TWO TECHNIQUES FOR IMPROVING BROADCAST GROUND APPLICATION OF PESTICIDES

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Summary

Two techniques for improving the accuracy of broadcast ground application of pesticides are described. Quick-acting herbicide granules are used to measure effective field swaths of equivalent insecticide granules. This technique enables broadcast granule application swath widths to be measured from plant reaction in the field in the absence of the target insect population. A prototype swath marker system utilizing high density biodegradable foam deposits promises to have much practical value for accurately defining broadcast ground applications.

INTRODUCTION

IN almost every field situation, some degree of granule bounce occurs when the granules are thrown from a spinning disc or reciprocating arm applicator to give a broadcast treatment. Thus it is difficult to simulate field conditions on a test bed and it will often be necessary to measure swath widths under field conditions. Herbicide granules, formulated to be physically similar to insecticide granules, were used to determine field swaths in the absence of a target insect population in pastures.

McLean (1969) emphasized the need for specialized application equipment for precise deposition of pesticides. To this end, a prototype swath marker system has been developed utilizing a high foaming detergent to produce foam deposits. The unit operates on a long boom and allows the driver to keep his vehicle on course when applying pesticides to dense crops which are several inches high.

MATERIALS AND METHODS

In the granule broadcast swath test, both petrol-motor-driven and p.t.o. driven reciprocating arm fertilizer and seed spreaders were used. These units had modified flow regulators to dispense accurately between 10 lb and 140 lb of 16/30 BSS granules per acre. The "on-off" mechanisms were altered to give more reproducible settings and the 21 in. spouts were modified to reduce the dosage variation across the swath width (Ivon Watkins-Dow Ltd., 1969). The machines were run at 540 rpm and were set with the spouts horizontal to, and at varying heights (28 to 55 in.) above the test bed or pasture.

Granules were formulated on 16/30 BSS absorbent clay or limestone cores and contained 5% w/w amitrole-T, 10% w/w diazinon or 20% w/w parathion, together with conditioning agents. Granules were applied at 10, 15 and 20 lb per acre. Flow rates were initially compared in the laboratory to check uniformity.

Granule distribution was measured inside a shed as a static test on "bounce beds" made of LT7 aluminium sheets, the corrugations of which produced catching areas every 5 in. across the swath. Air conditions were still during the tests. Swath width field sites were moderately or closely grazed sheep pastures consisting mostly of ryegrasses, various clovers and broadleaf weeds. A forward speed of 4 mph was used and air conditions were calm during the tests.

Field measurements from the chlorotic responses with amitrole-T granules were later compared in the field using equivalent granules containing diazinon or parathion as the active ingredients. These latter granules were used on 3rd instar grass grub (*Costelytra zealandica*) inhabiting the top ½ to 2 in. of soil under ryegrass/white clover pastures. Pasture colour and growth responses to all treatments were measured between 5 and 8 weeks after application.

The foam marker system was operated in conjunction with a typical boom spraying unit (18 ft 9 in. articulated boom) mounted on a six-cylinder, four-wheel drive vehicle. Exhaust gases at a pressure of 4 to 7 lb/sq. in. from the vehicle were used to energize the marker system. Trials were conducted on a ryegrass/browntop/white clover sward 4 to 6 in. high and on a 2 in. high (grazed) established lucerne stand. A bio-degradable detergent blend concentrate was used to produce the foam.

RESULTS AND DISCUSSIONS

MEASUREMENT OF SWATH WIDTH

The results of the swath widths obtained with the equivalent herbicide and insecticide granules are presented in Table 1.

TABLE 1: EFFECTIVE SWATH WIDTHS

Granule	Active	Swath Width	
		Test Bed	Field Site
A, 16/30BSS limestone	10% w/w diazinon	23 ft 3 in.	19 to 21 ft
AE, 16/30BSS	5% w/w amitrole-T	23 ft 3 in.	19 to 21 ft
B, 16/30BSS clay	20% w/w parathion	25 ft	20 to 21 ft
BE, 16/30BSS	5% w/w amitrole-T	25 ft	20 to 21 ft

Similar swath widths were obtained comparing the herbicide granules with insecticide granules in both the field sites and on the test bed. Different formulations, however, can give a variety of swath widths and dosages at fixed settings. The ability of low concentrations (less than 25 ppm) of amitrole-T to give readily seen symptoms in both grasses and broadleaf plants make it particularly suitable for this type of use. In addition, the material has a very low order of toxicity and is non-hormone. The chlorotic effects are soon outgrown at the rates used (½ to 1 lb) thus allowing the field test site to be reused. Thus, amitrole-T is of considerable value when sites are difficult to obtain or are close to hormone-susceptible plants.

A variation (zig-zag) in effective swath edge was measured in some of the field test strips. These zig-zags were not apparent from the measurements taken on the static test bed, probably because they were masked by successive overlays of granules. To-and-fro field applications at 20 ft centres with both herbicide and insecticide test granules, however, have not shown the "wavy" swath edge to produce an under-dose zone.

SWATH MARKER

During the visual evaluations of the amitrole-T granule treatments, it was obvious that some form of swath edge marker would assist in avoiding excessive overlapping or "misses" in broadcast field-scale treatments.

The developed prototype system generates high density foam which is forced by exhaust gases through the delivery line to the dispenser on the boom end. At this point most of the exhaust gases escape, leaving the high density foam to build up in the unit. Gradually the surface tension is broken and a "blob" of high standing foam is released. The process is repeated. This foam lasts for up to 1½ to 2 hr in the upright position and up to 10 to 14 hr in the flat position, depending on humidity, air temperature and wind. The most satisfactory dilution rate of detergent blend to water is 1 to 25. Excess dilution of the concentrate will cause frequent, watery, low standing foam deposits. Heavy rain soon disintegrates the "blobs". Side winds gusting up to 5 to 6 mph do not seriously affect foam placement, especially since the dispenser can be set close to the ground.

The frequency of the blobs and the stability of the foam can be changed by adjusting the tank pressure, the engine rpm (and hence the exhaust flow) in relation to forward speed, the dilution rate of the detergent concentrate, and the length of delivery hose. A "blob" frequency every 14 to 17 ft was considered most suitable for adequate marking under field operations.

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REFERENCES

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