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Effects of Anti-Transpirants and Phosphate Levels on Seed Yield Green Gram (*Vigna radiata* L.)

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A B S T R A C T

The field experiment was conducted during summer season of 2018 at the Bagusala Farm of MS Swaminathan School of Agriculture, Centurion University of Technology and Management, Gajapathi district, Paralakhemundi, Odisha (84.18'N longitude and 18.80' E latitude). The mean minimum and maximum temperatures were 210C and 310C respectively. The soil at the experimental site is sandy loam in texture. The soil is slightly acidic in reaction (6.2), normal in electrical conductivity, low in organic carbon (0.41%), available nitrogen is 76.2 kg/ha, with 21.3 kg/ha of available phosphorus and 126.2 kg/ha of available potassium. The experiment was laid out in a Factorial Randomized Block Design with 12-treatment combinations in 3 replications. The first factor was comprised of three levels of sprayings: S1= no spraying; S2= single spraying at 25 days after sowing (DAS) i.e. at vegetative stage; S3= double spraying, one at 25 DAS (vegetative stage) another at reproductive stage 50 DAS at full flowering and the second factor was four phosphorous levels, that is 20 kg P_2O_5/ ha; 40 kg P_2O_5/ ha; 60 kg P_2O_5/ ha and 80 kg P_2O_5/ ha. Seeds are sown at a depth of about 3 cm as per layout plan at a row to row distance of 30 cm and 10 cm distance amongst plants was maintained in row. Prior to sowing after final land preparation and layout, the fertilizers were supplied as FYM @ 10 t/ha and N and K_2O were applied @ 20 Kg/ha each in the form of urea and MOP, respectively. Phosphatic fertilizers as per treatments were applied in the form of SSP in accordance with treatments. Irrespective of phosphorous application the double spray of antitranspirant gave highest plant height (27.5 cm), Dry matter accumulation (297.67 cm), Leaf area index (1.61) and grain yield of (865.6 kg/ha) The application of phosphorous@80 kg/ha had shown maximum number of pods per plant (15.96), highest stover yield of (2059.76 kg/ha) along with maximum test weight (2.50 g) and harvest index (29.63). The double spray of anti transpirant along with 80 kg/ha had got highest net return and B: C ratio of 1.23.

Introduction

Green gram is an important pulse crop. Historically, India has been the largest global producer and consumer of green gram. It has wider adaptability and low input requirements and the ability to fix the nitrogen in symbiotic association with rhizobia, which not only enables it to meet its own nitrogen requirement but also benefits the succeeding crops. Green gram is a short duration crop that can be grown over a range of environments. It is grown extensively in India under varying soil types and climatic conditions. India alone accounts for about 65% of the world's acreage and 54% of the world production of this crop. The important states of India producing this pulse are Madhya Pradesh, Maharashtra, Uttar

Pradesh, Punjab and Andhra Pradesh, Rajasthan, Karnataka and Tamil Nadu. Despite holding such great promise, green gram is often grown in marginal lands with limited inputs making it prone to a number of abiotic stresses causing tremendous yield loss. For the adaptation of a crop to new environment, tolerance to abiotic stress is more important than the biotic stress. Terminal heat and drought stress may lead to considerable flower drop and thus to reduced pod set. The crop needs a well-distributed rainfall. Heavy rains at flowering are harmful, even moist winds at this stage interfere with fertilization.

Application of antitranspirant in summer gram is beneficial as it checks the moisture loss from the plants (Davenport *et al.,* 1974; Sanbagavalli *et al.,* 2017). Role of phosphorus in legumes needs no over emphasis. It is a constituent of nucleic acid and is present in plants as phosphorylated sugars, nucleoproteins, RNA, DNA, Purine, flavin and thiamine. In plant metabolism, phosphorus plays a direct role as carrier of energy. Earlier researchers recorded beneficial impact of phosphorus application in green gram (Samiullah *et al.,* 1982; Singh *et al.,* 1999).

Considering the above, a field experiments was conducted to study the response of application of antitranspirants and phosphorus levels to summer green gram in south Odisha conditions.

Materials and Methods

The field experiment was conducted during summer season of 2018 at the Bagusala Farm of MS Swaminathan School of Agriculture, Centurion University of Technology and Management, Gajapathi district, Paralakhemundi, Odisha (84.18'N longitude and 18.80'E latitude). The experiment was laid out in a Factorial Randomized Block Design with 12-treatment combinations in 3 replications. The first factor was comprised of three levels of sprayings: S_1= no spraying; S_2= single spraying at 25 DAS i.e. at vegetative stage; S_3 = double spraying, one at 25 DAS (vegetative stage) another at reproductive stage 50 DAS at full flowering and the second factor was four phosphorous levels, that is 20 kg P_2O_5/ ha; 40 kg P_2O_5/ ha; 60 kg P_2O_5/ ha and 80 kg P_2O_5/ ha.

Seeds are sown at a depth of about 3 cm as per layout plan at a row to row distance of 30 cm and 10 cm distance amongst plants was maintained in row. Prior to sowing after final land preparation and layout, the fertilizers were supplied as FYM @ 10 t/ha and N and K_2O were applied @ 20 Kg/ha each in the form of urea and MOP, respectively. P_2O_5 as per treatments was applied in the form of SSP in accordance with treatments. The variety of green gram was 'IPM 02-03'. The seed rate was 20 kg/ha and row X plant spacing was maintained at 30 cm x10 cm. The crop was sown on Mid of February and started harvested from mid-April of 2018through picking of pods.

Soil data

The soil at the experimental site is sandy loam in texture. The soil is slightly acidic in reaction (6.2), normal in electrical conductivity, low in organic carbon (0.41%), available nitrogen is 76.2 kg/ha, with 21.3 kg/ha of available phosphorus and 126.2 kg/ha of available potassium (Table 1).

Meteorological parameters

The mean minimum and maximum temperatures were 21^0C and 31^0C respectively. And relative humidity and rainfall was recorded as 90 % and 44.48 mm respectively (Table 2).

Results and Discussion

Effect on growth parameters

The plant height recorded both at 25 DAS and harvest significantly recorded highest (20.9 cm and 27.5 cm respectively) observations when anti-transpirant was sprayed double and dry matter when taken at 50 DAS and harvest had shown highest readings with double spray of anti transpirant (58.65 and 297.67 g/m^2/day respectively) whereas the lowest plant height and dry matter was observed with no spray of anti transpirant. The leaf area index at 25 DAS and harvest had shown significantly more leaf area (0.63 and 1.61) when double spray of anti transpirant was followed. Similar findings were observed by Agarwal and De (1977) in which kaolin increased the plant height significantly over control. Kachhadiya *et al.*, (2009) and Lai *et al.*, (1994) found the highest value of leaf area plant after spraying of kaolin than the control

At 25 DAS and harvest the plant height recorded significantly highest (21.5 cm and 26.7 cm respectively).when phosphorous@80 kg/ha applied and dry matter when taken at 50 DAS and harvest had shown highest readings with phosphorous @80 kg/ha (61.9 and 293.3 g/m2/day respectively) whereas the lowest plant height and dry matter was observed with no phosphorous application. The leaf area index at 25 DAS and harvest had shown significantly more leaf area (0.67 and 1.57) when phosphorous applied at 80 kg/ha. The results obtained were in agreement with Mahetele and Kushwaha (2011) who found that with the increasing levels of phosphorus highest plant height was obtained. Similar results were reported from Meena *et al.*, (2006) and Sengupta and Tamang (2015). Who reported that application of high amount of phosphorus increased dry matter accumulation. Majengo *et al.*, 2011.With the application of phosphorus got the similar results (Table 3).

Effect on yield and yield parameters

The number of pods/plant were significantly recorded highest in double spray of anti transpirant (15.82) at harvest and highest grain and stover yield had been observed significantly highest in treatment with double spray of anti-transpirant (865.6 and 2118.17 kg/ha respectively) whereas the lowest number of pods/ plant, grain yield and stover yield number of pods/plant was recorded in no spray of anti transpirant. The highest test weight and harvest index significantly observed highest when double spray of anti transpirant was followed (2.47 g and 28.93 respectively). Similar findings were made available from Singh *et al.*, (2000) which showed that the application of anti-transpirants increased the pod length and number of pod per plant (Table 4).

Table.1 Physical-chemical properties of experimental soil

Properties	Value	Unit
Textural class	Sandy loam	--
Soil reaction (pH)	6.2	--
Organic carbon	0.41	**%**
Electrical conductivity	0.28	**dSm^{-1}**
Available nitrogen	76.2	**kg/ha**
Available phosphorus	21.3	**kg/ha**
Available potassium	**126.2**	**kg/ha**

Table.2 Metrological data during crop period

Month	Temperature (˚C)		Relative humidity (%)		Rainfall (mm)	ET (mm)	BSS (Hr)
	Maximum	Minimum	Morning	Afternoon			
February, 2018	33.9	16.9	90	36	0.0	9	8.76
March, 2018	41.4	22.0	89	56	102.3	104	6.6
April, 2018	41.8	20.8	89	59	32.8	127.4	7.25
May, 2018	41.7	21.2	92	74	309.7	111.8	6.6

Table.3 Effect of anti-transpirant and phosphate levels on plant height, Dry matter accumulation of green gram

TREATMENT	Plant height (cm)		Dry matter accumulation ($g/m^2/day$)		LAI	
	25 DAS	Harvest	25 DAS	Harvest	25 DAS	Harvest
Anti-transpirant						
No spray	20.1	23.4	57.95	278.36	0.62	1.47
Single spray	20.8	26.7	58.45	289.34	0.63	1.52
Double spray	20.9	27.5	58.65	297.67	0.63	1.61
SEm±	0.11	0.15	0.27	1.20	0.00	0.00
CD (P=0.05)	0.33	0.45	0.79	3.52	0.01	0.02
phosphorous level						
20 kg ha^{-1}	19.8	25.0	53.4	281.58	0.56	1.49
40 kg ha^{-1}	20.1	25.6	58.1	287.73	0.64	1.52
60 kg ha^{-1}	20.8	26.1	59.9	291.22	0.65	1.55
80 kg ha^{-1}	21.5	26.7	61.9	293.3	0.67	1.57
SEm±	0.15	0.20	0.36	1.60	0.00	0.00
CD (P=0.05)	0.44	0.60	1.06	4.70	0.02	0.02
CV (%)	6.57	7.10	5.59	5.00	12.78	5.57

Table.4 Effect of anti - transpirant and phosphate levels on No of pod $plant^{-1}$, Test weight (g) grain yield, Stover yield and Harvest index of green gram

TREATMENTS	No of pod $plant^{-1}$	Test weight (g)	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index
Anti-transpirant					
No spray	15.07	2.23	783.12	2008.7	28.03
Single spray	15.5	2.34	820	2081.9	28.23
Double spray	15.82	2.47	865.6	2118.17	28.93
SEm±	0.09	0.02	3.74	23.94	0.15
CD (P=0.05)	0.29	0.07	10.97	70.22	0.44
Phosphorous level					
20 kg ha^{-1}	14.96	2.17	760.7	2061.23	26.94
40 kg ha^{-1}	15.33	2.32	812.16	2075.36	28.03
60 kg ha^{-1}	15.6	2.40	846.2	2082.77	28.89
80 kg ha^{-1}	15.96	2.50	867.56	2059.76	29.63
SEm±	0.13	0.03	9.48	31.92	0.20
CD (P=0.05)	0.38	0.09	27.77	93.63	0.59
CV (%)	7.70	12.40	9.45	13.88	6.42

Table.5 Effect of anti-transpirant and phosphate levels on Economics of green gram

ECONOMICS					
Treatments	GRAIN YIELD kg ha^{-1}	COST OF CULTIVATION	GROSS RETURN	NET RETURN	B:C RATIO
S0P1	718	20344	21540	1196	1.06
S0P2	774	20496	23220	2724	1.13
S0P3	808	20648	24240	3592	1.17
S0P4	833	20800	24990	4190	1.20
S1P1	766	21344	22980	1636	1.08
S1P2	808	21496	24240	2744	1.13
S1P3	837	21648	25110	3462	1.16
S1P4	868	21800	26040	4240	1.19
S2P1	798	22344	23940	1596	1.07
S2P2	854	22496	25620	3124	1.14
S2P3	879	22648	26370	3722	1.16
S2P4	931	22800	27930	5130	1.23

Number of pods/plant were significantly highest when phosphorous @80 kg/ha (15.96) at harvest and highest grain and Stover yield had been observed significantly highest in treatment with 80 kg/ha phosphorous application (867.56 and 2059.76 kg/ha respectively) whereas the lowest number of pods/plant, grain yield and Stover yield number of pods/plant was recorded in no application of phosphorous.

The highest test weight and harvest index (2.50g and 29.63 respectively) significantly observed highest when full dosage of phosphorus was applied 80 kg/ha.

Effect on economics

The interaction effect on double spray of anti-transpirant along with the application of phosphorous @ 80 kg/ha had shown highest net returns (5130 Rs/ha) when compared to other treatments the highest B:C ratio (1.23) was also recorded highest in treatment with double spray of anti -transpirant along with the application of phosphorous @ 80 kg/ha (Table 5). The double spray of anti-transpirant with application of phosphorous @80 kg/ha was the best treatment among all other treatments.

References

Agarwal, S.K. and De, R. (1977). Effect of application of nitrogen, mulching and antitranspirants on the growth and yield of barley under dryland *conditions. Indian J. Agric. Sci.* 47: 191-194.

Anderson, J.E. and Kreith, F.1978. Effects of film-forming and silicone antitranspirants on four herbaceous plant species, *Plant and soil,* 49(1): 161–173

Davenport, D.C., Uriu, K. and Hagan, R. M. 1974. Effects of Film Antitranspirants on Growth, *Journal of Experimental Botany* 25(2): 410–419

Lai, B.; Kaushik, S.K, and Gautam, R.C. (1994). Effect of soil moisture regime, Kaolin spray and phosphorus fertilizer on nodulation, P-uptake and water use

of lentil (*Lens eulinari's). Indian J. Agron.* 39(2): 241-245.

Mahetele, D., and Kushwaha, H. S. 2011. Productivity and profitability of pigeonpea as influenced by FYM, PSB and phosphorus fertilization under rainfed condition. *J. Food Legumes,* 24(1): 72-74.

Majengo, C. O., Okalebo, J. R., Lesueur, D., Pypers, P., NG'Etich, W., Mutegi, E., Mburu, M. W. and Musyoki, M. 2011. African Crop Science Society Interaction between nitrogen and phosphorus microbial inoculants on soybean production in Bungoma, Kenya. *African Crop Science Conference Proceedings,* 10: 121 – 123.

Meena, L. R., Singh, R. K. and Gautam, R. C. 2006. Effect of moisture conservation practices, phosphorus levels and bacterial inoculation on growth, yield and economics of chickpea. *Legume Res.*, 29(1): 68-72

Samiullah, A., Akhtar, M., Afridi, M.M.R.K. and Khan, M.M.A. 1982. Effect of basal nitrogen and phosphorus on yield characteristics of summer moong *(Vigna radiata* var. T-44), *Indian J. Pl. Physiol.* 25(1): 27-31.

Sanbagavalli, S., Vaiyapuri, K, Sudhagar, R., Kannan Bapu, J.R. and Ejilane J. 2017. Impact of mulching and anti-transpirants on growth and yield of soybean (*Glycine max* L. Merril), *AENSI Journals*, 11(1): 84-89.

Schnable, P. S., Ware, D., Fulton, R. S., Stein, J. C., Wei, F., Pasternak, S., and Minx, P. 2009. The B73 maize genome: complexity, diversity, and dynamics. *Science, 326*(5956), 1112-1115.

Sengupta, K., and Tamang, D. 2015. Response of greengram to foliar application of nutrients and berassinolide. *J. Crop Weed,* 11(1): 43-45.

Singh, M., Singh, Harbir; Singh, T., Jhorar, R.K. and Singh, B.P. 2000. Seed yield, water-use and water-use efficiency of sunflower *(H. annuus)* genotypes under irrigation and nitrogen variables. *Indian J. Agron*. 45(l): 188-192.

Singh, O.P., Tripathi, P.N. and. Singh, R. 1999. Effect of phosphorus and sulphur nutrition on summer greengram *(Phaseolus radiatus). Indian J. Agric. Sci*. 69(11): 796-799.

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