SUGAR BEET (*Beta vulgaris* ssp. *vulgaris*)
Storage rot; *Athelia*-like sp., *Botrytis cinerea*, and *Penicillium* spp.

C. A. Strausbaugh, USDA-ARS NWISRL, 3793 N. 3600 E., Kimberly, ID 83341; Nora Olsen and Mary Jo Frazier, Univ. of Idaho, Kimberly, ID 83341; and Carol Wambolt, Amalgamated Research LLC, 2531 Orchard Dr. East, Twin Falls, ID 83301

Evaluation of fungicide and biological treatments for control of fungal storage rots in sugar beet, 2014.

Ten fungicide/biological treatments were evaluated versus a water control for the management of fungal storage rots on sugar beet roots in a commercial indoor storage building in Paul, ID. Roots of the commercial sugar beet cultivar B-7 were produced in a field using standard cultural practices. The roots were harvested on 1 Oct with a plot harvester and two eight-beet samples were submitted to the Amalgamated Sugar Co. Tare Lab (sucrose concentration, conductivity, nitrates, and tare were determined). Additional eight-beet root samples were weighed, treated, and placed in mesh onion bags and arranged in the storage building on top of the commercial sugar beet pile in a randomized complete block design with six replications. The temperature set point for the storage was 1.1°C (relative humidity > 90%). The fungicides were diluted in well water and applied as a direct spray (except for fog treatments) to the root surface on 2 Oct in a volume of 8.34 ml/kg roots using a CO_2-pressurized backpack sprayer equipped with a wand and a band nozzle (Model 8004EVS; TeeJet Technologies, Wheaton, IL) at a pressure of 2.8 kg/cm^2. The cold fog aerosols were applied on 2 Oct via a Dyna-Fog Cyclone (Model 2730 Series #1, Curtis Dyna-Fog, Ltd., Westfield, IN). The thermal fog (Univ. of Idaho, Kimberly R&E Center, custom equipment; set for a temperature of 371°C) was applied on 29 Oct (28 days after harvest; roots were stored on top of commercial pile from harvest until application). For the roots that received a second thermal fog application, the treatment was repeated on 1 Dec. Fungal growth on the root surface was evaluated visually to establish the percentage of root surface covered with fungal growth on 16 Jan 15 and 5 Feb 15. Prior to processing roots on 13 Feb for brei samples after 136 days in storage, the roots were weighted, a surface rot evaluation (percentage of root surface with discolored tissue) was conducted, and percent sucrose was established via gas chromatography. Data were analyzed in SAS Ver. 9.2 using the general linear models procedure (Proc GLM), and Fisher's protected least significant difference (LSD; α = 0.05) was used for mean comparisons.

The treatments did not result in root injury. Fungal development on the roots was similar to that seen on the commercial roots in the storage building. There were significant differences among the treatments for all variables. The thermal fog Jet-Ag treatments increased fungal growth (176 to 179% increase) and rot (52 to 62% increase) compared to the control. On the other hand, Propulse led to a reduction in both fungal growth (90 to 100% reduction) and rot (81% reduction) compared to the control, while Stadium and Phostrol as direct sprays and the Propulse cold fog treatment could only reduce rot 62% compared to the control. These same four treatments (Phostrol, Propulse, Propulse cold fog, and Stadium) also had the least sucrose reduction. Isolations from aerial mycelium and root lesions confirmed the presence of the *Athelia*-like Basidiomycete (Mycologia 104:70-78), *Botrytis cinerea*, and *Penicillium* spp. The results indicate that several of the fungicides evaluated have the potential to significantly reduce fungal rot and sucrose loss.

	Surface fungal growth (%)[y]				Sucrose
Treatment and rate/kg roots[z]	16 Jan	5 Feb	Surface rot (%)[x]	Wt. loss (%)[w]	reduction (%)[v]
Water-only control	14 b	21 b	21 b	7.6 c	33 a
Stadium SC (cold fog) 2.2 ml	6 bc	17 bc	13 bc	9.3 a-c	31 ab
Jet-Ag (thermal fog) 0.015 ml	39 a	58 a	34 a	7.6 c	28 a-c
Jet-Ag (thermal fog twice) 0.015 ml	39 a	51 a	32 a	7.5 c	26 b-d
HDH TBZ 99WP 0.625 g BioSave 10LP 0.00367 g	10 bc	9 b-d	15 bc	10.2 a	26 b-e
BioSave10LP 0.00367 g	16 b	21 b	14 bc	9.3 a-c	24 c-f
HDH TBZ 99WP 0.625 g	8 bc	11 b-d	16 bc	9.3 a-c	23 d-f
Propulse SC (cold fog) 2.2 ml	8 bc	8 b-d	8 cd	8.9 a-c	21 e-g
Phostrol 0.392 ml	6 bc	8 b-d	8 cd	9.7 ab	21 fg
Propulse SC 0.049 ml	0 c	2 d	4 d	7.8 bc	18 g
Stadium SC 0.13 ml	2 c	2 cd	8 cd	7.9 bc	17 g
Overall mean	13	19	16	8.7	24
P > *F*[u]	<0.0001	<0.0001	<0.0001	0.0393	<0.0001
LSD (α = 0.05)	12	15	9	2.0	5

[z] The treatments were applied to the roots as a direct spray diluted in well water at a rate of 8.43 ml/kg roots, except for the fog treatments (designated in parentheses following the product name). For the cold fog treatments, the product was diluted to 10,000 ppm and then fogged at the rate indicated. The thermal fog was applied with the fogger set to 371°C. One thermal fog treatment was applied a second time (thermal fog twice).

[y] Surface fungal growth = the percentage of root surface covered by fungal growth.

[x] Surface rot = the percentage of root surface with discolored tissue.

[w] Wt. loss = the percentage of root weight lost between harvest and evaluation at the end of storage.

[v] Sucrose reduction = the percentage of root sucrose lost between harvest and evaluation at the end of storage.

[u] *P* > F was the probability associated with the F value. Within a column, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference (LSD; α = 0.05) value.