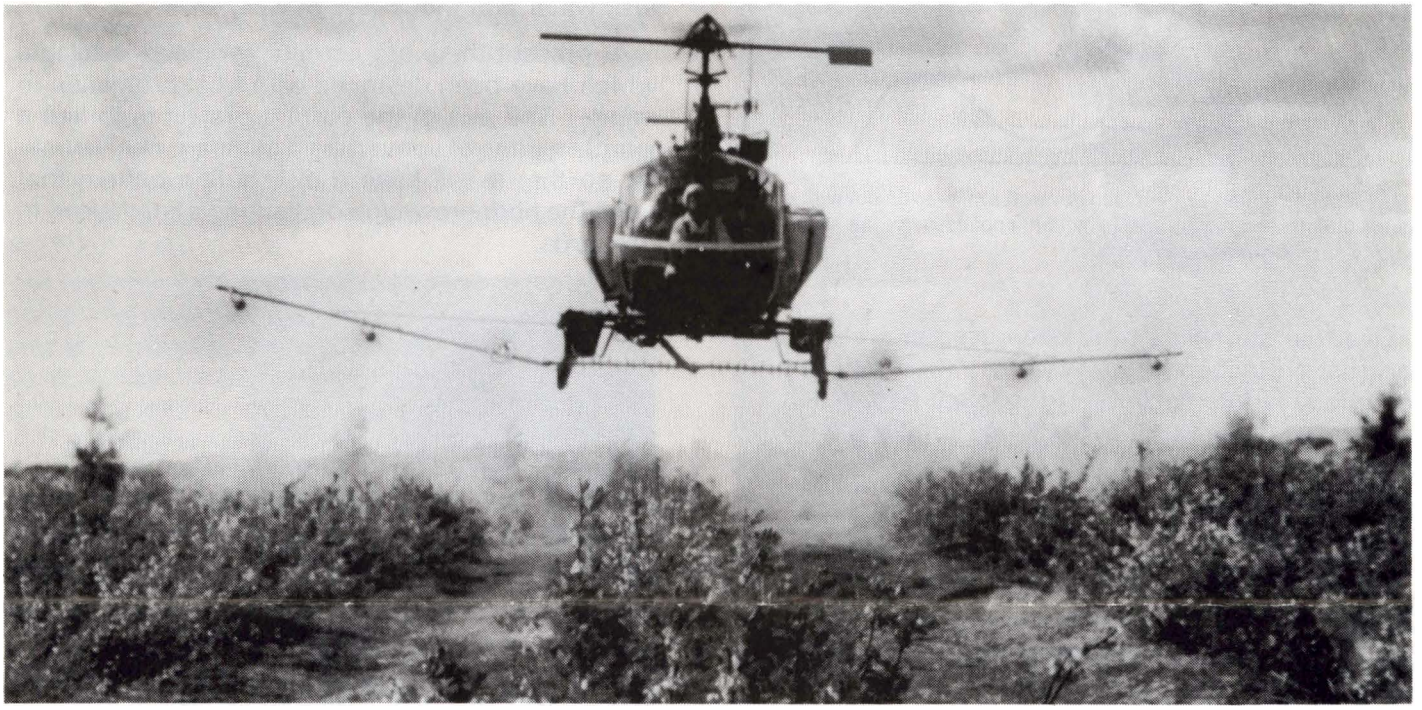
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Aerial Spraying of Fruit. C.D.A. + Crosswind Works Well



Helicopter equipped with Micronaire CDA sprayers applying pesticide in blueberries. A moderate cross-wind spreads the spray better than blast from propellers or rotors.

Efforts to apply fungicides onto grapes and blue-berries by air have not been particularly successful in New Zealand. Aircraft - particularly helicopters - create a lot of turbulence which should be just the thing to beat the spray into the crop. But it doesn't work well in practice. The spray does not seem to penetrate the crop or reach the underside of the leaves.

John Maber and his team from the NZAEI station at Rukuhia have been working on this problem. They have found that if an aircraft applies the chemical in a moderate cross-wind, using spray equipment which produces the correct size droplets, the results can be good.

Work on the project began last year near Blenheim. A total area of 100 hectares is being sprayed with fungicides and insecticides using specially calibrated Micronaire equipment on a helicopter and a fixed-wing aircraft.

A conventional tractor-drawn sprayer applies about 1,200 litres per hectare, and may have to repeat the treatment every two weeks during the six-month season. Aerial application with the Micronaire uses only 30 litres per hectare, and can do the job infinitely faster than the cumbersome ground sprayer.

For fungicide application, rates of about 30 l/ha are being used, with a droplet size of 80-100 microns. The average aircraft height is about 2 metres above the crop.

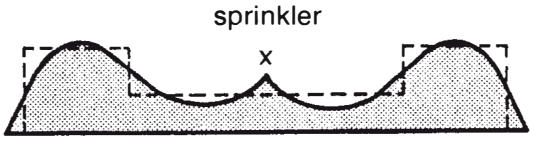
The most important factor needed to achieve good results is a crosswind of about 10 knots (5 m/sec), a fact which caused some disbelief amongst pilots. It has been found that the crosswind is much more effective in causing the spray to penetrate the crop than the turbulence and downwash from the aircraft.

Until recently, the fungicides in common use required an all-over coverage to be effective. Newer products are now available which are semi--systemic and do not require the same total penetration. Although this contributes to the improved results from aerial application, John Maber hopes to achieve good disease control with contact fungicides if the right techniques are used.

This crosswind technique can only be used for applying fungicides and insecticides, not herbicides, due to the probable damage which could be caused by drift.

Frost Fighting with The Doughnut

A new project to develop a better sprinkler for the "Targeting" system of protecting fruit orchards from frost is being developed at Lincoln. The idea is to spray only the target crop and not the headlands or areas between the rows of trees, using mini-sprinklers which throw doughnut-shape spray patterns.



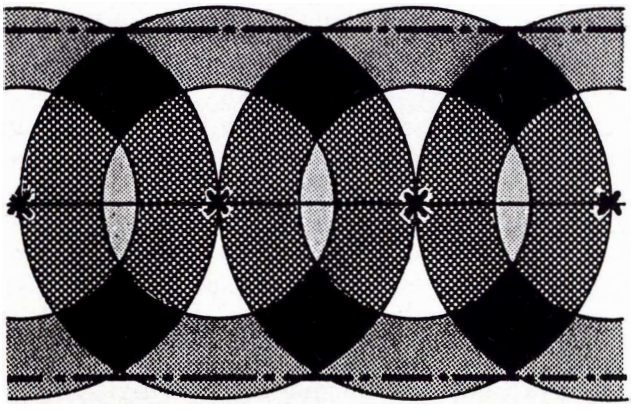
The aim of the new project is to develop a mini-sprinkler with a doughnut-shaped spray profile which applies twice as much water near the outer edge.

Overtree sprinklers have been used in orchards for frost protection for many years. The sprinkling technique works because of the latent heat which is released when water freezes. As long as the ice on a plant remains wet, the temperature will not drop low enough to damage the crop.

The Institute has been concerned with frost protection sprinkler systems since the mid-1970's when this method became popular with New Zealand growers. Last year, work on frost protection expanded when three new frost projects were undertaken.

Although there are many sprinkler frost protection systems in New Zealand, none of them are true targeted installations aimed only at the crop. They are all sprinkler irrigation systems adapted for use as frost fighters.

The most commonly used sprinklers have been the standard impact types used for irrigation. Although these can prevent frost damage, they need high pumping pressures to create an effective spray, and use large volumes of water because they spray the whole orchard area and not just the trees. This excess water can cause disease and turn the orchard into a bog.



Overhead view of the spray pattern made by a targeted frost protection system. The doughnut pattern mini-sprinklers (×) are spaced from 1.5 to 3 metres apart, above the row of trees.

Mini sprinklers seem to provide protection comparable with the usual impact sprinklers. The advantages of minis are that they can use much less water and much less power.

At present there are no mini sprinklers available which have been designed with frost protection in mind. The aim of the current project is to find a simple means of converting a standard mini sprinkler so that it will have a distribution pattern that suits the hedgerow-type of planting system used in orchards.



Nigel Gualter with one of his modified mini-sprinklers. He has made and discarded six earlier designs. This one seems to be just about right for making doughnuts.

Present work is being done in the Institute's newly-extended Still Air Laboratory at Lincoln. The aim is to modify a sprinkler so that it will give a spray pattern with a doughnut-shaped profile. The doughnut pattern is favoured because it puts the right amount of water on the outside of the rows and also on the major part of the area where the sprinklers overlap.

Commercial growers have shown a lot of interest in improved frost protection systems, but as yet there is no commercial firm involved with this project. The Institute would be interested in a joint arrangement with any firm which may wish to market any new product developed during the work.

A new technical report entitled "Overhead Targeted Frost Protection" will be available in March. Price $10.00 including postage.

Aerial Spreading Trials

The first part of a joint program with the East Coast Fertilizer Company is under way. The work is concerned with the aerial application of high analysis fertilisers which have a higher nutrient content.

The use of these fertilisers means the application rates can be reduced. Instead of using 250 kg/ha, it may be possible to apply the same amount of active ingredients with an application rate of 100 kg/ha or less.

A reduced application rate will mean a reduction in the flow rate from the aircraft. This will require a smaller discharge outlet from the fertiliser bin. The particle size range of the material may affect flow rates through the smaller discharge orifice.

The Institute's people at Rukuhia are conducting flow tests on aerial distribution equipment using partially acidulated phosphate rock. This is a high analysis fertiliser which may be applied at lower rates, less frequently. When these tests are completed they will be followed by calibration flights and field trials.

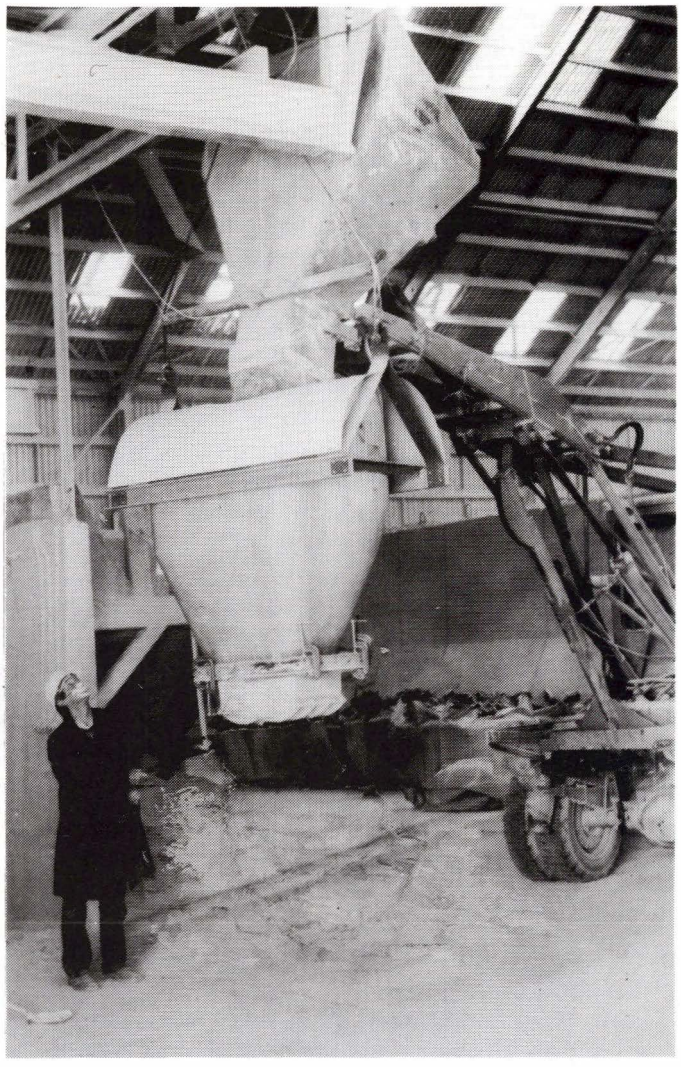
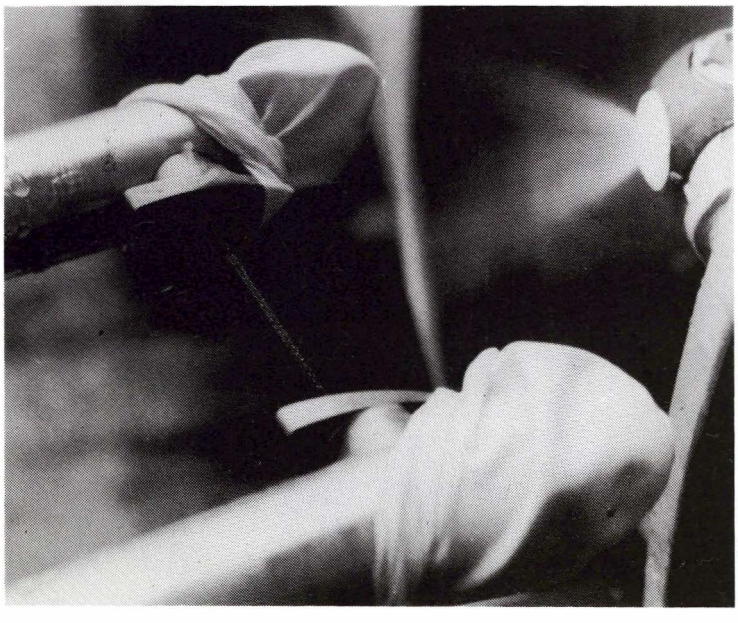


Photo at right shows a fertiliser tank from an aircraft being loaded during recent flow tests near Hamilton.

Laser Aids Spray Research



Droplet size is the key factor in efficient spray operation. A sprayer which can apply the correct size of droplet to knock out a specific pest can mean a big reduction in cost and time.

The Institute's spray research team at Rukuhia is studying droplet size in spray produced from hydraulic nozzles, and the effects of reducing application rates in kiwifruit crops.

The measurement of droplet size has been made easier by the development of a laser diffraction technique which allows in-flight measurement of droplets.

No more catching droplets on cards, measuring stain sizes and applying spread factors. The laser allows direct measurements to be made.

The photo shows part of the spray from a hollow cone hydraulic nozzle passing through the laser beam. In this case the laser is arranged to measure the droplets produced at the edge of the spray which tend to be larger than the droplets in the centre.