

THE EFFECT OF FIRE ON THE TOXICITY OF RESIDUAL  
DEPOSITS OF DDT WETTABLE POWDER IN THE COPPER  
QUEEN PURCHASE AREA

METHODS

Bark samples were collected from trees sprayed with 5% DDT Wettable Powder suspension during the 1971 Gokwe spraying operations. The experimental area was part of the Copper Queen Purchase area which was sprayed on the 700 ft grid line system developed by Mr. A.G. Robertson in the Sabi.

All the samples were collected by cutting circular pieces of bark from the sprayed trees using a  $\frac{3}{4}$ " ring punch. Every effort was made to ensure that samples were taken from sites on any particular tree which had definitely been sprayed.

The three different types of sample collected were:-

- (a) from an area which had been burnt out prior to the spraying operation, thus removing the possibility of fire damage after spraying was completed;
- (b) from two areas where bush fires had passed through several weeks after spraying had been completed;
- (c) from vegetation on ant heaps within an area which had been burnt out after spraying had been completed.

The vegetation in the sample areas was mainly mixed mopane woodland in one case, with a good stand of grass (3 ft high before the passage of fire); and mixed mopane-Combretum sp scrub, in the other case, with a slightly shorter stand of grass (2 ft high before the passage of fire).

The majority of samples was collected from Colophospermum mopane trees, while some were from Kirkia acuminata trees, others from Combretum sp trees, and a few from other unidentified species.

The samples were collected on 19/9/71, before any rain had fallen in the sprayed area, and transported to Rekomitjie Research Station for bioassay testing.

Each sample was tested by placing ten adult female Glossina pallidipes, one at a time, in contact with the surface of the bark for a period of 45 seconds, using the battery method already described by Mr. Pilson. The flies were then held individually in glass tubes in the insectory, and mortalities scored at 24, 48 and 72 hours respectively.

RESULTS

From the results tabulated in Appendix 1 & 2 it may be seen that 100% mortality was produced by all but one of the sixteen samples collected from the area burnt out before spraying commenced.

The eight samples collected from vegetation on ant heaps also produced 100% mortalities, despite their being from an area subjected to fire after the completion of spraying.

The mortalities from the samples collected in the area burnt out after spraying were extremely variable, and in general much lower than those from the other two areas. There appears to be little difference in the mortalities produced from the mopane area with 3 ft grass before (183) burning (183 deaths out of 240 flies at 72 hrs), and the Combretum sp. area with 2 ft grass (108 deaths out of 160 flies at 72 hrs); although the burn in the latter area appeared to have been slightly milder, than the very hot burn in the mixed mopane woodland.

From Table 1 it may be seen that fire damage was severe to a height of 1 ft for samples collected from the side of the tree facing the fire, with only one sample producing mortalities over 35%. Samples collected from above 4 ft show no significant reduction in their lethal effect. Samples facing away from the fire show less damage than those facing it.

TABLE I

Effect of Height and Position on Percentage Mortality After 48 hrs.

Height of Sample above ground level

Position of Sample with regard to fire

No. of Samples Producing over 35% Mortality

No. of Samples Producing 40%-85% Mortality

No. of Samples Producing below 40% mortality

	0 - 1 ft		2 - 4 ft		5 - 6 ft	
	Facing	Away	Facing	Away	Facing	Away
No. of Samples Producing over 35% Mortality	1	0	4	2	6	2
No. of Samples Producing 40%-85% Mortality	0	2	4	1	0	0
No. of Samples Producing below 40% mortality	8	0	9	0	2*	0

\*It was uncertain at the time of collection whether these sites had been sprayed.

DISCUSSION

The results of the trial clearly demonstrate the deleterious effect of fire on DDT W.P. deposits laid down during normal tsetse control operations. The damage is in fact probably greater than that brought out by the above results, because, in order to ensure a fair sample, collections were only made where it was reasonably certain that a particular sample site had been sprayed. Where fire damage was so great that it was impossible to determine whether a site had been sprayed, no samples were collected.

To put the matter in perspective one can consider the results in toto. Thus, of four hundred fly/bark contacts from samples in the burnt area without ant heaps some 109 proved non-fatal to flies after 72 hours, or, put another way, just over a quarter of the experimental population survived. Furthermore it must be assumed that some of the deaths may have been due to causes other than insecticide poisoning, because 52 out of the 180 control flies (not subjected to insecticide treatment) died.

One cannot assume that the distribution of resting flies in nature would produce the same pattern as that reproduced in the experimental population. So it is dangerous to draw direct comparisons between the experimental population and a natural one.

I think it is reasonable to conclude, however, that damage to DDT W.P. deposits by bush fires could seriously reduce the chances of success of a normal spraying operation. This would be particularly true of conventional drainage line spraying where the proportion of bush actually treated with insecticide is so small, and consequently damage to the DDT deposit would severely limit the chances of the fly contacting a lethal deposit of insecticide.

The high mortalities produced by the samples from ant heaps in an area burnt after spraying further enhance the significance of ant heap vegetation to the tsetse controller; for not only does this provide prime resting/refuge sites during the late dry season, but it is also a place where DDT may be expected to be protected from the ravages of a bush fire. The same is probably also true of rot holes in trees.

#### SUMMARY

Bioassay tests were carried out to estimate the damage caused to DDT W.P. deposits in a bush fire.

Significant damage was shown to have occurred to deposits up to a height of 4 ft.

It was demonstrated that deposits on vegetation on ant heaps escaped fire damage.

The significance of fire damage in relation to normal spraying operations is discussed.

#### ACKNOWLEDGMENTS

I would like to thank Mr. Pilson for carrying out the bioassay tests, and for producing the tables in the Appendix.

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APPENDIX 1.

MORTALITY OF ADULT FEMALE G. PALLIDIPES AFTER  $\pm$   
45 SECONDS CONTACTS WITH COPPER QUEEN BARK SAMPLES

Area burnt before spraying	(3) 9 10	(2) 10	(3) 10	(2) 10	(3) 10	(1) 10	(2) 10	(3) 10	
Ant heap area burnt after spraying	(1) 10	(1) 10	(2) 10	(2) 10	(3) 10	(1) 10	(1) 10	(2) 8 9 9	
Area with 3 ft grass burnt after spraying	(2) 1 2 3	(3) 10	(1) 9 9 9	(2) 10	(3) 3 4 5	(2) 3 5 6	(2) 9 10	(3) 4 6 8	
Area with 2 ft grass burnt after spraying	(2) 1 4 7	(2) 6 6 8	(3) 10	(2) 0 1 7	(1) 4 6 10	(1) 0 1 7	(2) 8 8 9	(2) 9 10	
Area with 2 ft grass burnt after spraying	(1) 10	(2) 10	(2) 1 2 7	(1) 0 0 4	(3) 0 0 2	(1) 5 9 10	(3) 2 2 7	(2) 0 2 4	
Area with 2 ft grass burnt after spraying	(3) 8 9 10	(2) 10	(3) 1 4 4	(1) 10	(1) 0 1 6	(2) 0 0 2	(2) 0 4 5	(3) 7 7 9	
Area with 2 ft grass burnt after spraying	(1) 7 5 10	(3) 0 2 5	(2) 0 0 2	(3) 4 5 7	(1) 8 10	(2) 0 0 (3)	(3) 10	(2) 0 2 5	
Controls	(1) 0 2 24	(2) 1 5 15	(3) 2 6 13	Sample size for test = 10					
						Sample size for control = 60			

LEGEND

(Test) (Day )	Mortality 24 hours
Mortality 48 hrs	Mortality 72 hours

Test Day 1 27/10/71  
" " 2 28/10/71  
" " 3 29/10/71

APPENDIX 2

MORTALITIES FROM APPENDIX 1 CORRECTED FOR CONTROL DEATHS  
USING ABBOTTS FORMULA AND PRESENTED AS PERCENTAGES

Area burnt before spraying	(3) 90 100	(2) 100	(3) 100	(2) 100	(3) 100	(1) 100	(2) 100	(3) 100
	(1) 100	(1) 100	(2) 100	(2) 100	(3) 100	(1) 100	(1) 100	(2) 80 89 87
Ant heap area burnt after spraying	(2) 100	(1) 100	(1) 100	(3) 100	(1) 100	(3) 90 100	(1) 100	(1) 100
Area with 3 ft grass burnt after spraying	(2) 6 18 28	(3) 100	(1) 90 90 87	(2) 100	(3) 28 33 36	(2) 29 46 47	(2) 90 100	(3) 38 55 75
	(2) 8 35 60	(2) 59 56 74	(3) 100	(2) 0 2 60	(1) 40 59 100	(1) 0 7 50	(2) 80 78 87	(2) 90 100
	(1) 100	(2) 100	(2) 8 13 60	(1) 0 0 0	(3) 0 0 0	(1) 50 90 100	(3) 17 11 61	(2) 0 13 20
Area with 2 ft grass burnt after spraying	(3) 79 89 100	(2) 100	(3) 7 33 23	(1) 100	(1) 0 7 33	(2) 0 0 0	(2) 0 35 33	(3) 69 67 88
	(1) 100	(3) 0 11 36	(2) 0 0 0	(3) 38 44 61	(1) 80 100	(2) 0 0 7	(3) 100	(2) 0 13 33