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Effect of pressmud & vermicompost on growth, yield and yield attributes of URD bean (*Vigna mungo*. L)

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Abstract

A field experiment instilled was conducted during *kharif* season, 2016 to study the nutrient removal and yield of urd bean (*Vigna mungo*. L) as influenced by vermicompost and pressmud application. PU-31 variety was sown at Crop Research Centre (CRC) Chirori, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P). there was eight treatments comprising Control, R.D.F., Vermicompost 1.2 @ t/ha⁻¹, R.D.F + Vermicompost (50:50), Press mud 1.5 @ t/ha⁻¹, R.D.F. + Pressmud (50:50), R.D.F. + Vermicompost + Pressmud (50:25:25), Vermicompost + Pressmud (50:50) were tested in randomized block design with three replication. The result revealed the plant population, plant height, number of trifoliolate; number of pods per plant, length of pod, number of grain per pod and test weight were affected significantly by different treatments. Application of RDF along with vermicompost 1.2 t ha⁻¹ gave the maximum grain yield (10.7 q ha⁻¹) which was 57.3% higher over control. Grain yield was affected by with number of pod per plant, length of pod, number grain per pod and test weight.

Keywords: *Vigna mungo*, pressmud, URD bean

Introduction

Agriculture is the backbone of Indian economy contributing nearly 13.7 percent of gross domestic product (GDP). Globally pulse crops are grown on an area of 76 million hectare with a production of about 68 million tonnes. The average productivity at the global level is about 800 kg ha⁻¹. India is the largest producer, consumer, importer and processor of pulses in the world which accounts for 33% of the world area and 22% of the world production of pulses. In India, total pulse area is about 25 m ha with production about 18 mt with average productivity of 750 kg ha⁻¹ (Datta and Singh, 2015). Pulse crops, also called grain legumes, have been valued as food, fodder and feed and have remained as a main stay of Indian agriculture for centuries.

Urd bean (*Vigna mungo*. L) is third important pulse crops of country. India and central Asia are considered as center origin of black gram. The distribution of black gram is comparatively restricted to tropical regions. In India, Maharashtra, Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Karnataka, Rajasthan and Orissa are major black gram producing states (Anonymous 2014). The average productivity of black gram in Uttar Pradesh state is quite low than national level as well as its production potential. The main reason for low productivity are cultivation on marginal and sub marginal lands of poor fertility, inadequate fertilization, improper sowing time, plant population, monsoon dependent cultivation, and heavy weed infestation, high sensitivity to pests and diseases and non-availability of suitable varieties.

This also had a direct effect on per capita availability of pulses i.e. 39.4 g/capita/day during 2012-13 as compared from the earlier 36g/capita/day in 2004-05 (Gowda *et al.* 2015) [7]. Black gram occupy a special place in human nutrition which contains 48.0% carbohydrates, 22.3% protein, oil (1.0-1.5%), fibre (3.5 – 4.5%), ash (4.5 – 5.5%), 154 mg calcium, 9.1 mg iron, 1.4 gram (g) fat, 0.37 g riboflavin and 0.42 mg thiamine in per 100 gm of black gram. Amino acid analysis indicates that as with most grain legume crops, the concentrations of sulphur containing amino acid (methionine and cystine) are small (Asaduzzaman *et al.*, 2010) [2]. Press mud is reported to be a valuable resource of plant nutrients and may therefore affect physical, chemical and biological properties of a soil (Rangaraj *et al.*, 2007) [12].

By virtue of the chemical composition and high content of organic carbon, the usefulness of pressmud as a valuable organic manure has been reported by several workers. Reddy *et al.*, 2002^[16] reported that the sugar press residue (SPR) or pressmud is a potential source of major minerals (Ca-2.40 %, P-1.27 %, K-1.81 %, Mg-1.28 %, S-2.62 %) as well as trace elements (Cu-22.6 ppm, Fe-2042.0 ppm, Zn-36.5 ppm, Mn-228.0 ppm). Razzaq, 2001^[13] also reported that substituting chemical fertilizers with sugarcane filter cake in crop production will add sulfur and boost up O. M. status of soil to satisfactory level within 5-6 years and improve and maintain soil health. Pressmud as an organic manure has been well recognized for utilizing in agriculture as it contains valuable plant nutrients in organic form besides being a very effective soil ameliorant (Ramaswamy, 1999)^[14].

Vermicompost as organic manure is known to play an important role in improving the fertility and productivity of soils (Baran *et al.*, 1998)^[3]. Through its positive effects on soil physical, chemical and biological properties and balanced plant nutrition. It improves the structure and water holding capacity of soil.

Methods and Materials

A field experiment was carried out during the *kharif* season of 2016 at the crop research centre Chirauri of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut (U.P.), India to study the Effect of Pressmud & Vermicompost on growth, yield and yield attributes of Urd Bean (*Vigna mungo*. L) in Western Uttar Pradesh. Which is located at latitude of 29° 40' North and longitude of 77° 42' East and at an altitude of 237 meter above mean sea level (MSL). Meerut lies in the heart of Western Uttar Pradesh and has semi-arid to sub-tropical climate. Eight treatments comprising control, R.D.F. (N:P:K 20:40:20 kg ha⁻¹), Vermicompost @ 1.2 t/ha⁻¹, R.D.F + Vermicompost (50:50), Press mud @ 1.5 t/ha⁻¹, R.D.F. + Press mud (50:50), R.D.F. + Vermicompost + Press mud (50:25:25), Vermicompost + Press mud (50:50), were replicated thrice in a randomized block design. Soil samples from a depth of 0-15 cm were collected from each plot of the experiment prior to sowing for determining its physical and chemical properties. And experimental field was alkaline with pH 8.14, EC 0.26 dS m⁻¹, OC 0.31%, available nitrogen 162.20 kg ha⁻¹, available phosphorus 9.3 kg ha⁻¹, available potassium 163.13 kg ha⁻¹, available zinc 0.69 mg kg⁻¹ & available iron 12.4 mg kg⁻¹ and sandy loam in texture.

Results and discussion

1. Plant height (cm)

The data given in the table clearly show that with the effect of vermicompost and press mud on plant height of urd bean at 30, 60 DAS and harvest was significant and increased with advancement of crop. The maximum plant height of 34.2 cm recorded in T₄ [R.D.F + Vermicompost (50:50)] at 30 DAS was significantly higher than the plant height recorded in T₁ and statistically at par to rest of the treatments. Increase of 7.8 to 21.7 per cent in plant height was recorded due to application of nutrient through different source over control result supported by Srivastava *et al.* (2006)^[20]. At 60 DAS, the maximum plant height of (51.6) cm recorded in T₄ [R.D.F + Vermicompost (50:50)] was significantly higher than T₁, T₃, T₅ and T₈ and statistically at par to rest of the treatments. At harvest of urd bean, the plant height measured in different treatments ranged from 44.0 to 52.6 cm. With exception of T₄,

and T₇, rests of the treatment were found statistically similar. results supported by Choudhary *et al.* (1997)^[4].

2. Trifoliolate leaves per plant

The data on average number of trifoliolate per plant recorded at 30, 60 DAS and harvest are presented in Table 1. The number of trifoliolate per plant in general increased up to 60 DAS in all the treatments and there after decline was recorded under all the treatments. At 30 DAS the maximum number of trifoliolate per plant (13.4) recorded in T₄ [R.D.F + Vermicompost (50:50)] were significantly higher than the number of trifoliolate recorded in T₁, T₅ and T₈ and statistically at par to rest of the treatments, while minimum number of trifoliolate per plant (10.5) were found in T₁ (control). At 60 DAS, the maximum number of trifoliolate per plant (27.1) recorded in T₄ [R.D.F + Vermicompost (50:50)] were found significantly higher than the number of trifoliolate recorded in T₁, T₅ and T₈ and statistically at par to the remaining treatments. The minimum number of trifoliolate per plant (22.6) was recorded in T₁ (control). At harvest stage, the maximum number of trifoliolate per plant (18) recorded in T₄ [R.D.F + Vermicompost (50:50)] were significantly higher than the number of trifoliolate recorded in T₁, T₂, T₃ and T₅ and statistically at par to rest of the treatments, while minimum number of trifoliolate per plant (13) was recorded in T₁ (control). Results supported by Prakash and Hemalatha (2013)^[11].

3. Number of pods plant⁻¹

It is clear from data given in table that application of [R.D.F + Vermicompost (50:50)] were was significantly higher than the number of pods recorded in T₁, T₅ and T₈ and statistically at par to rest of the treatments, while minimum number of pods per plant (38.2) in T₁ were found in control. Number of pods per plant increased by 4.9 to 17.5 per cent over control due to nutrient application. Results supported by Kushwaha (1993)^[9], Jha, Sharma and Amarawat (2015)^[8].

4. Pod length (cm)

The data on length of pod (cm) of urd bean are presented Table 1. Vermicompost and press mud application had significant effect on length of pod. The maximum length of pod (8.3 cm) recorded in T₄ [R.D.F + Vermicompost (50:50)] which was significantly higher than the length of pods recorded in T₁, T₅ and T₈ and statistically at par to rest of the treatments, while minimum length of pod (5.6 cm) was found in T₁ (control). results supported by Shivkumar and Mishra (2001)^[19].

5. Number of grains per pod

The number of grains per pod of urd bean were affected significantly by different treatments. The maximum number of grain (7.6 pod⁻¹) recorded in T₄ [R.D.F + Vermicompost (50:50)] were significantly higher than the number of grain recorded in T₁, T₂, T₃, T₅, T₆ and T₈ and statistically at par to rest of the treatments, while minimum number of grain (4.3 pod⁻¹) were recorded in T₁ (control). result supported by Niraj and Prakash (2014)^[10].

6. Test weight 1000 seeds (g)

It is clear from data given in table that application of vermicompost and press mud had significant effect on test weight (g) of urd bean. The maximum test weight 1000 seeds (47.1 g) recorded in T₄ [R.D.F + Vermicompost (50:50)] was significantly higher than the test weight recorded in T₁, T₅ and

T₈ and statistically at par to rest of the treatments, while minimum test weight (40.6 g) was found in T₁ (control). Result supported by Choudhary *et al.* (1997) ^[4] and Ghulam *et al.* (2012) ^[6].

7. Harvest index

The data pertaining on harvest index of urd bean as influenced

by vermicompost and press mud treatments are presented in Table 1. The maximum harvest index 42.4 percent was recorded in T₇ [R.D.F. + Vermicompost + Press mud (50:25:25)] while minimum harvest index 39.9 percent was recorded in T₁ (control). Result supported by Ghulam *et al.* (2012) ^[6].

Table 1: Effect of vermicompost and press mud application on plant height (cm), trifoliolate per plant, Number of pods plant, pod length (cm), Number of grains pod, Test weight 1000 seed (g) and harvest index of urd bean.

Treatments	plant height (cm)			Trifoliolate leaves per plant			Number of pods plant ⁻¹	Pod length (cm)	Number of grains pod ⁻¹	Test weight 1000 seeds (g)	Harvest index (%)
	30 days	60 days	At harvest	30 days	60 days	At Harvest					
T ₁ - Control	28.1	43.2	44.0	10.5	22.6	13.0	42.1	7.7	6.3	43.3	41.5
T ₂ - R.D.F.	31.3	47.4	48.3	12.2	25.0	15.5	41.8	7.5	5.6	42.8	40.9
T ₃ - Vermicompost @ 1.2 t/ha ⁻¹	31.0	46.9	47.7	12.0	24.6	15.1	44.9	8.3	7.6	47.1	41.6
T ₄ - R.D.F + Vermicompost (50:50)	34.2	51.6	52.6	13.4	27.1	18.0	40.1	6.7	4.6	41.7	41.5
T ₅ - Press mud 1.5 @ t/ha ⁻¹	30.3	45.7	46.0	11.3	24.0	14.4	42.3	7.9	6.6	43.8	41.5
T ₆ -R.D.F. + Press mud (50:50)	31.7	48.0	48.7	12.3	25.2	16.0	42.7	8.1	7	44.7	42.4
T ₇ -R.D.F. + Vermicompost + Press mud (50:25:25)	32.8	49.0	49.8	12.8	25.9	16.2	40.5	6.9	5.3	42.4	41.7
T ₈ -Vermicompost + Press mud (50:50)	30.7	46.1	46.9	11.8	24.1	15.8	1.38	0.34	0.27	1.44	-
SEm (±)	1.3	1.4	1.5	0.51	0.90	0.79	4.1	1.0	0.8	4.4	-
CD at 5%	4.1	4.4	4.6	1.5	2.6	2.4	4.1	1.0	0.8	4.4	-

Dry matter accumulation (q ha⁻¹)

The data pertaining on dry matter accumulation (q ha⁻¹) of urd bean as influenced by vermicompost and press mud treatments are presented in Table 2. Maximum dry matter accumulation (5.7 q ha⁻¹) found in T₄ [R.D.F + Vermicompost (50:50)] was significantly higher than the dry matter accumulation recorded in T₁, T₃, T₅ and T₈ and statistically at par to rest of the treatments, while minimum accumulation of dry matter (3.1 q ha⁻¹) significantly lower than the rest of the treatments with exception of T₅, was observed in T₁ (control). And increase of 29.0 to 83.8 per cent in dry matter accumulation was recorded due to application of different nutrient source over control. Result supported by Ghulam *et al.* (2012) ^[6]. At 60 DAS, dry matter accumulation ranges from 13.7 to 20.3 q ha⁻¹ under different treatments. The highest dry matter (20.3 q ha⁻¹) was recorded in T₄ [R.D.F + Vermicompost (50:50)] was significantly higher than the dry matter accumulation recorded in T₁ and statistically at par to the remaining treatments where as minimum dry matter accumulation (13.7 q ha⁻¹) was recorded in T₁ (control). Result supported by Niraj and Prakash (2014) ^[10].

Biological Yield

The vermicompost and press mud application had significant effect on biological yield of urd bean. The maximum biological yield 25.7 q ha⁻¹ recorded in T₄ [R.D.F + Vermicompost (50:50)] significantly higher than the biological yield recorded in T₁, T₂, T₃, T₅ and T₈ and statistically at par to rest of the treatments, while minimum biological yield 17 q ha⁻¹ was found in T₁ (control). Biological

yield increased by 51.1 and 43.5 per cent in over control due to T₄ and T₇. Result supported by Niraj and Prakash (2014) ^[10], Jha, Sharma and Amarawat (2015) ^[8] respectively. And it is concluded from the table 2.

4.1.6 Grain Yield

The vermicompost and press mud application had significant effect on grain yield of urd bean. The maximum grain yield (10.7 q ha⁻¹) recorded in T₄ [R.D.F + Vermicompost (50:50)] significantly higher than the grain yield recorded in T₁, T₃, T₅ and T₈ and statistically at par to rest of the treatments, while minimum grain yield (6.8 q ha⁻¹) was recorded in T₁ (control). Grain yield of urd bean in treatments T₄ and T₇ increased by 57.3 and 50.0 per cent, respectively over control. Result supported by Niraj and Prakash (2014) ^[10], Jha, Sharma and Amarawat (2015) ^[8] respectively. And it is concluded from the table 2.

4.1.7 Straw Yield.

The vermicompost and press mud application had significant effect on straw yield of urd bean. The maximum straw yield (15 q ha⁻¹) recorded in T₄ [R.D.F + Vermicompost (50:50)] was significantly higher than the straw yield recorded in T₁, T₂, T₃, T₅ and T₈ and statistically at par to rest of the treatments, while minimum straw yield (10.2 q ha⁻¹) was recorded in T₁ (control). Straw yield in T₄ and T₇ increased by 47.0 and 37.2 per cent, respectively over control. Result supported by Sardar *et al.* (2016) ^[17], Sharma and Amarawat (2015) ^[8] respectively. And it is concluded from the table 2.

Table 2: Effect of vermicompost and press mud application on dry matter accumulation (q ha^{-1}) and yield of urd bean.

Treatments	30 DAS (q ha^{-1})	60 DAS (q ha^{-1})	At harvest		
			Biological (q ha^{-1})	Grain (q ha^{-1})	Straw (q ha^{-1})
T ₁ - Control	3.1	13.7	17.0	6.8	10.2
T ₂ - R.D.F.	4.8	17.7	23.5	9.8	13.7
T ₃ - Vermicompost 1.2 @ t/ha^{-1}	4.6	17.2	23.1	9.4	13.6
T ₄ - R.D.F + Vermicompost (50:50)	5.7	20.3	25.7	10.7	15.0
T ₅ - Pressmud 1.5 @ t/ha^{-1}	4.0	15.9	20.7	8.6	12.1
T ₆ -R.D.F. + Pressmud (50:50)	5.0	18.4	24.0	10.0	13.9
T ₇ -R.D.F. + Vermicompost + Pressmud (50:25:25)	5.2	18.9	24.4	10.2	14.0
T ₈ -Vermicompost + Pressmud (50:50)	4.4	16.9	21.4	8.9	12.5
SEm ($\pm$)	0.34	1.53	0.69	0.32	0.38
CD at 5%	1.0	4.7	2.1	0.9	1.1

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