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EFFECT OF *EUDRILUS EUGENIAE* VERMIWASH ON THE GROWTH OF *ARACHIS HYPHOGEA*

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Abstract

In the present study, the properties and the effect of vermiwash of *Eudrilus eugeniae* on the growth and biochemical constituents of *Arachis hypogea* were analyzed. Varying concentrations of vermiwash were used to detect the effect on the growth of *Arachis hypogea* for a period of 4 weeks. The plants were divided into control and three treatment groups, Treatment I (1% Concentration used), Treatment II (3% Concentration used) & Treatment III (6% Concentration used). After the treatment period the root length, shoot length, number of leaves and biomass were evaluated for all the *Eudrilus eugeniae* vermiwash treated plants and for the control group. It has been found that treatment III was found to be effective in all the physical and chemical parameters analyzed when compared to the control and other treatment groups.

Keywords: Vermiwash, *Eudrilus eugeniae*, *Arachis hypogea*.

Introduction

Earthworms are the breakdown of organic matter and the release of the nutrients. It has been demonstrated clearly of earthworms are specialized to live in decaying organic matter and can degrade it into fine particulate materials, rich in available nutrients, with considerable commercial potential as plant growth media or soil amendments (Edwards and Bohlen, 1996). Earthworm is the common name for the larger members of the *Oligochaeta*; they belong to the phylum *Annelida* and are mostly terrestrial organisms found living in the soil. They are described as segmented bristle-bearing worms contributing at large to the biomass of soil invertebrates, particularly in the temperate and tropical regions of the world (Edwards and Lofty *et al.*, 1972). The principle features of the earthworm are that they are bilaterally

symmetrical, externally segmented bearing set on all segments except the first two, hermaphrodites and lacks a skeleton (Edwards and Bohlen, 1996).

They have been found to be an excellent source of animal feed protein, essential amino acids, fats, vitamins, and minerals for livestock and fish. Chemical analysis of the body tissues of earthworms showed the following composition: protein 60-70%, fat 7-10%, carbohydrate 8-20%, and minerals 2-3% (Edwards et al., 2006). It is recommended for processing into vermimeal, a dried and pulverized feed preparation. They can be used in removing soil pollutants through bioremediation. Heavy metals and other pollutants can be taken up by the worms and removed from the soil, a process called vermiremediation (Edwards and Arancon, 2006).

They also confirmed the anti-blood clotting action of a crude extract from mashed earthworms used by an indigenous group in Western Visayas to thin the blood in the elderlies. Back in 1986, an enzyme called lumbrokinase which dissolves blood clots in the human blood stream was isolated by a Japanese scientist. This breakthrough has been put into use through the manufacture and commercialization of dietary products (Guerrero, 2006).

Groundnut is the sixth most important oilseed crop in the world. It contains 48-50% oil and 26-28% protein, and is a rich source of dietary fiber, minerals, and vitamins. Groundnut is grown on 26.4 million ha worldwide with a total production of 37.1 million metric t and an average productivity of 1.4 metric t/ha (FAO, 2004). Over 100 countries worldwide grows groundnut. Developing countries constitute 97% of the global area and 94% of the global production of this crop. The production of groundnut is concentrated in Asia and Africa (56% and 40% of the global area and 68% and 25% of the global production, respectively) (Nigam et al., 1983).

Vermiwash is a brown colored liquid fertilizer, it is a storehouse of nutrients and microorganisms (Ismail, 1997). Vermiwash can be processed into vermiceuticals, or pharmaceutical products, for the treatment of human diseases. There are many reports that these worms and body extracts have been used for the treatment of numerous human diseases in China and other Asian countries (Edwards and Arancon, 2006). Studies conducted by Lopez and Alis (2006) revealed that earthworms are used as folkloric medicine in the Philippines. Vermiwash has excellent growth promoting compound besides serving as a pesticide. In recent days the vermiwash is used as liquid manure. Even though much work has been done on vermicomposting, very few reports are available related to vermiwash and its impact on the plant growth. *Eudrilus Eugenia* is epigenic earthworm species commonly used in vermiculture, contributing much in

increasing the soil fertility. Therefore, it is in our interest to study the effect of vermiwash of *Eudrilus Eugenia* on commonly growing plants like *Arachis hypogea* (Edwends et al., 1985).

Materials and Methods

Collection Seed Selection and Treatment of *Arachis Hypogea* Plant Seed: The *Arachis hypogea* plant seeds were collected from Tiruchengode, Tamilnadu, India. The plants were authenticated at the Tamilnadu Agritech portal . A well-drained sandy red soil was used to cultivate the *Arachis hypogea* plants, for the cultivation of *Arachis hypogea* the temperature was maintained from 25°C to 35°C. Before sowing, seeds were carefully prepared. *Arachis hypogea* pods intended for sowing should be hand-shelled and sorted in order to eliminate skinned, immature, moldy, and small seeds. The selected seeds were sowed in the moisture surface soil (Plate 2 & 3).

Plate - 2

SEEDLINGS OF ARACHIS HYPHOGEA



Plate - 3

SOWED SEEDLINGS OF ARACHIS HYPHOGEA IN SOIL



Collection of Vermiwash by Cold Shock Method

Healthy *Eudrilus eugeniae* were collected from Salem (Plate 1). The vermiwash can be collected from the body cavity of earthworms without causing any harm to them. In this method of collecting the fluid, three to four earthworms were taken in an approximately 10 cm diameter Petri plate. Holding the plate in a slanting position and keeping earthworms pointing downwards, cold shock was given to earthworms by gently moving a Petri dish containing a few ice cubes over the body of worms (Plate 4 & 5). The vermiwash released due to cold shock drips and gets collected on the side of the Petri plate. The fluid can be pipetted out using a treated pipetted with fine nozzle (Radha Kale, 2006).

Plate - 1



Plate - 4



Plate - 5



Treatment Period

The pots were filled with air-dried, macro and micro nutrient tested the red soil. Qualities of the seeds of *Arachis hypogea* proven have 80-90% germinations were brought from the Government Recognized Seed Corporation. The pots were divided into three treatments for the experiment. Control group - Sowed with 15 *Arachis hypogea* seeds in the red soil. After germination the seedlings were sprayed with water as foliar spray every day. The treatment I - consists of 1% Coelomic fluid dissolved in 100ml of distilled water. Treatment-II consists of 3% Coelomic fluid dissolved in 100ml of distilled water.

Plate - 6



Plate 8



Plate - 7



Plate - 9



Treatment III - This consists of 6% Coelomic fluid is dissolved in 100ml of distilled water. After germination in all the treatment groups, the seedlings were sprayed with above prepared Coelomic. Volume of coelomic fluid was prepared as mentioned and sprayed as foliar spray every day. All the foliar spray was sprayed by using the hand spray method in the alternative day's morning between 9.30 to 10.30 for four weeks.

Preparations of Plant Extracts

After four weeks of the treatment. The plants were harvested, the roots, branches and leaves were segregated and their lengths were measured and washed with distilled water, and grounded with 10ml of cold Tris-Hcl buffer using mortar and pestle. The extracts were then centrifuged and the supernatant liquid was collected. This supernatant liquid is used for the biochemical estimation (Plate 10).

Plate - 10



Evaluation of physico-chemical properties of vermiwash

Potassium and Calcium were determined by Toth and Prince, 1949. Sulfate and Phosphorus were evaluated by NPDES, 1978 & Modified Vogel's Method (Dantzig, 1963). Nitrogen (Modified micro Kjeldahl method) and Organic Carbon (Walkey and black method) were evaluated by Mossberg, 1978 and Jackson, 1975 methods. pH and Micronutrients (Zinc, Copper, Iron and Manganese) were determined by ISO, 1994 and CIWMB, 2002.

Biochemical Estimations in *Arachis hypogea* leaf, root and stem Extract

Total Carbohydrate and protein were quantified by Anthrone Method (Hedge *et al.*, 1962) and Lowry's Method (Lowry *et al.*, 1951). Ascorbic acid content was evaluated by Harris *et al.*, 1935.

Results and Discussion

The effect of vermiwash was tested for growth on *Arachis hypogea* plant on soil at laboratory scale experiments. The growth of the plants was observed for 4 weeks only. Vermiwash supplemented soil showed good plant growth as compared to without supplementation. The positive effect of vermiwash on crop growth and yield was observed, in both, growth and yield of *Arachis hypogea* increased, according to the vermiwash concentrations treated (Table 1). The root and shoot length of *Arachis hypogea* plants are increased after the treatment of vermiwash for four weeks. The numbers of leaves are increased highly after respective spray of vermiwash for four weeks. The biomass were found to be increased in all the treatment groups, compared to the control (6, 7, 8, 9, 11 & 12). The results of these experiments indicate that vermiwash increases the growth of *Arachis hypogea*.

Table 1: The Effect of *Eudrilus Eugeniae* Vermiwash on the Growth of *Arachis Hypogea*

Groups	Root length (In cm) *	Number of Branch*	Shoot length (In cm) *	Number of leaves*	Bio mass (In grams) *
Control	1.5	2.5	1.04	2	0.98
Treatment I	5.5	3	1.30	6.3	1.28
Treatment II	9.66	3.3	1.65	7	1.45
Treatment III	11.68	7.16	2.45	27.16	2.13

*mean values of replicates

Figure 1 shows the physicochemical analysis of vermiwash. During the preparation of vermiwash all the physico-chemically active components soluble in water were extracted, and found to contain high amounts of nutrients. The vermiwash was found to be alkaline (9.14) because of high P^H. The nutrients present in the vermiwash may become an essential source of nutrients which are easily available to the plants.

Total carbohydrate, protein and ascorbic acid levels were found to be increased in the groups treated with vermiwash which are depicted in the figure 2, 3 & 4. The positive effects of vermiwash on groundnut growth and yield in the present study is in conformity with the studies of (Bucker filed et al.,1999) who reported that weekly applications of vermiwash increased radish yield and (Thangavel, 2003) who observed that both growth and yield of increased with the application of vermiwash extracts. Vermiwash revealed potential application in sustainable development in agriculture biotechnology with respect to its origin, cost effectiveness, easily availability, time saving, reproducibility, reliability and Eco friendliness.

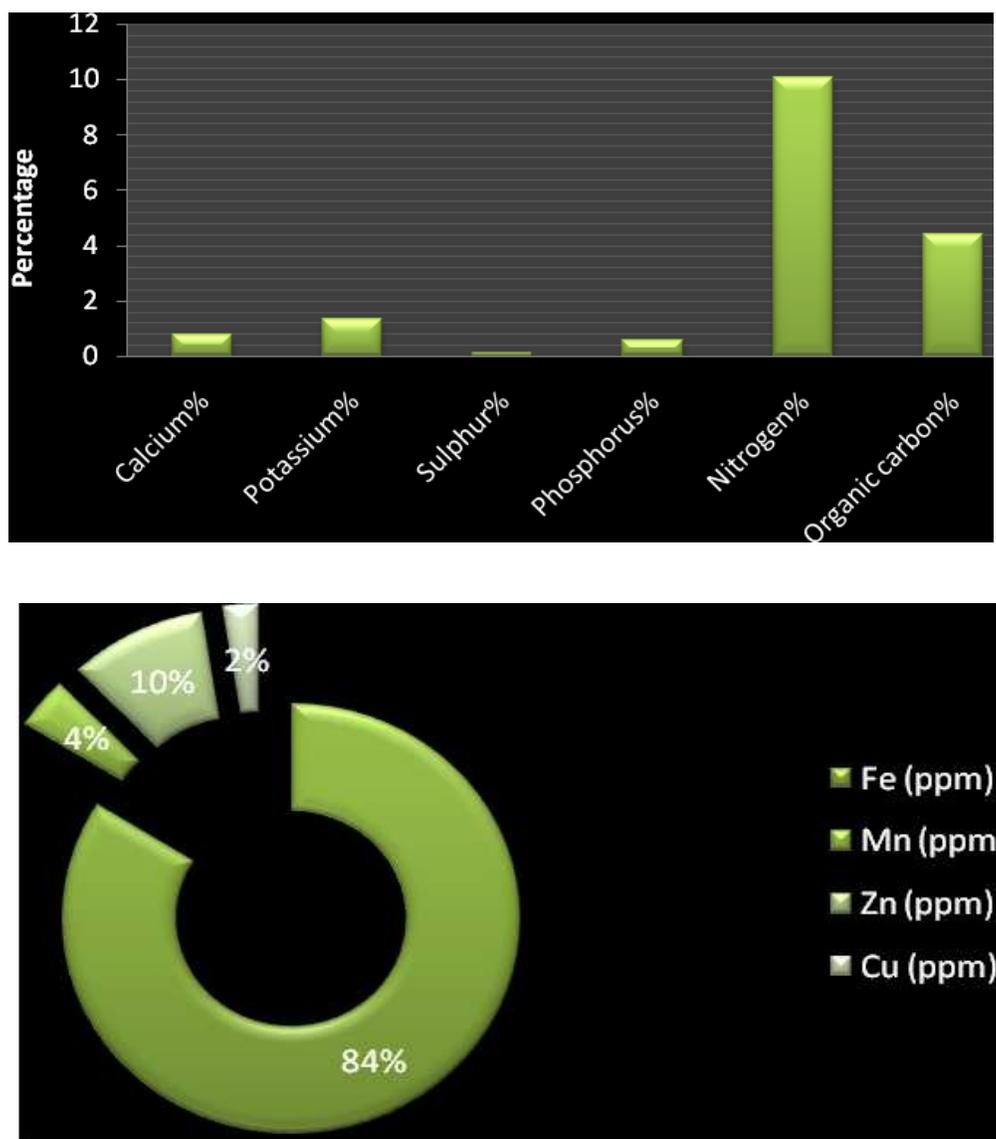


Figure 1: Physico Chemical Analysis of Vermiwash

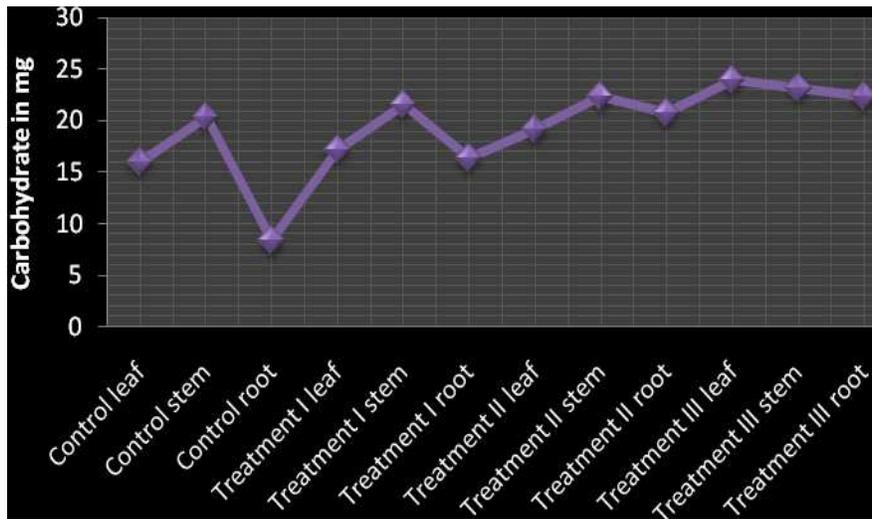


Figure 2: Estimation of Carbohydrate in root, leaves and stem of *Arachis Hypogaea*

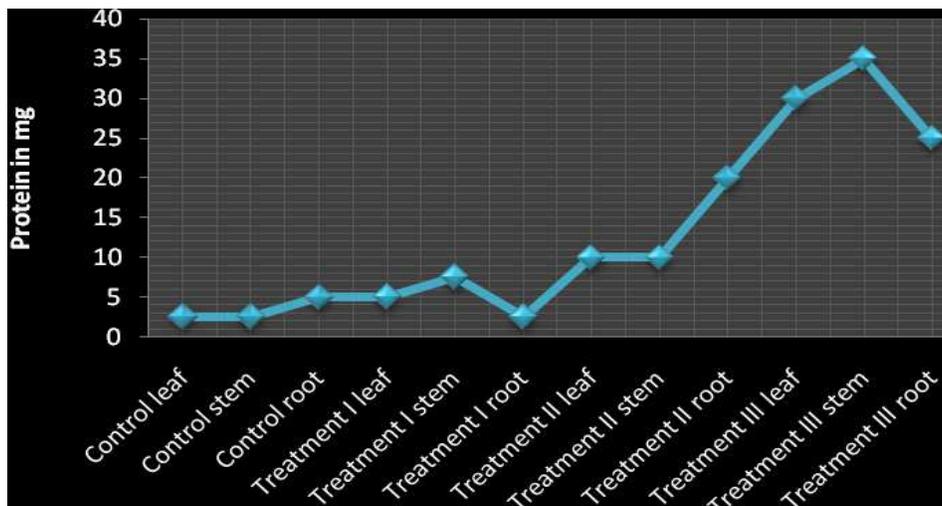


Figure 3: Estimation of protein in root, leaves and stem of *Arachis Hypogaea*

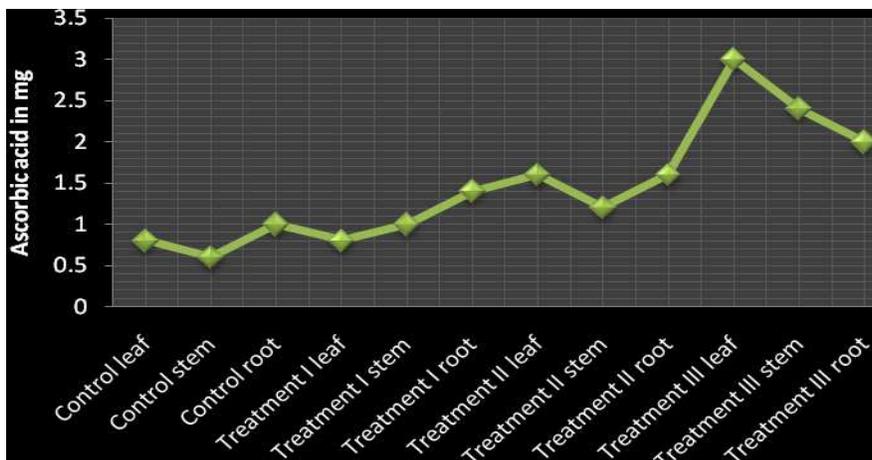


Figure 4: Estimation of ascorbic acid in root, leaves and stem of *Arachis Hypogaea*



The nutrient condition of sandy red soil is poor, more over nutrients applied to inorganic fertilizers get leached out. Organic inputs in the form of vermiwash in the passive inoculation of sandy red soil, which helps in the retention of nutrients enabling plant growth. Addition of vermiwash has provided effect on growing plants. Kale *et al.*, (1987) reported that, earth worm saliva and casts helped for establishment of symbiotic mechanized fungi, which are known to increase the phosphate uptake of the plants, which in turn influences the vegetative parameters. Also Kale *et al.*, (1991) and Vadiraj, (1996) reported better performance of crop plants under in vermiculture with growth parameters.

The vermiwash found to contain higher amount of micro and macro nutrients. The nutrients enhance the plant growth and yield. The results obtained from these experiments revealed that growth and yield parameters such as leaf branches, root length etc. of plants were significantly enhanced by applying the vermiwash than in control plants. Aragon *et al.*, (2006) reported that the positive effects of vermiwash on the growth and yield increase of leaf area, shoot fresh and dry weight in field conditions.

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