THE SUCCESSFUL USE OF A LOW VOLUME HERBICIDE APPLICATOR

By D. A. G. RALFE

Mandalay Estate, PO Kearsney

Abstract

Because of the resistance shown by operators to the use of conventional hand-operated knapsack sprayers on steep slopes, the feasibility of using a low volume (LV) herbicide sprayer was investigated on a North Coast cane farm.

A spinning disc controlled droplet applicator (cda) was selected because it is easy to operate and relatively light to carry. It was found to be unreliable due to the poor electrical connections and inconvenient because of the small capacity of the container.

Modifications to solve the problems were made, which result in increased operator output, reduced equipment and staff requirements, and therefore considerable savings to the grower.

Introduction

Mandalay Estate is situated at Kearsney on the North Coast on hilly terrain and yields about 9 000 tons cane per annum. The use of herbicides was increased substantially some 10 years ago and problems were experienced in spraying on the steep slopes and in transporting the chemicals to the fields.

The operation was found to be time-consuming and expensive, requiring a tractor and chemical tanker, one tractor driver, three knapsack sprayers and three operators. The tractor driver also supervised the spraying and moved the tanker along the contour roads to reduce the time and physical effort required to refill the knapsacks. The operators experienced great difficulty in maintaining their balance on the steep trash-covered slopes, and therefore their walking speed as they applied the herbicide was inconsistent.

It became increasingly difficult to find operators willing to do the required task of 1 ha per day. The use of a tractor for the spraying operation created a shortage of tractors during the busy summer months. A need clearly existed for a sprayer which would be less arduous to operate than the conventional hand-operated knapsack sprayer.

Materials and Methods

Two spinning disc controlled droplet applicators (cda) were purchased for testing (Figure 1). The sprayer has a rigid PVC tube 1,4 m long containing 8 1,5 volt torch batteries located in the rear section of the tube and connected via an on/off switch to a 12 volt motor located at the front of the tube. The herbicide mixture is stored in a 2 litre container screwed onto a bracket at the rear of the tube and is led to the motor through a transparent plastic pipe. Three spinning disc nozzles with an output of 15 to 50 $\ell\ ha^{-1}$ were supplied. The nozzle is mounted on the motor body and the herbicide mixture drops onto a spinning toothed disc attached to the shaft of the motor. This produces a uniform droplet size and distributes the chemical mixture in a swath 1,4 m wide.

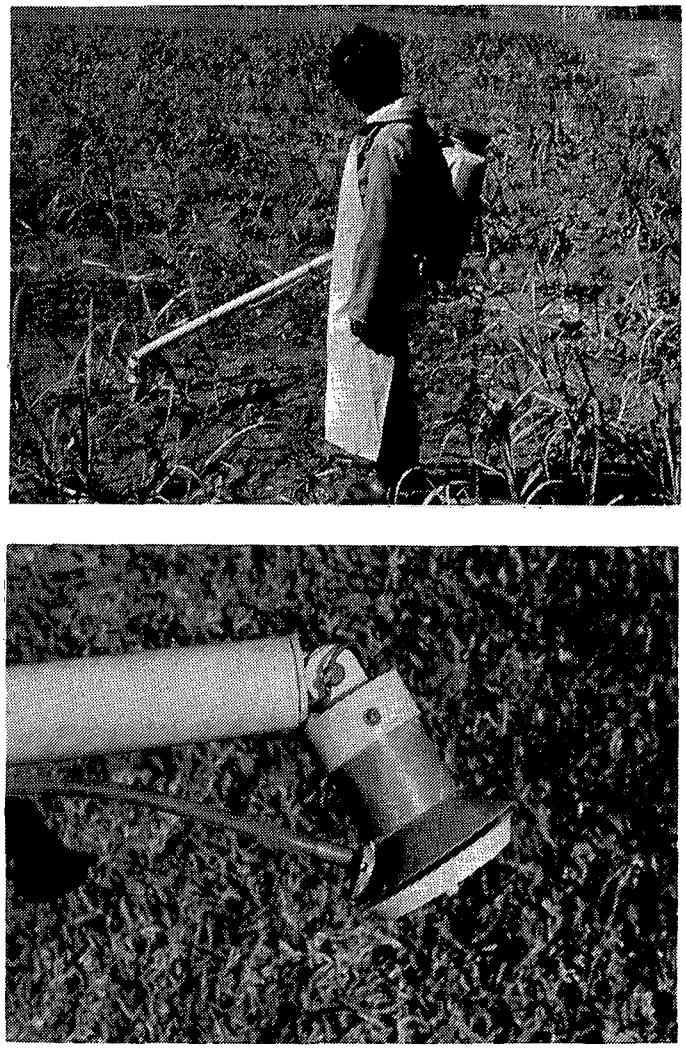

FIGURE 1 Modified spinning disc controlled droplet and applicator.

The cda sprayer was found to be unreliable for the following reasons:

- Poor electrical contacts caused current severance.
- The crude on/off switch mechanism for the motor did not effectively switch off the current, causing leakages and reducing the life of the batteries.
- Water leaked into the motor as a result of an ineffectual seal and the operator's poor technique.
- The container was too small and had to be frequently refilled.

The following modifications were made to the sprayer:

- All electrical joints and contact points were soldered to prevent corrosion and to maintain a continuous electrical supply to the motor.
- An effective vehicle toggle switch was installed.

- A knapsack sprayer tank, of 20 litre capacity but without the pumping mechanism, was fitted with a valve and nozzle to allow the transparent piping from the motor to be attached to the underside of the tank.

Results and Discussion

After it had been modified, the sprayer was more reliable than before. In addition, when the red nozzle with an output of 50 ℓ ha^{-1} was used, the container had to be refilled only 2½ times per ha. Because the operator had only to walk and no pumping was required, he was able to maintain a more constant walking speed and little effort was needed to operate the sprayer. This, together with the reduction in unproductive time due to refilling, enabled the operator to spray 2 ha per day quite easily. As this task required only 100 litres of herbicide mixture, the tractor, driver and tanker were no longer needed. The mixture could be poured into 4 plastic containers of 25 litre capacity and placed on the contour road for the operator to use for refilling the sprayer. The operator worked without supervision and was given sole responsibility for the task.

The sprayer proved effective for both pre- and post-emergence herbicides and has been used for fluid chemicals and wettable powders.

Some of the advantages of the cda sprayer compared with the conventional knapsack area:

- The cda sprayer relies on gravity to feed the mixture to the nozzle whereas the conventional knapsack sprayer requires 90 pumping strokes per minute to achieve the same result. This requires both physical effort and mental concentration and therefore may result in a greater variation in application rates than in the case of a cda sprayer.
- The cda applies only 50 litres ha^{-1} and is only one sixth of the mass to carry compared with a knapsack sprayer which applies about 300 litres ha^{-1}. The cda therefore requires only 2,5 refills per ha compared to 12 refills for a conventional knapsack sprayer.
- A lower volume of mixture is used and therefore no tractor, tanker or driver are required.
- The spinning disc can be held much closer to the ground and therefore in windy conditions spray drift is reduced, but the swath width remains the same. It is critical that when using a conventional knapsack sprayer the nozzle be held at a constant height in order to achieve a constant swath width. This is difficult to accomplish.
- More phytotoxic herbicides can be used for post-emergence applications, because the spray from the cda sprayer is directed horizontally under the leaves and into the cane line. From a T-jet on a conventional knapsack sprayer spray will be intercepted by cane leaves and may cause damage to the crop.
- The cda sprayer operator has one hand free which helps him to maintain his balance on steep slopes.

By modifying a commercially available spinning disc controlled droplet applicator to operate reliably and efficiently, one operator was able to do the work of 3 conventional knapsack operators. The need for a tractor, tanker and driver was also obviated thereby substantially reducing the costs of applying herbicides. The modified sprayer has been used without problems for about 10 years. This indicates that there is substantial potential for its wider use in the sugar industry, which would markedly reduce the production costs.