Chemical Weed Control Tests

yields of flower seed increased in experiments with various chemicals to control annual weed pests costly to growers

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Excellent control of annual weeds in flower seed plantings was achieved in Santa Barbara County test plots treated with Vapam, pre-emergence dinitro, methyl bromide, and Shell 20, during December 1954 and January 1955.

The tests started about Christmas time on replicated plots of alyssum, antirrhinum, larkspur, petunia, sweet pea, and verbena. Calcium cyanamide, methyl bromide, and Vapam were applied to the soil before planting.

On December 28—immediately following planting—Shell 20, pre-emergence dinitro, chloro IPC, and Alanap were applied. Shell 10 was sprayed just before flower seedlings emerged. Alyssum plantings were treated on January 3; sweet pea, larkspur, and antirrhinum on January 7; petunia on January 11; and verbena on January 20.

Calcium cyanamide was applied at the rate of one ton per acre; 1,000 pounds were broadcast over the surface and worked into the top 2″ of soil with a garden rake and 1,000 pounds broadcast over the surface as a top dressing. The soil was in a good seedbed condition and near field capacity. The area received two good rains after the calcium cyanamide was applied; one on December 3 and the other on December 9.

In the methyl bromide plots, the chemical was injected under an airtight tarp—at the rate of one pound per 100 square feet—from December 7 to December 22. The tarp was moved each day, giving an exposure of 24 hours for each setting.

Vapam was applied—at 0.75 pound per 100 square feet—with a garden sprinkling can and immediately irrigated by overhead sprinkler at the rate of 15 gallons per 100 square feet to wet the soil to a depth of 2.5″. The Vapam was applied on December 21 and the flower seed planted one week later.

Alanap at three and six pounds per acre, pre-emergence dinitro at six and nine pounds and chloro IPC at four and six pounds were applied in 40 gallons of water per acre. Shell 10 and Shell 20 were applied undiluted at 40 gallons per acre.

The flower seed varieties were planted in four-row strips 150′ long. Each treatment covered 24 rows 12.5′ long and was replicated four times. A weed count was made on March 8.

The control of weeds was excellent in Vapam, methyl bromide, Alanap, pre-emergence dinitro 9-pound rate, chloro IPC 6-pound rate, and Shell 20 treated plots.

Weeds growing in the check plot included nettles, wild radish, lambsquarter, volunteer sweet pea, shepherd's purse, malva, nightshade, nettleleaf goosefoot, and wiregrass.

All chemicals used killed wild radish. Malva was completely eliminated by Shell 20 and nettleleaf goosefoot by Alanap at the six-pound rate. The low rate of Alanap and chloro IPC, pre-emergence dinitro, Shell 10, and Shell 20 failed to control nettles. Lambsquarter was controlled by all treatments except chloro IPC. Methyl bromide, low rate chloro IPC, Shell 10 and Shell 20 did not control volunteer sweet pea. All chemical treatments except Vapam, calcium cyanamide, and low rate chloro IPC controlled shepherd's purse.

Weed control in the calcium cyanamide plots was very poor. This may have been due to the method of application as the dosage was sufficiently high and the soil moisture was favorable for breakdown. The calcium cyanamide did increase slightly the yield of alyssum, larkspur, and sweet pea. The increase in yield was probably from the nitrogen. The response to nitrogen was obvious in the growth and color of the larkspur.

Methyl bromide and Vapam gave excellent weed control and increased the seed yield of all flower crops. By using special techniques in the application of Vapam it may prove to be a very economical material for weed control in annually seeded crops.

Shell 20 gave excellent weed control but was toxic to the flower seed crop in the case of alyssum, antirrhinum, and petunia. The seed yield was slightly increased in the larkspur, sweet pea, and verbena. Since this material is very

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Ounces of Clean Seed from 4 Rows 12.5 Feet Long
Figures are Averages from 4 Replications

Treatment	Alyssum	Antirrhinum	Larkspur	Petunia	Sweet Pea	Verbena
Calcium cyanamide	8.757	3.62	14.56	5.25	26.88	6.44
Methyl bromide	8.804	9.31	14.43	10.69	27.06	11.75
Vapam	9.812	7.93	20.50	9.63	32.50	10.31
Shell 20		3.15	12.37		27.88	9.50
Check	7.429	7.06	11.19	6.75	24.94	6.63
Pre-emergence dinitro—6 lbs.		5.81	14.50		28.75	4.75
Pre-emergence dinitro—9 lbs.		6.43	14.00		29.56	3.88
Shell 10		7.37	15.43	4.62	23.81	8.00

Weed Control in Petunia Seed Crop Obtained by Chemical Treatment

Per Cent Weed Control

Treatment	%
Calcium cyanamide	12.9
Methyl bromide	85.7
Vapam	88.3
Shell 20	88.3
Check	...
Pre-emergence dinitro—6 pounds	55.8
Pre-emergence dinitro—9 pounds	74.0
Chloro IPC—4 pounds	84.4
Chloro IPC—6 pounds	89.6
Alanap—3 pounds	41.5
Alanap—6 pounds	94.8
Shell 10	42.8

BUILDINGS

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was taken as the air temperature inside the test building, and the temperature inside the unpainted building was calculated on the basis that the amount of heat transferred to the air in both buildings was the same. Such considerations indicated air temperature differences as great as 28°F within the two buildings.

Radiation from the surfaces was measured with a directional radiometer. At 2:30 p.m. the white surfaces in shade—east side—gave off 184 Btu—British thermal units—per hour per square foot compared to 172 Btu per hour per square foot from the unpainted surfaces, indicating a more rapid emission of energy from the white surfaces. In the sun—west side—315 Btu per hour per square foot came from the white surfaces and 231 from the unpainted surfaces. The greater amount of energy from the white surfaces indicated they had both greater reflectivity and greater emissivity than the unpainted surfaces—very desirable characteristics in building heat load consideration.

Painted Animal Shades

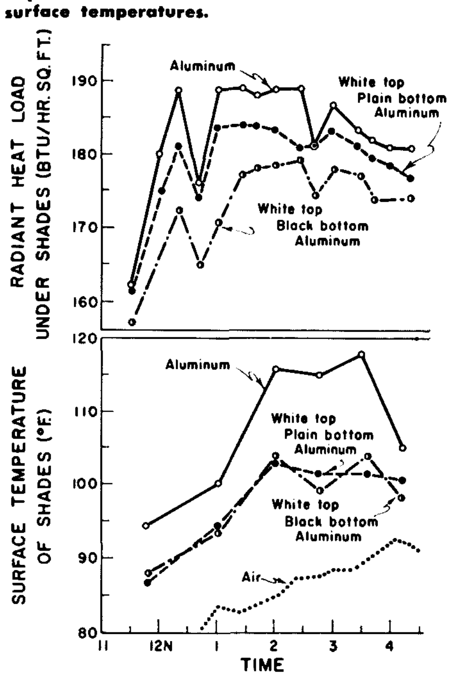
Shades are important for protecting livestock from radiation from the sun and sky and, indirectly, from the surroundings. Because the shade material is generally hotter than the surface of a shaded animal, the animal receives radiation from it.

The radiation characteristics of both surfaces of the shade material influence the radiation heat load on the animal. The characteristics of the top surface have a major influence on the temperature of the shade material; the emissivity of the bottom surface greatly affects the quantity of energy that will be emitted to the animal. In addition, the reflectivity of the bottom surface determines the quantity of incident energy from the ground that will be reflected back down to the animal.

White paint was tested as a means of reducing the temperature of metal shades to reduce the heat load on animals under them.

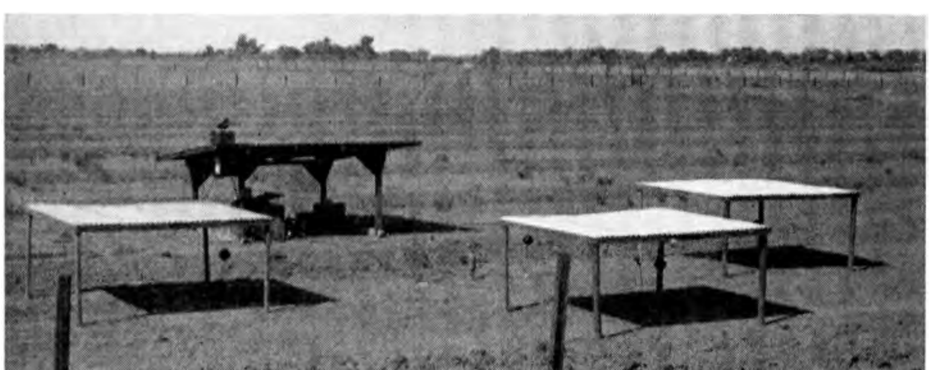
Three flat, portable shade frames 8′ × 8′ × 4′ high were covered with corrugated embossed aluminum roofing. One shade was left unpainted. White paint was applied to the top surface of the remaining two and the bottom of

Top—Radiant heat load under painted and unpainted aluminum shades. Bottom—shade surface temperatures.



one of these was painted with black paint. White paint and the unpainted aluminum sheet reflect about the same amount of solar energy but the emission of white paint, at ordinary shade material temperatures, is much greater. Because of this the temperature of the white painted aluminum was as much as 15°F lower than the unpainted aluminum. The radiant heat load—as indicated by black globe thermometers—was as much as 13 Btu per hour per square foot less under the white surfaced aluminum.

Portable 8′ × 8′ × 4′ high test shades. Black globe thermometers indicated the effect of paint in reducing the radiation heat load under the shades.



The third shade with the white top and black underside remained at about the same temperature as the shade with only the white top surface. However, because the black underside did not reflect energy from the ground back down to the animal, the radiant heat load under the white and black was lower than under the white shade and as much as 18 Btu per hour per square foot lower than under the unpainted shade.

The same advantages were found in painting galvanized steel shades—the surface temperature was reduced as much as 50°F by painting the upper surface white. In the tests, white painted galvanized steel shades showed an advantage over the unpainted aluminum shades.

These investigations are being continued with other building materials in order to evaluate their usefulness in protecting livestock and farm products from heat.

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WEED CONTROL

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cheap to use, it might prove very economical for weed control in larkspur, sweet pea, and verbena.

Pre-emergence dinitro—six pounds per acre rate—gave fair weed control; however, it was toxic to the seed crop of alyssum, antirrhinum, petunia, and verbena. When this material was used at the nine pounds per acre rate, it gave good weed control but was toxic to the same flower species as at the six pounds per acre. The two flower species which showed no harmful effects from this material at either dosage were larkspur and sweet pea. Pre-emergence dinitro at the nine pounds per acre rate should prove to be a satisfactory and economical material for weed control in larkspur and sweet pea.

Chloro IPC at six pounds per acre and Alanap at three and four pounds per acre gave excellent weed control but were toxic to all seeded flower crops.

Shell 10 gave fair weed control. However, there is danger of crop injury since it is necessary to apply the spray shortly before emergence of seedlings.

The check plot was hand weeded—on April 28—about four weeks later than it normally would be weeded. Therefore, the competition from weeds in the check was greater than would be expected in a field under normal conditions. The seed yield was materially increased in all chemically treated plots where weed control was good and the flower stand was not reduced excessively.

The soil fumigants—methyl bromide and Vapam—increased growth and seed yields beyond that attributed to lack of competition from weeds. Apparently these materials control other pests—such as insects and fungi—and prevent those pests from feeding on the flower plants and reducing plant vigor.

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SUGAR PINE

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after seven days. When the seed coats were removed germination was the same is if the seeds had been stratified.

After two-year storage at 36°F germination of the intact unstratified seeds began later and fewer germinated than when the seeds were fresh. However, after stratification seeds germinated as if they were fresh. When the seed coats were removed, germination was improved but not to the same extent as with fresh seeds. Thus, unlike fresh seeds, the germination of stored seeds was differentially affected by stratification and removal of the seed coats.

The effect of the storage temperature on germination was not apparent when the seeds were stratified, but was apparent when the seeds were unstratified, and the seed coats removed. Germination of fresh seeds—with seed coats removed —was complete in seven days, with 96% germinated; stored at 0°F germination was 91% and complete in 18 days; stored at 36°F germination was complete in 20 days, with 85% germinated; and stored at 77°F germination was complete in 20 days, with 55% germinated.

Two-year storage at 36°F had a pronounced effect upon root elongation, following germination. Of the embryos from the fresh seed that germinated, 98% developed roots 3″ or longer in 30 days while only 38% of the embryos from stored seeds did so. Furthermore, unlike germination, root elongation was unaffected by stratification.

Storage temperatures had a pronounced effect upon subsequent root elongation, which was not altered by stratification. Roots 3″ or longer were developed in 13 days by 98% of the fresh seeds while 82% of the seeds stored at 0°F, 38% of the seeds stored at 36°F, and 25% of the seeds stored at 77°F developed roots of 3″ or more in 30 days.

Thus the number of seeds that germinated was unaffected by two years of dry storage—provided the seeds had been stratified—but the number of seeds capable of subsequent root elongation was drastically reduced.

To measure potential field survival, fresh seeds and seeds that had been stored at 36°F for two years were planted—after stratification—in soil-filled flats in the greenhouse. Ten rows of 20 fresh seeds and 10 rows of 20 stored seeds were planted ½″ deep in each of six flats. The flats were watered until the entire soil mass was saturated. Three of the flats were not watered again but the soil in the other three was brought to field capacity, three times each week, by watering with a sprinkling can.

After two months, approximately 90% of the seedlings from fresh seeds were alive in both the watered and nonwatered flats.

In sharp contrast, survival of seedlings from stored seeds in the flats watered three times each week was approximately 70% after two months and approximately 20% in the flats watered only once.

It is apparent—from these studies—that seed storage conditions can affect seedling survival subsequent to germination.

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The above progress report is based on Research Project No. 1577.

FUMIGATION

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evening or early in the morning in order to avoid temperatures that are injuriously high.

At night or on cloudy days the undertarp temperatures approximate the outside air temperatures, but on sunny days they are considerably higher. With clear tarps this increase is so pronounced that they are too dangerous to use for fumigation. Fortunately, temperatures under white opaque tarps are much lower, even though they are still somewhat higher than outside air temperatures.

Temperatures under the tarp are so important it is essential that they be known. Electrical equipment such as thermocouples could be used but the initial expense and care in handling make them undesirable. Temperatures inside a small airtight box—about 8″ square—covered with a piece of the tarp plastic, approach temperatures under the tarp. A thermometer inserted through a hole in the side of the box makes it possible to determine undertarp temperatures rather closely. Temperatures in a box will drop a little more rapidly in the evening than those under the tarp because of the heat given off by the ground.

Overdosage or overexposure to methyl bromide will cause plant injury, as will high temperatures.

Mild damage merely burns the mature leaves, and the plants soon recover, but in more serious cases the young leaves and fruit buds are burned, and in severe cases the plants are completely killed.

If unexpected high temperatures are encountered during fumigation the tarp should be removed before serious injury can be done. When not being used to actually fumigate, the tarp should be removed or extensive damage to the plants will result.

Methyl bromide—like ethylene dibromide—generally stimulates the growth of strawberry plants even when the cyclamen mite has not been present. This stimulation is, at times, attributed to the control of microorganisms in the soil, but it seems more likely that it is caused by a direct effect on the plants themselves. The stimulating effect—coupled with mite control—usually brings about a striking plant response soon after fields are fumigated. However, fumigation should not be undertaken when the cyclamen mite is not a problem, because stimulation—at certain times—may merely result in small leaves, flowers and fruit. This is least likely to happen when fumigation is done between crops.

Early spring—about January and February—seems to be the most suitable time for fumigation and should give cyclamen mite control well into the summer if not for the entire season. Early spring fumigation should also control the two-spotted mite and strawberry aphid for a reasonable length of time. As the plants are dormant and the weather cool at that time, it is generally possible to fumigate throughout the day. The exact time of fumigation will be determined by the distribution of the spring rains, because it is impractical to fumigate in the rain. The tarp soon fills with water and becomes unmanageable, and—probably—fumigation is less effective when the plants are thoroughly soaked, because water forms an impenetrable barrier against methyl bromide.

When fumigation is necessary during the growing season, an attempt should be made to fumigate between crops; however, if severe damage is encountered control should not be delayed.

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