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GERMINATION OF RADISH (*RAPHANUS SATIVUS*) IN EARTHWORM CASTING

Zoology

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ABSTRACT

Fecal content or castings of earthworms are used as organic manure with soil to evaluate the growth of radish (*Raphanus sativus*). Earthworm castings were used as manure mixed with soil at different ratios like 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90,100%, and normal soil without earthworm cast were used as a control. The rate of red radish growth increases with the percentage of cast manure increases and maximum growth is observed in 90% and 100% ratio of soil and cast. In pot containing 100%, earthworm casting has a high water holding capacity and density is also high.

KEYWORDS

earthworm casting, radish, organic manure, fecal.

INTRODUCTION

The use of manures of different animals, fecal waste of humans, food waste, and sewage sludge as a source of organic substance in the field of crop production has a great impact on the production of crops without creating any harmful effect on the consumers and also they maintain the fertility of the soil for a long time by increasing population of microbial fauna in the soil. Earthworms are annelids that live in a narrow passage or burrow in the soil, creating interconnection in the soil layer for the mixing of air and organic substance with soil through which soil fertility increases. They feed on soil microbes and plant materials present in the soil. After digestion they liberate fecal content loaded with the organic substance on one end of the burrow as cast (vermicompost).

Earthworm castings are highly nutritive for the growth of plants, which help in the improvement of soil structure, soil fertility, plant growth, and crop yield (Abbot and Parker, 1981). Earthworm casting is a mixture of ammonia, urea, and body tissues. The earthworm cast is very rich in organic matters which are essential sources of nutrients for the growth of plants (Curry and Byrne, 1992). The percentage of nitrogen, potassium, and phosphorus is high in vermicompost, and the presence of micronutrients promotes the growth of soil microbes. Vermicompost also contains growth hormones & enzymes that are present in plants that mix after decomposition.

Radish is the common herbaceous plant, *Raphanus sativus*, of the mustard family (Brassicaceae). The radish, *Raphanus sativus*, is easily identified by white to purple flowers. The plant has both male and female organs and its pollination is facilitated by arthropods like bees and flies.

MATERIAL AND METHOD

Earthworm casting behaviors is varying depending upon the habitat. Some species of earthworm deposit cast in the soil cracks whereas some in their burrows. The seed germination and growth of radish (*Raphanus sativus*) was evaluated by taking earthworm castings as soil manure. The earthworm cast was collected from different locations of the Lucknow.

Table 1

S.No.	Collection Site for Earthworm cast (Lucknow)
1	Gomti nagar
2	Daliganj
3	Kukrail
4	Nishat Ganj

The Earthworm castings were collected with the help of a spatula in a 1 kg container. For the determination of seed growth (radish) 10 different growing media of earthworm castings and one control soil were made.

Table 2

Growing Media		
S.No.	Earthworm casting ratio(percentage)	Soil ratio (percentage)
1.	10	90
2.	20	80
3.	30	70
4.	40	60
5.	50	50
6.	60	40
7.	70	30
8.	80	20
9.	90	10
10.	100	00
11.	00	100 (Control)

Seeds were germinated at a mean temperature of 24-28 degrees Celsius and average humidity of 66% approximately. Pots were watered regularly and data was collected every day after seedling. Radish seeds are planted directly in the pots may be beneficial by the use of earthworm castings mixed with soil where the seed is to be planted. Regular uses for earthworm casting may increase production and also reduce the need for artificial chemical fertilization.

Physical examination of fresh caste: Deep brown in color, granular in shape, light-weighted, odorless, rich and earthy texture somewhat, crumbly "gooey", it should not be wet or muddy though.

Chemical constituents of fresh caste: pH of earthworm castings -7 (neutral) whereas pH of control soil is -8 (alkaline). The amount of iron, sulfur, calcium, nitrogen, phosphorous, and potassium is high in earthworm cast.

RESULT AND DISCUSSION

Growth improvement of specific plants and low cost of production were the reasons for to use of earthworm castings (vermicompost) as a growth medium (Thejesh C. 2020). During feeding in the earthworm, soil that passes through gut from where it mixed with enzyme and other chemical that are useful for the growth of plants. Therefore fecal matter in the form of casting promotes plant growth (Abbot and Parker, 1981).

There are many researchers who have studied the role of earthworms as manure or with the soil and its fertility. From present studies, it has been established that earthworms casting are one of the most useful and active agents that easily transmit a variety of suitable chemicals in the soil and increase increases the fertility and seed germination power in the soils (Joshi and Kelkar, 1951). Lee (1985) reported the significant role of earthworm casting for maintaining soil fertility and is also good for plant growth when use as fertilizer. Edwards and Bates (1992) reported that earthworm casting increased plants growth when used as fertilizer with soil.

Table 3

Determine the effect of earthworm castings as a soil media for germination and development of radish (*Raphanus sativus)* plant		
S.No.	Growth of radish	Mixture of earthworm casting and soil
1	Low	Control to 50%
2	Moderate	60%-80%
3	High	90%-100%

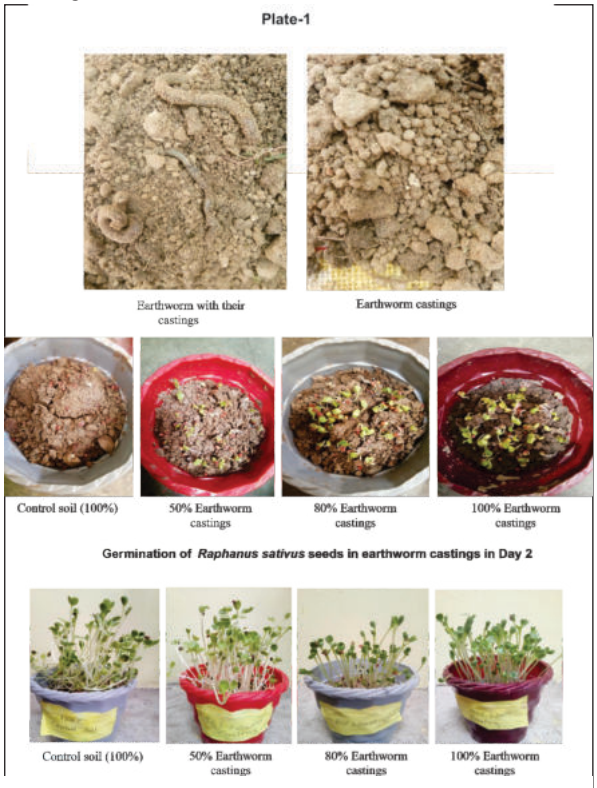
The growing plants were compared with different media of earthworm castings of mixed treatment, germination rate increases every day after seedling in 14 days.

Germination and root growth of seeds were more in earthworm castings alone rather than other mixes of castings and soil (Plate 1). More proportion of castings results in a high yield of plant production whereas a ratio of fewer earthworm castings has less production. As the number of castings increased in every pot, the efficiency of germination and growth of the plant is also increased (Table 3 and Plate 1).

In this experiment, the combination of earthworm castings and regular soil control resulted in seedling growth and germination rate comparable to castings alone (Plate 1). In addition, root growth was greater in plants grown in the normal soil mixed with earthworm castings act as manure and therefore, it would be suitable media to enhance germination and growth of the seedlings. Earthworm vermicompost protects plants from pests and disease.

CONCLUSIONS

Soil is the natural and main source for crop production but due to extensive use for fertilizer soil fertility decreases as soil microbial fauna numbers reduce with the use of artificial fertilizer (Parikh and James, 2012). The manure obtained from animals and human fecal matter is the best way to increase the fertility of the soil without harming soil microbial fauna. The use of Earthworm casting as manure or organic substrate in the kitchen garden is the best way to grow a variety of plants easily in the home. It is not easy to use earthworm casting as manure in cropland but the habitat (living) of earthworms in the crop soil itself increases fertility but due to the use of a variety of pesticides the earthworm population is also not able to survive like soil microbes. The author suggests that the earthworm casting can be easily used as soil or manure for germination of a variety of plants in the kitchen garden in the home.



Germination of *Raphanus sativus* seeds in earthworm castings in Day 14

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