AERIAL SPRAYING OF JARRAH LEAF MINER IN W.A.

by G.W. VanDidden.

(1) Introduction:

Wallace (1966) showed that the jarrah leaf miner (Lepidoptera: Incurvariidae) could be controlled in individual trees by injecting a systemic insecticide, dimethoate, directly into the trunk of the tree. Whilst this method is simple, effective and relatively cheap where individual trees are concerned, it is clearly unsuitable for large areas of dense forest where labour costs would be prohibitive.

In an exploratory experiment Curry (1966 unpublished) found that dimethoate was also effective when applied as a spray to the foliage of the tree, although in this instance a large amount of water was used and the leaves were actually saturated.

In view of these results the jarrah leaf miner group (Forests Department, C.S.I.R.O. and Department of Agriculture) decided to experiment with aerial application which is particularly suited to large areas in which access is often difficult.

(2) Organisation:

Cost of insecticide, and application costs carried by the Forests Department.

Planning and maintenance of the experiment to be carried jointly by C.S.I.R.O., and the Department of Agriculture with assistance from the staff of the Forests Department.

(3) Plot Layout and Location:

Surveys in 1965 and 1966 had shown that heavy leaf miner damage occurred in an extensive area of jarrah forest east of Manjimup. The likelihood of this being repeated in 1967 was confirmed by the large numbers of adult moths observed in the area in April and a suitable site was selected. This was located some 28 miles east of Manjimup just south of the Mordalup Road, and south west of its junction with Roo Road.

Six plots, each approximately 16 acres in area, or 4 chains wide by 40 chains long, were marked out, running west from Roo Road. The plots were separated by buffer areas 8 chains wide, the three northerly plots being separated by buffer areas 8 chains wide, also the three northerly plots being separated from the three southerly plots by Cessna Road, which runs west from Roo Road.

The actual areas of the plots decreased slightly from north to south, due to the delineation of the western boundary road. Plot 1 was in fact 17.6 acres in area compared with 14.0 acres for Plot 6. Two control areas were selected; one $\frac{1}{4}$ mile to the east and the other $\frac{1}{4}$ miles to the west of the plots to be sprayed.

(4) Insecticide Treatments:

The insecticide selected - Diostop - is a 40% emulsifiable concentrate of dimethoate, containing 4 lb per gallon active ingredient.

The six treatments chosen gave a dosage range of from 4 to 128 oz a.i. per acre. The main object of this wide range was to ensure that at least some control was achieved regardless of cost. The highest dosage rate, consisting of undiluted concentrate, was clearly uneconomic.

(5) Application:

Spraying was carried out by Agriculture and General Aviation Pty. Ltd. of Jandakot on June the 9th, 1967, between 1300 and 1630 hours using a single engined high wing Cessna Monoplane.

The aircraft was fitted with two Britten-Norman Microair atomisers one under each wing delivering a droplet size of 100 to 120 microns.

Thirty six gallons of insecticide were carried per sortie and sprayed at a rate of 2 gallons per acre over a swathe width of one chain. The aircraft was flown from Mr. E. Muir's airstrip, situated 6 miles north west of the Plots.

The insecticide treatments were mixed and loaded at the airstrip under the supervision of a technician from C.S.I.R.O.

To ensure the dosages delivered per plot were accurate, each quantity of insecticide and water was carefully measured. After the flight the tank was completely drained and the remaining quantity measured. This would allow then for the accurate amount to be calculated for the rate of application to each plot. The mixture strength could not be increased, if any liquid remained in the delivery pipes, due to the commencement of spraying, with the lower dosages first and increasing the dosage for each plot.

Each plot was covered by four swathe widths, the aircraft being flown twice in each direction, east/west, west/east, at a minimum height above the tree tops.

The plot ends were marked by red hydrogen filled balloons, two feet in diameter, flown on 120 ft. strings , to above tree top level. One balloon was tethered one chain in from each of the four corners of the plot.

The balloons were filled from a hydrogen cylinder carried in the back of a vehicle, then tethered on approximately 6 ft. of string in a position ready for release to the full length of string of 120 feet when required.

Contact between east and west side personnel, controlling the marker balloons, was by means of two "Pony" transistor walkie-talkie sets over a range of half a mile through heavy wooded forest. The quality of sound reproduction is something which could be improved , voice distortion being very high; only 30 % of the messages could be clearly understood. Air to ground contact was maintained by a vehicle from A.G.A. fitted with the plane's V.H.F. Frequency. The messages were then passed on through the pony sets.

When the balloons were up and ready the okay was given for the plane to start. Due to the relative short distance of 6 miles from plots to the airstrip the plane could be heard taking off. A flare was fired to facilitate locating the starting point of each strip after the plane was airbourne and approximately 4 miles away.

As one plot was completed, the plane returned to the airstrip to refill with a stronger mixture of insecticide. The balloons of the completed plot were then pulled down, and the personnel shifted to the next plot to let up the balloons for the next spray trial.

The weather conditions during the spraying were: gusty winds from 7 to 12 m.p.h. at the start, then winds dropping to 1 -2 m.p.h. at the last 2 plots, which then were ideal conditions.

(6) Sampling:

No large scale sampling of the leaf miner populations has been attempted before. Therefore it was decided to take advantage of this experiment to gain experience in sampling techniques in the field and to provide data for statistical analysis of sample size etc.

Before treatment, an east/west base line was established down the centre of the long axis of each plot.

Ten trees were selected in each plot to the north and south of this line, but no further than about 15 yards from it. Each tree was marked with a plastic band and numbered. Using a short barrelled .410 shotgun with 10 shot cartridges, ten leaves were removed from a minimum of two random locations of the crown of each tree. On an average 2.5 shots were required to remove ten leaves.

These leaves were then placed in plastic bags and taken back to the C.S.I.R.O. laboratory where all leaf miner eggs and larvae were individually dissected out and the number alive and dead recorded.

Two control areas were established, one 'western control' $\frac{1}{4}$ mile west of the main plot area and one 'eastern control' $\frac{1}{4}$ mile east of the main plot area.

In each control area five trees were sampled.

(7) Results:

Treatment	Percentage dead larvae			Variation in % larvae mortality between trees at 5.7.67.
Dimethoate active Ingredient	Pre-treatment - 6.6.67	- 20.6.67	Post-treatment - 5.7.67	
Control Nil	5.0	10.3	29.3	0 - 100
4 oz per ac.	2.3	26.1	43.7	10 - 58
5.6 oz per ac.	8.2	13.5	16.1	4 - 60
16.4 oz per ac.	7.5	11.0	25.3	15 - 67
30.8 oz per ac.	4.2	9.0	19.2	14 - 83
70.0 oz per ac.	6.5	15.6	33.6	8 - 72
155.4 oz per ac.	5.9	52.8	69.8	39 - 100

i) The highest dosage applied, 9.7 lb dimethoate active ingredient per acre, achieved about a 50% kill of larvae two weeks after spraying.

No additional mortality occurred between 2 and 4 weeks after spraying.

ii) The second highest dosage applied, 4.4 lb per acre, brought about some deaths but these would not amount to more than 10%.

iii) The relatively high mortality in the plot receiving the lowest dosage was almost certainly not due to any insecticide effect. In fact by chance in this plot, two "resistant" trees with many dead larvae occurred in the sampling. Individual larval mortality in these trees on July 5th was 58% and 49%. The overall mortality in the remaining 8 trees was only 29%, the same as the overall mortality in the trees in the control plots.

(8) Conclusion:

Aerial spraying with dimethoate can achieve mortality of leaf miner larvae and with higher rates of application, no doubt a near complete kill could be obtained. However, the cost of killing 50% of the larvae is already in the vicinity of $70 per acre and this would appear to be quite uneconomic on present evidence.