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NEMATODE CONTROL ON CONCORD GRAPES WITH DBCP (1)

by
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Surveys in central Washington have associated several genera of plant-parasitic nematodes with Concord grapevines (*Vitis labrusca* L.) exhibiting poor growth. Plant parasitic genera of suspected importance were *Macroposthonia*, *Meloidogyne*, *Pratylenchus* and *Xiphinema*, which have been reported to damage grapevines (Raski, *et al.*, 1973, Santo and Bolander, 1977, Santo and Hackney, 1980). Before it was banned DBCP (1,2-dibromo-3-chloropropane) was widely used in established *V. vinifera* L. vineyards to control nematodes (Raski, 1962, Raski, *et al.*, 1973), but it was not used in Washington on *V. labrusca*.

Studies were initiated to determine the effects of nematodes on Concord grapes and the efficacy of DBCP for their control. Preliminary studies with DBCP on Concord grapes were reported (Santo, 1978).

Materials and Methods

Field trials were initiated in 1976 in two 30-year-old Concord grape vineyards growing in a Warden silt loam soil near Prosser, Wash-

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ington. The predominant nematode in Trial A was *Xiphinema americanum* Cobb *sensu lato* (see Lamberti and Bleve-Zacheo, 1979) and a low population of *Paratylenchus* sp. Micoletzky. In Trial B the predominant nematodes were *Meloidogyne hapla* Chitwood, *Pratylenchus* sp. Filipjev, *Gracilacus* sp. Raski and *Paratylenchus* sp. Low numbers of *Tylenchorhynchus* sp. Cobb and *Helicotylenchus* sp. Steiner were also present.

Single rows of 20 vines/row were treated with DBCP 86E at rates of 23.6 and 39.3 litres (a.i.)/ha (3 and 5 gals/ac). Adjacent untreated vines served as controls. Four chisels, spaced 30.5 cm apart, injected the chemical 10-15 cm deep on each side of the vine row about 46 cm from the vines. Chisel openings were sealed by dragging a heavy chain behind the injector. Treatments were randomized and replicated four times in Trial A and three times in Trial B. In 1976, the vineyards were irrigated with 10-15 cm water 7 days after application and in 1977 24 hours after application. Plots in Trial A were fumigated in June 1976 and 1977 and in Trial B only in June 1976.

Nematode and post-treatment soil samples in 1976 and 1977 were taken with a 2.5-cm diameter soil tube, 30 cm deep and 30 cm on each side of the vine in the vine row. Ten samples were taken per plot, mixed together thoroughly, and a 250-cc sub-sample was used to extract nematodes by centrifugal flotation (Jenkins, 1964). Yield data expressed as kg/ha were obtained by hand harvest of grapes. Weights of pruned vines to measure vine growth were obtained after harvest in 1977.

Results and Discussion

DBCP treatments significantly ($P = 0.05$) reduced *X. americanum* populations in 1976 and 1977 (Table I) but had no apparent effect on the other nematodes (Table II). No yield differences were observed between treatments in either trial in 1976. In 1977, plot yields were reduced in Trial A by 19 and 28% and in Trial B by 24 and 39%, when treated with 23.6 and 39.3 litres DBCP/ha respectively (Fig. 1). This decrease in yield was unexpected, as DBCP at similar rates is commonly used on vinifera grapes and other woody perennials without any apparent reduction in yield or plant injury (Raski, *et al.*, 1973). Besides reduced bunch weight, reduction in yield was related

Table I - *Effect of DBCP on numbers of* Xiphinema americanum *on Concord grapes (Trial A).*

DBCP treatment litres (a.i.)/ha	X. americanum per 250 cc soil[a/]			
	1976		1977	
	Before	After	Before	After
0	25 a	17 a	36 a	22 a
23.6	36 a	6 b	6 b	10 b
39.3	39 a	1 b	1 b	1 b

a/ Values are mean of four replicates. Values in each column followed by the same letter do not differ significantly, P = 0.05, according to Duncan's multiple range test.

Table II - *Numbers of* Meloidogyne hapla *(root-knot),* Pratylenchus *sp. (lesion),* Gracilacus *sp. (pin) and* Paratylenchus *sp. (pin) under Concord grapes after treatment with DBCP (Trial B).*

DBCP treatment litres (a.i.)/ha	Nematodes per 250 cc soil[a/]		
	Pin[b/]	Root-knot	Lesion
0	112 a	110 a	1620 a
23.6	158 a	129 a	1360 a
39.3	83 a	105 a	1190 a

a/ Values are mean of three replicates. Values in each column followed by the same letter do not differ significantly, P = 0.05, according to Duncan's multiple range test.
b/ Includes both *Gracilacus* and *Paratylenchus.*

to reduced vine growth. Weight of pruned grapevines taken after harvest from Trial A showed that the low and high rates of DBCP reduced growth by 16 and 18% respectively (Fig. 2).

The detrimental effects of DBCP persisted for only one year as shown by yields taken in 1978 and 1979 (Fig. 1). In 1978 no yield reduction was observed in Trial B, which received DBCP only in 1976. The detrimental effects were still apparent in Trial A which

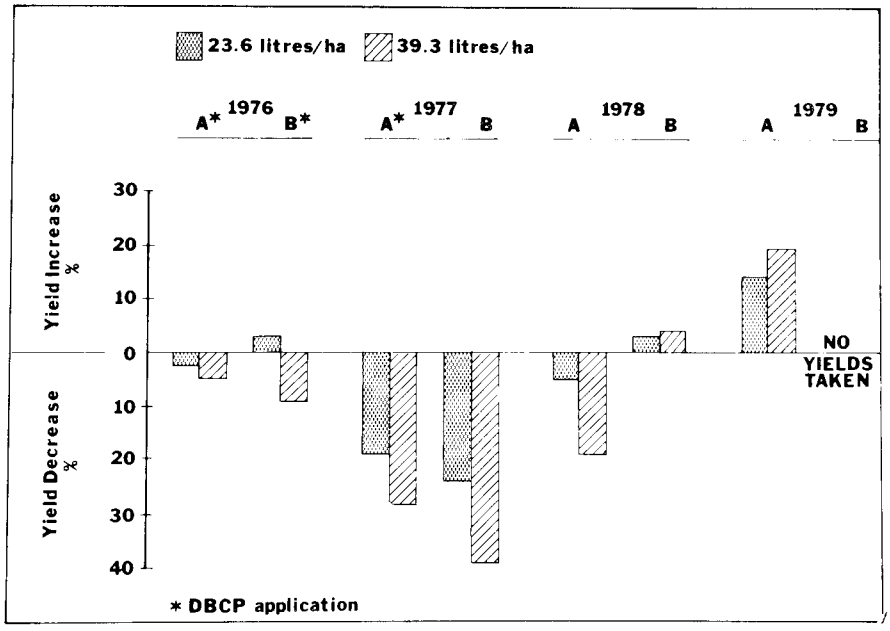

Fig. 1 - Yield of Concord grapes after treatment with 1,2-dibromo-3-chloropropane (DBCP) (Trials A and B).

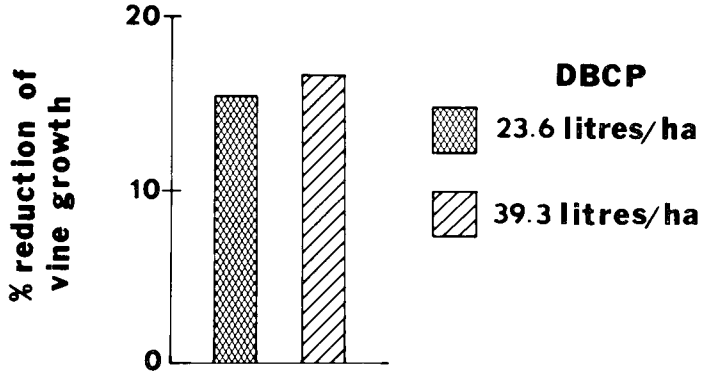

Fig. 2 - Percent reduction of *V. labrusca* vine growth from DBCP treatments compared to control in Trial A, 1977.

received DBCP in 1976 and 1977. Yields were reduced by 5 and 19% in the low and high DBCP treatments respectively. By 1979, yields in Trial A had recovered from the detrimental effects of DBCP and were increased by 14 and 19% in the low and high treatments respectively. This increase in yield was probably due to the control of *X. americanum* and the recovery of root growth from the damaging effects of DBCP.

Under the conditions of this study DBCP probably damaged feeder roots to the extent of adversely influence yields. Damage of roots by DBCP has been observed on vinifera grapes (McKenry, personal communication). The degree of damage depends on the dosage of DBCP. The reduced yields obtained with DBCP in this study indicate that Concord grape roots may be more sensitive to DBCP damage than vinifera grapes. Thus, it is important that tolerance limits of a crop to a chemical are known before recommendations are made for its use.

SUMMARY

Control of nematodes on Concord grapes (*Vitis labrusca* L.) with 1,2-dibromo-3-chloropropane (DBCP) at 23.6 and 39.3 litres (a.i.)/ha decreased *Xiphinema americanum* populations, but had no apparent effect on other plant parasitic nematodes in two field trials. Grape yields from vines treated with DBCP were reduced in the year after application. In one trial, yield increases were obsberved in the DBCP plots 2 years after application.

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