Sensitivity of *Ditylenchus dipsaci* to fluopyram

Sugar beet stem nematode is a soil-borne pest affecting 5% of the Swiss sugar beet area. The nematode colonizes sugar beet roots and leads to serious rotting symptoms and major yield losses. Crop rotation prevents pest appearance in the field. However, once in the field, no cultivation techniques are able to reduce the *D. dipsaci* population in the soil. As of 2016, no nematicide is authorized to control sugar beet stem nematode in Switzerland. However, fluopyram, a SDHI fungicide, is known to possess nematicide properties against other nematode species. This study, undertaken as a master thesis, therefore aims to determine the influence of fluopyram on *D. dipsaci* population development.

The study was conducted with in vitro, in situ and field experiments. In the motility bioassay, a 72-hr EC_{50} value of 4.12 µg/ml fluopyram was calculated for immotile *D. dipsaci*. Twenty-four hours after being rinsed and removed from 72-hr continuous exposure to fluopyram, the EC_{50} value decreased to 3.31 µg/ml a.i, suggesting no nematode recovery. *D. dipsaci* infectivity, observed in seedling-stage laboratory experiments, was lower with post-sowing fluopyram application compared to at-sowing application. However, *D. dipsaci* infectivity was reduced only at high a.i. concentrations (10 µg/ml) and with post-sowing application. Conversely, field experiments showed a positive effect of fluopyram at reducing *D. dipsaci* infectivity, independently of time of application. Nematode inoculation through the leaf axil in laboratory experiments might explain the poor efficacy of fluopyram. Greenhouse experiments confirmed the poor nematicide effect of fluopyram observed in laboratory conditions, showing no reduction of *D. dipsaci* population development in sugar beet treated with fluopyram. In the field, despite a reduction of *D. dipsaci* infectivity in spring, fluopyram was not effective at reducing *D. dipsaci* population development until harvest. *D. dipsaci* density in plant and in soil at harvest increased significantly. In field conditions, fluopyram was effective at reducing rotting severity, a symptom caused by *D. dipsaci* infection. In greenhouse conditions, *D. dipsaci* pressure was higher and no fungicide effect of fluopyram was observed. Cultivar selection also reduced rotting severity.

Thus, based on results obtained in the four experiments, fluopyram may influence *D. dipsaci*. However, its effect is not sufficient to control the development of *D. dipsaci* in the long term. Although fluopyram is effective at reducing *D. dipsaci* infectivity and rotting symptoms, the extremely high reproduction capacity of *D. dipsaci* inhibits long-term successful control of the sugar beet stem nematode in highly infested fields.

Key words: fluopyram, *Ditylenchus dipsaci*, nematicide, sugar beet, population development