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Got Pink Rot? Get Phosphorous Acid for Harvest

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For the past several years the potato industry has been fortunate to have access to a highly effective post-harvest material to control pink rot and late blight in storage. This material is called phosphorous acid or also known as phosphite, phosphonate or salts of phosphorous acid. Several products are available to the potato industry containing this active ingredient. Research results in the Pacific Northwest have been obtained using Crop-phite, Fosphite, Phostrol and Resist 57.

These materials are not the corrosive acid, phosphoric acid, you remember from high-school chemistry class nor a phosphate-based fertilizer, but rather a phosphite molecule known to be active in limiting the growth of water mold pathogens such as those that cause late blight and pink rot. Phosphorous acid has also been shown to induce natural defense reactions in plants. Multiple studies over many years comparing several potato varieties by University of Idaho and Miller Research researchers have shown highly effective control of pink rot and late blight when phosphorous acid is applied at 12.8 fl oz/ton as a post-harvest spray application as tubers are being loaded into storage. Tubers that have symptoms of late blight and pink rot coming out of the field can contaminate healthy tubers during the harvest operation. This post-harvest application works to help keep the healthy tubers from becoming infected.

Some varieties are notorious for being highly susceptible to pink rot. These include 'Russet Norkotah,' 'Premier Russet' and 'Western Russet.' These varieties will require a more aggressive pink rot management program both in the field and in storage. If there are any low lying areas in the field or suspect areas, it is highly advisable to use a post-harvest spray application of phosphorous acid.

Typically post-harvest products are applied as a low-pressure spray as potatoes are being conveyed into storage. It is important that post-harvest applications are applied at the rate and volume directed on the label. Post-harvest applications described in this article were all applied at 0.5 gal/ton. At this volume of aqueous solution, the potatoes are just barely wet but have good tuber coverage. When the correct amount of liquid is applied, the tubers should not be shiny, otherwise you may be adding more water than necessary for adequate coverage and effectiveness. Because such a high volume of product and water is necessary to treat large storages, it is critical to plan ahead for a post-harvest application of phosphorous acid. Many companies that make custom phosphorous acid applications need some lead time to arrange for the delivery of the appropriate equipment to make a post-harvest application.

Table 1. Efficacy of phosphorous acid and hydrogen peroxide/peroxyacetic acid (HPPA) on late blight and pink rot incidence in a small scale trial.[1]

Treatment	Rate/ton tubers	*Late blight (%)*	*Pink rot (%)*
Untreated control		72 a	98 a
HPPA	1:50 dilution	48 b	92 a
Phosphorous acid	3.2 fl oz (1:20 dilution)	3 c	0 b
Phosphorous acid	6.4 fl oz (1:10 dilution)	3 c	0 b
Phosphorous acid	12.8 fl oz (1:5 dilution)	0 c	0 c

[1] Tubers with typical disease symptoms or showing symptoms of secondary soft rot were counted as rotted tubers. Values in the same column followed by the same letters are not significantly different at p=0.05.

Table 2. Effect of post-harvest applications of phosphorous acid and hydrogen peroxide/peroxyacetic acid (HPPA) on percent potato tuber rot after 77 days in storage (48°F) in a 1-ton bin.[1]

Treatment	Rate/ton tubers	*Late blight (%)*	*Pink rot (%)*
Untreated control		90 a	61 a
HPPA	1:25 dilution	84 a	73 a
Phosphorous acid	1.6 fl oz (1:40 dilution)	26 b	32 b
Phosphorous acid	3.2 fl oz (1:20 dilution)	14 bc	10 b
Phosphorous acid	12.8 fl oz (1:5 dilution)	0 c	0 c

[1] Tubers with typical disease symptoms or showing symptoms of secondary soft rot were counted as rotted tubers. Values in the same column followed by the same letters are not significantly different at p=0.05.

Multiple small and large scale studies have been performed to determine the effectiveness of phosphorous acid against late blight and pink rot in storage. Small scale studies have shown excellent control even at low rates (Table 1), although larger scale studies have consistently shown better control with the 12.8 fl oz/ton rate. Complete control of late blight and pink rot was obtained with 12.8 fl oz/ton of phosphorous acid (Phostrol; Table 2) in multiple studies. Therefore, it is recommended to use the higher application rate especially under high disease pressure.

Tubers at harvest that go into storage with any fungal disease, such as pink rot, Pythium leak, or late blight are more susceptible to secondary bacterial soft rot development. Soft rot infection often creates "hot spots" that can lead to the breakdown of an entire pile of potatoes in storage. It is important

to accurately identify the disease(s) causing the problems in storage. Management decisions will vary depending on the type of disease present. See http://info.ag.uidaho.edu/pdf/CIS/CIS1131.pdf for additional suggestions on how to diagnose and manage storage diseases. For example, if you have pink rot and misdiagnose it as Pythium leak, an application of phosphorous acid would have been beneficial but maybe not considered.

In some situations you may be dealing with a condition where high infection rates of pink rot, Pythium leak, or late blight have made conditions favorable for soft rot development, and to avoid breakdown of the potato storage pile, it is necessary to use storage management practice to minimize losses. A few suggestions to avoid breakdown in storage include: 1) maximize fan run-time especially to remove field heat, 2) run ventilation immediately while filling storage, 3) be aggressive with airflow, 4) minimize free moisture (condensation), 5) modify humidification, and 6) watch the storage very closely for odor and sunken areas. If the pile needs additional drying, it may be necessary to reduce humidity, but realize additional shrinkage may result.

Continuous fan operation and high airflow are absolutely necessary to dry out wet or problem potatoes, thus reducing the likelihood for further disease development. Simply exposing the soft rot pathogen on the surface of a potato to air for 1 hour will reduce the pathogen viability by 90 percent. Research has also shown that curing potatoes at 50°F versus 55°F will decrease the potential for soft rot development due to primary infections of pink rot or late blight. Lower relative humidity during the curing time also decreased soft rot breakdown but may compromise integrity of the healthy tubers via additional weight loss.

In general, if you are concerned with wet rot in storage, a post-harvest application of phosphorous acid may be beneficial to reduce the risk of breakdown in storage. As with any post-harvest product, it must be used in conjunction with other storage management options to reduce favorable disease conditions in storage.

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Did You Know?

A field averaging 350 cwt per acre would have approximately 70,000 tubers if the average tuber weight was 8 oz.

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