

Observations on Biocontrol potential of *Cyrtobagous salviniae* (Calder and Sands) (Coleoptera: Curculionidae) against *Salvinia natans* Hoffins in Kashmir Valley

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Salvinia natans Hoffins was first recorded in Kashmir Valley by Biswas and Calder (1936). *S. natans*, an annual aquatic free floating fern, grows gregariously in the lakes and the side channels of the lakes in Srinagar (Kaul and Vass, 1970). The weed is also abundantly prevalent in paddy fields in some of the areas of Kashmir Valley (Anonymous, 1987). The weevil *Cyrtobagous salviniae* (Calder and Sands) is native to South America and has been found feeding on all species of the *S. auriculata* species complex of floating ferns (Forno and Bourne, 1984). In Australia, *C. salviniae* has successfully controlled *Salvinia molesta* Mitchell at numerous sites where mean daily air temperatures are above 20° C. (Forno and Bourne, 1985). The adult weevil survives in areas where air temperature range from less than 0° C upto 45.0° C (Room *et al.*, 1984). Thomas and Room (1986) have reported that the curculionid *C. salviniae* was considered to provide cost-effective, environmentally sound and apparently permanent biological control of the weed in Australia, Papua New Guinea, India and Namibia. Recently, this exotic weevil was introduced successfully in Kerala against *S. molesta* and now it has cleared more than 1,000 sq. km of water surface, infested with *S. molesta* in Kuttanad area (Joy *et al.*, 1985; Joy, 1986). Since the weevil *C. salviniae* is found safe to other economic plants in host specificity tests (Jayanth and Nagarkatti, 1987), trials were conducted to study the biocontrol potential of this weevil against *S. natans* in Kashmir valley.

A consignment of one hundred adults of both male and female *C. salviniae* were received from Dr. S.P. Singh, Project co-ordinator (Biological Control), Indian Institute of Horticultural Research, Bangalore, on 15th July, 1986. Since *S. molesta* plants were not available in Kashmir, a few plants were taken from Bangalore for laboratory trials. Trials were conducted on feeding activity of *C. salviniae* on *S. natans* kept in tap water and in natural water separately (Dal lake Water) and observations were made on the feeding preference between plants of *S. molesta* and *S. natans*. The rate of feeding of *C. salviniae* on *S. natans* and its reproductive activity on *S. natans* were studied till the death of the last adult i.e. upto 18th December, 1986.

Adults of *C. salviniae* fed on *S. natans*. When both *S. natans* and *S. molesta* were kept together, the adults preferred to feed on *S. natans*. Only very few feeding scars were noticed on the buds of *S. molesta* whereas, severe damage symptoms were noticed in *S. natans*. Adults preferred to feed on plants of *S. natans* with tender leaves even when kept sandwiched on either side by big buds and petioles of *S. molesta*. The non-preference of *S. molesta* may be due to the physiological shock experienced by the plants, which were brought from Bangalore, Karnataka.

Though *C. salviniae* fed on all parts of the *S. natans* plants, the adults exhibited feeding preference for the tender leaves and buds. The older leaves and roots were the least preferred. When not feeding, the adults rested on roots and stolon of the plants at the sub-surface water level. The feeding symptoms on tender leaves were very clear with round, big holes. Adult started feeding from the midrib regions

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on the ventral side of the leaves. Usually, the adults cut off the leaves after consuming about 75.0% of the leaves. *S. natans* plants thrived well in water having pH of alkaline range with low quantity of dissolved sodium chloride (usually seen in Kashmir lakes). To know the influence of alkaline water on the feeding activity of *C. salviniae*, trials were conducted using water drawn from the side channels of the 'Dal' lake, where *S. natans* existed in nature. There was no marked difference in the feeding activity of adults of *C. salviniae* in both tap and Dal lake water samples. *S. natans* more than doubled its biomass production in twenty four days. However, the adults of *C. salviniae* fed voraciously on the tender leaves of *S. natans*. From the observation, it was evident that the rate of feeding activity of *C. salviniae* was slightly reduced at higher densities. Forno and Bourne (1986) reported that these insects were active, when the temperature was between 16.0°C to 30.0°C and the adults could survive even when the temperature was less than 0°C. Our present results at Srinagar, also confirmed these observations. Adults survived for more than five months, exclusively feeding on *S. natans* plants, when the maximum temperature range was from 15.0°C to 28.8°C and the minimum temperature range from 10.0 to 24.0°C. Since the consignment was received in adult stage, no life stage studies were conducted. Microscopic observation revealed that there was no egg laying on *S. natans* plants. Forno and Bourne (1986) have observed that there was no oviposition when the air temperature was less than 20.0°C. In this trial, the temperature was more than 20.0°C for most of the trial period. So the non-oviposition was not due to the temperature factor but it might be due to the unsuitability of the host.

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