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Vermitechnology: a promising tool for sustainable agriculture in 21st century

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ABSTRACT

Newly developed vermicomposting model is eco-friendly, has low cost, minimum space requirement, protection from predators, minimum water requirement, self roof, easy management. This model tries to keeps constant temperature and humidity. Due to these favorable conditions earthworms feed voraciously, shows fast growth, increases rate of reproduction and vermicompost formation within short period (45-days), which is qualitative and quantitative. Vermicompost increases soil fertility, water holding capacity, healthy growth in plants and regulates the soil pH neutral. Newly developed vermiwash model medium cost, space requirement 2'X2', mobile model. The vermiwash from this model is qualitative and quantitative. Analyzed contains total 48- components. Includes 10- Micronutrients, 5- Hormones, 5- Enzymes, 7-microbes and 21- other Physico-chemical components. Vermiwash acts plant tonic, good organic foliar spray increases vegetative and reproductive growth in plants. On flowering plants: flower size, number increases, better color and also acts as post harvesting tonic. Vermiwash in nursery for vegetative growth in cutting, grafting and layering.

Introduction

India's own achievement in agriculture production after first Green Revolution in late 1960's, under the leadership of Swami Nathan, Karwar and Bourlaug, resulting in quantum jump in agricultural productivity. This happens due to increased use of the components of modern agriculture namely chemical fertilizers, pesticides, herbicides, hybrid verities of seeds, farm machinery and other inputs. The food grains production in India more than doubled it self during first green revolution, virtually no increase in net cultivated area. It increases from 95 million tons in 1967-68 to 209 million tons in 1999-2000. Increased productivity resulted in India becoming self sufficient and self reliant with reference to agriculture and in turns of food material, but adversely affected on eco-system and gene pool at large. Effect of unsustainable use of these agricultural inputs shifted the focus back as an organic farming. In this scenario and paradigm shift in agriculture. Farmers are switching to use eco-friendly techniques.

New vermitechnology models in which use of surface and subsurface variety of earthworm *Eudrillus eugenie* in production of vermicompost and vermiwash (Ismail, 2005). Darwin (2006) carefully studied and concluded that it is lowly organized creature, which is very important as compare to other animals. The work on Vermitechnology has tremendous importance in agriculture. Earthworms have a critical role in soil fertility and processing along with soil microbes (Elvira et al. 1996 and Atiysh et al. 2000). The use of vermicompost in clay soil improves the passage the entry of air. The mucous is hygroscopic absorbs the water and increase the water holding capacity. The soil enriched with vermicompost provide additional substances which are not found in chemical fertilizers (Kale, 1998) Vermiwash is nothing but coelomic fluid and vermicomposting filtrate, collected after the passage of water through a column of worm action. It is very useful as foliar spray, contains no. of micronutrient, enzymes, hormones and microbes (Patil et al. 2007). The properly collected vermiwash is transparent, pale yellow colored fluid (Ismail, 1997). The feed materials for the earthworms can be in the form of agro waste, kitchen waste and nitrogen rich materials like dung of cattle, sheep and pig fecal matter (Ismail, 2005).

World population more than doubled it self during the last half of the 20th century, it increased from 2.5 billion in 1950 to 6 billion in 2000 and it will touches 12 billion marks at the end of 21st century. Most of this increase in population has been and will be in the developing and third world countries of Asia, Africa and South America. In India we were only 361 million people and by 2000 AD, we are 1004.5 million, nearly trebling our population in the second half of 20th century. Infact now India is one of the major producers and exported in many agricultural commodities, but flip side of these developments are fast emerging. Now it is evident that, these developments have adversely affected on eco-system at large. Effects are noticed not only to soil, water, produced food and air, but went way beyond and affected on gene pool of wild seeds and in turns of bio-diversity.

Due to growing public awareness towards environment, adverse effects of agro-chemicals, increasing input cost, instability in price of produce and emergence of pesticide resistance in pests. This changed scenario has brought about paradigm shift in agriculture in India. Now farmers are switching to more eco-friendly organic farming methods. It looks this is the dawn of Second Evergreen Revolution. In view of this we have started working on development of low cost, quality and effective agricultural inputs to help farming community. Qualitative and quantitative effects of vermicompost and vermiwash on crops and horticultural produce. In spite of excellent results its usage in farming practices is limited due unavailability of dependable techniques for production of quality of vermicomposting and vermiwash.

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Keeping these aspects in our mind we have developed new vermiwash and vermicomposting production systems.

Materials

A new vermicomposting model requires fabricated: cot- Size 10' L X 4' B X 2'.6" H., 600- Bricks for construction of tank on cot. 10- Water bowls. 4- Plastic porous pipes, Size - 2.6'X 2". Sprinkler water system, waste gunny bags. Self roof as a shade and half cut plastic pipe, length 10'.6".

A new vermiwash model requires: Plastic barrel - 200 lit. capacity (3'- Height x 2'- Circumference), Plastic / Iron tap- ½ inch, Brick pieces (size 1" x 1")– 55 to 60 kg., Course sand / Pebbles- 60 kg., Fine sand - 50 kg., Plastic porous pipe- 2' length and 1" diameter, Iron circular ring- 1' circumference, Rubber / Plastic pipe- 5' long & ½ cm diameter, 4- Water regulators, 5 - Three way connectors, 1- Water controller, Mature earthworms - *Eudrillus eugeniae* - 1. 5 kg / Unit, Fabricated stand (2'- L x 2'- B x 2'- H), Mosquito netlon mesh- 2' Circumference, Fresh dung + Decayed dung + Leaf moulds (Ratio - 2 : 2 : 1), Plastic bucket - 10 to 15 - lits. Capacity - For collection of vermiwash.

Methodology

For vermicomposting select shady & flat floor surface, place the cot with water bowls, spread plastic paper on cot and construct pit or tank with loose bricks having size 10' length X4' breadth X 2.6' height. Now inside pit bottom layer 4"dung on it 5"- 6" partly decayed any biodegradable material, third layer 4" dung, then 4" soft and completely decayed agricultural waste, uppermost fifth layer 12" of partly decayed and fresh cattle dung In middle of unit insert the plastic porous pipe at the distance of 2' each (requires 4 pipes having size - 2.6'X 2"), fit the water sprinklers and at centre lower side of the cot fit the vermiwash collecting pipe. Top surface of the dung covered waste gunny bags and total unit covered by fitting iron angles at four corners cover it with netlon mosquito mesh. The water is sprinkled on unit for three to four day to set unit, then release the 5 to 6 kg. earthworms (*Eudrillus eugeniae*). Within month 10" to 12" top surface of dung converted in to vermicompost collect it, next collection every week, total days required 45 days.

For vermiwash use of plastic barrel - 200- liters capacity (3'- Height X 2'- Diameter), fitting of - ½ inch plastic tap at the lower side of barrel, inside barrel- Bottom first layer- 7"- Brick pieces, second layer - 6"- Coarse sand pebbles, third layer - 5"- Fine sand, after third layer spread mosquito netlon mesh, on netlon mesh- 15" to 16'' : fresh dung +partly decomposed dung + decayed leaf moulds (Ratio 2 : 2 : 1), at the center of barrel i. e. In the middle of feeding layer insert plastic porous pipe up to netlon mesh, total unit set on rectangular iron stand with ant bowls, 2- feet above the ground level for easy management and protection from predators, release 1. 5 kg. mature earthworms (1500- 2000) in the unit, preference should be given to *Eudrillus eugenae*, in the unit, adjust the water flow- 3 - liters / day, drop by drop at 4- places, each day we gets - 2750 ml. pure vermiwash, after complete setting of unit, vermiwash comes out within 8 to 10 days but best quality of vermiwash, starts getting after 14- days.

Results And Discussion

Vermicompost increases soil fertility i. e. physically, chemically and biologically, used in any type of land and at any season. Use of vermicompost, crop shows healthygrowth. The cost of vermicompost is less than chemical fertilizers. Regulates the soil PH neutral. It avoids all types of pollutions, for betterment of human race and other animals. Cot system used is durable, easy to manage, mobile model for bungalows, multistoried buildings, row houses and farmers. Ant bowls for protectection from ants. Loose bricks for construction of tank on cot, bricks acts as self air-conditioner to the earthworms, to regulate temperature, humidity and absorbs excess water. Porous plastic pipes to regulate the air in the middle of the feeding zone. Sprinkler water system proper water requirement to earthworms. Use of waste gunny bags for protects worms from direct light, increases rate of feeding, regulates humidity and temperature. Self roof protection of earthworms from direct sunlight. A new vermicoposting model that we have developed is eco-friendly, low cost, minimum space requirement, easy management, durable. On the other hand gives qualitative and quantitative vermicopost within 45- days.

Vermiwash acts as organic biofertilizer as it contains organic and inorganic compounds like Micro-nutrients, Enzymes, Hormones and Microbes. Application of vermiwash increases vegetative and reproductive growth in different crops. It is very good organic foliar spray, no toxic residue remains. On flowering plants: size of flower increases, better colour develops. Vermiwash in nursery for vegetative growth i. e. In cutting, grafting and layering, induces formation of roots or joining. Vermiwash model is eco- friendly Model, low cost Model: The cost single unit / barrel is Rs. 2500.00, space requirement minimum- 2' x 2' feet / unit, easy to manage, mobile model, quality of vermiwash obtained is good, easy for foliar spray without any side effect on human beings, it has excellent keeping qualities.

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