INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume2, Issue6)

Available online at: www.ijariit.com

COMPARATIVE STUDY OF MANURE PRODUCED FROM WASTES

Akhil Kumar Gupta
Dept. of Chemical Engg,
IET LUCKNOW
kumarakhil058@gmail.com

Divyank Tiwari
Dept. of Chemical Engg.
IET LUCKNOW
divyank27795@gmail.com

Gaurav Singh*
Dept. of Chemical Engg.,
IET LUCKNOW
gaurav28696@gmail.com

Matulya Mani
Dept. of Chemical Engg.
IET LUCKNOW
matulyamani197@gmail.com

Abstract— The blind use of fertilizers have made the soil dilapidated to such an extent that it would take 3 years of no cultivation and continuous fixing of minerals by organic methods, to convert the soil for the purpose of organic farming. Chemical fertilizers are like a drug to the soil, the more we use the more will be required. In order to bring a change and to make organic method more demanding and handy, a set of trials were done. The experiments were conducted inside the college campus using different type of manures, farm yard manure (made by cow dung straw and cow urine), garden manure (made by dry shredded leaves, kitchen waste and thrown flowers) and vermicompost (using Eisenia fetida earthworms) made by easy composting in normal pressure and temperature and were tested on magnifera indica (mango) plants. Significant effects were observed on the plant yield. The use of lactobacillus serum alone has increased the yield significantly. Field studies evaluated the use of leachate along with the green manure. The study was done on the optimum use of manure for the nutrition requirement of plant.

Keywords: Composting, lactobacillus serum, leachate, Organic Manure, Vermicompost.

I. INTRODUCTION

Chemical fertilizers have an adverse effect on crop yield, soil nutrient content, yield of agricultural product and environment. For maximum yield and crop quality, large amount of fertilizers are used. However, application of high amount of mineral fertilizer can cause losses of nutrients from the soil, loss of crop genetic diversity and reduction in soil microbial activity, which affects the quality of surface and groundwater. Decreased soil fertility and increased mineral fertilizer prices made green manure a popular option as organic fertilizers. Green manure is an ideal method of sustaining soil fertility in the tropics and in organic farming, for both soil fertility and microbial activity. Many studies in India Eg. Chennai (nellakerai), Bihar (kedia district) highlighted the value of organic farming and green manure.

Although very few study reports are there which have focused on the types of manure and their optimum use. Farm yard manure (FYM) is not sufficient enough for organic arable farming since the excreta of animals is being used as manure to supply nutrients to crops for centuries. Even today, the animal dung and leftover agro-wastes of organic origin, like fodder are collected and accumulated in manure heaps on a daily basis. This is left in open for months to facilitate composting and during this period, the waste remains exposed to the vagaries of nature and experiences nutrient losses through volatilization and leaching, and this necessitates the use of other sources of Nitrogen for fully fertilizing high yielding plants under organic farming in our country. In India, nearly 2000 million tons (MT) of animal waste, 300 MT of crop waste besides huge amount of agro industrial and domestic sewage waste is produced annually and therefore there is a

tremendous scope for recycling of this waste so that quality organic manure can be produced; it is becoming increasingly popular due to the emerging trend of organic farming. Vermicomposting is an example of 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. The objective of this study was to develop a rapid and efficient solution for rehabilitating degraded cropland soil by precisely quantifying soil quality parameters through the application of manure compost, Vermicompost and farm yard manure (FYM). Field studies were carried out to compare how Vermicompost and manure using composting of waste product is beneficial over conventional farm yard manure (FYM) which is in common practice these days.

Study shows that the use of lactobacillus serum which enhances the yield to an extended level, irrespective of type of manure used as it increases the nutrient uptake efficiency.

Since handling with green manure is found to be tough and slow hence our research concentrated on making the organic farming efficient and handy.

II. MATERIAL AND METHODS

The process of preparation of manures (farm yard manure, compost manure and Vermicompost) was carried out in villages near Lucknow.

FIGURE 2.1 compost bin and manure samples

A. Preparation of compost manure-

During the preparation of this manure, plastic bucket was used as a bin and some holes were made in the bucket for the proper aeration so that there can be proper supply of oxygen for the bacteria. To prepare this manure, soil (6000gm approx.) was blended with potato scrap (1200gm approx.), cucumber scrap (1000gm approx.), banana peels (300gm approx.), used flowers such as roses and marigold (1500gm approx.), dry shredded leaves (500gm approx.) and straw (300gm approx.). To accelerate the decomposition, small amount of pre prepared farmyard manure was added in compost. Aerobic composting is an exothermic process and hence compost temperature risen during the complete course of composting and hence temperature was maintained at range of 110-140 ^{o} F for 45 days.

B. Preparation of Vermicompost-

Vermicomposting is a mesophilic process utilizing worms and micro-organisms that are active at temperature range of 15-40 degree C. Micro-organisms are responsible for the biochemical degradation of organic matter; the earthworms after passing the organic matter through their gizzard and gut increased the surface area for the microbial activity on the fragmented organic residues. As a result of this microbial conversion, both gut associated as well as the cast associated processes, the nutrients forms are much more soluble and available to plants than those in parent compounds. Vermicompost is considered as an excellent product, since it is homogenous, has desired aesthetics, has reduced levels of contaminants and tends to hold more nutrients over a longer period without impacting the environment. During preparation of Vermicompost, the ingredients were same as that of composting. Fresh dung was obtained from the dairy farm near IET campus Jankipuram, Lucknow, India. The earthworms (Eisenia fetida) were introduced to facilitate the process of Vermicomposting. A rectangular bed of vegetable peels, thrown flowers, banana peels and banana leaves was formed and partially decomposed cow dunk was layered above it, the whole arrangement was made in open atmosphere and in a shaded area to keep it away from direct sunlight and was covered with jute bag to maintain moisture. After adding moisture to the waste bed, earthworm (250gm /10kg waste) was added to it and the appropriate measures were taken to keep this bed away from ants, thermite and

snakes as they may harm earthworms. Manure was manually mixed using a spade, and optimum moisture content (~60%) was maintained by sprinkling water in the compost pits. After 30-45 days the whole matter was completely decomposed and it appears black and granular. Watering should be stopped as compost gets ready. The compost shout be kept over a heap of partially decomposed cow dung so that earthworms could migrate to cow dung from compost. After two days compost was separated and ready for experiment.

C. Preparation of lactobacillus serum-

Rice wash (which is a rich source of carbohydrate) was taken as the raw material for this purpose. This liquid was kept at warm temperature for couple of weeks which allows it to ferment and produce lactic acid; this prepared solution was mixed with 10 parts milk (10 L milk for 1 L rice wash). Mixture was kept in a closed container (to make process anaerobic), after 10 days, a layer of curd appeared on the surface of solution. The water below it (yellow coloured) enriched with lactic acid bacteria (lactobacillus) from the fermentation of milk. Equal amount of molasses was added to preserve it at room temperature

D. Preparation of farmyard manure-

5000gm cow dung from 4 different cows was taken and mixed with 1000ml of cow urine along with some dairy waste. Mixture is then put in pit of depth 2ft. and left for 40 days.

Manure was added in an area of circle of radius 1.5ft. An area of 0.5ft was left from base of plant as per the requirement of Citrus Limon. Investigation of dynamic impact on plant growth, health, strength was done using seven different treatment [no manure(NM), no manure(NM)+lactobacillus serum(LS), farm yard manure(FYM), farm yard manure(FYM)+lactobacillus serum(LS), compost manure(CM), compost manure(CM)+lactobacillus serum (LS), Vermicompost(VC). The *Mangifera indica* plant of approx. height 1.5ft was planted in campus garden (two plants per treatment)

III. RESULTS AND DISCUSSION

Vermicomposting is a method to treat faecal matter with water contents up to 85% but little is known about the environmental conditions in which worms treat the material effectively. The results have shown an interaction between different parameters. Compost manure and Vermicompost were having a higher value of available nitrogen as compared to FYM. Continuous analysis on the growth of plant shows that application of CM+LS and VC shows the best results than other set of treatments. (FYM+LS) and CM also shows very impressive results on the growth of plant. CM has more NPK content (table 3.1) than that of FYM and the complimentary results was observed during growth of plant and can be seen in table 3.2, graph 3.1 and graph 3.2. Usage of manure is found to be tough and process is slow. Thus, lactobacillus could be a good additive which enhances the quality and increases the efficiency of manure.

The result shows that using manure in place of chemical fertilizer can be beneficial as it not only provides better nutrition to the soil but keeps it microbe rich. Chemical fertilizers are very harmful for the genetic diversity of the crop. Examples can be seen in case of rice; just few years ago there were thousands of rice species in India but now-a-days the number of species have reduced to great extent.

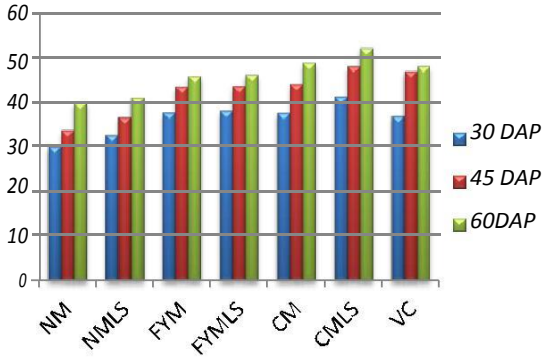
Compost manure shows better results than farm yard manure and thus provides better nutrition to the plant. The use of lactobacillus serum has helped the process of soaking of nutrition through roots as it contains bacteria which converts organic complex compound to inorganic matter which could easily be up taken by roots.

TABLE 3.1 Comparison of nutrient level in four samples

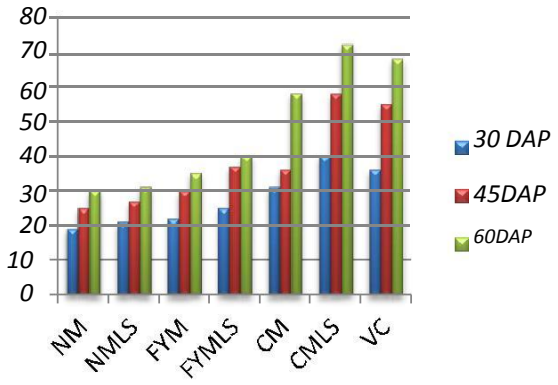
NUTRIENT	SOIL SAMPLE	FYM	COMPOST MANURE	VERMICOMPOST
Available Nitrogen(N)	127 kg/ha	1.20 %	1.44 %	1.58%
Phosphorus (P)	-	58.5 kg/ha	63.0 kg/ha	61.5 kg/ha
Potassium (K)	35.75 ppm	325 kg/ha	336 kg/ha	358 kg/ha
Calcium (Ca)	55 ppm	-	-	-
Sulphur (S)	-	35 ppm	27 ppm	22 ppm
Carbon% (C)	0.37%	-	-	-
pH value	7.11	7.0	7.7	6.9
Manganese (Mn)	40 ppm	32.32ppm	26.38 ppm	39.81 ppm
Iron (Fe)	-	39.88 ppm	35.16 ppm	37.15ppm

TABLE 3.2 Effect of given treatments after given DAP (DAYS AFTER PLANTATION)

Treatment	Plant height at 30 DAP(inch)	Plantheightat45 DAP(inch)	Plantheightat60 DAP(inch)
NM	29.9	33.6	39.8
NM+LS	32.5	36.5	40.9
FYM	37.6	43.3	45.6
FYM+LS	38.0	43.5	48.7
CM	37.5	44.0	46.0
CM+LS	41.20	47.9	51.1
VC	36.8	46.8	47.9



GRAPH 3.1 Length (inch) of plants after given DAP



GRAPH3.2 No. of leaves after given DAP

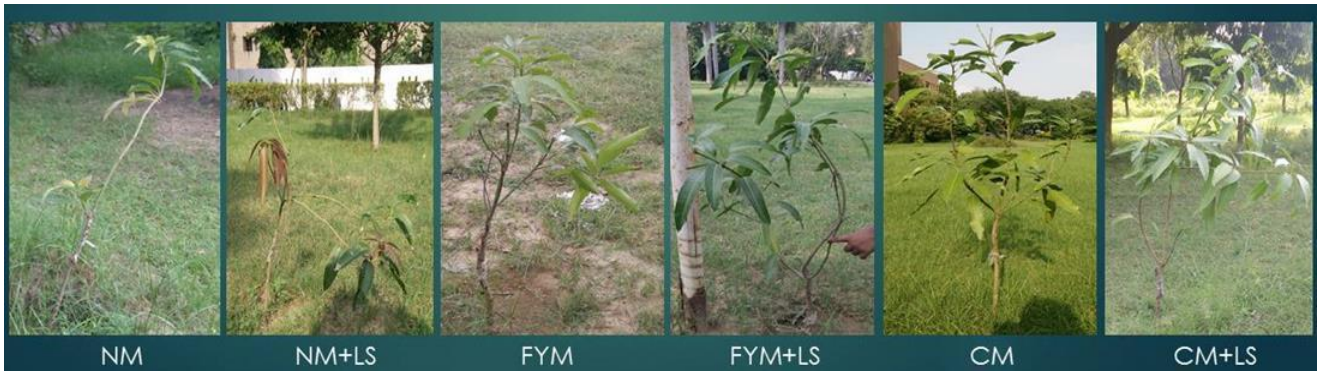
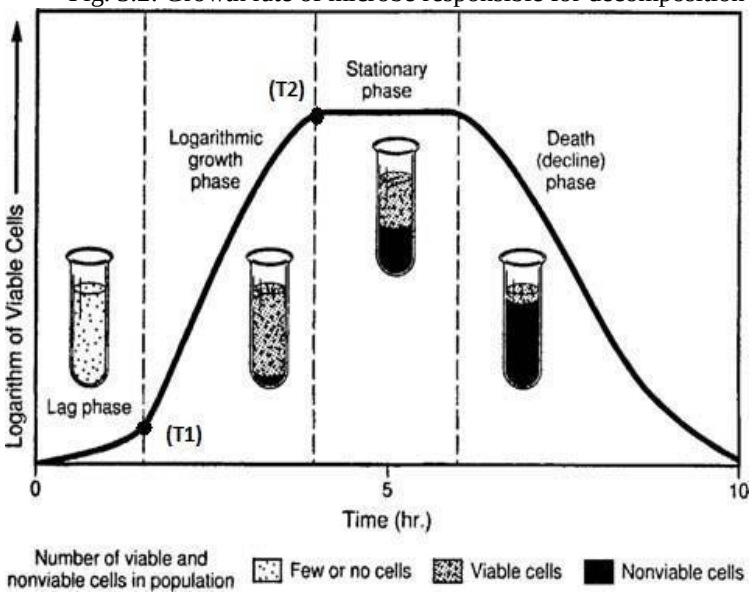


FIGURE 3.1 plants on which different samples were tested

Organic material decomposition with oxygen is an "aerobic" process. The process of decomposition is exothermic; as the process occurs the temperature of manure rises. These microbes develop their colonies and keep increasing with exponential rate when kept under the range of temperature from T1 to T2 (fig. 3.2). And attains a stationary phase at T2. The temperature of compost bin was regularly monitored and the rate of decomposition can be compared with the growth rate of microbe. The logarithmic growth phase (fig. 3.2) shows the temperature range of T1 to T2, in which the growth rate of microbe is maximum thus decomposition rate is increasing and reaches maximum value at T2.

Fig. 3.2: Growth rate of microbe responsible for decomposition of manure



The bacteria which are responsible for nitrogen fixation are known as Nitrifying bacteria; these are chemolithotropic organisms that include species of a genera- Nitrosomonas, Nitrsococcus, Nitrcoccus and Nitrobacter; these bacteria get their energy by the oxidation of inorganic nitrogen compound.

These bacteria have complex internal membrane system that is the location of key enzymes in nitrification; *Ammonium mono-oxygenase* (converts ammonia to hydroxylamine) and *Nitrite oxidoreductase* (further oxidises to nitrate).

The environment that manure is subjected to will influence the type of microorganisms introduced in it. During the time of decomposition of organic matter, the free living Diazotrophs were responsible for the process since they don't need any host body to grow on, whereas on other hand the symbiotic (mutualistic) Diazotrophs associates themselves with a host body and then perform their action for example- (*Rhizobium*-establishes in the root nodule of legumes), Frankia Azospirillum etc. The benefits of these symbiotic Diazotrophs can be seen during the process of crop rotation where a series of dissimilar or different types of crops in the same area in sequenced season is practiced.

The use of lactobacillus serum along with the manure helped manure to increases its microbial activity in every case and thus complimentary results were also obtained.

IV. CONCLUSIONS

The addition of compost manure and farm yard manure serves as good source of organic amendment for the improvement of nutrient level of soil to such an extent that it fulfills the requirement of plant. Throughout the experiment all the manure type had a significant influence on the yield response. Chemicals fertilizers may show better results in single stroke but cannot sustain for a long time, whereas green manure fixes the nutrients for a long period of time. Approximately 60% of farmer's income is spent on pharmaceutical, fertilizer and pesticides. Using green manure in place of chemical fertilizers can be very cost effective and could help the problem of farmers committing suicide in India.

ACKNOWLEDGEMENT

Authors of the paper would like to show our gratitude to Ashish Saroj (CEO at Xplooc Technologies) for sharing their pearls of wisdom with us during the course of this research.

REFERENCES

[1] Glycine max L. Merril, effect of organic and mineral fertilizer on growth and yield of soybean, IJAAR, JULY 09, 2015.

[2] Benvindo Serafim, effect of manure, lime and mineral P fertilizer on soybean yields and soil fertility in a Humic Nitisol in the central Highlands of Kenya, IJASR, september 2013.

[3] Willekens k, Effect of compost versus animal manure fertilization on crop development, yield and nitrogen residue in the organic cultivation of potatoes, 16th IFOAM organic world congress, june 16-20, 2008.

[4] M.N.Sreenivasa, influence of liquid manure on growth, nutrient content and yield of tomato (Lycopersicon esculentum Mill.) in the sterlized soil, karnataka J.agric. Sci. 24(2)

[5] Solomon Wisdom G.O, Ndana R.W, the comparative study of the effect of organic manure cowdung and inorganic fertilizer NPK on the growth rate of maize (Zea mays L), IRJAS volume 2(12) pp.516-519, Dec 2012.

[6] B.J.Amujoyegbe, effect of organic and inorganic fertilizer on yields and chlorophyll content of maize (Zeamays L.) and sorghum sorghum bicolour (L. moench), AJB volume 6(16), pp.1869-1873, 20 august 2007.

[7] A C Mishra and K S Negi, effect of organic manure and chemical fertilizers of a newely introduced aromatic crop clarysage (Salvia sclarea Linn) in the Uttarakhand, natural product radiance, volume 8(2), 2009, pp.158-16

[8] O.A. Awe1, A.O. Akinwa2 and A.Y. Cheshi2 Influence of poultry manure application methods and rates on the pod yield of okra (Abelmoschus esculentus)

