PROGRESS IN THE USE OF ARBORICIDES IN JARRAH SILVICULTURE.

by P.C. Kimber

Introduction.

It is becoming increasingly obvious that intensive silviculture in Jarrah cannot be practised without the use of efficient tree-killing chemicals (arboricides). A series of investigations into the best type of chemical and the method of application to the tree have been in progress in the Dwellingup Division over the last fifteen months. This article summarizes the findings to date from these investigations.

Chemical details.

Chemicals used as arboricides can be roughly divided into two groups:-

(a). Contact poisons which kill any living tissue with which they come into contact. Examples are compounds of arsenic and ammonium sulphamate (ammate).

(b). Systemic poisons which are absorbed by and move around in the tree, and kill by slowly building up to lethal concentrations in the growing tips (i.e. buds and/or root tips) or by blocking (or inactivating) the cells or tubes through which the foods and water of the tree are carried. In this category come 2,4,5-T, 2,4-D, and Tordon. These are commonly known as hormone poisons.

In describing the amount of a chemical, or the concentration of a solution of it the term acid equivalent (a.e.) is used. This means the amount or concentration of the active part of the chemical. As an example we can take the 2,4,5-T normally used by the department. This is called 80% a.e. solution and means that 80% or 8/10ths of it are active chemical.

When dealing with hormone poisons very small amounts are necessary and these are given in this article as c.c. (cubic centimetres) of which there are 4,546 to the gallon, or grammes (gm) at 454 to 1 pound.

Killing Jarrah Poles in Thinning.

a) Using contact poisons.

Two contact poisons have been tested on Jarrah and both, although capable of killing pole-sized stems, prove far more expensive than the currently used 2,4,5-T.

(i). Cacodylic acid - a chemical containing arsenic which is less poisonous to humans than the usual sodium arsenite used for tree killing. It is sold as a powder (which will mix with water) under the trade name of "Ansar". The powder contains 65% cacodylic acid. Applied to Jarrah poles at the rate of 6gm. powder in water/tree it appears to be giving a good kill but costs four or five times as much as a killing dose of 2,4,5-T. Less than 6gm. will not kill.

(ii). Ammate - applied to notches cut round the base of the stem at a rate of 8gm./tree it resulted in complete defoliation but trees subsequently recovered.

The dose recommended by the manufacturers is 2 ozs. (56gm.) which would cost six times as much as a killing dose of 2,4,5-T.

b) Using hormone poisons.

Investigations have been concentrated on this type of arboricide and on the most efficient methods of getting it into the tree. Each chemical tested is dealt with separately below.

A. 2,4,5-T. This product is commonly sold in two forms; one, the ester, is that which is currently used by the department. The ester will mix with oil (distillate or kerosene) but will only mix with water when an emulsifier is added. Departmental supplies already contain an emulsifier so will mix with water. The other form of 2,4,5-T is the amine which will mix with water but not with oil.

(i) Tests have been made spraying 2,4,5-T solutions into basal frills in Jarrah poles in the range 19" to 35" G.B.H., with the object of determining the minimum concentration of 2,4,5-T necessary to kill the tree, comparing the ester and amine forms, and comparing the ester form used with distillate and water. The results of these trials confirmed the following points:-

(a). 2,4,5-T ester is more efficient applied in distillate than in water; a 2% solution in distillate is adequate to give 100% kill applied in the Spring to Autumn period. For the winter months the concentration should be increased to 4%. In all cases enough poison mixture should be sprayed on the basal frill to thoroughly wet all cut surfaces.

(b). 2,4,5-T amine, although it can be mixed only with water, is slightly more efficient than the ester. Its greater killing power is, however, more than offset by its much higher price than the ester.

(ii) Overbark basal sprays have also been tried using 4% 2,4,5-T ester in distillate. This method demands that the bottom foot of the stem be sprayed with poison mixture until it begins to run off - known technically as spraying to refusal. Due to the thick bark of pole sized Jarrah large quantities of poison solution, in excess of 1 pint per tree, are required and the results are disappointing, especially in the larger sized stems:-

Pole size.	Percentage deaths after 15 months.
12" - 19" G.B.H.	50% (deaths are continuing)
20" - 27" G.B.H.	10%
28" - 35" G.B.H.	0

The method has been proven as satisfactory on large coppice stems before thick bark begins to develop.

In an attempt to avoid the costly operation of frilling, trials have been made placing the poison mixture into notches cut at intervals round the tree at waist level. These trials have given 70% certain deaths and 25% probable deaths within 15 months. Trees classed as probably dead have been leafless and free of epicormics and coppice for over 1 year but still retain small patches of green tissue

beneath the bark. Other points of interest to arise from the trials are:-

(a). The minimum effective dose of .2,4,5-T ester per pole (of 20" - 25" G.B.H.) seems to be 2.5gm. a.e., (20 c.c. of 12½% 2,4,5-T ester in distillate).

(b). Notches should be approximately 6" apart and the dose of poison for each notch 5 c.c. to 7½ c.c. of 12½% ester in distillate. (Quantity can be reduced if concentration is raised accordingly).

(c). There is evidence that better results may be forthcoming from trees notched at waist level than those notched at ground level.

(d). To date the best notching tool appears to be a hatchet with the cutting end ground down to approximately 1½" width. A sheep drencher, graduated in 2.5 c.c. divisions, is used to apply the poison.

B. 2,4-D. A hormone poison not normally recommended for use on trees; it has been tested out of interest and has given surprisingly good results. 4% solution of 2,4-D ester in distillate applied to a basal frill gave over 80% deaths after 15 months. It is, as was expected, less efficient than 2,4,5-T.

C. Tordon. A new chemical which has only recently become available. Two trials have been made applying the chemical intonotches. The first trial, started when little was known about Tordon, demonstrated that 1gm. a.e. per pole (approx. 24" G.B.H.) was more than adequate to give 100% kill. A later trial which is as yet incomplete, has indicated the following:-

Dose per pole.	Effect 4 months after treatment.
0.4gm. a.e.	100% crown deaths. No epicormics or coppice.
0.08gm. a.e.	76% crown deaths, no epicormics or coppice. 24% crowns dead apart from a few green leaves.
0.04gm. a.e.	57% crown deaths, no epicormics or coppice. 43% crowns dead apart from a few green leaves.

Evidence from the silimarity of reactions of trees in earlier notching trials with 2,4,5-T leads to the conclusion that the 0.08gm. treatment will almost certainly result in 100% deaths. 0.08gm. a.e. is the amount contained in 10 c.c. of 0.8% solution.

Anyone who intends making trials along these lines is advised to place notches approximately 6" apart at waist height and to use 2.5 c.c of 1% solution per notch. This will give a dose of 0.1gm. a.e. per pole of 24" G.B.H. and the cost of chemical will be two-thirds that of 2,4,5-T.

Where larger or smaller stems than 24" G.B.H. are treated, the 6" notching distance will automatically cause the necessary increase or reduction in the dose of chemical given.

Tordon is available only as a mixture with 2,4-D under the trade name "Tordon 50 D." The mixture contains 5% a.e. Tordon.

Foliar sprays.

a) On Jarrah Coppice.

Emphasis has been placed on testing low volume sprays of 2,4,5-T. Current departmental practice is to use high volume sprays which aim to completely drench coppice shoots with poison solution.

Where dense areas of coppice are to be treated using high volume sprays, water will be found to be the most costly item; 100 to 400 gallons per acre treated being required. Low volume sprays aim at getting a good cover of poison on the coppice at the rate of 5 to 10 gallons/acre. A knapsack-type motor mistblower is used to apply the poison solution.

Both 5 gallons of 8% 2,4,5-T ester in distillate/acre and 10 gallons of 3% acre have given good top kill of coppice up to 4' high with very little reshooting 9 months after the treatment. Fine sprays of distillate as were necessary are very unpleasant and a small trial was made using water as a carrier. Good top kill resulted from 4% 2,4,5-T in water at 10 gallons per acre and also 1% Tordon at the same rate.

With low volume water sprays a spreading chemical (surfactant) must be used at the minimum rate of 1 part per thousand (0.1%) of the spray mixture. The more that is added, up to about 1%, the more efficient will the poison be. The spreader used in the above trials was "Agral L.N."

In low volume spraying it is necessary to have a very fine mist spray and this may drift over considerable distances. It should not be used within a mile or more of orchards, gardens, or agricultural crops.

b) On Acacia pulchella.

Using low volume sprays as described for use on Jarrah coppice, good kills have been made using 5 gallons of 2% to 4% 2,4,5-T/acre in either water or distillate.

c) General.

The use of low volume sprays is still at experimental level and their wide-scale use is not recommended at present.

d) The use of Tordon.

The following notes on using Tordon as a foliar spray may prove useful to officers testing this chemical:

(1). According to the manufacturers, pines are highly susceptible to Tordon and may be affected by doses of $\frac{1}{2}$-1 lb. a.e./acre (or a 0.05% solution).

(2). Tordon can be absorbed through the leaves or, if applied to the soil, through the roots.

(3). Recent trials of foliar sprays of Tordon on Jarrah coppice have been very disappointing using the form of the chemical known as 22K. It is expected that better results may be found with the 50D, and with other forms if they become available.