Evaluation of strobilurin fungicides (Abound and Cabrio), potassium phosphite (ProPhyt) and Ridomil Gold for control of leather rot of strawberry, caused by *Phytophthora cactorum*.

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Annual Research Activity Report Submitted to The North American Strawberry Growers Association.

November 2, 2004

Introduction:

Leather rot of strawberry is caused by the fungus *Phytophthora cactorum*. The disease is a serious fruit rot that can result in complete destruction of the crop. Of particular concern is the adverse effect that the disease has on fruit quality. Infected berries may be difficult to identify, and they have a distinct bad taste that is actually a symptom of the disease. Consumers pick infected berries along with healthy berries and complain to growers that the processed or freshly eaten fruit has a bad taste. Thus, even a low incidence of leather rot in a planting can result in serious losses due to the loss of customers.

The new fungicides Abound (azoxystrobin) and Cabrio (pyroclastrobin) are strobilurin fungicides that are currently registered for use on strawberry for control of anthracnose and powdery mildew. Leather rot is not on the Abound or Cabrio label; however, these fungicides are highly effective for controlling diseases caused by Phytophthora species on other crops. Although no information is available on the efficacy of these new fungicides for leather rot control, it is highly probable that they could provide excellent control of leather rot in addition to anthracnose..

Information prior to this study, on the efficacy of these fungicides for control of leather rot is lacking. The objective of this research is to determine the efficacy of Abound, Cabrio and potassium phosphite (ProPhyt) for control of strawberry leather rot , and to compare their efficacy to Ridomil Gold.

Methods:

A field trial was established in a commercial strawberry planting at Wooster, Ohio during Spring 2004. The planting was two years old (first bearing year) and consisted of the variety

Honeoye. Plants were grown in a matted-row perennial system with rows approximately 1-ft wide grown on 3-ft centers. Individual plots consisted of three rows each 10-ft long. On May 12, straw was removed from between all rows leaving bare soil only in order to enhance disease development. To further enhance disease development, all plots were flooded using overhead sprinklers approximately every other day (unless rain occurred) from May 26 through June 22. After each watering, standing water could be observed between the rows. Treatments were arranged in a completely randomized block design with four replications (blocks). Fungicides were applied in an equivalent of 100 gallons of water per acre to the center row of each plot. The following fungicides and (rate per acre) were evaluated: 1) pyroclastrobin, Cabrio 20EG (14 oz); 2) azoxystrobin, Abound 22.9F (15.4 fl oz); 3) potassium phosphite, ProPhyt (4 pts); and 4) mefenoxam, Ridomil Gold 4EC (1 pt). Foliar applications of Abound, Cabrio and ProPhyt were applied on 21 May (late bloom), 28 May (fruit set, green fruit present), 4 June (green fruit present), and 11 June (fruit starting to ripen, turning red). Ridomil Gold was applied as a drench on April 26 and June 2. All ripe and diseased fruit were harvested from each plot on 16, 19 and 24 June. The total number of leather rot-infected and marketable fruit, and total yield (weight) were recorded for each replication and harvest date.

Results :

Removing straw from between the rows and repeatedly flooding test plots resulted in a disease incidence ranging from 62 to 69% for each individual harvest date (table1). The mean percentage leather rot incidence for all three harvest dates combined was 67% (table2). All fungicide treatments had significantly less leather rot than the untreated control, and there were no significant differences in leather rot incidence between any fungicide treatment. The percent disease control provided by Cabrio, Abound, ProPhyt and Ridomil Gold was 95, 91, 89 and 84, respectively. This resulted in significantly higher levels of marketable fruit for all fungicide treatments. When one considers the extremely adverse conditions for disease development, all fungicides tested provided an excellent level of control. Field conditions created for this study should never occur in a commercial strawberry planting.

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Previous reports have shown that ProPhyt (essentially the same material as Aliette) and Mefenoxam (Ridomil Gold) provide good control of leather rot and these materials are currently the industry standards for leather rot control. This is the first report that Cabrio and Abound are highly effective for leather rot control.

Additional funding will be requested in order to initiate new studies to establish the baseline sensitivity and the physical mode of action of the stobilurin fungicides for the leather rot fungus (*Phytophthora cactorum).*We need to determine the baseline sensitvity of these fungicides in order to be able to monitor for fungicide resistance development in the future. Through studying the physical mode of action of the strobilurin fungicides for control of berry infections, we will determine if these fungicides have any “curative” or “ after-infection” activity. If they do provide good curative activity, we have a disease predictive model for leather rot that could potentially be used to schedule fungicide applications based on the occurrence of

predicted infection periods.

This research was partially funded by the Ohio Vegetable and Small Fruit Research and Development Program

Strawberry (Honeoye)

Table 1: Effect of Fungicides on percentage of strawberry fruit with leather rot for 3 harvest dates in 2004 ('Honeoye').

	Harvest Date		
Treatment and rate/A	**5/16**	**5/19**	**5/24**
Cabrio 20EG, 14 oz.....	6.4 b	1.3 b	3.4 c
Quadris 22.9F, 15.4 fl oz	8.9 b	7.2b	5.6 c
ProPhyt 4.2F, 4 pts.....	13.2 b	5.4 b	6.6 c
Ridomil Gold 4EC, 1 pt	4.5 b	5.1 b	17.8 b
Untreated Control.....	62.0a	66.2a	69.3a

* Numbers followed by the same letter within columns do not differ significantly according to Duncan's modified (Bayesian) LSD test (P=0.05).

Table 2: Total number of fruit, mean percentage marketable fruit, total weight (yield) and mean of percentage fruit with leather rot for strawberry ('Honeoye') treated with various fungicides for three harvest dates (16, 19 and 24 June).

Treatment and rate/A	Total Number of fruit	Marketable Fruit (%)[x]	Total Weight[y] kg (yield)	Leather Rot[w] (%)	Percent Disease Control
Cabrio 20EG, 14 oz	850.8 a	90.3 a[z]	10.7 a	3.6 b	95
Quadris 22.9F, 15.4 fl oz	732.3 a	89.8 a	9.9 a	6.3 b	91
ProPhyt 4.2F, 4 pts	823.8 a	85.8 ab	9.3 ab	7.4 b	89
Ridomil Gold 4EC, 1 pt	829.0 a	80.0 b	9.5 a	11.0 b	84
Untreated Control	885.8 a	29.1 c	7.7 b	67.3 a	

w) Mean percentage of *Phytophthora cactorum*-infected fruit from three harvest dates (16, 19 and 24 June).
x) Mean percentage of marketable fruit from the above three harvest dates.
y) Total yield from the above three harvest dates.
z) Numbers followed by the same letter within columns do not differ significantly according to Duncan's modified (Bayesian) LSD test (P=0.05).