by weight at Del Rey and Biola, respectively.

Some yield reduction might be expected during the first one or two years of vine conversion for mechanical harvesting. At Del Rey the Duplex vines produced 16 per cent less raisin yield during the first year, as compared with standard vines. During the second year, this loss was narrowed to only 7 per cent less fruit in the Duplex vines. This was attributed to the necessary removal of poorly positioned arms and canes during the conversion period. Work is continuing to determine if yields return to normal or improve once conversion or retraining is completed in three to four years. Further possible effects of the Duplex system on grape maturity and raisin quality will also be evaluated.

The defloriating and deshooting operation in the Biola vineyard resulted in a 30 per cent lower raisin yield in the machine harvested plots. However, work is underway to determine if this loss of fruit can be offset by retaining more fruiting canes at pruning time.

Attractive appearance

One of the most striking results of on-the-vine drying of Black Corinth is the attractive appearance. The fruit retains a uniform, natural shape with its bloom left intact. The surface wrinkling is very fine and uniform. The color is a uniform dark blue.

In contrast, the tray-dried raisins are more often misshapen and have larger, less uniform wrinkling. The color is less uniform and has a more reddish cast. The vine-dried currants also have a more fruity flavor.

The 1969 machine-harvested raisins from both vineyards were successfully processed at the Sun-Maid Raisin Growers plant. It was found that the presence of some fresh fruit on the vines at machine harvest would result in juicy berries with embedded leaf fragments. These off-grade raisins are difficult to remove during processing. Thus, the spring flower cluster removal and cane cutting operations must be done very carefully and perhaps gone over a second time—to insure that all the fruit is on cut canes and will be dried at machine harvest time.

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D-1410 . .

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This article reports results of trials with a systemic experimental nematocide, du Pont's 1410, chemically identified as S-methyl 1-(dimethylcarbamoyl)-N-[(methylcarbamoyl)oxy]thioformimidate (D-1410). When D-1410 was released for testing, evidence was presented that demonstrated its systemic activity. Trials reported here have shown that when D-1410 is sprayed on plant foliage, it—or one of its breakdown products—is translocated to the roots and controls plant-pathogenic nematodes.

SINGLE FOLIAR SPRAYS of D-1410 (at 4 lbs per 100 gallons of water), applied in greenhouse tests at Riverside, on the same day the soil in which the plants were growing was infested with nematodes, provided plants a high degree of protection from nematode attack for periods ranging from 21 to 28 days. This has been demonstrated with the root-knot nematode, *M. incognita*, on tobacco, sugar pumpkins, tomatoes, and sweet potatoes; and with a lesion nematode, *P. scribneri*, on pole beans.

Single or multiple foliar sprays applied a week or more after nematode infection either slowed down nematode development, or in some way interfered with nematode reproduction and sex ratios. In trial 1 on sweet potato plants (treatments 2, 3, and 6 in table 1), where sprays were delayed for 1, 2, or 3 weeks after nematode infection occurred, the root gall index was as severe as that in the unsprayed check. However, only a small number of larvae were recovered from the sprayed plants, compared with the check.

The best control was achieved when initial sprays were applied at the time of the nematode infestation of the soil and when additional sprays were applied 1 or 2 weeks later. This is shown in trial 1 (table 1) where roots from plants sprayed twice (treatments 4 and 5) yielded only a small number of nematodes compared with the results of the single spray treatment applied at the time of soil infestation (treatment 1). No apparent benefits were obtained when a D-1410 dip was used on the sweet potato slips. The results of trial 2 further substantiate this apparent increase in control of both root-knot and lesion nematodes (see table 2). However, additional sprays (treatments 8 and 9) applied on the third and fourth weeks did not further increase control. Foliar sprays of D-1410 did cause some degree of marginal leaf necrosis in all plants tested in the greenhouse.

Phytotoxicity

In trial 3 where rates of 1, 2, and 4 lbs of D-1410 per 100 gallons of water were used, the degree of phytotoxicity was proportional to the rate used. The 1-lb rate gave essentially the same degree of control as higher rates (see table 3). In trial 4, the soil drench test on roses, no phytotoxicity was observed at the rate of 20 lbs per acre (see table 4).

In trial 3 there was greater control of *M. incognita* on small sugar pumpkins than in trial 2. This difference in the results of the two trials can perhaps be explained by differences in the age of the plants at the time the spray was applied, or by differences in the initial nematode inoculum level. The effect of plant age on uptake of D-1410, and the efficiency of the compound against different inoculum levels, need further study.

Spot soil samples taken from the vari-

a new foliar spray offers systemic protection from nematodes

ous tests reported here showed that live nematodes were present in the soil at the time the tests were terminated. However, the sprayed plants growing in containers were relatively free of nematodes, as evidenced by the gall ratings and the counts of nematodes recovered from the root systems. This indicates that the foliar sprays repelled nematode penetration, or hindered development and reproduction after entry.

Drench application

When D-1410 was applied to the soil in rose beds as a drench (see table 4), the lesion nematode population in the soil diminished for two months. The soil nematode counts, however, were not significant at any of the post-treatment sampling dates. No nematodes were detected in the root samples from the treated plots at the 4-month sampling date, but an average of 126 *P. scribneri* per gram of root was found in the checks. This indicates that the chemical was taken up by the roots and was providing protection four months after the drench was applied. Because rose root samples were not taken at the earlier sampling dates, the speed of root uptake of D-1410 is not known.

Since D-1410 does possess the unique characteristic of being able to be translocated downward in a plant and in some yet unproven way protect that plant from nematode damage, even when used at low rates, the potential for this compound appears promising. Additional field testing is now underway and results appear similar to those obtained in greenhouse work.

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TABLE 1. EFFECTS OF TIMING OF SPRAY AND ROOT DIPS WITH D-1410 ON CONTROL OF M. INCOGNITA ON POTTED SWEET POTATO PLANTS

Treatment	Spray dates				Gall Index*		Second-stage larval count from composite of 30 g of roots	
	5/16	5/23	5/29	6/6	No dip	Dip	No dip	Dip
1	x				0.0	0.0	2108	3756
2			x		1.2	1.6	456	408
3				x	1.6	1.6	516	138
4	x	x			0.0	0.2	0	18
5	x		x		0.0	0.0	0	594
6		x		x	1.2	1.6	216	510
7	x	x	x		0.4	0.2	30	498
8	x	x	x	x	0.2	0.0	0	84
9					1.2		1092	5172

* Gall index rating: 0 = no nematode galls; 4 = 100% of roots galled.

TABLE 2. EFFECT OF TIMING AND FREQUENCY OF D-1410 SPRAYS FOR THE CONTROL OF M. INCOGNITA ON TOMATO AND SUGAR PUMPKINS AND OF P. SCRIBNERI ON POLE BEANS

Treatments	Nematode counts*		
	Pole bean	Pumpkin	Tomato
1. No sprays	6,264	26,640	25,272
2. Sprayed 7/7	66	174	342
3. 7/14	756	960	450
4. 7/21	186	2,160	1,212
5. 7/28	300	27,432	8,352
6. 7/7, 7/14	30	0	30
7. 7/7, 7/21	4	78	4
8. 7/7, 7/14, 7/28	24	0	258
9. 7/7, 7/14, 7/21, 7/28	4	5	36

* Counts are numbers of nematodes recovered from the mister from 40 g of roots.

TABLE 3. EFFICIENCY OF DIFFERENT RATES OF D-1410 FOLIAR SPRAYS FOR THE CONTROL OF M. INCOGNITA ON SUGAR PUMPKINS

Treatment	Mean top weight (g)	Mean root weight (g)	Mean no. nematodes recovered*
1#/100 gal. D-1410	35.4	10.8	1.2
2#/100 gal. D-1410	42.9	8.0	0.6
4#/100 gal. D-1410	35.9	8.4	0.2
0#/100 (Emulsifier only)	31.6	9.3	3702.0
Check (no D-1410, no nemas)	29.0	8.9	0.0

* From three plants per pot.

TABLE 4. RESULTS OF A D-1410 DRENCH FOR CONTROL OF P. SCRIBNERI ON ESTABLISHED ROSES

Soil sampling dates		Mean number of P. scribneri per 750 ml of soil*
June 30†,	treated	208
	check	208
July 18,	treated	56
	check	104
August 18,	treated	15
	check	98
October 16,	treated	113
	check	512

* There are no significant differences in these nematode counts.

† June 30 was treatment date; D-1410 was sprayed on surface and ½-acre inch of water was added by sprinklers.