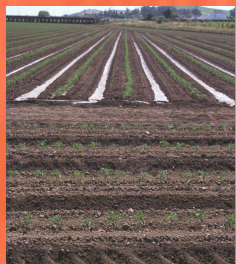


PERSISTENCE AND DISTRIBUTION OF ENDOSULFAN APPLIED TO TOMATO CROP

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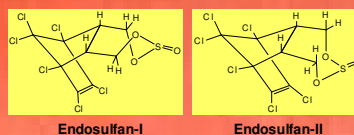
Introduction



Several commercial formulations containing various insecticides are usually applied to horticultural crops to prevent or eradicate pests. The organochlorine insecticide *endosulfan* is frequently applied, as a mixture of isomers,

for the control of sucking and chewing insects on fruits and vegetables. In the application process, part of the compound reaches the target (foliage) while other part may reach other environmental compartments, such as soil, air or water.

The variable amount of pesticide deposited in those compartments is subjected to different transformations that will be determined by the particular conditions existing in each compartment.



The aim of this work was to study the distribution of endosulfan in tomato fields, after its application, and the persistence of this insecticide once deposited in leaves and soil in order to assess the potential risk of the endosulfan residues in the environment.

Experimental

Field assays

Two tomato fields, from the Spanish region of Badajoz, treated with endosulfan at a dose of 0.9 Kg/Ha, were periodically sampled from the beginning of the season (May) to the harvesting date (September-October). Soil sampling was carried out by taking samples from the surface layer (0-10 cm) at various points (10) following the diagonal of the plot and leaving the borders without being sampled. Sampling of leaves was carried out by taking two leaves of 10 plants, one from the upper part of the plant and the other from a lower position.

Laboratory assays

Soil was treated with an aqueous suspension of Thimul to reach a final concentration of endosulfan of 1 µg/g. After 24 h of homogenisation period, individual samples (4) of 300 g were weighed into screw-top glass jars and placed in an incubation chamber at 35 °C. The soil moisture content was adjusted by adding water at 8%. Samples were incubated for four months and sampled at intervals of about 20 days.

Determination

► Soil samples (5g) were placed in plastic columns containing two filter paper circles and 2 g of Na₂SO₄ anhydrous, and extracted twice with ethyl acetate for 15 min in an ultrasonic water bath at room temperature. The samples were washed with 1 ml of additional solvent and analysed by GC-ECD.

► Leaf samples were placed in glass tubes and homogenised twice with 4 ml of ethyl acetate. The homogenised samples were then centrifuged. Clean-up was accomplished by passing the extract through a column containing 3.5 g of aluminium oxide with a thin layer of Na₂SO₄ anhydrous lying on top and using a hexane-ethyl acetate (80:20, v/v) mixture as elution solvent. Extracts were analysed by GC-ECD.

Results

Half-lives obtained for endosulfan in tomato leaves under field conditions

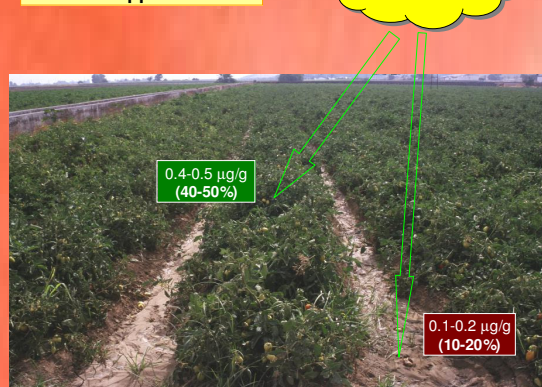
Compound	Field A		Field B	
	(K ± SD)x10 ⁻²	t _{1/2} (days)	(K ± SD)x10 ⁻²	t _{1/2} (days)
Endosulfan-I	17,82 ± 3,36	4	18,50 ± 2,37	4
Endosulfan-II	13,13 ± 3,29	5	9,15 ± 0,81	8
Endosulfan-I+II	14,84 ± 3,27	5	12,36 ± 0,95	6

Half-lives obtained for endosulfan in soil under field and laboratory conditions

Compound	Laboratory assay*		Field assay	
	(K ± SD)x10 ⁻²	t _{1/2} (days)	A	B
Endosulfan-I	2,58 ± 0,18	27	21	22
Endosulfan-II	0,77 ± 0,07	89	73	33
Endosulfan-I+II	1,50 ± 0,13	46	40	28

* Laboratory assay was performed with the soil adjusted at 8% of soil moisture content and at 35 °C

Distribution of endosulfan after application



Conclusions

► Treatment of tomato crops with endosulfan, at a normal dose around 1 Kg/Ha, yields a deposit on leaves that ranges from 40 to 50 % of the amount applied, while the deposit on soil varied from 10 to 20 %.

► The endosulfan deposited on leaves disappeared faster than the residues located in soil. Pesticide half-lives in leaves ranged from 5 to 6 days while those in soil varied between 28 and 40 days.

► Endosulfan-II was the most persistent isomer in leaves and soil.