

# THE USE OF INSECTICIDES IN TEA

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## INTRODUCTION

Before the advent of post-war insecticides, namely, chlorinated hydrocarbons, such as DDT, BHC and followed by the most powerful 'drin' compounds (Aldrin, Dieldrin, etc.), use of potent insecticides was hardly known. Most of the methods utilized to control pests at that time were either cut and burn or bury, or the use of commonly available inorganic chemicals, e.g. Arsenic, Sulphur, Copper salts etc. Prior to 1950, the methods adopted to control the Shot-hole Borer of tea, were to 'cut and burn' or 'cut and bury' the prunings of tea bushes. The tea tortrix was controlled by hand collection of egg masses. However, in 1939, effective biological control of this pest was achieved by the introduction of the larval parasite, *Macrocentrus homonae*. Mites were controlled by spraying Sulphur or lime sulphur. This was in use for a period of over 60 years. Similarly, the termites were controlled by the use of Paris Green (Copper aceto arsenite), fuel oil, an 'unpleasant liquid', Arsenic powder and Gammexane dust. Nettle grubs were controlled by spraying soap (Umbrella brand) or Nicotine.

With the introduction of an array of persistent and powerful insecticides, many of them were utilized on a large scale in field experimentation from the 1950s. Following the results obtained from these experiments, several insecticides were recommended for various pest problems from time to time. At the same time many of them were withdrawn, following unprecedented and widespread outbreaks of unleashed secondary/potential pests.

## RECOMMENDATIONS AND WITHDRAWAL OF INSECTICIDES

For the control of Shot-hole Borer, the first recommendation made in December 1961 was to spray Dieldrin at the rate of 1.5 lb/acre, soon after pruning. With the recommendation of Dieldrin spray, it was anticipated that many estates would face outbreaks of tea tortrix. As such, in December 1961 itself DDT at the rate of 1.5 lb/acre was recommended as a spray against tea tortrix. In December 1962 Dipterex at the rate of 1.5 lb/acre (2 lb in 2 applications) was recommended as an alternate insecticide for tea tortrix. In March 1964 aldrin at the rate of 1.5 lb/acre was recommended for the control of shot-hole borer in new clearings. Again in March 1966 Aldrin at the rate of 1.5 lb/acre was recommended as a mid-cycle spray in mature tea against shot-hole borer.

However, as a result of widespread outbreaks of tea tortrix, twig and looper caterpillars, Dieldrin and Aldrin were withdrawn in September 1966. At this juncture, only one exception was made for the use of Dieldrin in new clearings. With more experimentation and search for alternate insecticides against shot-hole borer Heptachlor was recommended at the rate of 2.0 lb/acre in mature tea and 1.5 lb/acre in new clearings in December 1967.

With the awareness of environmental pollution as a result of the widespread use of insecticides, DDT was banned in any form in tea in December 1972. Following this, Heptachlor too, was banned, in any tea in December 1975. Instead, Fenthion was recommended at the rate of 1.8 lb/acre for the control of shot-hole borer.

By March/June 1984 a decision was taken to ban in any form the use of organochlorine insecticides in tea. In May 1985 a strategy for the management of Shot-hole Borer was recommended (TRI Advisory Circular No. I 4). This included a very limited spray of Fenthion

at the rate of 2.2 kg/ha for mature tea with very severe infestation and 1.8 kg/ha for new clearings.

### **EXTENT OF PEST INCIDENCE**

From the available information of the acreage of each tea district out of 52 tea planting districts in Sri Lanka, the following acreage for the respective pest incidence, have been evaluated on the basis of serious pest incidence recorded from such districts.

<u>Pest</u>	<u>Acreage</u>
Shot-hole Borer	343,000
Tea Tortrix	124,000
Mites	94,000
Low Country Live wood Termite	91,000
Up Country Live wood Termite	25,000

### **TOTAL CONSUMPTION OF INSECTICIDES**

In 1967, Danthararayana, sent out a questionnaire to all tea estates to obtain quantitative data on the acreage and the total amount of insecticides sprayed. Based on the information he obtained, consumption of Dieldrin and DDT on Tea plantations in Sri Lanka, from 1960 to 1967 and the calculated acreage sprayed are as follows:-

Year	Consumption (Imperial gallons)		Estimate of acreage sprayed	
	Dieldrin	DDT	Dieldrin	DDT
1960	1641	2817	2188	3756
1961	4094	5207	5459	6942
1962	8498	8680	11330	11573
1963	11630	12002	15506	16002
1964	14979	17329	19972	23105
1965	19825	23335	26433	31113
1966	8217	28575	10939	38100
1967	252	10743	342	14324

The above table indicates the insecticides sprayed for Shot-hole Borer, tea tortrix, twig and looper caterpillars, during 1960-1967.

However, after 1967 when Heptachlor was recommended as an alternative to Dieldrin and Aldrin, to various unavoidable reasons all estates did not strictly follow this recommendation. It can be assumed that only about 50% of the estates infested with Shot-hole Borer adopted this control measure. At this rate, it is estimated that 170,000 acres would have been sprayed with 170,000 Imperial gallons of 20% Heptachlor. This tentative estimate of the acreage and total consumption of Heptachlor were bound to decrease in the following years due to outbreaks of caterpillar pests, until Heptachlor was banned in 1975. With the recommendation of Fenthion, in 1975, we could expect still less percentage of estates resorting to spray, say 20%. On this estimate about 70,000 acres of tea would have been sprayed with 13,000 Imperial gallons of Fenthion 100 % E.C.

With the withdrawal of DDT and the recommendation of Dipterex and Lannate for the control of tortrix, the estates that resorted to spray were fewer. Further, spraying was also less in view of the very effective biological control found for tea tortrix. As such, only about 10 % of the tortrix infested estates would have resorted to spray. On this estimate, 12,000 acres would have been sprayed with 3,000 Imperial gallons of Dipterex 50 % EC or 6,000 lb of Lannate 90 % SP. Outbreaks of twig and looper caterpillars were hardly known from 1970 onwards.

Incidence of mite outbreaks are less frequent than tea tortrix. For instance there have been no serious outbreaks reported in 1984 and 1985. Mite outbreaks, if they occur are more common in Uva region due to the prolonged drought conditions (May to September) than in the mid-country or high country. Even in Uva, the estates that resort to prophylactic spray are much fewer. It can be estimated to be around 10 %. According to this assumption, about 10,000 acres would have been sprayed with 3,000 litres of Kelthane 42 % MF or with 5,000 lbs of Morestan 25 % WP.

For termites (Up Country live wood, Low Country live wood and scavenging termites) no firm recommendations for insecticidal spray were made, except for compounds like Tritox and Phostoxin, which were tried only on an experimental basis. However, these recommendations were not adopted on a large scale in estates.

## **INSECTICIDE RESIDUES**

Since tea is a beverage consumed for its flavour, and any insecticidal application will have its effect on the finished product, any recommendation of routine or prophylactic insecticidal spray is made only after thorough testing to minimize, if not to eliminate, any residue of the insecticide in made tea.

It is with this intention that when Dieldrin was recommended against Shot-hole Borer in 1961, the Institute took the decision to spray immediately after pruning the tea. However, in the following years, mid-cycle spray of Aldrin, Heptachlor and Fenthion were recommended, provided a safe period of 4 weeks of either resting or discarding the harvested flush was adopted. Even after the safe period, the flush was required to be bulked with ten times the flush from untreated areas. The European Tea Committee, which summarized the results of pesticide residue levels in black tea during the period of 1976-1980, concluded:

- i. A wide incidence of organochlorine pesticide residues in tea.
- ii. That residue levels are dropping progressively.
- iii. Only insignificant amounts of pesticides are extracted in brewing into the consumed beverage.

This committee has found the Sri Lanka tea to contain the following residues during this period (1976-1980).

<u>Insecticide</u>	<u>Range mg/kg</u>
Dieldrin	0.001 - 0.015
DDT	0.001 - 0.160
Heptachlor	0.001 - 0.060
Kelthane	0.035

The German residue limits for tea are as follows:

<u>Insecticide</u>	<u>ppm.</u>
Fenthion	1.0
Dipterex	n.a.
Kelthane	n.a.
Morestan	n.a.
Carbofuran	n.a.

(n.a. - not allowed)

Weeraratne (1983), who overviewed the pesticides with particular reference to Sri Lanka, enumerated the following values as Accepted Daily Intake (ADI).

<u>Insecticide</u>	<u>ADI values (mg/kg body weight)</u>
Dieldrin	0.0001
Aldrin	0.0001
DDT	0.3

## PROBLEMS OF PESTICIDE USE

The disadvantage of over-dependence on insecticides are too well known. With the recommendation of Dieldrin (and also Aldrin) severe outbreaks of tortrix occurred in many estates. In fact, this was anticipated even before this recommendation, so much so, that DDT was also simultaneously recommended against tortrix. With the use of DDT, mite outbreaks occurred in many estates. Kelthane or Morestan was recommended to be sprayed against mites. This "vicious circle" continued until the widespread outbreaks of twig and looper caterpillars in many districts, that caused the withdrawal of Dieldrin and Aldrin. With this withdrawal, the situation returned to normal and as a result tea tortrix and mites were no longer serious pests in those districts. The amount of harvest that is lost either by discarding the flush or by resting the tea bushes is also considerable. The resistance developed by insect pests to the various insecticides would also cause problems of searching for more effective and powerful insecticides.

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