LOW VOLUME POTATO SPRAYING IN MAINE

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ABSTRACT

Various types of sprayers were used to measure the effectiveness of low volume fungicidal sprays for control of late blight. Early experiments compared 100 or more gallons per acre (gpa) with 25 to 50 gpa. Later work involved aerial application and aerial application simulators where 3 gpa or less were used. In these studies, conducted over several years, the late blight organism was artificially introduced and disease development usually was adequate for evaluation of control efficiency. In some experiments insect control data were obtained as were measurements on chemical vine-killing. Evidence of improved fungicidal action through low volume application was observed and further studies on this effect are in progress. In general, fungicidal applications at all gallonages tested were effective if the equipment was operated according to manufacturer's recommendations.

For many years plant pathologists were convinced that high gallonage applications of a dilute spray were needed to insure complete plant coverage. Beginning in the late 1940's, however, the so-called "concentrate sprayers" applying much lower gallonages began to appear. These machines applied 25 to 50 gpa at 80 to 100 lb per square inch (psi) pressure rather than the accustomed 100-150 gpa at 400 to 600 psi. They were shown to equal the more expensive high gallonage equipment in disease and insect control as well as being useful for application of herbicides.

Parallel with the improvement of low gallonage hydraulic spraying came the development of airblast rowcrop equipment. Use of air as a pesticide carrier offered still greater reduction in volume of spray per acre. Before the potential of airblast spraying was fully realized, improvements in aerial application equipment started rapid growth of this industry. Results of experiments conducted with machinery representative of the various stages in the evaluation of low gallonage spraying in Maine are presented.

MATERIALS AND METHODS AND RESULTS

Hydraulic sprayers:

In 1954 experiments with low gpa equipment Peikert and Bonde (1) showed that these sprayers, if equipped with drop nozzles, did a commercially acceptable job. However, their data indicate slightly better disease control was obtained with high gpa. In the present studies similar results were obtained. Changing from high to low or low to high gpa at midseason showed no advantage. Observations of high gpa sprayers converted to low gpa showed that using high pressure with low gpa nozzles reduced effectiveness because of the small size of the spray droplets. Con-
sequently, the practice of increasing pressure when plants are large should not be followed.

*Airblast sprayers:*

In 1962 studies were initiated on the effectiveness of airblast spraying. A John Bean Aircrop 12-row sprayer applying 50 gpa was compared with two types of high gpa machines and a new boom-type airblast "Sprayfoil" sprayer. The latter was capable of applying as little as 10 gpa. The late blight fungus was artificially introduced in these tests and all machines did an effective job. Insect counts showed that insecticides were effectively applied also. The John Bean sprayer was tested further in 1963 and subsequently purchased for general spraying at the Station.

Though airblast sprayers are more expensive than hydraulic low gallonage equipment, they offer a special advantage to seed growers. Vine contact with machinery can be greatly reduced or eliminated, thereby reducing the spread of mechanically transmitted virus diseases. Therefore, airblast machines appeared to have a place in Maine until the advent of aerial application.

*Aerial application:*

Dr. Reiner Bonde and others at the Maine Station showed that aerial application in the late 1940's was decidedly inferior to conventional methods of pesticide application. In the years following these early tests, considerable progress was made in the development of aerial application equipment and methods. Among the most significant of these was the evolution of effective low-volume wet-spray techniques. Little interest could be generated in support of a reevaluation of aerial application in Maine until 1965. In that year, a helicopter applying wet-spray was compared with conventional ground equipment in a grower's field. The following year saw both a helicopter and fixed-wing aircraft operating commercially in Aroostook. Unfortunately for test results, late blight was not a problem in either of these years. Therefore, evaluations could be made only on the basis of spray distribution, control of insect infestations, and vine-killing.

A four-acre field at the Maine Station was selected for aerial application tests in 1967. An eight-row high gallonage boom sprayer applied fungicide weekly on one side of the field and a helicopter, applying 5 gpa, sprayed the other side on the same day each week. The row of plants separating the two strips was artificially inoculated with late blight spores. Though late blight was well-established in the inoculated row, the disease was not detected in either test strip at the end of the season. Similar experiments were conducted in the following two years with a fixed-wing aircraft applying 3 gpa. In both years late blight was restricted to the inoculated row indicating that adequate protection was obtained with each type of fungicide application.

*Aerial application simulators:*

From a research standpoint, land requirements for aerial application experiments are such that statistical control can be only minimal. Many

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2Manufactured and supplied by the Sprayfoil Corporation (now defunct) of Minneapolis, Minnesota.