Effect of *Lantana* manures on nutrient content of Fenugreek (*Trigonella –foenum graecum* L.)

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ABSTRACT

In this investigation attempts have been made to see the effect of *Lantana* manure on growth and productivity of *Trigonella* vegetable. A field experiment was conducted in the Botanical garden at Dr. Babasaheb Ambedkar Marathwada University's Research farm. The *Lantana* weed was collected from different sites of university campus. Equal amount of fresh aerial *Lantana* biomass was used to prepare various types of manure i.e. Vermicompost (VCOM), Compost (COM), dry leaf manure (DLM), mixed compost (MIX) 1:1 proportion (*Ipomoea carnea* and *Lantana camera*). *Trigonella–foenum graecum* L. was grown on these manures in the field and compared with fertilizer alone (FER) and absolute control (CO) with four replicates each. Chemical analysis of each manure was carried out. Chlorophyll a, Chlorophyll b, total Chlorophyll, β carotene, Ascorbic acid content of fresh *Trigonella* was also estimated. The chlorophyll a, total chlorophyll, β carotene, Ascorbic acid content were highest in DLM treated plots followed by VCOM, while Chlorophyll b was more in VCOM amendment followed by Dry leaf manure.

Key words: Chlorophyll, *Lantana*, manure, *Trigonella*, weed

INTRODUCTION

Agricultural practices have changed significantly over the past century. In India, nearly 300 MT of agricultural waste including weeds is produced annually. Therefore there is a tremendous scope for recycling of this waste using vermitechnology so that quality organic manure can be produced (Ramaswami, 1998; Mishra, 2001); it is becoming increasingly popular due to the emerging trend of organic farming. Sustainable agriculture has been growing rapidly in popularity for a number of reasons.

Agricultural substrates and wastes are potential sources of organic nutrients which if converted into various manures as compost, vermicompost, dry leaf manure etc. to improve soil and water conservation, sustain crop productivity and enhance crop yields (Hundal and Zinia, 2009). Vermicomposting is an accelerated biotechnological process of composting of organic wastes that involves interaction between earthworms and micro-organisms. Utilization of earthworms for recycling of organic wastes is an important development in biological sciences and studies have documented vermicomposting as a low-cost technology for the processing or treatment of organic wastes to convert them into value added nutrient rich compost (Hand *et al*., 1988; Garg *et al*., 2006, Singh *et al*.,2008) Research was also carried out for use of common weeds (Naikwade *et al*., 2011a), leaf litter (Naikwade *et al*., 2011b) as source of nutrients by composting and vermicomposting.

Lantana camera is common weed belonging to Verbenaceae family. Despite serious negative traits it has been shown that *Lantana* could be put to more than one use. The organic recycling of *Lantana* provides return in the form of manure. The beneficial method of management of *Lantana* is preparation of various types of manures. In this investigation attempts have been made to see the effect of *Lantana* manure on growth and productivity of *Trigonella* vegetable.

MATERIAL AND METHODS

Field site and experimental design

A field experiment was conducted in the Botanical garden at Dr. Babasaheb Ambedkar Marathwada University's Research farm during Nov.2007 to Jan. 2008. The experimental design was a randomized block design (RBD) with six treatments and four replicates.

Treatments, composting process and plot size

The *Lantana* weed was collected from different sites of university campus. Equal amount of fresh aerial *Lantana* biomass i.e. 5.76 kg/plot (13333 kg/ha) was used to prepare various types of manure i.e. Vermicompost (VCOM), Compost (COM), dry leaf manure (DLM), mixed compost (MIX) 1:1 proportion (*Ipomoea carnea* and *lantana camera*). For each type of manure weeds were chopped into small pieces (2-3cm) and dumped in 2.5 x 2.5 x 2.5 ft. pit with the alternate layers of weed biomass, soil and dung. For the preparation of vermicompost 1/2 Kg earthworms were inserted, in the pit and distributed uniformly. Equal amount (13333 kg/ha) of weed biomass was kept for drying as dry leaf manure (DLM). After 60 days good quality manures were obtained. The uniform mixed samples (100gm) of each treatment were collected immediately for nutrients analyses. The compositions of these applications are reported in Table 2. The *Lantana* manures were then applied in four replicates and six treatments.

To evaluate the performance of various manures of *Lantana camera*, *Trigonella–foenum graecum* L. seeds were sown at the rate 30Kg/ha in 1.8 x 2.4m. Plots, with *Lantana* compost, vermicompost, dry leaf manure, mixed (*Ipomoea* + *Lantana*), NPK and control treatments with 4 replicates of each.

Application of mineral fertilizers

The fertilizers were applied at the recommended levels of 40N, 30P, and 30K kg/ha as urea, single super phosphate and muriate of potash to NPK treatment alone. Entire amount of P_2O_5 and K_2O was applied as basal dose for all the plots at the time of cultivation. The crop received irrigation as per requirement regularly**.** To assess the effect of treatments; analyses were done at 40 DAS as Ascorbic acid and β-carotene, Chlorophyll content. The fresh aerial biomass yield obtained per plot was recorded and kept in oven at 90^0C for 48 h. the dried samples were weighed, finely milled, sieved and stored in labeled airtight polythene bags for nutrients analyses.

Chemical analysis

The manures prepared from weeds plant were analyzed for Ash values, N, P, K, Ca. Ash values were obtained by burning the moisture-free samples in a muffle furnace at 600°C for 2 hours and calcium (Ca) Content was analyzed by titrating the acid soluble ash solution against 0.01 N KMnO4 solution using methyl red as indicator (AOAC, 1995). Nitrogen (N) was estimated by micro-Kjeldahl method after digesting the sample with Conc. H_2SO_4 (Bailey, 1967). The amount of phosphorus was measured following Fiske and Subba Rao (1972) as described by Oser (1979). Potassium (K) Content was determined on a flame photometer (model Mediflame- 127) as suggested by Jackson (1973). The β carotene, Ascorbic acid, total chlorophyll content was estimated in fresh fenugreek. The leaf chlorophyll contents (a, b and total) were estimated following Arnon (1961), using 80 % acetone as a solvent for extraction of pigments. The amount of β carotene (Pro- vitamin A) was estimated by extracting it in petroleum ether and acetone (2: 1) following the method described by Knuckles *et al*. (1972). Ascorbic acid was estimated by titration method given by Sadasivam and Manickam (1992).

RESULTS AND DISCUSSION

Analysis of weed

The dry matter kg/ha of *Lantana* weed was 3022 while Mixed weed i.e. *Ipomoea carnea + Lantana camara* was high with 3203 kg/ha. Similar trend was observed in Nitrogen kg/ha. *Lantana camara* with 65 kg/ha and Mixed weeds show 76 kg ha Nitrogen. While percentage of Ash, P and Carbon was more in *Lantana* weed than Mixed weed but K percent was more in Mixed weed (Table 1).

Analysis of weed manure

Equal amount of weed biomass was used for the preparation of manures. Among all manures MIX manure was with high (6527.78 kg/ha) dry matter followed by COM (6111.98 kg/ha), VCOM (5309.57 kg/ha) and less DLM with 813.95 kg/ha. Similar pattern was observed in percentage of Ash, Carbon and C:N ratio. VCOM amendment shows ideal C/N ratio (29.16) followed by COM (39.79) and MIX (40.31) with high ratio.

DLM showed low C/N ratio (4.41). MIX amendment was with high Nitrogen (43.50 kg/ha), followed by VCOM (35.38 kg/ha),

Table 1. Analysis of *Lantana* and Mixed (*Ipomoea carnea +Lantana camara*) weeds MIX-(*Lantana* + *Ipomoea*)

Treatment	Fresh wt.		Dry Matter		Nitrogen		Percentage				C/N
	kg/plot	kg/ha	%	kg/ha	%	kg/ha	Ash	P	K	C	Ratio
Lantana	5.76	13333	22.67	3022	2.17	65	16.20	0.220	0.294	9.40	4.03
MIX	5.76	13333	24.02	3203	2.38	76	13.25	0.216	0.300	7.69	3.22

Table 2. Analysis of *Lantana* and Mixed (*Ipomoea carnea +Lantana camara*) manure.

Treatments	Fresh wt.		Dry Matter		Nitrogen		Percentage				C/N
	kg/plot	kg/ha	%	kg/ha	%	kg/ha	Ash	P	K	C	Ratio
VCOM	3.45	7986	66.49	5309.57	0.67	35.38	33.5	0.13	0.09	19.43	29.16
COM	3.75	8681	70.41	6111.98	0.54	33.09	37.15	0.10	0.11	21.55	39.79
DLM	1.45	3356	24.25	813.95	2.04	16.60	15.50	0.22	0.29	8.99	4.41
MIX	4.00	9259	70.50	6527.78	0.67	43.50	49.35	0.09	0.10	28.62	40.31

Fig.1. Ascorbic acid content influenced by *Lantana* manure. Age of plant 40 (DAS).

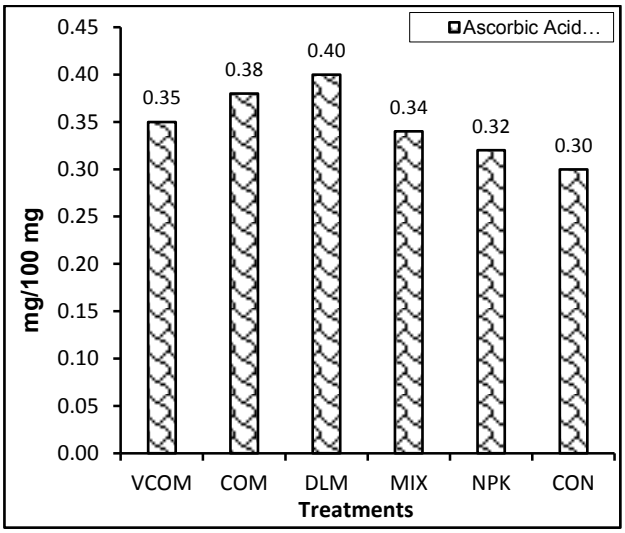
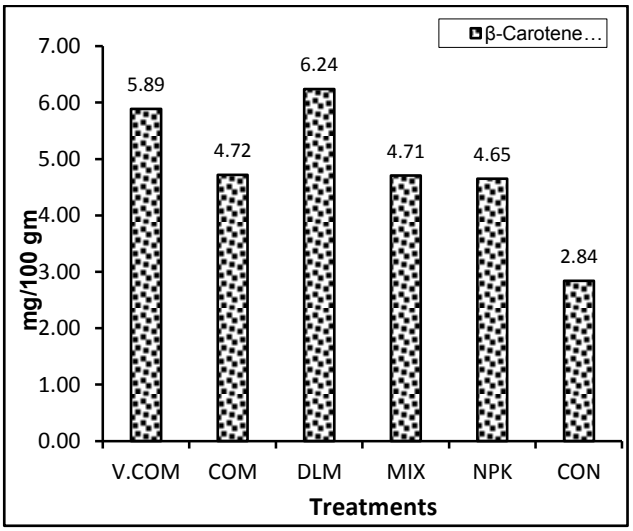


Fig.2. β-carotene influenced by *Lantana* manure. Age of plant 40 (DAS)



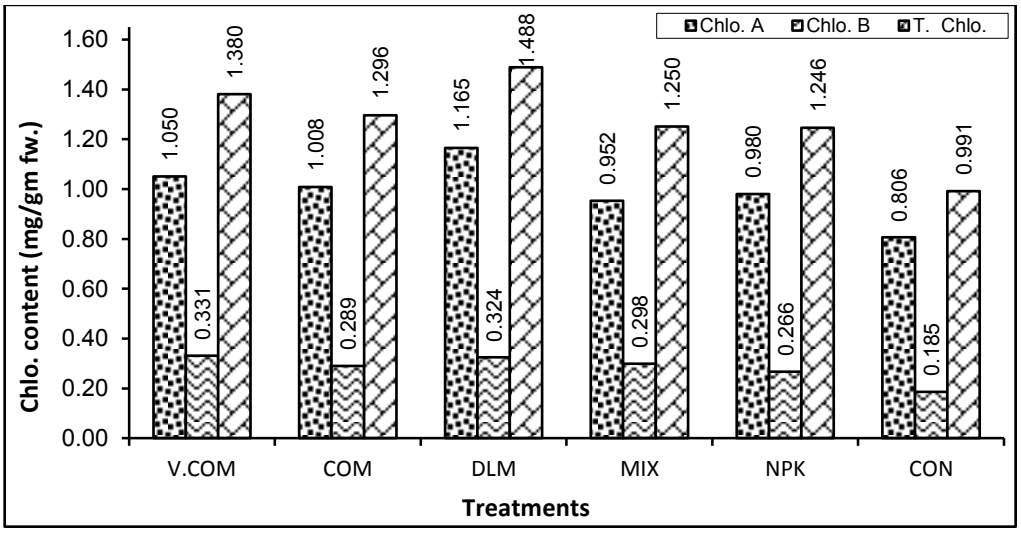


Fig.3. Chlorophyll content influenced by *Lantana* manure. Age of plant 40 (DAS).

COM (33.09 kg/ha) and less in DLM (17kg/ha). Percentage of P was more in DLM followed by VCOM, COM and less in MIX while K percent was more in DLM and in VCOM (Table 2). Nitrogen gets reduced during the composting process. The organic material is in form of cellulose or lignin which is in insoluble form and nitrogen present in the lignin humus complexes, formed by microbial activity in the composting process is not available unless lignin broke down. This in turn results into nitrogen loss (Crowford, 1985). Research done by Reddy and Shantaram (2005) showed that the vermicomposting resulted in faster reduction of C/N ratio as compared to other compost.

Ascorbic acid content of fenugreek

Ascorbic acid is also called as 'Vitamin-C' was recorded highest (0.40 mg/100mg) in DLM application followed in order by COM (0.38 mg/100mg), VCOM (0.35 mg/100mg), MIX (0.34 mg/100mg), NPK (0.32mg/100mg), and lowest in CON (0.30 mg/100mg) plots (Fig.1).

These results were confirmed as the findings of Lundegardh *et al*. (2008) who showed that organic manures increases ascorbic acid level, compared to chemical fertilizer. Naikwade *et al*. (2011) proved that *Trianthema* weed manures can be effectively used as a source of nutrients for spinach as reflected by ascorbic acid content.

β-Carotene content of fenugreek

β-Carotene is the precursor of vitamin- A. it was recorded maximum (6.24 mg/100mg) in DLM than VCOM (5.89 mg/100mg), COM (4.72 mg/100mg), MIX (4.71 mg/100mg), and NPK (4.65 mg/100mg) and lowest (2.84 mg/100mg) in CON plots (Fig.2). Singh *et al*., (2003) also indicated that organic manures increased Vitamin A content as compared to chemical fertilizer. Similar results were shown by Naikwade *et al*.(2011) in case of spinach.

Chlorophyll contents of fenugreek

Chlorophyll a, b and total chlorophyll contents ranged from 0.806-1.165, 0.185-0.331 and 0.991-1.488 mg g^{-1} leaf fresh weight at 40 DAS. The chlorophyll a and total chlorophyll were highest in DLM treated plots followed by VCOM, COM, NPK, MIX and lowest in untreated plots while Chlorophyll b was more in VCOM amendment followed by DLM, COM, NPK, MIX and less in CON plots (Fig.3). Increase in leaf chlorophyll content could in turn lead to increased protein synthesis of the plants and this could have a direct consequence on the plant growth and photosynthesis (Hendry *et al*. 1987). These results are in agreement with the finding of Sharma *et.al*, (2008).

Based on the results it reveals that the Ascorbic acid, β carotene, chlorophyll content of *Trigonella* increased significantly due to the fertilization of *Lantana* manures as a result of better uptake of nutrients from the soil. On the basis of the results obtained, it can be concluded that the application of *Lantana* manure was more effective in increasing the nutrient content without any detrimental effect on *Trigonella* vegetable. Among various type of *Lantana* manures VCOM amendment show highest yield and nutrient uptake as compared to other manuring methods VCOM is the best, active and cheapest source of plant nutrients. *Lantana* DLM is the efficient manure working with high efficiency.

Instead of eradicating *Lantana camara* with different physical, mechanical, biological methods or burning it, the practice of *Lantana* manuring is the best way of Lantana management which increases the soil fertility. *Lantana* vermicompost was found to be the best treatment for increasing *Trigonella* yield and maintaining soil fertility. There is minimum nutrient loss if *Lantana* is dried in shade and utilize as dry leaf manure. Hence it is nutrient rich, easily available source of organic manure.

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