Potato Disease, Nematode, and Insect Problems Worsened by Hairy Nightshade

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Potato is a member of the nightshade (Solanaceae) family. Three main nightshade species are present in potato rotations in the Columbia Basin; hairy nightshade (*Solanum sarrachoides*), black nightshade (*S. nigrum*), and cutleaf nightshade (*S. triflorum*). Hairy nightshade tends to be the most prevalent of the three in most irrigated row crops in the Columbia Basin. Hairy nightshade is a summer annual, germinating from mid April to late summer and produces numerous seed contained in pea-sized berries that are dark green colored at maturity. Hairy nightshade leaves and stems are covered with small hairs and the berries have a large calyx (cap) covering about half of the berry. The flowers are small and white with five petals resembling a potato flower. Hairy nightshade can have smooth or serrated (notched) leaf margins. Being a close relative of potato, hairy nightshade hosts many disease, nematode, and insect pests of potato. As a result, hairy nightshade presence in the rotation crops nullifies many of the positive effects of crop rotation. Many herbicides used to control weeds in potato fail to control hairy nightshade.

Hairy nightshade is a host of PVY, PVA, PLRV, TRV, and late blight (Alvarez and Srinivasan 2005; Deahl et al. 2005; Thomas 2002 and 2004; Olanya et al. 2005; Flier et al. 2003). Idaho research has shown that green peach aphids reproduce 50% better on hairy nightshade than on potato and prefer nightshade over potato when given a choice. PLRV disease transmission by green peach aphids from hairy nightshade to potato was 4 times the rate of disease transmission from potato to potato(Alverez and Srinivasan 2005). Colorado potato beetle also readily feed and lay egg masses on hairy nightshade (Xu and Long 1997). Furthermore, hairy nightshade is a good host of Columbia root knot nematode and stubby root nematode (Boydston et al 2004).

Stubby root nematodes transmit tobacco rattle virus (TRV) which causes corky ringspot disease of potato. Corky ringspot currently infests about 3% of the potato acreage in the Columbia basin. Corky ringspot disease can be greatly diminished or eliminated from soils by growing alfalfa for several months (Boydston et al. 2004, Mojtahedi et al. 2003). However, weed hosts present in the alfalfa, such as hairy nightshade, can nullify the cleansing effect of growing alfalfa. We have demonstrated that hairy nightshade growing with alfalfa can host TRV and the stubby root nematode and the disease can persist to injure potato.

Powdery scab (*Spongospora subterranea*) is another soil borne pathogen of potato that infects hairy nightshade. Hairy nightshade roots containing powdery scab galls have been collected near Moses Lake, WA in problem potato fields. Powdery scab galls on potato tubers contain spore balls (cystosori) that can persist for long periods in soil. Under cool and wet conditions, resting spores release zoospores that are able to swim short distances and infect new roots and tubers. The pathogen infects a number of plant species, but is unable to complete its life cycle and form spore balls on most species. However, root galls are formed on hairy nightshade and we are currently investigating whether these galls are capable of producing zoospores that will infect potatoes. Nightshade species that are present in the crop rotation could contribute to an increase of powdery scab inoculum in soils. Alternatively, weeds or cover crops that are hosts of powdery scab, but which do not lead to spore ball formation, may actually help decrease inoculum levels in soils.

Root knot nematode (*Meloidogyne chitwoodi*) is another pest of potato that lives quite nicely on hairy nightshade. Potato resistance to root knot nematode has been identified in breeding lines PA95 B4-67 and PA99 N82-4. In greenhouse trials, resistance to root knot nematode with these lines was excellent, but in several field situations damaged tubers were observed. Further trials growing these resistant lines in the presence or absence of hairy nightshade revealed that nightshade acted as an early season host of the nematode, which was then able to move and infect tubers of some resistant lines late in the growing season. Upon further testing, it appears that roots of line PA95 B4-67 are resistant to root knot nematode infection, but tubers are not. When grown without hairy nightshade, no tuber infection occurs because nematode populations unable to infect resistant roots quickly decline. However, when PA95 B4-67 is grown in the presence of nightshade, nematode populations are maintained throughout the growing season on nightshade roots and eventually infect tubers causing significant damage. Both roots and tubers of line PA99 N82-4 were found to be resistant to root knot nematode and tubers were free of nematode damage regardless of nightshade presence. Future evaluation of nematode resistance in breeding lines should include evaluation of both tuber and root resistance.

There are numerous examples of disease, nematode, and insect pests of potato that are worsened by the presence of hairy nightshade. Hairy nightshade control in potato and rotation crops is important to help suppress these pests of potato. Hairy nightshade prefers soil disturbance and is less of a problem in no-till or reduced tillage systems. Herbicides that control hairy nightshade in potato include Dual Magnum (suppression only), Eptam, Chateau, Matrix, and Outlook. Research indicates Matrix may control hairy nightshade better when applied early postemergence versus preemergence (Greenland and Howatt 2005).

Herbicides that control hairy nightshade when applied preemergence in rotation crops include Atrazine, Chateau, Command, Dual (suppression), Eptam, Eradicane, Ro-Neet, Karmex, Lasso, Matrix, Nortron, Outlook, Pursuit, Solicam, Sinbar, Sonolan (suppression), and Spartan. Herbicides that control hairy nightshade in rotation crops when applied postemergence include 2,4-D, Betamix, Buctril, Basagran, Clarity, Banvel, Goal, Gramoxone, Matrix, Raptor, Reflex, Roundup, Thistrol, and Stinger. Growers should pay careful attention to herbicide labels for proper timing and application of herbicides to maximize weed control and minimize crop injury.

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