

QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES  
DIVISION OF PLANT INDUSTRY BULLETIN No. 461

**INSECTICIDE TRIALS IN TOBACCO SEEDBEDS,  
1962-1965**

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**SUMMARY**

Azinphos-ethyl caused lamina puckering and vascular thickening and distortion in tobacco seedlings. Fenitrothion and trichlorphon treated plants were stunted and had dark circular leaves. Isobenzan caused intervacular and marginal distortion of leaves. Endrin applications had no phytotoxic effects.

**I. INTRODUCTION**

Tobacco seedlings are known to be sensitive to some insecticide formulations (Smith 1961). New materials likely to be of value for pest control on seedlings are tested by the Department of Primary Industries under actual seedbed conditions. Dieldrin and DDT were tested by Smith (1961), when suitable formulations without phytotoxic effects at standard spray strengths were determined. Formulations of endrin, comparable to those of the related cyclodiene dieldrin, soon became available. This material and another cyclodiene, isobenzan, were tested in seedbeds in 1962. The organophosphorus compound azinphos-ethyl came into use on tobacco in 1963 and was included in the seedbed trials for that year. Two other organophosphorus compounds, fenitrothion and trichlorphon, were included in 1964 and 1965 respectively.

**II. MATERIALS AND METHODS**

The following insecticides were used in the trials at the spray strengths stated.

*Azinphos-ethyl*.—An emulsifiable concentrate containing 40.0% w/v active constituent; used at 0.025% and 0.05%.

*Endrin*.—An emulsifiable concentrate containing 20·0% w/v active constituent; used at 0·05%.

*Fenitrothion*.—An emulsifiable concentrate containing 50·0% active constituent; used at 0·05%.

*Isobenzan*.—An emulsifiable concentrate containing 15·0% active constituent; used at 0·05% and 0·1%.

*Trichlorphon*.—A wettable powder containing 80·0% w/w active constituent; used at 0·1%.

In addition, the following fungicides were used in one or other of the trials.

*Benzol*.—A 100·0% liquid of benzene used as the evaporating pure liquid.

*Mancozeb*.—A colloidal powder containing 80·0% w/w active constituent; used at 0·16%.

The seedbeds were established on the Parada Research Station by station staff according to standard methods.

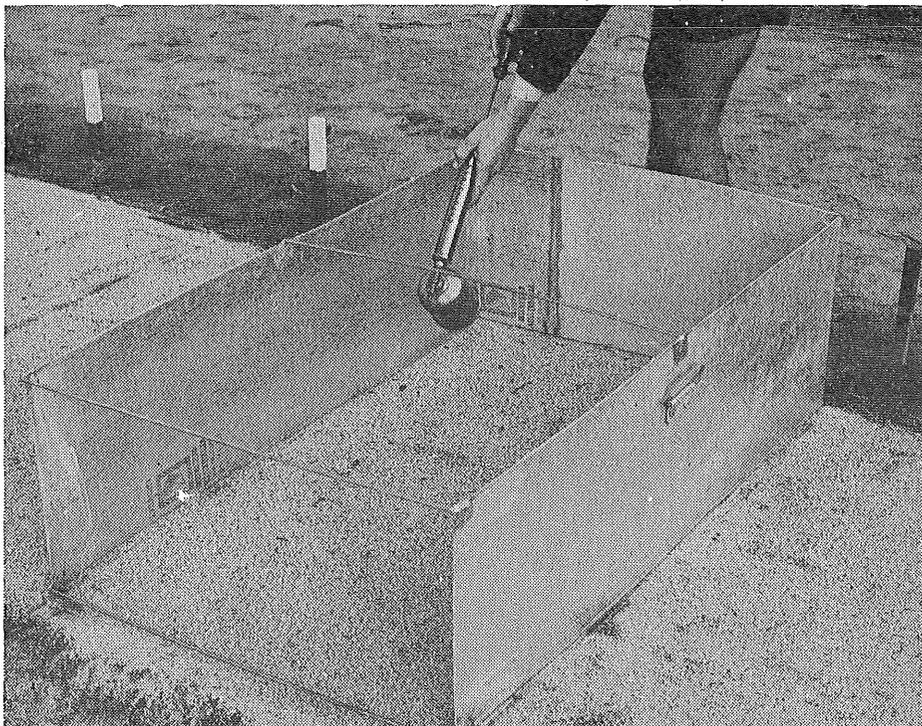


Fig. 1.—Spraying tobacco seedlings, showing 18 in. high movable metal screen used to prevent spray drift between plots.

As it is customary to apply an insecticide to tobacco seedbeds prior to seed germination for the control of seed-harvesting and leaf-harvesting ants, all treatments were commenced within 2 days of sowing to enable the determination of any effects they might have on germination or seedling establishment. Subsequent applications were at intervals of 1 or 2 weeks, according to the particular treatments, and continued until the seedlings were of transplant size.

Trial 1 was of a 4 x 4 randomized block layout, trials 2, 3 and 4 of a 5 x 4 layout and trial 5 of a 10 x 5 layout. Unit plot in all trials was 4 ft x 2 ft 6 in. of seedbed, with datum plot 3 ft x 2 ft.

In trials 1, 2 and 3, treatments were made with a continuous-pressure hand atomizer, while in trials 4 and 5 an Oxford Precision Sprayer was used. For all applications a movable metal screen 18 in. high was placed around each plot to prevent spray drift to adjacent plots (Figure 1).

Benzol treatments for blue mould control were used in trials 1 to 4. In trial 5, benzol or mancozeb was used on separate plots of each insecticide treatment. Fungicide applications commenced when the seedlings were 3 weeks old and continued throughout the periods of the trials.



Fig. 2.—Tobacco seedbed plots, showing the wire grid and two of the 6 in. x 6 in. quadrats.

Counts of plant numbers commenced 2 weeks after sowing and were repeated weekly for two further counts. Total plants per treatment were recorded in four 6 in. x 6 in. quadrats per plot. The four wire grids were fixed to a larger frame so that the quadrats were comparable in position for each plot at each count (Figure 2).

At planting out, numbers of plants in the seedbeds were recorded in four 9 in. x 9 in. quadrats taken at random in each plot. Following counting in trials 1 and 2, the seedlings were weighed green, while in trials 3, 4 and 5 weighing was done after the plants were dried for 48 hr in a forced-draught oven at 140°F.

Observations on phytotoxic effects on seedlings were made each week and typical effects recorded photographically.

TABLE 1  
RESULTS OF TOBACCO SEEDBED TRIALS, 1962-1964

Treatment	Spray Interval (weeks)	Fungicide Treatment	Weekly Seedling Counts			At Transplanting		
			First	Second	Third	Mean Seedling Green Weight (g)	Mean No. of Seedlings	
Trial 1, 1962								
Endrin 0.05% .. ..	1	Benzol	345.2	265.5	298.5	2.927	242.2	
Isobenzan 0.05% .. ..	1	Benzol	247.5	252.8	222.8	2.882	277.8	
Isobenzan 0.1% .. ..	1	Benzol	180.5	207.5	199.5	3.293	220.2	
No treatment .. ..		Benzol	273.0	236.5	293.5	3.169	232.5	
Necessary differences for significance			5%	74.1	N.S.D.	26.2	N.S.D.	N.S.D.
			1%	106.4		37.6		
Trial 2, 1963								
Azinphos-ethyl 0.025% ..	1	Benzol	130.50	169.75	171.50	3.556	154.50	
Azinphos-ethyl 0.05% ..	1	Benzol	103.75	130.75	137.00	3.865	122.25	
Endrin 0.05% .. ..	1	Benzol	144.25	161.50	178.00	3.345	164.00	
Isobenzan 0.1% .. ..	1	Benzol	136.00	170.75	193.50	3.064	170.00	
No treatment .. ..		Benzol	155.50	188.75	192.75	3.302	159.75	
Necessary differences for significance			5%	48.50	48.31	44.52	0.980	36.28
			1%	68.00	67.73	62.41	1.375	50.87
Trial 3, 1964								
Azinphos-ethyl 0.025% ..	1	Benzol	118.25	134.50	123.50	..	..	
Azinphos-ethyl 0.05% ..	2	Benzol	106.50	136.50	123.75	..	..	
Endrin 0.05% .. ..	1	Benzol	95.75	114.25	115.75	..	..	
Fenitrothion 0.05% .. ..	1	Benzol	122.75	124.00	151.25	..	..	
No treatment .. ..		Benzol	115.00	133.25	130.00	..	..	
Necessary differences for significance			5%	23.42	37.41	42.87	..	..
			1%	32.83	52.44	60.10	..	..

## III. RESULTS

Details of seedling counts and weights are given in Tables 1 and 2. Insect infestations were insufficient for assessment of insecticidal effects. Details on phytotoxicity are given in the discussion of each insecticide and in Figures 3-6.

## IV. DISCUSSION

*Azinphos-ethyl*.—Treatments of azinphos-ethyl 0.05% applied weekly significantly retarded seed germination but when applied fortnightly or at 0.025% weekly there was no retarding effect. All azinphos-ethyl treated seedlings

TABLE 2  
RESULTS OF TOBACCO SEEDBED TRIALS, 1965

Treatment	Spray Interval (weeks)	Fungicide Treatment	Weekly Seedling Counts			At Transplanting	
			First	Second	Third	Mean Seedling Dry Weight (g)	Mean No. of Seedlings
Trial 4							
Azinphos-ethyl 0.025% ..	1	Benzol .. ..	174.67	210.33	169.00	0.863	213.67
Azinphos-ethyl 0.05% ..	2	Benzol .. ..	167.33	194.33	217.67	1.057	197.33
Endrin 0.05% .. ..	1	Benzol .. ..	170.33	199.67	193.33	0.944	173.00
Trichlorphon 0.1% ..	1	Benzol .. ..	186.33	192.67	263.00	0.902	183.67
No treatment .. ..		Benzol .. ..	175.67	204.67	184.67	1.001	175.67
Necessary differences for significance	5%		43.67	56.05	65.33	0.310	77.71
		1%	63.54	81.56	95.06	0.451	113.08
Trial 5							
Azinphos-ethyl 0.025% ..	1	Benzol	190.00	171.33	155.33	0.555	260.33
Azinphos-ethyl 0.025% ..	1	Mancozeb	169.00	156.67	197.33	0.927	156.33
Azinphos-ethyl 0.05% ..	2	Benzol	155.00	181.67	189.67	0.501	300.67
Azinphos-ethyl 0.05% ..	2	Mancozeb	153.00	173.67	199.00	0.914	158.00
Endrin 0.05% .. ..	1	Benzol	178.00	186.67	166.33	0.622	248.00
Endrin 0.05% .. ..	1	Mancozeb	169.33	180.00	197.33	0.985	150.00
Trichlorphon 0.1% ..	1	Benzol	176.00	170.00	178.33	0.456	329.67
Trichlorphon 0.1% ..	1	Mancozeb	159.33	156.33	192.67	0.829	177.00
No treatment .. ..			176.33	164.67	180.00	0.520	295.33
No treatment .. ..			165.67	159.67	174.67	1.020	138.67
Necessary differences for significance benzol	5%		52.80	48.36	66.30	0.139	74.15
		1%	76.83	70.37	96.48	0.203	107.89
Necessary differences for significance mancozeb	5%		34.30	35.92	37.07	0.248	48.52
		1%	49.90	52.26	53.94	0.361	70.60

showed leaf distortion of the nature of lamina puckering and mottling, with vascular thickening and distortion (Figures 3 and 4). This effect was pronounced in the weekly applications of both 0.05% and 0.025%, but much less in the plots sprayed with 0.05% fortnightly. It became most noticeable 4 weeks after germination, decreased as the plants grew larger and was barely apparent at planting out. At this time seedling numbers and weights were unaffected.

*Endrin.*—Used at 0.05%, endrin is the standard seedbed insecticide recommendation. This material did not affect germination or plant size and in most instances no phytotoxic symptoms were noted.

*Fenitrothion.*—Used at weekly intervals at 0.05%, fenitrothion showed phytotoxic effects 4 weeks after germination. This treatment produced stunted, dark-green seedlings with circular leaves. These symptoms decreased as the plants grew larger and after 8 weeks they were barely apparent. No other differences were recorded.

*Isobenzan.*—At both 0.05% and 0.1%, isobenzan as weekly applications significantly reduced germination and this was still noted 4 weeks later. All

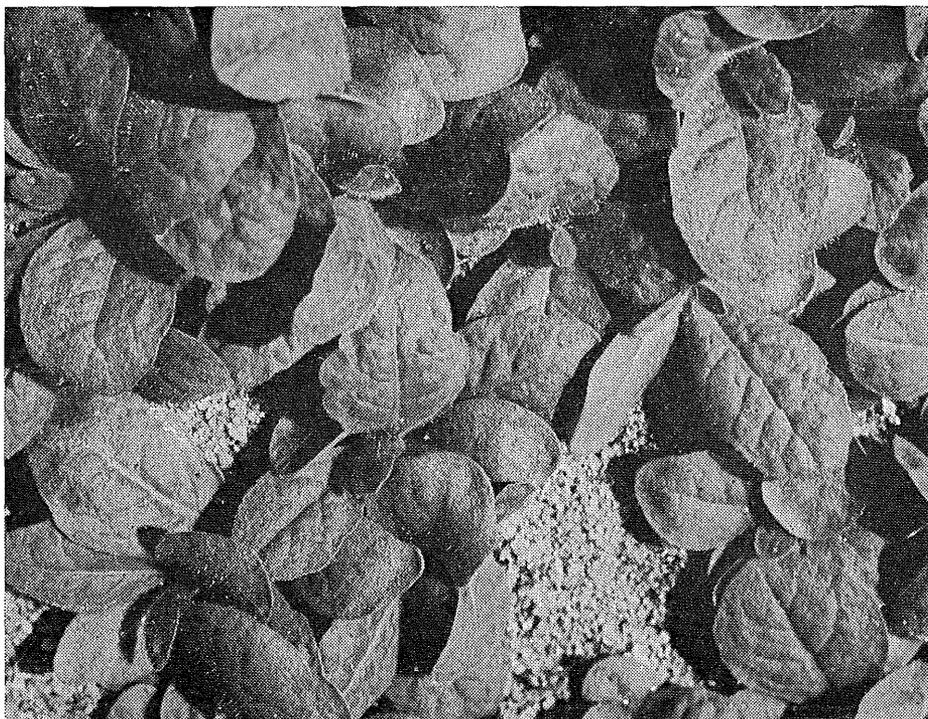


Fig. 3.—Tobacco seedlings sprayed weekly with azinphos-ethyl 0.05%, showing leaf puckering, mottling, vascular thickening and marginal distortion.

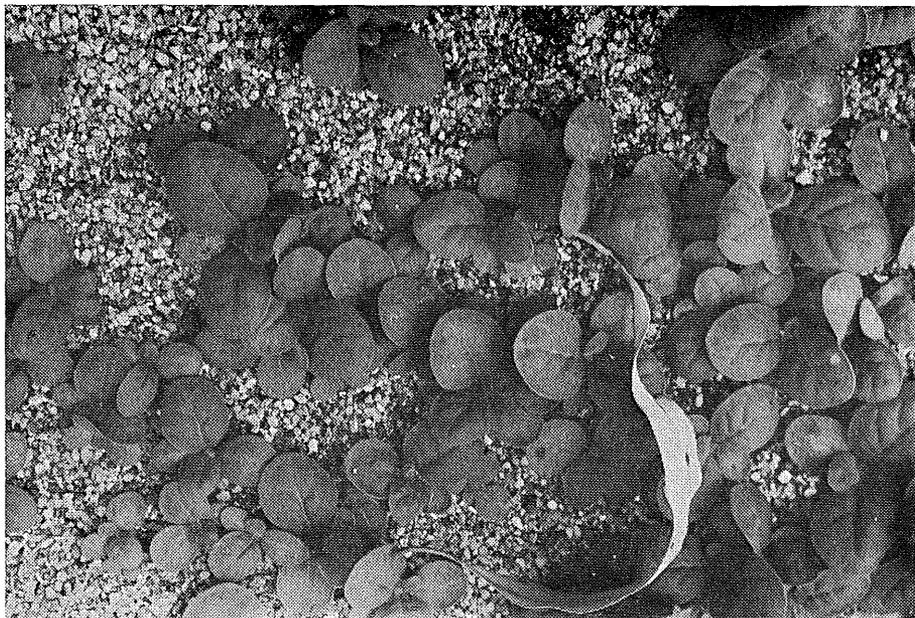


Fig. 4.—Tobacco seedlings sprayed with azinphos-ethyl 0.05% fortnightly, showing slight leaf puckering and vascular distortion.

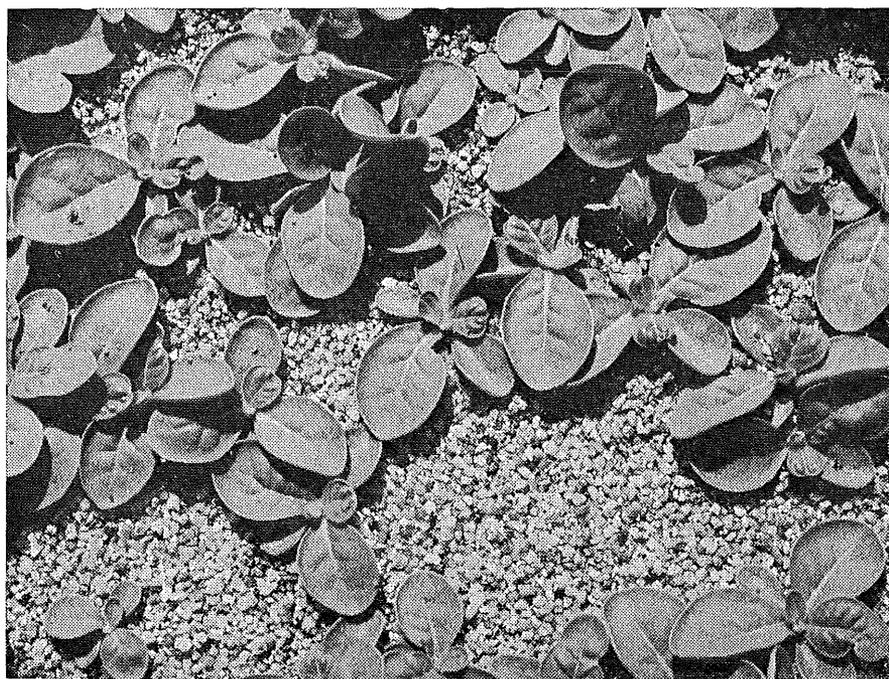


Fig. 5.—Tobacco seedlings sprayed weekly with isobenzan at 0.1%, showing vascular and marginal distortion.

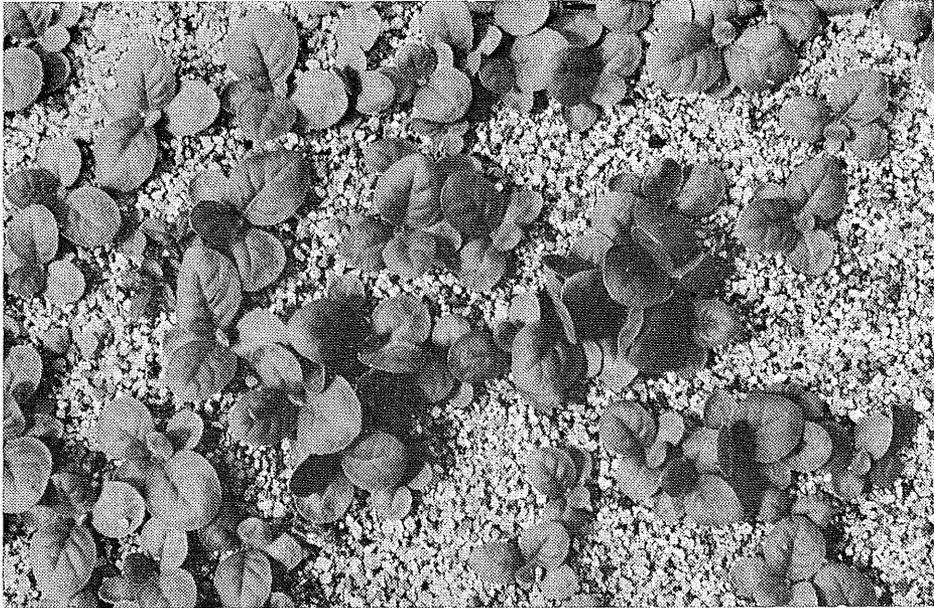


Fig. 6.— Tobacco seedlings sprayed weekly with trichlorphon 0·1%; they were generally stunted and had dark-green leaves.

treatments caused plant deformity, which was most marked during the fifth week after sowing. Leaf deformity was in the nature of intervacular and marginal distortion (Figure 5). By the time of planting out this effect had disappeared and there were no significant differences in the numbers and weights of transplants.

*Trichlorphon.*—Seedlings sprayed weekly with trichlorphon 0·1% were generally stunted, and had dark-green, circular leaves (Figure 6). The reduction in seedling size persisted to transplanting.

#### V. ACKNOWLEDGEMENT

The work on which this paper is based was financed by the Tobacco Industry Trust Account.

#### REFERENCE

- SMITH, W. A. (1961)—Tobacco leaf pest investigations, 1949-1955. *Qd J. Agric. Sci.* 18:33-56.

(Received for publication September 11, 1967)

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