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45 Days *Safal* Compost from Dung Heap

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Abstract:

India has enough potential for providing the nutrients through animal dung base organic manures. Organic manures maintain and restore the active soil life and health. These manures are important sources of plant nutrients, soil carbon conservation and beneficial microbial buildup in soil. But the available rural animal dung manure is made of poor quality compost due to its un-decomposed process being very hot even after many years lying in the heap.

So far scientists have evaluated more than ten methods of composting i.e. Pit Manure, Heap Manure, Con Heap Manure, Bangalore Method, Indore Method, Pune Compost, Above Ground Pit Compost, Multi Cut Manures, Windrow Compost, Wet & Drying Compost, Polyethylene Covered Compost, NADEP compost etc. The above suggested method of compost usually takes 90 to 120 days for maturity. Regional Centre for Organic Farming, Hisar has conducted the study of 45 Days *Safal* Compost on dung heap at Shapur village and replicated the same in six villages (*Shapur, Umra, Bayanakheda, Dhiktana, Rayaman, Kharad* in Hisar District) covered during RIF project of NABARD-SDC implemented by AIOFS.

During the project, we shaped the rural manure heap in rectangular size i.e. 14'x10'x 2.5' proper leveled above ground (the size of heap may be extend according to quantity available but the height of heap must be remain same 2.5 feet maximum) and we made holes with the help bamboo (or pipe) to release the internal heat in the heap of 2-3 inches in size at a distance of 1.0 to 1.5 feet laterally at 60^0 angle just for maximum covering the surface area during poring the decomposer (*Panchghavya*) inoculums in holes.

When the heap temperature come down to normal in ten days, then we added one week old Enriched Panchghabbya (a fermented mixture of cow dong, cow urine, milk, butter milk and butter, pulses floor, Methi floor, Gur, old ripened bananas, banyan tree soil) @ one liter per hole and repeat the same process three times at every 10 days intervals.

This (*Safal* Compost**)** quality manure got ready to use within 45 days. The quality of compost reveals good results on crop growth performance due to its high enzymatic activity and high microbial load.

[The quality parameters i.e. C: N ratio, pH, Bulk density, odorless smell, brown color, enzymatic activity, high microbial of beneficial microorganisms,

normal to cool temperature at maturity time, nutrients readily available to crop are the indicator of good quality of composts]. During the study, the farmers experience the rapid compost results as being almost equal to triple time doses applied in the fields of normal heap manure.

Key words: Safal Compost, fermented mixture, Heat Release from heap

Introduction:

India has enough potential for providing the nutrients through animal dung base organic manures. Organic manures maintain and restore the active soil life and health. These manures are important sources of plant nutrients, soil carbon conservation and beneficial microbial buildup in soil. But the available rural animal dung manure is made of poor quality compost due to its un-decomposed process being very hot even years lying in the heap.

Swaminathan (2007) reported the presence of naturally occurring beneficial microorganisms predominantly produced lactic acid, bacteria, yeast, actinomycetes, photosynthetic bacteria and certain fungi in Punchghavya[3].

(*Manure is anything that has been added to the soil to increase its fertility and enhancing for plant growth. The high carbon to nitrogen ratio (C:N ratio) of immature compost also means that, as the carbon compounds continue to break down, microorganisms will draw on soil nutrients to assist in the process, leaving the root zone temporarily nitrogen and other nutrients poor*). Plants need a well balanced diet, for better growth and yield. Manures are the substances which provide nutrients for proper nourishment and growth of plants.

Table-1: A review on different Composting methods used in India

Sr. No.	Method of Composting/ Maturity Time	Merits of Method	Demerits	Adoptability	Labor and Cost	Remarks
1.	**NADEP Compost 90-120 days**	Produced aerobic compost	Structure cost is high	Promoted by government.	Medium to high	Much propagated by govt. but less adaptability but due to cumbersomeness
2.	**Bangalore Method 70-90 days**	Good quality of compost	Frequent turning	Limited adoptability	High labor cost	High labour and cost resulted in less replicability
3.	**Indore Method 70-90 days**	Good quality of compost	Frequent turning in three pits	Limited adoptability	High labor cost	High labour and cost resulted in less replicability
4.	**Pit Manure 180-210 days**	Most common method	Some time immature compost	Moderate popularity	Minimum labour	Weaker quality compost
5.	**Four pit Method 90 days**	Produces Good quality of compost	Alternate filling of four pits	Non popular	Costly	Less adaptability due to higher cost
6.	**Open Windrow Compost 84-140 days**	Easy method of composting	Imperfect maturity	Very less	Laborious and high input cost	Less applicable due to non-availability of raw material
7.	**Polyethylene Covered Compost**	Easy method of composting	Aeration require through blower	Not popular	Less labour and cost	Impractical approach due to wear and tear

	56-90 days					
8.	**Heap Manure 180-250 days**	Simple method of compost production	Immature compost production	Most popular method in farmers	No cost	Weakest quality compost due to non-technical approach
9.	**Wet & Drying Compost 40-50 days**	Fast composting process	Laborious method	Labor oriented method	High labor cost	Less adaptable due to high labour
10.	**Biogas Compost 53-60 days**	Good quality compost	Some time difficult to apply	Becoming popular	Little bit costly	Costly and due to technical flow of subsidy
11.	**45-days Safal Compost Maximum 45 days**	Very good quality compost	Very easily applicable	Very effective and quality output	Little or no cost with 3-hour labour only	Becoming most popular wherever adopted due to quick maturity and that too of a bigger heap at one time

Approach:

The compost lying in rural heaps has been found un-decomposed as well as high in temperature resulting in non-nutritive residues leading to release of harmful pathogenic microbes and undecomposed carbon to the soil when applied which changes the soil carbon nitrogen (C:N) ratio in wide range, consequent upon its yield shortage of nitrogen to crop as well as in soil too. These type of compost heaps are available in every villages throughout country and farmers usually apply such type of immature compost, that's poorly performs for crop productivity and promotes the infestation of disease and insects.

So providing a cost effective, simple, easy to produced, readily releasing the nutrients, suitable production technology to Indian farmers is the need of the hour.

Composting is an attractive proposition for turning on-farm organic waste materials into a farm resource. [*Composting is an exothermic aerobic biological process that stabilizes biodegradable organic matter (BOM). Decomposition rates are affected by all factors that commonly affect microbial growth, i.e. carbon nitrogen ratio, oxygen supply, moisture, pH, temperature, and nutrient levels*]. A composting process occurs until all BOM is stabilized that is odor and pathogen free, and a poor breeding substrate for flies and other insects. Even the compost care should be taken for application to soil for crop use because of biological processes continues and can rob the nutrients of soil. A measure of compost that is conducive for crop growth refers to maturity representing relationship between compost quality and crop growth[8]. On the other hand stability refers to the aerobic biological activity[4], representing relationship between compost quality and biological activity within the compost.

Initially the composting process starts from stabilizing the shape and its size from naturally cone shape dung heap to rectangular size i.e. 14'x 10'x 2.5' properly levelled above ground, the size of heap may be extended according to quantity available but the height of heap must be remain same 2.5 feet maximum.

Second step is to making holes in the heap 2-3 inches in size at a distance of 1.0 to 1.5 feet laterally at 60^0 angles with the help of bamboo or pipe to release the internal heat.

Third step, Now the heap temperature would come down to normal within ten days, than add one week old Enriched Panchghavya (a fermented mixture of cow dong, cow urine, milk, butter milk and butter, pulses floor, Methi (Buck wheat) flour, Gur, old ripped bananas, banyan tree soil) @ one to two liter per hole and repeat the same process three times at the interval of every 10 days.

Material and Method:

45 Days Safal Compost on dung heap experiment was conducted during 2010-11 at Shapur and replicated the same in six locations i.e. (Villages *Shahpur, Umra, Bayanakheda, Dhiktana, Rayaman, Kharad* in Hisar District) under the technical guidance and suggestions by Incharge, Regional Centre for Organic Farming, Hisar.

The study was covered under NABARD SDC, RIF's Funded Project implemented by All India Organic Farmers' Society to short out the simple methodology of composting as compare to traditional methods available for the promotion of organic farming by procuring and production of quality component that too on-farm with cost effective inputs for better soil health and microbial load.

Site selection, size and choosing materials:

In all the six locations the material selected basically animal dung heaps on uniform earth surface. Initially the heap shaped in rectangular size i.e. 14'x 10'x 2.5' proper leveled above ground from natural heap shaped. There is no restriction in size of heap, it may be extending according to quantity available but the height of heap must be remaining same 2.5 feet maximum.

Making holes in the heap 2-3 inch in size at a distance of 1.0 to 1.5 feet laterally at 60^0 angles with the help of bamboo or pipe to release the internal heat from top side. Leveling of dung heap and hole making process breakdown the anaerobic condition maintained high temperature in heap to slow down by releasing heat through holes and make the dung heap to normal temperature due to proper aeration. Normally dung heap takes 6 to 10 days for heap cooling. This temperature change in dung heap creates congenial environment for stimulating the fast decomposition process.

Add inoculums:

Use of microbial inoculants provides more rapid and efficient conversion of raw organic materials into compost. Now the heap temperature come down to normal than add one week old Enriched *Panchghavya*, an organic product has the potential to play the role of promoting growth and providing immunity in plant system[6] Ferment this material for 5-7 days for raising the microbial load in drum. Add water to dilute (if require) and apply this fermented liquid @ one liter per hole

and repeat the same process three times at every 10 days intervals for accelerating the decomposition process. Presence of naturally occurring beneficial and effective microorganisms (EMOs) predominantly lactic acid bacteria (*Lactobacillus*) Yeast (*Sacchacromyces*), Actinomycetes (*Streptomycetes*), photosynthetic bacteria and certain fungi besides beneficial and proven biofertilisers such as azotobacter, Azospirillium and Phosphobacteria were detected in Panchagavya[7].

Figure 1: Enriched Composition of Panchghavya

- Fresh cowdung slurry 5 kg
- Cow urine 3 liter
- Cow milk 2 liter
- Cow Curd 2 liter
- Gur (Jaggery) 0.5 kg
- Cow butter (Milk butter) 1.0 kg
- Pulses flour 1.0 kg
- Buckwheat flour 0.5 kg
- Banyan tree soil 1.0 fruits
- Banana paste of 12 fruits

Table: Physio-chemical and Biological Properties of Panchgavya [5]

Sr. No.	Chemical	Composition	Microbes	Microbial load
1.	pH	5.45	Fungal	$3.88x10^{-4}$
2.	Total Nitrogen (PPM)	10.22	Bacteria	$1.88x10^{-5}$
3.	Total P	229	Lactobacillus	$2.26\ x10^{-5}$
4.	Total K	209	Total anaerobes	$1.00\ x10^{-3}$
5.	Sodium	232	Acid formers	$3.60\ x10^{-2}$
6.	Calcium	90	Methanogen	$2.50\ x10^{-2}$
7.	IAA(PPM)	25		
8.	GA(PPM)	8.5		

Value addition:

For enriching the quality of dung heap compost in terms of nutrient quality, the following can be added i.e.

- Rock phosphate upto 5%
- Gypsum (Calcium 23.2%, Sulphur 18.6%) upto 5%
- Pyrite (Upto 5%)
  - Iron 20-22%
  - Total sulphur 22-24%
  - Magnesium oxide 0.5-0.6%
  - Calcium oxide 1%
  - Aluminum 6-8%

- Slice 35-40%
- Carbon%
- Zinc 0.02%
- Copper 0.05%)

❖ Lime (Upto 2%) can be added with animal's urine in the alternate hole made in dung heap one time within one week from the date of leveling and hole making. Addition of these materials would fasten the mineralization process and hence make the nutrients readily and easily available to the crops.

Table-2: Specifications of Organic Fertilizers (Vermicompost) [1]

S. No.	Parameter	Requirement
i	Moisture percent by weight	15.0-25.0
ii	Colour	Dark brown to black
iii	Odour	Absence of foul odour
iv	Particle size % material should Pass through 4.0 mm IS sieve	4.0 mm in size Minimum 90%
v	Bulk Density (g/cm^3)	0.7-0.9
vi	Total Organic Carbon, % by weight, minimum	18.0
vii	Total Nitrogen (as N) % by weight, Minimum	1.0
viii	Total Phosphates (as P_2O_5) % by weight Minimum	1.0
ix	Total Potash (as K_2O) % by weight, Minimum	1.0
x	C:N ratio	20: 1 or less
xi	pH	6.5-7.5
xii	Conductivity (as dSm^{-1}) not more than	4.0
xiii	Pathogens	Nil
xiv	Heavy metal content (as mg/kg) Percent by weight Maximum Arsenic (as As_2O_3) Cadmium (as Cd) Chromium (as Cr) Mercury (as Hg) Nickel (as Ni) Lead (as Pb)	 10.00 5.00 50.00 0.15 50.00 100.00

Result and Discussion:

The research trial conducted in five different locations to evaluate the mythology of 45 days *Safal* composting with simple and farmer's adoptable technology. Heap dung leveling up to 2.5 feet height helps in decomposition process due to helps in 35^oC normal temperatures. Simple hole making in dung heap makes the temperature normal within 6 to 10 days.

Normal temperature in dung heap provides congenial environment for proliferating the composting process. Adding of panchghavya would enhance the rate of decomposition process through microbial action added as inoculums at 10 days interval.

Due to addition of gypsum, pyrite and lime would improve the quality of compost in terms of macro and micronutrients content as compare to Fertilizer Control Order in all the trails.

Bulk density was found better 0.6-0.7; particle size was less than 0.2 mm due well decomposed *safal* compost. Process took lesser time due to frequent adding inoculums. Composting maturity was found remain same in case of non value added compost. The chance of harmful pathogens is negligible due to pre heating in dung heap.

Safal compost introduced through this method has been found quite suitable for organic as well as conventional field due to readily available nutrients to crop as compare other methods.

Benefits of 45 *Safal Compost Production* Technologies:

- No need of regular turning of dung heap material
- No extra cost on structure construction
- Least laborious (Only three-hour labour) work for complete composting
- No market-oriented input required
- This method would fasten the mineralization process and hence make the nutrients readily and easily available to the crops
- Quality performance is better than other composting methods due to high biological activity with decomposition process at normal temperature with added natural minerals in compost.
- *45 Days Safal* compost is comparable with FCO suggested standards for compost

Conclusion:

This study provides a comprehensive overview on *safal* (successful) compost with the minimum disturbance in traditional manure production system with high quality compost, at low cost on production and with least labour. Due to availability of high quality compost, biologically strong microbially rich and complete mineralized form of nutrients availability, this compost can be broadcasted in the field directly.

Thus, quality manure would get ready to be used within 45 days with characteristics of better C:N ratio, optimum pH, better bulk density and would be of brown colour odourless granular appearance with rich enzymic activity along with higher number of beneficial microbes and that too at the normal temperature. Hence, it would result in the humic and ionic composition (of animal dung) which is ready to be assimilated in a sustained manner by the crop. In the

experiment, it was also found that rapid compost is almost 3-times stronger (nourishment) than normal animal dung heap.

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