Potato Sprout Inhibitor Spray

aircraft spraying of growth regulator maleic hydrazide is not effective means of reducing sprouting of stored potatoes

Herman Timm

Maleic hydrazide — MH-40—effectively reduces storage losses of potatoes and onions but little use has been made of it as a growth regulator in potato growing in California.

California growers have shown reluctance to use MH-40 because, first, there seems to be some discrepancy in the residue tolerance limits of plant growth regulators that are allowed by the Pure Foods and Drug Administration. Secondly, poor sprout inhibition of stored tubers has resulted from several limited field trials with the use of foliar applications.

Studies on the effects of MH-40 applied to actively growing potato plants by aircraft spraying were initiated in the fall of 1956.

Thirty acres of Kennebec potatoes grown in a high organic soil in San Joaquin County were sprayed by aircraft at the rate of seven pounds of MH-40 per acre. The treatment was applied four weeks before harvest.

At harvest, uniform sized potatoes of U. S. No. 1 grade were selected from treated and untreated areas for storage trials. The potatoes were placed in common—45°F–55°F—storage and in controlled—32°F, 41°F, 50°F and 59°F—storage.

The potatoes were held in storage four months, somewhat longer than is the general commercial practice for chipping potatoes.

Periodically, tuber samples from each storage temperature were removed for determination of specific gravity, weight loss, reducing sugar content and chipping quality.

No discernible change was found in the specific gravity of either treated or untreated tubers during the four months storage. Determination of specific gravity was accomplished by employing a potato hydrometer. Differences in specific gravity were not large enough to be statistically significant.

There was some tendency for tubers to lose weight with time. Little difference in the magnitude of weight loss between treated and untreated potatoes was found within a storage temperature, or between temperatures. A trend toward a greater loss in weight may be expected with an increase in storage temperature and time of storage.

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Specific Gravity and Weight Changes of Stored Potatoes With Time.*

Storage temperature (°F)**	Tubers from plants treated	Specific gravity				Storage wt. loss—total lbs.			
		Date removed from storage				Date removed from storage			
		Nov. 29	Dec. 27	Jan. 23	Feb. 27	Nov. 29	Dec. 27	Jan. 23	Feb. 27
41°	MH-40	1.075	1.079	....	....	2.50	2.50	...	...
	Check	1.078	1.074	....	....	2.00	1.25	...	...
Common	MH-40	1.069	1.079	1.077	1.078	1.00	1.25	2.00	2.00
(45–55°)	Check	1.075	1.076	1.075	1.079	1.50	1.25	1.25	1.50
50°	MH-40	1.070	1.071	1.070	1.074	1.00	0.75	1.50	1.45
59°	MH-40	1.077	1.071	1.073	1.077	1.25	1.50	1.45	2.50

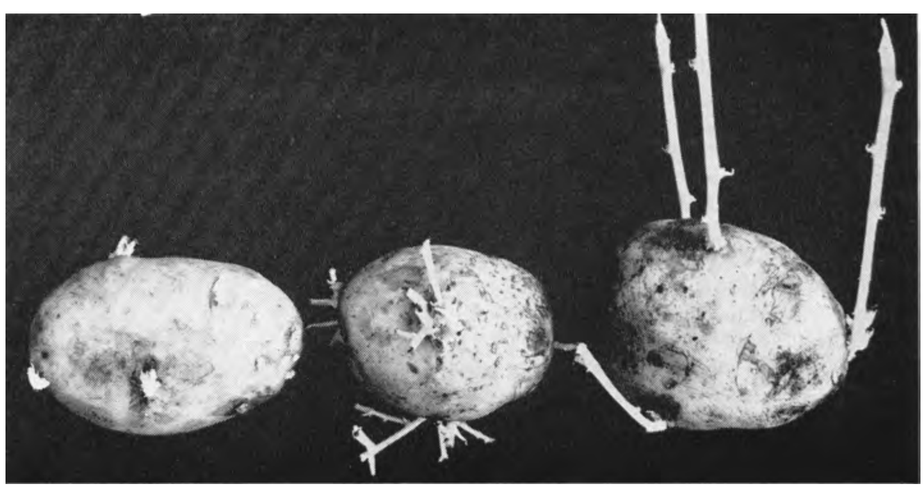
* Placed in storage Nov. 3, 1956, and terminated Feb. 27, 1957.
** Controlled temperatures, unless denoted otherwise.

Reducing Sugar Content Changes Due to Storage Temperatures and Color Rating of Chips.

Storage temperature (°F)	Tubers from plants treated	Reducing sugar content—percent*				Rating of chip color
		Date removed from storage				
		Nov. 29	Dec. 27	Jan. 23	Feb. 27	
32°	Check	...	...	2.10	...	Very dark brown
41°	MH-40	0.70	0.73	...	...	Dark brown
	Check	0.70	0.66	...	...	Dark brown
Common	MH-40	0.16	0.13	0.16	0.19	Light brown
(45–55°)	Check	0.15	0.11	0.07	0.13	Light brown
50°	MH-40	0.20	0.12	0.16	0.13	Light brown
59°	MH-40	0.08	0.09	0.07	0.08	Light brown
Removed from 32° and Reconditioned at 68°		Feb. 6	Feb. 15	Feb. 27		
		0.84	0.84	0.38		Very dark brown

* Reducing sugar content analyzed using Ceric sulfate method by Hassid.

Where there was incomplete coverage of MH-40 spraying by aircraft, some tubers from treated areas showed more sprouting than tubers from untreated areas. *Left to right,* good inhibition, poor and stimulated sprout development of tubers from treated areas.



CHAMISE

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or other methods. Therefore a study was initiated to develop information on that specific point.

Formulations of 2,4-D and 2,4,5-T or combinations of the two were the spray materials used. The main formulations tested were the butoxy ethanol esters and the mixed propylene glycol butyl ether esters. The main additive was water; but others included diesel oil, kerosene, and various nontoxic spray oils.

The most dependable chamise-sprout control by aircraft applications was achieved by spraying in the spring following a summer or fall burn. The main factors affecting chamise-sprout control appear to be adequate soil moisture, uniform spray coverage—as for all types of foliage spraying—and the age of the sprouts which is important after the first year. Older sprouts become increasingly hard to kill until individual plant treatment is required for satisfactory results.

Diesel emulsions proved superior to straight oil mixtures. When used correctly, consistent results were generally obtained ranging as high as 95% kill of sprouts and 100% of the seedlings.

In these studies, the brush seedlings of all species encountered were controlled. However, some seedlings emerged and were established after spraying in certain test areas that had not been seeded following burning or where grass failed to become established. In those cases where —for various reasons—no grass was established or where the stand was sparse, there was generally some delayed germination and survival of brush seedlings following the spraying. This points out the importance of seeding and establishing grass as an essential part of the whole control operation.

When plant sensitivity is not optimum, a mixture of 2,4-D and 2,4,5-T appears to result in a greater kill of chamise sprouts than does 2,4-D by itself. A dosage of three pounds of acid equivalent per acre was clearly superior to two pounds in obtaining a satisfactory kill.

Total volume of grass production, especially of established perennials, is greatly increased when brush competition is reduced or eliminated by spraying. A single application of two pounds of 2,4-D per acre nearly tripled forage production the following year.

An aircraft spray application the spring following a fall burn results in a remarkable general kill on a broad range of brush seedlings, and it also kills most of the chamise sprouts. However, the sprouts of other nondeciduous plants are generally not killed by the spray application, although they are severely injured. Probably a ground-spray application on those sprouts in the fall following the spring aircraft spraying would give the best results. Many sprouts, including toyon and a sprouting manzanita, have been killed by a single application of the spray. More than one application was necessary to complete the cleanup job on live oak, leather oak, scrub oak, and coffeeberry. By starting the ground spraying in the fall, very small amounts of chemical per bush were needed, thus simplifying the cleanup job. The spray mixture used was one gallon of brush killer —4-pound mixture of 2,4-D and 2,4,5-T esters—in one gallon of diesel oil and enough water to make 100 gallons of spray.

Successful control of sprouting chamise by aircraft depends on two conditions. First, the sprouts must be fully emerged and they must be small—within the first growing period following burning—to ensure a high mortality of the sprouting burls. Second, the soil moisture must be high. This means a rather short critical period between full emergence of the sprouts and loss of soil moisture due to summer drought when the plants rapidly become less susceptible.

General view of a 30-acre converted chamise chaparral field. The brush was crushed in 1953, burned and seeded in 1954, and sprayed with two pounds 2,4-D per acre in 1955.

Conversion of selected areas of chamise to grassland within a relatively short period of time appears entirely possible—provided initial removal of the brush, usually by burning—is followed by successful reseeding in the late fall and by aircraft spraying for sprout and seedling control in the spring.

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POTATOES

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No sprouting occurred during the entire storage period at 32°F. At higher temperatures some of the treated tubers showed signs of more active sprouting than did untreated tubers. As the storage temperature increased from common—45°F–55°F—to 50°F and 59°F, some of the sprouts of the treated tubers were noticeably longer than those on the untreated. At 59°F there was a wide range in length of sprouts. Tubers from plants receiving full coverage of MH-40 developed rosette type sprouts. Because of this wide variability in sprouting, no sprout weight measurements were recorded.

The difference in sprouting found among treated tubers strongly suggests that the application of the growth regulator by aircraft was not uniform. Drifting and overlapping of swaths of spray is more than likely when aircraft spraying results are measured. Many growth regulators are found in small quantities in plants. Small dosages of such substances can stimulate growth activity.

Chip color was markedly influenced by storage temperature and reducing sugar content. Chips made from tubers stored at 32°F and 41°F were unacceptable because of a dark brown color. Chips from tubers held at 50°F and higher temperatures were lighter in color and acceptable.

Tubers held at 32°F and then placed into 68°F for reconditioning for three weeks did not produce chips which were acceptable. However, tubers from the 41°F storage were reconditioned after two weeks at 68°F and gave the same colored chips as tubers stored at 59°F.

Where the reducing sugar content of tubers was 0.20% or less, chips were of acceptable color. No difference in chip color was found between untreated and treated tubers at similar storage temperatures.

Further studies are in progress to evaluate ground spray foliar applications.

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