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Pathogens occurring in a population of *Tortrix viridana* L. (Tortricidae) in Southern Italy

INTRODUCTION

The green tortrix (*Tortrix viridana* L.) is an important pest in Oak forests (*Quercus* spp.) in Europe, frequently occurring in outbreaks and then causing serious defoliations (TIBERI and ROVERSI, 1989). FRANZ and HUGER (1971) and LIPA and MAZDIARA-BORUSIEWICZ (1976) reported on the major role of the parasitic microsporidians in the collapse of tortrix outbreaks in Germany and in Poland. Since 1988 there is observed a serious decrease in density of the population of the green tortrix in Putignano - BA (Southern Italy) we have undertaken the microscopic studies whether and which biotic factors play a role in this decrease.

MATERIAL AND METHODS

Dead and moribound larvae of *Tortrix viridana* were collected on May 1989, during a retrogradation of a population of *Tortrix viridana* in a Oak wood (bosco comunale di Putignano), about 35 Km south-west from Bari. The larvae were brought to the laboratory, individually dissected and their tissues were examined under the microscope. For identification of pathogens the tissues of the larvae were smeared on the microscopic slides, fixed for 2 minutes in methanol and stained with 0.25% Giemsa stain for 8-12 hours.

RESULTS

Out of 45 examined larvae, only 7 (15.5%) were uninfected while 38 were

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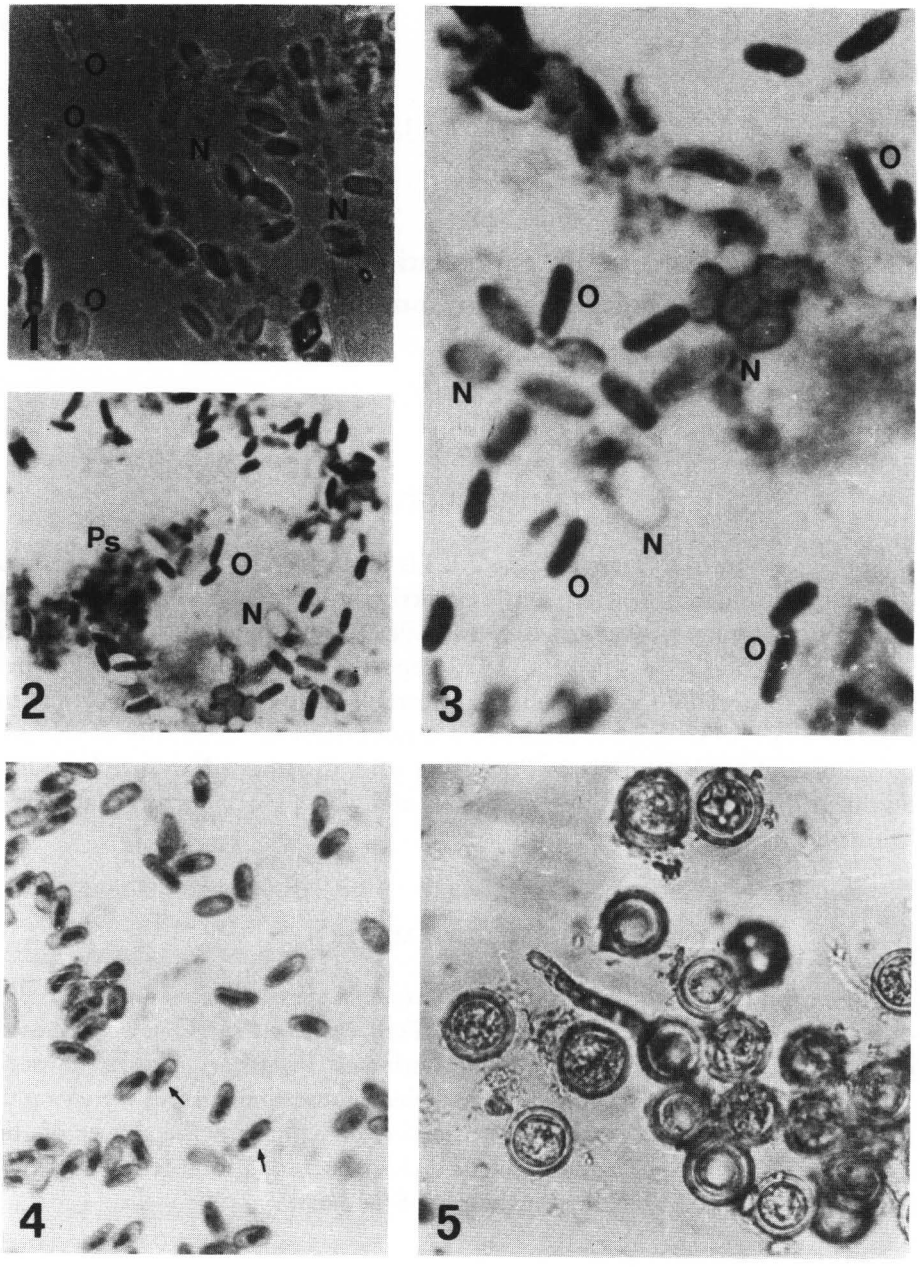

Fig. 1 - Spores of *Nosema tortricis* (N) and *Octosporea viridana* (O) in water (phase contrast).

Fig. 2 - Spores of *Nosema tortricis* (N) and intensively stained spores of *Octosporea viridana* (O) on smeared preparation of tissues from larva infected by both parasites.

Fig. 3 - Stained smeared tissues of larva with mixed infection by *Nosema tortricis* and *Octosporea viridana*; notice the maturing pansporoblast (Ps) with eight spores of *O. viridana*.

Fig. 4 - Stained spores of *Octosporea viridana* with well seen two nuclei (arrow) inside sporoplasm.

Fig. 5 - Resting spores of *Entomophthora* sp. from the body of dead tortrix larva.

infected with various pathogens (Table 1). The following pathogens were encountered and identified.

Nosema tortricis Weiser

This microsporidian was identified in 18 larvae and developed in their fat body. The fixed and stained spores were 3.33-4.68 μm by 1.89-2.70 μm (mean 3.92 x 2.12 μm) (fig. 1). The spores are round- oval and take stain only in their central part, so differing gratly from the narrow and elongated spores of *Octosporea viridana*. WEISER (1956) recorded this microsporidian only in 3% of larvae in Czechoslovakia while FRANZ and HUGER (1971) found it in 43.6% of larvae in Germany. In studies conducted in Poland, LIPA and MADZIARA-BORUSIEWICZ (1976) found this microsporidian in 15% of larvae.

Octosporea viridana Weiser

This microsporidian also infects the fat body and was identified in 10 larvae. The fixed and stained spores were 3.60- 5.04 μm by 1.44-2.07 μm (mean 4.13 x 1.78 μm) (figs. 2-3). The spores are elongated and quite narrow, they stain very intensively with Giemsa's stain being frequently deeply blue. They also contain two nuclei, as spores of *Nosema tortricis*, but they are formed in groups of eight spores in pansporoblastes (figs. 3-4). WEISER (1956) and LIPA and MADZIARA-BORUSIEWICZ (1976) observed that this microsporidian occurs in the period of density decline of the green tortrix and e.g. in Poland it infected 30% of population of *T. viridana*. FRANZ and HUGER (1971) observed this microsporidian only in 0.9% of the tortrix larvae in Germany.

Entomophthora sp.

This fungus was observed in 7 larvae which indicates that it also play an important role in the population reduction of the green tortrix. The diameter of resting spores was from 22.6 to 40.0 μm. In the body of the larvae mostly resting spores were present but also some hyphal bodies were observed (fig. 5).

It may be pointed out that neither in Germany and neither in Poland infection caused by *Entomophthora* sp. was not observed, and this is the first report on this subject.

Nuclear polyhedrosis virus

The presence of polyhedra inclusion bodies was observed in the nuclei of body cells of 3 larvae (6.6%) that is at much higher parcentage than in obser-

vations of FRANZ and HUGER (1971) who observed the infection only in 0.3% of examined larvae.

TAB. 1 - The results of microscopic examination of larvae of *Tortrix viridana* collected at Putignano 1.V. 1989.

Diagnosis	N. of infected larvae	% of infection larvae
Nosema tortricis	18	40.0
Octosporea viridana	10	22.3
Entomophthora sp.	7	15.5
Nuclear polyhedrosis virus	3	6.7
Total	38	84.5

DISCUSSION

The high incidence of diseases caused by protozoa, fungi and viruses indicate that the population of *Tortrix viridana* in Putignano district is in the stage of collapse. The proportion of uninfected population being about 15.5% is not sufficient to maintain the high or normal population density and further decrease of *T. viridana* in Putignano district may be expected.

Out of four microsporidians known to infect *T. viridana* in Europe we recorded only 2 species in italian populations. The other two, namely *Thelohania weiseri* Gunther (1960) recorded in Germany and *Plistophora* sp. recorded by FRANZ and HUGER (1971) in Germany and by LIPA and MADZIARA-BORUSIEWICZ (1976) in Poland, were not occurring in the green tortrix in Putignano.

As it my be judged from the infection incidence of 40%, *Nosema tortricis* plays the major role in decreasing the green tortrix population in southern Italy. Important role is also played by *Octosporea viridana* recorded in 15.5% of examined larvae. It is interesting to notice that in various populations of tortrix different microsporidians play the major role in the reducing their host populations. In Czechoslovakia *N. tortricis* was recorded only in 3% of the tortrix larvae (WEISER, 1956), in Poland in 15% (LIPA and MADZIARA-BORUSIEWICZ, 1978) while in Germany in 43.6% (FRANZ and HUGER, 1971). On other hand, *Octosporea viridana* was recorded in Germany only in 0.9% of the tortrix larvae (FRANZ and HUGER, 1971) while in Poland it was observed in 30% of larvae (LIPA and MADZIARA- BORUSIEWICZ, 1976).

The course of the diseases epizootic in the green tortrix populations in Putignano resembles the situation recorded in Germany in respect to high incidence of *Nosema tortricis* infection, and in Poland, in respect to *Octosporea viridana* infection. However, an interesting feature of the collapse of the green

tortrix population in Putignano is the presence and role of *Entomophthora* sp. Infection, for the first time reported in the literature. The role of nuclear polyhedrosis virus, in the decreasing the green tortrix population in Putignano remains so far unclear. The 6.7 level of infection may indicate that the virus epizootic is already over or that is just starting. Further monitoring of the health status of the green tortrix in Italy will allow to collect additional information.

SUMMARY

In the population of the green tortrix (*Tortrix viridana* L.), showing drastic decrease of density in southern Italy, two microsporidian, one fungus, and one virus were isolated and identified. It is assumed that *Nosema tortricis* Weiser infecting 40.0% of larvae, and *Octosporea viridana* Weiser infecting 22.3% of larvae, are responsible for the collapse of the green tortrix population. The fungus *Entomophthora* sp. is for the first time reported as causing an epizootic in the population of *T. viridana*.

RIASSUNTO

Larve moribonde e morte di *Tortrix viridana* raccolte nel bosco comunale di Putignano (Puglia) denotarono all'esame microscopico la presenza nei loro tessuti di due protozoi microsporidi, un fungo (*Entomophthora* sp.) e un virus. Dei microsporidi il *Nosema tortricis* Weiser era presente nel 40% delle larve, mentre l'*Octosporea viridana* Weiser nel 22,3%. L'*Entomophthora* sp., riscontrata nel 15,5% delle larve, deve ritenersi come la prima segnalazione in letteratura quale agente di controllo naturale nelle popolazioni larvali della *T. viridana*.

La presenza di tali microrganismi e di un virus della poliedrosi nucleare rappresentano i fattori di maggior importanza nella riduzione della infestazione del Tortricide nel biotopo oggetto di studio.

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