Studies on the life cycle and ecology of *Salvinia molesta* Mitchell

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MS received 11 April 1980, revised 3 October 1980

Abstract. *Salvinia molesta* Mitchell propagates vegetatively by proliferation. Spores are nonviable. Mechanical disturbance enhances the rate of proliferation. The rates of proliferation within 30 days are 1.8 in agitated media and 1.16 in intact media under laboratory conditions. While the frequency of addition of fresh set of leaves ranged between 3-18 days in the natural habitat it was between 3-9 days under the laboratory condition. Crowding of *Salvinia* is a prerequisite for the cessation of proliferation and initiation of the final 'grown up stage'. *Salvia* of 'floating stage', 'intermediate stage' and 'grown up stage' have different density ranges such as 765-986, 942-1280, and 65-345/m² and biomass ranges of 18-25, 50-70 and 340-375 g dry wt/m² respectively under natural conditions.

Keywords. *Salvinia molesta* Mitchell, vegetative propagation, asexual reproduction; sporocarp.

1. Introduction

*Salvinia molesta* Mitchell is a free-floating aquatic fern capable of fast growth. Its capacity to tide over adverse environmental conditions is unique and this accounts for its spreading over wide areas. *Salvinia*, a native of South America, has now established itself well in many new areas including several of the tropical and subtropical countries. Ever since its accidental introduction to India around 1940, it has spread to an alarming degree in many parts of Kerala.

It has become a serious menace in certain places paralysing water transport, hampering fishing and shell collection, preventing agricultural operations and choking turbines of generators in hydroelectric projects. This weed is, in fact, threatening the very means of livelihood of the people of the infested areas and the base of the State's economy as a whole.

However, in any attempt to find out a permanent solution for problems of this sort a detailed knowledge of the propagation, life cycle, general structure and various environmental parameters and other agencies that regulate and control the growth and spread of the organism is an essential prerequisite. In this context

While studies available on the ecology of this weed are fragmentary, information on its propagation is controversial. Lack of adequate knowledge on these aspects has, in effect, resulted in the failure of its eradication programmes undertaken elsewhere and hence with a view to bridge that gap the present work was carried out.

2. Material and methods

To study the role of sporocarps in the propagation of *Salvinia molesta* the following experiments were conducted. For one experiment (Expt 1a) two freshwater ponds which had been densely populated by *Salvinia* for several years were selected. These ponds were approximately 8 × 8 metres size with a maximum depth of 2 metres. *Salvinia* of these ponds was completely removed and kept away from the water. Care was taken to remove even the smallest bits possible. These ponds were later subjected to the study of regeneration of *Salvinia* at fortnightly intervals for about 6 months and monthly observations for the next one year. During the early days of observation a number of small viable twigs of proliferating stage appeared and were removed, the nature of growth carefully examined. Simultaneously with the above study samples of the abundantly floating spores were also collected and examined under the microscope to see any incidence of germination (Expt 1b). In another experiment (Expt 1c) about 400 g of the sporangia of different stages of maturation were collected. Of these 100 g each were put in two freshwater ponds which were not previously inhabited by *Salvinia*. These ponds were later examined at fortnightly intervals to note whether any of the sporangia of *Salvinia* showed signs of germination. Of the rest, 100 g were kept under direct sunlight and the rest in the shade for about thirty days without water. During this period samples of approximately 5 g each were transferred at an interval of two days to freshwater jars kept in the laboratory. In order to see the suitability of the media in the jars for the growth of plants a small number of aquatic plants were allowed to grow in the bottom soil. A portion of the water was changed once in 10 days. The poured off water was filtered through organdi cloth and the sporangia recovered were reintroduced to the respective jars. Samples of these spores were periodically observed under the microscope. The addition of sporangia continued for one month and the observation continued for three more months.

A set of experiments were conducted to study the true nature of the vegetative propagation. For this fresh proliferating twigs each having an internode with an apical bud, a pair of leaves and 'roots' were used. In one experiment (Expt 2a) such twigs were cultured under the laboratory condition in glass jars containing 2½ litre of water. Ten such jars were set up each containing 5 each of the above-mentioned twigs. Since the temperature of the experimental media was found to rise higher than that of the natural habitat the jars were protected from direct