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Examination of tritrophic association in crucifer ecosystem

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Crucifers are important crops in Sri Lanka and cultivated over 4155 ha annually. Insecticide spraying has been the common practice among farmers to manage cabbage caterpillar complex. Excessive use of chemicals leads to many ecological and health problems; therefore, integrated pest management (IPM) has been suggested. Biological control of insect pests has been well recognized as a strong component of IPM. Use of egg parasitoids for controlling cabbage caterpillar is a potential option and it requires the understanding of interactions among host plant, host pest species and the parasitoids. Therefore, the objective of this study was to examine the tritrophic association in relation to host plant preference by adult moths and the host preference of parasitoids for caterpillar eggs.

Four crucifers: radish, cabbage, mustard and knol-khol were cultivated in the University experiment farm at Dodangolla from May to September, 2012. Crops were cultivated in 5 x 5 m² plots, separated by 5 m wide non crop vegetation. Crops were established in order to get synchronized vegetation. Samples were collected at weekly intervals and 10% of plants of the plot were examined at each sampling date. Insect eggs were collected and incubated until the emergence of parasitoids adult, upon the confirmation of host species.

Plutella xylostella, *Crosidolomia pavonana*, *Trichoplusia ni*, and *Spodoptera litura* were found infesting crucifers but at variable preference to host plants. The total number of eggs collected in all samples in all crops was 5761. The number of eggs in each crop significantly varied with the crops ($\chi^2 = 6567$ df = 3, $P < 0.001$). Mustard had the highest number (4059) representing 70.4% followed by knol-khol (15.8%), cabbage (11.5%) and radish (2.3%). Preference of *P. xylostella* significantly varied among crops ($\chi^2 = 177$ df = 3, $P < 0.001$), with highest preference to mustard while cabbage, knol-khol and radish were equally preferred. *C. pavonana* laid eggs in all crops but mostly on mustard. The number of eggs laid significantly varied among crops ($\chi^2 = 7699$ df = 3, $P < 0.001$) and 77.8% eggs were found on mustard, followed by knol-khol (10.7%), cabbage (9.0%) and radish (2.5%). Number of eggs laid by *T. ni* was 111 and found only on knol-khol and cabbage and the numbers were not significantly different. *Spodoptera* eggs were not found on mustard and radish. The number of eggs found on knoll-khol (54.0%) was significantly higher than the number of eggs on cabbage (46.0%) ($\chi^2 = 50$ df = 1, $P < 0.001$).

Overall parasitism of eggs in different crops was significantly varied among crops ($\chi^2 = 102.609$ df = 3, $P < 0.000$) and the highest parasitism was found in cabbage (4.2%). *Trichoplusia ni* parasitism was found only in cabbage and knoll-khol and the levels of parasitism were 55.0% and 30.0% respectively, which were significantly different ($\chi^2 = 7.0$ df = 1, $P = 0.008$). Numbers of parasitized eggs of *P. xylostella*, *C. pavonana* and *Spodoptera litura* were not high enough for statistical analysis.



Keywords: Oviposition, parasitism, Plutella, Trichogramma, Trichoplusia

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