

## Powdery Scab: Is there Hope for Economic Control?

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Powdery scab is a major concern for potato production in the Columbia Basin of central Washington and north central Oregon. Occurrence of powdery scab in the Columbia Basin before 1981 was light and sporadic, whereas currently, the disease occurs at high severities in many fields throughout the region. Infected seed tubers and contaminated soils are means of disseminating the fungus that causes powdery scab, *Spongospora subterranea* f. sp. *subterranea*. This fungus also transmits the virus that causes potato mop top. Potato mop top virus (PMTV) has not been positively identified in the Columbia Basin.

Powdery scab infections in the Columbia Basin occur early in the growing season when soils are relatively cool. Irrigation water supplies the wet soils needed for infection. Symptoms, however, do not develop for three or more weeks after infection. The powdery scab fungus synergistically interacts with *Colletotrichum coccodes*, the cause of potato black dot, to produce more severe disease and plant damage. The powdery scab fungus persists in soil longer than ten years.

Symptoms of powdery scab are confined to belowground plant organs. Infected roots and stolons develop wart-like galls. These are white at first and turn brown as they mature. Galls vary in size up to that of a pea. Symptoms on young tubers consist of small, gray, elevated areas (pustules) on the tuber surface. Pustules later dry and break open, leaving circular to oval, small, scabby pits. The pits contain a brownish powder that consists of a mass of spores. Pustules on tubers can be entry points for infection by the tuber pink rot, Pythium leak, and late blight pathogens.

Numerous pustules develop on tubers of Shepody and red cultivars, whereas, tubers of Russet Burbank, Ranger, Alturas, and Umatilla are moderately resistant and usually do not become severely infected. Roots of all cultivars grown in the Columbia Basin are susceptible and can become severely infected.

The potato mop top virus causes raised rings on the tuber surface and necrotic dark brown arcs in the tuber flesh, which resemble corky ring spot (Tobacco rattle virus) symptoms. The necrotic arcs caused by PMTV in tubers are especially severe in cool weather potato production regions. Symptoms on foliage consist of stunting of stems and shortening of internodes on some or all of the stems of infected plants. Bright yellow blotches, rings, and V-shaped yellow markings occur on leaflets.

Developing control practices for powdery scab has been a focus in the Columbia Basin the past few years. Several products including fluazinam (Omega) at 4.4 oz/acre (0.28 pt/a), 8.6 oz/acre (0.54 pt/acre) and 17.2 oz/a (1.1 pt/acre) (applied in furrow at planting), zinc sulfate at 2, 4, and 6 lb/a (applied in furrow at planting), combinations of fluazinam (Omega) and zinc sulfate (applied in furrow at planting), Maxim MZ at 0.75 lb/cwt (seed treatment), a formulation of zoxamide + mancozeb + flutolanil (PCC ZMA-2) at 0.75 lb/cwt (seed treatment), and phosphorous acid (Phostrol) at 10 pt/a (four applications to foliage before row closure) have been evaluated in replicated field experiments in the Columbia Basin, but powdery scab galls on roots were not significantly reduced with any of the materials. Chemical control of powdery scab galls will likely require either a systemic fungicide that is translocated to new root growth or an application method that will distribute an effective material in the root zone. Neither a systemic fungicide nor thorough soil application method are currently available.

In 2003, 18 potato lines from either *Solanum bulbocastanum* or *S. hougasii* with resistance to the Columbia root knot nematode were evaluated for resistance to powdery scab in contaminated soil near Warden. Twelve lines had significantly fewer galls on roots than the standards Russet Burbank, Ranger Russet, and Umatilla Russet. Roots and tubers of three lines were highly resistant to powdery scab (Figure 1). Powdery scab resistance could eventually be incorporated into commercially acceptable potato cultivars and be a basis for economical powdery scab management.

Tuber resistance effectively reduces powdery scab on tubers on many russet potato cultivars (Russet Burbank, Ranger Russet, Umatilla Russet). However, effective control practices are not currently available for reducing powdery scab galls on roots and stolons of potato cultivars once the fungus has been introduced into a field or soil. The fungus needs to be kept out of fields and areas where it is not currently present. Management of powdery scab consists of planting disease-free seed tubers, avoiding land contaminated with the scab fungus, avoiding applying manure from animals fed infected tubers, controlling weeds in the potato family (nightshade), and avoiding moving contaminated soil on equipment or irrigation water to clean fields.

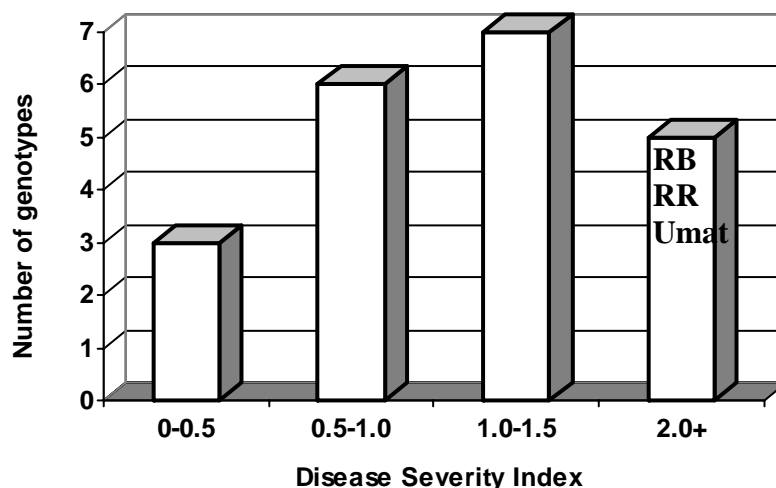


Figure 1. Relative severity of twenty-one potato genotypes to powdery scab galls on roots, Moses Lake 2003.