IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

EFFECT OF AMIRTHAKARAISAL AND VERMIWASH ON GROWTH PARAMETERS OF THE PLANTS *SOLANUM LYCOPERSICUM* AND *ABELMOSCHUS ESCULENTUS.*

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ABSTRACT

Organic fertilizers maintain the soil structure and increase its nutrient holding capacity. They are easily biodegradable and free from environmental pollution. On the other hand, chemical fertilizers contaminate land and water resulting in the extinction of a number living organisms. Now a day's most of the people in rural India depend directly or indirectly on farming for their livelihood. They are using some traditional methods to prepare the liquid bio fertilizers for their crop land to enhance the soil quality, growth and yield of the plants. In this study the organic liquid fertilizers, amirtha karaisal and vermiwash effects were analyzed by their application to the plants *Solanum lycopersicum* (Tomato) and *Abelmoschus esculentus* (Lady Finger). And the results were compared to the control and inorganic fertilizer applied plants. The growth parameters such as seed germination, plants' height, internode, leaf length, leaf area index and number of leaves were significantly increased in organic liquid fertilizers applied plants ($P<0.05$).

Key words: Amirtha karaisal, Vermiwash, *Solanum lycopersicum*, *Abelmoschus esculentus* , seed germination, height, internode, leaf length and leaf area index etc.,.

1. INTRODUCTION

The use of organic wastes such as cattle, food, sewage, sludge and composts has long been recognized in agriculture as beneficial for plant growth and maintaining of soil fertility. The new approaches to the organic amendments in farming have proven to be an effective means of improving soil structure, enhancing soil fertility and increasing crop yields.

Chemicals are being used either as fertilizers, insecticides or fungicides. Agricultural workers are exposed to toxic hazards from these chemicals. The beginning of the green revolution in the mid-sixties initiated sudden change in the use of chemical fertilizers and a gradual decline in the use of organic manures (Yadav, 2003) with the broadening awareness about the deleterious effect of chemical agriculture on human health and the environment, food crops grown free from the use of chemical inputs are being increasingly preferred the world over and in fact it is attached high premium in the discerning markets of Europe and America.

With the progressive increase in the size of the world's population and the adoption of intensive animal husbandry production, large volumes of organic wastes produced all over the world are creating a serious disposal problem and a major source of environmental pollution. They can rarely be applied directly to the soil since they might damage soil fertility severely and result in structural incompatibility, nitrogen immobilization, and phytotoxicity (Inbar et al. 1985).

In order to re-establish hitherto spoiled or devastated the ecological balance in nature, organic farming aims to correct unwanted results of wrong production practices by using; biological methods to control pests and diseases, to improve soil fertility, to contain environment and human friendly production systems, to ban the use of synthetic and chemical fertilizer and pesticides while encouraging organic and green fertilizing, crop rotation and soil conservation. Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers and livestock feed additives.

Darwin (1881) stated that earth worms, prepare the ground in an excellent manner for the growth of fibrous – rooted plants and for seedlings of all kinds. Among the soil organisms which contributed to soil fertility, earthworms are the most important ones. When earth worms are available in soil they always promote plant growth (Wollny, 1890). Plant growth rates, a new generation of Agrochemicals used as foliar fertilizer, modifies the natural growth right from seed germination to senescence in crop plants. But the production of these Agrochemicals is not economically feasible and the optimum conditions at which they can perform is difficult to ascertain. Moreover, due to health and environmental pollution problems, the need for an organic liquid fertilizer arises (Weaver, 1972).

Organic manures and sprays such as Panchagavya, Dasagavya and Amirtha karaisal have always been regarded as low budget technologies by farmers. “Though Panchagavya and Dasagavya are quite popular among organic farmers, (agritech.tnau.ac.in - Farmers Note Book, July 13 and May 18, 2006 for information on their manufacture) not much is known about amirtha karaisal.

“Compared to both the gavyas I find amirtha karaisal more effective in the control of pests and increasing crop yield,” said Ms. Rajareega. Mr.M. Prabu said the cost of making Amirta karaisal for an acre comes to Rs. 5-8 (The Hindu, Feb, 21; 2008)

Vermiwash (VW), a foliar spray, is a liquid biofertilizer collected after the passage of water through a column of worm activation. It is a collection of excretory and secretory products of earthworm along with other micronutrients. It also contains sugars, amino acids and phenols along with plant growth promoting hormones such as in Indole acetic acid and humic acid. The fresh vermiwash has a large number of beneficial microorganisms, which help with plant growth and protects it from a number of infestations (Gulsar and Iyer, 2006). Vermiwash also possesses an inherent property of acting not only as a fertilizer but also as a mild biocide (Ansari, 2008). In this present study, the both vermiwash and Amirtha karaisal were used as a liquid organic fertilizers and leaf foliar spray to the plants *Solanum lycopersicum* and *Abelmoschus esculentus* and their effects were analysed by the seed germination and plant growth parameters.

Vermiwash and Amutha karaisal are beneficial for crop land soil in many ways www.af-ecologycentre.org. They change and improve the physical structure and biological properties of the soil, improving water holding capacity and enhancing the seed germination, plant growth and yield.

2. MATERIALS AND METHODS

2.1. PREPARATION OF VERMIWASH

Vermiwash extracted through a device having the capacity of 10 litre and a tap at its bottom. Broken bricks were placed at the bottom of the drum upto a height of 10cm, followed by a sand layer of 2 – 3 cm height, finally the drum was filled with vermicompost combined with 2 kg of earthworms and fresh water was added into drop by drop. A collecting container was kept below the tap of the device. After 24 hours, the drainage our brownish extract vermiwash was collected from the device.

1.2. PREPARATION AMIRTHA KARAISAL

20kg of cow dung, 2 litre of cow urine, and 2 kg of black gram powder and 100 gram of land soil were poured into 200 litre of water in a barrel and mixed well. After the mixture was socked for 3 to 4 days. Then it was stirred in unidirectional way and filtered with muslin cloth. This extract was mixed with water in 1:10 ratio and sprinkled to the plant.

2.3. PREPARATION OF GROW BAG

Clay soil, red soil and sand were collected from in and around the Village, Tirunelveli District, Tamil Nadu, India. The seeds of *Solanum lycopersicum* (Tomato) and *Abelmoschus esculentus* (Lady Finger) were purchased from Agriculture Seed Sales Centre, Tirunelveli. Bag culture studies were conducted to find out the effect of vermiwash, Amirtha karaisal and Chemical fertilizers on the growth of *Solanum lycopersicum*

(Tomato) and *Abelmoschus esculentus* (Ladies finger). Eight thick plastic bags of 40 cm height and 23 cm diameter were procured. Clay soil, red soil, sand and thoroughly washed coir pith waste were mixed in the ratio of 3:2:1: 0.5 and the bags were filled with the mixed soil. The soil mixture filled bags were divided into two sets, then plugged ten numbers of Ladies finger seeds in each bag on the first set and the same procedure was followed to the tomato on the second set. After germination two plants were maintained in each bag of both sets.

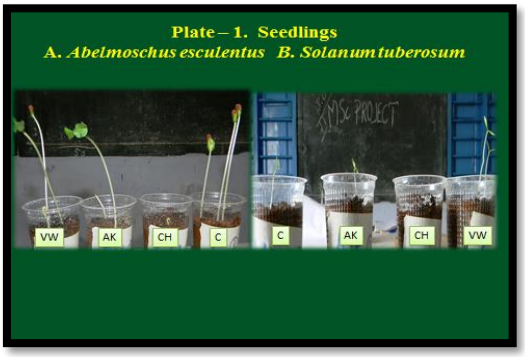
On the 5th day, vermiwash, amirtha karaisal and chemical fertilizers were taken separately and diluted with 1:10 ratio of each liquid fertilizer with water and in chemical one gram of mixed chemical fertilizer was taken and liquefied it with 500ml of water. Then the first three of the each set were treated with vermiwash, amirtha karaisal and chemical fertilizers respectively the remaining fourth bag of the each set were kept as control. The parameters such as shoot and root length, leaf length and breadth were measured on the seedlings of the each plant group. Then the plant growth parameters such as plant height, inter node, leaf length, leaf breadth and leaf area index were measured at 20th and 40th day of each set. A hand sprayer was used for spraying. Ordinary tap water was sprayed in the control.

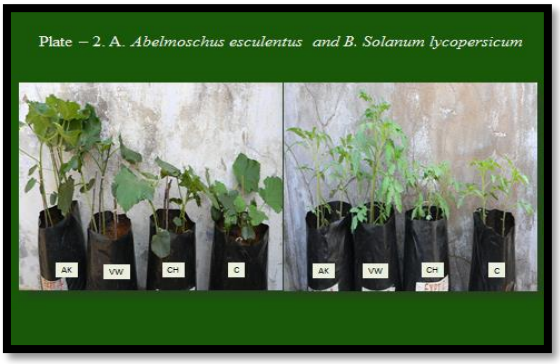
3. RESULT and DISCUSSION

Table –1. Plant growth parameters: SL - *Solanum lycopersicum;* AE - *Abelmoschus esculentus;* ± *SD*

Experiments	Height (cm)				Leaf length (cm)				Leaf breadth (cm)				No. of leaves				Internode (cm)			
	SL		AE		SL		AE		SL		AE		SL		AE		SL		AE	
	20th day	40th	20th	40th	20th	40th	20th	40th	20th	40th	20th day	40th	20th	40th day	20th	40th	20th	40th day	20th day	40th day
VW	8 ± 0.2	27 ± 0.5	18 ± 0.3	40 ± 0.7	5.9 ± 0.09	11.3 ± 0.4	7.3 ± 0.4	13.6 ± 0.5	2.6 ± 0.1	7.7 ± 0.3	5 ± 0.2	11.8 ± 0.4	5.6 ± 0.4	18 ± 0.7	5 ± 0.2	11 ± 0.5	0.8 ± 0.05	3.4 ± 0.2	2.0 ± 0.1	8.6 ± 0.2
AK	9.6 ± 0.1	26 ± 0.6	19 ± 0.4	39 ± 0.6	6.4 ± 0.05	10.9 ± 0.5	7.2 ± 0.5	14.1 ± 0.3	3.1 ± 0.05	6.4± 0.2	5.1 ± 0.3	12.3 ± 0.5	6.3 ± 0.3	19 ± 0.4	5 ± 0.3	12 ± 0.7	1.2 ± 0.08	3.2± 0.1	1.5 ± 0.1	7.9 ± 0.4
CH	7.8 ± 0.3	16.6 ± 0.4	9.5 ± 0.4	26 ± 0.4	3.8 ± 0.1	7.3 ± 0.4	6.0 ± 0.3	10.2 ± 0.5	1.2 ± 0.06	5.3± 0.6	4.2 ± 0.2	9.6 ± 0.3	4.5 ± 0.2	13 ± 0.5	3 ± 0.1	8 ± 0.4	0.5 ± 0.01	2.6± 0.1	1.0 ± 0.1	4.2 ± 0.2
C	7.1 ± 0.2	17 ± 0.6	10.6 ± 0.4	30 ± 0.5	4.4 ± 0.1	8.6 ± 0.6	5.9 ± 0.2	12.5 ± 0.3	2.6 ± 0.09	5.9± 0.4	4.6 ± 0.1	10.3 ± 0.3	4.6 ± 0.2	16 ± 0.2	4 ± 0.1	10 ± 0.6	0.7 ± 0.03	2.2± 0.2	1.2 ± 0.1	7.2 ± 0.3

*VW – Vermiwash; AK – Amirtha karaisal; CH – Chemical; C – control.





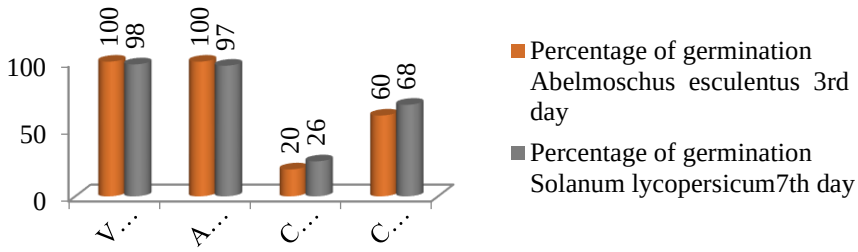


Figure - 1. Germination

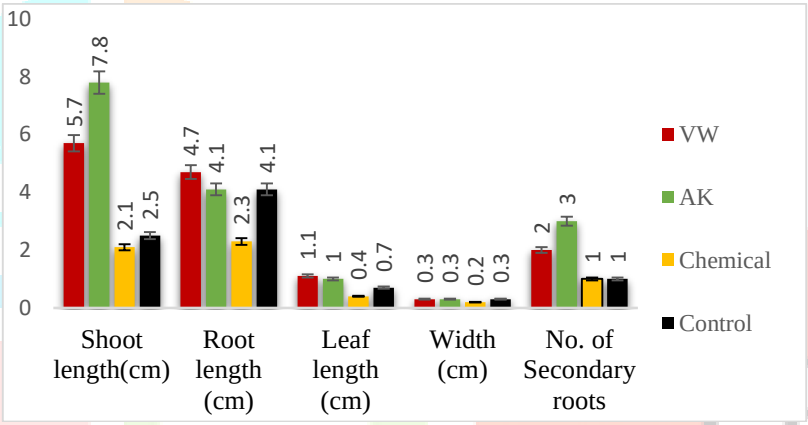


Figure - 2. Seedlings parameters of *Abelmoschus esculentus*

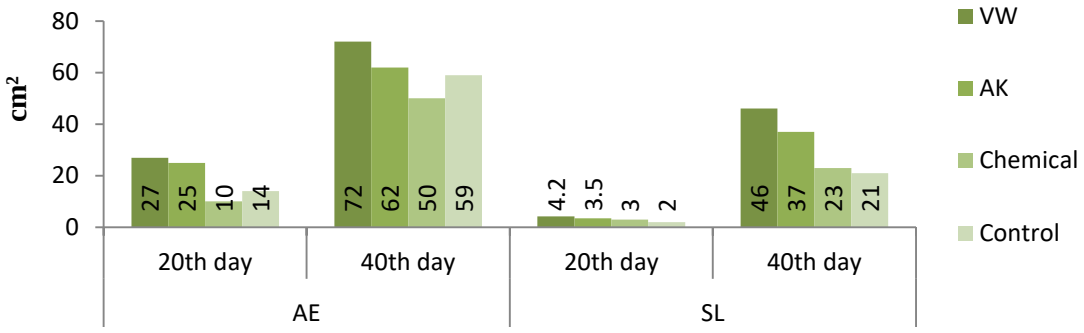


Figure – 4. Leaf Area Index

3.1 GERMINATION:

Figure – 1 showed that the percentage of the seed germination of the plants *A. esculentus* and *S. lycopersicum.* 100% results were observed in VW and AK treated *A. esculentus;* 98% and 97% in *S.lycopersicum.*

3.2 SEEDLINGS PARAMETERS:

Figure – 2 and 3 are indicated that the seedlings parameters of *A.esculentus* and *S.lycopersicum* respectively. In *A.esculentus* the seedlings parameters such as shoot length (7.8cm) and number of secondary roots (3) were higher in Ak treated; root length (4.7cm) and primary leaf width were higher in VW treated. In *S.lycopersicum*, shoot length (11.4cm), root length (7.1cm), leaf length (2.1cm) and width (1.5cm) were higher in AK treated, but the highest number of secondary roots; i.e 13.3 numbers of roots were obtained in VW treated.

3.4 PLANT GROWTH PARAMETERS:

The plant growth parameters such as plant height, leaf length, leaf width, number of leaves, inter node length and leaf area index were measured at 20th and 40th day. All kinds of parameters were more or less equivalent in AK and VW treated plants (Table – 2).

In *S.lycopersicum*, Plant height – highest result was obtained from AK treated on 20th day (9.6cm) and 40th day (26 cm). Leaf length – on 20th day 6.4cm treated with AK; 40th day 11.3 cm treated with VW. Leaf Width – on 20th day 3.1cm treated with AK; 40th day 7.7cm treaded with VW. Inter node – on 20th day 1.2cm treated with AK; 40th day 3.4cm treated with VW. Number of Secondary leaves – on 20th day 6.3 and on 40th day 19 numbers of leaves were obtained from AK treated. Leaf Area Index (Fig – 4) – highest result was obtained from VW treated on 20th day (4.2cm²) and 40th day (46cm²).

In *A.esculentus*

Plant height – highest result was obtained on 20th day from AK treated19cm and 40th day 40 cm from VW treated. Leaf length – on 20th day 7.3cm treated with VW; 40th day 14.1 cm treated with AK. Leaf Width – on 20th day 5.1cm and 40th day 12.3cm treaded with AK. Inter node – on 20th day 2.0cm and 40th day 8.6cm, treated with VW. Number of Secondary leaves – on 20th day 5 numbers of leaves were obtained from AK and VW treated and on 40th day 12 numbers of leaves were obtained from AK treated. Leaf Area Index (Fig – 4) – highest result was obtained from VW treated on 20th day (27cm²) and 40th day (72cm²).

The vermicasts, mucus deposits, epidermal gland, cell and ceolomic fluid showed that they contain a plant growth factor and group of B- vitamins. The cast contains 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) reported that vermiwsh as foliar spray was effective in increasing the growth and yield response of Anthurium.

The vermiwash and vermicompost contribute macro nutrients and micro nutrients in an amount that is required by plants. Atiyeh et al (2002) and Subler et al. (1998) were reported that vermiwash increases in the rate of germination, growth and yield of tomato plants. According to Lalitha et al. (2000), applications of organic fertilizers have an emphatic effect on plant growth and production. The soil enriched with vermicompost provides additional substances that are not found in chemical fertilizers (Kale, 1998; Ansari and Ismail, 2008). The data clearly indicate a better performance of *A. esculentus* and *S. lycopersicum* using the vermiwash and amirtha karaisal. Results are in agreement with those obtained by earlier workers (Lalitha et al., 2000; Ansari and Ismail, 2008; Ansari and Sukhraj, 2010). The plant growth in verminwash and vermicompost and vermicompost may be due to the impact of microbes in bio- fertilizers (Lalitha et al., 2000).

The main function of physical and chemical properties of the plants depends on soil organic matter. Adinarayana Reddy – (www.af-ecologycentre.org **)** is a young farmer has reported that the Jeevamirtham applied chilli plants were grown healthy, pests free and gave a better yield. Atiyeh et al (2002) and Subler et al. (1998) were reported that vermiwash increases in the rate of germination, growth and yield of tomato plants, as in the same way the present result of the germination percentage was100 in *A.esculentus* treated with AK and VW and *S.lycopersicum* 98% and 97% for VW and AK respectively (Figure – 1).

In India, apart from these, the pancha gavya and amritha karaisal which are part of organic farming is also practiced in bio-dynamic farming. Essentially all these techniques are aimed at enhancing the micro-organisms that form part of the soil ecosystem. When these micro-organisms are thriving in the soil, their activity generates all types of nutrients to the plants http://psenthilraja.wordpress.com/2010/03/11/bio-dynamic-farming-revival-of-traditional-indian-farming/. This statement was proved by this present study also, because the AK and VW treated plants of *A.esculentus* and *S.lycopersicum* had a better results than the CH treated plants (Table – 1; Plate – 1 and 2, Figure – 1 and 2; $P<0.05$; especially AK treated plants had high significant results when correlated with CH treated plants $P<0.01$). Primarily this will also prove by the application pancha kavya and amirtha karaisal to rice field by Rajukkannu et al.,2007, it was agreed by this present study too. From this study it was concluded the vermiwash and amirtha karaisal are the major contributor of micronutrients. Both are also enriched the soil nutrients, which are also help to enhance seed germination percentage and plant growth rate.

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