VOLUME 8 ISSUE 2 2022

ISSN 2454-3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 8, No. 2, 179-187 (2022)

International Journal of Zoological Investigations
Contents available at Journals Home Page: www.ijzi.net
Editor-in-Chief: Prof. Ajai Kumar Srivastav
Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Effect of Organic Foliar Spray of Fermented Fish Waste (Gunapasalem) on Growth and Yield of Radish, *Raphanus sativus*

Srikumaran M.P.[1], Kaleena P.K.[1*], Maheswari V.N.[1], Rekha G.S.[1], Elumalai D.[1,2] and Babu M.[1,3]

[1]Department of Zoology, Presidency College (Autonomous), Chennai 600005, Tamil Nadu, India
[2]Department of Zoology, Pachaiyappa's College for Men, Kanchipuram 631501, Tamil Nadu, India
[3]Department of Microbiology and Biotechnology, Faculty of Arts and Science, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India

**Corresponding Author*

Received: 25th June, 2022; **Accepted:** 30th July, 2022; **Published online:** 5th August, 2022

https://doi.org/10.33745/ijzi.2022.v08i02.023

Abstract: Foliar sprays are leaf fertilizers which enhance the respiration and transports nutrients throughout the plant. They also mix with soil to support the plant from root. Gunapasalem is prepared from marine fish waste mixed with jaggery and cow urine. The mixture is kept undisturbed for 30 days to make a fine solution. Extract from Garlic is mixed along with ginger, cow urine and asafetida paste to formulate NCBT 01 pest repellent. This mixture is then diluted with non-chlorinated water. A field study was experimented with selected species of Radish plant which were sprayed with Gunapasalem and NCBT at regular intervals. The growth and development of plants is then compared along with control and chemically fertilized plants.

Keywords: Foliar sprays, Gunapasalem, Fish wastes, NCBT 01, Vermibed, Asafetida, Cow urine

Citation: Srikumaran M.P., Kaleena P.K., Maheswari V.N., Rekha G.S., Elumalai D. and Babu M.: Effect of organic foliar spray of fermented fish waste (Gunapasalem) on growth and yield of radish, *Raphanus sativus.* Intern. J. Zool. Invest. 8(2): 179-187, 2022.
https://doi.org/10.33745/ijzi.2022.v08i02.023

Introduction

Organic farming (OF) can be defined as 'an ecologically, economically and socially responsible way of farming, providing an enduring supply of safe and healthy food and fibers, with the least possible losses of nutrients and energy, and the least negative impacts on the environment, as regulated by certification agencies (Finckh and van Bruggen, 2015). It is quite distinct in the sense that it relies on closed nutrient cycles with less dependence on off-farming inputs. Organic farming has developed very rapidly in recent years. Indian agriculture has a better chance to convert itself as organic agriculture because, the per capita and per ha consumption of chemical fertilizer and pesticides in the country is much lower than the global standards (Vallimayil and

Sekar, 2012).

Efficient plant nutrition management should ensure both enhanced and sustainable to agricultural production and safeguard the environment. Chemical, organic or microbial fertilizer has its advantages and disadvantages in terms of nutrient supply, soil quality and crop growth. Developing a suitable nutrient management system that integrates use of these three kinds of fertilizers may be challenging to reach the goal of sustainable agriculture (Chen, 2006)

Soils are an integral component of agriculture and serve as medium for numerous eco-biological, chemical and physical processes. Over-burdening of the soil as a natural resource capital has always been an issue due to its widely varied applications in the maintenance of human life activities. The need thus to effectively manage soil resources in order to achieve optimum productivity of soils is obvious (Omotayo and Chukwuka, 2009). The perception is that organic farming practices, because of zero input of chemical nitrate-N fertilizers, can reduce accumulation and leaching of them in the soil profile (Malhi, 2012).

Raphanus sativus is originally from Europe and Asia. It grows in temperate climates at altitudes between 190 and1240 m. It is 30–90 cm high and its roots are thick and of various sizes, forms, and colors. They are edible with a pungent taste. These are consumed in the amount of about 500,000 tons/year globally and are essentially a part of the traditional foods (Cañizares Pérez *et al*., 2004)

Radish *(Raphanus sativus)* is a root vegetable grown and consumed all over the world and is considered part of the human diet, even though it is not common among some populations.

Usually, people eat raw radishes as a crunchy vegetable, mainly in salad, while it also appears in many continental dishes. Some people, at least in the Middle East, prefer to drink its juice in pursuit of certain health benefits.

In the present study, a field study was conducted with selected species of Radish plant which were sprayed with Gunapasalem and NCBT at regular intervals. The growth and development of plants is then compared along with control and chemically fertilized plants.

Materials and Methods

Formulation of foliar:

Gunapasalem was prepared from marine fish waste consisting of scales, fins, head and tail which are rich in amino acid content. These were mixed with Jaggery and non-chlorinated de-ionized water and are allowed to ferment for thirty days.

The mixture was placed in a drum based on the quantity to be prepared and stirred well once in two weeks to have complete oxidation and closed with a cloth tied on the mouth of the drum. For this study initially we took 10 kg of fish waste with 8 kg of Jaggery and 18 litres of water. As we progress on the experiment, the foliar formulation was scaled up.

Field selection:

A rectangular field of 1.8 acres was selected at Vayalanallur Village near Poonamallee which is surrounded by many other vegetable growing fields and hub for exporting vegetables to different parts of Tamil Nadu, India. The reason for selection of the field was because the current land lord and his neighbors were using very high volume of chemical fertilizers to kill and eradicate the pests on their crop. Irrespective of plants being perfectly grown and healthy, the crops when observed closer were layered with chemical residues making dangerous to consume.

Field Treatment:

The selected field was measured and divided into 5 randomized blocks of same size (Fig. 1). Chemical fertilizer NPK 15:15:15 was selected as this is widely used and recommended for high yield.

Basal dressing:

The soil of organic blocks were mixed with

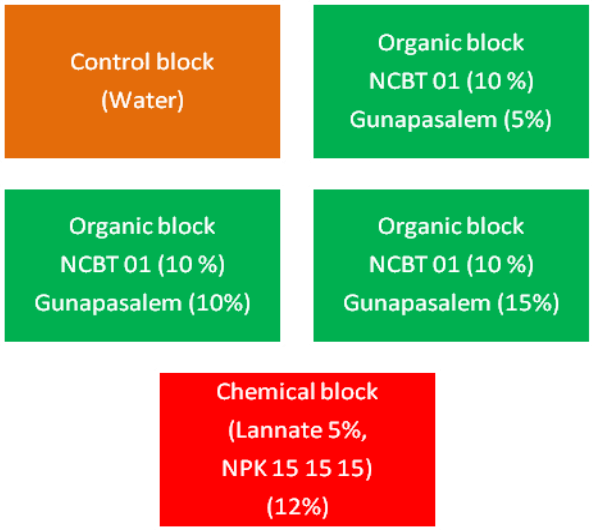

Fig. 1: Randomized blocks.

Fig. 2: Field treatment with Basal dressing (Left) and Seed treatment using Vermibed (Right).

combination of Neem, turmeric and coriander powder in the ratio 2:1:1, respectively forming a layer over the soil and post ploughing is done (Fig. 2). The incubation period for the experiment is given in Table 1.

Vermibed Seeding:

A vermibed was designed and built with a mixture of cow dung pats over garden soil and species of *Eudrilus eugeniae* (earthworms) were added to it. After few weeks, natural seeds of *Raphanus sativus* are bought, sowed in the vermibed and allowed to germinate.

Chemical fertilizer NPK was mixed with ash and soil in a unit and seeds for chemical block were sowed into it. Seeds for control block were sowed directly and watered appropriately. All the three units were kept undisturbed for 15 days.

Pesticide/Pest repellent preparation:

Lannate (Methomyl 40%) is a powerful pesticide which are widely used in *Raphanus sativus* fields. 5% of lannate was formulated and sprayed into the chemical block fields once in a week.

NCBT01 (New College Biotechnology 01) formulation consisting of cow urine, ginger, garlic and asafetida were selected as the organic pest repellent for the study. NCBT01 was prepared from 3 litres of cow urine, completely smashed 250 g of Ginger, 250 g of garlic and 250 g of asafetida mixed together and diluted to 5% for spraying. NCBT 01 was sprayed once in a 7 days.

Table 1: Incubation period for experiments in days

Incubation Period		
Activity	Days	Condition
Gunapasalem Preparation	45-60	Complete solution
Seed Germination	8-10	3-5 leaves above ground
Field treatment and ploughing	7	Basal dressing and irrigation

Table 2: Concentration of foliar in the organic block

Organic Block		
Concentration	Gunapasalem (per 100 ml)	De-ionized water (per 100 ml)
5%	5 ml	95 ml
10%	10 ml	90 ml
15%	15 ml	85 ml

Plant Growth Parameters and exo-morphological studies:

Once the seeds were germinated to seedling, theheight of the plant, shoot length, number of leaves, length of internodes, diameter of internodes and leaf surface area were measured and sowed into their appropriate blocks. Control block seedlings were poured with the non-chlorinated de-ionized water. Chemical blocks were sprayed with NPK 15:15:15 of 12% concentration (as prescribed) and lannate was used as a pesticide to control pests. Organic blocks named as 5%, 10% and 15% were sprayed with appropriate concentration of Gunapasalem (Table 2).

Hand sprayers expelling 7 ml solution at one press were used to spray Foliars and chemical fertilizers over the leaves and shoot area till 8 weeks. Knapsack power sprayers which are battery operated were used for the plants bearing fruits from 8 to 16 weeks. Each plant was evenly sprayed with foliar spray of different concentrates and chemical fertilizers. The tank, pipes and nozzles were thoroughly cleared before every spraying.

Spraying:

Foliar sprays for respective blocks were sprayed once in 3 days post-water regulation (Fig. 3).

Exo-morphological Studies:

Exo-morphological growth of plants were measured at zero hour i.e. before application of spray every week and tabulated to understand the efficiency of the foliar spray Gunapasalem in comparison with chemical and control blocks.

The following are the parameters analyzed for the study using random simplify method:

a) Height of the plant

b) Length of shoot

c) Number of leaves

d) Leaf surface area

Measurement of the plant growth parameters:

Plant height, length of shoot, internode, leafsurface and diameter of internode were measured using tape. Number of leaves were counted. Leaf surface areas were measured with a graph sheet with 1 square = 1 cm^2.

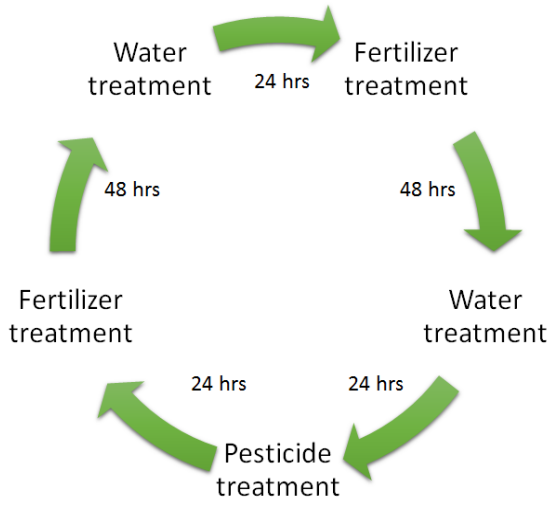

Fig. 3: Plant treatment cycle.

Statistical analysis:

Plant morphological measurements were subjected to statistical analysis. All reading and measurements were expressed as mean and standard error. The differences between groups were statistically analyzed by analysis of variance (ANOVA). The level of significance was set at $P<0.05$ rejecting the null hypothesis.

Results and Discussion

Germination phase:

Transformation of seed to seedling in three different units viz. control chemical and organic were noticed after second week of sowing (Table 3).

The seedling of chemical and organic unit showed about 75% positive growth as 90 out of 120 seeds were healthily germinated with 8 cm in length within two weeks. The control plants were comparatively lacking in growth (Figs. 4, 5).

The plants from vermibed and chemical bed, planted linear at their respective blocks, showed distinctive growth. The result of spraying in chemical and organic blocks made the plants to grow faster than usual rate. Pesticides/pest repellents sprayed protected the plants to a greater extent (Figs. 6, 7, 8).

The leaves of the chemical block appeared pale green with a layer of chemical residues over them and expected to affect the chlorophyll content and photosynthesis process leading to fruit shrinkage. The Organic leaves were fresh and green (Figs. 6, 7).

The control plants showed very minimal growth and Gunapasalem 10% showed maximum growth (Figs. 8, 9).

Leaves play a vital role in photosynthesis making every plant a producer. In the present study, the count of the leaves and its surface area were comparatively high in 10% Gunapasalem proving it to be a perfect growth supplement for plants (Fig. 9).

The comparative study of organic foliar spray prepared from Gunapasalem at different concentrations along with chemically treated plants and control plants indicated that organic foliar spray, Gunapasalem prepared from Marine fish waste have produced significant healthy plants in comparison with chemically treated plants and control. It is also noticed that control plants are deeply affected by insect pests and microbial invasion on leaves forming chlorosis etc. Chemical block plants though appear competitive for Gunapasalem treated plants, they have a layer of chemical residues making them less attractive and efficient. These plants have not been densely affected by pests but there are some of them among the block. The different concentration of Gunapasalem have provided good results in comparison with chemical plants and among the three concentrations viz. 5%, 10% and 15%, the 10% concentrated Gunapasalem have proven distinctive results on all parameters. The plants appear healthy, neat and attractive. It is also observed that among the 3 concentration of Gunapasalem viz 5%, 10% and 15%, 10% block plants are productive because of the following reasons:

1. 5% could not supply sufficient nutrients to the plant leading to malnutrition and defect in growth.

Table 3: Germination rate

Unit	% of seeds showing positive growth	Height of seedling
Control	60%	7 cm
Chemical	79%	8 cm
Organic	75%	8 cm

Fig. 4: Field study on plant growth parameters at different blocks of chemical and control plants.

Fig. 5: Field study on plant growth parameters at different blocks of organically grown plants.

Fig. 6: Exo-morphological study on experimental plants Chemical block (Left) and Organic Block (Right).

Fig. 7: Exo-morphological study on experimental plants (Organic Block).

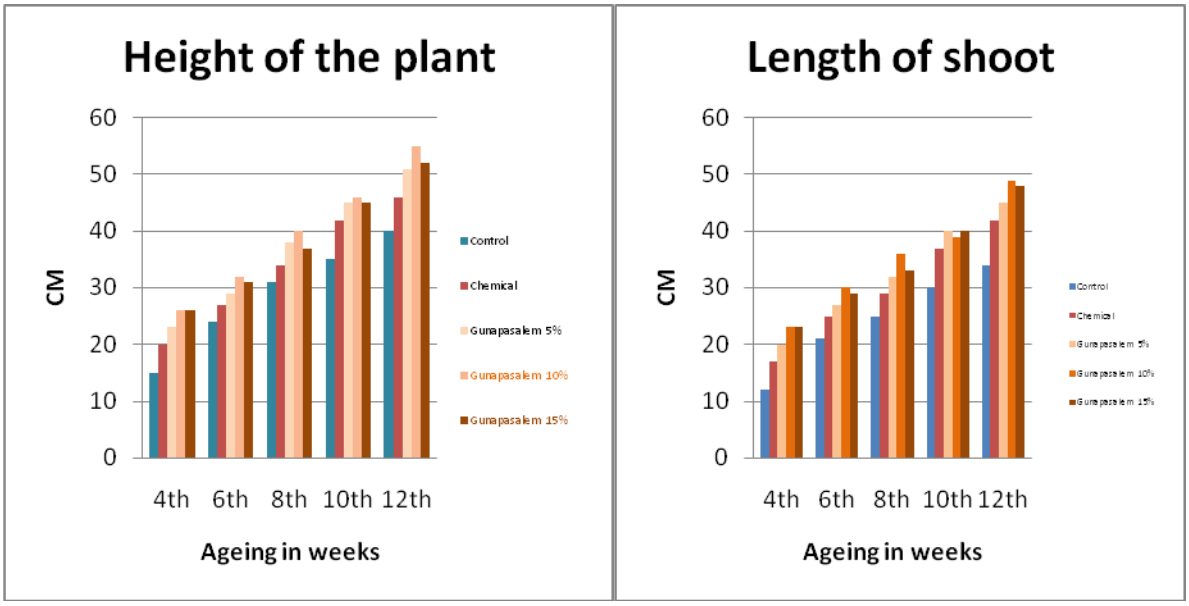

Fig. 8: Effect of Gunapasalem on the height of the plant and length of shoot.

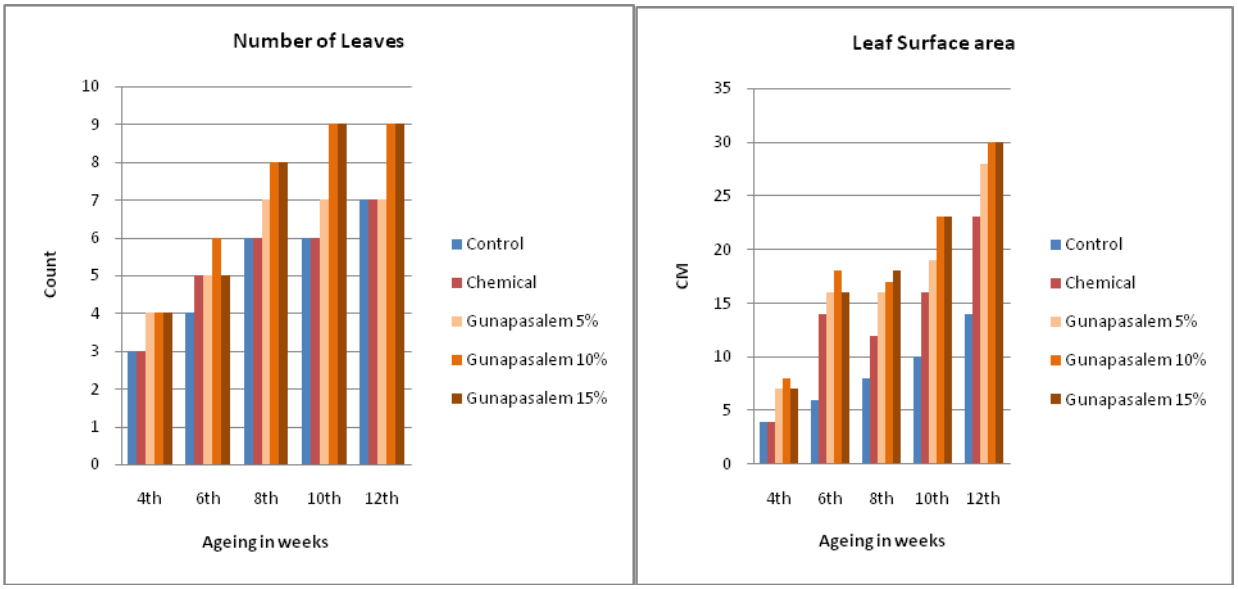

Fig. 9: Effect of Gunapasalem on development of leaves.

2. 15% provides over nutrition therefore the plant *Raphanus sativus* takes time to break down the complex molecules to simpler ones. Meanwhile, when the plant is assimilating, the growth is affected showing lesser results among the three.

The steps involved in field treatment and basal dressing also plays a vital role in such a beneficial result. The seed receives nourishment from the vermibed and starts growing at a faster rate. The Basal dressing gives the soil nourishment by supplying all required minerals and kills pathogenic bacteria which are harmful to the plant. By setting the level of significance of (ANOVA) at $P<0.05$ the null hypothesis is rejected as the population means are not equal and the most matured plants in the block are taken and considered for our experiments and measurements.

Conclusion

Traditional method of agriculture was initially organic based which retained the soil fertility and health. Current system in usage of chemical pesticides and fertilizers by the farmers have reduced the soil health to greater extent, This study had significantly proven the benefits of organic foliar sprays like Gunapasalem as it is comparatively better option for crop development with no hazardous side effects. It provide high yield with lesser cost, lesser effort and fall under waste management and bio-remediation. Gunapasalem 10% provides all necessary nutrients at required proportion making the plants to grow at a faster rate in an organic way.

References

Cañizares Pérez M, Barroso Utra I, Alfonso León A, García Roche R, Alfonso Sagué K, Chang De La Rosa M, Gorbea MB and León ME. (2004) Estimaciones usadas en diseños muestrales complejos: aplicaciones en la encuesta de salud cubana del año 2001. Rev Paname Salud Pública 15: 176-184.

Chen JH. (2006) The combined use of chemical and organic fertilizers and/or biofertilizer for crop growth and soil fertility. In: International workshop on sustained management of the soil-rhizosphere system for efficient crop production and fertilizer use, 16(20): 1-11.

Finckh MR and van Bruggen AHC. (2015) General introduction, In: Plant Diseases and their Management in Organic Agriculture, (eds.) Finckh M.R., van Bruggen A.H.C. and Tamm L., APS Press, St Paul, MN, pp. 3-11.

Malhi SS. (2012) Short-term residual effects of various amendments on organic C and N, and available nutrients in soil under organic crop production. Agricult Sci. 3(3): 375-384.

Omotayo OE and Chukwuka KS. (2009) Soil fertility restoration techniques in sub-Saharan Africa using organic resources. African J Agricult Res. 4(3): 144-150.

Vallimayil J and Sekar R. (2012) Investigation on the effect of panchagavya on sounthern sunnhemp mosaic virus (SSMV) infected plant systems. Global J Environ Res. 6(2): 75-79.

Van Bruggen AH, He MM, Shin K, Mai V, Jeong KC, Finckh MR and Morris Jr JG. (2018) Environmental and health effects of the herbicide glyphosate. Sci Total Environ. 616: 255-268.