1971-72 Report
COMPREHENSIVE RESEARCH ON RICE
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PROJECT NUMBER AND TITLE: RP-4. Increasing Efficiency and Reducing Contamination from Chemical Applications to Rice.

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OBJECTIVES

To examine in the laboratory and to field test where desirable all the techniques, formulations, and machines that offer promise for reducing to a minimum aerial drift losses while maintaining a basically sound pest control program to enable profitable rice production. This would include:

1. Machines offered by commercial interests, such as the Microfoil system, as well as developments of our own, the University LTN (low turbulence piezoelectric atomizer).

2. Formulations which include a wide variety of liquid thickening agents as well as foams and other additives or adjuvants that have promise.

3. Spray equipment, both ground and aircraft types, the latter with fixed and rotary wings, will be field tested for drift control. These equipment types will be used for field studies to evaluate pest control efficacy in cooperation with Agricultural Botany and Entomology.

4. Dry material formulations and spreading equipment will be tested in seeding and fertilization studies for more uniform and more effective applications by aircraft.

5. Other types of equipment or application techniques such as the Electrostatic spray equipment will be examined and tested where these offer advantages to rice production.

WORK IN PROGRESS

1. Further refinements for more simplified and practical design is being done on the LTN spray system nozzles for fixed wing aircraft. We conducted some very successful spray drift tests (data is being analysed) this fall and hope to have a better set of nozzles with which to do field weed control tests in 1973. Plans are being made to conduct these spray tests with a fixed wing aircraft.

2. Approximately 300 acres of rice were sprayed with a Microfoil boom on a helicopter in the Merced area. No detectable drift was found beyond 500 ft.

on air samplers and on fall-out plastic collection sheets; samples taken to two miles distance. Further data analysis is in progress on this work.

3. A limited series of tests were run this year with a very narrow (10-15 ft.) swath application of granular materials using a Piper Pawnee fixed wing aircraft. Results show that such swaths are practical and application rates of 2 to 10 lbs/A can be uniformly applied. Data analysis is being completed on this and other work is in progress on the centrifugal spreaders for seeds, fertilizers, and granular pesticides.

4. Several field drift control tests were run on foam additives and foam producing nozzles versus conventional nozzles used on both aircraft and ground equipment. Preliminary results show drift reduction is due to increased drop size from coarse atomizing nozzles and not from the foam as an additive.

5. Laboratory work is in progress on several thickening agents for spray additives to reduce drift.

EXPERIMENTS COMPLETED

The drift tests on the foam nozzles complete this portion of work, although weed control results with foam as a sticker-spreader agent still needs further evaluation.

WORK PLANNED

1. Field weed control plots in cooperation with Botany using the LTN nozzles will be started as soon as weather permits in the spring of 1973.

2. Field weed control plots using various thickening agents will be commenced early in 1973 as well, to evaluate the new thickening agents that we are laboratory testing and that are now being marketed for herbicide drift control.

3. Laboratory work is planned to study the effects of several of these thickening agents on drop production and limitation by various types of nozzles used on aircraft and ground equipment.

4. Further work is planned on narrow swath, low volume granular applicators as well as continued development on centrifugal systems for fertilizer and seeding applications.

MAJOR ACCOMPLISHMENTS

1. Drift control tests with the Universtiy LTN system on a fixed wing aircraft showed drop production largely limited to drops between 200-300 µm diameter. Drift data verified that downwind transport of chemical drops (those below 50 µm) was largely eliminated. This does not mean that this system can guarantee no crop damage if 2,4-D or similar highly active chemicals are applied across the road from a highly sensitive crop. But rather, it does mean that non-volatile materials will not cause detectable symptoms or damage to crops within a specified distance dependent upon the degree of sensitivity of the nearby crop. Probably this will mean a practical useable limit of 1/4 to 1/2 mile, but this should permit increased use of good herbicides in areas where

they are now banned or severely limited as to time and condition of use. The equipment is not commercially available, but we hope to get a manufacturer interested in making these units this coming year.

2. Our drift tests on foam additives show that with either ground or aircraft equipment the drift control obtained is due to the coarsely atomized spray and not the additive itself. Further field and laboratory tests on the effects of the additive on chemical activity (synergistic or chemical enhancement) need to be conducted to see if any benefits from foam actually exist or if in fact the foam additive is simply a very good sticker-spreader material.

IMMEDIATELY APPLICABLE RESULTS

The most important information found from our work this year relates to the limitations in drift control that are obtained with foam additives. The foam system requires coarse atomizing nozzles in order to obtain any drift control. The control thus obtained is of the same order as that achieved by any coarse nozzle such as the D4 to D8 jets as are required by State regulation for applying 2,4-D within designated hazardous areas. The foam additive alone does not reduce drift by any formulation effect.

EVALUATION OF PROJECT

The LTN system as developed by the Agricultural Engineers will cost more to purchase and operate, but offers as close to complete drift control, when spray is applied by fixed wing aircraft, as we can expect to be achieved with the present state of knowledge. The fact that this system produces smaller drops than either thickening agents or the Microfoil system also makes it the best for effective chemical application and plant coverage.

The granular pesticide and fertilizer studies will aid greatly in reducing costs and increasing effective use of the valuable granular formulations. Highly effective drift control is also achieved with good, non-dusting type granules.

The studies proposed on thickening additives should provide another tool in the hands of both ground and aerial applicators to increase drift control effectiveness while obtaining good weed control to enable economical rice production.

PUBLICATIONS OR REPORTS

Wilce, Stephen, N.B. Akesson, P. Christensen, R.E. Cowden, D.C. Hudson, G.I. Weigt, and W.E. Yates. Low turbulence piezoelectric-driven atomizers. Paper No. 72-643, ASAE Winter Meeting, Chicago, Illinois, December 1972.

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Akesson, N.B., Wesley E. Yates, and Stephen E. Wilce. Review of current techniques and prospects for increasing the confinement of chemical applications to treated fields. Eighth Northeast Aerial Applicators Conference, Cornell University, February 1972.

Akesson, N.B., S.E. Wilce, W.E. Yates and D.E. Bayer. Increased efficiency and reduced drift losses from herbicides applied for rice weed control. Int. Conf. Tropical and Sub-Tropical Agriculture, Honolulu, Hawaii, ASAE Publication, pages 177-181, April 1972.

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