

# Effect of *Gliocladium catenulatum* J1446 to the respiration rate of the bumble bee *Bombus terrestris*



R. Muljar, M. Mänd

Department of Plant Protection, Estonian University of Life Sciences, Tartu 51014, Estonia, e-mail: riin.muljar@emu.ee

## INTRODUCTION

- Increasing use of agrochemicals has led to pesticide residues in food and environment, it has caused resistance problems in the control of many plant pests and diseases.
- An alternative to chemical spraying is to use bees to disperse biological control agents, however, the effects of such biocontrol agents to bumble bees, which are important pollinators in agricultural and natural ecosystems, are relatively little studied.
- Prestop Mix is a biofungicide that contains spores of the naturally occurring parasitic fungus *Gliocladium catenulatum* J1446, which is also approved for organic production.
- There is no information about the effects of *G. catenulatum* to the respiratory system of bees, which is one of the most vulnerable targets of most contemporary pesticides.

**AIM OF THE STUDY:** Conduct laboratory experiments to test the effect of Prestop Mix on the respiration rate of bumble bees, since there is no data about the safety of *G. catenulatum* to the gas exchange of bees.

## METHODS

- Laboratory experiments were conducted with commercially produced bumble bees (Koppert Biological Systems).
- Oral test:** bumble bee colonies were fed for three weeks:
  - Test bumble bees with pollen and a mix of sugar solution and the Prestop Mix preparation (7,5 g L<sup>-1</sup>).
  - Control bumble bees with pollen and sugar solution only.
- Contact test:**
  - Test bumble bees were dusted with the Prestop Mix preparation powder (0,05 g per bee).
  - Control bumble bees were untreated.
- Infrared gas analyser (Infralyt-4, VEB, Junkalor, Dessau) was used to measure the respiration rate of the test and control bees by recording the amount of CO<sub>2</sub> release (VCO<sub>2</sub> ml h<sup>-1</sup>).

## RESULTS

### Oral test

Feeding bumble bees with the Prestop Mix preparation had no effect on the respiration rate of treated bumble bees ( $F_{(1;56)}=0,004$ ;  $p=0,95$ ) (Fig.1).

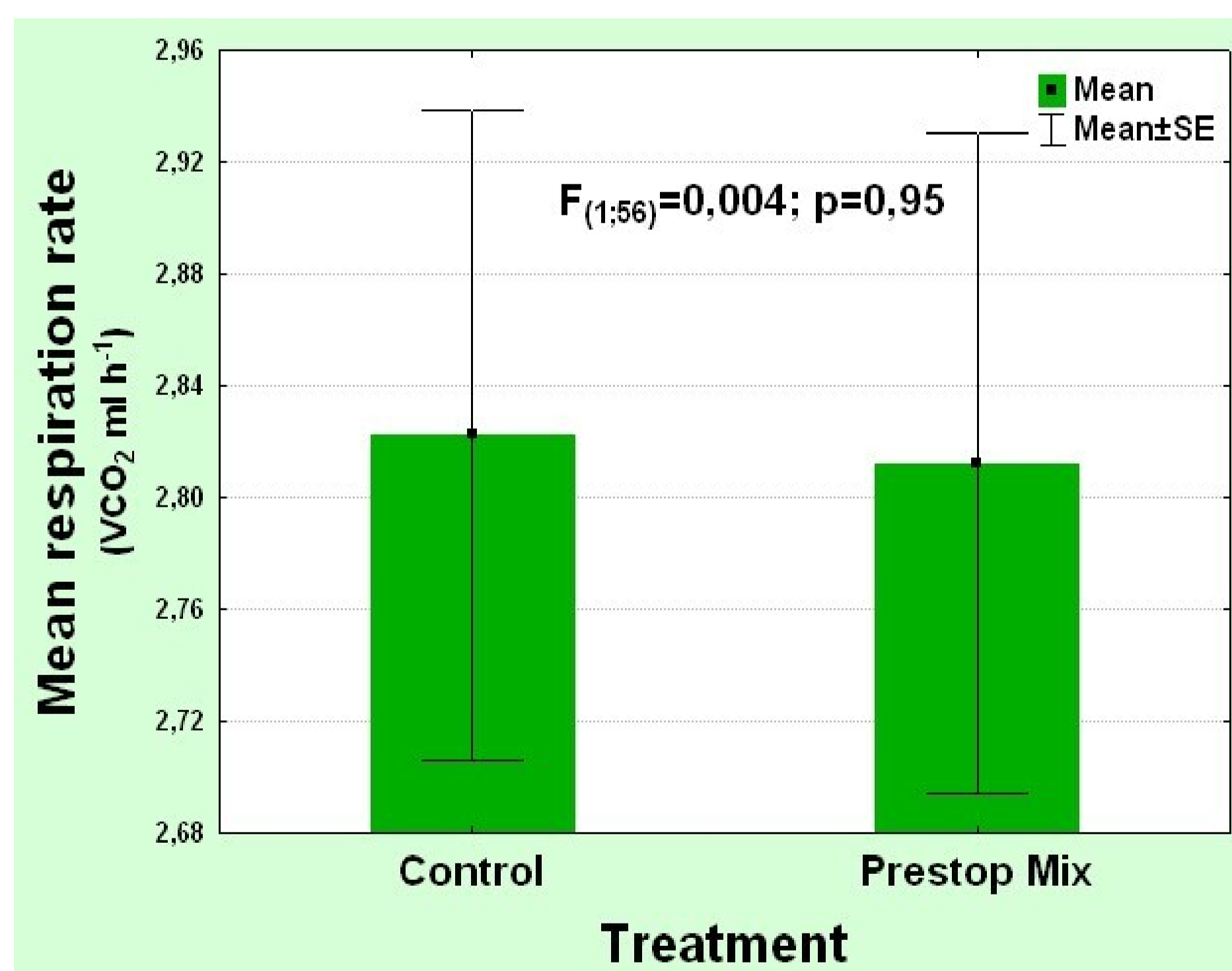


Fig.1. Mean respiration rate of untreated and treated bumble bees after feeding of Prestop Mix.

### Contact test

Dusting bumble bees with the Prestop Mix Powder lowered somewhat the respiration rate of treated bees, but no significant effect was found ( $F_{(1;43)}=2,51$ ;  $p=0,12$ ) (Fig.2).

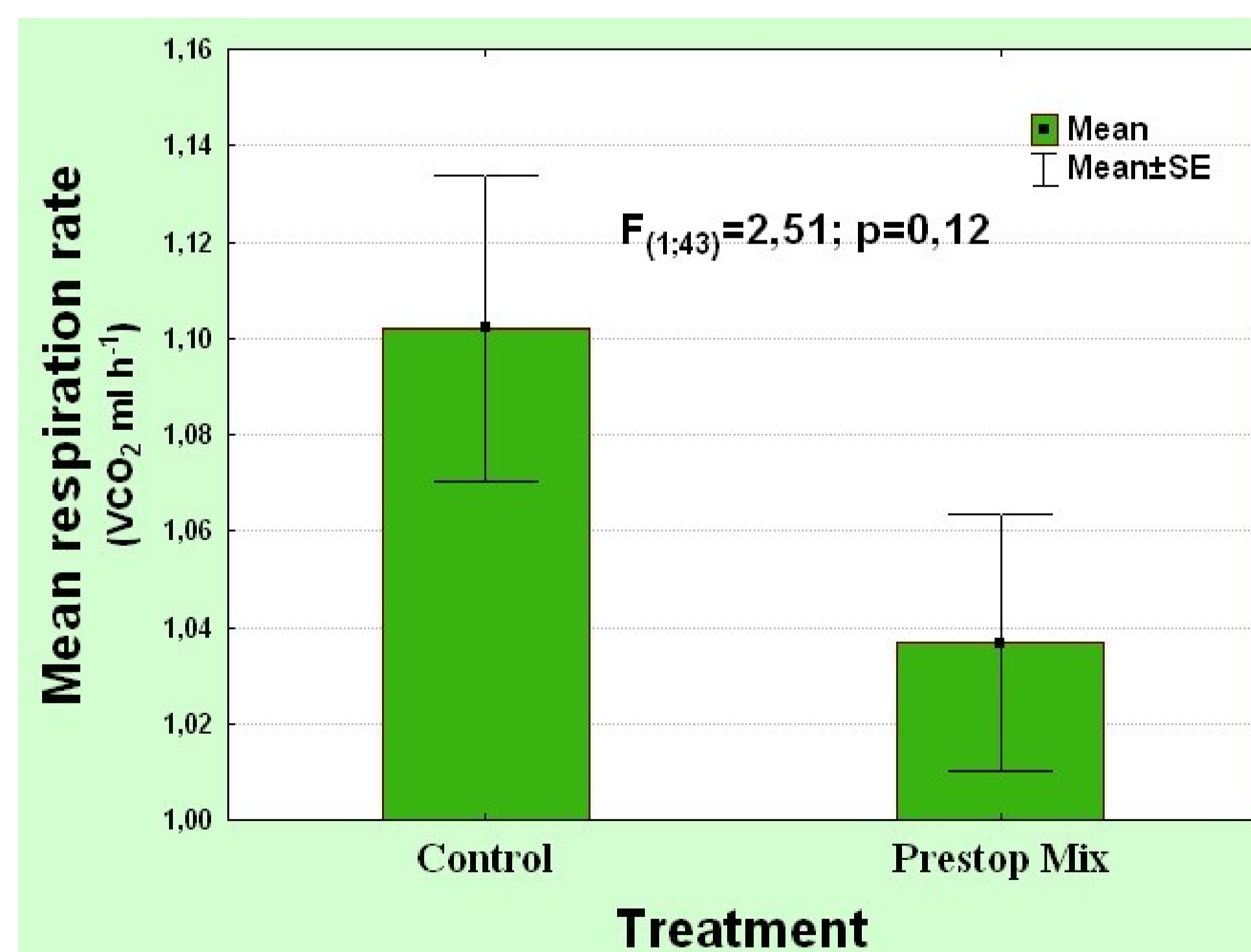


Fig.2. Mean respiration rate of untreated and treated bumble bees after contact with Prestop Mix.

## CONCLUSIONS

- Neither oral or contact treatment with biopesticide Prestop Mix, which contains the spores of *Gliocladium catenulatum* J1446, significantly affected the respiration of bumble bees, therefore *G. catenulatum* J144 doesn't seem to have any toxic effect on the respiration rate of bumble bees.
- Also in previous studies no negative impact of Prestop Mix to bumble bee reproduction and foraging behaviour has been found (Mommaerts *et al*, 2009), therefore we conclude that *Gliocladium catenulatum* J144 can be considered relatively safe when using around bumble bees.