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# Selectivity and Efficacy of Diuron for Weed Control in Peppermint

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Agricultural Experiment Station  
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SELECTIVITY AND EFFICACY OF DIURON  
FOR WEED CONTROL IN PEPPERMINT  
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INTRODUCTION

Peppermint (*Mentha piperita*) was grown on more than 53,000 acres in western and central Oregon in 1978. This acreage accounted for more than 90 percent of the state total of 57,000 acres, and produced peppermint oil valued at almost \$34 million.<sup>1</sup>

To achieve an economical oil yield, peppermint growers must overcome several major production problems. One of these major problems is weeds. Weeds not only reduce peppermint oil yield through competition, but also can reduce oil quality by affecting taste, aroma, or color. To overcome the increasing costs of hand labor and to reduce the spread of the soil-borne pathogen, verticillium wilt (*Verticillium dahliae*), growers have turned to herbicides to solve most of their weed control problems.

This circular presents data collected from field trials from 1954 to 1979 on the effects of diuron {3-(3,4-dichlorophenyl)-1,1-dimethylurea} on peppermint and its effectiveness in controlling weeds. Data were collected from fields in central, western (including Josephine County), and northeastern Oregon (Umatilla County).

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<sup>1</sup>Compiled by Extension Economic Information Office, Oregon State University.

Since climate, soils, and weed species differ greatly between western and central Oregon, the two areas are generally dealt with separately in this circular. Data from northeastern Oregon and central Oregon are presented together.

Because no single herbicide can control all weeds selectively in a crop, and because terbacil (Sinbar) is a more persistent (but effective and safe) herbicide than diuron, which leads to crop rotation problems, combinations of diuron with terbacil and other herbicides also were investigated.

## EXPERIMENTAL PROCEDURES

Experiments were conducted as randomized complete block designs. Most experiments had three or four replications but some had only two and one experiment had 12. The minimum plot width was 6 feet and the minimum plot length was 20 feet. Herbicides were applied with a CO<sub>2</sub> pressurized backpack sprayer or a unicycle, compressed-air sprayer.

Visual evaluations were made as percentage weed control or percentage peppermint injury as compared to an untreated check. Peppermint oil yield was determined by collecting subsamples of peppermint hay from individual plots and distilling the oil in a small-scale still.

The rate of diuron was expressed as pounds active ingredient (a.i.) per acre. The diuron formulation used in these studies (Karmex 80W) was provided by the du Pont Chemical Company.

## RESULTS

Control of Annual Weeds in Western Oregon

Diuron was usually more effective on winter annual weeds when applied in early fall compared to mid or late fall (Table 1). Since diuron is not readily leached and is absorbed by plants primarily through the root system, application when weeds are small is essential for maximum effectiveness.

In trials where more than one rate was used, weed control was often best with the highest rate. Differences in effectiveness between rates tended to increase with the later applications.

Control of Annual Weeds in Western Oregon with Diuron Combinations

The combination of 0.8 lb/A of terbacil with 1.6 lb/A of diuron was more effective for controlling annual broadleaf weeds than 1.6 lb/A of diuron alone, but was not more effective than 2.4 lb/A of diuron (compare Table 2 to Table 1). The addition of terbacil to diuron did produce better Italian ryegrass (*Lolium multiflorum*) control than diuron alone (Table 3). This was most dramatic with the later timings. For example, Italian ryegrass control at Location 28 with 2.4 lb/A of diuron applied on December 8, 1965 was 67% while with diuron at 1.6 lb/A plus terbacil at 0.8 lb/A was 97%.

Paraquat was an especially useful herbicide for combining with diuron since it has virtually no soil activity to injure rotational crops. At Location 35, common groundsel (*Senecio vulgaris*) control was

17% with diuron (Table 1) and 93% with paraquat plus diuron (Table 2). Italian ryegrass control at Location 36 was 56% with diuron (Table 1) and 82% with paraquat plus diuron (Table 3).

Napropamide (Devrinol) increased common groundsel control (Table 2) but not Italian ryegrass control (Table 3). Since napropamide is effective only on germinating seedlings, the preemergence application on the groundsel was more effective than the postemergence application on the ryegrass.

#### Control of Annual Weeds in Central Oregon

Summer annual weed control in central Oregon tended to be better with later timings and higher rates of diuron except for Russian thistle (*Salsola kali*), which tended to be more resistant later in the season (Table 4). Applications before April did not give adequate control of most summer annual weeds.

Combinations of trifluralin (Treflan) with diuron increased control of Russian thistle and redroot pigweed, while combinations of metribuzin with diuron improved the control of lambsquarters and redroot pigweed (Table 5).

#### Control of Perennial Weeds

Control of established perennial weeds was generally poor (Table 6). Two exceptions to this were the combination of paraquat and diuron on velvetgrass (*Holcus lanatus*) and the combination of terbacil and diuron on quackgrass (*Agropyron repens*).

### Peppermint Tolerance in Western Oregon

Except for an April application on fall-planted peppermint, no injury was recorded for diuron treatments of 2.4 lb/A or less applied between mid-October and the end of April (Table 7). Peppermint cannot tolerate applications of diuron on the foliage during periods of active growth.

Although it is generally accepted that organic matter and clay content of the soil affect the herbicidal activity of diuron, the date of application (i.e., dormant versus actively growing mint) appeared to be a greater factor in relation to peppermint tolerance.

### Peppermint Tolerance in Central and Northeastern Oregon

Peppermint tolerance was not quite as good in central Oregon as it was in western Oregon (Table 8). However, stage of growth as reflected in the application date appeared to be a more important factor than soil type. The generally lower organic matter content of central Oregon soils was probably the major difference between the peppermint tolerance of the two regions.

### Peppermint Tolerance with Diuron Combinations

The addition of terbacil, paraquat, or napropamide to diuron on dormant peppermint did not increase crop injury (Table 9). However, the addition of metribuzin did cause more injury than diuron alone.

### Peppermint Yields in Western and Central Oregon

Peppermint fresh hay yields were significantly higher than the untreated check in the March applications at Location 2 at rates up to 3.2 lb/A (Table 10). Since Location 2 had a loam soil, that factor might account for the greater tolerance compared to Location 1 (fine sandy loam) and Location 3 (sandy loam).

Fresh weights at Location 21 in western Oregon were unaffected by diuron at 1.6 lb/A. At Location 50, paraquat increased peppermint oil yield by further reducing weed competition.

Table 1. Control of annual weeds in western Oregon peppermint with diuron

Location	County	Application Date	Evaluation Date	Rate (lb ai/A)	Weed Control (%)									
					Italian ryegrass	Rattail fescue	Annual bluegrass	Common groundsel	Common chickweed	Annual sowthistle	Prickly lettuce	Red nettle	dead	Shepherds-purse
32	Linn	Oct 7, 1965	Apr 1, 1966	1.6	-	-	99	98	100	-	100	100	100	100
32	Linn	Oct 7, 1965	Apr 1, 1966	2.4	-	-	100	99	100	-	100	100	100	100
27	Linn	Oct 15, 1965	Apr 6, 1966	1.6	97	-	-	97	-	-	-	-	-	-
27	Linn	Oct 15, 1965	Apr 6, 1966	2.4	100	-	-	100	-	-	-	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	1.6	70	-	95	70	98	83	-	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	2.4	99	-	100	98	100	100	-	-	-	-
24	Benton	Oct 27, 1970	Mar 18, 1971	1.5	-	-	-	20	-	-	-	-	-	-
24	Benton	Oct 27, 1970	Mar 18, 1971	2.0	-	-	-	40	-	-	-	-	-	-
24	Benton	Oct 27, 1970	Mar 18, 1971	4.0	-	-	-	75	-	-	-	-	-	-
36	Linn	Nov 18, 1975	June 18, 1976	2.4	57	-	-	-	-	-	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	1.6	-	-	100	17	-	-	-	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	1.6	57	-	30	92	93	99	-	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	2.4	67	-	53	97	96	99	-	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	1.6	17	-	-	0	-	-	-	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	2.4	45	-	-	50	-	-	-	-	-	-
32	Linn	Dec 15, 1965	Apr 1, 1966	1.6	-	-	0	0	0	-	0	0	0	0
32	Linn	Dec 15, 1965	Apr 1, 1966	2.4	-	-	25	37	63	-	47	40	30	80
39	Polk	Dec 16, 1974	July 7, 1975	2.4	40	63	-	-	-	-	-	-	-	-
50	Linn	Jan 15, 1975	July 11, 1975	2.4	73	-	-	-	-	-	-	-	-	-
23	Polk	Apr 28, 1971	June 7, 1971	1.5	0	-	-	-	-	-	-	-	-	-
23	Polk	Apr 28, 1971	June 7, 1971	2.0	0	-	-	-	-	-	-	-	-	-
23	Polk	Apr 28, 1971	June 7, 1971	4.0	10	-	-	-	-	-	-	-	-	-
22	Benton	May 12, 1971	June 25, 1971	1.5	15	-	-	-	-	-	-	-	-	-
22	Benton	May 12, 1971	June 25, 1971	2.0	20	-	-	-	-	-	-	-	-	-
22	Benton	May 12, 1971	June 25, 1971	4.0	85	-	-	-	-	-	-	-	-	-

Table 2. Control of annual broadleaf weeds in western Oregon peppermint with diuron combinations

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Weed Control (%)							
						Common groundsel	Common chickweed	Annual sowthistle	Prickly lettuce	Redroot pigweed	Red dead nettle	Sherherds-purse	Mayweed
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	100	100	-	100	-	100	100	100
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	100	100	-	100	-	100	100	100
27	Linn	Oct 15, 1965	Apr 6, 1966	terbacil + diuron	0.8 + 1.6	99	-	-	-	-	-	-	-
27	Linn	Oct 15, 1965	Apr 6, 1966	terbacil + diuron	1.6 + 1.6	99	-	-	-	-	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	terbacil + diuron	0.8 + 1.6	92	100	100	-	-	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	terbacil + diuron	1.6 + 1.6	96	100	100	-	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	terbacil + diuron	0.8 + 1.2	17	-	-	-	-	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	terbacil + diuron	0.8 + 1.6	98	100	92	-	-	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	terbacil + diuron	1.6 + 1.6	100	97	93	-	-	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	terbacil + diuron	0.8 + 1.6	37	-	-	-	-	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	terbacil + diuron	1.6 + 1.6	40	-	-	-	-	-	-	-
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	17	30	-	33	-	0	23	0
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	17	80	-	7	-	20	83	50
29	Linn	Apr 28, 1966	July 18, 1966	terbacil + diuron	1.6 + 1.6	-	-	-	-	99	-	-	-
33	Benton	Nov 20, 1976	May 25, 1977	paraquat + diuron	0.38 + 2.4	65	-	-	100	-	-	-	-
34	Polk	Dec 7, 1976	May 25, 1977	paraquat + diuron	0.38 + 1.6	25	-	-	100	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	paraquat + diuron	0.38 + 1.6	93	-	-	-	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	metribuzin + diuron	1.0 + 1.2	17	-	-	-	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	napropamide + diuron	2.0 + 1.6	65	-	-	-	-	-	-	-
30	Marion	Apr 26, 1966	Aug 9, 1966	terbacil + diuron	1.6 + 1.6	100	-	-	-	100	-	-	-

Table 3. Control of annual grasses in western Oregon peppermint with diuron combinations

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Weed Control (%)				
						Italian ryegrass	Annual bluegrass	Ripgut brome	Rattail fescue	Barnyardgrass
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	-	99	-	-	-
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	-	100	-	-	-
27	Linn	Oct 15, 1965	Apr 6, 1966	terbacil + diuron	0.8 + 1.6	100	-	-	-	-
27	Linn	Oct 15, 1965	Apr 6, 1966	terbacil + diuron	1.6 + 1.6	100	-	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	terbacil + diuron	0.8 + 1.6	100	100	-	-	-
28	Benton	Oct 16, 1965	Apr 5, 1966	terbacil + diuron	1.6 + 1.6	100	98	-	-	-
31	Linn	Nov 9, 1965	Mar 25, 1966	terbacil + diuron	1.2 + 1.6	-	-	88	-	-
36	Linn	Nov 18, 1975	June 18, 1976	terbacil + diuron	1.2 + 1.6	50	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	terbacil + diuron	0.8 + 1.2	-	100	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	terbacil + diuron	0.8 + 1.6	97	93	-	-	-
28	Benton	Dec 8, 1965	Apr 5, 1966	terbacil + diuron	1.6 + 1.6	100	98	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	terbacil + diuron	0.8 + 1.6	77	-	-	-	-
27	Linn	Dec 10, 1965	Apr 6, 1966	terbacil + diuron	1.6 + 1.6	83	-	-	-	-
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	-	27	-	-	-
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	-	20	-	-	-
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + diuron	0.38 + 2.4	82	-	-	-	-
33	Benton	Nov 20, 1976	May 25, 1977	paraquat + diuron	0.38 + 2.4	100	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	paraquat + diuron	0.38 + 1.6	-	100	-	-	-

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Table 3. (continued)

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Weed Control (%)				
						Italian ryegrass	Annual bluegrass	Ripgut brome	Rattail fescue	Barnyardgrass
39	Polk	Dec 16, 1974	July 7, 1975	paraquat + diuron	0.38 + 2.4	70	-	-	67	-
38	Linn	Jan 15, 1975	July 11, 1975	paraquat + diuron	0.38 + 2.4	99	-	-	-	-
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + terbacil + diuron	0.38 + 1.2 + 1.6	78	-	-	-	-
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + napropamide + diuron	0.38 + 3.0 + 1.6	77	-	-	-	-
36	Linn	Nov 18, 1975	June 18, 1976	napropamide + diuron	3.0 + 1.6	57	-	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	metribuzin + diuron	1.0 + 1.2	-	100	-	-	-
35	Polk	Dec 7, 1976	May 25, 1977	napropamide + diuron	2.0 + 1.6	-	100	-	-	-
38	Linn	Jan 15, 1975	July 11, 1975	dinoseb + diuron	1.5 + 2.4	78	-	-	-	-
29	Linn	Apr 28, 1966	July 18, 1966	terbacil + diuron	1.6 + 1.6	98	-	-	-	98

Table 4. Control of annual weeds in peppermint with diuron at rates of 1.5 to 6.0 lbs a.i/A in central Oregon

Location	County	Application Date	Evaluation Date	Rate	Weed Control (%)					
					Lambs- quarters	Barnyard- grass	Redroot Pigweed	Russian Thistle	Night- shade	Prickly Lettuce
18	Jefferson	Nov 16, 1977	June 29, 1978	1.8	-	-	53	58	-	-
19	Jefferson	Jan 20, 1977	June 6, 1977	1.6	37	17	17	-	-	-
18	Jefferson	Feb 3, 1978	June 29, 1978	1.8	-	-	27	38	-	-
6	Jefferson	Apr 9, 1964	July 1, 1964	1.6	55	47	83	75	-	-
6	Jefferson	Apr 9, 1964	July 1, 1964	2.4	25	25	47	52	-	-
6	Jefferson	Apr 9, 1964	July 1, 1964	3.2	55	100	83	70	-	-
15	Deschutes	Apr 9, 1970	June 25, 1970	2.0	-	-	-	35	93	-
15	Deschutes	Apr 9, 1970	June 25, 1970	4.0	-	-	-	80	95	-
7	Jefferson	Apr 10, 1964	July 1, 1964	1.6	-	-	52	-	-	65
7	Jefferson	Apr 10, 1964	July 1, 1964	2.4	-	-	50	-	-	80
7	Jefferson	Apr 10, 1964	July 1, 1964	3.2	-	-	88	-	-	100
9	Jefferson	Apr 17, 1965	June 7, 1965	2.4	98	-	-	95	94	-
14	Jefferson	Apr 30, 1970	June 23, 1970	2.0	-	-	99	-	99	-
14	Jefferson	Apr 30, 1970	June 23, 1970	4.0	-	-	100	-	100	-
14	Jefferson	Apr 30, 1970	June 23, 1970	6.0	-	-	100	-	100	-
5	Jefferson	May 2, 1962	July 10, 1962	1.6	70	50	-	-	-	-
5	Jefferson	May 2, 1962	July 10, 1962	3.2	93	87	-	-	-	-
17	Jefferson	May 1, 1971	July 20, 1971	1.5	0	70	-	20	0	-
17	Jefferson	May 1, 1971	July 20, 1971	2.0	70	92	-	5	70	-
17	Jefferson	May 1, 1971	July 20, 1971	4.0	100	100	-	55	100	-
16	Jefferson	May 10, 1971	July 20, 1971	1.5	-	-	90	0	100	-
16	Jefferson	May 10, 1971	July 20, 1971	2.0	-	-	100	0	100	-
16	Jefferson	May 10, 1971	July 20, 1971	4.0	-	-	100	50	100	-

Table 5. Control of annual weeds with diuron combinations in Jefferson County

Location	Application Date	Evaluation Date	Treatment	Rate (lb ai/A)	Weed Control (%)					
					Russian Thistle	Redroot Pigweed	Tansy Mustard	Purslane	Lambs-quarters	Barnyard-grass
18	Nov. 16, 1977	June 29, 1978	trifluralin + diuron	0.6 + 1.8	87	91	-	-	-	-
19	Jan. 20, 1977	June 6, 1977	metribuzin + diuron	0.75 + 1.2	-	92	-	-	92	62
19	Jan. 20, 1977	June 6, 1977	terbacil + diuron	0.8 + 1.2	-	81	-	-	10	57
19	Jan. 20, 1977	June 6, 1977	napropamide + diuron	2.0 + 1.2	-	37	-	-	0	53
18	Feb. 3, 1978	June 29, 1978	trifluralin + diuron	0.6 + 1.8	57	55	-	-	-	-
10	May 7, 1966	June 21, 1966	terbacil + diuron	1.2 + 1.6	91	-	79	-	-	-
11	May 7, 1966	July 19, 1966	terbacil + diuron	1.2 + 1.6	-	-	-	99	-	-

Table 6. Control of perennial weeds in western and central Oregon peppermint with diuron and diuron combination

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Weed Control (%)						
						Spotted catsear	Sheep sorrel	Yellow nutsedge	Velvetgrass	Volunteer garlic	Quackgrass	Tansy ragwort
39	Polk	Dec 16, 1974	July 7, 1975	diuron	2.4	0	0	-	10	-	-	-
40	Josephine	Apr 11, 1963	Aug 7, 1963	diuron	1.6	-	-	10	-	-	-	-
40	Josephine	Apr 11, 1963	Aug 7, 1963	diuron	3.2	-	-	60	-	-	-	-
41	Josephine	Apr 15, 1964	July 9, 1964	diuron	1.6	-	-	13	-	-	-	-
41	Josephine	Apr 15, 1964	July 9, 1964	diuron	2.4	-	-	0	-	-	-	-
41	Josephine	Apr 15, 1964	July 9, 1964	diuron	3.2	-	-	24	-	-	-	-
39	Polk	Dec 16, 1974	July 7, 1975	paraquat + diuron	0.38 + 2.4	10	0	-	100	-	-	-
19	Jefferson	Jan 20, 1977	June 6, 1977	metribuzin + diuron	0.75 + 1.2	-	-	-	-	60	-	-
19	Jefferson	Jan 20, 1977	June 6, 1977	napropamide + diuron	2.0 + 1.2	-	-	-	-	0	-	-
19	Jefferson	Jan 20, 1977	June 6, 1977	terbacil + diuron	0.8 + 1.2	-	-	-	-	20	-	-
19	Jefferson	Jan 20, 1977	June 6, 1977	diuron	1.6	-	-	-	-	37	-	-
23	Polk	Apr 28, 1971	June 7, 1971	diuron	1.5	-	-	-	0	-	-	0
23	Polk	Apr 28, 1971	June 7, 1971	diuron	2.0	-	-	-	2	-	-	0
23	Polk	Apr 28, 1971	June 7, 1971	diuron	4.0	-	-	-	25	-	-	0
8	Umatilla	Apr 14, 1964	Aug 18, 1964	diuron	1.6	-	-	-	-	-	0	-
8	Umatilla	Apr 14, 1964	Aug 18, 1964	diuron	2.4	-	-	-	-	-	0	-
8	Umatilla	Apr 14, 1964	Aug 18, 1964	diuron	3.2	-	-	-	-	-	0	-
30	Marion	Apr 26, 1966	Aug 9, 1966	terbacil + diuron	1.6 + 1.6	-	-	-	-	-	99	-

Table 7. Visual evaluations of peppermint injury from diuron applications at rates of 1.6 to 4.0 lbs a.i./A in western Oregon.

Location	County	Application date	Evaluation date	Peppermint Injury (%)					Soil type	O.M. (%)
				1.6	2.0	2.4	3.2	4.0		
32	Linn	Oct 7, 1965	Apr 1, 1966	5	-	13	-	-	Sandy loam	-
24	Benton	Oct 17, 1970	Mar 18, 1971	0	0	-	-	0	Silty clay loam	3.6
36	Linn	Nov 18, 1975	June 18, 1976	-	-	0	-	-	Silt loam	3.8
37	Benton	Nov 18, 1969	Apr 2, 1970	-	0	-	-	0	Silty clay loam	
60	Benton	Nov 20, 1976	May 25, 1977	-	-	0	-	-	Loam	2.6
35	Polk	Dec 7, 1976	May 25, 1977	0	-	-	-	-	Silty clay loam	3.5
32	Linn	Dec 15, 1966	Apr 1, 1966	0	-	0	-	-	Sandy loam	-
39	Polk	Dec 16, 1974	July 7, 1975	-	-	0	-	-	Silt loam	2.5
42 <sup>a</sup>	Linn	Apr 9, 1965	June 19, 1965	43	-	-	-	-	Sandy loam	-
40	Josephine	Apr 11, 1963	Aug 7, 1963	0	-	-	0	-	-	-
43	Linn	Apr 12, 1965	June 4, 1965	0	-	-	-	-	Sandy loam	-
20	Benton	Apr 14, 1954	July 14, 1954	0	-	-	0	-	Silt loam	-
41	Josephine	Apr 15, 1964	Aug 20, 1964	0	-	0	8	-	Fine sandy loam	-
23	Polk	Apr 28, 1971	June 7, 1971	0	8	-	-	15	Clay loam	4.0
22	Benton	May 12, 1971	June 25, 1971	0	5	-	-	35	Loam	3.6
26	Linn	May 16, 1974	Aug 14, 1974	-	-	35	-	-	Silt loam	3.4
25	Benton	June 27, 1969	Aug 9, 1969	-	-	-	-	55	Silt loam	-

<sup>a</sup>Planted fall, 1964.

Table 8. Visual evaluations of peppermint injury from diuron applications at rates of 0.4 to 6.0 lbs a.i./A in central and northeastern Oregon

Location	County	Application Date	Evaluation Date	Peppermint Injury (%)						Soil type	O.M. (%)
				0.4	0.8	1.6	2.0-2.4	3.2-4.0	6.0		
19	Jefferson	Jan. 20, 1977	June 6, 1977	-	-	0	-	-	-	Loam	2.2
1	Jefferson	Mar. 29, 1957	June 11, 1957	0	0	0	-	0	-	Fine sandy loam	-
2	Jefferson	Mar. 29, 1957	June 11, 1957	0	0	0	-	0	-	Loam	-
3	Jefferson	Mar. 29, 1957	June 11, 1957	0	0	10	-	15	-	Sandy loam	-
6	Jefferson	Apr. 9, 1964	July 1, 1964	-	-	0	0	0	-	--	-
15	Deschutes	Apr. 9, 1970	June 25, 1970	-	-	-	5	30	-	Sandy loam	2.0
7	Jefferson	Apr. 10, 1964	July 1, 1964	-	-	0	5	0	-	--	-
8	Umatilla	Apr. 14, 1964	Aug. 18, 1964	-	-	0	0	0	-	--	-
9	Jefferson	Apr. 17, 1965	July 19, 1965	-	-	-	0	-	-	Sandy loam	-
1	Jefferson	Apr. 19, 1957	June 11, 1957	0	0	0	-	0	-	Fine sandy loam	-
3	Jefferson	Apr. 19, 1957	June 11, 1957	0	20	20	-	40	-	Sandy loam	-
13	Jefferson	Apr. 30, 1970	June 23, 1970	-	-	-	0	5	-	Sandy loam	1.3
14	Jefferson	Apr. 30, 1970	June 23, 1970	-	-	-	5	33	55	Sandy loam	0.86
17	Jefferson	May 1, 1971	July 2, 1971	-	-	2	0	35	-	--	1.6
5	Jefferson	May 2, 1962	July 10, 1962	-	-	3	-	13	-	Loam	-
16	Jefferson	May 10, 1971	July 20, 1971	-	-	25	30	60	-	--	1.0
1	Jefferson	May 14, 1957	June 11, 1957	30	50	70	-	80	-	Fine sandy loam	-
2	Jefferson	May 14, 1957	June 11, 1957	20	30	60	-	70	-	Loam	-
3	Jefferson	May 14, 1957	June 11, 1957	20	60	65	-	86	-	Sandy loam	-

Table 9. Visual evaluations of peppermint injury from diuron combinations

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Peppermint injury (%)	Soil type	O.M. (%)
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	10	Sandy loam	-
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	0.8 + 1.6	0	Sandy loam	-
35	Polk	Dec 7, 1976	May 25, 1977	terbacil + diuron	0.8 + 1.2	0	Silty clay loam	3.5
19	Jefferson	Jan 20, 1977	June 6, 1977	terbacil + diuron	0.8 + 1.2	0	Loam	2.2
31	Linn	Nov 9, 1965	Mar 25, 1966	terbacil + diuron	1.2 + 1.6	0	--	-
36	Linn	Nov 18, 1975	June 18, 1976	terbacil + diuron	1.2 + 1.6	0	Silt loam	3.8
12	Umatilla	Mar 10, 1966	May 20, 1966	terbacil + diuron	1.2 + 1.6	27	Very fine sandy loam	-
32	Linn	Oct 7, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	13	Sandy loam	-
32	Linn	Dec 15, 1965	Apr 1, 1966	terbacil + diuron	1.6 + 1.6	0	Sandy loam	-
25	Benton	Apr 25, 1969	Aug 9, 1969	terbacil + diuron	1.6 + 4.0	15	Silt loam	-
25	Benton	Apr 25, 1969	Aug 9, 1969	terbacil + diuron	1.6 + 8.0	88	Silt loam	-

(Continued on next page)

Table 9 (continued)

Location	County	Application date	Evaluation date	Treatment	Rate (lb ai/A)	Peppermint injury (%)	Soil type	O.M. (%)
34	Polk	Dec 7, 1976	May 25, 1977	paraquat + diuron	0.38 + 1.6	3	Silty clay loam	3.5
35	Polk	Dec 7, 1976	May 25, 1977	paraquat + diuron	0.38 + 1.6	0	Silty clay loam	3.5
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + diuron	0.38 + 2.4	0	Silt loam	3.8
33	Benton	Nov 20, 1976	May 25, 1977	paraquat + diuron	0.38 + 2.4	0	Loam	2.6
39	Polk	Dec 16, 1974	July 7, 1975	paraquat + diuron	0.38 + 2.4	0	Silt loam	2.5
46	Linn	Dec 5, 1978	June 10, 1979	paraquat + diuron	0.75 + 2.4	0	Silt loam	3.3
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + terbacil + diuron	0.38 + 1.2 + 1.6	0	Silt loam	3.8
36	Linn	Nov 18, 1975	June 18, 1976	paraquat + napropamide + diuron	0.38 + 3.0 + 1.6	0	Silt loam	3.8
19	Jefferson	Jan 20, 1977	June 6, 1977	napropamide + diuron	2.0 + 1.2	0	Loam	2.2
35	Polk	Dec 7, 1976	May 25, 1977	napropamide + diuron	2.0 + 1.6	0	Silty clay loam	3.5
36	Linn	Nov 18, 1975	June 18, 1976	napropamide + diuron	3.0 + 1.6	0	Silt loam	3.8
19	Jefferson	Jan 20, 1977	June 6, 1977	metribuzin + diuron	0.75 + 1.2	6	Loam	2.2
35	Polk	Dec 7, 1976	May 25, 1977	metribuzin + diuron	1.0 + 1.2	26	Silty clay loam	3.5
47	Linn	May 19, 1978	July 11, 1978	bentazon + diclofop + diuron	0.9 + 1.8 + 0.5	3	Silt loam	5.7

Table 10. Peppermint fresh hay and oil yields from diuron applications in western and central Oregon.  
Yields expressed as percentage of untreated check

Location	County	Application date	Hay yield (%)						Oil yield (%)								
			diuron					paraquat + diuron	LS0	LS0	diuron				paraquat + diuron	LS0	LS0
			0.4	0.8	1.6	2.4	3.2	0.38 + 2.4	(.05)	(.01)	0.8	1.6	2.4	3.2	0.38 + 2.4	(.05)	(.01)
1	Jefferson	Mar 29, 1957	119	101	86	-	59	--	35.8	51.8	123	123	-	-	--	n.s.	n.s.
2	Jefferson	Mar 29, 1957	149	142	163	-	172	--	31.0	45.7	121	137	-	-	--	n.s.	n.s.
3	Jefferson	Mar 29, 1957	113	94	96	-	76	--	n.s.	n.s.	99	89	-	-	--	n.s.	n.s.
1	Jefferson	Apr 19, 1957	116	79	90	-	64	--	n.s.	n.s.	124	132	-	-	--	n.s.	n.s.
3	Jefferson	Apr 19, 1957	99	109	94	-	87	--	n.s.	ns.	107	71	-	-	--	n.s.	n.s.
1	Jefferson	May 14, 1957	63	54	52	-	31	--	38.0	55.3	-	-	-	-	--	-	-
2	Jefferson	May 14, 1957	96	94	95	-	78	--	n.s.	n.s.	-	-	-	-	--	-	-
3	Jefferson	May 14, 1957	76	77	66	-	34	--	36.5	n.s.	-	-	-	-	--	-	-
4	Jefferson	Mar 15, 1958	-	-	106	-	106	--	n.s.	n.s.	-	78	-	103	--	n.s.	n.s.
21	Marion	- 1955	-	105	92	-	-	--	n.s.	n.s.	-	-	-	-	--	-	-
50	Linn	Jan 15, 1975	-	-	-	118	-	206	68.8	114.0	-	-	257	-	395	123	168

## SUMMARY

1. Weed control was best when diuron was applied just before or during weed emergence. Applications made several weeks to months before or after weed emergence were often less effective.
2. Combinations of diuron with other herbicides were sometimes more effective than diuron applied alone.
3. Peppermint injury was greater when applications were made to mint that was actively growing.
4. Peppermint injury was greater if the crop was grown on soils low in organic matter or clay content, although this factor was not as important as stage of growth at time of application.
5. Lower rates of diuron in combination with other herbicides could increase crop safety.

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