EFFECT OF TIME OF APPLICATION OF NEMATOCIDES ON THE HALIDE CONTENT OF FLUE-CURED TOBACCO LEAF

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SUMMARY

In field trials at Beerwah in south-eastern Queensland the increase in leaf halides following the use of DD and EDB for root-knot nematode control was reduced by earlier fumigation. The reduction was more marked with DD than with EDB.

I. INTRODUCTION

Colbran and Green (1961) showed that in the Beerwah district preplant fumigation with EDB resulted in an increase in the bromine content of flue-cured leaf of the variety Hicks and the chloride content was increased following use of both EDB and DD. This effect had been noted elsewhere by other workers, including McCants, Skogley, and Woltz (1959), who considered it was due in part to the interruption of nitrification resulting in a temporary accumulation of ammonium nitrogen.

During the 1961-62 season two field trials were established in the same district to determine the effect of time of application of DD and EDB on soil nitrogen and halide content of the leaf.

II. MATERIALS AND METHODS

The chemicals used were:

EDB.—Ethylene dibromide in power kerosine. EDB (sp. gr. 25/25 2·17) content 15 per cent. v/v.

DD.—A mixture of 1,3-dichloropropene and 1,2-dichloropropane containing 50-59 per cent. of total chlorine; inert compounds not exceeding 1 per cent. by weight.

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The treatments were:

Trial 1

1. EDB 20 gal/ac applied 15 days before planting
2. „ „ „ „ „ 63 „ „ „
3. „ „ „ „ „ 99 „ „ „
4. DD 20 gal/ac „ 15 „ „ „
5. „ „ „ „ „ 63 „ „ „
6. „ „ „ „ „ 99 „ „ „

Trial 2

1. EDB 20 gal/ac applied 35 days before planting
2. „ „ „ „ „ 76 „ „ „
3. „ „ „ „ „ 112 „ „ „
4. EDB 30 gal/ac „ 35 „ „ „
5. „ „ „ „ „ 76 „ „ „
6. „ „ „ „ „ 112 „ „ „

The six treatments in each trial were replicated four times in randomized block designs. In Trial 1 each plot measured 11 ft x 142 ft and contained 2 datum rows 4·5 ft apart; in Trial 2, 11 ft x 198 ft with 2 similarly spaced datum rows. A blue-mould resistant variety was used with plants 20 in. apart in the row.

The fumigants were applied by a tractor-mounted gravity injector and the areas were rolled after treatment.

Nitrogen supplied in the basal fertilizer was in the form of nitrate of soda.

Soil samples for nitrate nitrogen and ammonium nitrogen determinations were taken with a 1-in. soil sampling tube from the 0–6-in. horizon and consisted of 20 subsamples from each plot. Each sample was placed in a plastic bag and chloroform added prior to sealing to halt nitrification.

Nitrate nitrogen and ammonium nitrogen were determined by the Conway micro-diffusion technique (after Bremner and Shaw 1955).

One ripe leaf from each of 12 plants per plot was picked and flue-cured prior to halide analysis. Chloride and bromine were determined by the methods used by Colbran and Green (1961).

Trial 1 was planted on September 21; Trial 2 on October 4. Leaf samples for halide analyses were taken from Trial 1 on December 8 and from Trial 2 on January 4.

III. RESULTS

(a) Trial 1

The results of Trial 1 are presented in Tables 1–4.

There was a 28 per cent. reduction in the chloride content of the flue-cured leaf following fumigation with DD when the interval between fumigation and planting was increased from 15 days to 99 days. This interaction did not occur with EDB.

TABLE 1

TRIAL 1: CHLORIDE CONTENT OF CURED LEAF

Fumigation–Planting (days)	Chloride Content (% Cl)		
	EDB	DD	Mean
15	0·71	0·90	0·80
63	0·68	0·81	0·74
99	0·72	0·65	0·69
Mean	0·70	0·79	0·74
	DD, EDB	Time	Individual
Necessary differences for significance 5%	0·08	0·10	0·15
Necessary differences for significance 1%	0·12	0·14	0·20

TABLE 2

TRIAL 1: BROMINE CONTENT OF CURED LEAF

Fumigation–Planting (days)	Bromine Content (p.p.m.)	
	EDB	DD
15	2,785	277·5
63	1,889	322·5
99	1,700	345·0
Necessary differences for significance 5%	725	No significant differences
Necessary differences for significance 1%	1,137	

TABLE 3

TRIAL 1: SOIL NITRATE

Sampling Date	Days after Fumigation	Nitrate N (p.p.m.)			Differences
		EDB	DD	Mean	
July 5	21	1·08	0·98	1·03	Control>DD
	Control			1·28	
August 11	22	4·50	3·52	4·01	Control>>DD
	58	5·88	2·35	4·11	EDB>>DD
		(5·19)*	(2·94)	(4·06)	
	Control			5·70	
September 27	21	6·58	7·02	6·80	
	69	6·35	3·25	4·80	EDB>>DD
	105	8·68	3·70	6·19	
		(7·20)	(4·66)	(5·93)	
October 25	49	7·85	5·55	6·70	
	97	6·78	5·00	5·89	Not significant
	133	5·00	6·60	5·80	
		(6·54)	(5·72)	(6·13)	

* Figures in parentheses represent means of treated plots at the respective sampling dates.

TABLE 4

TRIAL 1: SOIL AMMONIUM

Sampling Date	Days after Fumigation	Ammonium N (p.p.m.)			Differences
		EDB	DD	Mean	
July 5	21	7·58	9·82	8·70	Not significant
	Control			7·28	
August 11	22	1·68	1·60	1·64	
	58	1·12	1·55	1·34	Not significant
		(1·40)*	(1·58)	(1·49)	
	Control			1·19	
September 27	21	17·28	23·72	20·50	
	69	18·65	29·65	24·15	DD>>EDB
	105	16·10	26·32	21·21	
		(17·34)	(26·57)	(21·95)	
October 25	49	25·90	27·88	26·89	
	97	23·95	27·85	25·90	Not significant
	133	20·25	25·42	22·84	
		(23·37)	(27·05)	(25·21)	

* Figures in parentheses represent means of treated plots at the respective sampling dates.

There was a reduction of 41 per cent. in the bromine content of leaf following fumigation with EDB when the interval between fumigation and planting was similarly increased. The level of soil nitrate nitrogen was reduced by EDB and DD, the reduction being more pronounced with DD.

(b) Trial 2

The results of Trial 2 are given in Tables 5–8.

The chloride content of leaf in plots treated with EDB was reduced when the interval between fumigation and planting was increased from 35 days to 112 days. The bromine content of leaf from plots treated with EDB at the 30 gal/ac rate was greater than from plots treated at the 20 gal/ac rate and decreased as the interval between fumigation and planting was increased from 35 days to 112 days. Changes in soil nitrate nitrogen and ammonium nitrogen were not significant.

TABLE 5

TRIAL 2: CHLORIDE CONTENT OF CURED LEAF

Fumigation–Planting (days)	Chloride Content (%Cl)		
	EDB (20 gal/ac.)	EDB (30 gal/ac.)	Mean
35	1·12	1·03	1·07
76	0·80	0·98	0·89
112	0·83	0·65	0·74
Mean	0·91	0·89	0·90
	Rate	Time	Individual
Necessary difference for 5%	0·18	0·22	0·32
for significance 1%	0·25	0·31	0·44

TABLE 6

TRIAL 2: BROMINE CONTENT OF CURED LEAF

Fumigation–Planting (days)	Bromine Content (p.p.m. Br)		
	EDB (20 gal/ac.)	EDB (30 gal/ac.)	Mean
35	2,945	3,620	3,282
76	1,820	2,945	2,382
112	1,820	1,610	1,715
Mean	2,195	2,725	2,460
	Rate	Time	Individual
Necessary differences for 5%	475	582	823
significance 1%	657	805	1,139

TABLE 7

TRIAL 2: SOIL NITRATE

Sampling Date	Days after Fumigation	Nitrate N (p.p.m.)		Mean	Differences
		EDB (20 gal/ac)	EDB (30 gal/ac)		
July 5	21	0·55	0·62	0·58	Not significant
	Control			0·59	
August 11	22	2·48	2·18	2·32	
	58	2·18	1·98	2·08	Not significant
		(2·32)*	(2·08)	(2·20)	
	Control			2·22	
September 27	21	3·90	4·65	4·28	
	69	4·12	3·85	3·99	Not significant
	105	3·55	4·20	3·88	
		(3·86)	(4·23)	(4·05)	
October 25	49	3·18	3·28	3·22	
	97	3·05	3·15	3·10	Not significant
	133	3·12	3·42	3·28	
		(3·12)	(3·28)	(3·20)	

* Figures in parentheses represent means of treated plots at the respective sampling dates.

TABLE 8

TRIAL 2: SOIL AMMONIUM

Sampling Date	Days after Fumigation	Ammonium N (p.p.m.)		Mean	Differences
		EDB (20 gal/ac)	EDB (30 gal/ac)		
July 5	21	10·05	8·25	9·17	Not significant
	Control			9·66	
Aug. 11	22	0·80	0·30	0·55	
	58	0·50	0·70	0·60	EDB 20, EDB 30>
		(0·65)*	(0·50)	(0·58)	Control
	Control			0·29	
September 27	21	5·72	10·92	8·32	
	69	6·98	3·70	5·34	Not significant
	105	8·55	8·80	8·68	
		(7·08)	(7·81)	(7·45)	
October 25	49	3·20	4·88	4·04	
	97	6·82	8·18	7·50	Not significant
	133	4·28	4·30	4·29	
		(4·77)	(5·78)	(5·28)	

* Figures in parentheses represent means of treated plots at the respective sampling dates.

IV. DISCUSSION

In the Beerwah district most of the growers have limited acreages available for tobacco production and the crop is commonly grown on the same area every year. Under these conditions preplant fumigation is necessary to ensure root-knot nematode control. The data presented in this paper indicate that the increase in the halide content of flue-cured leaf following use of nematocides can be reduced considerably by earlier fumigation. Accordingly, in fields where the halide content of leaf is an important consideration, EDB is preferable to DD and it should be applied during autumn or early winter instead of 2–3 weeks prior to planting.

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