

Effect of *Heterodera goettingiana* population densities on the yield of pea, broad bean and vetch

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SUMMARY

Three microplot experiments were undertaken in Italy in 1985-1987 to relate yield of pea, broad bean and vetch to population densities of *Heterodera goettingiana*. The microplots were bottomless square (30 × 30 cm) tubes, 50-cm long. They contained 35 dm³ of soil infested with eggs of *H. goettingiana* at the rate of 0, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256, or 512 eggs/g soil. The microplots were sown to pea (November 22, 1985), broad bean (November 24, 1986) and vetch (November 25, 1986). Plant growth for pea was measured as green pea pods and plant tops, for broad bean as dry beans and plant tops, and for vetch as hay production. *H. goettingiana* was very damaging to pea and broad bean, while vetch was more tolerant. Tolerance limits (*T*) were 0.5, 0.8, and 2.0 eggs/g soil for pea, broad bean and vetch, while minimum yields (*m*) were 0.0, 0.1-0.2, and 0.4, respectively. Yield losses of 20 and 50 % occurred at 3 and 8 eggs/g soil for pea, 5 and 15 eggs/g soil for broad bean, and 20 and 78 eggs/g soil for vetch. Complete crop failure occurred at 32 and 64 eggs/g soil for pea and broad bean, respectively.

RÉSUMÉ

Effet du taux de population d'Heterodera goettingiana sur la récolte de pois, fève et vesce

Trois expérimentations en microparcelles ont été effectuées en Italie en 1985-1987 pour connaître les relations entre la valeur de la récolte de pois, fève et vesce et la densité des populations d'*Heterodera goettingiana*. Ces microparcelles consistaient en tubes carrés (30 × 30 cm), de 50 cm de haut et dépourvus de fond; ils contenaient 35 dm³ de sol infesté avec des œufs de *H. goettingiana* aux taux de 0; 0.25; 0.5; 1; 2; 4; 8; 16; 32; 64; 128; 256 et 512 œufs par gramme de sol. Les microparcelles ont été ensencées

various management options; and to determine the effect of host crops on reproduction of the nematode.

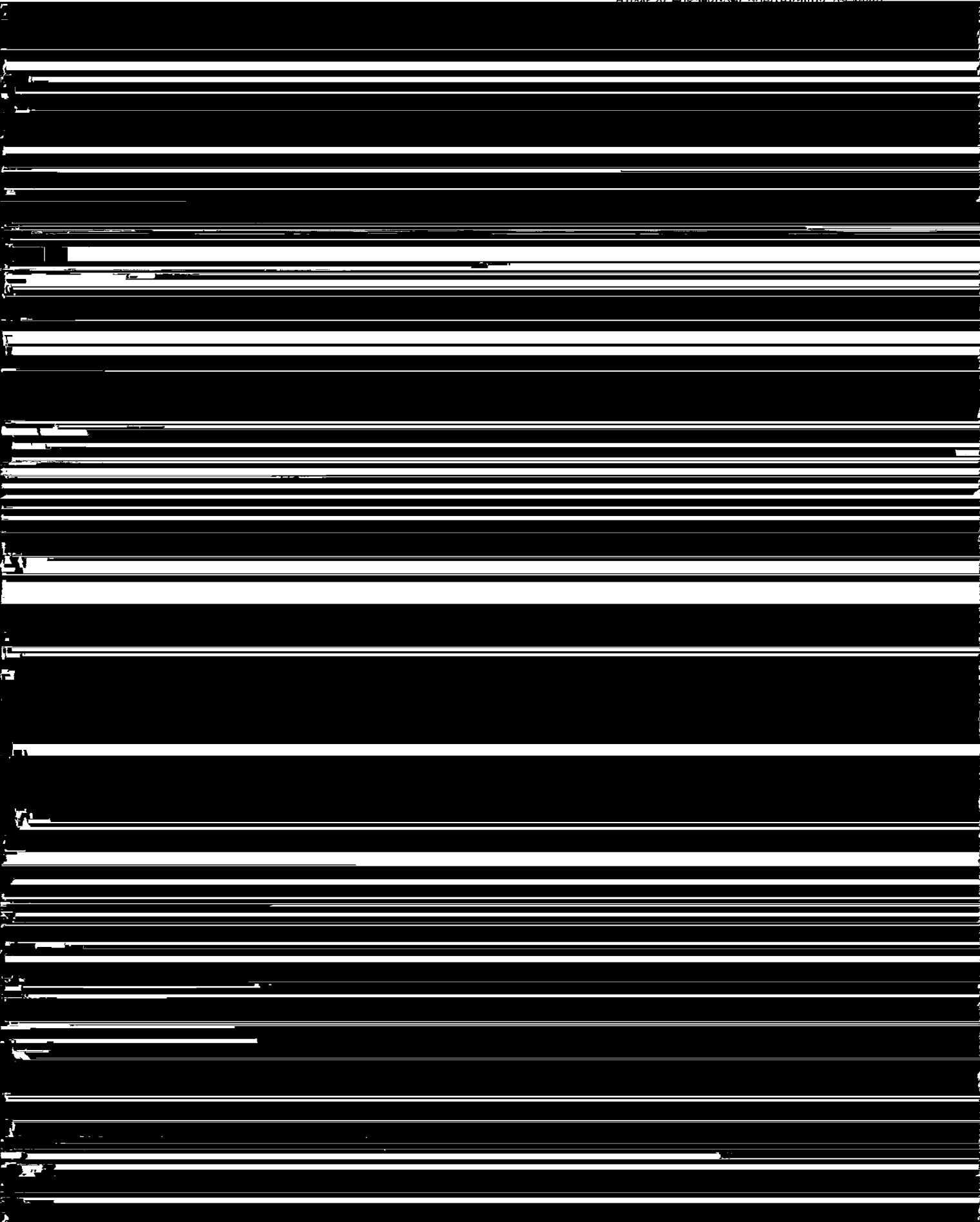
Materials and methods

Experiments were conducted in bottomless concrete tiles, 30 × 30 cm square × 50 cm length. The plots were sunk into the ground so that 5 cm remained above the surface. They were arranged in ten randomized blocks of fourteen microplots each in a field in Bari (southern Italy).

The microplots were filled with red mediterranean soil (37.5 % clay, 32.0 % sand, 30.5 % silt and 2.3 % organic matter, with a pH of 7.8) from a field that had been fumigated with methyl bromide four months previously and that was not infested with *H. goettingiana*. Twenty

4091 ± 98 eggs/g soil. The inoculum was mixed into the soil of the microplots on November 23, 1986, to create a range of population densities : 0, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 and 256 *H. goettingiana* eggs/g soil. Ten microplots were inoculated with 55.5 eggs/g soil and left fallow to determine nematode survival in the absence of a host. The remainder of the microplots were planted with 3.3 g (approx. 55 seeds) of a local vetch variety or three pre-germinated broad bean seeds (cv. Agua dulce), on November 24 and 25, respectively. There were ten replicates of each treatment. Two hundred millilitres of *Rhizobium* suspension were added to each microplot on November 26, and all microplots were lightly irrigated.

CULTURAL DETAILS AND HARVEST PROCEDURES



Minimum yields (*m*) were 0.08, 0.10, 0.12, and 0.23 for dry bean yield, plant-top weight, numbers of seeds and pods per microplot, respectively. Yield losses were 20 % and 50 % at 5 and 15 eggs/g soil, respectively, and there was complete crop failure at ≥ 64 eggs/g soil (Fig. 2).

Symptoms of nematode damage were less evident on

Numbers of eggs/cysts in microplots planted with pea or broad bean did not differ, but there were significantly fewer eggs/cysts in microplots planted with vetch. In general, number of eggs/cyst were lower at population densities of ≤ 1 or ≤ 0.5 eggs/g soil on peas and broad beans, respectively, than also declined at initial popula-

lution density of *H. goettingiana*. Later, Winfield (1965)

Lamberti (1980) indicate that, under the same condi-

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