THE USE AND APPLICATION OF VISCOUS PESTICIDE FORMULATIONS

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Summary

This paper presents a preliminary report on a process made for the application of viscous pesticide formulations. Certain possible advantages are discussed, of which the main one may be the prevention of spray drift. Overseas trial reports are mentioned and possible lines of investigation in New Zealand commented on. No results are yet available on testing of this process in New Zealand.

REVIEW OF PROBLEM

EMULSIFIABLE CONCENTRATES such as those used in agricultural practices, when diluted with water, produce emulsions in which droplets of the oil phase are suspended in a continuous water phase. It is, conversely, possible to produce emulsions in which droplets of water are suspended in a continuous oil phase and these are commonly referred to as invert emulsions.

Invert emulsions are often characterized by their high viscosity, or mayonnaise-like consistency, and this property has been considered to be a disadvantage because of application difficulties. Another disadvantage has been the inability to dilute such an emulsion with water beyond a certain point. These facts, coupled with the relatively high concentration of emulsifiers normally needed to produce an invert, have meant that such emulsions are more expensive than conventional ones.

However, if the physical problems involved in spraying the viscous liquids can be overcome, it is possible to obtain relatively large, heavy, reasonably uniform droplets. This should enable accurate placement of the biocide with a virtual absence of drift. At the same time, these droplets could be expected to show better adhesion and rain resistance and, therefore, improved persistence and penetrative powers.

STULL "BI-FLUID" PROCESS

A recent development has now overcome many of the physical problems which have hindered the introduction of invert emulsions. Known as the "bi-fluid" process and invented by the Stull Chemical Company, this spraying method makes possible the application of viscous formulations such as invert emulsions. Essentially, instead of producing the invert emulsion in a tank and then pumping this viscous liquid to the spray nozzles, the oil and water phases are pumped separately into the cavity of a specially designed nozzle where they are mixed together with considerable agitation forming the viscous invert emulsion which is immediately ejected through the nozzle orifice. The process is suitable for use with all general application methods, including aerial, spot and boom spraying and the equipment is easily converted for use with conventional emulsions.

OVERSEAS RESULTS

In trial applications carried out in the U.S.A. using invert emulsions of 2,4,5-T applied by helicopter, the following observations were noted:

- (1) Accurate placement was achieved even in deep gullies inaccessible to the helicopter and when operating over high voltage transmission lines 120 ft tall.
- (2) Brush control using the invert formulation was, in every case, at least as good as that obtained by similar doses of the same toxicant in conventional emulsion.
- (3) There was no ground deposition of invert more than 40 ft from a designated spray path of a helicopter operating in a 7 m.p.h. cross wind and no deposition beyond 10 ft which would be of any consequence. Deposition from a conventional emulsion sprayer under similar conditions was still detectable 600 ft from the designated spray path.
- (4) No invert was detected by suction sampling 50 ft from the ground and at a distance of more than 100 ft from the designated spray path, whereas conventional emulsion could be detected at distances of 800 ft.

POSSIBLE ADVANTAGES OF APPLYING INVERTS

The following possible advantages appear feasible, in the light of present knowledge.

- (1) The ability to spray more often under conditions which would preclude aerial spraying operations using conventional formulations (*e.g.*, gusty wind).
- (2) The avoidance of damage to susceptible crops because of drift.
- (3) The avoidance of waste of chemical due to drift and the ability to obtain more accurate placement of the droplets on the foliage.
- (4) The probability of obtaining increased biological action, not only on account of (3), but also on account of the superior persistence, penetration, spreading and sticking properties, and rain resistance of a viscous product (although this may prove to be offset in some circumstances by increased phytotoxicity).
- (5) The avoidance of waste of biocide left over at the end of spray operations.
- (6) The elimination of residues on areas adjacent to crops treated with insecticides.

THE CURRENT POSITION

It is proposed to carry out trials in New Zealand to determine:

- (1) The relative efficiency of the invert formulations as compared with conventional sprays containing the same biocide.
- (2) Techniques which would be suitable for the peculiar conditions pertaining to brush weed control in this country as compared with overseas problems.
- (3) To compare different invert formulations and oil/water ratios.

CONCLUSION

Until further exploratory work is undertaken, it would be premature to make sweeping claims for the "bi-fluid" process and invert emulsions as a whole. This preliminary report, however, would suggest that the process could be of considerable importance to the pesticide industry in New Zealand.