

REPORT ON USE OF
MALEIC HYDRAZIDE FOR TEMPORARY GROWTH INHIBITION OF GRASS

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THE unique plant-growth-inhibiting property of maleic hydrazide (MH) was discovered in our laboratory in 1949, and since has been applied to various uses among which are inhibition of sprouting of onions and potatoes, (Wittwer and Paterson, 1951), inhibition of sucker development of tobacco (Petersen, 1952), inhibition of bolting of sugar beets with corresponding increase in yield of sugar (Mikkelsen, Griffith and Ririe, 1952).

Degree of inhibition of plants is correlated with the dosage of MH applied. Engle and Ahlgren (1950) found that 2.4 pounds of MH per acre applied in April inhibited growth of turf grasses. Application of a narrow band around sidewalks and flower beds was useful in trimming Bermuda, St. Augustine and carpet grasses (Tullis, 1951). Phelan in the Chicago area and Kennedy (1952) in the New Haven area have found MH useful in reducing grass-trimming costs in cemeteries.

Freed (1953) found in two seasons' studies in Oregon that four pounds of MH applied to Ladino clover in spring stimulated production of seed heads and markedly increased seed yield without adversely affecting stand.

Extensive toxicological studies now in progress show no apparent adverse effect on animals consuming 5 percent MH as sodium salt incorporated in their daily diet in chronic feeding studies after one year and three months. Cows consuming grass treated with MH eliminated the chemical with none present in the milk.

Methods

A formulation of MH as sodium salt containing wetting agent and sticker was used (MH-40). Both roadside and median areas were sprayed with power sprayers at 200 pounds pressure, delivering 50 gallons of solution per acre through a nozzle producing a fan spray.

Rates of treatment were calculated by the following formula:

$$\text{Gallons per hour} = \frac{\text{Gallons per acre} \times \text{Miles per hour} \times \text{Width}}{8.25}$$

No drift or sprayer contamination problems were encountered with the use of MH. Soil plugs of 2-inch or 3½-inch diameters and a depth of 7 inches were collected, washed and dried to constant weight. MH residues were determined by the method described by Wood (1952).

Results

The results of treating 74 acres of plots in Connecticut in 1950 and 1951 has previously been summarized (Zukel, 1952). Experiments in 1952 covered 225 acres for a total of approximately 300 acres during the three years.

- 1/ - Off-center spray nozzle with OC80 tip, Spraying Systems Co., Bellwood, Ill.
2/ - The assistance of John L. Wright and William C. Greene of the Connecticut State Highway Department is acknowledged.

Fall Application of October, 1951

A plot of 20 acres of median was sprayed at four pounds per acre on October 15, 1951. This treatment showed an even and delayed growth in the spring of 1952 with no adverse effect on the appearance of the grass. Ten acres of the plot were inadvertently mowed. The remainder was retreated at four pounds MH per acre on May 23, plus 2,4-D to eliminate plantain and dandelion present in the plot. The combined fall and spring application, totaling eight pounds per acre, required one mowing during the season whereas the check was mowed 17 times. The basic grasses, namely Chewings New Zealand fescue, reedtop and Kentucky bluegrass were satisfactorily inhibited. Some isolated patches of annual grasses appeared which showed uneven growth but did not total more than one fork full over the whole plot.

A number of uneven brown patches in both untreated and in treated areas were noted, but these were found to be associated with presence of Japanese and Asiatic beetle larvae which were eliminated with a Chlordane spray.

Spring Application 1952

A total of 48 acres was sprayed at 4 and 6 pounds per acre during April and May of 1952. The 4-pound level inhibited grass for 6 weeks, whereas the 6 pounds per acre was noticeably inhibited for approximately 3 months when mowing was required. These results were not as satisfactory as those observed the previous spring. The lessened effect obtained was due in part to above normal rainfall in these two months. There is some indication that absorption of MH by grass requires about 24 hours and a rain occurring within this period will reduce the effect in proportion to the amount of precipitation. (Figure 1).



Figure 1. MH sprayed at 4 lb. in October and 4 lb. in May. Photographed in July.

was some weed growth present in the plot. A portion of the plot was retreated with 6 pounds MH plus $1\frac{1}{2}$ pounds of 2,4-D per acre. This eliminated the weeds and the grass was inhibited for the entire season. No mowing was necessary on this plot.

Treatment of a roadside was made at Winsted at 4 and 6 pounds per acre in May of 1952. The 4-pound level delayed growth for two months; then the effect was not apparent after July. The higher dosage satisfactorily inhibited grass growth throughout the season (Figure 2). Since 2,4-D was not included there



Figure 2(a). Untreated check plot.

Summer Application 1952



Figure 2(b). MH sprayed at 6 lb. in May. Photographed in July.

Summer applications were made at dosages of 4, 6, 8, and 14 pounds per acre. Length of period of inhibition was less during the summer than application of equivalent dosages either in the fall or spring. For example, treatment at 4 pounds per acre inhibited for about 6 weeks and the 6, 8, and 14 pounds per acre inhibited for the remainder of season with the exception of weed growth, predominantly ragweed, which could have been eliminated by inclusion of 2,4-D.

The abnormally high dosages were made to determine any adverse effect on grass growth. No adverse effect on appearance of the grass was evident during an abnormally dry July and normal precipitation during August and September.

A series of retreatments was made to various plots at times when no regrowth had occurred to determine cumulative effects and also to areas showing recovery from prior dosages. Roots from a total of 105 soil plugs taken from these plots in November, 1952, were weighed and amount of MH present was determined. The retreatments are summarized in the following table.

TABLE 1: SUMMARY OF RETREATMENTS WITH MH

							MH ppm. 11/52	
A.	NEW HAVEN	Median 8/50	4 lbs.	9/51	5 lbs.		3.0	
		8/50	8 lbs.	9/51	5 lbs.		0.0	
			Untreated				0.0	
B.	NEW HAVEN	Median 5/51	2 lbs.	6/51	4 lbs.		3.0	
			Untreated				0.0	
C.	WINSTED	Roadside 5/52	6 lbs.	6/52	8 lbs.	10/52	8 lbs.	37.8
			Untreated					0.0
D.	MERIDEN	Median 11/51	4 lbs.	5/52	4 lbs.			3.0
			Untreated					0.0
E.	BERLIN	Median 8/51	4 lbs.	6/52	6 lbs.	11/52	6 lbs.	15.4
		8/51	4 lbs.	6/52	14 lbs.	11/52	10 lbs.	8.2
				6/52	8 lbs.	11/52	8 lbs.	3.0
			Untreated					0.0

Grass which showed no inhibition at the time roots were collected likewise showed none or low quantities of MH in the roots (Table 1, plots A, B, D.) Plots which showed recovery from prior treatment by a resumption of vigorous growth and then were retreated showed the degree of inhibition expected of similar applications in untreated areas.

The areas which were retreated while a strong degree of inhibition was evident showed a cumulative effect similar to that observed by Crafts, Currier and Day (1950), who found that weekly applications of a specific dosage produced a cumulative effect about equivalent to the total dosage applied at one time.

Winsted plots (Table 1 C) showed a brown appearance from the combined May and June dosages which was apparent for about one month; they then resumed a normal green color.

Ten root samples each from the treated plots averaged 13.56 grams and from untreated averaged 14.67 grams with a standard error of 3.1 grams. The difference was not significant (Snedecor, 1940).

The 37.8 ppm residue indicates that inhibition can be expected next spring.

Berlin treatments (Table 1 E) showed no discoloration even at the 14-pound MH treatment on June 23. This was probably associated with a severe drought occurring during July. The spray in November was apparently applied too late in the season in view of the lower MH residues in roots. Grass plots throughout the area were partially brown and the MH applied was apparently not absorbed and translocated by foliage in this condition.

Root weights of plots A, B, D, E, (Table 1) were not statistically significant over check analyzed by the analysis of variance method (Snedecor, 1940).

There was no residual toxicity of MH in the soil, confirming a recent detailed study by Levi and Crafts (1952) who found that the chemical either leached or decomposed in the 11 soil types studied.

Summary

1. Application of MH is suggested only for established turf areas.
2. Since approximately 24 hours are required for complete absorption of an MH spray, rainfall records within this period will assist in interpretation of results.
3. A fall spray of 4 or 6 pounds of MH in not less than 40 gallons of water per acre applied to green turf is suggested. Mowing after application is not required.
4. An early spring application at 4 or 6 pounds in not less than 40 gallons of water per acre applied to green grass at start of growth offers results equivalent to fall treatment.
5. Summer spraying of 4 to 6 pounds in not less than 40 gallons of water per acre inhibits grass but not to the degree resulting from either fall or spring treatment. If a mowing is necessary to trim an area, one week should be allowed to elapse before mowing is made, for absorption and translocation of MH to roots.
6. Retreatment within the same season can be made after the growth has resumed. No more than two applications in one season are recommended at this stage of development.
7. Presence of broadleaved weeds in plots will require inclusion of 2,4-D as amine salt at locally recommended dosages.

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