Predatory potential of Coccinelid beetle spp. on *Deltocephalus menoni*; vector of sugarcane white leaf disease

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1. Introduction

Sugar is one of the major food commodities in Sri Lanka, and it has become an important sub-sector in the economy of the country. Currently, Sugar production is reduced due to several kinds of problems (Keerthipala, 2016). Among them, Sugarcane White Leaf Disease (WLD) is a highly contributing factor for the drastic reduction of production and hence, WLD is one of the major threats to the cane sugar industry in the country. *Deltocephalus menoni* (Hemiptera: Cicadellidae, Deltocephalinae) is the only locally identified vector of this phytoplasma disease.

Therefore, the management of WLD vector has been identified as a strategic and integrated approach to prevent the rapid spread of this disease in sugarcane plantations. Natural enemies are reported as one of the most effective management strategies to manage the WLD vector. Typically, Hemipterans are attacked by a range of predators and parasitoids. Hence, those predatory and parasitic insects play a vital role in agriculture ecosystems as a sustainable hemipteran pest control strategy.

Coccinellid beetle spp available in the sugarcane ecosystem are common predators of the sugarcane pest and they are recorded to be predating on *D. menoni* too. The objective of the study is the identification of the predatory potential of the naturally available Coccinellid beetle *spp* in the sugarcane ecosystem on *D. menoni* to incorporate them into vector management program.

Specific objectives of the study will be the identification of the,

I. Naturally available Coccinellid beetle *spp* in sugarcane ecosystem
II. The predatory potential of the collected Coccinellid beetle *spp* on *D .menoni*
III. Identifying the potential Coccinellid beetle *spp* to incorporate into the vector management program

2. Materials and Methods

I. Identification of the naturally available Coccinelid beetle *spp* in sugarcane ecosystem

The coccinellids beetles were collected from UdaWalawa, Sevanagala, Pelwatta, Siyambalanduwa, Passara, Higurana, Kanthalai areas using sweep nets, glass vials, and aspirators.

The collected Coccinelid beetles were knocked down and dried in an oven for 5-6 hours under 45°C temperature and stored. Different *spp* were separated based on morphological features. Identification was done using available literature.

II. Identification of the Predatory potential of the collected Coccinelid beetle *spp* on *D. menoni*

Insect cultures of all collected Coccinelid beetle species and were maintained separately. *D. menoni* adults and nymphs were provided separately to larvae and adults of each Coccinelid beetle species. The number of *D. menoni* nymphs or adults predated by Coccinelid beetle species within 24 hour period were recorded separately.

III. Identification of the potential Coccinelid beetle *spp* to incorporate into the vector management program

The predatory potential of each Coccinelid beetle *spp* were compared. Preference of selected *spp* for *D. menoni* over the other available insect *spp* in sugarcane ecosystem was studied.

Thiomethoxam (Actara) chemical treatments were used. Sugarcane leaves from four-month old plants were collected just after application to the plants as per the vector management recommendation. Survival of the Coccinelid beetle *spp* on them was studied to confirm the abundance and survival during the periods where *D. menoni* populations are lower.

3. Results and Discussion

1. Naturally available Coccinelid beetle *spp* in sugarcane ecosystem

Ten Coccinelid beetle spp belongs to 4 sub families and 5 tribes were recorded. Some species were recorded with several morphotypes. Variation within same species were observed due to fading of pattern in elytra with the age.

Coccinelid beetls species of *Coccinellinae* subfamily and *Coccinellini* tribe

1. ***Micraspis discolor***
2. ***Micraspis allardi***
3. ***Propylea dissecta***
4. ***Cheilomenes sexmaculata***
5. ***Coccinella transversalis***

Coccinelid beetls species of *Chilocorainae* subfamily and *Chilocoraini* tribe

1. ***Brumoides piae***
2. ***Brumoides suturalis***

Scymninae sub family

1. ***Scymnus nubilus***
2. ***Pseudaspidimerus trinotatus***

Sticholotidinae sub family and *Sticholotidini* tribe

1. ***Jauravia dorsalis***

a. Population density of naturally available Coccinellids beetles

Highest number of coccinellid beetle species were recorded from the Siyambalanduwa (S=7) and Sevanagala (S=6) Species dominance was high in Pelwatta (D=0.823) by recording 3 spp and *M. discolour* represent 90.5% of total population. Species dominance was lower in Siyambalanduwa (D=0.427) where 8 *spp* present. Shannon-Wiener's species diversity index (H') was highest (H'=1.182) in Siyambalanduwa.

b. Population dynamics of naturally available Coccinellid beetles

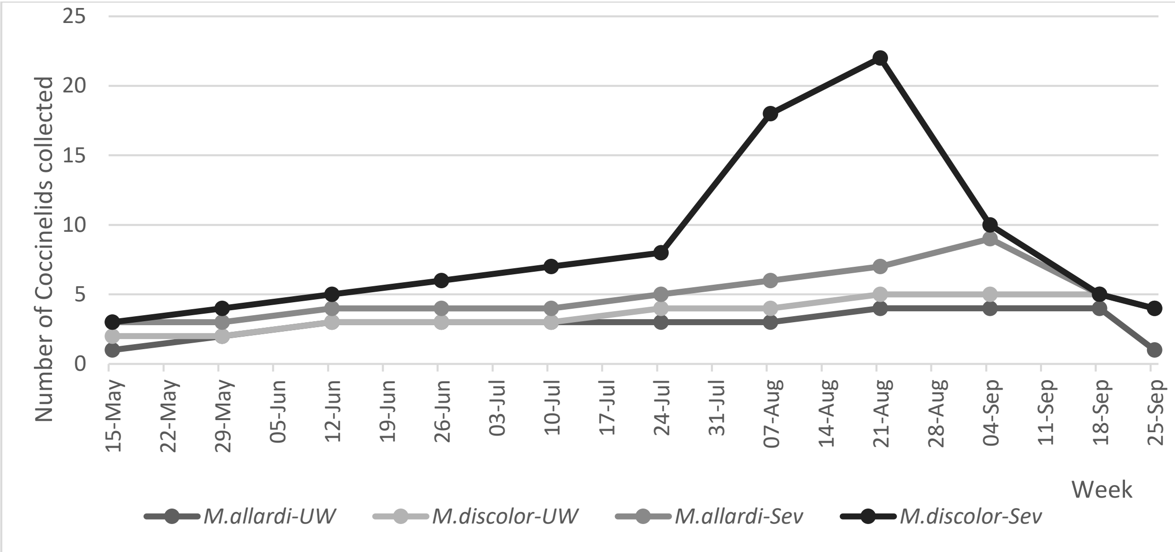

Figure 1. Population dynamics of naturally available Coccinellid beetles Uda Walawe and Sewanagala

II. Predatory potential of the collected Coccinellid beetle *spp* on *D. menoni*

From ten coccinellid beetle spp collected only six species fed on the *D. menoni.*

Feeding rate of the considered coccinellid beetle spp was significantly different ($F_{15, 29}$=12.9. P<0.05). Highest feeding rates were recorded in two morpho types of *Micarspis discolor* (MT1:0.36± 0.023, MT2: 0.32± 0.007) and *Micraspis allardi* (0.32± 0.025). Lowest feeding rates were recorded in *Propylea dissector* (0.28± 0.015) and *Pseudaspidimerus trinotatus* (0.16± 0.005).

III. Identifying the potential Coccinellid beetle *spp* to incorporate to vector management program

a. Feeding potential of M. discolour adult on deferent stages of WLD vector

Feeding rate of *M. discolour* on five (5) nymphal stages, eggs and adults was significantly different (ChiSq 102.77, Pr<.0001). Highest feeding rate of *M. discolour* was recorded in *D. menoni* eggs (6.00±0.258) and 1st instar nymphal of (1.56±0.151)

b. Feeding potential of M. discolour adult on deferent pest species in sugarcane eco-system

M. discolour was fed on Pyrilla eggs, Pink mealy bug and Sugarcane Wholly Aphid efficiently during the study period. Wanasinghe *et al.* (2014) recorded *M. discolour* as an efficient predator of SWA in the natural environment.

c. Potential of *M. discolour* adult to survive during pesticide spray (Thiomethoxam 5g/16l water)

Insecticide recommendation for *D. menoni*; Thiomethoxam 5g/16l water was having significant effect on *M. discolour* adults (ChiSq 21.54, Pr<.0001). But 20% of *M. discolour* adults were survived after 48hrs from the treatment and was capable to withstand the insecticide recommendation, which should be a good predatory insect to incorporate to an integrated vector management program with insecticide application.

4. Conclusions

Ten Coccinelid beetle *spp* belongs to four (4) sub families and 5 tribes were recorded. Highest abundance was recorded in Siyabalanduwa area and species dominance was high in passara. *Micarpis discolor* has the highest distribution and abundance over other spp. Six species were recorded as predatory spp over *D. menoni. M. discolor* was capable to feed efficiently over all life stages of *D. menoni*, specialy on eggs and first instrar nymps. *M. discolor* predate over other sugarcane pest *spp*. Twenty percent of *M. discolor* population was survived after heavy application of pesticide. Accordingly, *M. discolor* have potential to incorporate in an efficient vector management program

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