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Impact of Paddy and Coffee Husk as the Bio Compost and its Effect on the Growth and Yield of Black Gram [*Vigna mungo* (L.) Hepper]

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ABSTRACT

The recent developments of urban areas change the climate in the ecosystem and decreasing the arable land became the pressurized problems for all the producers of the present world. Moreover organic agriculture optimizes the application of biocomposts to improve soil fertility and productivity while minimizing the environmental implications and also it is necessary for sustainable agriculture. The study was conducted at St Josephs College for Women (A), Visakhapatnam Andhra Pradesh. Agro-industrial wastes of Paddy and Coffee husk were collected and were used for the biocomposting process using *Pleurotus eous, P. florida, Trichoderma asperelloides* and *Eisenia fetida.* The vermicompost was used for the growth of black gram with 6 treatments. The plant was analyzed for root length, shoot length, number of leaves, number of nodules, fresh weight and dry weight at different stages (20, 40 and 60 DAS). On 90th day the yield parameters like number of pods/plant, number of seeds/plant, length of the pod, weight of the seeds/pod, fresh weight and dry weight of the pod were analyzed. The experimental study results revealed that the treatment 6 (Pre decomposed Coffee husk, Consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* and *Eisenia fetida*) has shown a significant increase in root length (7.9,12.2 and 16.5 cm), shoot length (11.8, 25.8 and 30.7 cm), number of leaves(19.0,37.0 and 41.0) number of nodules (10.0,30.0 and 17.0), fresh weight (2.77,7.37 and 15.39 g) and dry weight (0.52,3.67 and 5.73 g) of the plant on 20 DAS, 40 DAS and 60 DAS and the yield parameters also showed the increase in number of pods/plant (39), number of seeds/plant (5), length of the pod (5.6 cm), weight of the seeds /pod (2.384 g), fresh weight of the pod (2.95 g) and dry weight (1.195 g) on 90th Day of black gram when in comparison with the control. It is to conclude that treatment 6 can be a better manure to enhance the growth and yield of plants and also it can be a great help for the farmers.

Key words: Black gram, *Eisenia fetida,* Paddy and Coffee husk, *Pleurotus eous, Pleurotus florida*, *Trichoderma asperelloides.*

The recent developments of the urban areas climate changes in the ecosystem and decreasing of the arable land became the pressurized problems for all the producers of the present world. Ghasemi Ghehsareh *et al.* (2020). Moreover organic agriculture optimizes the application of boicomposts to improve soil fertility and productivity while minimizing the environmental implications and also it is necessary for sustainable agriculture (Masunga *et al*., 2016; Askari *et al.,* 2020). Conversion of agricultural wastes into biocomposts will reduce the pressure of chemical fertilizers and also take the important role in conditioning the nutrients in the soil as the main source of nutrient for agricultural soil. According to Sakthivigneswari and Vijayalakshmi, (2016) the best way to save the soil is to convert the organic residues to vermicomposts and it can be used as an efficient fertilizer, it contains all the necessary enzymes, vitamins and substances that are used for the plant growth. The commonly used earthworm species for the vermicompost process are *Eisenia fetida, Eudrilus euginea* (Blouin *et al.,* 2019; Gupta *et al*., 2020; Ceritoglu *et al.,* 2021). Black gram is the important pulse crop which grows throughout India for it is the major source of protein hence a lot of efforts are being put to enhance the crop (Gomathinayagam *et al*., 2021). Among the entire legumes black gram is an important crop which is grown in India. And it contains 24% of protein, 60% of carbohydrate and 1.3% of fat. It is commonly called as 'urd' or 'urd bean' through its ability it fixes the atmospheric nitrogen and improves the soil fertility with its root nodules (Shekhawat *et al.,* 2018). The main aim of this present study is to evaluate the effect of paddy and coffee husk vermicompost on the growth at 20, 40 and 60 days after sowing (DAS) and yield parameters (90th Day) of black gram (*Vigna mungo* L.).

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The pot culture experimental study was conducted from June to August 2019 at St. Joseph's College for Women (A), Visakhapatnam and Andhra Pradesh situated at (17°43′07″N, 83°17′13″E).

Collection of Agro-industrial wastes

The paddy and coffee husks were collected from nearby villages in Visakhapatnam District of Andhra Pradesh. The wastes which were collected for the study were sun-dried and preserved for further study. The collected raw samples were used for the pre-decomposition with the incorporation of *Pleurotu seous, Pleurotus florida* spawn and *Trichoderma asperelloides*, it is done in six pits each with the measurement of 1.5 feet in length and 4 square feet width, the composts were given the following names C1, C2, C3, C4, C5 and C6. After 30 days of the pre-decomposition process, the samples were filled in plastic trays of 50×20×20 cm for the further process of vermicompost. 15 exotic earthworms *Eisenia fetida* were added to the respective trays and left for 60 days for the composting process. This whole process was done from January to March 2019.

Collection of seeds

The viable seeds of black gram were collected from Tamil Nadu Agricultural University, Coimbatore. The viable seeds were used for the pot culture experiments.

The experimental pot cultures with the treatments

The pot culture experiments were carried out with 6 treatments respectively, all the pots were filled with the paddy and coffee husk vermicompost and 7 kg of red sandy loamy soil was used. Viable seeds were sown in each pot nearly 5 plants were maintained for the study in all the treatments triplicates were maintained. The following treatments are used for the study.

Statistical analysis

The obtained results on 20, 40 and 60 DAS for vegetative parameters and the yield parameters on 90 DAS were analyzed statistically using One-way and Two -way ANOVA (Sigma stat 3.1).

C	Control
T_1	Pre decomposed paddy husk, *Pleurotus eous* and *Eisenia fetida* (5 t/ha).
T_2	Pre decomposed paddy husk, *Pleurotus florida* and *Eisenia fetida* (5 t/ha).
T_3	Pre decomposed paddy husk, Consortium of *Pleurotus eous, Pleurotus florida, Trichoderma asperelloides* and *Eisenia fetida* (5 t/ha).
T_4	Pre decomposed Coffee husk,*Pleurotus eous* and *Eisenia fetida* (5 t/ha).
T_5	Pre decomposed Coffee husk, *Pleurotus florida* and *Eisenia fetida* (5 t/ha).
T_6	Pre decomposed Coffee husk, Consortium of *Pleurotus eous, P. florida,Trichoderma asperelloides* and *Eisenia fetida* (5 t/ha).

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Treatment 6 (Pre decomposed Coffee husk, Consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* and *Eisenia fetida*) showed the maximum growth in vegetative parameters of *Vigna mungo* as it is shown in Tables (1 and 2). Root length was observed to be increasing from 20 Days after sowing (DAS) to 60 DAS in treatment 6 (7.9,12.2 and 16.5 cm) followed by treatment 3 (6.1,11.3and15.6 cm) as it is compared to control (3.1,7.3 and 11.6 cm). Shoot length increased gradually in the treatment 6 (11.8, 25.8 and 30.7 cm) followed by the treatment 3 (11.1, 25.2 and 29.1 cm) compared to the control (8.2, 18.6 and 24.9 cm). Similar results were correlated with Raihing and Vijayalakshmi, (2022) in black gram with the application of vegetable and fruit waste, shoot length was found to be more in treatment-8 (56.9, 62.1 and 71.5 cm) and root length in treatment 8 (14.5,17.2 and 18.5 cm).

Number of leaves showed a great increase on 20 to 60 DAS as shown in Table 1 remarkable increase was found in treatment 6 (19.0, 37.0 and 41.0) in comparison with the other treatments and it is followed by treatment 3 (17.0, 32.0 and 39.0) and the control (10.0, 20.0 and 29.0) showed the minimum number of leaves. Similar results were also reported by Palla *et al*., 2021) the maximum number of leaves was found to be more at 90 DAS (7.70) in brinjal when it is applied with different inorganic and organic fertilizers.

Number of nodules showed an increase in 40 DAS was found to be decreasing in its number at 60 DAS and treatment 6 (10.0, 30.0 and 17.0) showed a remarkable increase among all the other treatments and the control (4.0, 11.0 and 9.0). Similar results were found in the observations of Sentirenla Changkija and Gohain, (2018) the maximum number of nodules (14.33) were found in soybean with the application of poultry manure 6 t ha + *Rhizobium* @ 20 g Kg^{-1} seed+Phosphatica @20 g Kg^{-1} (T_6).

As is shown in Table 2 maximum fresh weight was found in treatment 6 (2.77, 7.37 and 15.39 g) followed by treatment 3 (1.99,6.16 and 15.20 g) and the minimum fresh weight was found in control (1.10,4.01 and 10.97 g) and remarkable dry weight was recorded in treatment 6 (0.52,3.67 and 5.73 g) and it is nearly followed by treatment 3 (0.49,3.07 and 5.06 g) and the least dry weight was recorded in control (0.19, 2.01 and 3.07 g). Similar results were in par with the work of Silpa and Vijayalakshmi, (2022) in *Vigna unguiculata* the incorporation of bio compost raw jack fruit peel+*Pleurotus florida* + *Eudrilus euginiae* in treatment 8 showed the good results in the fresh weight (5.491 g, 9.811 g and 32.516 g) and dry weight (0.855 g, 1.489 g and 3.020 g) of the plant.

As shown in Table 3 the yield parameters of black gram recorded the highest results in the treatment 6 (Pre decomposed coffee husk, consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* and *Eisenia fetida*) and it is closely followed by the treatment 3 (Pre decomposed

Table 1: Impact of paddy and coffee husk as the biocompost and its effect on the vegetative parameters of *Vigna mungo* (L.) Hepper.

Treatments	Root length (cm)			Shoot length (cm)			Number of leaves			Number of nodules		
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS
C	3.1	7.3	11.6	8.2	18.6	24.9	10.0	20.0	29.0	4.0	11.0	9.0
T_1	4.7	9.7	13.9	10.5	21.1	27.2	12.0	23.0	34.0	6.0	19.0	13.0
T_2	4.2	9.5	13.4	10.2	20.8	27.8	11.0	24.0	32.0	7.0	17.0	11.0
T_3	6.1	11.3	15.6	11.1	25.2	29.1	17.0	32.0	39.0	9.0	25.0	15.0
T_4	4.3	8.6	12.7	10.9	19.1	27.5	13.0	22.0	30.0	5.0	18.0	10.0
T_5	5.2	9.9	12.5	9.9	19.7	26.9	14.0	25.0	31.0	8.0	20.0	12.0
T_6	7.9	12.2	16.5	11.8	25.8	30.7	19.0	37.0	41.0	10.0	30.0	17.0
SEd		0.01858			0.17871			0.44129			0.20840	
CD (p<0.05)		0.03754**			0.36119**			0.89191**			0.42119**	

**Significant at (p<0.05) DAS-Days after sowing.

C- Control, T_1- Raw paddy husk pre decomposed by *Pleurotus eous+Eisenia fetida* (5 t/ha), T_2- Raw paddy husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha),T_3- Raw paddy husk pre decomposed by consortium of *Pleurotus eous, Pleurotus florida, Trichoderma asperelloides* + *Eisenia fetida* (5t/ha), T_4- Raw Coffee husk pre decomposed by *Pleurotus eous* + *Eisenia fetida* (5 t/ha), T_5- Raw coffee husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha), T_6- Raw coffee husk pre decomposed by Consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* + *Eisenia fetida* (5 t/ha).

Table 2: Impact of paddy and coffee husk as the biocompost and its effect on the fresh weight and dry weight of *Vigna mungo* (L.) Hepper.

Treatments	Fresh weight (g)			Dry weight (g)		
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS
C	1.10	4.01	10.97	0.19	2.01	3.07
T_1	1.52	5.06	12.14	0.24	2.34	4.03
T_2	1.51	5.17	12.09	0.28	2.15	4.21
T_3	1.99	6.16	15.20	0.49	3.07	5.06
T_4	1.66	5.39	12.13	0.20	2.09	4.01
T_5	1.71	6.01	13.19	0.29	2.31	4.02
T_6	2.77	7.37	15.39	0.52	3.67	5.73
SEd		0.19346			0.07555	
CD (p<0.05)		0.39101**			0.15250**	

**Significant at (p<0.05); DAS-Days after sowing.

C- Control, T_1- Raw paddy husk pre decomposed by *Pleurotus eous* + *Eisenia fetida* (5 t/ha), T_2- Raw paddy husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha),T_3- Raw paddy husk pre decomposed by consortium of *Pleurotus eous, Pleurotus florida,Trichoderma asperelloides* + *Eisenia fetida* (5 t/ha), T_4- Raw coffee husk pre decomposed by *Pleurotus eous* + *Eisenia fetida* (5t/ha), T_5- Raw coffee husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha), T_6- Raw coffee husk pre decomposed by Consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* + *Eisenia fetida* (5 t/ha).

paddy husk, consortium of *Pleurotus eous, Pleurotus florida*, *Trichoderma asperelloides* and *Eisenia fetida*) when compared to the control and all the other treatments. Treatment 6 (39) showed the maximum number of pods/ plant and it is followed by the treatment 3 (37) and the minimum number showed by control (29) as well as the length of the pod was also recorded to be high in treatment 6 (5.6 cm) followed by treatment 3 (5.1 cm) and the lowest is found in control (3.5 cm). The length of the pod was found to be high in the work of Raihing and Vijayalakshmi, (2021) in treatment 8 (13.00 cm) with the application of fruit waste, cow dung, *P. eous*,*Trichoderma asperelloides* and *Eudrilus eugeniae* (5 t/ha).

The maximum number of seeds in treatment 6and treatment 3 was found to have the similar results (5) and the control (3) showed the lowest results, similar results were found in soybean with the application of poultry manure 6 t ha +*Rhizobium* @ 20 g Kg^{-1} seed Phosphatica @20 g Kg^{-1} (T6) in the maximum number of seeds/pod (2.83) (Changkija and Gohain, (2018). The maximum increase is found in the weight of the seeds/pod in treatment 6 (2.384 g) followed by treatment 3 (2.012 g) when it is compared to other treatments and the control (1.012 g), as well as pod fresh weight and dry weight also showed the highest increase in treatment 6 (2.95 and 1.195 g) followed by treatment 3 (2.87 and 1.102 g) the lowest was found in control (1.22 and 0.670 g).

Table 3: Impact of paddy and coffee husk as the biocompost and its effect on the yield parameters of *Vigna mungo* (L.) hepper at 90 DAS.

Treatments	Number of pods/plant	Length of the pod (cm)	Number of seeds/pod	weight of the seeds/pod (g)	Pod fresh weight (g)	Pod dry weight (g)
C	29	3.5	3	1.012	1.22	0.670
T_1	36	4.0	4	1.885	1.61	0.831
T_2	34	3.9	4	1.911	1.77	0.901
T_3	37	5.1	5	2.012	2.87	1.102
T_4	35	4.3	5	1.117	1.75	0.811
T_5	36	4.7	4	1.224	1.67	0.728
T_6	39	5.6	5	2.384	2.95	1.195
SEd	0.0440	0.3171	0.1688	0.2535	0.1936	0.0402
CD (p<0.05)	0.0943**	0.6802**	0.3622**	0.5438**	0.4153**	0.0863**

**Significant at (p<0.05) DAS-Days after sowing.

C-Control, T_1- Raw paddy husk pre decomposed by *Pleurotus eous* + *Eisenia fetida* (5 t/ha), T_2- Raw paddy husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha),T_3- Raw paddy husk pre decomposed by consortium of *Pleurotus eous, Pleurotus florida,Trichoderma asperelloides* + *Eisenia fetida* (5 t/ha), T_4 - Raw Coffee husk pre decomposed by *Pleurotus eous* + *Eisenia fetida* (5 t/ha), T_5- Raw coffee husk pre decomposed by *Pleurotus florida* + *Eisenia fetida* (5 t/ha), T_6 - Raw Coffee husk pre decomposed by Consortium of *Pleurotus eous, P. florida, Trichoderma asperelloides* + *Eisenia fetida* (5 t/ha).

Similar results are correlated with Kumar *et al*. (2021) who found the increase in the yield of pea crops 40 to 61% and capsicum crop 14-48% with the application of biomass with matkakhad, rock phosphate, gypsum, patent Kali and lime @ 1% and with the inclusion of *Tricoderma, Rhizobium, Azatobacter* along with PSB. Veeral and Kalaimathi, (2021) observed similar results in groundnut plants an increase in the plant height (29.9 cm) in the treatment 7 (Press mud @ 12.5 t/ha+50% RDF and *Rhizobia* @ 2 kg ha) and the number of pods/plant (27.4). Significant results were found in cluster bean with the application of chemical fertilizer with *rhizobium* (2.5 g). Treatment 16 showed the highest number of pods (221.2) (Gul *et al.,* 2019). The maximum number of pods/plant (45.94) were found in soya beans with the application of 90 P_2O_5 level (kg/ha) (Edwin Luikham *et al*., 2018).

CONCLUSION

The application of Agro-industrial wastes Paddy and Coffee husk biocompost on black gram and its influence on the growth and yield parameters of black gram was proved with maximum results in treatment 6 (T6). The study concludes that it can be a substitute for the chemicals and it can be used as promising, sustainable, safe and eco-friendly manure to have the best growth, yield and productivity of plants.

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Conflict of interest

I declare that Authors have no conflict of interest regarding this article.

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