

Influence of Vermiwash on Germination and Growth of Cow Pea *Vigna Ungiculata* and Rice *Oryza Sativa*

M.R.Rajan* and P. Murugesan

Department of Biology, Gandhigram Rural Institute – Deemed University, (Re – Accredited with ‘A’ Grade by NAAC), Gandhigram – 624302, Tamil Nadu, India

Abstract-The present study deals with the influence of Vermiwash on germination and growth of Cow pea *Vigna unguiculata* and Rice *Oryza sativa* grown for a period of 25 days. Vermicompost was prepared by using earthworm, *Eudrilus eugeniae* and by using cowdung and leaf litter in the ratio of 1: 1. Vermiwash was prepared from the vermibed. The physico – chemical and microbiological characteristics of the vermiwash were analyzed. Three different concentrations of vermiwash such as 50, 75 and 100 % were prepared by using tap water. Clay soil, red soil and sand were mixed in the ratio of 3:2:1 and filled in mud pots and seeds of *Vigna unguiculata* and *Oryza sativa* were shown. Fifth day onwards vermiwash was applied. On 25th day parameters such as shoot and root length, number of branches and leaves, leaf length and breadth were measured. Increased Vigor index in *Oryza sativa* exposed to different concentration of vermiwash. Growth parameters were higher in 75 and 100% of vermiwash sprayed *Vigna unguiculata* and *Oryza sativa*.

Keywords: Vermiwash, germination, growth, cow pea, rice.

I. INTRODUCTION

In recent days Vermicompost as organic manure is being popularized. Importance of organically grown products is in demand at present due to health awareness. Vermicomposting is a process of bio-oxidation and stabilization of organic wastes and by the joint action of earthworms and microorganisms. Vermicompost has a great potential as plant growth media and shown to promote growth of cereals, vegetables, ornamental plants etc (1-3). Vermicomposting can also be used as a structural addition for poor soils. An important feature is that during the processing of the wastes by earthworm, many of the nutrients that they contain are changed to forms which are more readily taken up by plants, such as nitrates, ammonium nitrogen, exchangeable phosphorus, soluble potassium, calcium and magnesium (4). The vermin casts, mucus deposits, epidermal gland, cell and coelomic fluid showed that they contain plant growth factor and group of B- vitamins. The cast contain auxin like substance that modifies the effects of the plant auxins and enhanced plant growth and the application of vermiwash to plants. Foliar nutrients are recognized as an important method of fertilization, because foliar nutrients usually penetrate the leaf cuticle, stomata and enter the cells facilitating easy rapid utilization of nutrients. The vermiwash also contains enzymes and secretions of earthworms and would stimulate the growth and yield of crops. Kale (1998) (5) reported that vermiwash as foliar spray was effective in increasing the growth and yield response of anthurium. The work related to the influence of vermiwash on germination and growth of Cow pea *Vigna unguiculata* and Rice *Oryza sativa* were totally wanting. Hence the present study was carried out.

II. MATERIALS AND METHODS:

Vermiwash is the collection of excretory products and excess secretions of earthworms along with micronutrients from soil organic molecules. It is a liquid fertilizer collected after passage of water through a column of worm culture and it is used as a foliar spray.

III. COLLECTION OF SUBSTRATES:

Earthworms with compost were the raw materials for the preparation of vermiwash. Earthworms were collected from Sakthi Vermifarm, Sanarpatti, Madurai District, Tamil Nadu, India.

IV. PREPARATION OF VERMICOMPOST:

Cow dung and leaf litter were dried under shade and broken to small pieces. The substrates were mixed in the ratio of 1: 1. Required amount of water was added to the mixer to hold 70 – 80% moisture. This mixer was pre- decomposed for 10 days and filled in a cement tank having proper drainage facilities. The earthworm species, *Eudrilus eugeniae* were introduced in the mixture. The unit was kept in shade. Sufficient moisture level

was maintained by sprinkling water, within one month the earthworms started to multiply. These worms were used for the vermisubstrate prepared by using cowdung and leaf litter in the ratio of 1: 1.

V. VERMIWASH UNIT

Vermiwash unit was set up in a plastic barrel of 20 liter capacity. A hole is drilled on one side and a vertical limb of a “T” joint tube is attached in a way that half of the tube projects inside the barrel. A tap is attached to the end of horizontal limb and the other end is closed with dummy net. The whole setup was mounted on a suitable pedestal keeping the tap open, a layer of broken bricks or pebbles are filled up to 25 to 30 cm inside the barrel. Water was made to flow through this layer followed by 20 – 30 cm layer of coarse sand or garden soil. This forms the base of filter unit. Over this 30 – 45 cm layer of good loamy soil is kept moistened. In this layer, *Eudrilus eugeniae* sp. of earthworms is introduced. Cowdung and hay are paced on the top of this layer. This unit was moistened every day.

VI. VERMIWASH COLLECTION

The tap is closed and water is sprinkled on the top of the unit. The water slowly percolates through the compost carrying with nutrients through the filter unit. The tap is opened on the next day; collect the wash, which is spread on plants as a foliar spray.

VII. POT CULTURE EXPERIMENT

Clay soil, red soil and sand were collected from in and around Eriyodu Village, Dindigul District, Tamil Nadu, India. The seeds of Cow pea *Vigna unguiculata* were collected from Agriculture Seed Sales Centre, Dindigul. Pot culture studies were conducted to find out the effect of vermiwash on growth of cow pea *Vigna unguiculata*. Mud pots of 30 cm height and 20 cm diameter were procured. Clay soil, red soil and sand were mixed in the ratio of 3:2:1 and the pots were filled with the mixed soil. Cow pea was raised in the mud pots by sowing 10 seeds per pot and at least 4 plants were maintained after germination. On the 5th day, vermiwash sprayed as foliar spray on the surface of the leaves. The parameters such as shoot and root length, number of branches and leaves, leaf length and breadth were measured on the 25th day. Vermiwash was sprayed in four concentration such as 0 (control), 50, 75 and 100%. Vermiwash is mixed with water to get the desired concentration. A hand sprayer was used for spraying. Ordinary tap water is sprayed in the control.

VIII. PLATE CULTURE EXPERIMENT

Certified rice (*Oryza sativa* ADT 36) seeds were purchased from Farm Aid Corporation, Madurai, India and were used to determine the growth of in relation to different concentration of vermiwash. Growth parameters like germination (%), shoot length, root length and vigor index (6) were studied. Rice seeds were dressed with distilled water. Filter paper soaked in 10 ml of chosen concentration of the vermiwash and placed in glass Petri plates. A control is set up with filter paper soaked in distilled water was maintained for the purpose of comparison. The Petri plates were kept at indoor laboratory conditions under diffused light. Germination counts were under taken after 48 hrs and the shoot and root length was measured after 10 days. The vigor index was calculated. Triplicates were maintained.

IX. RESULTS AND DISCUSSION

The physico- chemical and microbiological characteristics of vermiwash is presented in Table 1. Pot culture studies were carried out to find out the effects of vermiwash spray on the growth of cow pea *Vigna unguiculata*. Parameters such as shoot and root length, number of leaves, number of branches, leaf length and breadth were observed in the experimental and control plants. The effect of different concentrations of vermiwash spray on shoot and root length, number of leaves and branches and leaf length and breadth were presented in Table 2. The shoot length of cow pea was 20.27, 20.04, 20.53 and 20.63 cm in control, 50, 75 and 100% of vermiwash respectively. In the present study the shoot length of the plants, which is received 75 and 100% concentration of vermiwash, should excellent growth. The growth of roots has considerably increased in all the experimental plants. With the increase in the concentration of vermiwash the root length has also increased (Table 2). The number of leaves was 7.23, 7.44, 7.36 and 7.33 for control, 50, 75 and 100% respectively. The number of branches increased in experimental plants than the control. The leaf length is higher in 75 and 100% concentration of vermiwash application. The breadth is increased in all the experimental plants over the control. The effect of different concentrations of vermiwash spray on germination, shoot and root length and vigor index of Rice *Oryza sativa* is presented in Table 3. Karmegam and Daniel(2000d)(7) have reported the manorial value of vermicompost and its effect on the growth and yield of plant *Vigna unguiculata* on 30.60, and 90th day of pot culture studies. Similar results have been observed on the application of vermiwash also. Karmegam et al (1999) (8) studied the growth and yield of *Phaseolus aureus*.

ACKNOWLEDGMENT

Authors are thankful to Department of Biology, Gandhigram Rural Institute – Deemed University, Gandhigram for offering facilities to carry out this work.

REFERENCES

- [1]. Kale, R. D. and Bank, K. Field trails with vermicompost as organic fertilizer. Proc. Nat. Sem. Organic Waste Utiliz., Part B. Verms and Vermin compost.(Ed. Desh, M,C., B.K. Senapathi and P.C. Mishra. pp. 151- 157. (1986).
- [2]. Kale, R.D., k. Bano., M.N. Sreenivasa and D.J.Bagyaraj. Influence of worm cast on the growth and mycorrhizal colonization of two ornamental plants. South India Horticulture, 35: 433 – 437. (1987).
- [3]. Edwards, C.A and Burrow, I . The potential of earthworms compost as plant growth media. In earth worms in waste and environmental management. (C.A. Edwards and E.P. Nevhavser. Eds.) S.P.B.Academic, The Havge. pp. 211- 219. (1988).
- [4]. Edwards, C.A.and Bohlen, P.J. Biology and Ecology of earth worms. 3rd edition. Chapman and Hall, London.pp.1-426. (1996).
- [5]. Kale, R.D. Earthworms. Nature’s gift for utilization of organic wastes. In earthworm’s ecology.Edwards, C.A (Ed.) CRC Press LLC. BOCCA. Raton, Florida.pp.355-376. (1998).
- [6]. Abdul Baki, A.A and J.O. Anderson. (Vigor determination in Soya bean by multiple criteria. Crop Sci., 13:630 – 663. (1973).
- [7]. Karmegam, N and Daniel, T. Utilization of some weeds as substrates for vermicompost preparation using an epigeic earthworm *Eudrilus eugeniae*. Asian J.Microbio. Biotech. and Environ. Sci., 2(1): 63 – 66. (2000d).
- [8]. Karmegam, N., K. Alagumalai and Daniel, T. Effect of vermicompost on the growth and yield of green gram (*Phaseolus aureus* Roxb.) Trop. Agri., 76(2): 143 – 146. (1999).

Table 1. Physico- Chemical and Microbiological Characteristics of Vermiwash

Parameters	Values
pH	7.48 ± 0.01
Electrical Conductivity(dS/m)	0.25 ± 0.03
Organic Carbon (%)	0.008 ± 0.001
Total Nitrogen ”	0.01 ± 0.005
Available Phosphate ”	1.69 ± 0.05
Potassium (ppm)	25 ± 2
Sodium ”	8 ± 1
Calcium ”	3 ± 1
Copper ”	0.01 ± 0.001
Magnesium ”	0.06 ± 0.001
Manganese ”	158.44 ± 23.42
Zinc ”	0.58 ± 0.040
Total Heterotrophs (CFU / ml)	0.02 ± 0.001
Nitrosomonas ”	1.79 X 10³
Nitrobacter ”	1.01 X 10³
Total Fungi ”	1.12 X 10³
	1.46 X 10³

Table 2. Effect Of Different Concentrations Of Vermiwash Spray On Shoot And Root Length, Number Of Leaves And Branches And Leaf Length And Breadth Of Cow Pea *Vigna Ungiculata* (25th Day).

Parameters	0(control)	50	75	100
Shoot Length(cm)	20.27 ± 0.90	20.04 ± 1.24	20.53± 2.42	20.63 ± 0.73
Root Length (cm)	4.65 ± 0.12	4.81 ± 0.32	4.86 ± 1.4	4.79 ± 0.16
Number of Leaves	7.23 ±1.17	7.34 ± 1.05	7.40± 1.04	7.33 ± 1.28
Numberof Branches	3.55 ± 0.52	3.32 ± 0.47	3.74 ± 0.57	3.24 ± 0.69
Leaf Length	6.55 ± 0.42	6.83 ± 0.35	6.59 ± 0.43	6.94 ± 0.36
Leaf Breadth	4.74 ± 0.38	4.87 ± 0.22	4.71 ± 0.34	4.93 ± 0.20

Table 3. Effect Of Different Concentration Of Vermiwash Spray On Germination, Shoot Length, Root Length And Vigor Index Of *Oryza Sativa* (10th Day)

Parameters	0(control)	50	75	100
Germination (%)	80	90	90	100
Shoot Length(cm)	6.1	6.3	6.6	7.2
Root Length (cm)	7.4	7.7	7.9	8.2
Vigor Index	1080	1260	1305	1540