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Research Article

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Effect of organic foliar spray – Gunapasalem on growth and yield of *Abelmoschus esculentus* (Okra)

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Abstract

Gunapasalem, an organic foliar spray rich in protein, amino acid and humic acid is prepared from marine fish waste available in the market at a very economical price. Jaggery and non-chlorinated water are added to it to enhance fermentation and solubilizing complex molecules to simpler ones to ease plant assimilation. The role of Gunapasalem in the growth of *Abelmoschus sp*in comparison with chemical fertilizers that are widely used at present by the farmers are studied and articulated through this study. This experimental study also explains the benefits of organic farming as a method to sustain soil and environmental safety.

Keywords: Gunapasalem, humic acid, assimilation, articulate.

Introduction

Organic fertilizers beneficially effect soil structure and nutrient availability; they maintain quantity and quality of yield and can be less costly than synthetic fertilizers (Olfati *et al*., 2012; Thy and Buntha, 2005). Application of organic fertilizers may help alleviate soil erosion (Shahvali and Abedi, 2006), and saline and sodium problems as a result of excessive chemical fertilization and irrigation (Allahyari *et al*., 2008). Use of sustainable organic materials can increase fertility without negative effects on human health and environment. 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 MR and van Bruggen *et al*., 2015).

The degradation in soil health in many intensively cultivated areas is manifested in terms of loss of soil organic matter, depletion of native soil fertility, particularly with respect to secondary micronutrients and stagnation or even decline in crop productivity. The depletion in soil fertility is due to imbalanced and unscientific use of fertilizer and is one of the major constraints in improving crop productivity, (Dwivedi., *et al* 2007).

Materials and Methods

Formulation of foliar sprays

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

Fig 1. Formulating methods of Gunapasalem using Fish waste in a Drum

The mixture is 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. 10 kgs of fish waste with 8 kgs of Jaggery and 18 litres of water were initially taken for this study, later the foliar formulation was scaled up.

Field selection

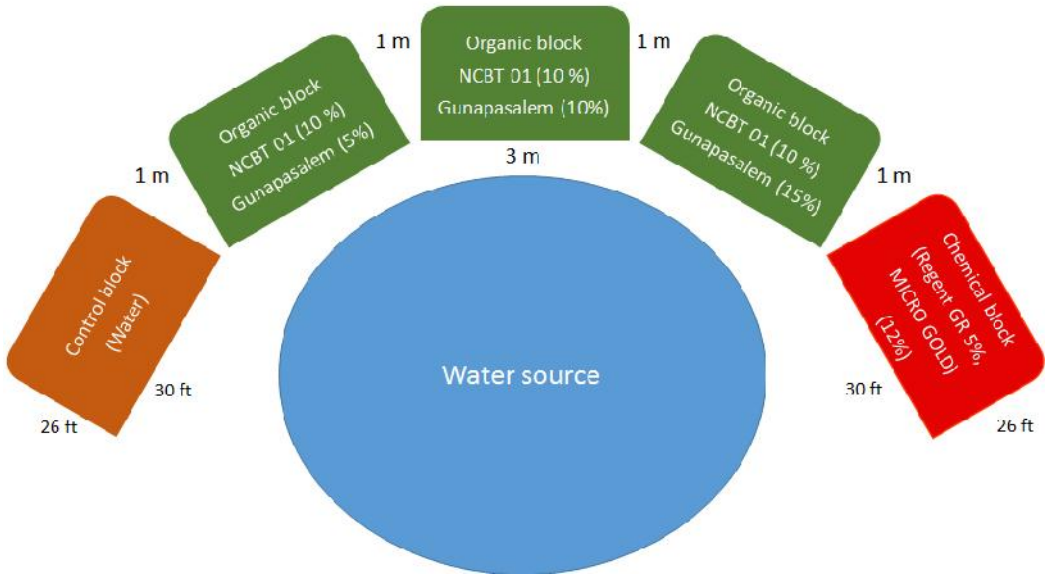
A rectangular field of 1.8 acres was selected at Vayalanallur Village near Poonamallee which is surrounded by many other vegetable growing fields and is a hub for exporting vegetables and greens to different parts of Tamil Nadu.

The reason for selection of the field is because, the current land lord and his neighbors are using very high volume of chemical fertilizers to kill and eradicate the pests on their crop.

Though the field looked perfectly grown and healthy, the crops when observed closer are layered with chemical residues making it dangerous to consume.

Field Treatment

The selected field was measured and divided into 5 randomized blocks of same size and named as follows:



Chemical Sprays

Chemical fertilizer **MICRO GOLD** was selected as this is widely used and recommended for high yield. It is found Regent GR 5 % is used as a strong pesticide for okra plants.

Fig 2. The contents of Chemical pesticide

Fig 3. The contents of Chemical fertilizer

Basal dressing

The soil of organic blocks are mixed with combination of Neem, turmeric and coriander powder to the ratio 2:1:1 respectively forming a layer over the soil post ploughing is done.

Fig 4. Field treatment with Basal dressing (Left) and evenly ploughed field(Right)

Sowing

Seeds from TNAU – Coimbatore are bought, soaked in non-chlorinated water overnight and sowed in the field at the early morning hours across all the blocks in a well-drained soil about ½ to 1 inch deep in the soil and 12 to 18 inches apart.

Table 1.Incubation period for experiments in days

Incubation Period		
Activity	Days	Condition
Gunapasalem Preparation	45-60	Complete solution
Field treatment and ploughing	7	Basal dressing and irrigation
Seed Sowing and weed clearance	4	Seeds sowed linear , weeds must be controlled

Pesticide/Pest repellent Preparation:

Regent GRis a powerful pesticide which are widely used in *Abelmoschus esculentus*fields. 5% of Regent GR is 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 Asafoetida are selected as the organic pest repellent for the study.

NCBT01 is prepared from 3 litres of cow urine, completely smashed 250 gms of Ginger, 250 gms of Garlic and asafoetida 250 gms mixed together and diluted to 5% for spraying. NCBT 01 is sprayed once in a 7 days.

Plant Growth Parameters and exomorphological studies:

Once the seeds are germinated to seedling, the height of the plant, shoot length, number of leaves, length of internodes, diameter of internodes and leaf surface area are measured and sowed into their appropriate blocks.

Control block seedlings are poured with the non-chlorinated de-ionized water. Chemical blocks are sprayed with MICRO GOLD of 12% concentration (as prescribed) and Regent GR is used as a pesticide to control pests.

Organic blocks named as 5%, 10% and 15% are sprayed with appropriate concentration of Gunapasalem.

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

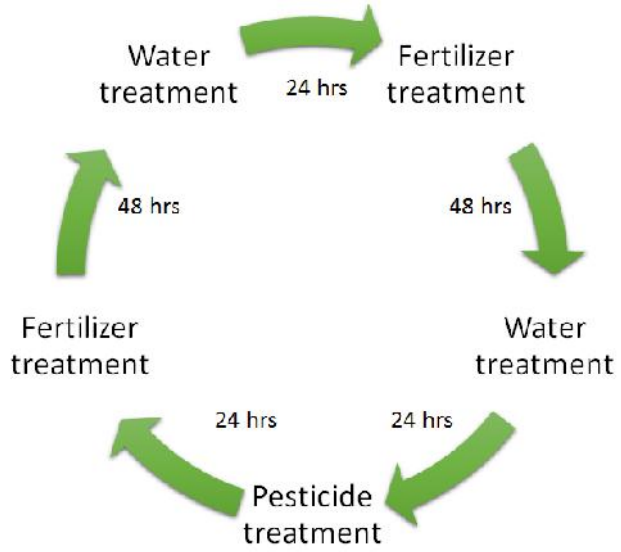
Hand sprayers expelling 7ml solution at one press were used to spray Foliar and chemical fertilizers over the leaves and shoot area till 8 weeks.

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 are sprayed once in 3 days post water regulation.

Fig 5. Plant treatment cycle



Exo-Morphological Studies

Exo-Morphological growth of plants are measured at zero hour (ie) 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) Length of Internode
d) Diameter of Internode
e) Number of leaves
f) Leaf surface area

Measurement of the plant growth parameters

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

Statistical analysis

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

Results

Fig 6. Plant growth analysis on 3 week plant of each block

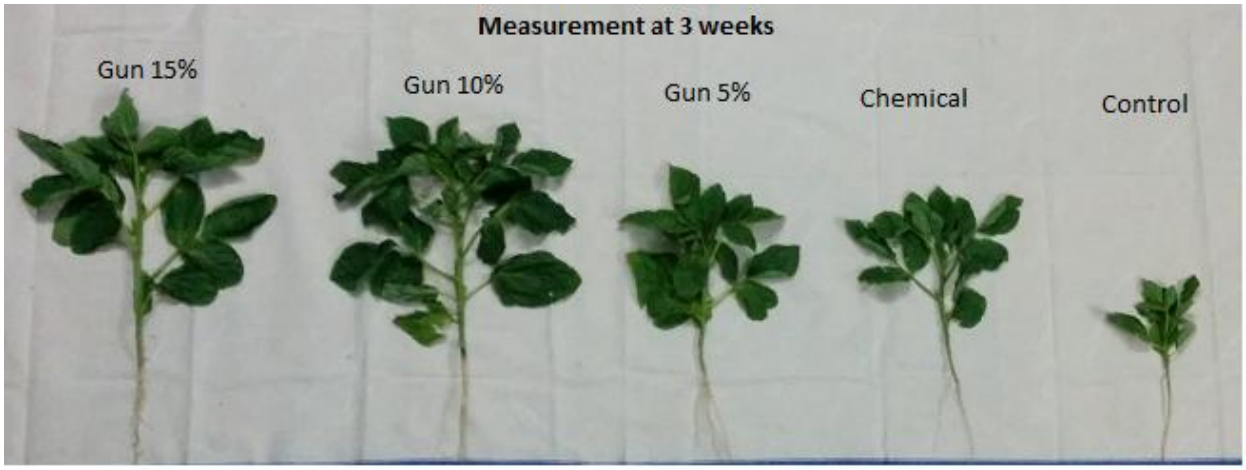


Fig 7. Plant growth analysis on 5 week plant of each block

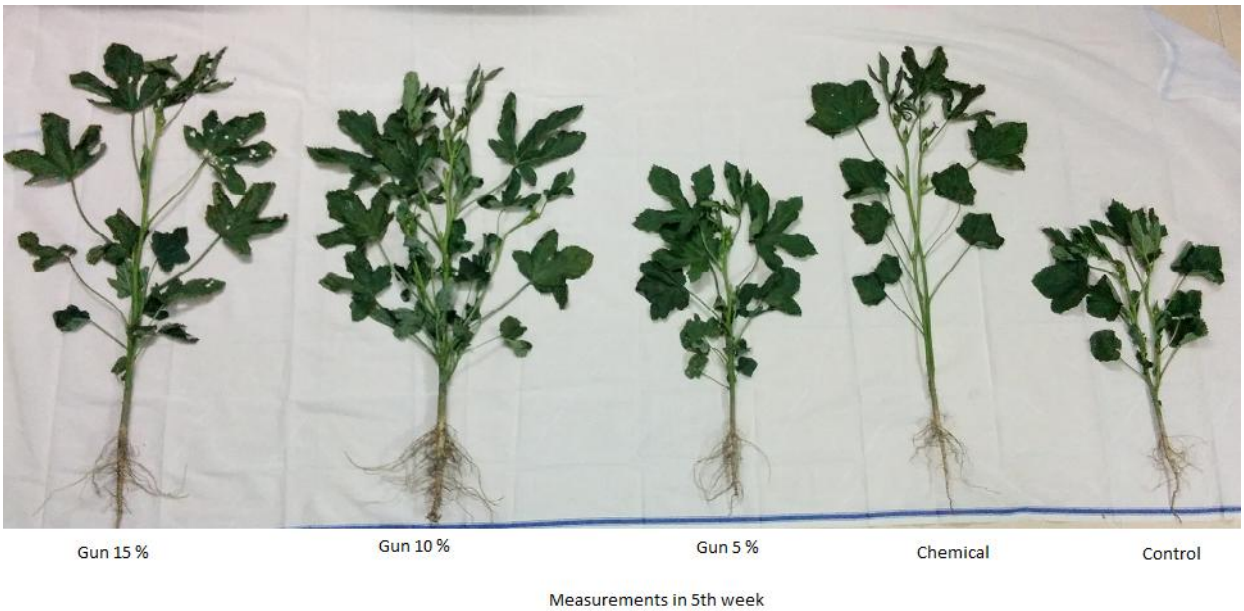


Fig 9. Field study on plant growth parameters at different blocks of Organic, Chemical and Control plants

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.

Fig 10. Exo-morphological study on experimental plants

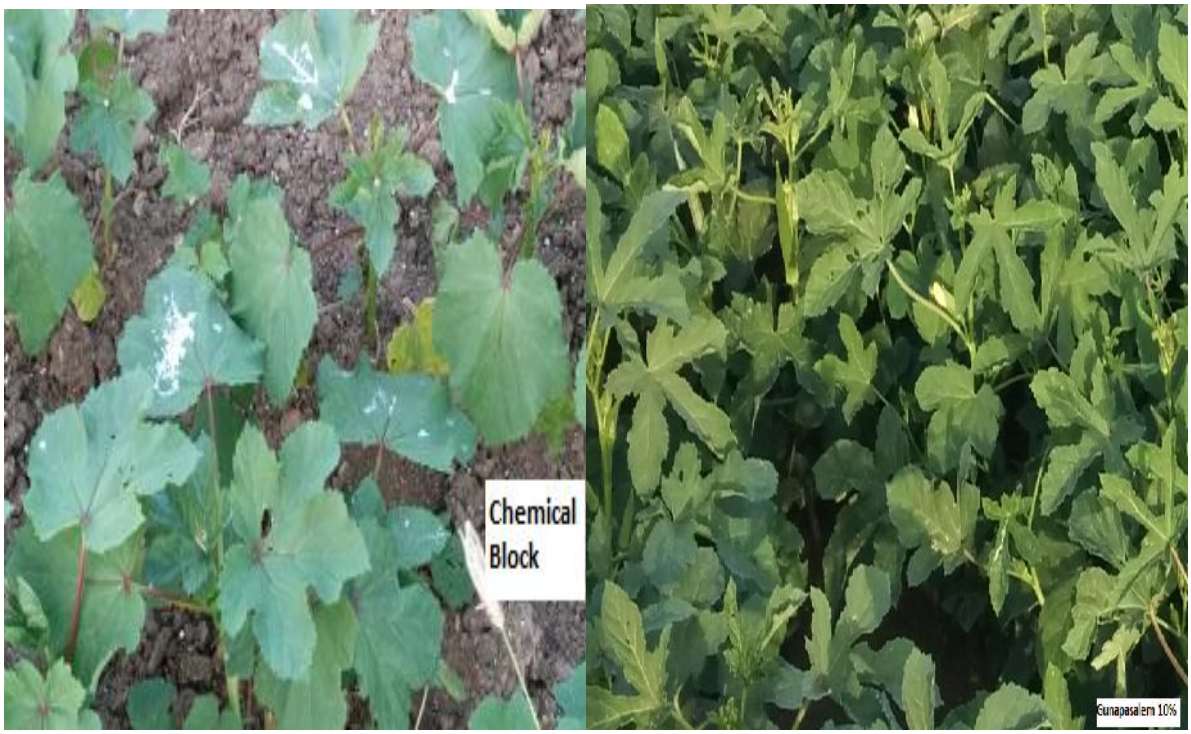
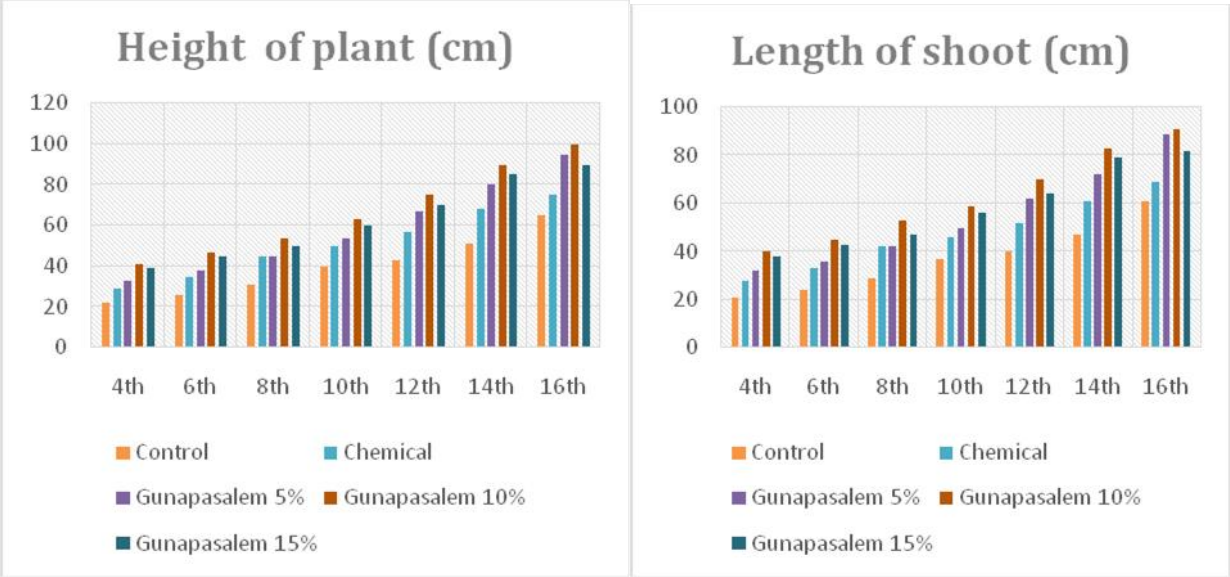
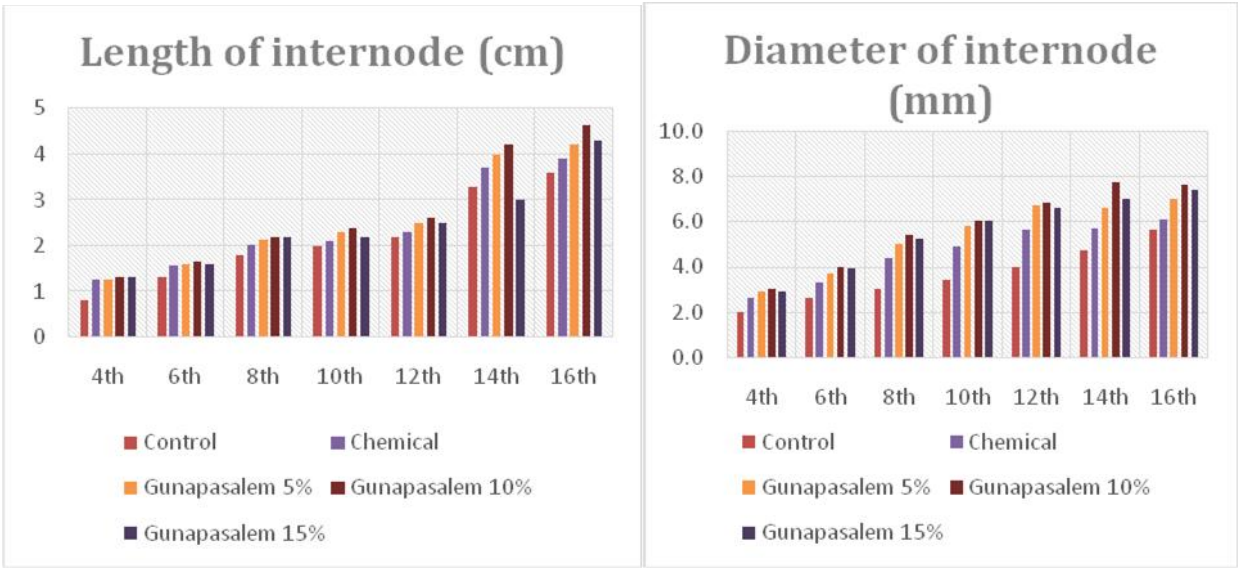


Fig 6. Effect of Gunapasalem in the height of the plant and length of shoot



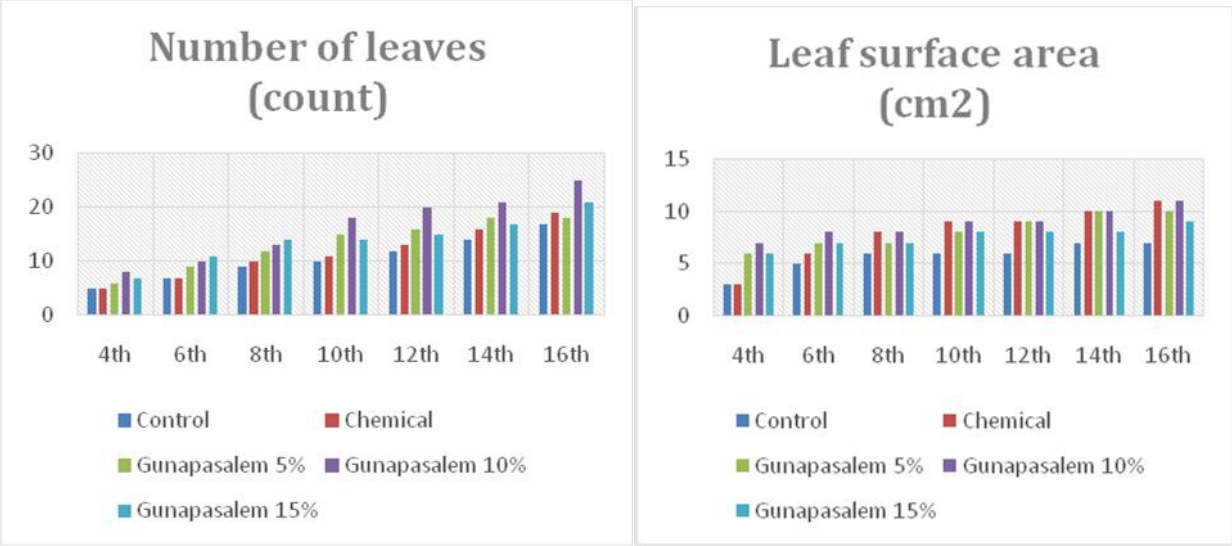
In the above parameters, the control plants showed very minimal growth and Gunapasalem 10% showed maximum growth.

Fig 7. Effect of Gunapasalem in development of internode



Internodes are important factor for growth and health of plants and they are found long and strong in the Organic block especially in 10% formulation.

Fig 8. Effect of Gunapasalem in development of leaves



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

Discussion

Based on the various foliar treatment given in the present experiment. It is evident 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 in all parameters. The plants appear healthy, green 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 mal-nutrition and defect in growth.
2. 15% provides over nutrition therefore the plant *Abelmoschus esculentus* 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 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.

Organic agriculture is now practiced in almost all countries of the world, and its share ofagricultural land and farms is growing. The total organically managed area is more than 22million hectares worldwide. In addition, the area of certified “wild harvested plants” is atleast a further 10.7million hectares, according to various certification bodies. The market for organic products is growing, not only in Europe and North America (which are the major markets) but also in many other countries, including many developing countries. Official interest in organic agriculture is emerging in many countries (Yussefi & Mitscke, 2003).

As my quoted by Dr. S. Narayanan, "Adverse effects of modern agricultural practices not only on the farm but also on the health of all living things and thus on the environment have been well documented all over the world. Application of technology, particularly in terms of the use of chemical fertilizers and pesticides all around us has persuaded people to think aloud. Their negative effects on the environment are manifested through soil erosion, water shortages, salination, soil contamination, genetic erosion, etc." (Narayan, 2005)

Conclusion

Through fertilizers and pesticides play a vital role in the current crop production, It is important to analyze the usage of them and the side effects they cause. Chemical fertilizers are hazardous to health and environment causing various skin problems and respiratory issues.

Organic foliar sprays like Gunapasalem are comparatively better option for crop development with no hazardous side effects. They 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 plant to grow at a faster rate in an organic way.

The ultimate goal of farmers in sustainable agriculture according to J.F. Parr, are to (1)maintain or improve the natural resource base, (2) protect the environment, (3) ensure profitability, (4) conserve energy, (5) increase productivity,(6) improve food quality and safety, and (7)create more viable socio-economic infrastructure for farms and rural communities (Parr, 1990).

A general definition of organic food is food which has not been subjected to chemical pesticides or artificial fertilizers and which has been grown in soil whose humus content has been increased by the addition of organic matter. Organic farming is the raising of such food (Oelhaf, 1978).

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