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Picloram translocation in leafy spurge

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Several experiments were conducted to determine picloram translocation in leafy spurge. In the first experiment, ^{14}C -picloram translocation was compared to ^{14}C -picloram plus 2,4-D translocation in a leafy spurge root system. Leafy spurge plants were grown in 24 by 54 by 2 inch root boxes for 9 months in a greenhouse. The topgrowth was removed and allowed to regrow to a height of 6 to 8 inches before treatment. Three leaves of each plant were treated with a total of 270,093 dpm of ^{14}C -picloram. Unlabeled herbicide was added to bring the final application rate of picloram to 0.25 and 2.0 lb/A and picloram plus 2,4-D to 0.25 plus 2.0 lb/A. One plant per root box was treated and the treatments were not replicated. The plants were harvested one week after treatment and separated into treated leaves, foliage, root buds (from soil level to 15 cm below) and the root tissue which was subdivided into segments of 30 cm. The plant tissue was frozen, oven dried, combusted and assayed for ^{14}C -picloram.

After one week leaves treated with ^{14}C -picloram plus 2,4-D became chlorotic and dried out. The rapid destruction may have been caused by too much herbicide or herbicide carrier being applied per leaf. This probably caused less picloram than expected to be translocated.

The treatment ^{14}C -picloram at 0.25 lb/A result in more ^{14}C -picloram translocation into the leafy spurge root system than ^{14}C -picloram at 2.0 lb/A or ^{14}C -picloram plus 2,4-D at 0.25 plus 2.0 lb/A (Table 1). Also, the deepest translocation of ^{14}C -picloram occurred in the ^{14}C -picloram at 0.25 lb/A treated plant. Very little ^{14}C -picloram was found in the root buds, or secondary root tissue.

In the second experiment, ^{14}C -picloram translocation from treated (parent) plants to root connected (daughter) plants was investigated. Leafy spurge plants attached by a common root were grown in separate 1 L plastic pots with 1 N Hoaglands solution and aerated. The common root connected the parent plant with the daughter plant via holes drilled in the side of each pot and sealed with a vaseline:paraffin wax in a 30:70 ratio. 1 ppm Cu sulfate was added to the nutrient solution to prevent algal growth. The parent plant was treated on three leaves midway between the apex and the base of the stem. Each parent plant received a total of 212,600 dpm of ^{14}C -picloram followed by unlabeled picloram to make the rate equal to 2 lb/A; also, 10 μl surfactant WK at 0.04% (v/v) was added prior to and 15 minutes after treatment. The plants were separated as before, combusted and assayed for ^{14}C . The nutrient solution was condensed to 40 ml and a 1 ml aliquot was assayed for radioactivity. There were five pairs of plants/treatment and the experiment was replicated.

Of the total ^{14}C applied, only 18.3% was translocated from the treated leaves (Table 2). The ^{14}C translocated from the parent stem totaled 7.5% of the ^{14}C applied, including 4.9% in the nutrient solution of the parent and daughter plants. Thus 65% of the ^{14}C -picloram that was translocated to the parent root was excreted by the parent and daughter plant roots into the media. These experiments demonstrate that most of the picloram applied to leafy spurge is not translocated to the roots, and that about 65% of the picloram that is translocated to the root is excreted. Picloram applied at 0.25 lb/A translocated further into the root system than picloram applied at 2.0 lb/A. Thus long term control from the high rates of picloram in the field may be due primarily to soil residual and not deep root translocation following treatment.

Table 1. Distribution of ^{14}C in various parts of leafy spurge grown in root boxes after leaf application of ^{14}C -picloram. (Lym and Messersmith).

Plant part	Treatment		
	^{14}C -picloram 2.0 lb/A	^{14}C -picloram 0.25 lb/A	^{14}C -picloram+2,4-D 0.25+2.0 lb/A
	(% of total ^{14}C -applied)		
Treated leaf	37.7	43.8	52.9
Shoots and leaves	17.9	20.3	5.1
Root buds (0 to 15 cm)	0	0	0
<u>Primary vertical root</u>			
0-15 cm	1.4	4.4	1.7
15-45 cm	0.3	1.9	0.3
45-75 cm	0	1.2	0.2
75-105 cm	0	0.5	0
105-135 cm	0	0	0
135-165 cm	0	0	0
<u>Secondary root</u>			
0-15 cm	0.1	0	0.1
15-45 cm	0.2	0	0.1
45-75 cm	0.4	0	0
105-135 cm	0	0	0
135-165 cm	0	0	0

Table 2. Distribution of ^{14}C in various parts of leafy spurge plants after leaf application of ^{14}C -picloram. (Lym and Messersmith).

Plant part	Parent plant		Daughter plant	
	(% of total ^{14}C applied)			
Treated leaf	39.4		---	
Shoots and leaves	10.8		0.8	
Root buds	0		0	
Roots	1.5		0.3	
Nutrient solution	3.2		1.7	