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EFFECT OF SARGASSUM POLYCYSTUM EXTRACTS ON THE GROWTH OF MULBERRY SILKWORM (BOMBYX MORI L.)

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ABSTRACT

Marine algae are economically valuable resources, used as food, fodder, fertilizer and medicine and thus useful to mankind in many ways. In the present study, *Sargassum polycystum* extracts were tested at five different concentrations (100ppm, 200ppm, 300ppm, 400ppm and 500ppm) against mulberry silkworm *Bombyx mori* (L.) third instar larvae by leaf dip method.The seaweed extract enhanced the growth of silkworm larvae *B.mori* with increase the concentrations. The highest concentration (500ppm) showed more growth rate than the control. The 100ppm, 200ppm, 300ppm, and 400ppm showed maximum growth when compared to control at 96hrs of my study period. These finding envisages that secondary metabolites could be extracted with cold percolation method can be used for biological and agricultural lead.

Key words*: Bombyx mori*, growth parameters, mulberry silkworm, *Sargassum polycystum*.

INTRODUCTION

The mulberry leaves are the sole source of food for the larval instars of Silkworm, *Bombyx mori*. This insect is a typical monophagous insect. Man has immensely benefited from the silk prouduct by silkworm and subsequently researchers have always been trying to unveil the factors that can be manipulated to the benefit of the silkworm rears. (Nair and Kumar, 2004). Sericulture is an age-old land based practice in India with high employment potential and economic benefits to agrarian families.

India is the second largest producer of mulbery silk (Vijaya Prakash and Dandin, 2005). Plants are the richest source of organic chemical on earth and phytochemical have been report to influence the life and performance of different insects (Rajesekar Gouda *et al*., 1997). Various extract of medicinal plants have been tested as supplementation in food for the growth of silkworm *B. mori* and were seen to influence the body weight, silk gland weight and the silk thread length in *B. mori* (Murugan *et al*., 1998).

Dietary supplementation of the leaf and pod extract of *Moringa oleifera* are studied by Rajeswari and Isaiarasu (2004). The herbal tonic having the extracts of some selected medicinal plants reflected better response from the larva of *B. mori* (Balamurugan and Isaiarasu, 2007). Numerous scientific studies on *Aloe vera* had been demonstrated for analgestic anti-inflammatory, wound healing, immune modulating and anti-tumour activities as well as antiviral, antibacterial and antifungal properties.(Reynolds and Dweck, 1996). *A.vera* Products are also used in Pharmaceutical and food industries (Eshun Kand He, 2004). *A.vera* contains over 75 nutrients and 200 active compound including vitamins, enzymes, minerals, sugars, lignin, anthaquinones, soponins, salicilic acid and amino acid (Park and Jo, 2006).

MATERIALS AND METHODS

Collection and preparation of macroalgal seaweeds

The selected macroalgal seaweeds were collected by hand picking method from the submerged marine rocks at Idinthakarai (N 08°10'32.3" E 077°44'31.3") in Tirunelveli district on February, 2019. The seaweeds were collected during low tide in the intertidal and sub-tidal regions where the vegetation was discontinuous and occurring in patches. Moreover, drifted algae were also collected using disposable latex gloves in glass bottles and polythene bags. After collection, the collected seaweeds were washed thoroughly thrice with tap water and once with sterile distilled water to remove salt, sand and epiphytes. Fresh samples were preserved in 4% formalin.

The latitude and longitudes of the study areas were recorded using GPS- map 76 (GARMAN). Cleaned seaweeds were shade dried for two weeks, partially powdered using domestic blender (Preethi XL-7, Maya appliances (P) Ltd, Madras) and used for the experiments. The powdered algal material was extracted by cold percolation method using polar and non- polar solvents.

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Silkworm Rearing

For this study, disease free laying (DFL) of multivoltine silkworm, *Bombyx mori* (L.) Race (PMX csR2) were produced from Department of Sericulture, Government of Tamil Nadu, Nannagaram, Tenkasi. They were processed for incubation in Block Boxing and transfer the hatched larvae to the rearing tray with appropriate quantity of mulberry leaves MR2 variety. The third stage of the larvae collected from COP Sericulture Pilot Silkworm Rearing Centre, Sadakathullah Appa College (Autonomous), Tirunelveli, India. The collected Larvae were maintained in the rearing tray under laboratory conditions. Larva was fed with its natural diet. The larvae in the rearing bed and the larvae were feeding with appropriate quantity of mulberry leaves (MR2 Variety). The third instar larvae were utilized for the observation of seaweed extract treatment. The third moult larvae were acclimatised to the laboratory condition by rearing them in the plastic box and plastic tray.

Fresh and healthy leaves of MR2 variety of mulberry were used in the present study. The leaves were harvested daily from the mulberry farm during the early hours of the day and stored in cool condition and to maintain its freshness until use using wet gunny cloth. The rearing room was disinfected by spraying two percentage formalin solution three days prior to the commencement of rearing.

The rearing materials such as box and trays with washed with disinfectant solution. Dettol solution was used to wash the hand before and after handling of the worms during the experiment. A bed disinfected powder was prepared by grinding lime powder, paraformaldehyde and benzoic acid. It was dusted mildly on the worms daily after bed cleaning. The larvae were taken in equal numbers of 15 each is 3 trays and fed with soaked leaf of mulberry with 100ppm, 200ppm, 300ppm, 400ppm and 500ppm. It was observed for 24hrs, 48hrs, 72hrs and 96hrs. Solution of herbal formulation is diluted separately in 500ml distilled water with 100ppm, 200ppm, 300ppm, 400ppm and 500ppm. The mulberry leaves were kept soaked in the solution before feeding them to the larvae in the respective trays. Control group larvae with same number is maintained and fed with water-soaked mulberry leaves

RESULT AND DISCUSSION

Treatment of seaweed extract

The seaweed extract is enhanced the growth of silkworm larvae *B.mori* with increase of concentrations. The high concentration (500ppm) showed more growth rate than the control. The 100ppm, 200ppm, 300ppm, and 400ppm showed maximum growth when compared with control at 96hrs of my study period (Figure 1.). Initially, the silkworm larvae *B.mori* showed sluggish nature in uptake of feed upto 72 hrs but it took more feed at 96hrs in the all concentrations compare with 24hrs (Figure 2).

The *Alove vera* health tonic showed maximum growth rate in the silkworm larvae *B.mori* with increase of concentrations. The high concentration (500ppm) showed more growth rate compared with the control. The importance of growth and development of *Bombyx mori* (L) lies in the wealthy nutrition (Kanafi *et al*., 2007). As per the observation of (Alagumalai *et al*., 1991), fortification of mulberry leaves with the flour of black gram and red gram to improve the larval growth and cocoon characteristics in *Bombyx mori* (L). Similarly, the growth of silkworm larvae improved significantly upon feeding them with mulberry leaves supplemented with different nutrients (Sarker, 1993). In the present study, the mean larval weight of the final instar larvae increased in the case of the larvae that received seaweed and "Aloe", the herbal formulation as the dietary supplement.

It was noticed by (Rajasekaragouda, 1997) the growth promoting effect of the water extracts on the growth of silkworm *B.mori.* The observation of increase in the live weight of the instar larvae of *Bombyx mori* (L) upon receiving the dietary supplementation of "Aloe", the herbal formulation and seaweed in the present study may, therefore, be attributed to the nutritive nature of this plant extract. The quantity and the quality of dietary protein have long been considered to be important in the growth of the silkworm (Khyade and Band Doshi, 2012).

Higher growth rate as well as weight gain can be observed in higher protein utilized group and the relative growth rate varied among the different breeds of the silkworm (Magadum, 1996) and were influenced by the season (Isaiarasu and Ganga, 2000). The difference in the relative growth rate of *A. vera and* seaweed extract supplemented larvae from the control observed in the present study indicates that the *A. vera* and seaweed extract supplementation results in higher protein utilization. Sundaramahalingam (2000) noticed that the growth rate and protein utilization of silkworm are high as a result of the supplementation of Miraculan, a plant growth regulator.

A strong correlation between the growth of silkworm and the silk production in the silkworm after the treatment with plant extracts and attributed the growth promoting effect of the plant extracts to the stimulation of biochemical processes leading to protein synthesis (Murugan et al., 1998). It can be asserted that cold percolation method can be used for the extraction of more number of secondary metabolites from marine macrolagae and Aloe health tonic. Further, marine macroalgae and Aloe health tonic are of great importance as potential sources for developing novel biocides in the field

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of Sericulture. This finding helps in further research in the investigation of other seaweeds and aloe health tonic with different solvent extract for their biological activities and also for the possibility of their being used as a source of feed for silkworm.

Treating the mulberry leaves with aqueous solution of *Aloe* herbal formulation and seaweed extract and feeding them to the larvae of silk worm, *B.mori* resulted in elicitation better response of growth. *A.vera* herbal formulation and seaweed extract contains the active compounds like: vitamins, enzymes, minerals, sugars, lignin, anthraquinones, saponins, salicylic acid and amino acids. These bio compounds may be activating the velocities of bio chemical reactions catalyzed by the mid gut enzymes and thereby increase the digestibility in the larvae of silk worm, *B.mori*. Improved digestibility may reflect in the wealthy performance of the silk worm larvae and may also improve the efficiency of spinning of cocoons. So, the marine algal extract may open a new avenue in the rearing technology of larval instars of the multivoltine cross breed races of silkworm, *B. mori.*

Figure 1. Different concentrations (100ppm, 200ppm, 300ppm, 400ppm and 500ppm) of selected algal seaweed *Sargassum polycystum* water extract treated against mulberry silkworm *Bombyx mori*

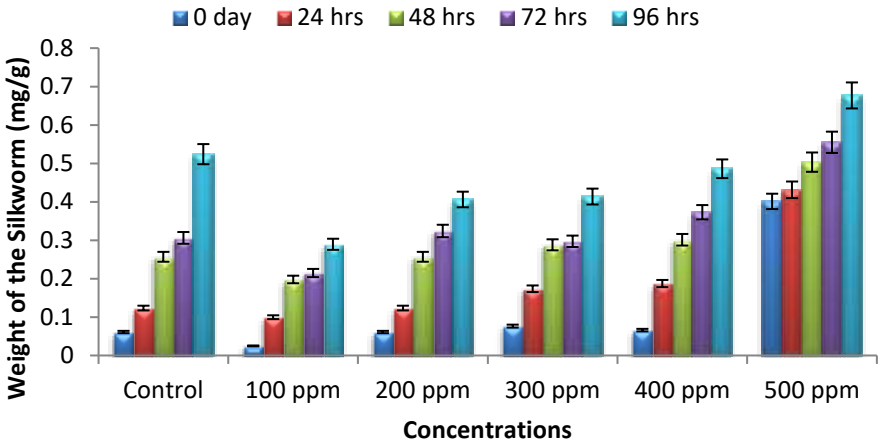
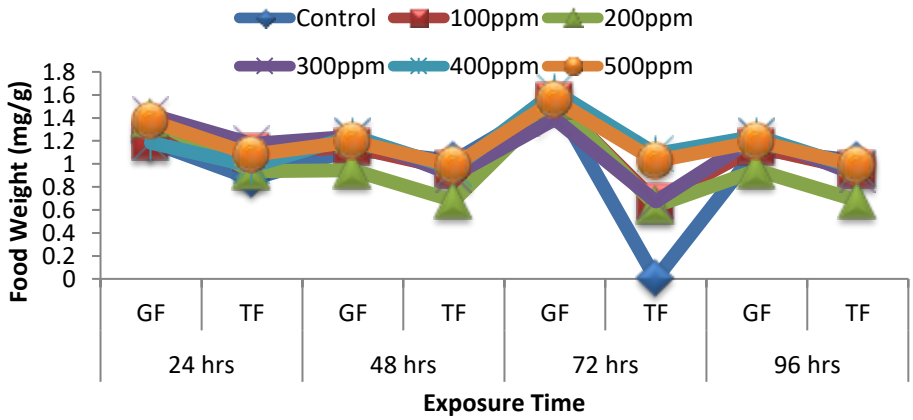


Figure 2. Different concentrations (100ppm, 200ppm, 300ppm, 400ppm and 500ppm) of selected algal seaweed *Sargassum polycystum* water extract treatment against mulberry silkworm *Bombyx mori*



GF- Given Food; TF- Taken Food

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