



Vermicompost: An organic manure for sustainable agriculture

Ajay Kumar¹, Brejesh Ajrabat¹, Satbir Singh¹, Vijay kumar², Balbir Dhotra³
and Amitesh Sharma³

¹Krishi Vigyan Kendra (SKUAST-J), Kathua (J&K) India

²Rainfed Research Sub-Station for Sub-tropical Fruits (SKUAST-J), Raya (J&K) India

³Organic Farming Research Centre (SKUAST-J), Chatha (J&K) India

(Email: kumarajay_19802008@rediffmail.com)

Vermicompost is an organic manure (bio-fertilizer) produced as the vermicast by earth worm feeding on biological waste material; plant residues. Vermi casts are popularly called as 'Black Gold'. This compost is an odorless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth. The prime market for vermicompost is in agriculture and horticulture. Farmers are already using vermicompost in large quantities. Small and marginal farmers would do well to produce vermicompost on their own. Home gardens, kitchen gardens and commercial plant nurseries are an excellent market for vermicompost in urban areas. This enterprise offers tremendous scope for expansion in rural areas because it has the potential to engage small farmers and women who can easily set up such units at the household level. The enterprise is based on the conversion of waste matter into rich plant humus by using earthworms. No specific skill is required. It is a viable production oriented enterprise with tremendous scope for expansion in rural areas. Moreover, it will solve the employment problems of both literate and illiterate, especially women. In view of this, vermicomposting is an effective means of composting the decomposable organic wastes using earthworms naturally present in the soil. It improves the physical and biological condition of soil, improves soil fertility and pulverizes it through their churning and turning action in addition to contributing plant nutrients, improves aeration and water holding capacity. It is the scope to small and marginal farmers in creating their own organic manure resources and ways to generate not only alternative income but maintain the soil health also. Vermicompost is a preferred nutrient source for organic farming, which enriches soil quality by improving its physicochemical and biological properties. It is eco-friendly, non-toxic, consumes low energy input for composting and is a recycled biological product. Vermicompost is becoming popular as a major component of organic farming system.

Why organic farming? Over few decades, approach and

outlook towards agriculture and marketing of food has seen a quantum change worldwide. Earlier, the seasons and climate of an determined what would be grown and when, but today, it is the 'market' that determines what it wants and what should be grown. Today, main focus is on quantity and outer quality rather than on intrinsic or nutritional quality which in turn have reduced food quality. This immense commercialization of agriculture has also had a very negative effect on the environment. Fertilizer have a short term effect on productivity but a longer term effect on the environment, where they remain for years after leaching and running off, contaminating ground water and water bodies . This is where organic farming comes in.

Base-materials required for preparation of vermicompost: Vermicompost can be made from any crop material but it should be so soft and fine so as not to damage the digestive systems of verms. Raw material like crop residues, hotel refuse, weed biomass, waste from agro-industries, vegetable waste, leaf litter etc. can be used for vermicompost.

Selection of suitable earthworm: For vermicompost production, the surface home earthworm alone should be used. The earthworm, which lives below the soil, is not suitable for vermicompost production. The African earthworm (*Eudrillus eugeniae*), red worms (*Eisenia foetida*) and composting worm (*Peronyx excavatus*) are promising worms used for vermicompost production. All the three worms can be mixed together for vermicompost production. African earthworm (*Eudrillus eugeniae*) is preferred over other two types, because it produces higher production of vermicompost in short period of time and thereby converts the organic matter into vermicompost within 45-50 days. Since it is a surface feeder it converts organic materials into vermicompost from top.

Methods of preparation of vermicompost:

– The vermicompost can be prepared in concrete/cement tank. The size of the tank should be around 10 ft. in length or more depending upon the availability of land



and raw materials, 3- 5 ft. in width and 3 ft. in height. The floor of the tank should be constructed with stones or bricks. The available bio-wastes are to be collected and heaped under sun about 7-10 days and be chopped if necessary.

- Sprinkling of the cow dung slurry to the heap may be done.

- A thin layer of half decomposed cow dung (3-5 cm) is to be placed at the bottom.

- Place the chopped weed biomass and partially decaying cow dung layer wise (4 - 8 inches) in the tank / pot upto the depth of 2 ½ ft. The bio waste and cow dung ratio should be 60: 40 on dry wt. basis.

- Release about 2-3 kg earthworms per ton of biomass.

- Put wire net / bamboo net over the tank to protect earthworm from birds.

- Sprinkling of water should be done to maintain 70-80 per cent moisture content.

- Provision of shed over the compost pit is essential to avoid direct entry of rainwater and sunshine.

- Sprinkling of water should be closed when 90 per cent bio-wastes are decomposed. Maturity could be judged visually by observing the formation of grainy structure of the compost at the surface of the tank.

- Collect the Vermicompost by scrapping layer wise from the top of the tank and stack under shed.

This will help in separation of earthworms from the compost. Sieving may also be done to separate the earthworms and cocoons.

Application rates of vermicompost: The regular use of vermicompost improves the soil health, fertility, structure (makes soil loose and arable and facilitates better aeration and drainage even in heavy clay soils) and creates favourable conditions for healthy plant growth and development along with crop yield and quality. It can be used in following quantities :

- Field crops: 5-6 tons/ hac.
- Vegetables: 10-12 tons/ hac.
- Fruits trees: 5-10 kg/ tree
- Flowering plants: 100 g /square feet.

Nutritive content of vermicompost: The nutrients content in vermicompost may vary depending on the waste material that is used for compost preparation. If the waste materials are heterogeneous one, there will be wide range of nutrients available in the compost. If the waste materials are homogenous one, there will be only certain nutrients are available. The balance nutrition is essential for every kind of organisms either plants or animal origin. The Vermicompost supplies all the essential micro and macro nutrients in rational proportional throughout the life of the plants. In general, Vermicompost contains following nutrients but nutrient content may vary with organic matter supplied or conditions under which prepared.

Parameters	:	Content
Organic carbon	:	9.5 – 17.98%
Nitrogen	:	1.5 – 2.5 %
Phosphorus	:	0.9 – 1.7%
Potassium	:	1.5 – 2.4 %
Sodium	:	0.06 – 0.30%
Calcium and magnesium	:	22.67 to 47.60 meq/100g
Copper	:	2 – 9.50 mg kg ⁻¹
Iron	:	2 – 9.30 mg kg ⁻¹
Zinc	:	5.70 – 11.50 mg kg ⁻¹
Sulphur	:	0.4 - 0.5 %

The other materials supplied by Vermicompost are vitamins, enzymes and hormones.

Benefits of vermicompost:

- Vermi-compost is rich in all essential plant nutrients.
- Provides excellent effect on overall plant growth encourages the growth of new shoots / leaves and improves the quality and shelf life of the produce.
- Due to granular form it can be used easily at the

phase of crop.

- It is free flowing, easy to apply, handle and store and does not have bad odour.
- It improves soil structure, texture, aeration and chemical properties of soils.
- It has very high water holding capacity and thus maintains water regimes of soil
- It enhances the decomposition of organic matter and prevents soil erosion.
- It is rich in beneficial micro flora such as N fixers, P- solubilizers, cellulose decomposing etc. improve soil environment.
- It contains earthworm cocoons and increases the population and activity of earthworm in the soil.
- It neutralizes the soil protection.
- It prevents nutrient losses and increases the fertilizer use efficiency.
- It is free from pathogens, toxic elements, weed seeds etc.
- It minimizes the incidence of pest and diseases.
- It contains valuable vitamins, enzymes and hormones like auxins, gibberellins etc.
- It can be prepared very fast (45-60 days).
- It is ½ to ¾ times cheaper than chemical fertilizers.
- It use per unit area is ¼ times less than fertilizers.

Precautions for vermicompost:

- There should be sufficient food and moisture for earthworms.
- The layer of waste material should not be very thick.

– Protect the vermibeds from direct sun and temperature of bed should be within the range of 20-30 degree centigrade.

– Bed should be protected from predators like red ants, white ants, centipedes and others like rats, cats, poultry birds and even dogs also.

– Worms should not be injured during handling.

– The organic wastes should be free from plastics, chemicals, pesticides and metals etc.

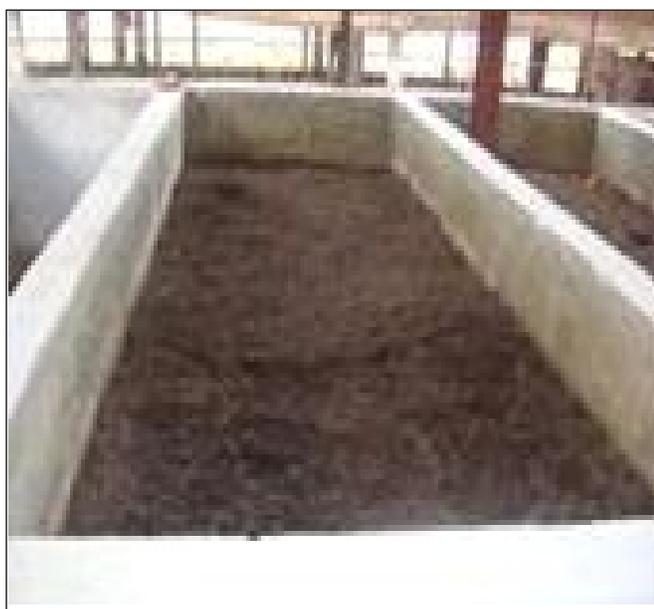
– Do not use water containing soap, detergents or other chemicals

– Recomposing of heap is very necessary otherwise worms will move away from that place.

Economical aspects of vermicompost:

Vermicomposting for Indian conditions: Most towns and cities in India do not have proper waste management systems and untreated solid waste is generally dumped in landfills or on the roadsides and the liquid wastes are discharged into water bodies. Domestic wastes are mostly organic and on average are about 50 per cent of the total wastes. It is estimated that each household produces not less than 200 kg of organic solid wastes per year. This can be put to productive use rather than being thrown into the bin from where it makes its way to over loaded landfills. These wastes can be considered as a resource to produce manure for the soil using vermicomposting technology.

Vermicomposting for rural development: Large quantity of potential agro-industrial wastes and by products are



Vermicompost bed



Vermicompost ready for harvesting

thrown out as wastes/under utilized by the local population since they are not aware of its importance. The materials can be utilized profitably by vermicomposting, which is a low cost technology. Unemployed rural population can do this, as part time/ full time profession if they are aware of the technical know how to utilize the materials. Awareness about vermiculture and vermicomposting will motivate the rural people to start vermicomposting units, which can fetch regular income.

Revenue generation through vermiculture and vermicomposting: Vermitechnology is popular because it is a simple methodology with low investment and does not need sophisticated infrastructure. To process one ton of organic matter daily, it would require about 1500 sq meters of space with 6 workers. It would produce about 70 tons of earthworms casting annually. Innovative, interested and talented rural people can be successful entrepreneurs in vermicompost production and accruing profits will enhance their life style and income. They will be able to spend time usefully by getting job opportunities

with the help of self-employment schemes.

Conclusion: It is concluded that the vermicomposting is the process by which the earthworm is used to convert organic waste into vermicompost, excellent organic manure. Earthworms consume all kinds of organic wastes under conducive conditions, including kitchen waste, animal waste, agricultural residues and even paper also. The utilization of vermicomposting results in rejuvenation of degraded soil by protecting topsoil and sustaining productive soils. It amends soil with good quality organic additives which enhances the water holding capacity and nutrient supplying capacity of soil and also develops resistance in plants against pests and diseases. Moreover, this low cost technology saves a huge amount of the nation's currency for importing raw material to prepare fertilizers. The Vermicompost is best alternatives for nutrients and also being easily and cheaply produced can be used as a source of additional income.

Received : 09.10.2018

Revised : 04.04.2019

Accepted : 18.04.2019

R N I N o . : U P E N G / 2 0 1 0 / 3 2 2 7 5 ISSN : 0 9 7 6 - 1 2 7 6



FOOD SCIENCE RESEARCH JOURNAL

Accredited by NAAS : NAAS Score 4.11
Internationally Refereed Research Journal
For More detail contact www.researchjournal.co.in



HIND MEDICAL RESEARCH INSTITUTE

Invitation INTRODUCING THE LATEST NAMES IN RESEARCH SPECIFIED JOURNALS

Hind Medical and Research Institute of Research sector invites proposal/consents from academicians and scientists for their incorporation in different bodies as Advisory/Executive/Editorial Board for the forth coming issues of the Journals published by the society.

Internationally Refereed Research Journal of the H.M.R.I.:

RNI : UPENG/2008/24395 ISSN : 0974-2654
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES
Accredited By NAAS : NAAS Score : 2.95

RNI : UPENG/2010/32274 ISSN : 0976-125X
ANNALS OF PHARMACY AND PHARMACEUTICAL SCIENCES
Accredited By NAAS : NAAS Score : 2.21

**HEAD OFFICE : ASHRAM 418/4, SOUTH CIVIL LINES,
NUMAISH CAMP, MUZAFFARNAGAR-251 001 (U.P.) INDIA**

Tale Fax : 0131-2622221, Mobile : 09410284909

Website : www.researchjournal.co.in

E.mail : hahs_2005@yahoo.com, hind_society@yahoo.com, hahs1624@gmail.com; researchjournal2005@gmail.com