SCHOLAR—A NEW BROAD-SPECTRUM POSTHARVEST FUNGICIDE FOR POMEFRUITS

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I thank the meeting organizers for the opportunity to speak to you on this very momentous occasion, representing 100 years for the Washington State Horticultural Association. A lot has happened over that past 100 years and it is fortuitous that at this very moment in time we are experiencing the greatest changes in the number of new fungicides that are entering the market for postharvest disease control of pome fruit. For the past 30 years the pome fruit packing industry has only had a few fungicides to utilize, and disease control with many of these fungicides has been compromised due to the development of resistant isolates. It is my privilege to speak to you today about Scholar, an exciting new broad-spectrum fungicide that just received federal registration in November of 2004. Scholar contains the active ingredient fludioxonil, and this product is registered for postharvest disease control on stone fruit, pome fruit, kiwi, and yam. For the remainder of this presentation I intend to provide you with detailed explanations of what Scholar is and what it can do for you. What you will realize is that Scholar is a broad-spectrum fungicide with a new and unique mode of action different from all other fungicides. Scholar has long lasting residual activity that protects your fruit from disease decay so that you can deliver quality fruit to the market year-after-year. Scholar has an excellent toxicological profile and is classified by the U.S. Environmental Protection Agency as a "reduced risk" fungicide due to its low toxicity to mammals. Scholar is compatible with most waxes and applications systems, and is stable in chlorinating agents that are used in many packing lines.

The discovery of Scholar had nature as its lead. Fludioxonil was discovered by evaluating the natural compound pyrrolnitrin that was produced by the soil-borne bacterium *Pseudomonas pyrrocinia*. Pyrrolnitrin had activity against a range of plant pathogenic fungi but it was highly light labile and therefore was unsuitable for field use. Chemists were able to improve both the light stability and the biological activity by replacing certain parts of the pyrrolnitrin molecule. They produced fludioxonil, which had better biological activity against plant pathogenic fungi than its parent molecule, pyrrolnitrin (Figure 1).

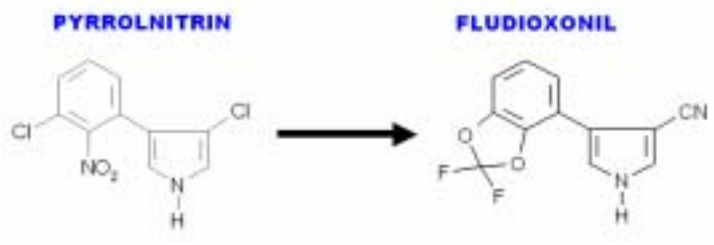

Figure 1. Fludioxonil is less sensitive to photolytic degradation and has better biological activity against plant pathogenic fungi than its parent molecule, pyrrolnitrin.

Fludioxonil kills plant pathogenic fungi by blocking a regulatory enzyme that is required for normal glycerol synthesis. This inhibits spore germination and growth of germ tubes and mycelia on the fruit surface. Fludioxonil remains on the surface of the fruit, providing protection from fungal spores that might otherwise attack.

Scholar has an excellent toxicological profile and has been classified by the U.S. Environmental agency as a "reduced risk" fungicide. It has no acute toxicity, and is non-mutagenic, non-teratogenic, and non-carcinogenic.

Let's now look at what Scholar can do for you. There are many fungi that like to eat apples as much as we do, and Scholar keeps them from doing just that. Scholar provides excellent control of blue mold, gray mold, Rhizopus rot, and Bull's-eye rot (Table 1). Neither the old standard, thiabendazole (TBZ) nor the newly registered fungicide Penbotec provide equal protection against all four of these key postharvest diseases of pome fruit.

Table 1. Comparative efficacy of fungicides for postharvest disease control of pome fruits

Postharvest Disease	Mertect Thiabendazole	Scholar Fludioxonil	Penbotec Pyrimethanil
Blue Mold	(+++)	+++	+++
Gray Mold	(+++)	+++	+++
Rhizopus Rot	+	+++	+
Bull's Eye Rot	++	+++	?

( ) = activity against non-resistant isolates;
+++ = excellent; ++ = good; + = some control? = not determined.

In the absence of resistant isolates, TBZ provides excellent control of gray mold and blue mold on both pears and apples. However, the development of resistant isolates can compromise the efficacy of TBZ. Scholar has a different mode of action than the other postharvest fungicides and therefore will provide disease control even against TBZ resistant isolates (Figure 2). Since Scholar is the sole commercially available member of the phenylpyrrole chemistry class the chances for development of cross-resistance to other fungicides are highly unlikely. Scholar provides the industry with an excellent opportunity for sound resistance management practices.

In addition to preventing postharvest diseases from developing, Scholar also prohibits the sporulation and spread of some diseases like blue mold. Dr. David Rosenberger from Cornell University conducted a study in 2001 to evaluate the potential of Scholar in preventing sporulation of the blue mold pathogen on 'Delicious' apples (Figure 3). Scholar completely prevented sporulation in that study. This is important because sporulation spreads the disease further within the packinghouse and/or in shipment. Spores also can stain fruit making fruit lots unacceptable for delivery.

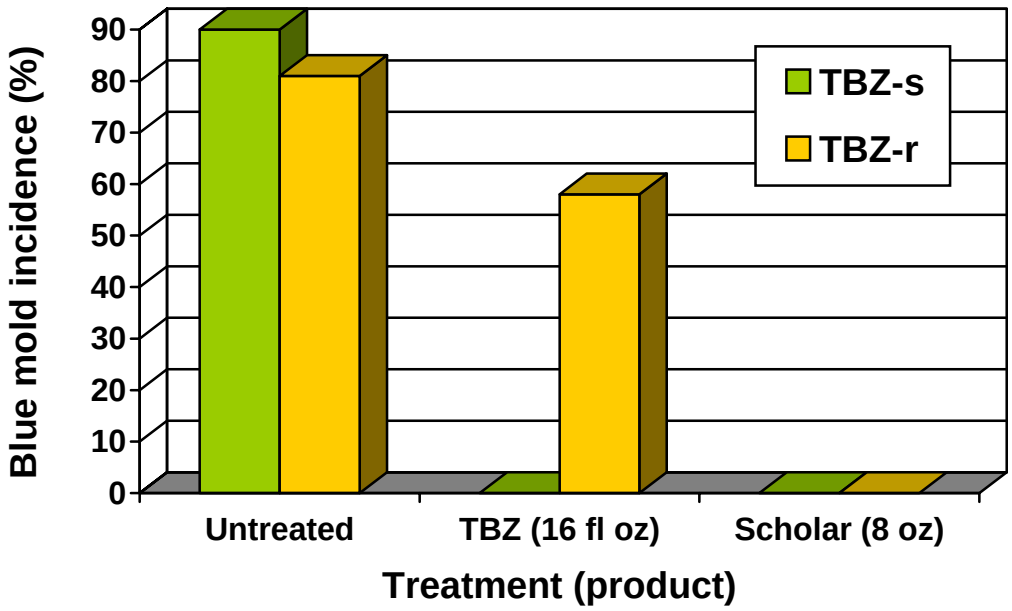

Figure 2. Evaluation of line spray applications of TBZ or Scholar for control of blue mold (caused by *Penicillium expansum*) on 'Bosc' pears. Fruit were wound inoculated with TBZ sensitive (TBZ-s) or TBZ resistant (TBZ-r) isolates prior to treatment. Source: Dr. Jim Adaskaveg, University California, Riverside, 2002.

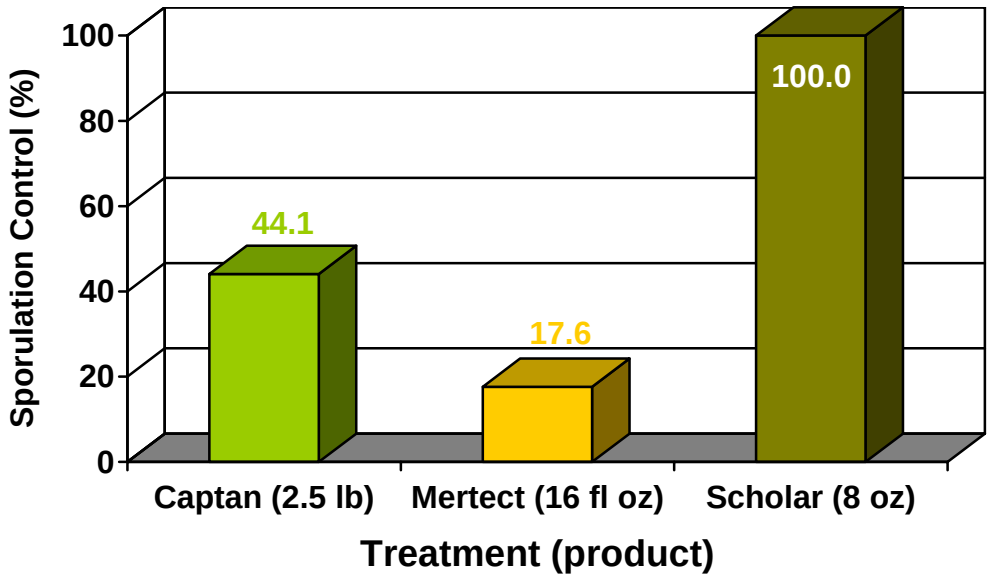

Figure 3. Control of blue mold sporulation on stems of 'Empire' apples. Non-wounded fruit were dipped into fungicide solutions or water containing spores of a benzamidazole-resistant isolate of *Penicillium expansum* and observed for sporulation following incubation. DPA (1000 ppm) was added to all treatments. Source: Dr. David Rosenberger, Cornell University, 2001.

Reputations are built on smart choices. Scholar protects your crop so that you can deliver quality fruit to your customers year-after-year. In summary, Scholar has the broadest spectrum disease control of all commercially available postharvest fungicides for pome fruit. Application options are extremely flexible for this product; you can apply it as a drench prior to storage, as a dip/wash, or as a line spray prior to packing. Scholar is compatible with DPA (drenching), chlorine (wash/dip tanks), and fruit coatings/waxes (line sprays prior to packing). It provides long residual activity that will protect your fruit to the market and extend the fruits shelf-life after it gets there. Scholar prevents sporulation of some postharvest pathogens and reduces the spread of disease in the packing house and in shipment. This fungicide has a new and unique mode of action that is different from all other postharvest fungicides. Therefore, it is an excellent product to use for resistance management in the packinghouse. Finally Scholar has an excellent safety profile (EPA designated "Reduced Risk Product"). Reducing your losses and packing costs, improving fruit quality, and extending the shelf-life of your fruit is what Scholar is all about.