

Nosemosis In Laboratory Mass-Rearing of Two Braconid Parasitoids, *Microplitis Rufiventris* and *Cotesia Marginiventris*



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Short Communication

The larval endoparasitoids, *Microplitis rufiventris* Kok. and *Cotesia marginiventris* (Cresson) (Hymenoptera: Braconidae) are small wasps. Females of both parasitoids bear short ovipositors and parasitize young larvae. They are important wasps attacking some important noctuid pests. The two parasitoids have successfully been mass-reared at the biological Control lab, Alexandria University, for decades for the first wasp and several years for the 2nd one. Suddenly, nosemosis was obviously found in both male and female of the 2 wasps, as well as their larval hosts of *S.littoralis*. *Nosema*-infection rate was, in general, higher among adult females of both *M.rufiventris* (88%) and *C.marginiventris* (70 %) parasitoids and their infected larval hosts were short-lived and all harbored massive numbers of *Nosema* spores. Insectary mass rearing's of the two parasitoids and their larval host populations were totally collapsed within few days.

M. rufiventris and *C.marginiventris* are sexually reproducing koinobiont end parasitoids of important noctuid pests including some *Spodoptera spp* [1-5]. In the field, these parasitoids prefer to attack earlier instars of their hosts when they still live in clusters near the place of egg deposition. However, 1st-2nd instars for *C.marginiventris* and third instars for *M. rufiventris* are optimal stages for insectary rearing purposes [5,6]. Both wasps were reared from several year-old colonies maintained on young *S.littoralis* larvae. Recently, both wasps and hosts (*S.littoralis* larvae) were severely infected by *Nosema spp.*. In the present

work, *Nosema* infection was carefully examined. Cultures of the parasitoids were kept on young larvae of *S. littoralis* at 27 ± 1 °C, 65 ± 5% RH and a photoperiod of 12.00:12.00 hours L: D. Both parasitoids were reared following the methods developed in the Department of Economic Entomology (Faculty of Agriculture, Alexandria University) [7] for rearing *M.rufiventris* wasp. *C. marginiventris* (Cresson) used in this study were kindly obtained (Dr. Ted Turlings) from Institute of Zoology, University of Neuchatel, Switzerland. For decades and to date, *S.littoralis* larvae have been used as hosts for the subject parasitoids. Recently, the productivity of *Microplitis* or *Cotesia* mass rearing's has severely been decreased as a result of a protozoan disease, nosemosis (Microsporidia: *Nosematidae*). The causative entomopathogen is a member of the genus *Nosema* (Figure 1), phylum *Microspora*, kingdom Protista [8,9]. Hence, this protozoan disease would be considered as a great threat for the biological control of some economically important insect pests. The observations revealed that both the infected parasitoid adults and the *S.littoralis*-host larvae were obviously short-lived. Samples (n=80) of these short-lived *Nosema*-infected parasitoid adults, *M.rufiventris* and *C.marginiventris*, and their host larvae, *S.littoralis* were checked up microscopically for presence of *Nosema* spores, as well as estimation of infection rates. On a microscopic slide, a wet-mount smear for each examined individual was prepared in Ringer solution. The smears were examined by a light microscope at a magnification of 400-1000x.

The microscopic examinations revealed that ca. 86 and 60 % of *Microplitis* and *Cotesia* adults, respectively, were heavily infected with *Nosema* spores (Figure 1). In terms of sex differences, presence of *Nosema* infection was also examined in adult male and female parasitoids. Infection rate in Microplate females and males was, in respect, ca. 88 and 86 %; whereas the corresponding rates in *Cotesia* females and males were ca. 70 and

57%, respectively. In the meantime, the prevalence of *Nosema* disease in the host population, *S.littoralis* larvae, was very marked, as the infection rate ranging from 70 to 87 %. Moreover, *Nosema*-infection rate was, in general, higher among adult females of both *C.marginiventris* (88%) and *M.rufiventris* (70%) than their males (86 and 57 %,respectively).



(A) isolated from the braconid parasitoids, *M.rufiventris* and *C.marginiventris*, and their hosts, *S.littoralis* larvae
(B) as well. Note the dark spots seen through the integument of the parasitoid larvae
(C) which represent accumulation of spores.

Figure 1: Huge numbers of *Nosema* spores.

On the other hand, *Nosema* spores, per adult parasitoid, male and female, and larval host, were counted (n= 16-40) using a hemocytometer and a light microscope, at a magnification of 400x. The adopted statistical analyses which based on t-test and Duncan's Multiple range test, significance at 5 % level, indicate that, in average, *Nosema*-infected *C.marginiventris* adult females were found harboring, significantly, less spores ($19.04 \pm 0.70 \times 10^6$ spores per female) than their males ($23.38 \pm 0.41 \times 10^6$ spores per male) or *M. rufiventris* males and females (23.38 ± 0.90 and $22.84 \pm 0.68 \times 10^6$ spores per adult parasitoid, in respect), and their larval hosts ($23.0 \pm 0.89 \times 10^6$ spores per *S. littoralis* larva). In the available literature, no reports for nosemosis in *M. rufiventris* or *C. marginiventris*, but [5] reported that *Nosema*-infected host larvae of *Plutella xylostella* (L.) had severe undesired effects on the braconid parasitoid, *C. vestalis* (Haliday). Hence, the present observations seem to be the first record for nosemosis on the two braconid parasitoids, *M. rufiventris* and *C. marginiventris*. Also, the disease is found in both male and female parasitoid samples. The nosemosis has previously been reported to cause a major problem in the laboratory or the insectary of the mass rearing of insect hosts and their parasitoids, where the *Nosema*-infected host populations have a negative effect on parasitoid populations [5, 9,10].

Conclusion

In summary, the present observations had recorded high rates (60 – 87 %) of nosemosis among insectary mass rearing's of populations of promising two braconid parasitoids, *M. rufiventris* and *C.marginiventris*, as well as their hosts, *S. littoralis* larvae. The disease does not significantly prefer any sex of the studied two parasitoids where nosemosis was obviously found in both male and female parasitoid samples, as well as their larval hosts of *S.littoralis*. Adults of diseased parasitoids and their larval hosts were short-lived and harbored massive numbers of *Nosema* spores. Insectary mass rearing of the two parasitoids and their larval host populations were totally collapsed; but soon, this problem will be overcome.

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