

ABSTRACT

Evaluation of *Nephaspis bicolor* Gordon (Coleoptera:Coccinellidae) as a predator for Aleyrodidae (particularly *Aleurodicus* spp.) (Hemiptera: Sternorrhyncha)

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Nephaspis bicolor Gordon (Coleoptera: Coccinellidae) has been successfully used in the past for the classical biological control of *Aleurodicus* spp. (Hemiptera: Sternorrhyncha: Aleyrodidae). The introduction of the spiralling whitefly, *Aleurodicus dispersus* Rusell, to West Africa and Asia in the 1990s and difficulties experienced in its control has revived an interest in *Nephaspis* spp. as classical biological control agents. The studies reported here were undertaken to assess the prey range of *N. bicolor* within and without Aleyrodidae, as well as the environmental conditions under which the coccinellid could be effectively used.

Sustainable cultures were established of the predator and three prey species: *Aleurodicus cocois* Curtis, *Aleurodicus pulvinatus* Maskell and *Aleurothrixus floccosus* Maskell. The development of all three aleyrodids lasted 25-35 days in the laboratory (25°C and 55% RH). The adults lived about 7-12 days and oviposited 36-89 eggs.

Field surveys were undertaken throughout Trinidad and Tobago to determine the presence of *A. dispersus* and other *Aleurodicus* spp. and to assess the prey range of *N. bicolor*. Several known and new species of Aleyrodidae were recorded and a number of new host plant associations were established. However, *A. dispersus* was not found, casting doubts on its presence in the two islands. Local weather conditions, host plant phenology and natural enemies were found

to be among the main factors responsible for the observed fluctuations in field populations of Aleyrodidae.

Prey specificity of *N. bicolor* was deduced from published literature, field observations and laboratory studies. Of forty-three described *Nephaspis* species, prey records available for 15 species were all from Aleyrodidae. In the field, *Nephaspis* spp. were never recorded on other Sternorrhyncha when these occurred alone. Laboratory tests, using the principle of centrifugal testing, revealed that although some feeding occurred on a few other Sternorrhyncha, this was not sufficient for survival or reproduction of the coccinellid. Aleyrodidae were the only prey species on which there was generation survival and reproduction. Within the Aleyrodidae, a wide range of wax-producing species was attacked. Adult *N. bicolor* recognized and avoided late stages of parasitized hosts and did not feed on parasitoid pupae, thus making it a good candidate for IPM.

A series of experiments on the suitability of the three whitefly species as prey of *N. bicolor* and of switching prey revealed that the coccinellid is an oligophagous predator of Aleyrodidae. Prey species impacted on a number of developmental (duration, survival) and reproductive (lifetime fecundity) parameters. Coccinellid larvae and adults adapted with little or no difficulty when switched to other whitefly species. Longevity of the synovigenic females was a key factor that determined their overall performance, since the longer they lived, the more eggs they oviposited.

Laboratory experiments on the effects of temperature and RH revealed that the coccinellid fed, survived, developed and reproduced under the four

temperature (average 23.3° C, 25.9° C, 27.7° C (ambient) and 30.1° C) and two RH (75-81% and 89-92%) regimes tested. Constant low (21-25° C) or high (27-34° C) temperatures were, however, not conducive to its development and reproduction since survival was greatly reduced. Thus, the introduction of *N. bicolor* into such environments may not result in long-term establishment. Suggestions for achieving establishment include thermal adaptation prior to release and adjustment of the time of release of the coccinellid.