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Preliminary investigations on the herbicidal efficacy of compounds of natural origin and of experimental synthetic herbicides on greenhouse-grown leafy spurge plants

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Leafy spurge plants were grown in vermiculite in a greenhouse for primary research evaluation of several compounds on their effects on shoots and, most importantly, the subsequent regrowth of underground buds. The evaluations usually were initiated when the plants were about six weeks old and in a vegetative state. Shoots were sprayed with several concentrations of each compound, ranging from 0.1 mM to 1 mM active ingredient. Ten ml per plant corresponds to about 1 to 1-1/4 pounds per acre at the 1 mM concentration. The spray solutions contain up to 0.3% detergent. Compounds with very low water solubility were solubilized with acetone or methanol as needed, and detergent added for retention on the foliage. Plants were observed 2 to 3 weeks after treatment for shoot damage and subsequent regrowth. Shoots were then cut off and the roots were left in the pots for an additional 3 to 4 weeks to determine whether new shoots would form from underground buds.

Surfactants evaluated were Triton-X-100, Tween 20, Tween 80, acetone and methanol (the latter two at 10% v/v). Of the additives used, only Triton-X-100 (0.3% w/v) had any deleterious effects. Leaf edges became necrotic and leaves curled on treated plants. Triton-X-100 was not used for subsequent experiments so that the surfactant effects would not interfere with the evaluation of the other compounds.

Because only milligram quantities of some chemicals were available, the number of plants used for some treatments was very small (1 to 3 for a given concentration). Therefore, analyses on the basis of fresh dry weights are of limited value. The data presented in Table 1 is only a relative synopsis of the general effects of the chemicals on shoot tissues and their potential to prevent regrowth.

Table 1. General effects of compounds on shoots of greenhouse-grown leafy spurge.

I.	Additives:	
	Polyoxyethylene (9.5)octyl phenol (Triton-X-100)	1
	Polyoxyethylene-(20)-sorbitan monolaurate (Tween 20)	0
	Polyoxyethylene-(20)-sorbitan monooleate (Tween 80)	0
	Methanol, acetone	0
II.	Trichodermin (rating of 3) and the following analogs:	
	Trichodermol	1
	Trichodermol-ethylether	0
	4-epi-trichodermol	1
	Trichodermone	0
	Trichodermol-carbaminat	3
	Trichodermol-trichloroacetyl-carbaminat	3
	4- α -chloro-12,13-epoxy- Δ^9 -tricothecene	1
	4- α -azido-12,13-epoxy- Δ^9 -tricothecene	1
	Trichodermal-epi-methansulfonat	1
III.	Miscellaneous:	
	Moniliformin	2
	CAT ^a	2
	Cytochalasin H	2
	Cladosporein	2
	Oosporein	2
	Methyl jasmonat	0
IV.	Synthetic Herbicides:	
	2-chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) -aminocarbonyl] benzenesulfonamid	6
	Methyl 2-[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)-amino]carbonyl] amino] sulfonyl]benzoat	7
	Methyl 2-[[[[4,6-dimethyl-2-pyrimidinyl)amino]carbonyl)amino]sulfonyl]benzoat	8
	2.3-dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetraoxid (Harvade)	3

1-2 Necrosis of leaves.

3-5 Some shoots dead, regrowth occurred readily.

6-8 Shoots dead, regrowth slow.

10 Shoots dead, no regrowth.

^aName withheld due to proprietary agreement.

Most of the compounds listed in Table 1 had some effect on leafy spurge shoots. Trichodermin and seven of its analogs damaged shoots (Table 1). Regrowth occurred in all treatments, so none of the compounds appeared to be likely candidates for leafy

spurge control. Two of the treichodermin analogs had no effect on shoots. The effects were more severe with increased concentrations.

All of the compounds (except for methyl jasmonate) listed as miscellaneous in Table 1 also damaged shoot tissues. In one experiment, oosporein inhibited regrowth, but in subsequent studies regrowth of shoots occurred. Harvade, a cotton defoliant, also defoliated leafy spurge shoots. New shoots developed on all of the treated plants. None of these miscellaneous compounds have proved to be likely candidates for leafy spurge control.

The first three synthetic herbicides listed in Table 1 have similar chemical characteristics. They stopped the growth of vegetative or flowering plants and inhibited regrowth, but did not prevent it. Therefore, even these chemicals at the higher concentrations tested do not appear to be likely candidates for leafy spurge control. However, other compounds from this class of herbicides should be tested further, because they appear to have potential. Other analogs might be more effective.