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SOME EFFECTS OF DDT, DIELDRIN, DIMETHOATE AND FENTHION ON GROWTH OF CUCUMBERS

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SUMMARY

Dimethoate was the most satisfactory material. Dieldrin showed no adverse effects; DDT dispersible powder and fenthion had minor adverse effects but are acceptable commercially; DDT emulsion caused severe damage.

Commercial plantings of Cucurbitaceae in south-eastern Queensland are attacked by numerous arthropod pests, including *Tetranychus urticae* Koch (Tetranychidae); *Epilachna* 28-*punctata* Fabr. (Coccinellidae); *Ceratia hilaris* Boisd. and *Rhapidopalpa abdominalis* Fabr. (Chrysomelidae); *Aphis gossypii* Glov. (Aphididae); various Hemipterans; and *Austrodacus cucumis* French (Trypetidae) (May 1946). Detrimental effects on cucurbits by DDT, an otherwise useful insecticide for most of these pests, have been recorded locally at least in early stages of growth (Anon. 1951, pp. 467-82). Common usage has determined that, while liquid formulations of DDT are extremely phytotoxic, dispersible powders may be used with comparative safety.

A selection of potentially useful insecticide formulations was tested for phytotoxicity on cucumbers (*Cucumis sativus* L.) cv. Palmetto over the period January-April 1961 at Redlands Horticultural Research Station in south-eastern Queensland. DDT was used as a 0·1% w/v active ingredient water dispersion diluted from a 25% w/v *pp'*-i emulsion concentrate containing toluol as solvent, and from a 50% w/v dispersible powder on kaolin; dieldrin as a 0·05% w/v active ingredient water emulsion diluted from a 15% w/v active ingredient emulsifiable concentrate containing a high aromatic hydrocarbon solvent; dimethoate as a 0·05% w/v active ingredient water emulsion diluted from a 30% w/v emulsifiable concentrate containing cyclohexanone as solvent; and fenthion as a 0·05% w/v active ingredient water emulsion diluted from a 55% w/v active ingredient emulsifiable concentrate containing xylene.

Single-row plots of 15 plants, replicated four times, were used at a row spacing of 6 ft and plant spacing of 2 ft. Buffer plants separated all plots in rows.

Treatments began immediately the first leaves appeared, and test plots were sprayed weekly, using a knapsack, to complete wetting of foliage.

Phytotoxicity was assessed on the following criteria:—

(1) Female flower production—as total female flowers per vine at each of six assessments during active growth of the vines.

(2) Fruit setting—as fruit greater than 5 cm in length present at each assessment, plus the cumulative total of fruit harvested.

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(3) Relative growth rates over the 9-day period from the 3-4-leaf stage to the 6-7-leaf stage, and before branching occurred—as
   (*a*) leaf area ($\leqslant L^2$ where L = midrib length),
   (*b*) number of leaves, and
   (*c*) runner length.

(4) Harvest data, including total fruit per vine, mean fruit weight and time from planting to harvest ($\frac{\leqslant T}{N}$ where T = time for each fruit and N = number of fruit).

Results are presented in Figure 1 and Table 1.

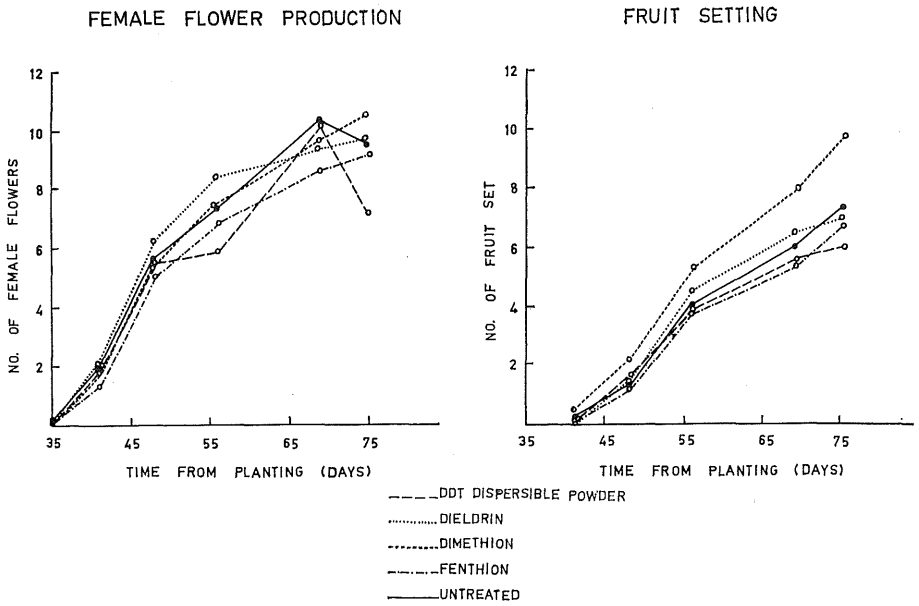

Fig. 1.—Effects of DDT dispersible powder and dieldrin, dimethoate and fenthion emulsions on female flower production and fruit setting of cucumber cv. Palmetto. Redlands Horticultural Research Station, 1961.

TABLE 1

EFFECTS OF DDT, DIELDRIN, DIMETHOATE AND FENTHION ON GROWTH AND FRUIT PRODUCTION

Treatment	Relative Growth Rates (means)			Harvest Data (means)		
	Leaf Area	No. of Leaves	Runner Length	No. of Fruit per Vine	Individual Fruit Weight (g)	Days to Harvest
DDT dispersible powder ..	·507	·344	·362	4·34	392	63·75
Dieldrin emulsion ..	·507	·335	·352	5·85	413	65·75
Dimethoate emulsion ..	·493	·344	·378	8·30	426	67·32
Fenthion emulsion ..	·449	·230	·345	4·74	389	67·08
Untreated	·514	·319	·354	5·54	422	65·09
Necessary differences for significance 5%	·071 (·054)	·066 (·050)	·029 (·022)	1·62 (1·41)	32 (28)	1·64 (1·42)
Necessary differences for significance 1%	·096 (·073)	·088 (·068)	·039 (·030)	2·19 (1·90)	43 (37)	2·21 (1·91)

Data for DDT emulsion are not included, as plants were killed or severely damaged from the first treatment. DDT dispersible powder did not affect growth rates measurably, although marginal scorch and limited yellowing were evident. Harvest data indicated lower yield, but this depression was not significant for spraying from the seedling stage. Dieldrin treatment did not result in any detectable change in plant growth and fruit production. Dimethoate treatment increased the number of fruit produced per vine but did not change the mean weight of the fruit produced. Fenthion treatment caused visible stunting in early stages, which was expressed as a decrease in the number of leaves produced and reflected later in a decrease in size of fruit.

The number of fruit produced was related to the time taken for crops to mature; larger crops gave greater mean times to maturity because plants remained healthy and producing marketable fruit longer. The most important cause of plant deterioration in the latter part of the trial was downy mildew (*Pseudoperonospora cubensis* (Burk. & Curt.) Rostow.), powdery mildew (*Sphaerotheca fuliginea* (Schlecht.) Poll.) and to a lesser extent the melon aphid *Aphis gossypii*: plants treated with the acknowledged aphicides dimethoate and fenthion remained healthy longest and showed least mildew. The data in Figure 1 show the decline in plant growth as expressed by flower and fruit production.

Further trials on rockmelons (*Cucumis melo* L. var. *reticulatus* Naud.) cv. Conqueror at Redlands Horticultural Research Station, and on cucumbers and rockmelons at Gatton Research Station, gave similar results.

In summary, dimethoate proved the most satisfactory material and dieldrin showed no adverse effects. DDT prepared from an emulsion concentrate caused severe damage or killed plants. DDT dispersible powder and fenthion caused minor growth upsets but these deficiencies were not of an order to preclude commercial use where necessary for control of insect pests.

REFERENCES

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