

The Use of Systemics Di-Syston and Thimet to Control Virus Yellows in California

J. C. HOFF, R. H. HEATH, AND D. D. DICKENSON¹

Received for publication September 15, 1958

The virus yellows disease of sugar beets, formerly found only in Western Europe, is fast becoming a major problem in certain sugar beet growing areas of the United States. Since the initial report by Coons (2)² in 1952 that the disease was evident in the United States, it has developed into a serious disease problem. Evidence compiled from damage appraisal studies (1, 3, 4) has shown that the disease causes considerable losses in yields and sucrose percentages in sections of Colorado, and that it is especially serious in parts of California. During the 1956 growing season the disease was observed in the South San Joaquin Valley of California, damage being most prevalent to sugar beets grown in Kern County. The following season (1957) damage was even more severe and widespread within the county. A need for some type of control of the disease was evident.

Since resistant varieties are not available and the causal virus is persistent in green peach aphids, control or partial control of the disease involves the control of this vector. Thus the following test was designed to test the effectiveness of systematic insecticides in controlling the green peach aphid (*Myzus persicae*) and, at the same time, to measure losses caused by the disease.

Materials and Methods

Thimet 44-D [44% O, O-diethyl S-(ethylthiomethyl) phosphorodithioate] and Di-syston [50% O, O-diethyl S2-(ethylthio) ethyl phosphorodithioate] were the two systemics used both as seed treatments and sidedress applications. These two materials can be absorbed by the root system and then be translocated to the stems and leaves. Once in the leaves they may be picked up by the aphid at feeding time. The test conducted near Wasco, California, (Kern County), was planted February 25, 1957, using the sugar beet variety US 22. Plots consisted of twelve 32-inch rows 100 feet long. Fifty feet of the four center rows of each plot were harvested and used for yield data. Two samples of about 35 pounds per plot were analyzed at harvest for sucrose and purity.

The test was designed to include the following treatments and an untreated check in a 5 x 5 Latin Square.

¹ Research Agriculturist, formerly Research Agriculturist and Plant Breeder and Pathologist, respectively, Holly Sugar Corporation, Tracy, California.

² Numbers in parentheses refer to literature cited.

1. Check—no treatment.
2. Thimet 44-D—seed treatment (4 lbs. of 44% Thimet material per 100 lbs. of seed).
3. Thimet 44-D—seed treatment (4 lbs. of 44% Thimet material per 100 lbs. of seed) plus two sidedressing applications 8 and 14 weeks after planting with 25 lbs. of 4% granular Thimet per acre per application.
4. Di-syston—seed treatment (4 lbs. of 50% Di-syston per 100 lbs. of seed).
5. Di-syston—seed treatment (4 lbs. of 50% Di-syston per 100 lbs. of seed) plus two sidedressing applications 8 and 14 weeks after planting with 60 and 32.8 lbs. of 2.5% granular Di-syston per acre per application, respectively.

Results

On March 27, approximately one month after planting, an inspection of the test plot indicated the possibility of a slight stunting of the beet seedlings in the seed treated plots. A small amount of tip burn was evident on the cotyledons of seedlings from the treated seed compared to the cotyledons of seedlings from untreated seed. Two months after planting, the stunting of the plants and the tip burn on the cotyledons was not evident.

Green peach aphids were not visible until April 28, or two months after planting, but no more than two aphids per plant were found then. The first sidedress application was applied at this time. The plots requiring a second sidedressing received the application on June 13, three and one-half months after planting. At this time no aphids were visible in any of the plots. One week later the plots were inspected and again aphids were not found in any of the plots. The absence of aphids prevailed through harvest.

Virus yellows symptoms were not found in any of the plots until June 13, three and one-half months after planting. At this time yellowing had become apparent but not too prevalent. Some individual beets showed symptoms of virus yellows in both the treated and untreated plots. One week later yellowing had begun to appear in a general manner in the entire experiment, and no differences among the treatments were noted.

At the final inspection of the plots on July 7, two months prior to harvest, a yellows count was attempted, but infection appeared to be 100 percent, as judged by symptoms on the older leaves. New or young leaves appeared green at this time. This situation prevailed until the plots were harvested on September 4, 1957.

Yield data: Table 1 presents the yield in tons of roots per

Table 1.—Effect of Systemic Insecticide Treatments on the Percent Sucrose, Percent Thin Juice Purity, Tons Per Acre, and Gross Sugar Per Acre at Wasco, California in 1957.

Treatment	Treatment Means			
	% Sucrose	% Thin Juice Purity	Tons/Acre	Gross Sugar/Acre
1. Check	12.1	87.2	11.8	2853
2. Thimet (seed trt.)	12.3	85.8	12.7	3099
3. Thimet (seed trt. plus sidedress)	12.2	88.1	14.2	3452
4. Di-syston (seed trt.)	12.1	89.0	14.3	3444
5. Di-syston (seed trt. plus sidedress)	11.8	89.1	14.6	3439
General Mean	12.1	87.8	13.5	3257
SEX	.255	.739	.879	—
L.S.D.	NS	2.3	NS	NS

acre, gross sugar per acre, percent sucrose, and percent thin juice purity. Results shown in Table 1 indicate that significant differences were obtained for percent thin juice purity only. Treatment 2 (Thimet 44D seed treatment) was lower in purity than treatments 3, 4, and 5, but did not indicate a significant decrease in purity compared to the check. The difference in purity between treatments 2 and 3 is unexplainable.

Gross sugar per acre and tons per acre for all treatments did not differ significantly from the check. However, the test using systemic insecticides to determine tonnage and sugar losses due to virus yellows indicated a trend toward higher yields.

Discussion

It may be noted that the plots were sidedressed 8 and 14 weeks after planting. While the 8 week sidedress application may have been beneficial to the control of the green peach aphid, some aphids were actually present on the plants at the time of this first sidedress application. Evidence presented by McLean in 1957 (5) indicated that the systemic insecticide Thimet used on table beet seed plants was not effective in leaves 21 days after application as a seed treatment. Thus, the sidedress treatments in this test may possibly have been applied too late to have been available to the green peach aphid at all times after planting. The results obtained, however, seem promising enough to warrant further study of the use of systemic insecticides to control the green peach aphid on sugar beets.

Summary

1. The use of two systemic insecticides (Di-syston and Thimet 44-D) as seed treatment and seed treatment plus two sidedress applications was studied to determine actual losses in tonnage and sugar caused by the virus yellows disease of sugar beets in Kern County, California, for the 1957 growing season.

2. Visual inspection indicated both insecticides caused some tip burning on the cotyledons from treated seed. Damage from sidedressing the sugar beets with the insecticides was not evident.

3. Green peach aphids were found in the plots two months after planting. One and one-half months later no aphids were found. The absence of aphids prevailed through harvest.

4. Further inspection revealed individual beets had virus yellows symptoms four months after planting. One week later all the plots indicated a general yellowing effect. Infection appeared to be 100 percent two months before harvest.

5. Data compiled from the test indicated a trend toward increases in the mean tons per acre and mean gross sugar per acre with the use of the systemic insecticides. However, these increases were not statistically significant. A significant difference among treatments for thin juice purity percentage was obtained at the 5% level, but was not entirely explainable.

6. Data derived from the test point to negative results with these two systemic insecticides to control virus yellows of sugar beets, but the possibility of too long a time lapse between systemic insecticide treatment applications and a trend of increased yield with more applications seem to warrant further experimentation.

Literature Cited

- (1) BENNETT, C. W., PRICE, C., and GILLESPIE, G. E. 1954. Effect of virus yellows on yield and sucrose content of sugar beets in tests at Riverside, California. Proc. Amer. Soc. Sugar Beet Tech. VIII (1):236-240.
- (2) COONS, G. H. 1952. Sugar beet virus yellows situation in the United States. Proc. Amer. Soc. Sugar Beet Tech. pp. 540-548.
- (3) COONS, G. H., GASKILL, H. O., and DANIELS, L. B. 1954. Results of an experiment in Colorado to appraise effects of virus yellows in sugar beet. Proc. Amer. Soc. Sugar Beet Tech. VIII (1):219-224.
- (4) MCFARLANE, J. S., BENNETT, C. W., and COSTA, A. S. 1954. Effect of virus yellows on the yield and sucrose percentage of the sugar beet at Salinas, California, in 1952. Proc. Amer. Soc. Sugar Beet Tech. VIII (1):215-218.
- (5) McLEAN, D. M. 1957. Effect of insecticide treatments of beets on transmission of yellows virus by *Myzus persicae*. Phytopathology 47 (9):557-559.