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GROWTH OF BLACK GRAM BY *PHLORMIDIUM SP* TREATED COIRWASTE AND COW DUNG ON DROUGHT STRESS

S.Anbuselvi*, Guddu kumar
Industrial Bio Tech, Bharath University, Chennai 73. India.
Email: anbuselvichennai@yahoo.com

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Abstract

This study was conducted to evaluate the performance of black gram (*Vigna mungo.L*) were grown under drought stress using cyanobacterial treated coir waste manure and cow dung manure. Two varieties of black gram-ATD mash 3 and ATD mash 1 were used. There is a linear relationship existed between leaf chlorophyll and leaf nitrogen content with two organic manures. N, P and K accumulation of black gram in the two varieties was affected significantly. However there was an rapid increasing tendency of N, P and K levels using coir waste manure. This is mainly due to water holding capacity and drought resistance activity of coir waste. Among the two varieties ATD mash 3 showed better performances than ATD mash1.

Key words: Nitrogen, Chlorophyll, Black gram P analysis.

Introduction

Black gram ranks fourth among the pulses with an area of about 70,000 hectare. Nitrogen is an important determinant for growth and development of crop plant[1]. The important factor of concern is the significant environmental decline already associated with the injudicious use of the fertilizer nitrogen. It has been observed that photosynthesis rate decreases after flowering[2,3]. The sudden delay of photosynthesis only after flowering .This was due to the mobilization and translocation of nitrogen from leaves to seeds[4,5]

Organic manures help to increase N_2 fixation by legumes through genetic improvement and management practices[6,7]. This study was to find out the relationship of organic manures on the chlorophyll, nutrient composition and nutrient uptake by black gram plants grown under drought conditions.

Materials and Methods

A field experiment was conducted at sevalpatti, Virudhunagar District, Tamilnadu (from March to June 2015). The soil of the experimental field was found to be silty clay with pH of 6.2. The experimental soil contains nitrogen (0.109%) , organic carbon (0.419%) per 100 g soil. The cyanobacterial strain BDU-5 was cultured and sparyed on the organic manures at regular intervals. The experiment was laid out in a factorial RCBD with 3 replications.

Treatment Combinations: Two varieties of black gram were grown with *phlormidium* sp treated coir waste and cow dung with the following combinations:

ATD mash-3 was treated with different concentration of 20kg ha^{-1}, 40kg $ha^{-1,}$60kg $ha^{-1,}$80kg ha^{-1} and 100kg ha^{-1} of cow dung manure and control plants without any manure. Similar procedure was applied to ATD mash1. The above procedure was followed for coir waste manure. Nitrogen was applied as half dose and full dose of P and K were applied as basal at the time of seed sowing. Seeds were sown and light irrigation was given to experimental design[8]. The crop was top-dressed with remaining half of N.

Leaf chlorophyll content: Leaf chlorophyll content of two black gram varieties were measured at pre-flowering and pod filling stage. The chlorophyll was determined in the lab by utilizing acetone method[9].

Nitrogen analysis: This was done by colorimetric method . The sample was digested in Kjeldahl digestion flask with salicylic sulfuric acid and digestion catalyst. After digestion, color of the solution was developed with four different reagents (reagent B I ml, 7-10 drop of A, 5 ml of solution C and 5 ml of solution D). Then absorbance of the solution was measured at 625 nm wavelength with Double Beam Spectrophotometer[10].

Phosphorus analysis: Total P was determined by nitric-perchloric acid digestion method (King1996). The absorbance was measured at 440nm with Double Beam Spectrophotometer[11]

Potassium analysis: Dry plant sample was digested with nitric-perchloric acid solution . After digestion the sample was diluted with distilled water. Then the absorbance of that respective ion was measured with atomic absorption spectrophotometer[12].

Results and Discussion

The black gram plants were grown with different concentration of nitrogen, phosphorus and potassium mixed in *phlormidium sp* treated coir waste and cow dung.

Table 1: Effect of *Phlormidium* sp treated coir waste manure on N, P and K contents of two black gram varieties at harvest.

Variety	Organic N (kg ha^{-1})	Nutrient concentration (%) in total plant at harvest stage		
		N(%)	P(%)	K(%)
ATD mash3	0	1.41	0.12	0.09
	20	1.47	0.15	1.01
	40	1.48	0.16	1.02
	60	1.53	0.17	1.20
	80	1.52	0.17	1.20
	100	1.49	0.16	1.16
` ATD mash1	0	1.33	0.10	0.73
	20	1.35	0.12	0.85
	40	1.37	0.14	0.89
	60	1.50	0.15	1.00
	80	1.47	0.15	1.01
	100	1.35	0.14	0.98
LSD(0.05)		NS	NS	NS
CV (%)		8.64	15.65	12.38

Nitrogen is one of the significant key factors in regulating the growth and yield of crops. Applied organic fertilizer influenced the N, P and K content in plant parts increased in N levels up to 60kg ha^{-1} and it helped to sustain high concentration of N(Table 1). Similar trend in pea was obtained by Verma et al.[13].

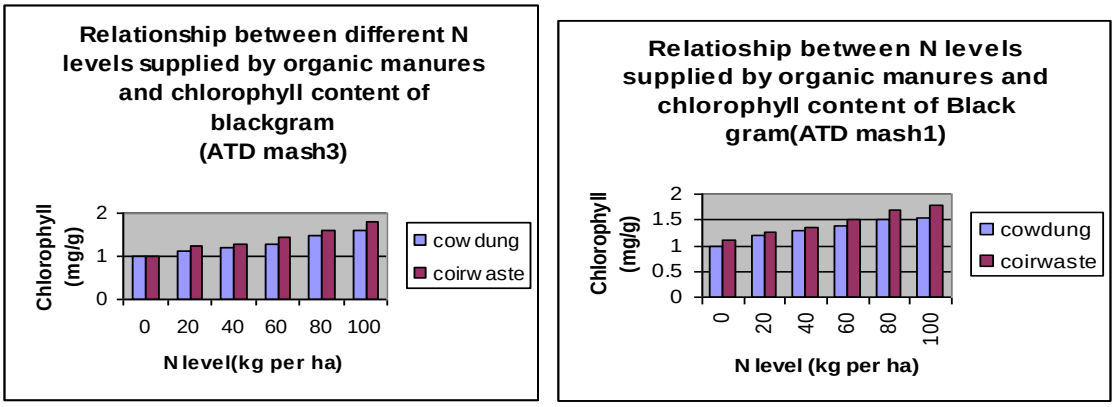
Table 2: Effect on N, P and K contents in seed of two black grams Varieties at harvest using cow dung manure.

Variety	Organic N (kg ha^{-1})	Nutrient concentration (%) in black gram at harvest stage using cow dung manure		
		N	P	K
ATD mash3	0	2.05	0.16	0.78
	20	2.04	0.18	0.83
	40	2.50	0.19	0.86
	60	2.25	0.20	0.92
	80	2.27	0.19	0.89

	100	2.25	0.17	0.77
ATD mash1	0	2.00	0.13	0.78
	20	2.08	0.12	0.83
	40	2.12	0.15	0.84
	60	2.30	0.16	0.90
	80	2.22	0.17	0.88
	100	2.20	0.15	0.86
LSD(0.05)		NS	NS	NS
CV (%)		8.01	5.09	2.00

Minimum nitrogen uptake and levels of N,P and K in ATD mash 3 were found to be slightly decrased than ATD mash1(Table 2). Among the varieties ATD mash 3 showed that Nitrogen uptake in grain increased with increase in N levels of coir waste manuring plants than cowdung manuring plants.

Figure 1: Relationship between different N levels and chlorophyll content of two black gram varieties at harvesting stage.



Chlorophyll and leaf Nitrogen content of two blackgram varieties were measured at pre-flowering and pod titling stage. There is a positive linear functional relationship existed between leaf chlorophyll and leaf nitrogen content with different manures. (Figure1). This similar findings are consistent with the findings of Mitra et al.[14].The chlorophyll and leaf nitrogen content were found to be slightly higher in coirwaste manuring plants than cowdung manuring plants[15]. Among the varieties ATD mash 3 always showed better uptake of these nutrients compared to ATD mash 1

Conclusion

It was concluded that organic manure as an exogenous source of nitrogen was used to test the model that increased nitrogen supply during flowering and pod filling stage would retard leaf senescence and improve photosynthesis , nitrogen

availability for seed biomass and drought stress tolerance. Cyanobacterial treated coir waste manure showed better water holding capacity and biological nitrogen fixation than cow dung manure.

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Corresponding Author:

S.Anbuselvi*,

Email: *anbuselvichennai@yahoo.com*