	0.324*	1.564**
Error		1.6	0.753	1.483	1.677	11.625	1.587	297.660	1.071	0.143	0.209
SD		0.311	0.214	0.300	0.319	0.839	0.31	4.247	0.255	0.093	0.112
CV%		6.5	14.94	9.68	13.29	8.9	8.88	13.06	15.87	10.82	10.2

***Significant at 0.05% and ** at 0.01 % level, respectively**

DF-Degree of Freedom; Pl.ht(cm)- Plant height (cm); Br/pl-Branches per plant; LN/pl-Leaves number per plant; CL/pl-Clusters per plant; PD/pl-Pods per plant; PDW-Pod weight; SDN-Seed number per plant; SDW-Seed yield; 100SDW-100 seed weight; HSW-Husk weight.

Table 2: Analysis of variance for physiological and biochemical parameters in blackgram under irrigated and drought stress conditions

Source of Variation	DF	MSSQ				
		Characters				
		RWC(%)	SPAD	C. Temp	MDA	Proline
Replications	2	3.848	3.3	0.776	0.056	7.378
Treatments	1	567.307**	8.903*	4.41	126.105**	3439.752**
Genotypes	10	103.122**	8.183**	12.963	29.274**	227.949**
Treatments *vs* Genotypes	10	11.141**	2.403	8.569	4.462**	107.153**
Error		2.404	1.857	2.219	0.246	5.5
SD		0.382	0.335	0.367	0.122	0.577
CV%		2.03	3.96	4.25	3.2	7.26

***Significant at 0.05% and ** at 0.01 % level, respectively**

RWC- Relative water content; SPAD-Chlorophyll content; C.Temp-Canopy temperature (°C); MDA-Malondialdehyde(µM/g fresh Wt)

The mean value of plant height recorded highest by IC426766 (30.33cm) under Irrigated condition whereas the variety IC261182 (22.33) recorded highest plant under Drought condition. Whereas under Drought condition the plant height was ranged from IC261182 (22.33cm) to IC436628 (14.22cm). Number of branches per plant ranged from T-9 (9.00) to IC476753 (4.33) under Irrigated condition. Whereas under Drought condition number of branches ranged from IC436524 (5.67) to IC476784 (3.50). In Drought condition highest number of branches per plant was observed by IC436524 (5.67), IC426766 (5.67) and lowest branches per plant was recorded by IC476784 (3.50) drought stress condition. The number of leaves per plant highest was observed in IC426766 (18.00) under Irrigated condition. Whereas highest plant was observed by IC436628 (15.33) under Drought condition. The character number of clusters per plant ranged from IC382811 (12.67) to IC519620 (10.00) under irrigated condition. Where as in drought condition recorded from IC426766 (14.67) to IC519620 (4.00). The mean value of pods per plant highest was observed under irrigated condition by IC261182 (45.00). Whereas under drought condition it was observed in IC426766 (52.00). The character pod weight per plant was observed highest under irrigated condition by IC426766 (17.33g) and lowest by IC546472 (10.00g). Whereas highest was observed under Drought condition IC261182 (16.69g) and lowest by T-9 (11.29g). The mean value of number of seeds per plant highest seeds are observed in plant by IC426766 (243.33) and lowest

by IC436628 (136.33) under irrigation condition. Whereas in Drought condition highest seeds by IC426766 (229.00) and lowest by IC436628 (57.67). The character hundred seeds was observed highest by IC261182 (4.23g) lowest was observed by T-9 (3.25g) under irrigated condition. Whereas drought condition heights was observed as IC426766 (3.61g) the lowest was observed T-9 (2.64g).The character of husk weight per plant range from IC382811 (7.24g/pl) to IC519620 (4.16g/pl) under irrigated condition where as in drought condition highest husk weight (g/pl) was observed range from IC426766 (7.62) to IC436524 (2.56) (Table 4). Prior research on legumes also revealed similar results (Bhatt and Srinivasa Rao 2005; Baroowa and Gogoi 2012). Reduced leaf count is the outcome of defoliation and the cessation of new leaf production brought on by drought stress (Mwale et al. 2007). The character seed yield was observed under irrigated condition highest by IC436524 as 14.33g/pl and lowest by T-9 (4.67g/pl). Whereas highest seed yield was observed under drought condition by IC426766 recorded as 7.49g/pl and lowest seed yield was observed in IC436628 (2.27g/pl).It was also observed that the genotype IC426766 28.84% over its control and 37.65% over T-9 under drought condition (Table 5).Gurumurthy *et al.*,2019 reported that similar increased seed yield and yield contributing traits over control under drought stress condition in blackgram.

Table 3. Mean performance of quantitative traits and physiological parameters in blackgram genotypes under irrigated condition.

Genotypes	Pl.ht(cm)	Br./pl	No.of L./pl	Cl./pl	Pods/pl	P. wt/pl(g)	No.of S./pl	S.Y.(g/pl)	100 S. wt	H. wt(g)
IC261182	23.13	7.67	16.67	11.00	45.00	16.67	241.67	10.67	4.23	7.02
IC436524	18.67	7.00	16.00	10.00	39.00	13.67	146.00	14.33	4.22	5.77
IC476753	20.67	4.33	8.67	10.67	32.00	11.33	143.00	4.67	3.41	4.81
IC382811	19.33	7.33	17.00	12.67	35.67	17.00	242.33	5.67	3.36	7.24
IC436628	17.83	4.67	8.33	10.33	36.67	10.67	136.33	4.67	3.72	4.60
IC476784	20.67	7.67	10.00	10.33	35.33	11.33	138.67	5.00	3.62	4.18
IC426766	30.33	7.67	18.00	10.33	39.56	17.33	243.33	5.33	3.50	6.95
IC546452	19.00	6.33	8.33	10.00	31.00	10.67	146.00	5.67	3.42	4.32
IC546472	19.00	7.00	9.00	11.00	35.67	10.00	141.00	5.67	3.26	4.33
IC519620	20.83	6.00	8.67	10.00	33.67	10.67	139.67	4.67	3.78	4.16
T-9	20.52	9.00	10.00	10.33	39.33	11.33	141.00	4.67	3.25	4.37
Mean	***20.91***	***6.79***	***11.88***	***10.61***	***36.63***	***12.79***	***169.00***	***6.45***	***3.61***	***5.25***
Sd	***3.44***	***1.38***	***4.06***	***0.77***	***3.96***	***2.86***	***47.26***	***3.13***	***0.35***	***1.25***

Pl.ht(cm)- Plant height (cm); Br/pl-Branches per plant; LN/pl-Leaves number per plant; CL/pl-Clusters per plant; PD/pl-Pods per plant; PDW-Pod weight; SDN-Seed number per plant; SDW-Seed yield; 100SDW-100 seed weight; HSW-Husk weight.

Table 4. Mean performance of quantitative traits and physiological parameters in blackgram genotypes underdrought stress condition.

Genotypes	Pl.ht(cm)	Br./pl	No.of L./pl	Cl./pl	Pods/pl	P. wt/pl(g)	No.of S./pl	S.Y.(g/pl)	100 S. wt	H. wt(g)
IC261182	22.33	5.40	14.33	14.00	45.00	16.69	129.33	4.44	3.43	5.76
IC436524	18.26	5.67	9.33	13.00	35.33	13.49	95.00	3.08	3.25	2.56
IC476753	14.31	4.50	14.67	4.33	36.67	12.43	65.00	2.39	3.67	2.57
IC382811	21.51	5.00	12.33	13.33	43.67	15.71	123.33	3.08	3.55	4.74
IC436628	14.22	4.50	15.33	8.67	34.33	13.49	57.67	2.27	3.93	2.82

IC476784	14.57	3.50	14.00	6.33	32.33	14.61	70.67	2.56	3.62	2.65
IC426766	22.15	5.67	11.33	14.67	52.00	16.54	229.00	7.49	3.93	7.62
IC546452	16.47	4.00	13.00	7.00	33.00	13.37	75.67	2.89	3.83	2.59
IC546472	17.27	4.50	14.00	5.33	37.67	13.24	66.33	2.59	3.91	2.62
IC519620	15.48	5.00	14.33	4.00	39.33	13.49	79.00	2.36	2.99	3.44
T-9	19.09	4.50	13.00	7.00	32.67	11.29	88.00	2.33	2.64	3.49
Mean	***17.79***	***4.75***	***13.24***	***8.88***	***38.36***	***14.03***	***98.09***	***3.23***	***3.52***	***3.71***
Sd	**3.13**	**0.68**	**1.73**	**4.09**	**6.21**	**1.69**	**49.21**	**1.54**	**0.42**	**1.66**

Pl.ht(cm)- Plant height (cm); Br/pl-Branches per plant; LN/pl-Leaves number per plant; CL/pl-Clusters per plant; PD/pl-Pods per plant; PDW-Pod weight; SDN-Seed number per plant; SDW-Seed yield; 100SDW-100 seed weight; HSW-Husk weight.

Table 5.% increase/decrease of seed yield (g/pl) over respective controls and over T-9 (check) under drought stress condition in blackgram genotypes

	Irrigation	**Drought**	**% increase/decrease**	
Genotypes	**SDW.(g/pl)**	**SDW(g/pl)**	**over control**	**over T-9**
IC261182	10.67	4.44	-140.32	-5.18
IC436524	14.33	3.08	-365.26	-51.62
IC476753	4.67	2.39	-95.40	-95.40
IC382811	5.67	3.08	-84.09	-51.62
IC436628	4.67	2.27	-105.73	-105.73
IC476784	5.00	2.56	-95.31	-82.42
IC426766	5.33	7.49	28.84	37.65
IC546452	5.67	2.89	-96.19	-61.59
IC546472	5.67	2.59	-118.92	-80.31
IC519620	4.67	2.36	-97.88	-97.88
T-9	4.67	2.33	-100.43	-100.43

Biochemical parameters:

Proline:

The proline content observed highest in IC426766 (64.5mg/g weight) fallowed by IC261182(48.3mg/g), IC519620 (41.5mg/g), IC476784 (40.6mg/g), T-9(40.3mg/g), IC436524 (38.2mg/g), IC382811(35.7mg/g), IC546452 (32.4mg/g), IC476753 (31.5mg/g), IC436628 (31.1mg/g) and IC546472 (30.7mg/g) respectively under drought condition. Under irrigated condition the proline content was observed highest in IC476784 (31.2mg/g) Followed by IC426766 (30.1mg/g), IC436524 (28.0mg/g), T-9(27.1mg/g), IC382811 (26.4mg/g), IC546452 (24.7mg/g), IC261182 (23.9mg/g), IC476753 (22.5mg/g), IC436628 (21.7mg/g), IC519620 (21.1mg/g) and IC546472 (20.2mg/g) respectively (Table 6).

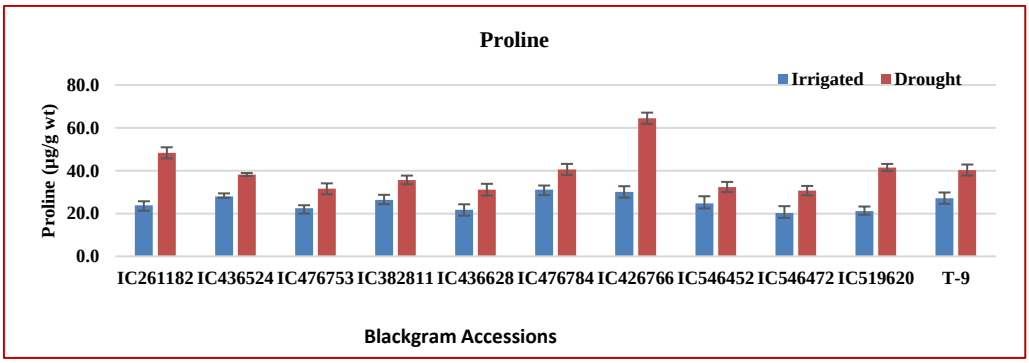

Fig.1 Graphical representation of Proline (%) in selected blackgrm genotypes under irrigated and drought stress condition

Membrane Lipid peroxidation (MDA):

The lipid peroxidation were measured by measuring matoxidaildehyde in our study. It was observed that IC426766 recorded Lowest (12.0µM/g fresh weight) MDA followed by IC261182 (12.9µM/g), IC519620 (15.4µM/g), T-9(16.0µM/g), IC476753 (16.6µM/g), IC436524 (17.0µM/g), IC546452 (18.4µM/g), IC476784 (18.8µM/g), IC546472 (19.3µM/g), IC382811 (19.4µM/g) and IC436628 (20.1µM/g) respectively under Drought condition. The MDA results showed that under irrigated condition the genotype IC426766 registered lowest by 11.6µM/g followed by IC261182(11.7µM/g), IC476753 (11.9µM/g), IC546472 (13.0µM/g), T-9(13.1µM/g), IC519620 (14.1µM/g), IC436524 (14.9µM/g), IC476784 (15.7µM/g), IC43662816.1µM/g), IC546452 (16.4µM/g) and IC382811 (17.1µM/g) respectively (Table 6). Under drought stress, MDA recorded lower in most of the pulse crops(Gurumurthy et al., 2019; Jain et al. 2001; Katsuhara et al. 2005). Free radical production and minimal membrane damage may be the cause of the tolerant plants' low MDA concentration.

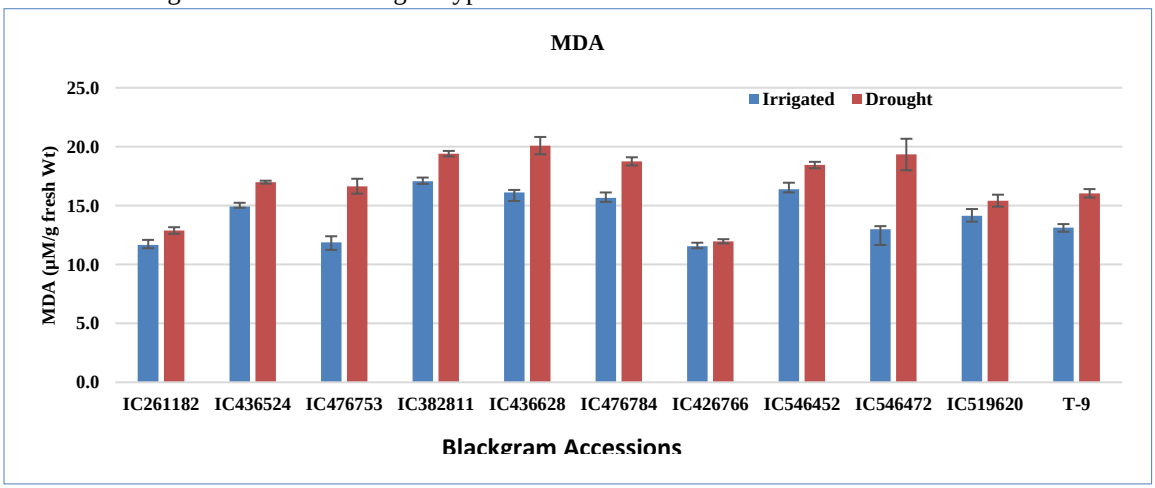

Fig.2 Graphical representation of MDA (%) in selected blackgrm genotypes under irrigated and drought stress condition

Physiological Parameters:

The results showed that relative water content (RWC %) observed highest for the variety IC426766 (87.08%) under irrigated condition whereas the same genotype showed highest (RWC %) (83.42%) under Drought condition .The genotype IC261182 Registered 83.22 followed by IC519620 (81.99%), IC436524 (79.90%), IC436628 (78.82%), IC476753 (77.56%), IC476784 (77.54%), IC546472 (77.42%), T-9(76.78%), IC382811 (76.13%) and IC546452 (75.51%) respectively under irrigated condition. Under drought condition fallowed by IC426766 (83.42%), IC261182 (79.09%), IC519620 (77.82%), IC436524 (75.54%), IC382811 (72.565), T-9 (72.31%), IC476753 (71.23%),

IC476784 (70.51%), IC546452 (70.32%), IC546472 (67.79%) and IC436628 (66.82%) respectively (Table 6).

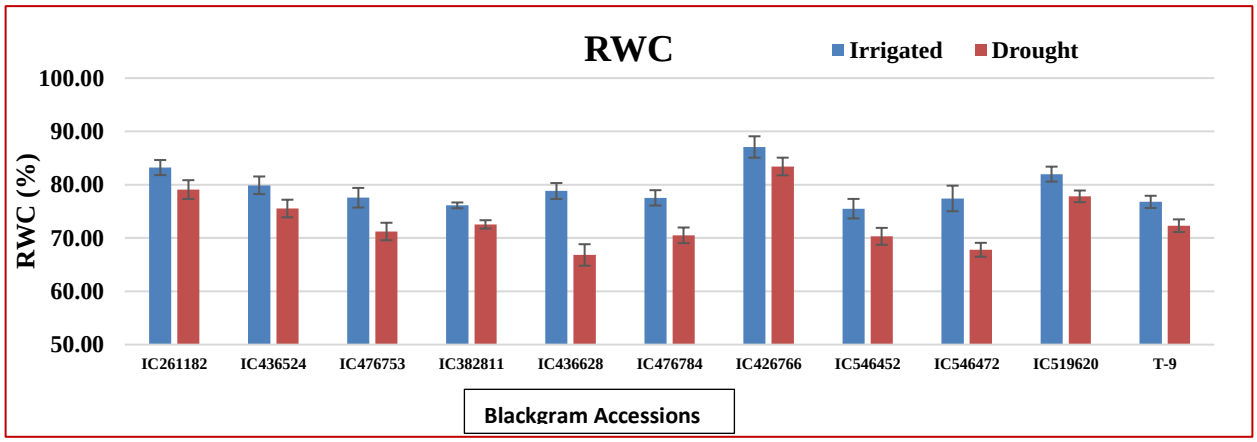

Fig.3 Graphical representation of RWC in selected blackgram genotypes under irrigated and drought stress condition

SPAD readings:

SPAD was observed under irrigation condition range from IC261182 (37.17) to IC476784 (33.15). Whereas under drought condition range from IC261182 (36.12) to IC436628 (32.45).Under irrigation condition varieties were observed followed by IC261182 (37.17), IC436524 (34.75), IC436628 (34.75), IC519620 (34.36), IC546452 (34.34), IC382811 (34.34), T-9 (34.32), IC546472 (33.99), IC426766 (33.78), IC476753 (33.68) and IC476784 (33.15) respectively. Under drought condition varieties were observed followed by IC261182 (36.12), IC426766 (36.00), IC476784 (35.34), IC382811 (35.00), IC546472 (34.40), IC519620 (34.34), IC546452 (33.68), T-9 (33.01), IC436524 (32.45), IC476753 (32.45) and IC436628 (32.45) respectively (Table 6).Similar higher SPAD readings were recorded under drought condition by Anitha *et al.*, 2015 in blackgram.

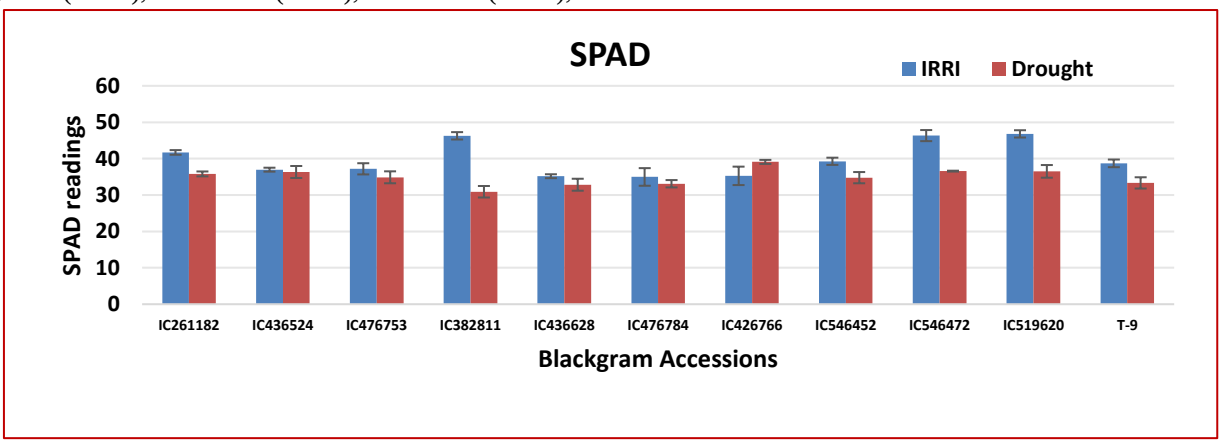

Fig.4 Graphical representation of physiological parameter (SPAD readings) under irrigated and drought stress condition in blackgram accessions

Canopy Temperature:

Canopy temperature was observed highest from lowest followed by IC261182 (37.90), IC546472 (35.34), T-9 (35.09), IC476784 (34.68), IC519620 (34.67), IC476753 (34.42), IC426766 (34.08), IC436628 (34.04), IC382811 (33.42), IC546452 (32.32) and IC436524 (31.81) respectively under irrigation condition.Whereas under drought condition varieties were observed highest range to lowest followed by IC519620 (42.23), IC476753 (41.34), IC436628 (41.33), IC546452 (41.12), T-9(40.33), IC476784 (40.13), IC436524 (40.03), IC546472 (39.98), IC426766 (38.67), IC261182 (37.17) and IC382811 (37.04) respectively (Table 6). Similar

lower canopy temperature was recorded under drought condition by Anitha *et al.*, 2015 in blackgram.

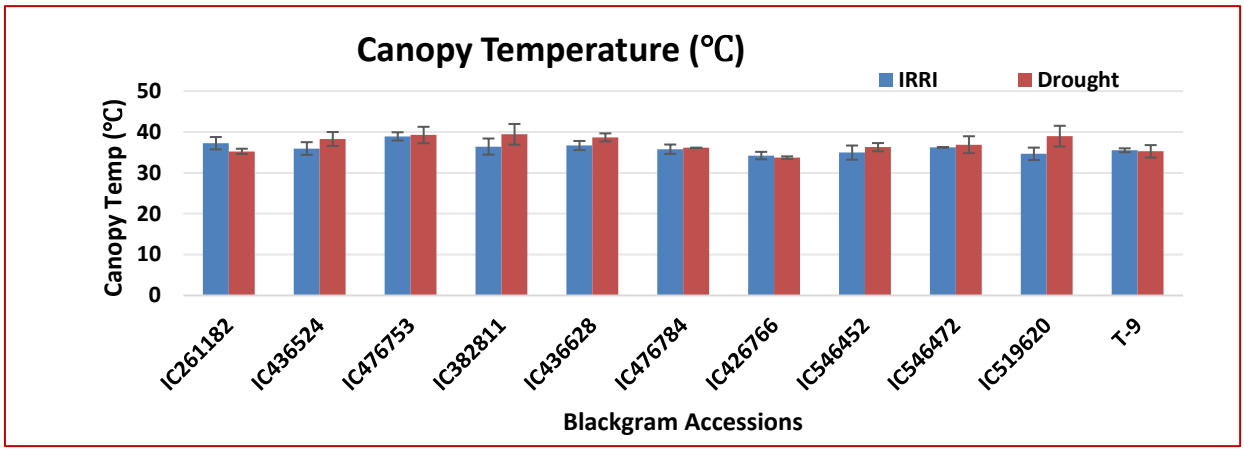

Fig.5 Graphical representation of Physiological parameter (Canopy temp℃.) under irrigated and drought stress condition in blackgram accessions

Table 6. Mean performance of physiological and biochemical parameters in blackgram genotypes under irrigated and drought condition.

	RWC (%)		SPAD		C. Temp(℃)		Proline.(µg/g wt)		MDA(µM/g fresh Wt)	
Genotypes	**Irr**	**Drought**	**Irr**	**Drought**	**Irr**	**Drought**	**Irr**	**Drought**	**Irr**	**Drought**
IC261182	83.22	79.09	37.17	36.12	37.90	37.17	23.9	48.3	11.7	12.9
IC436524	79.90	75.54	34.75	32.45	31.81	40.03	28.0	38.2	14.9	17.0
IC476753	77.56	71.23	33.68	32.45	34.42	41.34	22.5	31.5	11.9	16.6
IC382811	76.13	72.56	34.34	35.00	33.42	37.04	26.4	35.7	17.1	19.4
IC436628	78.82	66.82	34.75	32.45	34.04	41.33	21.7	31.1	16.1	20.1
IC476784	77.54	70.51	33.15	35.34	34.68	40.13	31.2	40.6	15.7	18.8
IC426766	87.08	83.42	33.78	36.00	34.08	38.67	30.1	64.5	11.6	12.0
IC546452	75.51	70.32	34.34	33.68	32.32	41.12	24.7	32.4	16.4	18.4
IC546472	77.42	67.79	33.99	34.40	35.34	39.98	20.2	30.7	13.0	19.3
IC519620	81.99	77.82	34.36	34.34	34.67	42.23	21.1	41.5	14.1	15.4
T-9	76.78	72.31	34.32	33.01	35.09	40.33	27.1	40.3	13.1	16.0
Mean	***79.267***	***73.401***	***34.421***	***34.113***	***34.343***	***39.943***	***25.172***	***39.521***	***14.142***	***16.907***
Sd	***3.522***	***5.060***	***1.028***	***1.404***	***1.611***	***1.686***	***3.687***	***9.928***	***2.020***	***2.677***

RWC- Relative water content; SPAD-Chlorophyll content; C.Temp-Canopy temperature (°C); MDA-Malondialdehyde(µM/g fresh Wt)

III. CONCLUSION

It is well known that sufficient water is necessary for crops to thrive and produce as much as possible. Nonetheless, crops are frequently subjected to drought stress at various phenological stages. Productivity of crops under water stress may be decreased as a result of modifications to the physiological and biochemical processes occurring at the molecular and cellular levels of plants because they employ it as a stress-reduction strategy. It was concluded that the genotype IC426766 28.84% over its control and 37.65% over T-9 under drought condition. The genotype IC426766 also showed higher proline content, RWC, lower MDA, higher SPAD reading and lower canopy temperature under drought condition. Among ten blackgram accession IC 426766 was identified as drought tolerant/resistance based on morphological, physiological and biochemical parameters.

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