PESTICIDE DRIFT

Ground versus Aerial Application

*by K. R. Frost & G. W. Ware**

With pesticide detection methods becoming more and more sensitive . . .

While increased biological activity of pesticides are being developed . . .

It is becoming more and more essential to agriculture to reduce to a minimum the amount of pesticide drift on non-target areas regardless of the type of application that is used.

The bulk of all pesticide applications today are in the form of sprays — usually water emulsions and wettable powders. This has come about because of the significantly greater drift hazard of dusts. And, where more of the insecticide drifts, less of the chemical deposits fall on the target area.

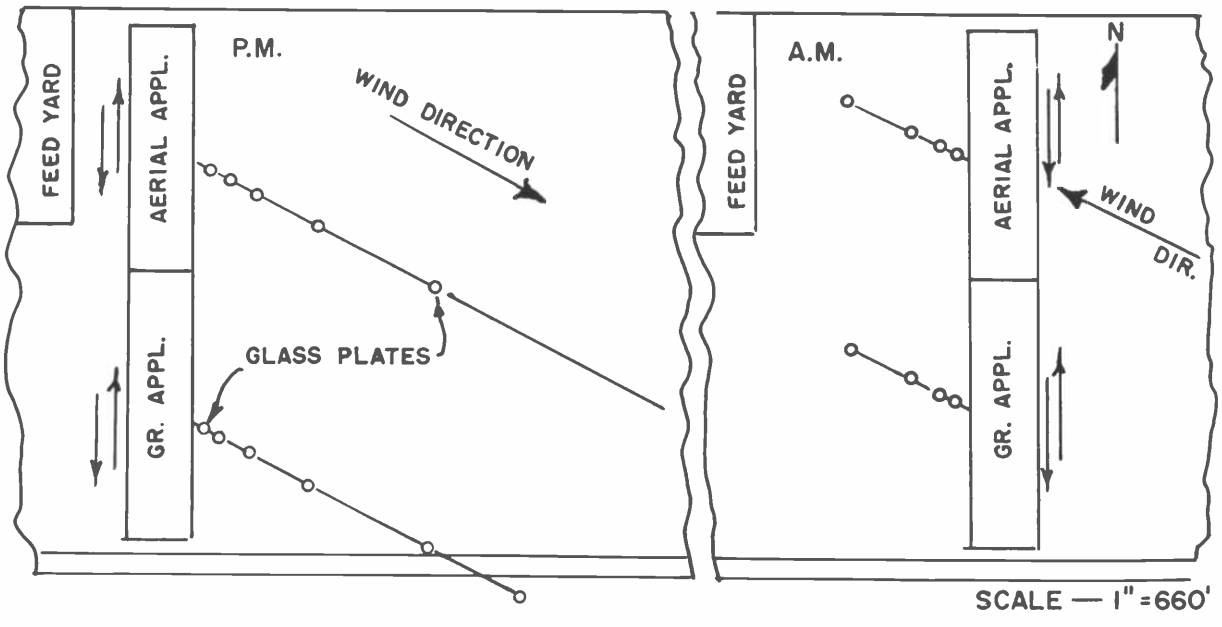
Few comparisons have been made of drift from aerially applied sprays with that which has been applied from ground applicators under similar conditions.

Though it is generally agreed that drift depends to a considerable degree on the distance of its release above the target crops, it is to be expected that drift from aerially-applied sprays would be greater than that from ground applications when conducted under similar conditions.

In the drift experiments reported here, the objectives of the trials were:

1. compare the detectable drift of an insecticidal emulsion spray applied by a high-clearance, self-propelled, ground spray rig with that from a "standard" aerial application, applied simultaneously;
2. compare insecticidal drift from late afternoon with that of early morning applications in the same field.

Figure 1. Field layout showing location of collecting stations, wind direction and target area.



Materials & Methods

FIELD DESCRIPTION. The aerial and ground applications were each made to 10 acre blocks in a 250 acre field of skip-row planted cotton, end-to-end, one-fourth mile long, on the Morrison Brothers Ranch, Higley, Arizona. A diagram of the plots is presented in Figure 1.

METEOROLOGICAL CONDITIONS. During the evening applications the wind was from the northwest at less than 1 mph. There was also an inversion of three degrees during most of the application, ranging from 83° at 8′ to

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86°F at 32′. During the morning application the wind came from the southeast varying from 1 to 2 mph, and a temperature lag from 0° to 2°F, within 80° to 85°F. These data are illustrated in Figures 2 and 3.

APPLICATION EQUIPMENT. A high-clearance ground spray rig (Hi-Boy) was used for the ground applications. The machine was operated in the evening experiments at 4-5 mph, 40 psi nozzle pressure, 3 Tee-Jet size 4X nozzles per row, applying 70 gallons of emulsion spray to 10 acres, or 1.5 lbs. of methoxychlor per acre. In the morning application it was operated under similar conditions but applied 80 gallons of spray to 10 acres, or 1.8 lb. of methoxychlor per acre.

A Stearman biplane utilizing 36 #8 nozzles at 30 psi boom pressure and flying at 80 mph, with a 42 foot swath applied 70 gallons of spray containing 20 lbs. of methoxychlor to 10 acres in both the evening and morning applications.

GLASS PLATES. Two glass plates, 10 x 25 cm, at each of two levels, ground and 24″, were used to collect naturally impinging drift from the aircraft and ground rig at the target.

Results and Discussion

The drift analysis results are tabulated in Tables 1 and 2, presenting the glass plate collection data for the evening and morning applications. These data are plotted in Figure 3 to illustrate the wide differences between aerial and ground application. At all distances beneath target and downwind, the aerial application resulted in much greater drift than the ground application. For instance, in the evening application at ¼ mile, the aerial drift was 5.0 fold that of the ground spray. In the morning application at ⅛ mile, the aerial drift was 4.2 fold that of the ground spray. Also it will be noted that the glass plates at ground level generally captured the same quantity of deposit as those placed two feet off the ground. Drift deposits on glass plates in both the evening and morning application were surprisingly similar for the aerial application. However, deposit from the Hi-Boy application in the morning was 2.6 times that of the previous evening at 660 feet downwind from the target area. This variation did not hold true for the collection stations nearer target.

It should be kept in mind that these data represent two complete tests under conditions which are frequently found in Arizona cotton fields. They do not, however, indicate what the exact drift rates would always be, regardless of the weather conditions. Generally speaking these tests indicate that an aerial application would result in considerably higher pesticide drift than a high-clearance ground rig under the same meteorological conditions.

Figure 2. Wind velocities across target area and air temperatures at eight and 33 feet for both a.m. and p.m. tests.

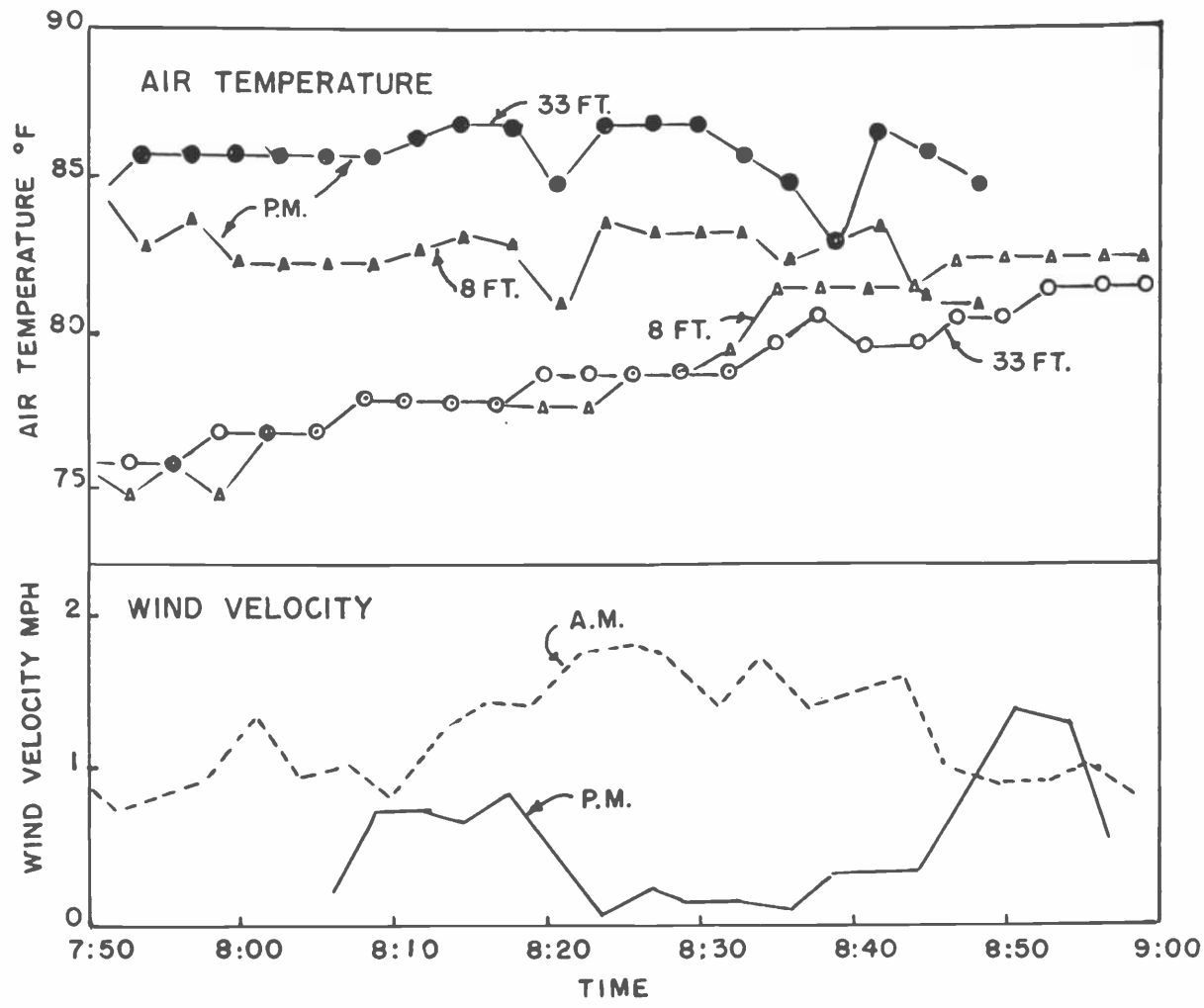

Figure 3. Results of a.m. and p.m. tests with Hi-Boy and aerial application as collected at indicated station on glass plates placed on ground level and at 24 inch level.