# EFFECTS OF THE ANTITRANSPIRANT DOW CORNING$^{R}$XEF-4-3561 ON ARTHROPODS ON A NORTH IDAHO CATCHMENT[1]

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ABSTRACT

The effects of an antitranspirant material, Dow Corning$^{R}$XEF-4-3561, applied aerially on arthropods in 1974 were examined.

The only detectable difference ($P > .05$) noted was of short duration ($< 120$ h) in the lower 10% of the treated watershed which received an excessive application. Only sheets placed in the open had significant arthropod collections.

## INTRODUCTION

The initiation of a field investigation of an antitranspirant material Dow Corning$^{R}$XEF-4-3561 on water yield (Belt *et al.* 1977) on a north Idaho catchment provided an opportunity to investigate whether the material affected arthropods. Dow Corning Corporation of Midland, Michigan, contracted with the College of Forestry, Wildlife and Range Sciences, University of Idaho, to conduct these tests.

## METHODS AND MATERIALS

On 8 June 1974, from 0800 to 1600 h, 375 litres/hectare of a 5% aqueous emulsion of the XEF-4-3561 material was applied aerially to a watershed catchment (Belt *et al.* 1977) of 26.3 hectares on the Priest River Experimental Forest 14.4 km N or Priest River, Idaho. An adjacent catchment was maintained as a control.

The treated catchment has a northwest aspect and ranges in elevation from 1049 to 1541 m. Slopes range from 10 to 45%. Soils are silt loam 1.31 to 1.97 m in depth underlain by coarse rocks, primarily gneiss. Vegetation was characteristic of the cedar-hemlock-grand fir (*Thuja plicata* Donn, *Tsuga heterophylla* Sargent and *Abies grandis* (Douglas) Lindley) type. The overstory vegetation was 30.5 to 61 m in height with a dense canopy. The sparse understory was composed of hemlock and red cedar seedlings and forbs.

Sample cards placed to monitor the dispersal of the XEF-4-3561 emulsion indicated dosage was reduced by 50% in an area near the ridge top; and in the lower 10% of the drainage, a convergence in flight pattern resulted in an excessive deposit. The bulk of the spray was intercepted by the canopy (Belt *et al.* 1977).

To investigate the effects of the emulsion on arthropods, the catchment was divided into 3 treatments (T) with 11 replicates in each treatment. A control of 11 replicates was established in the untreated catchment. Each treatment consisted of the placement of eleven 1.2 by 1.8 m plastic drop sheets at random intervals in the catchment.

In treatment 1 (T1) 50% of the sheet was covered by vegetation; treatment 2 (T2) and the control had 100% coverage; and treatment 3 (T3) was in the open. At distances of 4 to 11 m, along the roads, the drop sheets were placed either up or down slope at a distance of 1 to 4 m from the road. Each sheet was oriented to the slope; a small trough was placed at the bottom of each sheet to catch any arthropods sliding down the sheet. Moisture did not collect on the sheets. The sheets were cleared of any arthropods or debris 24 h before the aerial application. Each sheet was then checked 24, 48 and 120 h after application. Arthropod fauna on the sheets were counted, collected and preserved in 75% ethanol. Each collection sample was kept separate and the number, size, frequency, and kind of arthropod recorded.

Samples of 100 sweeps with a standard insect net were taken 24 h before and 24 h after the aerial application to monitor insect activity in the vicinity of the collection sheets. The major taxa and relative abundance were recorded.

The data were analyzed using a Kruskal-Wallis nonparametric test. Treatment means were compared using Dunn's multiple comparison procedure (Hollander and Wolfe 1973).

## RESULTS AND DISCUSSION

A total of 765 arthropods were collected from the control and treatment drop sheets from the 24 and 48 h post-application periods. At 24 h 375 arthropods were collected; and 390 at 48 h. By 120 h, only 100 identifiable insect parts were collected on all treatments and the control. Ninety-two percent of the 24 h sample

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TABLE 1. Arthropods collected 24 and 48 hours after an aerial application of 375 l/ha of a 5% aqueous emulsion of Dow Corning$^{R}$XEF-4-3561, Priest River Experimental Forest, Priest River, Idaho, 1974.

| Treatment | Mean ± SE[1] | |
|---|---|---|
| | 24 h | 48 h |
| T1 | 0.73 ± 0.38a | 0.45 ± 0.31a |
| T2 | 1.40 ± 0.64 ab | 1.63 ± 0.66 ab |
| T3 | 31.54 ± 14.42 b | 33.36 ± 17.52 b |
| Control | 0.36 ± 0.28a | 0.00 a |

[1]Means of 11 replicates; means in the same columns followed by the same letter are not significantly different at $P < 0.05$.

and 94% of the 48 h sample were collected from drop sheets placed in the open (T3).

Two arachnid orders (Acarina and Araneida) and 10 insectan orders (Coleoptera, Diptera, Ephemeroptera, Hemiptera, Homoptera, Hymenoptera, Neuroptera, Plecoptera, Trichoptera, and Thysanoptera) were represented. Over 80% of the 24 h sample and about 90% of the 48 h sample were small, fragile (less than 2 mm) insects. Most were small flies (Diptera) (72% in the 24 h sample; 82% in the 48 h sample). Midges (Chironomidae) comprised 35% of the 24 h collection and 40% of the 48 h collection. Small ground beetles (Carabidae) represented 12% of the 24 h collection and 7% of the 48 h collection. The insect species are being identified and a publication recording their occurrence will be prepared.

There were no observed differences in the abundance or composition of the sweep net samples 24 h before and 24 h after aerial application.

Significant mean differences were detected between the open (T3) and the control and between T3 and the sheets under full forest canopy (T2) in both the 24 and 48 h samples (Table 1).

The greatest insect collections occurred on sheets in the lower 10% of the drainage which received an excessive dosage. On three collection sheets in the open (T3), over 80% of the 24 h collection and 77% of the 48 h collection was from three drop sheets.

We conclude that there is no appreciable effect of the compound on insect communities at the prescribed dosage. The excessive dosage (not measured) had a slight, temporary effect in clearings. The lack of any differences in sweep net collections before and after spray suggests there is no significant effect on population levels.

## LITERATURE CITED

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