

APPLE (*Malus × domestica* ‘Empire’)
 Blue mold; *Penicillium expansum*
 Gray mold; *Botrytis cinerea*

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Effects of water quality on efficacy of postharvest treatments with Scholar, 2001-02.

This experiment was designed to determine if activity of Scholar is affected by cleanliness of the postharvest treatment solution or by the inclusion of calcium chloride in the treatment solution. Seven different concentrations of Scholar were applied to fruit using either clean water, water containing 4% (w/w) of a low-organic soil, or water containing a similar concentration of a high-organic soil. The low-organic soil was a silt-loam soil collected from 2 to 4 inches below the soil surface in a nearby orchard. The high-organic soil was collected from the same site by taking the top inch of soil, including grass roots and surface debris, and then further amending that with an equal volume of peat moss. The low and high organic-matter soil contained approximately 1.2% and 14.5% organic matter respectively on a dry-weight basis as determined by ashing the soils. On 15 Nov, 3.3 lb of the air-dried low-organic soil was added to one set of eight treatment tanks (20-gal capacity polyethylene garbage cans), and a similar amount of the high-organic soil was placed in another set of eight tanks. A third set of eight tanks was used for clean water. Water was added to make 10 gal of solution in each of the 24 tanks. Scholar was added to seven of the eight tanks in each set to create the seven test concentrations of Scholar. One tank of each soil type was used as a water control. All of the tanks containing Scholar solutions were held at approximately 60° F from 15-21 Nov (approximately 140 hr) to simulate the holding periods that might occur in commercial settings. The soil/Scholar solutions were stirred for several minutes three times on each of 3 days during the holding period before the solutions were used to treat fruit. Inoculum was added to the treatment tanks approximately an hour before fruit were treated on 21 Nov. Inoculum consisted of 10,000 conidia per ml from a benzimidazole-resistant isolate of *P. expansum* (P-301). Conidia were washed from 5-day old PDA plates, spore densities were determined using a hemacytometer, and the final inoculum density of 10,000 spores per ml was achieved by adding appropriate amounts of stock solution to the treatment tanks. Empire fruit for this experiment were harvested 26 Sep and were held at 34° F until the day before treatments were applied. Each treatment was replicated four times using 25 fruit per replicate. Each apple was wounded using a large cork fitted with three finishing nails spaced about three-eighth in. apart in a triangular pattern. Wounds created on the fruit were approximately one-eighth in. deep by one-sixteenth in. in diameter. Fruit were wounded approximately 18 hr before treatments were initiated. Baskets containing 25 wounded fruit were dipped for 30 sec into the treatment/inoculum solutions. Treated fruit were allowed to dry for 4 hr before they were arranged on spring cushion trays, placed in wooden crates in a randomized block design, and moved to cold storage at 34° F. Apples were evaluated for decay after 70 and 138 days of cold storage counting from the time that the first treatments were applied on 21 Nov. The software program “SuperAnova” from Abacus Concepts was used for the two-way analysis of variance (eight fungicide treatments × three water qualities) for each observation date.

Seventy days after treatment, untreated control fruit had significantly more decay (incidence of 29%) than fruit in any of the Scholar treatments. After 138 days of cold storage, fruit treated with Scholar at 0.5 or 1.0 oz/100 gal had more decay than fruit treated with higher concentrations of Scholar. Water quality did not affect disease incidence on either observation date ($P=0.78$ and 0.48 after 70 and 138 days, respectively). However, there was a significant treatment × water quality interaction on the last evaluation date ($P=0.007$). The interaction occurred because the addition of calcium chloride to the lowest rate of Scholar, when compared to the same rate of Scholar used alone, resulted in more decay in the clean water treatment and less decay in the water amended with a high-organic soil. Gray mold noted in this experiment presumably was attributed to *B. cinerea* present on fruit when the fruit were harvested. The incidence of gray mold remained low, and there were no significant differences among treatments after 70 or 98 days. After 138 days, the incidence of gray mold in control fruit was significantly greater than in any of the treatments. Water quality did not have any significant effect on incidence of gray mold. Results from this experiment verify that aqueous solutions of Scholar remain effective for at least 6 days after mixing even if the treatment solutions contain soil and organic debris.

Material and rate of formulated product per 100 gal	% fruit with decay on 8 Apr after 138 days of storage at 34° F				
	clean water	blue mold		grand means for fungicide treatments	Gray mold: grand means for fungicide treatments
		low or-organic soil	high or-organic soil		
Control.....	74.0 c*	75.0 c	87.0 d	78.7 d	2.7 b
Scholar 50W 0.5 oz + Decco 405					
Calcium Chloride 1.35 gal.....	59.0 c	6.0 ab	8.0 ab	24.3 bc	0.7 a
Scholar 50W 0.5 oz.....	29.0 b	23.0 b	32.0 c	28.0 c	0.3 a
Scholar 50W 1.0 oz.....	8.0 a	15.0 ab	17.0 bc	13.3 b	0.3 a
Scholar 50W 2.0 oz.....	4.0 a	5.0 a	5.0 ab	4.7 a	0.3 a
Scholar 50W 4.0 oz.....	3.0 a	7.0 ab	1.0 a	3.7 a	0.0 a
Scholar 50W 8.0 oz.....	2.0 a	4.0 a	2.0 a	2.7 a	0.0 a
Scholar 50W 16.0 oz.....	2.0 a	2.0 a	5.0 ab	3.0 a	0.0 a
Grand means for water quality.....	22.6	17.1	19.6		

* Within columns, means followed by the same small letter do not differ significantly ($P \leq 0.05$) as determined using Fisher's Protected LSD applied to arc-sine transformed data. Arithmetic means are shown in the table.