Research Note

Phytotoxicity to Four Vegetables of Residue Levels of Prometryn and Diuron in Soil[1]

On a field trip last year to the vegetable-growing region near Santa Isabel, dieback of many sweet pepper (*Capsicum annuum acuminatum*) plants was observed. Herbicide residue from previous plantings of sugarcane and pigeon peas was suspected as the cause of this condition. Soil samples from affected fields were sent to the Pesticide Laboratory of the Experiment Station at Río Piedras for analyses. The detected level of Prometryn in the soil averaged 0.12 p/m and that of Diuron 0.70 p/m. Inquiries were made to find out whether such levels of herbicide residues could be toxic to sweet peppers, but no definite information was obtained.

Toxicity of herbicide residues to vegetables is known to vary with soil type, organic matter content and clay minerals present in the soil.

A greenhouse experiment was carried out to determine whether the detected levels of Prometryn and Diuron in the soil near Santa Isabel could have caused the dieback of pepper plants. Cucumbers, tomatoes and dry beans were also included in the experiment.

Approximately 10 bags of uncontaminated Santa Isabel soil were collected. The soil had a pH of 7.5 and an organic matter content of 2.6%. The soil was air dried on a greenhouse bench and pulverized through a motor-driven grinder. Technical grades of Prometryn and Diuron were dissolved in 100 ml of 50% acetone as stock solutions. Subsequent dilutions of the stock solutions gave concentrations of 0, 0.10, 0.20, 0.40, 0.80 and 1.60 p/m on an air-dry weight basis soil. One hundred ml of each stock solution was mixed with 20 kg of soil in a rotary type mixer for 30 min and divided into 20 plastic pots, each containing 1 kg of soil. The pots were placed on greenhouse benches. A randomized complete block design with five replicates was used. Pepper plants of the Blanco del País variety and tomatoes of the Walter No. 2 variety were transplanted into the pots of treated soil when they were 4 to 5 weeks old. Five seeds of the Southern Pink bean variety were sown in each pot January 24, 1980. Three seeds of the Poinsett cucumber cultivar were sown in the pots the same day. Cucumber plants were thinned to two, and dry beans to three, per pot after emergence. All plants were allowed to grow for 8 weeks and were then harvested; with a razor blade the aerial part of the plant was cut off at ground level. Fresh weights were recorded and served as the index of phytotoxicity.

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TABLE 1.—*Effect of residue levels of Prometryn and Diuron on growth of plants of four vegetables*

Herbicide and concentrations	Fresh weight of plants after 8 weeks (g/plant)			
	Tomatoes	Peppers	Cucumbers	Dry beans
p/m				
1. Check 0	15.37 ab[1]	9.28 ab	11.70 a	6.10 a
2. Prometryn 0.10	13.14 abc	7.25 b	11.41 ab	5.90 a
3. Prometryn 0.20	15.66 a	7.27 b	9.78 ab	5.42 a
4. Prometryn 0.40	13.91 abc	7.07 b	9.76 ab	4.98 ab
5. Prometryn 0.80	14.27 abc	8.05 b	7.87 bc	4.89 ab
6. Prometryn 1.60	11.89 bc	10.96 a	0 d	3.76 b
7. Diuron 0.10	12.93 abc	7.47 b	9.07 bc	5.91 a
8. Diuron 0.20	13.64 abc	7.03 b	9.73 ab	5.45 a
9. Diuron 0.40	12.55 abc	7.64 b	9.93 ab	5.00 a
10. Diuron 0.80	14.53 ab	8.89 ab	7.10 c	5.12 ab
11. Diuron 1.60	10.66 c	3.60 c	0 d	1.73 c

[1] Values followed by the same letter in the same column do not differ significantly at the 5% probability level. Each value is the mean of four replications.

Table 1 shows the effect of different concentrations of herbicides in the Santa Isabel soil on fresh weights of the four vegetables. Pepper plants were quite tolerant to both Prometryn and Diuron. Prometryn at 0.10 p/m, a concentration near the level detected in the field, did not significantly affect the fresh weight of the pepper plants as compared to that of the pepper plants from untreated soil, nor did Diuron at 0.80 p/m. The highest Diuron concentration tested, 1.60 p/m, caused significant reductions in fresh weight but did not cause dieback of the pepper plants; therefore, it appears that neither Diuron nor Prometryn residues caused the observed dieback of pepper plants occurring near Santa Isabel.

Diuron and Prometryn at the highest concentration of 1.60 p/m completely killed the cucumber plants. Also, the fresh weight of cucumber plants was significantly reduced by both herbicides at 0.80 p/m.

Neither herbicide at its highest concentration of 1.60 p/m caused the death of the bean plants. However, the fresh weight of the plants was significantly reduced by the highest concentration of Prometryn and Diuron.

Tomato plants seem to be highly tolerant to both Prometryn and Diuron. The fresh weight of tomato plants was not significantly affected by the highest concentration of Prometryn tested. However, the highest concentration of Diuron significantly reduced the fresh weight of tomato plants as compared to that of the plants in the untreated check.

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