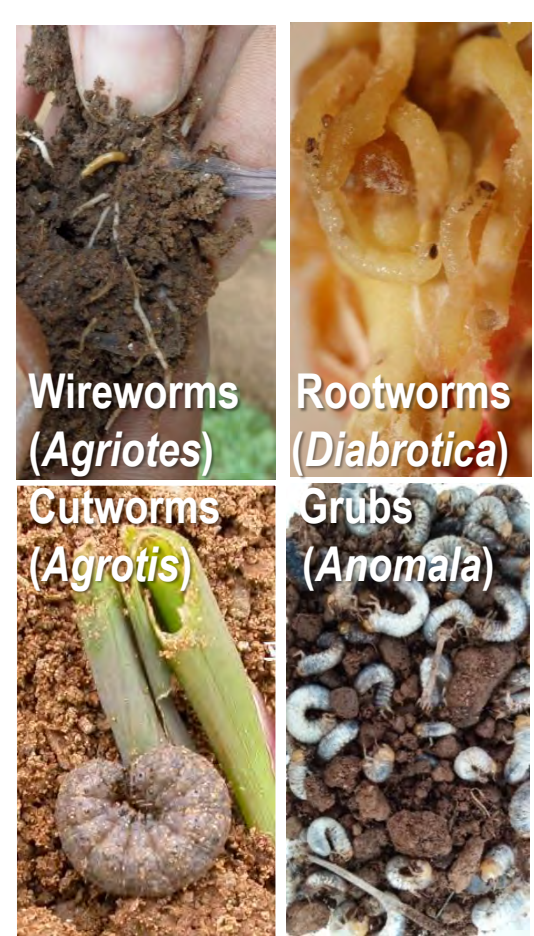


Application techniques for beneficial nematodes against soil insect pests in maize

Stefan Toepfer, CABI, Hodmezovasarhely, Hungary; s.toepfer@cabi.org + Chinese Ministry of Agriculture - CABI Joint Laboratory for Biosafety, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing; China
Michael Zellner, Bavaria State Research Centre for Agriculture, Freising, Germany; michael.zellner@lfl.bayern.de

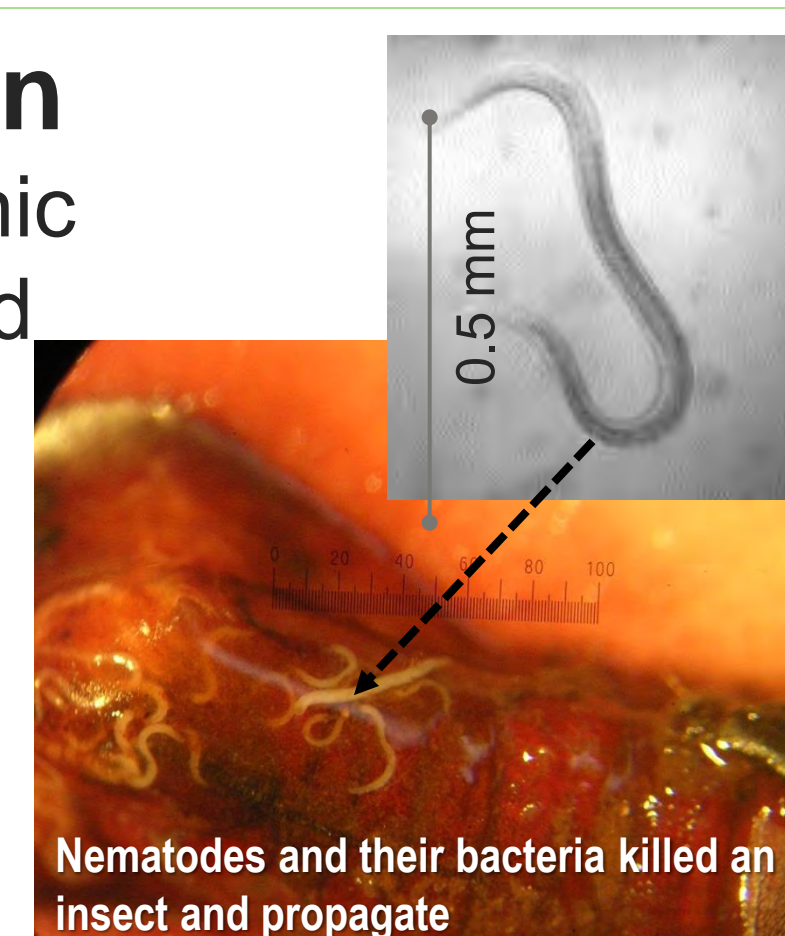
The problem

Soil insects such as wireworms, grubs, cutworms or rootworms cause major crop losses as they are difficult to control. Many soil insecticides are either/or highly toxic to humans, have serious other non-target effects, or are banned from use.



The potential solution

Beneficial, entomopathogenic nematodes are well-adapted to the soil and non-toxic. They kill insects and can proliferate in them. Many nematode products are available, but their use at field scale is still limited.



What we did

During 5 years, application techniques for beneficial nematodes were developed for field crops like maize; being practical and using grower machinery, as well as being effective at such a scale at reasonable costs.



Application techniques

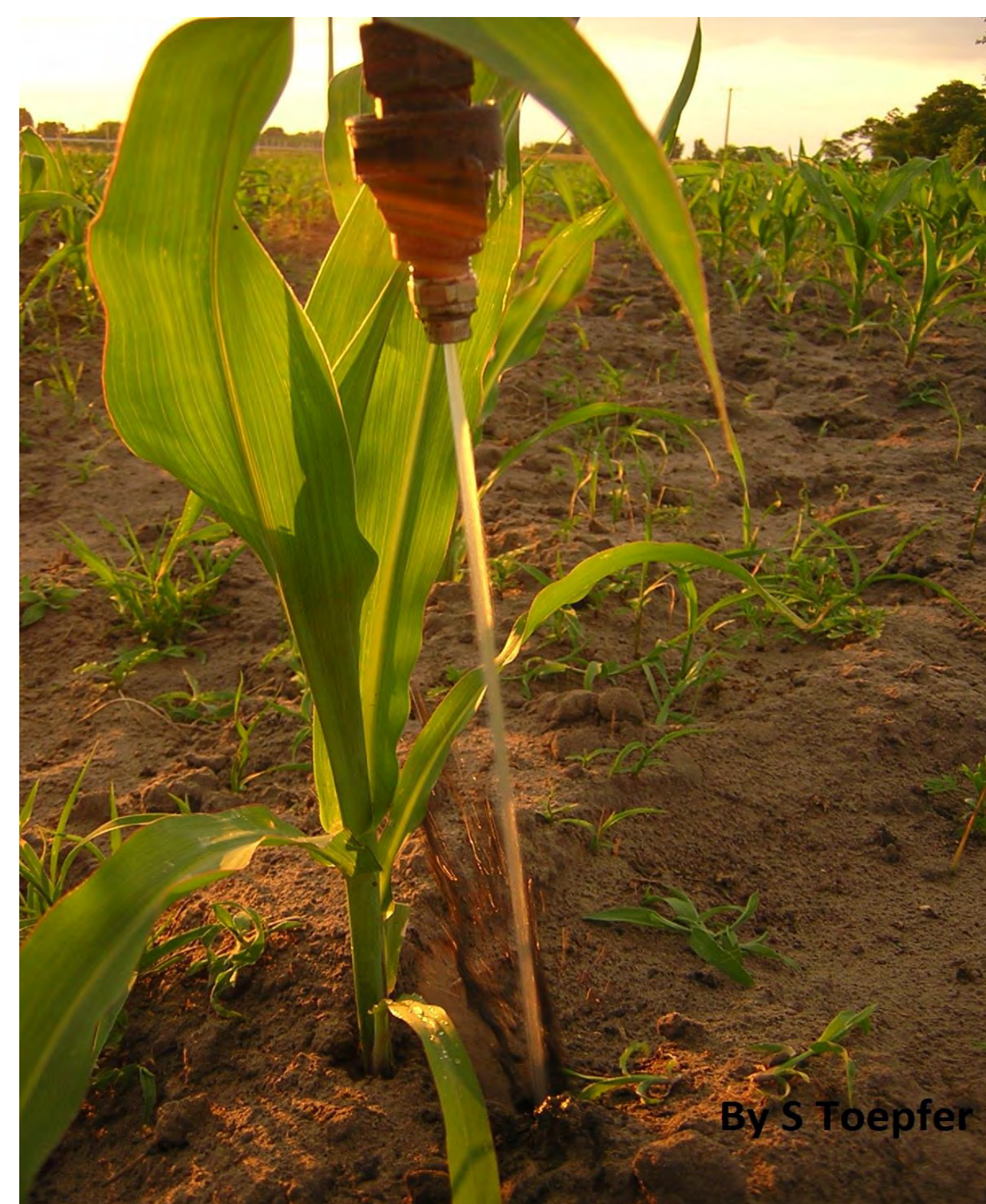
Nematode fluid into soil

- into soil together with sowing or with mechanical weed control
- most used and validated technique in field crops
- all-in-one drive approach
- nematodes placed into moist areas of soil, thus only 200 to 500 litre water /ha needed



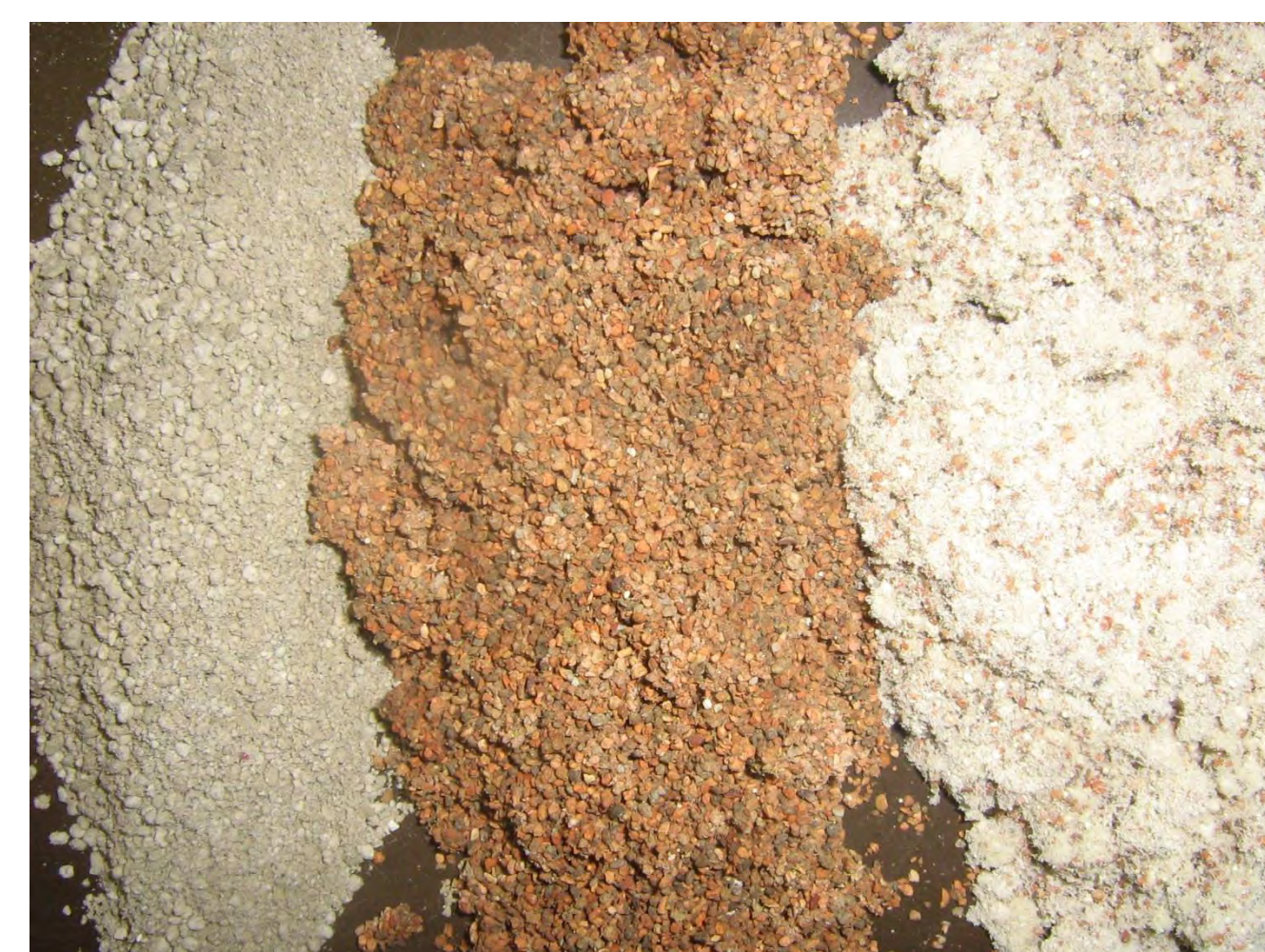
Nematode fluid onto soil

- onto soil usually prior period when pest larvae start to damage roots
- stream spray instead of flat spray needed to allow well-moisturising soil surface so that nematodes can move into deeper moist soil
- extra drive needed
- 1000 to 2000 litre water /ha



Nematode granules into soil

- into soil together with sowing
- normal granule applicators used
- all-in-one drive approach
- nematodes placed into moist areas of soil; no water needed
- express shipments of the heavy and moist granule product costly
- further R & D needed



Nematode seed coating

- into soil together with sowing
- no water needed
- all-in-one drive approach
- coating with living nematodes only possible directly prior seeding
- storage of moist coating on dry seeds not possible
- further R & D needed



Take home message

The easiest and currently most promising technique against soil pests in maize is the fluid stream spray of a nematode-water suspension into soil at the moment of sowing or during mechanical weed control. Sowing machines are used that have simple fluid applicators that spray nematodes behind the sowing or press wheel into the furrow prior the soil-closing wheels. Farmers may adapt their equipment for fluid soil insecticides, or may use nematode-specific application tools. This allows reducing the nematode dose to between 2 and 3 x 10⁹ nematodes per hectare, and thus the costs of this control technique.

acknowledgements: This work was possible due to the hospitality and technical support of the Plant Protection Directorate of Csongrad County in Hodmezovasarhely in Hungary. Field space and machinery was provided by the Cereal Research Station GK. We thank Rajmond Stuber, Ferenc Koncz, Ferenc Kiraly, Andor Kiss for their help in field work. This study was funded by German tax payers via the Bavarian State Ministry of Food, Agriculture and Forestry StMELF through the Bavaria State Research Centre for Agriculture in Freising, Germany.