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Enriched vermicompost production: A success story of Guntur farmer

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Abstract
Vermicompost is a fine granular, dark brown/black colored organic product prepared by earthworms by using cow dung and organic wastes which is much useful for soil health. It has biological properties as rich in population of soil micro-organisms compared with those in conventional composts. Vermicompost has adequate amount of micronutrient and macronutrients depending on sources of earthworm's feedstock. Earthworm promotes soil fragmentation and increase aeration of soil by volume 8-30 per cent. Vermicompost has at least four times more plant nutrients than conventional cattle dung compost. Vermicomposting is a source of creating self employment and revenue generation. This is an easy and faster process of converting organic matter into compost than other conventional methods. A farmer, Shri Ravuri. Suresh Kumar opted vermicomposting for his livelihood and started from a very small scale and became a successful producer of quality enriched vermi compost product. He argued that his product is demanded by nearby farmers, NGO's and government organizations of Andhra Pradesh. Moreover, he is encouraging interested farmers to prepare this multifunctional quality of vermi compost on their own farms so that farming community can be benefitted.

Keywords: Vermicompost, worms, humus, soil, micronutrient, doubling the farmer's income

Introduction
Vermicomposting is the process of producing compost by utilizing earthworms to turn the organic waste into high-quality compost that consists mainly of worm cast in addition to decayed organic matter (Ismail 2005; Devi and Prakash 2015) [12, 4]. Vermicastings are the excreta of earthworms, rich in bacteria and plant nutrients. Vermicastings have beneficial effect on plant growth due to presence of micro and macro nutrients.
Today vermicomposting is an important component of organic farming systems, because it I easy to prepare, has excellent properties and is harmless to plants. Vermicompost improves the physical, chemical and biological properties of the soil as well contribute to organic enrichment (Chauhan and Singh 2013) [5]. Research on vermicomposting will provide farmers with an environment-friendly fertilizer and assist in promoting the agriculture sector towards a Greene future. The use of such technology will help in cost management in agriculture which is increased in the recent years and has added to the burden of farmers in terms of chemical fertilizers and chemical pesticides. Consequently, the cost of production has increased many folds.
Use of organic source of fertilizers like vermicompost could be an effective solution to the problem where it could substitute the chemical inputs in crop productivity and reduce the economic cost and on the other hand may also lead to organic produce which fetches higher price in the market. The increase in living standards around the world has created a growing demand for such organic produce, or cultivation using only natural pesticides and fertilizers, which are perceived to be healthier for consumers and environment friendly (Kaplan 2016) [2].

Methods and Materials
Success story of Ravuri. Suresh Kumar
Sri Ravuri.Suresh Kumar of hanumanth rao, born in1984 He completed B.Com, He is resident of Narakullapaadu village under Amaravathi Mandal of Guntur district (Andhra Pradesh). He opted Agriculture occupation for his livelihood instead of job. He started commercial cultivation of chilli and cotton at his 4 acres of land but always tried to incorporate recent technologies in practice. In Guntur district, chilli crop was affected with Gemini virus and results in damage of total crop yield. The Scientists and Agricultural Officers advised to apply biocontrol agents along with vermicompost. At that situation, the village required large quantity of vermicompost. Then, Sri Suresh Kumar tried to overcome these situation by producing the vermicomposting. He initiated production of vermicompost with the technical

help of Krishi Vigyan Kendra, Lam, Guntur. at very small level i.e. with 1 units in 2012 and during 2019-20 he reached at about 4 units at his Narakullapaadu farm and producing over 700 tons of quality vermicompost per annum. He has started improving the quality of vermicompost through mixing biocontrol agents like *Tricoderma viridae*, *Pseudomonas flouresence*, PSB & Azospirillum. By adding these biocontrol agents, he has done value addition to vermicompost and started selling his product at a cost of Rs.7/- per kg. Whereas earlier he had sold the vermicompost @Rs.5/kg. Hence he is gaining good amount of profit through value addition of vermicompost and also he is planning to extend his business to other districts. He started supply surplus quantity of vermi compost to other farmers throughout the Guntur district.. His success story is inspiring to the farmers working in Agriculture and allied sectors.

Preparation & Method adopted for vermicomposting: The types of vermicomposting depend upon the amount of production and composting structures. Small-scale vermicomposting is done to meet the personal requirement and farmer can harvest 5-10 tons of vermicompost annually. While, large-scale vermicomposting is done at commercial scale by recycling large quantity of organic waste with the production of more than 50-100 tons annually.

Vermicomposting is done by various methods, among them bed and pit methods are more common.

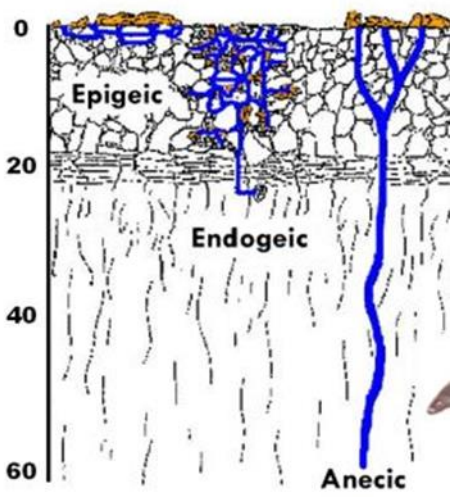
Bed method: Composting is done on the pucca / kachcha floor by making bed (6x2x2 feet size) of organic mixture. This method is easy to maintain and to practice (Fig.1).

Pit method: Composting is done in the cemented pits of size 5x5x3 feet. The unit is covered with thatch grass or any other locally available materials. This method is not preferred due to poor aeration, water logging at bottom, and more cost of production (fig.2)

Fig 1: Bed Method

Fig 2: Pit Method

There are about 240 genera of worms worldwide, among them about 50 species are available in India. On the basis of habitat, worms can be categorize into three groups:



(A) Epizoic: It is known as manure worms or compost worms which have short life span and rapid breeding ability. Epizoic worms obtain their food from upper surface of half decomposed organic matter and move downward. *Eisenia foetida* (Red earthworm), *Eudrilus eugeniae* (night crawler), *Perionyx excavatus* etc. are under this group. *Eisenia foetida* is selected because of its high multiplication rate and converts abandoned amount of organic wastes into vermicompost. Red earthworm have body length 3-10cm, body weight 0.4-0.6g, maturity 50-55days, conversion rate 2.0 q/1500worms/2 months, cocoon production 1 in every 3 days and incubation period is 20-23days.

Eisenia fetida

Lumbricus rubellus

(B) Endozoic: Endozoic worms, known as field worm, consume food from lower portion and prefer soil than organic matter. Endozoic worm help in churning of soil, air circulation in soil and mixing of organic matter

O. cyaneum (blue-grey worm)

Lumbricus terrestris (night crawlers)

(C) Anesic: Anesic form hole and stay in it. Lives of anesic is very complex and prefer leaves.

Vermicomposting unit (size 6x2x2 feet) was established in a cool, moist and shady place. Number of units increased according to availability of raw materials and requirements. Cow dung and chopped dried leafy materials were mixed in the proportion of 3: 1 and kept for 15 – 20 days for partial decomposition. During this period, heap kept moist by sprinkling of water so that temperature can be favorable to worms. A layer of 15-20cm of chopped dried leaves/grasses kept as bedding material at the bottom of the bed. Each bed contained 1.5-2.0q of raw material. Now 1500-2000 Red earthworms released on the upper layer of the pit/bed and covered with gunny bags/paddy straw so that worms can be saved from predators. Water sprinkled immediately after releasing worms and kept it moist by frequent sprinkling as per need. Bed turned once after 20-30 days for maintaining aeration and proper decomposition. A reddish colour liquid, with an alkaline reaction having dissolved nutrients, called vermiwash collected in the small chamber connected through drainage pipes fitted at the bottom of the tank. By this way vermicompost was ready in 45-50 days and amounting by weight ¾ th of the raw materials used. Moreover, vermiwash was additional product which was abandoned in nutrition having plant growth hormones, micronutrients and organic acids. For value addition of vermicompost, rock phosphate**,** azolla etc. added accordingly.

Preventive measures during production:

- Selection of site was most important according to purpose of production either commercial or personal.
- Producer was trained by Scientist (Agronomy) of Krishi Vigyan Kendra, LAM, Guntur before start the production.
- According to purpose, vermicompost unit pit/floor was prepared and it kept compact to prevent downward migration of worms.
- 15-20 days old cow dung used to avoid excess heat.
- Avoid fresh dung and waste because worms would die in fresh caw dung, citrus rinds avoided carefully.
- The organic wastes were free from plastics, chemicals, pesticides and metals etc.
- Aeration was maintained for proper growth and multiplication of earthworms.
- Optimum moisture level (30-40 %) and temperature (18-35^{0}C) maintained for proper functioning of worms.
- Ants are dangerous enemy of worms, so charcoal powder was mixed to the raw materials to escape from them.
- Activities of worms were monitored frequently for producing quality produce.
- All works from production to packaging was done in shade and stored the products in shaded, spacious and 4-5 racks height in poly bags.

Pests and Diseases of vermicompost

Compost worms are not subject to diseases caused by micro-organisms, but they are subject to predation by certain animals and insects (red mites are the worst) and to a disease known as “sour crop” caused by environmental conditions.

Harvesting

When raw material is completely decomposed 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 can be separated and sieved for use.

Results and Discussion

The outcome of any production system is generally depends on need, availability of inputs & the marketing channels by which one can marketed with remunerative price by using locally available resources. The main objective to success in organic farming system is the production of all natural inputs like, manures to boost up the plant for proper growth and then for plant protection (biocontrol agents) etc., and on-farm utilizing the local resources whereas animal husbandry plays an important role. The economics of vermicompost production indicated that it is 50-57% economical enterprise as compared to costly chemical fertilizers. Direct marketing of vermicompost from producer to consumer was found to build up strong marketing channel in the business. However marketing through cooperatives and traders were also found in few instances. Specialized market for vermicompost was not yet observed in the study area but obvious that about 85 % of vermicompost was marketed directly from producers to local consumers and remaining 15% of production will be distributed or transported to other areas through traders. Ravuri Suresh Kumar have obtained an net income of Rs. 19,00,350/- by investing Rs. 8,99,650/- per annum for the production of value added vermicompost which is widely in demand for the local areas of Guntur district. Also, he is also transferring the technique of vermicomposting to farmers in order to produce their own natural manures to their field. He got benefit cost ratio of 2.1:1 for his production.

Cost of vermicompost production (Rs.) per annum	Gross income (Rs.) per annum	Net income (Rs.) per annum	B:C Ratio	Total -4 units working, 10 q/unit were produce, total compost produced-700 tons per annum, sale of vermicompost@700/Q,
899650	2800000	1900350	2.1:1	

Conclusion

By this case study it can be concluded that people like Ravuri. Suresh Kumar are selecting vermicompost production, enhancing their livelihood status, improving soil health and conserving beneficial soil micro-organisms. He has done value addition to the produced vermicompost by adding up biocontrol agents and improved the quality product which is demanded by nearby farmers, NGO’s and government organizations of Andhra Pradesh. Moreover, he is encouraging interested farmers to prepare this multifunctional quality product on their own farms so that farming community can be benefitted. Substituting these chemical fertilizers with the organic inputs, such as vermicompost, can provide an impulse for organic farming systems. Therefore,

this research aimed at technology development and modifications for the production of quality vermicompost from locally available organic waste materials using composting earthworms. Data collected from farmer's field indicated that benefit and cost ratio (2.1:1) is significantly higher and can boost-up eco-friend Indian economy which is today's essential need.

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