Controlling Moss in Nurseries

by Thomas D. Landis and James A. Altland

In the Winter, 2006 issue, Tom Landis mentioned the excellent article "Get a handle on liverwort" in which James Altland discusses all aspects of managing these plant pests. Since then, we thought we'd continue this theme with an article on ways to control mosses. These lower plants are similar to liverworts in that they reproduce from spores instead of seeds and thrive in moist and fertile nursery environments. Although they can become pests in both bareroot and container nurseries, mosses are particularly serious in containers where they cover the surface of the growing medium and interfere with water and nutrient infiltration (Figure 1). Larger mosses can also physically overshadow small seedlings and out compete them for light. The exact amount of damage caused by these plant pests is difficult to determine and varies from nursery to nursery, but Ross and Puritch (1981) conclude that damage is increasing, especially in older growing facilities.

Hosts. All species of seedlings can be affected by mosses but slower-growing conifers such as spruces and true firs are particularly vulnerable.

Moss Development. Mosses develop quickly and can affect the establishment of species that germinate and grow slowly. Once they cover the growing medium, they can choke out small seedlings, causing stunting and chlorosis. Even if the crop plants become established, moss "caps" interfere with water infiltration and reduce the effectiveness of fertigation or top-dressed fertilizers (Figure 1). Although no studies have been done, mosses may monopolize nutrient release from controlled-release fertilizer prills which are applied to the top of the container. Mosses and liverworts are more of a problem in open growing areas and shadehouses, where it is difficult to completely eliminate them between crops.

Although mosses continually enter nurseries by airborne spores, the main source of inoculum is from used containers or holdover plants. In a comprehensive study in British Columbia, no moss or liverwort spores were found in irrigation water or from peat or growing media samples (Ross and Puritch 1981). They concluded that the major sources of contamination in greenhouses were used containers and airborne spores, which are easily spread by fans.

Cultural controls. Mosses can be controlled by encouraging quick seed germination and vigorous early seedling growth. If they become established, the following practices have proven effective:

Figure 1 - When moss "caps" develop on small containers, they intercept water and fertilizer and retard seedling growth and development.

- Use a light-colored seed mulch or grit that completely covers the surface of the growing medium. Many container nurseries in the western US and western Canada use Target™ Forestry Sand as a seed covering, and perlite has also been effective. At a recent Growers' meeting, sawdust was mentioned as an excellent seed mulch that retards the moss development.

- Reduce irrigation amount and frequency to allow the growing medium surface to dry out, which discourages moss development.

- Sanitize greenhouse benches and floors between crops and pay special attention to used containers. If you must holdover nursery stock that is already infested with mosses, treat them with one of the following chemicals.

Chemical controls

- Preventing spore germination— Of course, the ideal chemical will prevent mosses from developing in the first place. ZeroTol™ has hydrogen dioxide as the active ingredient but also contains peroxyacetic acid, other surfactants, stabilizers and buffering agents. Tests have shown that ZeroTol has an oxidizing power 10 times that of ordinary hydrogen peroxide. When injected into irrigation water or sprayed on surfaces, ZeroTol kills the spores of algae, mosses, and liverworts before they can germinate.

- Killing mosses in containers— Several other chemicals have been used to control mosses on soils or growing media but few materials are registered specifically for that purpose. Haglund and others (1981) initiated a moss control test with several fungicides and surfactants, alone or in combination. X-77® was the least phytotoxic of the eight surfactants tested, and a tank mix of X-77® and the fungicide Captan gave "virtually complete" moss control. It was suggested that applications be made in the late afternoon on a cloudy day because phytotoxicity is more severe in bright sunlight. Where labeled, some preemergence herbicides prevent moss growth in containers or non-crop areas. Herbicides classified as PPO inhibitors (including oxyfluorfen, flumioxazin, and oxadiazon) provide contact postemergence burndown of small weeds including mosses and liverworts, and effective preemergence weed control up to 12 weeks. Fausey (2003) demonstrated that Goal (oxyfluorfen) and SureGuard (flumioxazin) provided excellent pre-emergence and postemergence moss control in containers.

- Controlling mosses in non-crop areas— Several chemicals have been used to control moss growth on greenhouse surfaces including Safer's De Moss®, copper sulfate and calcium hydroxide. Most common disinfectants such as chlorine bleach or even vinegar will kill mosses in non-crop areas. In a side-by-side comparison of chemicals thought to provide postemergence burndown of liverworts and mosses, Fausey (2003) demonstrated Scythe (pelargonic acid) to be the most effective product.

Obviously, any potential chemical control method should be carefully reviewed and tested before being attempted operationally.

Sources:

Copes WA. 2003. Efficacy of disinfestants applied to plant production surfaces. SNA Research Conference, Pathology and Nematology. 48: 212-214. URL: http:// www.sna.org/ research/03proceedings/3proceedingspdfs /section04.pdf (Accessed 31 July 2006).

Fausey JC. 2003. Controlling liverwort and moss now and in the future. HortTechnology. 13:35-38.

Haglund WA, Russell KW, Holland RC. 1981. Moss control in container-grown conifer seedlings. Tree Planters' Notes 32 (3):27-29.

Landis TD, Tinus RW, McDonald SE, Barnett JP. 1989. The Biological Component: Nursery Pests and Mycorrhizae, Vol. 5, The Container Tree Nursery Manual. Agric. Handbk. 674. Washington, DC: U.S. Department of Agriculture, Forest Service. 171 p.

Ross RLM, Puritch GS. 1981. Identification, abundance, and origin of moss, liverwort, and algal contaminants in greenhouses of containerized forest nurseries. Canadian Journal of Forest Research 11:356-360.