lings. Studies testing numerous herbicides, both as preemergence and postemergence treatments are now in progress. A few herbicides show promise for weed control in asparagus seedlings but they need further study.

Certain cultural practices were used in Riverside and are suggested as a way to control weeds until a suitable herbicide is available. Asparagus seed germinated slowly, taking about 30 days during the early spring when the weather was cold, and between 14 and 17 days during the summer in Riverside. Just prior to the emergence of the seedlings (one or two days), the entire field was sprayed with carrot oil or Paraquat. The initial spraying destroyed all the weed seedlings for a period of two to three weeks.

Plant shield

Subsequent control of weeds was accomplished by attaching a plant shield (see photo) under the sprayer to protect the seedling, and by spraying the entire area. The center bullet-like tracker was filled with sand to add weight and the two shields were mounted directly to the tracker. The shielding unit was attached to the sprayer on chains to allow the unit to move independently of the sprayer. Because of the independent mobility of the shielding unit, two or three units could be adapted for large area coverage in commercial operations. All the weeds could be controlled effectively by this method during the seedling stage, except those between plants. It is possible that the width of the shield could be reduced to less than 2 inches for more effective weed control.

After the plants reach approximately 1½ ft in height, annual grasses and broadleaf weeds are not detrimental to the establishment of a stand. Perennial weeds should be destroyed prior to seeding or they will be a continual source of difficulty to the grower.

Weeds that appeared late in the season were permitted to grow, because they were destroyed later when the soil was moved from the top of the furrows over the asparagus plants when the beds were prepared for the following season.

Frank H. Takatori is Specialist, and James I. Stillman is Laboratory Technician, Department of Vegetable Crops, University of California, Riverside. Barney Power is Senior Superintendent of Cultivations, Agricultural Operations, U.C,. Riverside. Mr. H. Armstrong developed the equipment discussed in this paper and assisted with the study.

Evaluation of SOIL *In Imperial*

F. E. ROBINSON • D. W. CUDNEY

J. P. JONES

Gypsum is added to irrigation water to increase soil intake rates in some areas of California. More than a third of a ton of this compound is already present in each acre foot of irrigation water as it is delivered to farms in the Imperial Valley. Tests were conducted at the Imperial Valley Field Station to determine whether the addition of other soil amendments would increase the soil intake rates. These tests were conducted with three compounds commonly used by growers in the area as soil amendments: calcium polysulfide, ammonium polysulfide, and sulfuric acid. Water treated with these compounds was compared with untreated water in a randomized block design. Only ammonium polysulfide produced a significant increase in soil intake rates.

THESE TESTS WERE conducted on a silty clay loam soil which was furrowed on 40-inch centers. Water was applied to the 300-foot furrows through gated pipe. A conventional inflow-outflow measurement was obtained with a stopwatch to determine the rate of fill of a known volume container. Inflow was recorded at the pipe outlet. Outflow was recorded by measuring the flow from plastic pipe inserted through earthen dams at the low end of the furrows. The measurements were obtained from every third furrow in the field. Each treatment was replicated four times.

The fluid chemical additives were applied in the irrigation water. A container with the correct quantity of additive was used on each furrow, and the additive was slowly metered into the water that flowed from the gated pipe. All of the material was added before the water reached the outflow point. This was done to prevent loss of the material in the drainage water.

First test

The first test was conducted on March 31, 1965 with an application rate of 20 gallons per acre (gpa) of calcium polysulfide, 16.5 gpa of ammonium polysulfide, and 13.6 gpa of sulfuric acid. These rates were equivalent to 62.5 lbs per acre of sulfur. The test was conducted over a 48-hour period; the first two replications were completed on the first day, the second two replications on the second day.

The variance of infiltration rates after 20 hours was analyzed. Results showed no significant effects from the treatment. However, a wide difference in inflow rates on the first and second day prompted

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the running of an analysis of covariance on the inflow rate in addition to the treatment effect. This analysis showed that the inflow rate had a highly significant effect upon the soil intake rate. Each increase of the inflow rate in gallons per minute (gpm) caused an increase of 0.24 gpm in the 300-foot furrow.

Second test

The second test was conducted on May 7, 1965, in the same area using the same quantity of chemicals. In this instance, the inflow rates were held closer to one another in all four replications. Analysis of covariance showed significant differences caused by the treatments and a gain resulting from the increased inflow rates. The soil intake rates adjusted to the mean flow are shown in table 1.

During this test an increase in inflow rate of one gpm was associated with an increase in soil intake rate of 0.40 gpm in the 300-ft furrow.

The significantly higher soil intake rate associated with the ammonium polysulfide was unexpected and another test was designed to determine if the effect would be residual.

Third test

The third test was conducted on May 27, 1965, with no amendment added. Analysis of covariance showed no significant residual effects from any of the chemicals. There was a highly significant effect of the inflow rate: In this instance, an increase of one gpm inflow was associated with an increase of 0.50 gpm soil intake rate in the 300 feet.

Fourth test

The objective of the fourth test (November 10, 1965) was to determine whether the increase in soil intake rate from the second test was associated with the ammonium ion or was a unique property of the ammonium polysulfide. Water treated with ammonium nitrate, ammonium hydroxide, and ammonium polysulfide was compared to untreated water. The quantities of nitrogen were equivalent to that applied as ammonium polysulfide in the second experiment, 31.3 lbs per acre. To eliminate the possibility of a position interaction the field was double disked and the furrows remade. Treatments were randomized and replicated four times. As shown in table 2, the ammonium polysulfide was the only compound to produce a significant increase in the soil intake rate. Efforts to achieve a common inflow rate in each furrow were successful as evidenced by the fact that the effect of inflow rate upon the soil intake rate was not significant.

Conclusions

Of the various chemicals tested, only ammonium polysulfide produced a significant increase in soil intake rates. The failure of calcium polysulfide to produce a similar increase proved that this effect was not associated with the polysulfide compound. Nor could the influence be associated with the ammonium ion, because neither ammonium nitrate nor ammonium hydroxide produced an increase. The increase in soil intake rates associated with the aqueous application of ammonium polysulfide was evidently caused by a unique property of this compound which is not yet understood.

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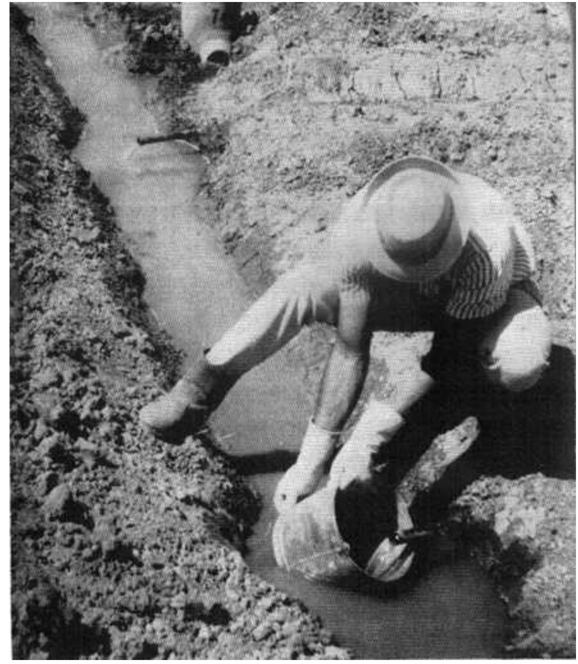

Inflow and outflow rates were measured with a known volume of irrigation water and a stop watch.

TABLE 1. SOIL INTAKE RATES AFTER TREATMENT WITH THREE CHEMICAL AMENDMENTS ON MAY 7, 1965 IN GALLONS PER MINUTE PER 300 FEET OF FURROW (ADJUSTED MEANS OF 4 REPLICATES)

	Amendments			
	Ammonium Polysulfide	Calcium Polysulfide	Sulfuric Acid	None (control)
Intake Rate	1.62	1.29	1.43	1.27

TABLE 2. SOIL INTAKE RATES AFTER TREATMENT WITH THREE CHEMICAL AMENDMENTS ON NOVEMBER 10, 1965, IN GALLONS PER MINUTE PER 300 FEET OF FURROW (MEAN OF 4 REPLICATES)

	Amendments			
	Ammonium Polysulfide	Ammonium Nitrate	Ammonium Hydroxide	None (control)
Intake Rate	2.50	1.37	1.34	1.21

Soil amendments were added to irrigation water at the gated pipe.