



Effect of Organic Manure and *Gliricidia* leaf Extract on Soil Properties after Harvest of Green Gram under Organic Farming

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2023/v35i203882

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/106535>

Original Research Article

Received: 25/07/2023
Accepted: 29/09/2023
Published: 05/10/2023

ABSTRACT

A field experiment was conducted during the summer season of 2022 to find out the influence of organic manure and *Gliricidia* leaf extract on soil fertility under green gram at the organic farm, Navsari Agricultural University, Navsari, Gujrat. The experiment site was high in organic C content (0.73 %), medium in available nitrogen (257.96 kg/ha) and phosphorus (27.14 kg/ha) while high in available potash (579.13 kg/ha) with pH 7.50 and EC 0.28 dS/m. The result indicated that available N was observed to significantly maximise under the application of 100% RDN through Compost + GLE @500 l/ha at 20, 40 and 60 DAS while available K₂O and DTPA extractable Fe were significantly maximum under the application of 100% RDN through Compost + 2% GLE through the foliar spray. Soil pH, EC, organic C, available P₂O₅, DTPA extractable Mn, Zn, and Cu were not affected significantly due to different treatment comprising various organic sources.

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Keywords: *Gliricidia* leaf extract; green gram; organic manure; soil fertility.

1. INTRODUCTION

“Pulse crops play an important role in Indian agriculture and India is the largest producer and consumer of pulses in the world. Pulses contain a high percentage of quality protein nearly three times as much as cereals” Upadhyay et al. [1]. “Pulses are known to improve the physical characteristics of soil through a tap root system which opens the soil into deeper layers and their ability to use atmospheric nitrogen through biological nitrogen fixation which is economically sound and environmentally acceptable. India grows nearly 27.99 million hectares of pulses with an annual production of 23.03 million tonnes and average productivity of 823 kg/ha” [2]. “India shares about 35-37 per cent and 27 per cent of the total area and production of pulses, respectively in the world” Ranpariya et al. [3]. “In Gujarat, it is cultivated in 1.3 million hectares with an annual production of 1.89 million tonnes and productivity of 1449.29 kg/ha” [4].

“The excessive utilization of chemical fertilizers has not only caused the exhaustion of soil of its reserved nutrients but also resulted in soil health problems. The high cost of inorganic fertilizers makes it uneconomical and out of reach to poor farmers and it is also undesirable due to its hazardous environmental effects. Moreover, the imbalance and continuous use of chemical fertilizers have adverse effects on soil physical, chemical and biological properties thereby affecting the sustainability of crop production, besides causing environmental pollution” [5]. “The application of organic sources of nutrients may work as the 'driving force' in sustainable crop production while improving soil health and fertility” [6]. “Organic manure acts not only as a source of organic matter and nutrients but also increases the size, biodiversity and activity of the microbial population in the soil, influences structure, nutrient get turn over and many other changes related to physical, chemical and biological parameters of the soil” Albiach et al. [7]. Further, the liquid organic manures meet the nutrient requirement of crops with greater nutrient use efficiency and also correct the deficiency as and when noticed under the organic production system.

2. MATERIALS AND METHODS

The experiment was conducted during the summer of 2022 at organic farming, ASPEE

College of Horticulture, Navsari Agricultural University, Navsari to study the “Effect of organic manure and *Gliricidia* leaf extract on soil properties in green gram under organic farming.” The green gram variety GM 7 was sown with a spacing of 45 cm x 10 cm. The experiment was laid out in randomized block design (RBD) with three replications and eight treatments. The details of treatments are as T₁: No manures, T₂: 50% RDN through Compost, T₃: 100% RDN through Compost, T₄: 50% RDN through Compost + GLE @ 500 l/ha, T₅: 50% RDN through Compost +2% GLE (FS), T₆: 100% RDN through Compost + GLE @500l/ha, T₇: 100% RDN through Compost + 2% GLE (FS) and T₈: GLE @ 500 l/ha + 2% GLE (FS). *Gliricidia* leaf extract (GLE) as a foliar spray applied at 15, 30 and 45 DAS while drenching at 20, 40 and 60 DAS. The soil of the experimental unit was clayey in texture with good water-holding capacity. The experiment site was high in organic C content (0.73 %), medium in available nitrogen (257.96 kg/ha) and phosphorus (27.14 kg/ha) while high in available potash (579.13 kg/ha) with pH 7.50 and EC 0.28 dS/m.

3. RESULTS AND DISCUSSION

3.1 pH, EC and Organic C

The result revealed that soil physiochemical properties (Table 1) were influenced by different treatments. Results indicated that the effect of different treatments on pH, EC and organic C of soil after the harvest of green gram was found non-significant. While organic C content was numerically higher (0.89 %) in T₇ (100% RDN through Compost+ 2% GLE through foliar spray) followed by T₃, T₂, T₆, T₄, and T₈. The data further showed that the lowest organic C content (0.75 %) in soil was found in T₁.

3.2 Availability of Major Nutrients

Organic matter addition significantly enhanced the nutrient availability of the soil. Data present in Table 1 indicate that application of 100% RDN through Compost + GLE @500 l/ha at 20, 40 and 60 DAS recorded significantly higher available nitrogen content (284.84 kg/ha) in soil after harvest of green gram as compared to control but at par with T₇ (100% RDN through Compost + 2% GLE through foliar spray) and T₃ (100% RDN through Compost) with corresponding values 275.34 and 268.88 kg/ha. The result

regarding available P₂O₅ did not affect significantly due to different treatments. But numerically the highest available P₂O₅ (47.57 kg/ha) in soil was obtained with treatment T₇ (100%RDN through Compost + 2% GLE through foliar spray) followed by T₆ (100% RDN through Compost + GLE @500l/ha) and T₃ (100% RDN through compost) with value of 47.39 and 46.87 kg/ha.

While available K₂O content in soil after harvest of green gram showed that significantly higher available K₂O (591.20 kg/ha) was found in treatment T₇ (100% RDN through Compost + 2% GLE through foliar spray) which was found statistically at par with T₆ (100% RDN through Compost + GLE @500 l/ha), T₃(100% RDN through Compost) and T₅ (50% RDN through Compost +2% GLE through foliar spray) with value 584.60, 581.04 and 547.11 kg/ha respectively. The result demonstrates that the use of organic manure compost with *Gliricidia* leaf extract could be used for maintaining soil

fertility by providing available major nutrients with improvement in soil physical and biological fertility. Similar results were also reported by the findings of, Ranpariya et al. [3] in green gram, Karnavat et al. [8] in green gram and Bag et al. [9] in chickpea; Yadav et al. [10] in chickpea; Swami et al. [11] in green gram.

3.3 DTPA extractable Fe, Mn, Zn and Cu

In the case of DTPA extractable Fe, Mn, Zn and Cu in the soil after the harvest of green gram (Table 2), Mn, Zn and Cu did not show a significant effect. While Fe content in the soil after the harvest of green gram was significantly higher (9.65 mg/kg) which was statistically at par with T₃ (9.24 mg/kg) and T₆ (8.79 mg/kg) and significantly lowest Fe content (7.96 mg/kg) in the soil after harvest of green gram was found in control treatment T₁ (No manure). The increment of available Fe in soil due to those applications of different organic sources like compost and liquid organic formulation GLE enhance microbial

Table 1. Effect of different treatments on pH, EC, OC and available major nutrients of soil after harvest of green gram

Treatment	pH (1:2.5)	EC (1:2.5) (ds/m)	OC (%)	Available major nutrients (kg/ha)		
				N	P ₂ O ₅	K ₂ O
T ₁	7.47	0.43	0.75	240.99	37.29	513.95
T ₂	7.30	0.48	0.86	248.97	39.35	518.76
T ₃	7.33	0.41	0.88	268.88	46.87	581.04
T ₄	7.41	0.49	0.82	252.60	44.25	538.05
T ₅	7.37	0.42	0.80	253.32	41.34	547.11
T ₆	7.46	0.43	0.84	284.84	47.39	584.60
T ₇	7.42	0.48	0.89	275.34	47.57	591.20
T ₈	7.56	0.47	0.76	245.61	40.45	529.39
SEm (±)	0.15	0.02	0.03	9.05	2.48	16.16
CD at 5%	N.S.	N.S.	N.S.	27.45	N.S.	49.01
CV (%)	3.42	7.68	6.92	6.06	9.97	5.08
Initial status	7.50	0.28	0.73	275.96	27.14	579.13

Table 2. Effect of various treatments on DTPA extractable Fe, Mn, Zn and Cu in soil after harvest of green gram

Treatment	DTPA extractable (mg/kg)			
	Fe	Mn	Zn	Cu
T ₁	7.96	5.74	0.46	1.56
T ₂	8.15	5.77	0.50	1.68
T ₃	9.24	6.17	0.62	1.88
T ₄	8.50	6.08	0.54	1.72
T ₅	8.38	6.11	0.55	1.57
T ₆	8.79	6.26	0.61	1.71
T ₇	9.65	6.39	0.64	1.96
T ₈	7.98	5.73	0.47	1.86
SEm (±)	0.36	0.24	0.04	0.12
CD at 5%	1.11	N.S.	N.S.	N.S.
CV (%)	7.36	7.00	12.89	11.49
Initial status	5.86	11.01	0.36	2.85

activity which increases the availability of Fe status in soil through solubilizations. Similar results were also obtained by Ranpariya et al. [3] in green gram; Karnavat et al. (2018) in green gram; Bag et al. [9] in chickpeas and Yadav et al. [10] in chick peas.

4. CONCLUSIONS

Based on the above finding, it can be concluded that application of 100% RDN through Compost alone or in combination with foliar spray @ 2% or drenching @ 500 l/ha of *Gliricidia* leaf extract increases the availability of major nutrients and DTPA extractable Fe content in soil after harvest of green gram as compared to control. However, Organic manure application and liquid organic manure spray could not bring any significant impact on Organic C, available P₂O₅ and DTPA extractable Mn, Zn and Cu in soil.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

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