Potato Progress

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Glyphosate Carryover in Seed Potatoes

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We want to remind seed potato growers that glyphosate can carryover in tubers and will affect sprouting and plant health the following season. The daughter tubers may or may not have visible damage such as folding in the bud end. Multiple sprouting below ground, sometimes called "candelabra sprouting," can occur, as well as poor emergence, stunted plants, and yellowing similar to symptoms caused by a direct glyphosate spray or drift.

There are a few likely ways glyphosate can contact foliage of the seed crop: 1.) drift from applications to adjacent fields, 2.) direct spray onto the potato plants from spot spraying within the crop, or 3.) residue left in a sprayer tank which also is used for vine killing the mother crop. Growers and custom applicators applying glyphosate in seed potato production areas should take special care to avoid drifting onto the seed crop or simply decide not to apply glyphosate in fields adjacent to potato seed. Such applications may be occurring on non-cropland or fallow ground for perennial weed control. Glyphosate also is labeled for use in wheat and barley at the end of the growing season for weed control after the grain has reached a certain moisture level (refer to a label for specific information).

Spot spraying glyphosate within or on the borders of a seed potato field should be avoided altogether and if a sprayer was used for glyphosate applications earlier in the season, the tank, boom, and injection/mixing system should be thoroughly cleaned with the appropriate spray tank products and well-rinsed before using the sprayer for vine-kill applications. Ideally, keep a sprayer dedicated to glyphosate applications, not to be used for any other herbicides.

University of Idaho research: We recently studied glyphosate drift in Ranger Russet to determine effect on the mother crop during the application year, and symptoms in plants grown from tubers produced by affected plants. Glyphosate at 1/100, 1/16, 1/8, ¼, or ½ typical use rates was applied to potato foliage when plants were 3 to 6 inches tall, at stolon hooking, tuber initiation, or mid-bulking. During the application year, foliar damage and tuber yield, grade, and symptoms were recorded. Tubers were kept in storage and planted the following year.

During the application year, the most foliar damage of stunting and leaf yellowing resulted from the earlier applications. In contrast, the mid-bulking application caused little or no visible injury. Tuber yield and grade from treated plots were reduced compared to the non-treated controls, and some of the tubers coming from treated plants had a rough, elephant-hiding appearance and bud-end folding. As an example of yield impacts, when plants encountered glyphosate during hooking or tuber initiation even at 1/100 the use rate, U.S. No. 1 yields were reduced as much as 37% compared to when the plants were sprayed at 3 to 6 inch height.

Daughter tubers with and without symptoms were planted the following spring. Surprisingly, since the most damage to the mother crop was from early applications, the poorest emergence was in plots with tubers from the last application made during mid-bulking. In fact, regardless of glyphosate rate applied the previous year, emergence of the daughter tubers from the mid-bulking timing was reduced 80% compared to emergence of tubers coming from nontreated plants. Tubers with and without symptoms were equally affected. No multiple sprouting below ground was observed and emergence of symptomatic or non-symptomatic tubers was similarly poor.

This past year, we conducted two trials partially funded by the Idaho Potato Commission. The first trial used Russet Burbank tubers from plants sprayed with a low glyphosate rate at vine-kill in 2010. Doug Boze (Idaho Crop Improvement Association) helped by planting some of the daughter tubers from those plants in the California winter grow-out trials. He noted poor emergence in tubers coming from treated, compared with non-treated, plants. Some multiple sprouting also was observed. When more of those daughter tubers were planted spring 2011, 86% of the tubers from non-treated plants compared with only 8% from treated plants emerged even if they had no tuber symptoms such as folding on the bud end.

In the second trial, Russet Burbank was planted spring 2011 and glyphosate at 1/100, 1/16, 1/8, and ¼ the typical use rates was applied to potatoes at the same times used in the Ranger Russet trial with the addition of a vine kill timing. Preliminary analyses of the 2011 yields has shown that *unlike the Ranger Russet trial where U.S. No 1 percent of total yield was reduced the most when glyphosate was applied at hooking or tuber initiation, Burbank U.S. No 1 percent of total yield during the application year was reduced the most from the 3 to 6 inch tall plant timing*. Tubers from all the Russet Burbank treatments including the non-treated control were sent to the California winter grow-out trials and watched for underground multiple sprouting, emergence, and emerged plant symptoms. Preliminary analysis of those data shows little or no effect on emergence from the 1/100 rate even at the late application timings, however, the higher rates affected emergence of daughter tubers from all timings except the earliest. Unlike Ranger daughter tubers, the Burbank tubers had some underground multiple sprouting. The Burbank daughter tubers will be planted spring 2012 to determine differences of tuber, emergence, and plant symptoms between rates and application timings.

In the future, we hope to conduct similar trials with Shepody and specialty varieties since each may have unique reactions to glyphosate.

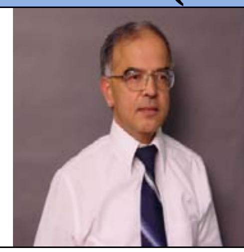
Summary: The take-home message from this study is that if glyphosate contacts seed potato crops late in the season, foliar damage might not be noticed since the vines may be starting to naturally senesce. However, this timing of glyphosate contact on the seed crop has the most effect on the tubers planted the next year! In the case of a spray tank used for vine kill contaminated with glyphosate, the foliage is dying from the desiccant and any effect from glyphosate will most likely not be visible. Tuber yield and quality during the "application" year and daughter tuber underground sprouting and emergence may vary depending upon potato variety.

So, be cautious and careful when making glyphosate applications near seed potato crops, or avoid spraying glyphosate near the crops altogether. Do not spot spray glyphosate within or on the borders of the seed crop itself and thoroughly clean any sprayer after glyphosate use.

Potato Research at the USDA-Agricultural Research Service, Prosser, WA

One purpose of Potato Progress is to help industry members and research/extension scientists to connect and get to know something about each other. Below is the second installment of a series of pieces showing a little about the work done with potatoes in Prosser by USDA-ARS scientists.

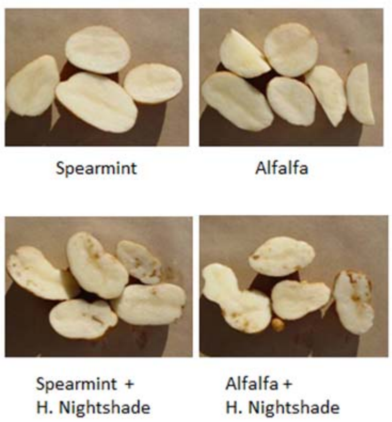
SUSTAINABLE CROPPING SYSTEMS (NP 216): POTATOES (45%); WEEDS, SOIL, BIOFUELS (55%)

		
Harold Collins Soil Microbiologist (45%) 509-786-9250	Rick Boydston Agronomist (40%) 509-786-9267	Ashok Alva Soil Scientist (27%) 509-786-9205

1. **Phosphorous Uptake by Potato from Biochar Coated with Anaerobic Digested Effluent *(Collins):*** Removal of nutrients by biochar from dairy storage lagoons and use as a supplemental fertilizer off site is a beneficial strategy to reduce nutrient contamination around dairies and supply nutrients for potato production. Biochar amended with dairy effluent applied at 2.5 Ton/acre maintained recommended soluble P levels (1000 ppm) in Ranger and Umatilla potato variety petioles through 60 days after emergence. Biochar additions improve soil pH, water holding capacity and soil C pools.

2. **Trace Gas Fluxes from Irrigated Sandy Soils within a Potato Based Crop Rotation *(Collins):*** Nitrous oxide emissions accounted for 0.5% of the applied fertilizer to corn and 0.3% to potato; 60 and 76% lower, respectively, than the current estimated emissions factor of 1.25% used by the Intergovernmental Panel on Climate Change (IPCC). The lower emissions were due to split applications ("spoon feeding") of N-fertilizer through the center pivot irrigation system during the growing season.

3. **Herbicide resistant weed populations in potato *(Boydston):*** Weed control in potato is primarily accomplished with herbicides and evolution of herbicide resistant biotypes could increase difficulty and cost of weed control. Fifteen of 27 pigweed biotypes and 8 of 25 common lambsquarters biotypes collected from Washington potato fields were highly resistant to metribuzin, the most common herbicide used in potato production. Herbicides with other modes of action were identified that control metribuzin resistant biotypes, giving growers management tools to prevent and control metribuzin resistant weeds.



4. **Crop Rotation without Weeds helps reduce Corky Ringspot (CRS) Incidence *(Boydston):*** CRS of potato, caused by tobacco rattle virus (TRV) and vectored by stubby root nematode is present in 5% of potato acreage in the Columbia Basin and requires soil fumigation, costing $200/acre, for control. We demonstrated that growing weed-free alfalfa or Scotch spearmint in potato rotation cleansed CRS from soil.

5. **Controlled Release Fertilizers for Potato *(Alva):***

Pre-plant application of 200 lbs N/acre as polymer coated urea PCU, (Complete or 50/50 mix of PCU/urea) produced similar tuber yield (about 35 tons/acre) of Umatilla Russet cultivar as compared to that with conventional fertilization practices of 300 lbs N/acre, i.e. 100 lbs N/acre urea pre-plant and five fertigations of UAN at 200 lbs N/acre.