Available online at http://www.ijcrls.com

International Journal of Current Research in Life Sciences
Vol. 07, No. 04, pp.1521-1524, April, 2018

ISSN: 2319-9490

RESEARCH ARTICLE

EFFECT OF IRRIGATION INTERVAL AND ANTITRANSPIRANTS ON THE GROWTH AND YIELD OF BLACKGRAM (*Vigna mungo*)

***Elavarasi, P.**

Department of Soil Science and Agrl, Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar - 608002, Tamil Nadu, India

Received 10th February, 2018; Accepted 19th March, 2018; Published Online 06th April, 2018

ABSTRACT

Drought is one of the major abiotic stresses which adversely affect crop growth and yield. Drought induced changes are mainly related metabolic functions, such as reduced synthesis of photosynthetic pigments, accumulation of osmoprotectants like proline in the cell, decline in the cell membrane stability. In order to overcome the drought, the antitranspirants are applied as foliar spray. The present investigation was carried out to find the effect of foliar application of different antitranspirant on growth and yield of black gram (*Vigna mungo)*. A field experiment was conducted at a farmer's field of sivapuri village, Chidambaram taluk, Cuddalore district during March-May 2017. The treatments consisted of three irrigation interval [5 DAI(Days after irrigation), 10 DAI and 15 DAI] and foliar application of antitranspirants [T_1- control, T_2- PPFM(pink pigmented facultative methalotrophs), T_3- salicylic acid, T_4- miracle gold, T_5- green gold, T_6- ATP 67@ 0.3%, T_7- ATP67@0.5%, T_8- ATP 68@ 0.3%, and T_9- ATP 68@ 0.5%]. The results of the study revealed that increase in the irrigation interval consistently decreased the growth and yield of blackgram. Application of antitranspirants to the blackgram reduced the impact of drought in respect of growth and yield. Application of the antitranspirants ATP67@0.3% recorded highest LAI(2.06), number of branches per plant(9.1), pod length(5.72 cm), number of seeds per pod (5.16), grain (1106.56 kg ha^{-1}) and stover yield (1292.56 kg ha^{-1}). However, other antitranspirants also significantly improved the growth and yield of blackgram significantly. Water sprayed control(T_1) recorded the lowest LAI(1.7), number of branches per plant(6.4), pod length(3.23 cm), number of seeds per pod(4.24), grain(792.33 kg ha^{-1}) and stover yield (969.98 kg ha^{-1}).

Key words: Patient data, Clinical knowledge, Healthcare and Community health

Citation: Elavarasi, P. 2018. "Effect of irrigation interval and antitranspirants on the growth and yield of blackgram(vigna mungo)" *International Journal of Current Research in Life Sciences*, 7, (04), 1521-1524.

INTRODUCTION

Pulses are the most important crops of the world because of their high nutritive value. In India, pulses have been described as a "poor man's meat and rich man's vegetable". The importance of vegetable protein has been well recognized throughout the world. India, with its predominant vegetarian population, has a distinction of being the world's largest producer cum consumer of grain legumes. Nevertheless, rapidly shooting up demographic pressure and almost static pulse production have posed a formidable problem in alleviating the nutritional imbalances. In that pulses blackgram is most important pulses. Blackgram belongs to the family fabaceae and the genus *Vigna*. Only seven species of the genus Vigna are cultivated as pulse crops, five Asian species of subgenus *Ceratotropis*, V*igna mungo* (blackgram), *V. radiate* (Mungbean), V. aconitifolia (mothbean), *V. angularis* (azuki bean) and *V. umbellate* (rice bean) and two African species of subgenus *Vigna, Vigna unguiculata* (cowpea) and V. subterranean (the bambra groundnut) Blackgram (*Vigna mungo L. Hepper)* is a member of the Asian Vigna crop group. It is a stable crop in the central and south East Asia; however it is extensively used only in India and now grown in the southern United States, west Indies, Japan and other tropics and subtropics. Pulses are grown globally covering large dimension of about 70.50 million hectares in area with a total production of 57.27 million tonnes. Amongst having 29% of the total pulse acreage (2003-2004) though it contributes only 19% of the global pulse production. Over a dozen pulse crops are grown in the country and among these, Chickpea(chana), Pigeonpea(Arhar), Mungbean(Moong) and Urdbean(urd) are the most important contributing total 88.6% (chickpea 38.81%, pigeonpea 20.94, mungbean 10.98%, urdbean 9.96% and lentil 6.96%) of the total pulses production. Among the various pulses, blackgram, scientifically known as *Vigna mungo* is the most important and esteemed grain legume. It enriches soil N content and has relatively a short life span. It is originated in India where it has been cultivated from ancient times and is

Corresponding author: **Elavarasi, P.,**
Department of Soil Science and Agrl. Chemistry, Faculty of Agriculture, Annamalai University, Annamalainagar - 608002, Tamil Nadu, India.

one of the most highly prized pulses in India. Although It has been introduced to other tropical areas mainly by Indian immigrants, about 70% of the world's black gram still comes from India. Black gram is a perfect combination of all nutrients which include 20 to 25% of proteins, 40 to 47% of starch along with ash, fats, carbohydrates and essential vitamins. It is boiled and eaten directly or used after splitting into dhal. Plant growth and development of black gram are greatly influenced by various environmental factors such as temperature, light, water and nutrient availability. Stress is defined as any biotic or abiotic factor of environment that affects plant's physiological and biochemical activity along with growth and development in such a way that plant perform below the average for a region (Bhaswatee Baroowa and Nirmali Gogoi 2012). It also results in a condition when water lost in the form of transpiration from the plant exceeds the availability of water in soil. Moisture stress, which results from periodic dry spells during the growing season, is among the limiting factors for common nbean production worldwide(Boutraa and Sanders,2001).Water deficit disturbs normal turgor pressure and the loss of cell turgidity may stop cell enlargement that causes reduced plant growth (mondal *et al.,* 2012)

MATERIALS AND METHODS

The present investigation was carried out to find the effect of foliar application of different antitranspirant, performance on growth and yield of black gram (*Vigna mungo)*. A field experiment was conducted at farmers field sivapuri village, Chidambaram taluk, Cuddalore district. The experimental methods and analytical procedures followed in the present study are presented in this chapter.

MATERIALS

Collection of soil

A composite soil sample for initial analysis was collected from the proposed experimental field before sowing and was air dried in shade, powdered and sieved to pass through a 2mm sieve, thoroughly mixed and used for detailed analysis.

Collection and analysis of different Antitranspirant

Different sources of Antitranspirant viz., ATP 67, ATP68, Green gold, Green miracle, PPFM, salicylic acid on different sources. were selected for the study.

Weather and climate

The climate of sivapuri is moderately warm with hot summer months. The mean maximum temperature fluctuates between 29.2 and 37.3^{o}C with a mean of while ,the minimum temperature ranges from 20.90 and 26.60^{o}C with a mean of 23.75^{o}C.The mean relative humidity is 85 percent. The mean annual rainfall is 1343.3 mm with a distribution of 806.mm during north –east monsoon (October - December),329.4 mm during south –west monsoon (June-September) and 199.8 mm during hot weather period (March- May) which spread in 62 rainy days.

Details of Field Experiment

The field experiment was conducted at Farmer's field, Sivapuri village, Chidambaram taluk, Cuddalore district, Tamil Nadu.

Crop and variety

Black gram variety VBN(bg)4 with a duration of 75days was sown as the test crop under irrigated condition during Feburary - May 2017

METHODS

Layout of the experimental field

The experiment was laid out in a randomized block design with three replications. The layout plan of the experiment is presented in fig.1.

Experimental details

The details of the field experiment are as follows:

Particulars

Crop	Black gram
Variety	VBN (Bg) 4
Design	FRBD
Plot size	5×4m
Replications	Three
Spacing	30 x 10 cm

Layout of Exprimental Field

R1T6	R2T7	R3T1
R1T7	R2T2	R3T6
R1T3	R2T1	R3T7
R1T5	R2T8	R3T3
R1T9	R2T6	R3T4
R1T2	R2T4	R3T5
R1T4	R2T3	R3T
R1T8	R2T5	R3T8
R1T1	R2T9	R3T2

Fig 1. Layout of the experimental field

Treatment details

T_1-control
T_2- foliar application of ppfm @1%
T_3- foliar application of salicylic acid @ 200 ppm
T_4- foliar application of miracle gold@ 0.3%
T_5- foliar application of green gold @ 0.5%
T_6- foliar application of ATP-67 @ 0.3%
T_7- foliar application of ATP-67 @ 0.5%
T_8- foliar application of ATP-68 @ 0.3%
T_9 - foliar application of ATP-68 @ 0.5%

Antitranspirant are reduce transpiration losses up to 30-40%. Mostly these are film forming type on leaf surface, retard the escape of water due to formation of physical barriers(Praveen Solanki *et al.,* 2016)

Biometric Observations

Five representative plants from each plot were chosen by simple random sampling method and were tagged. These tagged plants were used for recording all biometric observations on the growth characters and yield components at different stages of crop growth viz.,. The following biometric observations were recorded.

Growth Components

Dry matter production

Representative plant samples from each plot was collected at 30,45 DAS and at harvest were air-dried. The air-dried samples were oven-dried at 65^{o}C till constant was obtained. The oven dried plant samples were weighed and recorded. The DMP was expressed in kg ha^{-1}.

Yield components

The following yield components were recorded from five plants selected at random from each plot at.

Seed yield

Seed yield from each plot was recorded and expressed in kg ha^{-1} .

Statistical Analysis

The experimental data were statistically analysed as suggested by Gomez and Gomez (1984). For significant results, the critical difference was worked out at five percent probability level.

RESULTS AND DISCUSSION

shortage of water induces a series of physiological biochemical and morphological changes in crops which finally results in low yields (abbasi *et al.,* 2014). Increase in the days to irrigation from 5-15 significantly decreased the moisture content of soil. It ranged from 82.1% to 73.02%. Among the three irrigation intervals, 5 DAI recorded the highest mean soil moisture content of 82.1% followed by 10 DAI(79.9%) and 15 DAI(73.02%).

Among the treatments ATP 67 @ 0.3% (T_6) recorded the highest mean soil moisture content of 80.2% this was followed by T_7 (79.7%) and T_8(79.2%). Crop removed much of the applied water from the soil to meet its evapotranspiration demand(ET) but leaves most of the salt behind to concentrate in the shrinking volume of soil water(Sheffield and wood, 2008). Drought inhibits linear growth of plants, reduced leaf number per plant and individual leaf size, leaf longevity and dry matter accumulation by decreasing the soil water potential. (anjum *et al.,* 2011). Reduced plant size, leaf area and leaf area index are the major mechanisms to moderate water use and to decrease injury under osmotic stress(Mitchell *et al.,* 1998). Drought effect on plants evident in terms of reduced growth, loss of membrane stability and integrity, reduction in essential pigments like chlorophyll(sonali pondey *et al*.,2014) A significant interaction was noticed between day to irrigation and treatments in enhancing the seed yield of blackgram. Application of ATP 67 @ 0.3% to plants irrigated at 5 days interval recorded highest seed yield of 1235 kg ha^{-1}. which is followed by I_1T_7(1198.67), I_1T_8(1167.67) and I_1T_9 (1111.33). Drought caused impaired mitosis, cell elongation and expansion resulted in reduced growth and yield traits (Hussain *et al.,* 2008). Drought at grain development reduces yield while vegetative and grain filling stages are less sensitive to moisture stress(Borrell *et al*.,2006) Agricultural productivity is being subjected to increasing environmental constraints, particularly to drought. Scarcity of water, inadequate or failure of monsoon rains or prolonged period without rainfall is reason for drought. Drought is one of the major abiotic stresses which adversely affect crop growth and production. Water is one of the major components of plant cells, and is the medium in which growth processes occurs. The response of crops to drought various with degree and duration of stress, variety, growth stage of the crop and soil type.

Table No.1 Effect of irrigation interval and antitranspirant application on soil moisture at harvest stage of blackgram

IRRIGATION INTERVAL / TREATMENT	5 DAI	10 DAI	15 DAI	MEAN
T1	80.7	78.2	70.5	76.5
T2	81.4	79.0	72.0	77.5
T3	81.0	78.7	71.0	76.9
T4	81.7	79.5	72.5	77.9
T5	82.0	80.0	73.0	78.3
T6	83.7	81.5	75.5	80.2
T7	83.1	81.0	75.0	79.7
T8	82.8	80.8	74.0	79.2
T9	82.3	80.4	73.7	78.8
MEAN	82.1	79.9	73.0	78.34

Table 2. Effect of irrigation interval and antitranspirants application on DMP

IRRIGATION INTERVAL / TREATMENT	5 DAI	10 DAI	15 DAI	MEAN
T1	1153	958.13	798.8	969.98
T2	1223	1057.67	906.4	1062.36
T3	1162	996.33	893.17	1017.17
T4	1163.7	1095	968.4	1109.02
T5	1302.33	1183	994.63	1159.99
T6	1418.33	1291.33	1168	1292.56
T7	1365.67	1259	1110.67	1245.11
T8	1350.33	1196.67	1074.67	1207.22
MEAN	1284.48	1137.05	994.75	1138.76

Table 3. Effect of irrigation interval and antitranspirant application on seed yield of blackgram

IRRIGATION INTERVAL / TREATMENT	5 DAI	10 DAI	15 DAI	MEAN
T1	944.33	805.33	627.33	792.33
T2	990.33	867.38	728.47	862.04
T3	970.33	848.33	683.33	834
T4	1030.67	909.33	798.53	912.84
T5	1098.33	937.33	835.77	957.14
T6	1235	1105.33	979.33	1106.56
T7	1198.67	1013973	937.73	1049.8
T8	1167.67	973	912.4	1017.69
T9	1111.33	957.67	863.8	977.6
MEAN	1082.96	935.19	818.52	945.56

Significant reduction in relative water content was observed in drought stressed plants. To overcome drought the present experiment was carried out during the growing seasons (sep - dec) of 2016 – 2017 to evaluate the response of blackgram under both the irrigation interval and antitranspirant application. More than 87% of a area under pulses is presently rainfed and moisture stress is the main reason for crop failure or for low yield realization water deficit stress, at flowering and the post flowering stages of pulse crops as been found to have a greater adverse impact then that the vegetative stage(cortes and suidaria, 1986; uprety Bhatia 1989). The present experiment the irrigation intervals are 5 DAS, 10 DAS and 15 DAS in that, the antitranspirants are applied such as ppfm, salicyclic acid, green gold, micrle gold, ATP 67 and ATP 68 are used. The antitranspirant are transpiration suppressants. It reduce transpiration losses up to 30-40%. That are mostly film forming type. The plastic and waxy materials, which form a thin film on the leaf surface, retard the escape of water due to formation of physical barrier. These antitranspirants reduce the transpiration loss, thereby reduce the water stress on the plant simultaneously increase the crop growth and yield.

Conclusion

The study clearly indicate that application of antitranspirant will reduce the transpiration loss there by increasing the moisture content to soil. Simultaneously increase the crop growth and yield.

REFERENCES

Abbasi, A.R., Sarvestani, R., Mohammadi, B. and Baghery, A. 2014. Drought stress-induced changes at physiological and biochemical levels in some common vetch (*Vicia sativa L.*) genotypes , *J. Agric. Sci. Tech.,* 16, 505-516.

Anjum, S.A., Xie, X., Wang, L., Saleem, M.F., Man, C. and Lei, W. 2011. Morphological, physiological and biochemical responses of plants to drought stress, *Afr. J. Agric. Res.,* 6,2026-2032.

Baroowa, B. and Gogaoi, N. 2012. Effect of induced drought on different growth and biochemical attributes of blackgram (Vignamungo L.) and greengram (Vignaradiata L.), *J. Environ. Res. Develop.,* 6,584-593.

Black C.A. 1965 "methods of soil analysis part I physical and mineralogical properties". American society of agronomy, Madison, Wisconsin, USA.

Borrell, A., Jordan, D., Mullet, J., Henzell, B. and Hammer, G. 2006. "drought adaptation in sorghum. In: Ribaut, J.M. (Ed.), Drought adaptation in cereals". The Haworth Press, Binghamton, USA, pp.335-399.

Bputraa, T. and Sanders, F.E. 2001. Influence of water determinate growth habit, such as D81083, might have stress on grain yield and vegetative growth of two potential as a dryland rotation crop for most dryland areas cultivars of bean. *Joural of Agronomy ofIran Crop Science*, 187, 251-257.

Hussain M., Malik, M.A., Farooq, M., Ashraf, M.Y., Cheema, M.A. 2008. improving drought tolerance by exogenous application of glycinebetaine and salicyclic acid in sunflower, *J. Agron. Crop Sci*., 194,193-199.

Mitchell, J.H., Siamhan, D., Wamala, M.H., Risimeri, J.B., Chinyamakobvu, E., Henderson, S.A. and Fukai, S. 1998. The use of seedling leaf death scores for evaluation of drought resistance of rice, *Field Crops Res.,* 55,129-139.

Mondal, C., Bandopadhyay, P., Alipatra, A. and Banerjee, H. 2012. Performance of summer mungbean under different irrigation regimes and boron levels. *Journal of food legumes,* 2537-40.

Praveen Solanki, Rajeev Ranjan, Maitreyie Narayan and Surindra Negi 2016. "Effect of rising temperature on evapotransiration and ET control. *International Journal Of Advance Research in Science and Engineering*., 5(8): 607 - 617.

Sheffield, J. and Wood, E. 2008. "projected changes in drought occurrence under future global warming from multi-model, multi-scenario, IPCC AR4 simulations. *Clim Dyn.,* 31:79-105.

Sonalipandey, Shivani Ror and Dipjyotichakraborty 2014. Analysis of Biochemical Responses in *Vigna mungo* varieties subjected to drought stress and possible amelioration. *Intervational Journal of scientific Research in Agricultural science,* 1(1): 6-15.

****