Development of Liquid Fertilizer from Brown Seaweed-*Sargassum* sp

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Introduction

Seaweeds are macroscopic marine algae which mostly visible with naked eye, photosynthetic and eukaryotic organisms. Sri Lanka has many varieties of marine algae and about 340 seaweed species (Durairatnam,1961) that has a high potential to add value. Unfortunately exploitation and utilization of seaweeds is at a minimum level in Sri Lanka. The developments of Seaweed Liquid Fertilizer (SLF) from brown seaweed (*Sargassum* sp.) contribute scientifically and technologically to add value to seaweeds in Sri Lanka. SLF contain macro nutrients, trace elements, organic substances, and plant growth regulators such as auxin, cytokinin and gibberellins (Thirumaran *et al.*, 2009) and are important for plants to increase the yield of crop plants, increase nutrient uptake from the soil, enhance water retention capacity of soil and act as a soil conditioner. The present study is the first attempt in Sri Lanka to develop a Liquid fertilizer using seaweeds.

Methodology

The seaweed *Sargassum* sp. was collected from the reef found in Southern area and washed with salt water. Then it was packed in slush ice and transported to the laboratory. In the laboratory they were washed again using tap water to remove salt on the surface and finally washed using distilled water. The water was drained off and the algal material was spread on blotting papers to remove excess water. SLF were prepared following two methods. In the Physical method two and half kilogram of seaweed was measured and cut into small pieces and put in to autoclave (121 °C /1 hr). The hot extract liquid was filtered through a double layered cheese cloth and allowed to cool at room temperature. Then the resultant supernatant was taken as 100% seaweed extraction used for treatments.

In the fermentation method two and half kilogram weight of seaweed was measured and cut into small pieces, chopped and put in the large closed water bucket for fermentation. The liquid extraction was used as the fertilizer. Then trace elements in both extractions of two methods were analyzed using Atomic Absorption Spectrophotometer (AAS).

Each aqueous extraction was divided into two equal portions and trace elements specially phosphorous was added to one part of the fertilizer to compensate low or lacking elements and four types of SLF's were prepared. Treatments used are given below

T1LF- Liquid fertilizer prepared using physical method
T2LF- Liquid fertilizer prepared using physical method with added trace elements
T3FLF- Fermented Liquid fertilizer
T4FLF- Fermented Liquid fertilizer with added trace elements

Four concentrations, 1%, 2%, 3% and 4% were tested for each fertilizer.

MI-2 Red chili (*Capsicum annuum*) was used to test the effect of the prepared Liquid fertilizers. The plants of same age, same size planted in same amount of soil were used. Randomized Complete Block Design (RCBD) and T test were used for analyzing data.

Results and Discussion

MI-2 Red chili (*Capsicum annuum*)

One sample t test revealed that there is no significant difference ($P>0.05$) between control and the treatments for increase in height, number of leaves and number of buds. The RCBD was used as the experimental design using two way ANOVA to analyze the mean values of growth parameters to verify the hypothesis that, there is a significant difference between at least one pair of treatments (H_1). The results showed that, there is a significant difference between at least one pair of treatments for number of flowers versus SLF and number of pods versus SLF ($P<0.05$). Further analysis on one sample t test verified the hypothesis.

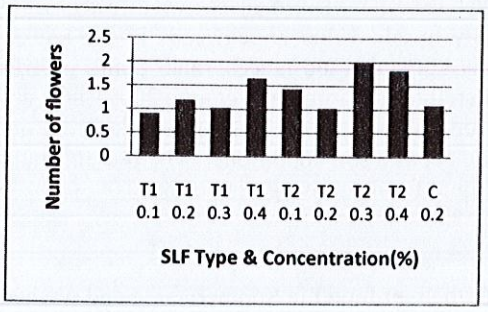

Figure 1: Comparison of number of flowers observed using SLF produced using physical method (with and without trace elements) and control

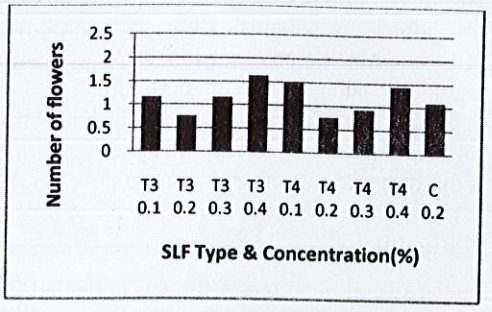

Figure 2: Comparison of number of flowers observed using SLF produced using fermentation method (with and without trace elements) and control

The maximum mean value of the number of flowers was recorded in the physical method with added elements SLF with 0.3% concentration than control value (Figure 1).

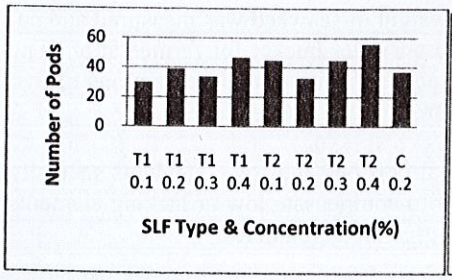

Figure 3: Comparison of number of pods observed using SLF produced using physical method (with and without trace elements) and control

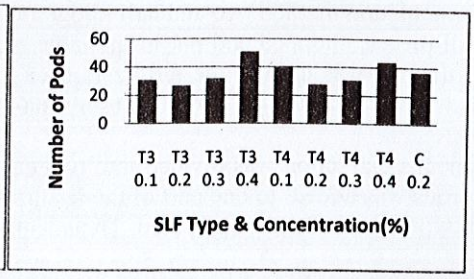

Figure 4: Comparison of number of pods observed using SLF produced using fermentation method (with and without trace elements) and control

The maximum mean value of the number of pods (56) was recorded in the physical method with added elements SLF applied with 0.4% concentration than control value (37) (Fig3). After the SLF treatments, unexpectedly, red chili flowering started 60-65 days after sowing seeds and the first harvest could be taken in 80-90 days after sowing seeds. Although, according to crop recommendation of Agricultural Department of Sri Lanka MI-2 variety flowering starts 75 -80 days after sowing seeds and first harvest can be taken in 110 - 115 days after sowing seeds.

Conclusion

It is evident from the results that the liquid fertilizer prepared using the brown seaweed is effective in enhancing the yield and growth of commercial plants within short time period compared to existing commercial products. The SLF prepared by physical method and added with trace elements is found to be the best SLF. It was also noted that early harvest can be obtained using the Seaweed Liquid Fertilizer. Hence, further research in this field will be beneficial to the farmer community.

References

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Thirumaran G., M. Arumugam, R. Arumugam and P. Anantharaman, 2009. Effect of Seaweed Liquid Fertilizer on Growth and Pigment Concentration of Cyamopsis tetrogonolaba (L) Taub, CAS in Marine Biology, Annamalai University, Tamil Nadu, India, American-Eurasian Journal of Agronomy 2 (2): 50-56