Effect of Evaluation Method on Efficacy of Fungicides for Managing Phytophthora Crown and Root Rot on Peppers

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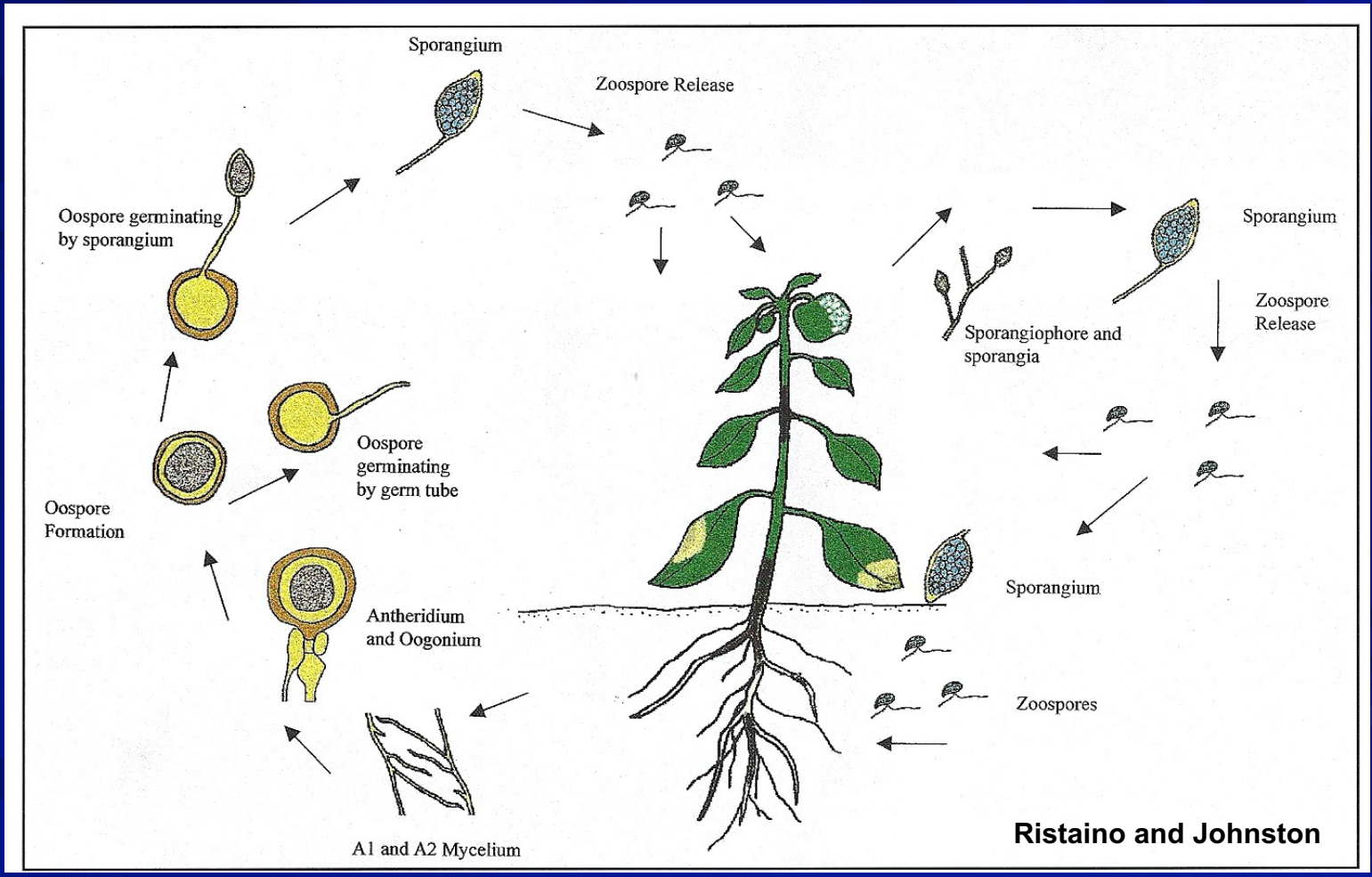
Phytophthora root and crown rot on peppers

Disease cycle for *Phytophthora capsici* on pepper



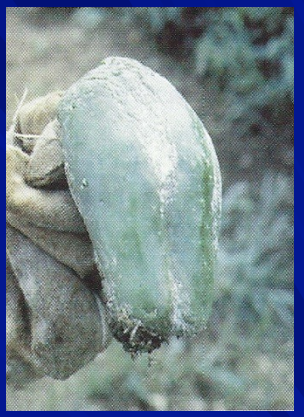
Disease cycle for *P. capsici* on pepper

Leaf lesions

Stem lesion

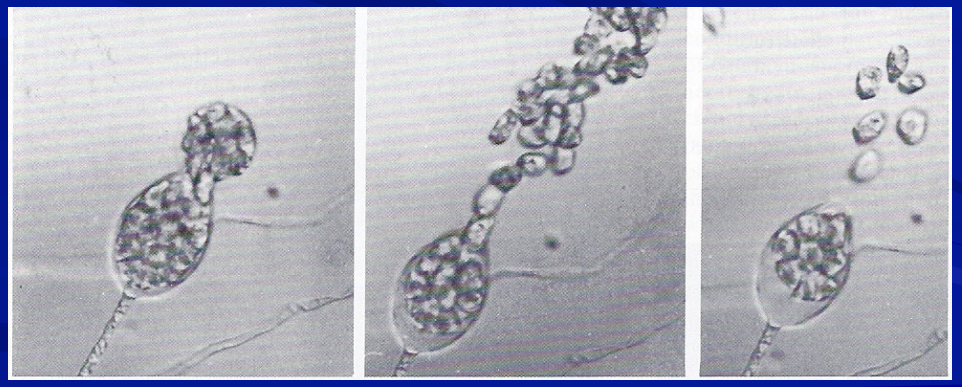
Root and crown rot

Fruit rot



Oospore

Oospore produces sporangium



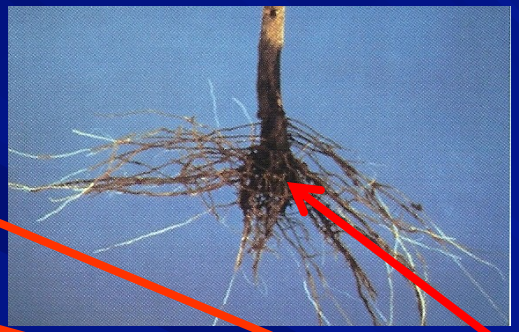
Zoospores develop in sporangium and are released

Disease cycle for *P. capsici* on pepper

Leaf lesions

Stem lesion

Root and crown rot



Fruit rot

Oospore

Oospore produces sporangium

Zoospores develop in sporangium and are released

Fungicide efficacy trials

- Inoculation of pepper plant stems with *P. capsici*
  - Fungicides applied to foliage and stems
- Soil infestation with *P. capsici* for plants grown in pots in the greenhouse
  - Fungicides applied by soil drench
- Soil infestation with *P. capsici* for plants seeded and grown in the field
  - Fungicides applied to soil surface and base of plants

Fungicides evaluated

Product trade name (Source)	FRAC number	Active ingredient
Actigard (Syngenta)	P	Acibenzolar-S-methyl
Aliette (Bayer)	33	Fosetyl-Al
Forum (BASF)	40	Dimethomorph
Omega (Syngenta)	29	Fluazinam
Presidio (Valent)	43	Fluopicolide
Previcur Flex (Bayer)	28	Propamocarb
Ranman (FMC)	21	Cyazofamid
Reason (Bayer)	11	Fenamidone
Ridomil Gold (Syngenta)	4	Mefenoxam
Revus (Syngenta)	40	Mandipropamid

Protocol for pepper stem inoculation

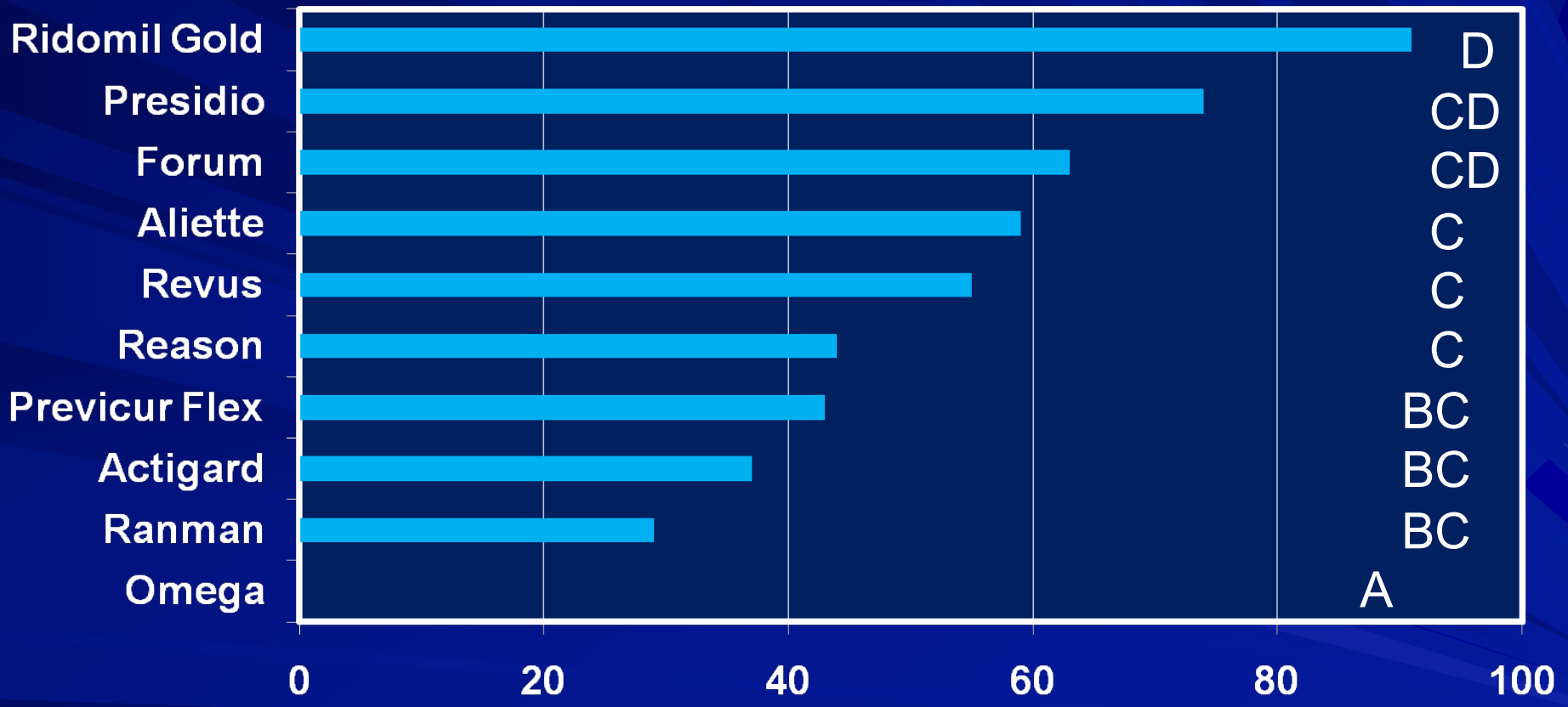
- 4-month-old chile pepper plants used in this trial
- A circular area of epidermis removed from stem with a 5-mm diameter cork borer about 8 cm from potting mix surface
- Plant foliage and stem submerged for 2 seconds in a test fungicide solution, then laid horizontally on paper towel until dry

Protocol for pepper stem inoculation (continued)

- Plants maintained in lath house for 7 days, then inoculated with a 5-mm-diameter agar disk containing mycelium of *P. capsici*, which was held in place with plastic tape
- 7 days after incubation at 27°C, the length of resultant stem cankers was recorded

Suppression of stem canker growth

2009 Growth chamber trials



Mean length of canker on untreated stems was 99 mm

Greenhouse studies - 2009

- 2-month-old pepper plants transplanted into 500 ml capacity pots containing potting mix infested with *P. capsici*
- Tested products applied as a soil drench in 200 ml of water per pot
  - At transplanting and 14, 28 and 42 days later

Greenhouse studies - 2009 (continued)

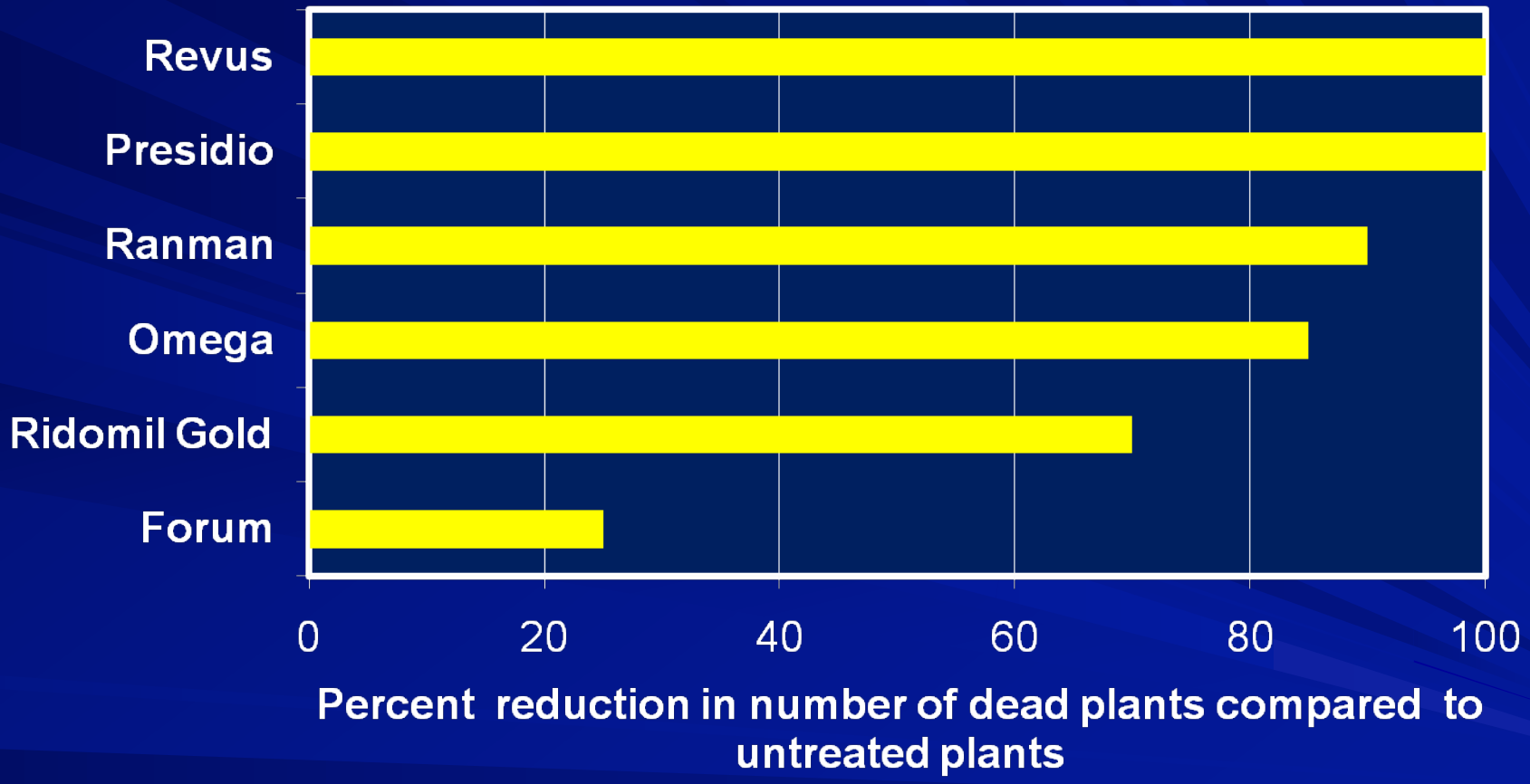
- Each pot was placed in a shallow container (4 cm deep), which was filled with water daily
- Plants maintained in greenhouse for about 2 months
- 10 replicate plants per treatment for each of 2 trials

Greenhouse studies

- The following data were collected either during or at the end of the experiment
  - **Duration of plant survival**
  - **Fresh weight of plant shoots**
  - **Incidence of crown rot**
  - **Final plant mortality**

Suppression of root and crown infection

2009 Greenhouse trials



All nontreated plants were dead by 3 weeks after beginning of trial

Inoculated field trials

- Chile pepper seed planted early April in a single row on beds 106 cm apart, then thinned to a 30 cm spacing (at UA Yuma Agricultural Center)
- Each treatment consisted of five replicate plots, each 4.6 m long
- Inoculated plots each received 150 cm^3 of vermiculite infested with *P. capsici*, placed 5 cm deep and 8 cm from plant stems in late June
- Tested products applied to soil and base of plants as a drench in 750 ml of water per 15-plant plot when inoculated and 14, 28, and 42 days later

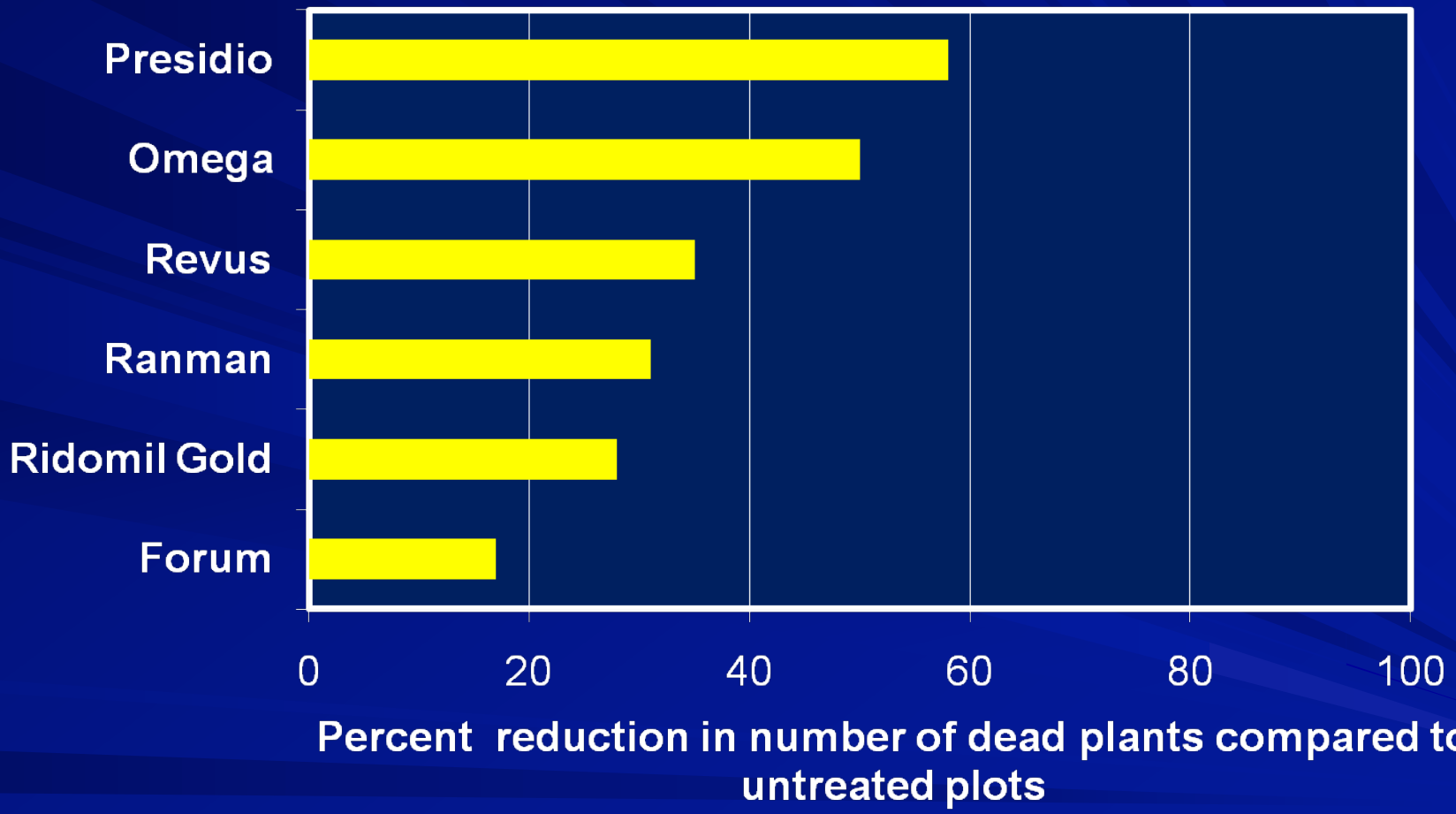
Inoculated field trials

- Pepper plants were generously irrigated weekly

- Final disease incidence recorded in late September by counting the number of dead plants in each plot

Suppression of root and crown infection

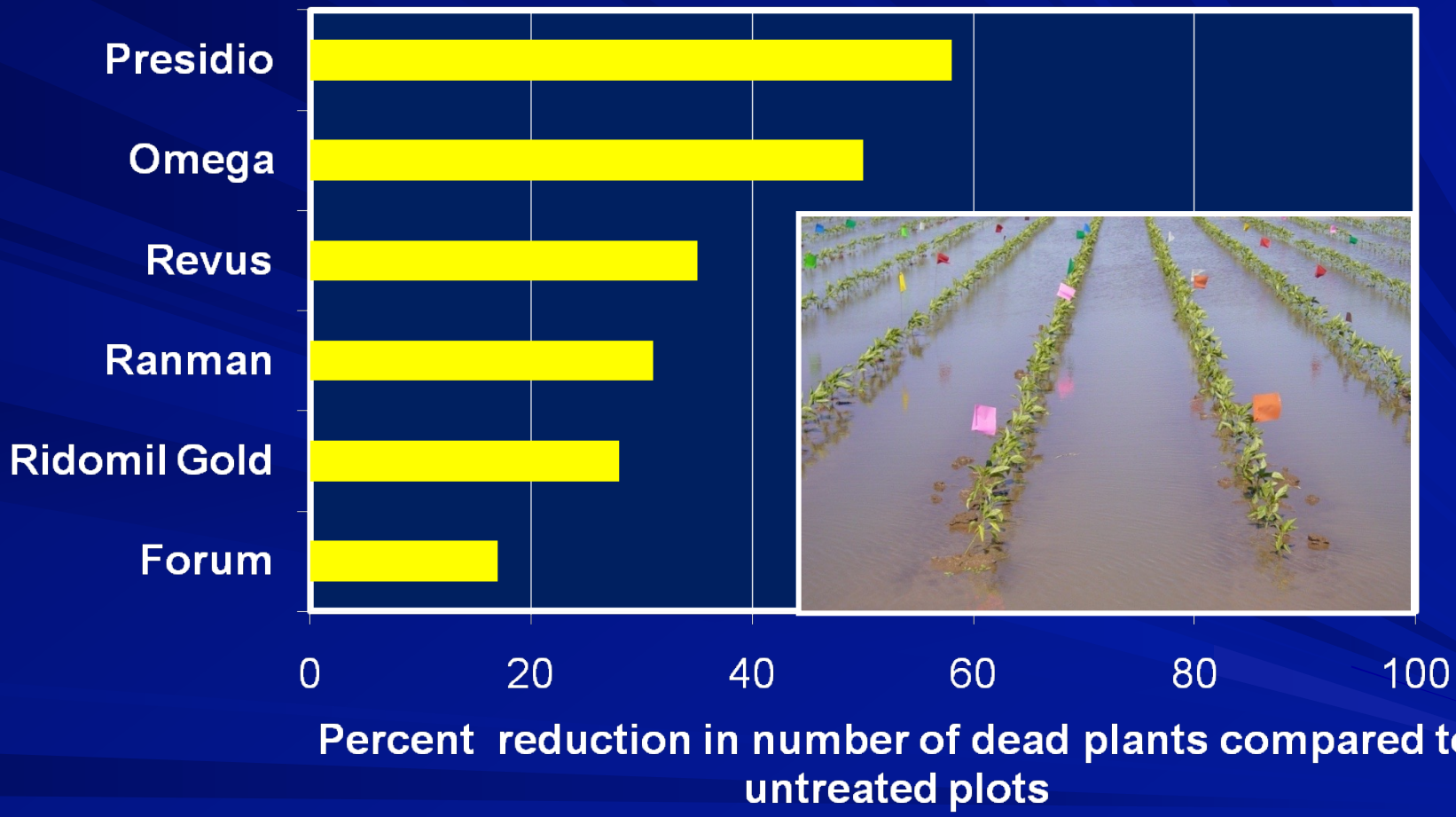
Summary of three field trials



Mean percentage of untreated plants that died per plot was 53%

Suppression of root and crown infection

Summary of three field trials



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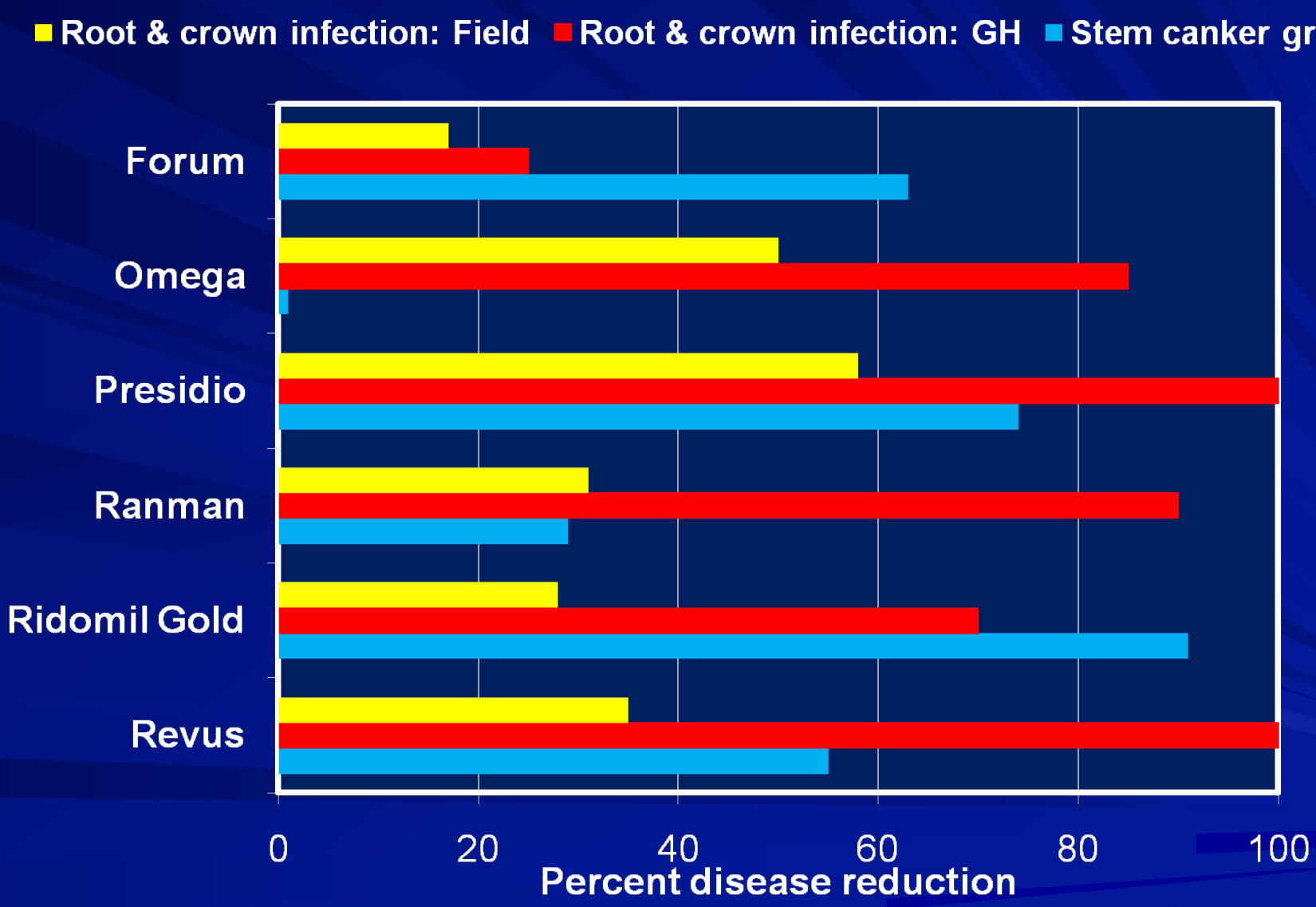
Fungicide efficacy from different trials



Possible reasons for differences in fungicide efficacy among experiments

- Omega is known to be a weak inhibitor of mycelial growth (stem inoculation), but very active against sporangia and zoospores (soil application)
- Generally higher disease control observed in greenhouse compared to field trials
  - More thorough incorporation of fungicides within soil in a pot compared to application to soil in the field

Canyon de Chelly

Arizona Highways