Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 1652-1655
Received: 28-05-2019
Accepted: 30-06-2019

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Study on residual effect of organic materials like farmyard manure and pressmud compost on green gram (*Vigna radiata*) in alluvial soil, Bihar (India)

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Abstract
A field experiment was designed to study the residual effect of organic materials like farmyard manure and pressmud compost on green gram in alluvial soil, Bihar (India). The experiment consisted of two main plots treatment of farmyard manure and pressmud compost and five subplots treatment organic manure levels of 0, 5, 10, 15 and 20 MT ha^{-1} along with full recommended dose of fertilizer of tomato crops followed by full recommended dose of fertilizer in green gram, replicated thrice in a split plot design in the same plots after harvest of tomato crop. Results showed that the seed yield of green gram crop increased significantly on the use of 10 MT ha^{-1} of farmyard manure and pressmud compost and further increased non-significantly over the control. The percentage increase in seed yield was 40.3 and 47.6, respectively for farmyard manure and pressmud compost in the treatment 10 MT ha^{-1} along with recommended dose of fertilizer over the control. Soil samples were analyzed for all the soil parameters and were found to be statistically similar across all treatments after the green gram crop. Thus it may be concluded that residual benefits could be possible in a subsequent legume crop even after heavy feeder crop like tomato crop is grown.

Keywords: Farmyard manure, pressmud compost, residual, soil, green gram

Introduction
Maintenance of soil fertility and its health can be achieved by applying certain organics. Blanket fertilizer recommendations have been advocated for proper crop growth and soil quality. Generally, farmers do not apply organics in their fields due to various reasons resulting in a decline in the fertility level as well as its quality. Lack of availability of sufficient organic materials for the purpose is one of the main reasons. Soil sustainability is possible only through applying certain organics at regular intervals. Study at different locations by various scientific communities have found positive and beneficial impact of organics on crop growth and soil health either in tropical or subtropical climatic conditions. Application of organics improves the crop quality and also improves the food security for human beings.

The excessive and injudicious application of inorganic fertilizer affects crop quality and soil productivity (Mamatha, 2006) [1] and complete shift to the organic sources alone cannot meet the crop demand and ensure food security (Sharma *et al*., 2019) [5]. Use of organic along with inorganic sources can harness natural resources appropriately and improve the soil fertility and livelihood in the region by enhancing production and productivity of crops (Timsina, 2018) [6]. Schuphan (1974) [4] reported that a combination of manure and synthetic fertilizer was superior to manure alone for crop productivity and food value in human nutrition. The application of organics like farmyard manure and press mud compost to the soil does not need any further elaboration when applied along with recommended dose of fertilizers to an individual crop. But there is a strong case to study its residual effects on the subsequent crops. Simultaneously, in the absence of organic matter addition, cropping systems involving legumes are advocated to bring resilience in the system and reduce the harmful effects of application of chemical fertilizers.

The present paper examines the influence of farmyard manure and press mud on residual effect of these treatments on the subsequent green gram cv. Pusa Vishal. The residual effect of organics requires long-term experimentation and their impact on soil sustainability and crop quality can be noticed contrastingly only if continued for long-term. However, this suggests that in the absence of any organic material application, pulse crops like green gram could serve

As a potential component of resilient cropping systems when organic materials are becoming scarce with demands for multiple alternate uses.

Materials and methods

Experimental site

The field experiment was conducted at Vegetable Research Farm of Bihar Agricultural University, Sabour, and Bhagalpur in the year 2016-17. It is located in South Bihar Alluvial Plain Zone i.e. the Agro climatic Zone III A of Bihar by National Agricultural Research Project in Bhagalpur district. Geographically it is located at 25°50' N latitude and 87°19' E longitude at an altitude of 52.73 meters above mean sea-level (MSL) in the heart of vast Indo-Gangetic plains of North India. The climate is Sub-tropical in nature having dry summer, moderate rainfall and very cold winter. During growing season, the maximum and minimum temperatures were recorded approx. 31.5ºC and 7.6ºC, respectively.

Soil

The experimental plot was well drained, having sandy loam soil texture with good fertility status (organic carbon- 5.3 g kg^{-1}, available nitrogen- 162.6 kg ha^{-1}, available P_2O_5- 43.1 kg ha^{-1} and available K2O- 167.2 kg ha^{-1}) fall under *Typic Haplustepts* (Table 1).

Table 1: Experimental Details and initial soil samples

S. N.	Experimental details			
1.	Location	:	Bihar Agricultural University Research farm	
2.	Crop	:	Tomato (Main)	Green gram (Residual)
3.	Variety	:	Kashi Vishesh (H86)	Pusa Vishal (B/S)
4.	Plot size	:	3m x 2.7 m	
5.	Spacing	:	60 cm x 45 cm	
6.	Design	:	Split plot	
7.	Treatments	:	Main plot-2 (FYM and Pressmud) Subplot-5 (0, 5, 10,15 & 20 MT/ha)	No addition
8.	Replication	:	Three	
9.	Fertilizers application (N: P_2O_5: K_2O kg/ha)	:	120:80:80	40:20:20
10.	Nutrient content in organic sources used (%)	:	Farmyard manure	Press mud compost
a.	Nitrogen	:	0.50	1.80
b.	Phosphorus	:	0.30	1.20
c.	Potassium	:	0.40	1.80
11.	Soil characteristics	:	Soil test value	
a.	pH*	:	7.94	
b.	Electrical Conductivity*(dS m^{-1})	:	0.694	
c.	Organic carbon (g kg^{-1})	:	5.3	
d.	Available Nitrogen (Kg ha^{-1})	:	162.6	
e.	Available phosphorus (Kg ha^{-1})	:	43.1	
f.	Available potassium (Kg ha^{-1})	:	167.2	
g.	Soil texture	:	Silt loam	

***** Soil: water: 1:2.5

Experimental detail

The experiment was laid out in split plot design with two main plot treatments farmyard manure & pressmud compost and having five subplot treatments i.e. organic manure levels i) 0 MT ha^{-1}, ii) 5 MT ha^{-1}, iii) 10 MT ha^{-1} iv) 15 MT ha^{-1} and v) 20 MT ha^{-1} with replicated thrice and tomato variety Kashi Vishesh (H-86) has been selected for test crop. All the subplots were supplied with full dose of recommended dose of fertilizer (RDF) (Table 1). The farmyard manure and pressmud compost were applied 20 days before transplanting the seedlings. Tomato fruits were collected at maturity and then green gram was sown to study the residual effect of these organic materials on this crop. The crop was supplied with full dose of RDF (Table 1). The intercultural operations were carried out in the field and crop was harvested at maturity. The yield and yield attributing characters were collected and nutrient status of the soils was studied. The percent protein content in the green gram was calculated using nitrogen content in the seed of the crop multiplied by the conversion factor (6.25). The data collected for all the characters involved under study was statistically analysed by Split Plot design followed by Panse and Sukhatme (1967) [2] for proper interpretation.

Results and discussion

Plant growth, yield and yield attributing characters

Plant height

Data pertaining to plant height has been shown in the Table 2. This represents no significant effect of residual organic materials like farmyard manure and pressmud compost on green gram crop. However, the plant height increased numerically from 67.4 cm to 77.3 cm in the treatment applied with 20 MT ha^{-1} of farmyard manure and 70.8 cm to 79.4 cm in the treatment applied 20 MT ha^{-1} of pressmud compost. The application of these organic materials has positive effect on plant height; this might be due to improvement of plant growth regulators and availability of nutrients in the soil on addition of organic manure in the soil. Similar results reported by Reddy and Reddy (2005) [3] and suggested that organic matter helps to improve plant growth.

Yield and Yield attributing characters

There was no significant effect on no. of primary branches/plant and no. of seeds/pod in the treatments, however there was significant effect of residual organic materials on no. of pods per plant, 100-seed weight and seed yield of green gram crop. The no. of pods per plant

significantly increased on the use of 15 MT ha^{-1} of farmyard manure and pressmud compost and further increased non-significantly over the control. The no. of pods per plant increased by 8.1 and 9.3, respectively in the treatments applied with 20 MT ha^{-1} of farmyard manure and pressmud compost in the soil (Table 2). Similarly, the test weight (100-seed weight) of green gram increased significantly on the use of 15 MT ha^{-1} of farmyard manure and pressmud compost and further increased non-significantly over the control. The test weight increased by 6.8 and 6.5, respectively in the treatments applied with 20 MT ha^{-1} of farmyard manure and pressmud compost in the soil (Table 2).

Table 2: Residual effect of different graded level of FYM and press mud on plant height, and yield attributing characters of green gram crop.

Treatment	MT/ha	Plant height (cm)	No. of primary branches/plant	No. of seeds/pod	No. of pods/plant	100-seed weight
FYM	0	67.4	3.6	9.24	50.1	60.0
	5	69.8	3.6	10.65	53.2	61.9
	10	74.2	3.4	11.03	54.2	62.0
	15	74.6	3.1	11.37	58.6	66.7
	20	77.3	3.6	11.96	58.2	66.8
Press mud compost	0	70.8	3.9	10.01	50.2	60.4
	5	72.3	4.6	10.67	52.4	61.9
	10	78.7	4.4	11.54	54.7	62.8
	15	79.1	4.4	11.67	59.6	66.9
	20	79.4	4.4	11.68	59.5	66.9
LSD (0.05)	M	NS	NS	NS	NS	NS
	S	NS	NS	NS	4.9	5.5
	MXS	NS	NS	NS	NS	NS

In case of mean seed yield of green gram crop, it increased significantly on the use of 10 MT ha^{-1} of farmyard manure and pressmud compost and further increased non-significantly over the control. The percentage increase in seed yield was 40.3 and 47.6, respectively for farmyard manure and pressmud compost in the treatment 10 MT ha^{-1} over the control (Figure 1). This might be due to the fact that inclusion of organic manure had improved soil physical conditions owing to its pulverizing effect on soil that have resulted in better root and pod development, nutrient absorption and better seed development. Interaction effect of sources of manure and level of organic manures was found non-significant effect.

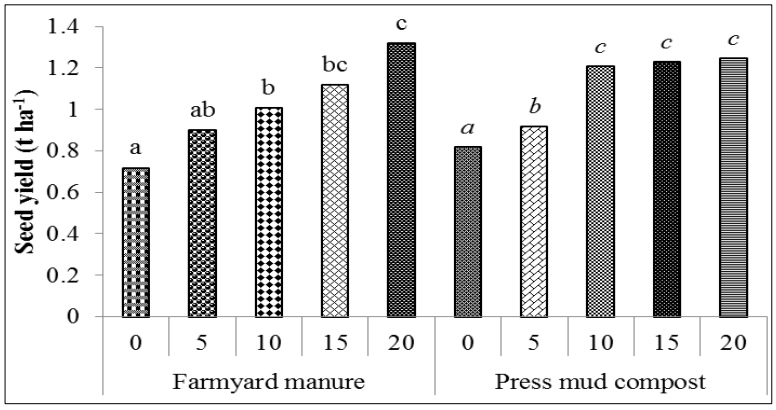

Fig 1: Residual effect of different graded level of FYM and press mud compost on seed yield of green gram

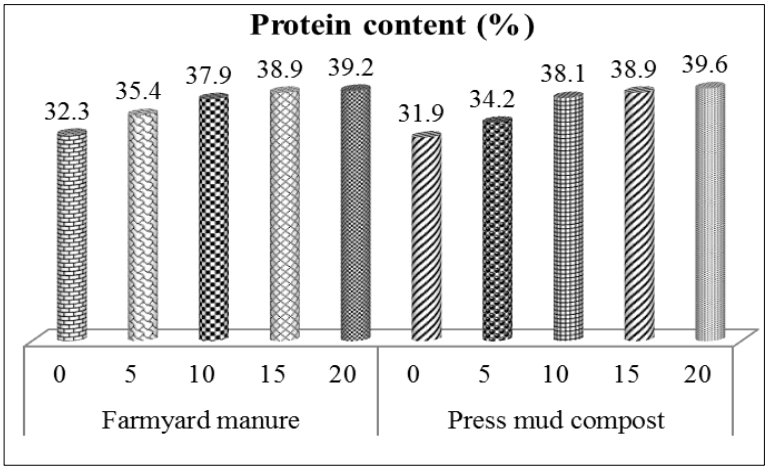

Fig 2: Residual effect of different graded level of FYM and press mud compost on protein content (%) of green gram.

The percent protein content in the green gram was found non-significant on residual organic material available in the soil. However, there was increase in protein content upto 39.2 and 39.6 percent on application of 20 MT ha^{-1} of farmyard manure and pressmud compost in the soil (Figure 2) Soil nutrient status before sowing and after harvest of green gram crop Data pertaining to soil nutrient status has been shown in the Table 3 & Table 4. There was no significant effect of organic manure addition on soil nutrient status except available phosphorus on after tomato harvest. But, the soil nutrients content increased on application of organic manure over inorganic fertilizer only. The increase in nutrient content is might due to addition of nutrients from the organic manure as well as release of organic acids from the organic manure that solubilizes the nutrients and improves the fertility level of the status.

Table 3: Effect of graded levels of farmyard manure and press mud compost on soil characteristics after tomato harvest

Treatment	MT/ha	pH	EC (dS m^{-1})	OC (g kg^{-1})	Av. N	Av. P	Av. K
FYM	0	7.81	0.67	5.2	171.5	44.3	165.4
	5	7.75	0.80	5.4	174.2	46.2	168.4
	10	7.65	0.76	5.5	178.9	47.7	169.5
	15	7.58	0.79	5.5	182.3	49.3	173.0
	20	7.56	0.61	5.7	186.5	49.6	174.4
Press mud compost	0	7.80	0.76	5.4	169.4	44.9	165.3
	5	7.59	0.61	5.5	173.9	46.4	181.6
	10	7.53	0.76	5.6	176.8	47.9	183.9
	15	7.52	0.92	5.6	183.7	49.9	188.5
	20	7.48	0.71	5.8	186.9	50.2	193.9
LSD (0.05)	M	NS	NS	NS	NS	NS	NS
	S	NS	NS	NS	NS	5.4	NS
	MXS	NS	NS	NS	NS	NS	NS

Table 4: Effect of graded levels of farmyard manure and Press mud on soil characteristics after harvest of green gram

Treatment	MT/ha	pH	EC (dS m^{-1})	OC (g kg^{-1})	Av. N	Av. P	Av. K
FYM	0	7.82	0.66	5.5	170.0	41.1	160.4
	5	7.79	0.76	5.6	176.5	44.2	160.9
	10	7.68	0.72	5.6	177.9	44.3	161.4
	15	7.67	0.72	5.6	178.3	47.9	170.0
	20	7.65	0.73	5.8	179.1	47.5	170.3
Press mud compost	0	7.84	0.75	5.4	168.4	44.2	163.2
	5	7.65	0.68	5.7	170.2	46.9	178.2
	10	7.65	0.78	5.7	171.2	47.5	176.9
	15	7.62	0.85	5.8	178.3	48.6	176.5
	20	7.52	0.83	6.2	180.0	48.6	186.4
LSD (0.05)	M	NS	NS	NS	NS	NS	NS
	S	NS	NS	NS	NS	NS	NS
	MXS	NS	NS	NS	NS	NS	NS

Conclusion

Residual benefits could be possible in a subsequent crop. The residual effect of organics requires long-term experimentation and their impact on soil sustainability and crop quality can be noticed. This suggests that presence of any organic material application, pulse crops like green gram could serve as a potential component of resilient cropping systems when organic materials are becoming scarce with demands for multiple alternate uses.

References

1. Mamatha HN. Effect of organic and inorganic sources of nitrogen of nitrogen on Yield and Quality of onion (*Allium cepa* L.) and soil properties in Alfisols. M. Sc (Agri.) Thesis, Univ. Agric. Sci., Dharwad, 2006.
2. Panse VG, Sukhatme PV. Statistical methods for Agricultural Workers. ICAR, New Delhi, 1967, 97-123.
3. Reddy KC, Reddy KM. Differential levels of vermicompost and nitrogen on growth and yield in onion (*Allium cepa* L.) –radish (*Raphanus sativus* L.) cropping system J Res. ANGRAU. 2005; 33(1):11-17.
4. Schuphan W. Nutritional value of crops as influenced by organic and inorganic fertilizer treatments. Qual. Plan.-Pl. Fds. Hum. Nutr. 1974; 23(4):333-358.
5. Sharma S, Padbhushan R, Kumar U. Integrated Nutrient Management in Rice–Wheat Cropping System: An Evidence on Sustainability in the Indian Subcontinent through Meta-Analysis Agronomy doi: 10. 3390/agronomy9020071. 2019; 9:71.
6. Timsina J. Can organic sources of nutrients increase crop yields to meet global food demand? Agronomy. 2018; 8: 214.