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COMBINED EFFECT OF PRESSMUD, FARMYARD MANURE, GYPSUM AND ZINC SULPHATE FOR ENHANCED CROP PRODUCTIVITY OF BLACK GRAM

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Introduction

India has a vast scope for re-utilization of renewable agricultural wastes like farm yard manure, industrial wastes like pressmud and industrial by-products like gypsum and zinc sulphate.

Black gram (*Vigna mungo* L.) is one of the important pulse crops originated in India. Black gram is the largest producer of black gram in the world. The crops are resistant to adverse climatic conditions and improve the soil fertility by fixing atmospheric nitrogen in the soil. Black gram rich in potassium, phosphorus and calcium with good amount of sodium also has small amount of iron and very rich in phosphoric acid. Black gram helps controlling diabetes, sexual dysfunction, nervous disorders, hair disorder, digestive system disorder and rheumatic affliction. The overall objective of the study was to develop a comprehensive strategy to utilize the organic wastes for the protection of environmental safety and to enhance the productivity of black gram.

Methodology

Collection of agro-industrial waste

The agro-industrial waste such as pressmud was collected in large amounts from Gomuki Sugar Factory, Kallakurichi at Villupuram district.

Pot Culture Experiment

Treatments application and cultivation

The pots were filled with 7 kg of sandy clay loam soil. The compost farmyard manure, gypsum and zinc sulphate were applied to the respective pots and mixed thoroughly. Viable black gram seeds were selected and about five seeds were sown in each pot with three replications. After germination three healthy plants were maintained per pot. Plant protection measures and other cultural practices were followed as per recommendation by Tamil Nadu Agricultural University, Coimbatore.

Treatment details

T_1 - Control

T_2 - Composted pressmud 12.5 t ha^{-1}

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T_3 - Composted pressmud 12.5 t ha^{-1} + Farmyard manure 12.5 t ha^{-1}

T_4 - Composted pressmud 12.5 t ha^{-1} + Farmyard manure 12.5 t ha^{-1} + Gypsum 12.5 t ha^{-1}

T_5 - Composted pressmud 12.5 ha^{-1} + farmyard manure 12.5 t ha^{-1} + zinc sulphate 12.5 t ha^{-1}

Vegetative parameters

On the 30 days and 45 days (black gram) the plants were uprooted from the pot and the following vegetative characters were noted like number of leaves, number of nodules, shoot length, root length, plant fresh weight, and plant dry weight.

Yield parameters

On the 70 days (black gram) the plants were uprooted from the pot and the following yield parameter were observed like length of the pod, weight of the pod, number of seeds per pod and weight of the seeds per pod.

Statistical analysis

The data obtained from various biometrical observations and yield parameters were subjected to the statistical analysis and based on the results, inferences were drawn.

Results and discussion

The experimental result pertaining to the composted pressmud, farmyard manure, gypsum, zinc sulphate, vegetative growth and yield parameters during the pot culture experiments on legume like *Vigna mungo* L. var. Co. 5 (Black gram) were analyzed and the details of which are presented in Table 1 and 2.

Table 1 Effect of composted pressmud, farmyard manure gypsum and zinc sulphate on vegetative stage of black gram

Treatment	Shoot length (cm)		Root length (cm)		Number of leaves		Number of nodules		Plant fresh weight (g)		Plant dry weight (g)	
	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS
T_1	5.5	8.8	9.5	16.4	4.6	7.6	1.0	1.3	1.1	0.9	0.38	0.22
T_2	7.8	8.1	14.1	18.5	5.1	10.6	0.0	6.1	1.9	1.1	0.48	0.27
T_3	6.4	10.5	11.1	18.0	4..0	9.6	0.0	3.0	0.6	1.2	0.16	0.28
T_4	5.4	10.8	17.1	17.3	4.7	11.1	1.3	2.8	0.9	1.5	0.24	0.38
T_5	4.7	7.8	10.4	22.2	4.1	9.0	0.0	1.6	0.8	0.7	0.18	0.21
SEd	0.66196		3.01166		0.68466		0.49839		0.16800		0.05239	
CD (0.05)	1.33330		6.06596		1.37902		1.00384		0.33839		0.10552	
CD (0.01)	1.78048		8.10045		1.84154		1.34052		0.45188		0.14091	

Plant fresh weight

On the 30th day the plant fresh weight was highly increased in T_2 (1.9 g) when compared to control T_1 (1.1 g). On the 45th day the plant fresh weight significantly increased in T_4 (1.5 g), T_3 (1.2 g) and T_2 (1.1 g) when compared to control T_1 (0.9 g). This is accordance with results of Zarrain Fatima *et al.* (2006).

Plant dry weight

On the 30th day plant dry weight increased in T_2 (0.48 g) when compared to control T_1 (0.38 g) where as a slight increase is noted in other treatments. On the 45th day the increase is noted in the treatment T_4 (0.38 g), T_3 (0.28 g), T_2 (0.27 g) when compared to control T_1 (0.22 g). Increase in yield was also reported by Makoi and Nadkidemi (2007).

Effect of composted pressmud, farmyard manure, gypsum and zinc sulphate in yield parameters of black gram (Table – 2).

Length and weight of the pods

At the harvest stage, the length of pods increased in T_3 (4.48 cm), T_4 (4.18 cm), T_2 (4.11 cm) when compared with the control T_1 (3.67 cm). The weight of the pods increased significantly in T_3 (0.31 g and T_4 (0.28 g) when compared to the control T_1 (0.18 g). This is in accordance with the results of Balakrishan et al. (2009).

Number and weight of the seeds per pod

At harvest stage the number of seeds per pod was increased in T_3 (5.33), T_4 (5.50), T_5 (5.00) when compared to control T_1 (4.67). The weight of the seeds per pod was increased in the treatments T_3 (0.18 g), T_4 (0.17 g) when compared to the control T_1 (0.09 g). Similar findings were reported by Amzad Hossain et al (2007) in turmeric.

Conclusion

The changes in agro wastes after composting, farmyard manure, gypsum and zinc sulphate on biometrical and yield parameters of black gram was analyzed and the results were summarized. The vegetative parameters like shoot length, root length, number of leaves, number of pods, number of nodules, plant fresh weigh and dry weight in black gram were increased by the application of pressmud, farmyard manure, gypsum and except zinc sulphate which reduced the shoot length.

The yield parameters studied increased significantly by composted pressmud, farmyard manure, and gypsum and zinc sulphate. The yield parameters like length of the pods, weight of the pods, number of seeds per pod, weight of the seeds per pod were increased in black gram.

Table 2 Effect of composted pressmud, farmyard manure, gypsum and zinc sulphate on yield parameters of black gram

Treatment	Length of pods (cm)	Weight of pods (g)	Number of seeds per pod	Weight of seeds per pod (g)
T_1	3.67	0.18	4.67	0.09
T_2	4.11	0.25	4.57	0.07
T_3	4.48	0.31	5.33	0.18
T_4	4.18	0.28	5.50	0.17
T_5	3.72	0.22	5.00	0.08
SEd	0.2260	0.0342	0.3197	0.02898
CD (0.05)	0.4714	0.0714	0.6669	0.0622
CD (0.01)	0.6430	0.0974	0.9098	0.0849

Pot culture experiment

Effect of composted pressmud, farmyard manure, gypsum and zinc sulphate on vegetative characters of black gram (table I).

Shoot length

On the 30th day the shoot length increased in T_2 (7.8 cm), T_3 (6.4 cm) when compared with control T_1 (5.5 cm). The treatments such as T_5 (4.7 cm) was decreased due to zinc sulphate. On 45th days shoot length was increased in T_3 (10.5 cm) and T_4 (10.8 cm) when compared to control T_1 (8.8 cm). As in the present study increased shoot length was noted in Bengal gram due to the addition of pressmud compost (Deshmukh, 2004).

Root length

On the 30th day the root length was significantly increased in T_4 (17.1 cm), T_2 (14.1 cm) and T_3 (11.1 cm) when compared to control T_1 (9.5 cm). On the 45th day T_5 (22.2 cm), T_2 (18.5 cm) and T_3 (18.0 cm) had significant increase when compared to control T_1 (16.4 cm). The result is in agreement with the results of Jamil et al. (2008).

Number of leaves

On the 30th day the number of leaves were highest in T_2 (5.1 cm), T_4 (4.7 cm) treatment than the control T_1 (4.6 cm) and on the 45th day an increase was noted in T_4 (11.1 cm), T_2 (10.6 cm) and T_3 (9.6 cm) than the control T_1 (7.6 cm). The result is in agreement with the result of Babcznska et al. (2008).

Number of nodules

On the 30th day the number of nodules were significantly increased in T_4 (1.3) when compared to control T_1 (1.0) and other treatments. On the 45th day the increase was significant in the treatments T_2 (6.1), T_3 (3.0) and T_4 (2.8) when compared with control T_1 (1.3). These results were in agreement with the findings of Gulam et al. (2010).

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