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Research Article

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Prevalence and Life-Table Studies of Calligrapha Pantherina, Biological Control Agent for Sida Acuta

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ABSTRACT

Sida acuta, a malvaceous weed native to Central America, has become a serious invasive species in Fiji, affecting both crop and livestock productivity. In 1997, *Calligrapha pantherina,* a leaf-feeding beetle, was introduced from Papua New Guinea to suppress S. acuta. Field surveys across Viti Levu, Taveuni, Kadavu, Gau, Koro, Beqa, Ovalau, and parts of Vanua Levu confirmed beetle dispersal up to 5 km from release sites and demonstrated significant reduction in weed populations. To support mass rearing, laboratory studies were conducted under controlled conditions (24–28°C, 65–70% RH) during 2017–2018. It helps to identify critical points for intervention and improving overall yield during mass production. Developmental durations for egg, larval, and pupal stages ranged from 2–7, 11–20, and 3–11 days, with survival rates of 81%, 46%, and 72%, respectively. This allows laboratory technicians to predict and manage rearing timelines efficiently. The sex ratio of newly emerged adults was 5:4 (male: female), with females exhibiting longer lifespans. These findings support the continued use and expansion of *C. pantherina* as an effective biological control agent for *S. acuta* in Fiji.

Keywords: Sida Acuta, Calligrapha Pantherine, Biological Control, Weed Suppression, Fiji

Introduction

- The malvaceous weed *Sida acuta* (sida) Burman
- f. (Asteraceae; here after Broom weed) is small, erect shrub, usually growing to a height of about 1 metre.
- The stems are woody, branching several times, and there is a well-developed tap root. The leaves are lance-shaped (tapered at both ends) with serrated margins.
- The flowers are yellow, usually solitary or growing in pairs in the leaf axils. Seed capsules divide into five to eight portions, each of which has two sharp points approximately 1.5 mm long at one end.
- Broom weed is native to Mexico and Central America but has spread throughout the tropics and subtropics. It has been found to affect both crop and livestock production in Fiji.
- *Calligrapha pantherina* (Calligrapha) Stål (Chrysomelidae), a leaf feeding beetle was introduced into Fiji from Papua New Guinea in 1997 to control Broom weed.
- *C. pantherina* was reared and released in various islands which includes the main island Viti Levu, Taveuni, Kadavu, Gau, Koro, Beqa, Ovalau and part of Vanua Levu between 1997 and 2008.





Figure 1 & 2: Broom weed inflorescence

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Objective

The principle aim of this study was to understand the current status of *C. pantherina* in the field and life table studies for future mass production of *C. pantherina* to control broom weed.

Materials and Methods

- Observations were made in field conditions and further tested in laboratory conditions to ascertain the life-table of *C. pantherina* for mass production.
- Biology of *C. pantherina* was studied under laboratory conditions (room temperature ranging from 24°C to 28°C with a relative humidity varying from 65 to 70%) during 2017-2018. This was to develop mass rearing techniques for the biological control agent.
- The freshly laid eggs retrieved from the potted host plant (Broom weed) was kept under observation with daily recording of the life cycle developments.

Results and Discussion

- Prevalence of biocontrol agent
- Field observations revealed that *C. pantherina* has been established and spreading from wherever it was continuously released. Both *C. pantherina* larvae and adult defoliate the leaves and flower of the plant.

Life Table Study

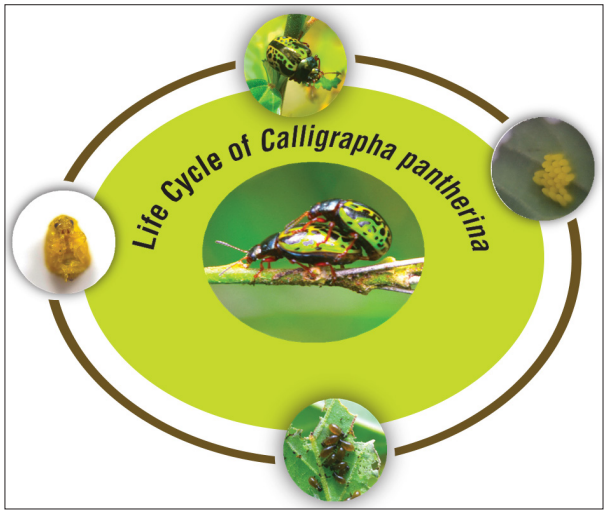
- The total incubation period occupied 2 to 7 days (percentage survival 81%) from eggs to larval stage, 11 to 20 days (percentage survival 46%) for from larval to pupa stage and 3 to 11 days (percentage survival 72%) from Pupa to adult stage.
- The data was collected over a period of one year under standard laboratory conditions.
- The population of male *C. pantherina* emergence from pupa stage was slightly higher as compared to female with male to female sex ratio of 5:4 recorded.
- Adult longevity data clearly showed that male had shorter life span as compared to female.



Figure 3 - 5: Rearing of C. pantherina in laboratory and damage symptoms

Conclusion

The findings from the field observations revealed that *C. pantherina* has been established and spreading from its released sites. The life-table study over a period of one year under laboratory conditions for *C. pantherina* revealed that mass production can be successfully done in a month's time. The sex ratios of emerged *C. pantherina* under laboratory conditions were estimated to be 5:4 (male and female) and males had shorter life span than females



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