



Field and postharvest management of avocado fruit diseases

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Field and postharvest management of avocado fruit diseases

- Surveys have consistently identified postharvest disease (anthracnose and stem-end rot) as one of the major quality defects of avocado fruit displayed for retail sale
- In “Hass” fruit, these diseases can be difficult for retailers and consumers to detect due to the black skin of ripe fruit. The thick skin of “Hass” also makes it difficult to determine optimum ripeness



Field and postharvest management of avocado fruit diseases

- Increasing restrictions on pesticide use due to environmental and food safety concerns is another issue facing the avocado industry
- Preharvest application of copper-based fungicides
- Postharvest application of prochloraz

Causal agents of avocado fruit diseases



- In Australia, anthracnose is predominantly caused by the fungus *Colletotrichum gloeosporioides*. *C. acutatum* is a minor causal agent
- Initial stages of infection by *C.g.* occur in the field on unripe fruit. Infections remain quiescent until fruit ripening



- Biochemical changes which occur during fruit ripening are thought to be the primary trigger for allowing quiescence to “break”
- In particular, changes in the concentration of antifungal compounds called “dienes” are thought to be important in the regulation of anthracnose quiescence
- In unripe avocado fruit, diene levels in the fruit skin are high enough to stop the fungus from invading cells. During ripening diene levels fall, allowing the fungus to invade

Causal agents of avocado fruit diseases



- Stem-end rot can be caused by a number of different fungi including *Dothiorella* spp., *Lasiodiplodia theobromae* and *Phomopsis perseae*
- The anthracnose pathogen *C.g.* can also cause a stem-end rot of avocado fruit
- The stem-end rot infection process has not been clearly established

Causal agents of avocado fruit diseases



- Pepper spot: a field disease that has been increasing in importance over the past decade
- Caused by the anthracnose pathogen *C.g.*
- Symptoms superficial, but downgrade fruit
- Common in the cultivar Hass
- Affects fruit as well as stem tissue
- Often most severe on the upper sun-exposed side of fruit
- More common on stressed trees (eg. root rot)

Causal agents of avocado fruit diseases



- Sooty blotch: a field disease of avocado recently shown to be caused by the fungus *Stomiopeltis* sp. in Australia
- Symptoms superficial, but downgrade fruit
- Readily controlled by the copper spray program for anthracnose

Management of avocado fruit diseases



Maintenance of healthy avocado trees

- Nutrition - the role of calcium and nitrogen
- Rootstock - interaction with nutrition and antifungal compounds
- Tree hygiene - reduction of canopy density through pruning and removal of dead wood, leaves and infected fruit from tree canopies

Management of avocado fruit diseases



Fungicide application

- Copper-based fungicides applied from fruit set to harvest for anthracnose control
- This spray program will also control sooty blotch and pepper spot as well as give some control of stem-end rot

Management of avocado fruit diseases



Fungicide application

- The copper spray program must be applied every 28 days (or every 14 days during wet weather) in order to be effective, and is therefore a very labour intensive and costly practice

Management of avocado fruit diseases



Fungicide application

- The presence of visible copper residues on fruit can be a problem, particularly in Hass
- We are currently testing new formulations (eg. Kocide^R Blue, Kocide^R Liquid Blue and Liquicop^R) for visible residues, disease control efficacy and phytotoxicity

Management of avocado fruit diseases



Fungicide application

- Currently the fungicide prochloraz (Sportak^R) is applied postharvest
- Prochloraz has some curative activity against *C.g.* (anthracnose) infections
- Not effective against the stem-end rot pathogens

Management of avocado fruit diseases



Manipulation of the postharvest storage environment

- Avoidance of high ripening temperatures
- Controlled ripening using ethylene
- Prompt marketing of fruit

New compounds for disease control: the strobilurin fungicides



- Strobilurin fungicides synthesised from a natural compound (strobilurin A) isolated from a mushroom
- The strobilurins have been described as environmentally benign as they are active at low concentrations, have low toxicity to mammals and bees, are non-persistent in the environment and breakdown readily in the soil

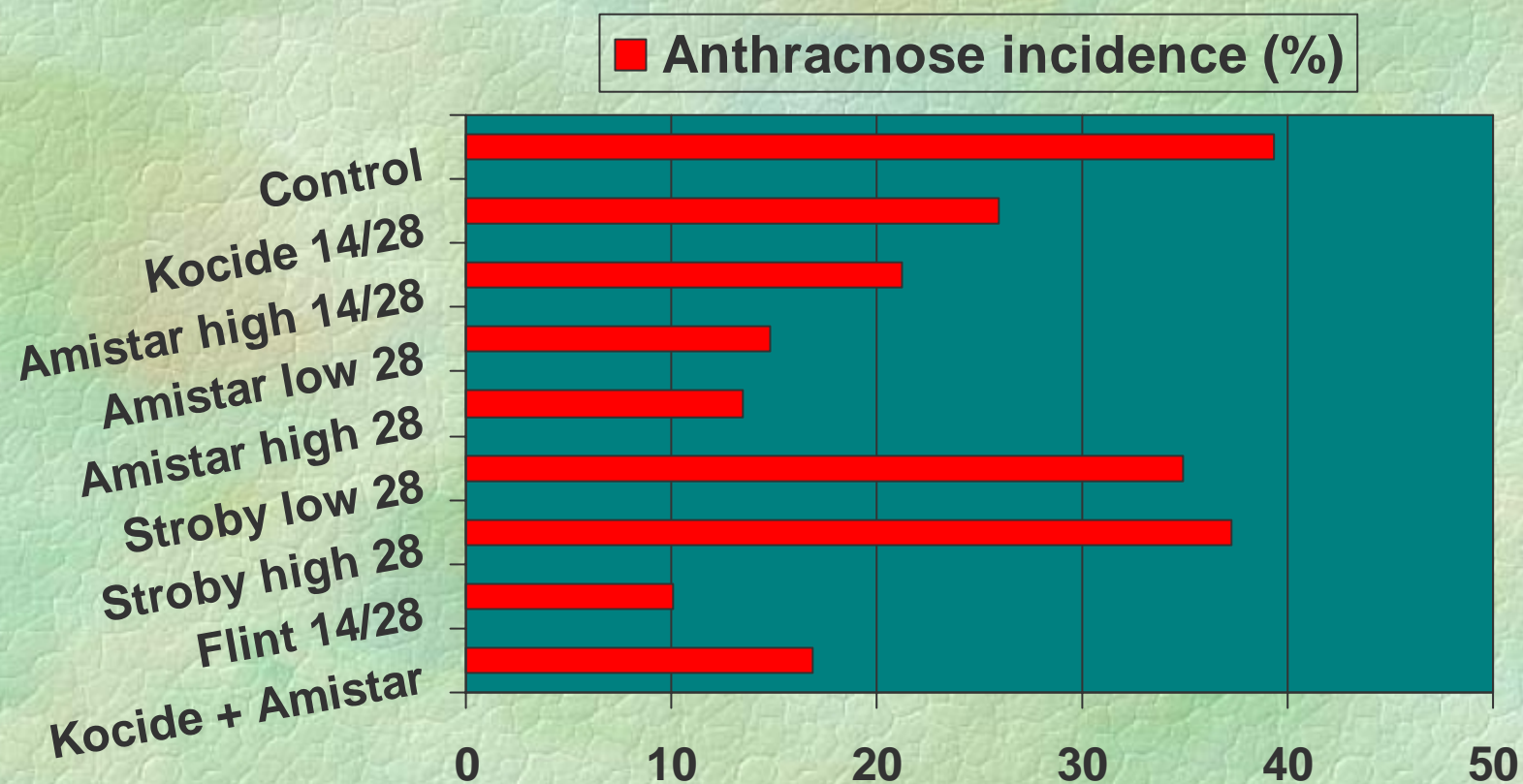
New compounds for disease control: the strobilurin fungicides



- Classified as “reduced-risk” fungicides
- Broad spectrum activity
- In 1997 Zeneca released Amistar^R (azoxystrobin) and BASF released Stroby^R (kresoxim-methyl). Soon after, Novartis released Flint^R (trifloxystrobin)

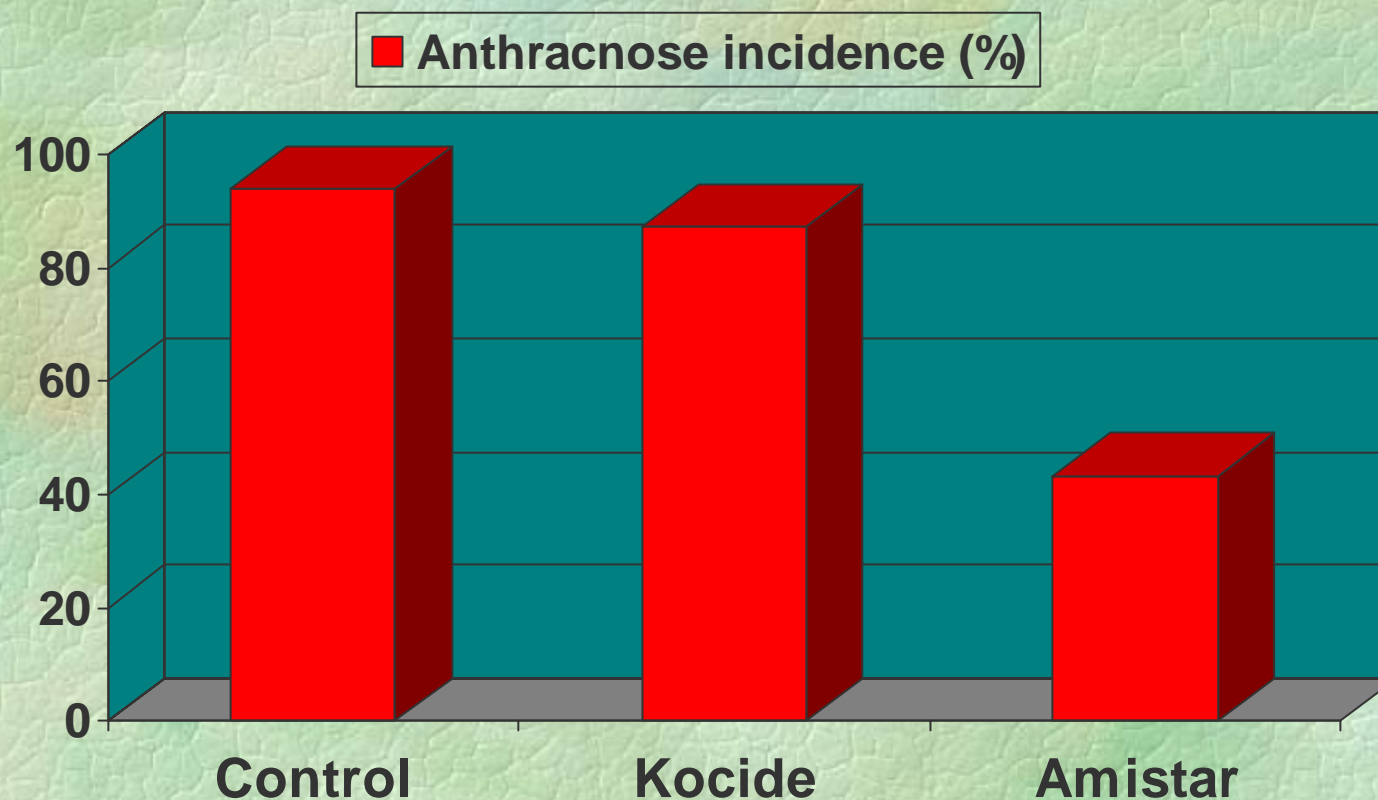


Effect of strobilurin fungicide foliar sprays on anthracnose in “Hass” avocado



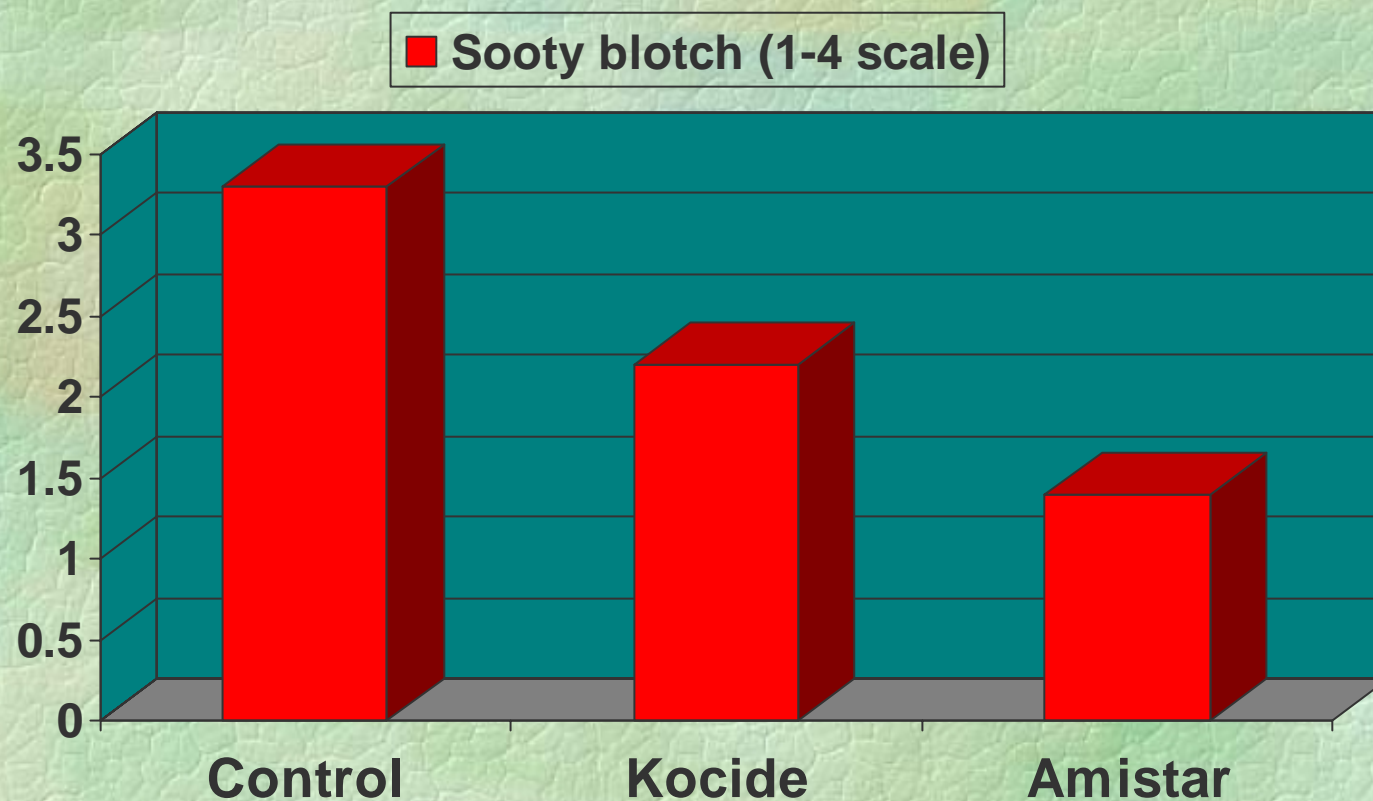


Effect of Amistar foliar sprays on anthracnose in “Fuerte” avocado





Effect of Amistar foliar sprays on sooty blotch in “Fuerte” avocado





Anti-resistance strategies for the strobilurin fungicides

- Limit use
 - only one third of the total number of fungicides applied in one season should be strobilurins
 - strobilurins should be blocked with other fungicides

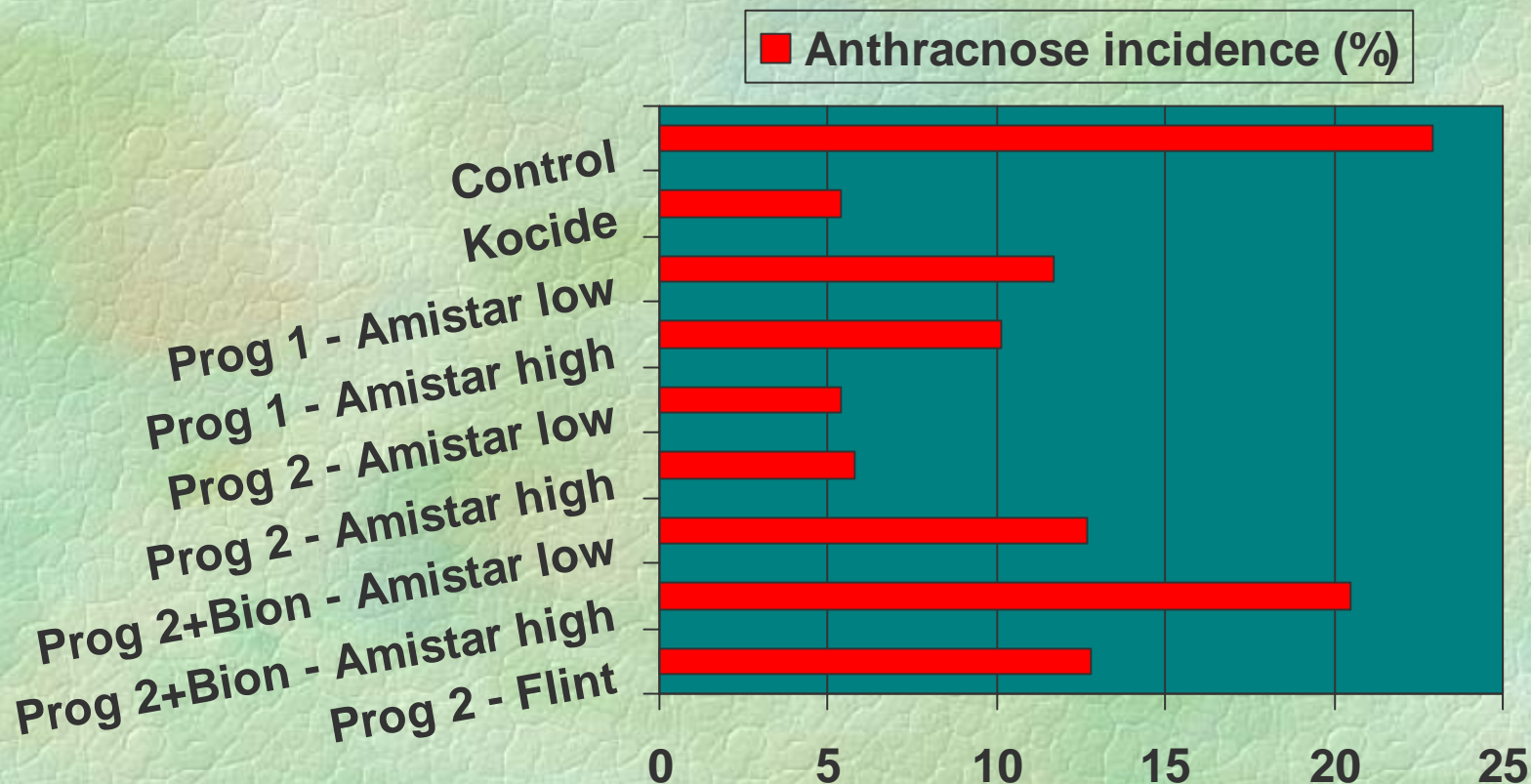


Anti-resistance strategies for the strobilurin fungicides

- Monitor fungal populations for sensitivity to the fungicides
 - before using strobilurins (baseline sensitivity data)
 - during use of strobilurins to check for any shifts in sensitivity
- Strobilurin fungicides should not be used in any way until these strategies are in place and the compounds registered by the NRA

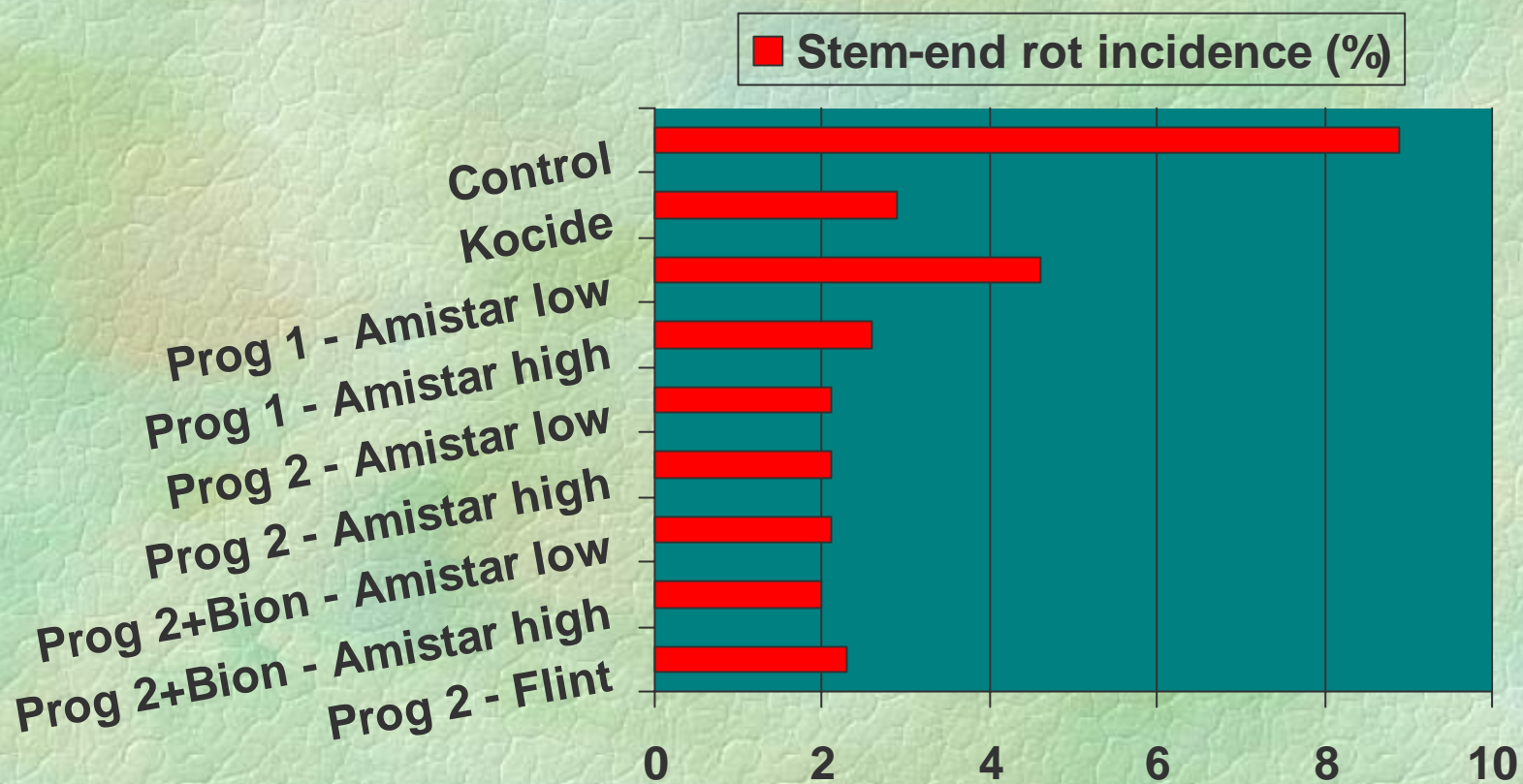


Effect of strobilurin fungicide foliar sprays applied in anti-resistance blocking programs with Kocide on anthracnose in “Hass” avocado



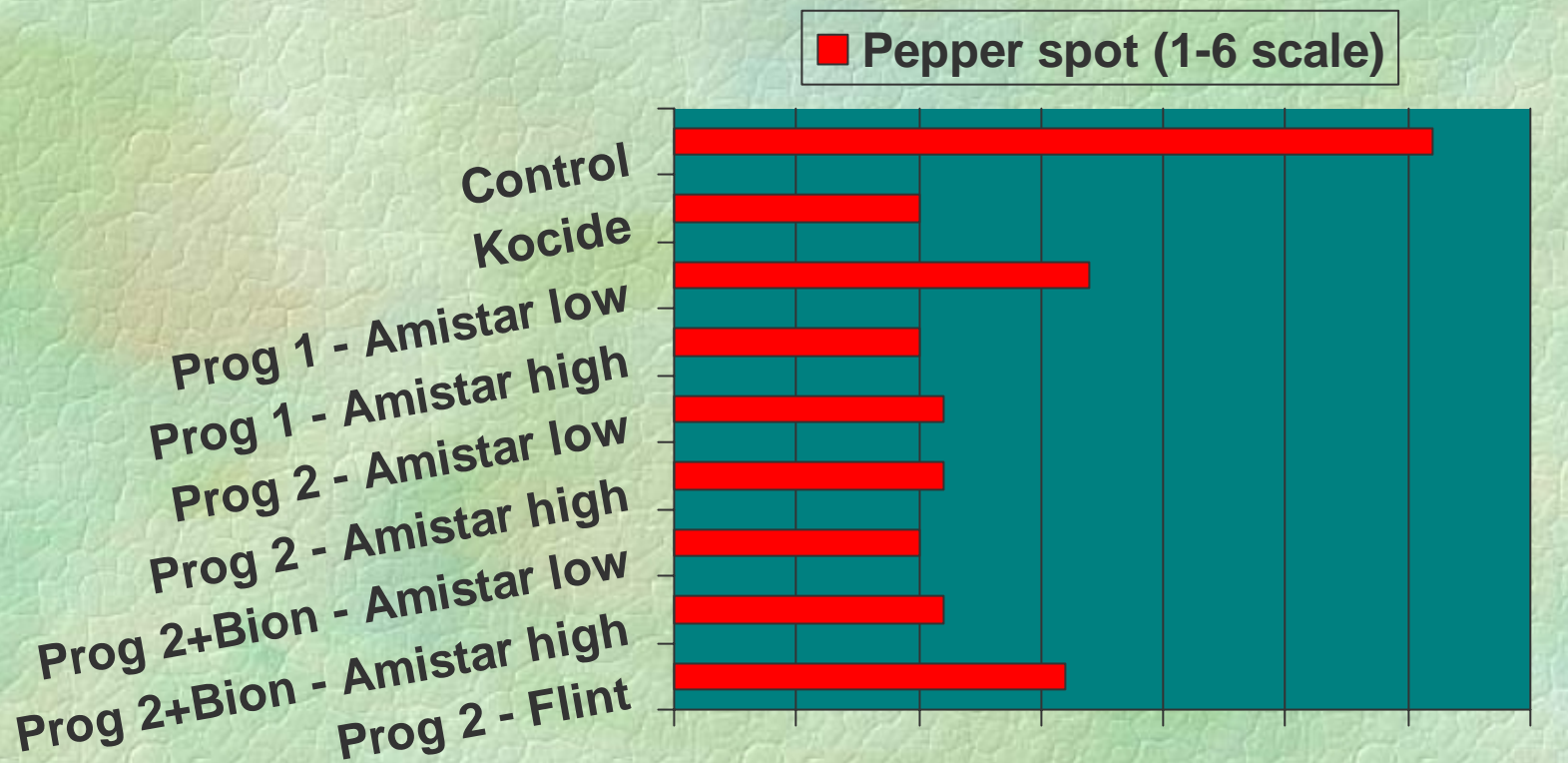


Effect of strobilurin fungicide foliar sprays applied in anti-resistance blocking programs with Kocide on stem-end rot in “Hass” avocado

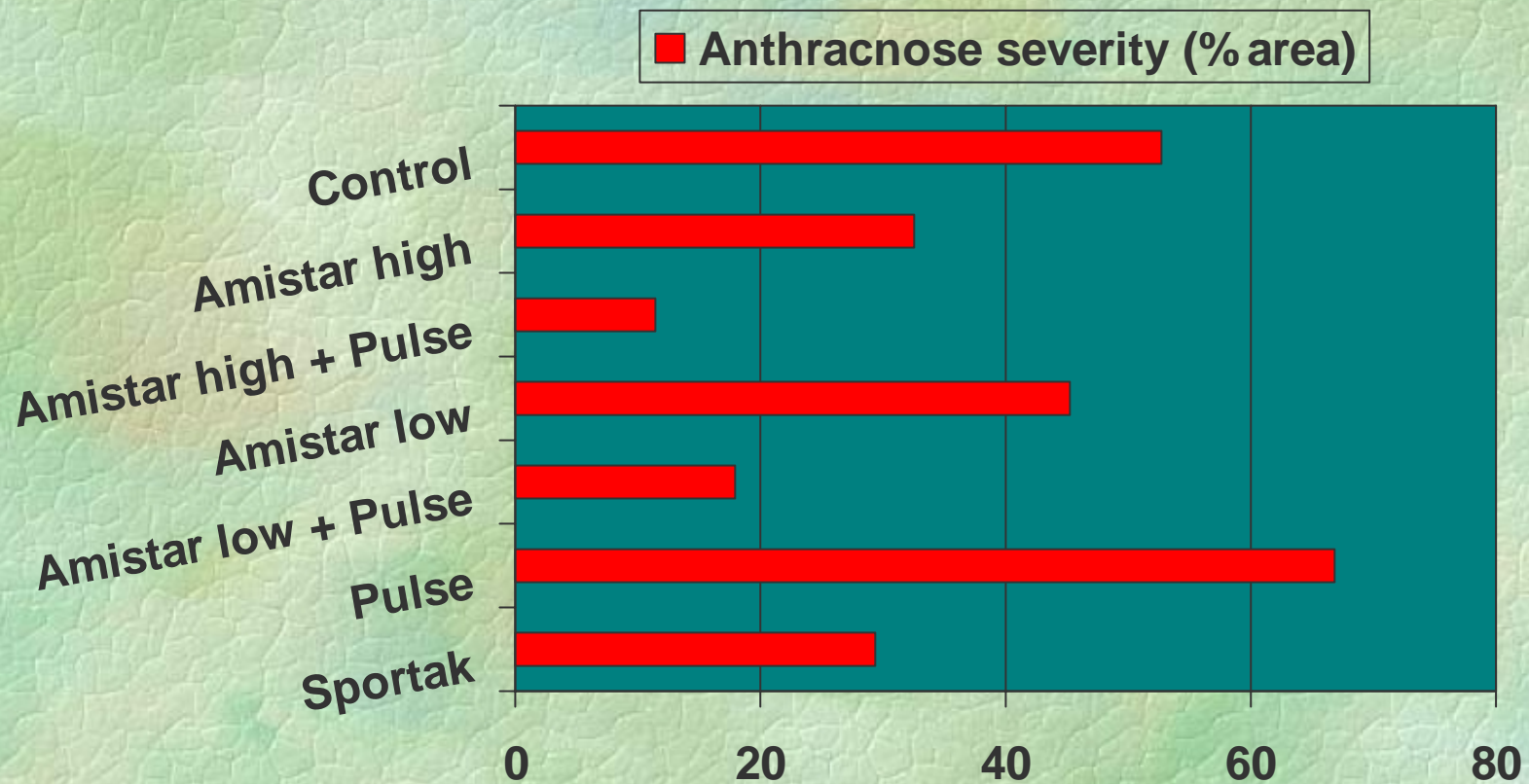




Effect of strobilurin fungicide foliar sprays applied in anti-resistance blocking programs with Kocide on pepper spot in “Hass” avocado



Effect of postharvest dip treatments of Amistar on anthracnose in “Hass” avocado



Where to now for the strobilurin fungicides?



- Sufficient efficacy and residue data for preharvest application of Amistar on avocado has now been generated for a submission to the National Registration Authority (NRA)
- The reports containing this data have been made available to the manufacturers of Amistar for inclusion in a NRA submission



Vision for the future

- Effective management of avocado fruit diseases will require an integrated approach
- Much more emphasis will be placed on rootstock selection when establishing orchards
- Nutritional recommendations for avocado will take into account combinations of nutrients which minimise disease



Vision for the future

- Copper fungicide use will be reduced and incorporated with strobilurins (and/or other reduced-risk fungicides) and host defence promoting compounds (eg. Bion)
- Postharvest application of fungicides will be restricted
- More emphasis will be placed on controlling the postharvest environment



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