

SPRAY DRIFT CONTROL WITH THICKENING AGENTS

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Drift of small droplets of spray solution onto desirable plants can restrict the use of herbicides in weed control operations. The severity of spray drift is determined by droplet size, wind velocity, and height of droplet release. Drift can be controlled by:

- (1) shielding the nozzles to prevent the escape of small drops
- (2) improved design of equipment
- (3) using the invert water in oil emulsions
- (4) adding thickening agents to the spray solution.

Experiments were carried out in the laboratory to examine factors that affect the efficiency of two thickening agents, Norbak (a water swellable plastic) and Vistik (hydroxyethyl cellulose), in reducing spray drift.

When mixed with distilled water Norbak formed a granular mixture of jelly-like lumps 2-3 mm in diameter.

Vistik dispersed rapidly when mixed with water and slowly formed a homogenous solution. To increase the rate of solution of Vistik 0.025% w/v sodium carbonate was added. The viscosity of Norbak and Vistik solutions increased as the polymer concentration was increased.

The viscosity of solutions of both polymers did not change under constant conditions once initial thickening was complete. For Norbak initial thickening took 10-15 minutes while Vistik needed about 1 hour. Temperature influenced the viscosity of both solutions, but temperature variations expected in the field will not affect the efficiency of Norbak in reducing drift. Vistik is more sensitive to temperature variation, and extreme changes (e.g. 15°C) will result in reduced efficiency.

The addition of ions, such as charged herbicide molecules (e.g. 2,4-D amine) and those in hard water, reduced the viscosity of Norbak mixtures. This was caused by a shrinkage of the particles of Norbak. The original viscosity could be restored by adding more polymer. The viscosity of Vistik solutions was not affected by charged or uncharged molecules.

Spray drift from various concentrations of Norbak and Vistik solutions was measured in wind tunnel. Drift was collected on test tubes 6 ft from a flat fan nozzle and was measured by weight. As the viscosity of the solutions was increased the

drift collected decreased. At optimum viscosities drift was reduced by 97% with Vistik and 75% with Norbak. Further increases in polymer concentration, and thus viscosity, did not improve control with Norbak. Vistik solutions were very sensitive to viscosity changes. An increase above the optimum level would inhibit divergence of the spray at the nozzle, and a decrease in viscosity would result in reduced drift control.

These results suggest that spray drift can be controlled in the field with thickening agents. Variations in viscosity of solutions caused by temperature changes and ions can be overcome by using varying amounts of polymer. Generally, conventional equipment can be used but some allowance for the thickness of solutions must be made.

Thickening agents only reduce the formation of small droplets - they do not reduce the movement of herbicide vapour. Complete control of drift cannot be achieved with thickening agents alone; this will only come with an integrated approach to design of equipment and spray solutions. The influence of droplet size on herbicide efficiency will also have to be considered in relation to spray drift.

EFFECT OF METEOROLOGICAL CONDITIONS ON DRIFT OF SPRAY CLOUDS

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Meteorological factors affect the behaviour of clouds of droplets released by spray units mounted on land vehicles or in low-flying aircraft. Such units will release swathes of droplets from a line source. In aerial spraying there is initial major disturbance of the spray cloud caused by the aerodynamics of the aircraft.

Our concern is with the atmospheric transport and diffusion of spray clouds, specifically of herbicides. As much as possible should be deposited on the target area, such as a field of weeds, but the risk that damaging concentrations will reach crops, livestock or humans must be avoided. Meteorological factors should be known and allowed for before release of the spray.

WIND