NEW ZEALAND EXPERIENCES WITH NEW WEEDKILLERS

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I will deal with one chemical, the amine salt of DNOC, and the result of trial work with it to date. The time allocated restricts me from dealing with other chemicals which are of importance for chemical methods of weed control. Apart from one English paper (1) I have seen no other reference to research conducted with this material.

Amine DNOC (Diethylamine salt of DNOC)

The advantage of this material is that it is 50 per cent. less toxic to humans than DNOC itself or the sodium salt (1) and is highly soluble in water to almost 10 times the normal concentration required for field use. Further it does not require activation with acid salts such as sulphate of ammonia to bring about maximum effect. Such activation in the sodium salt increases the concentration of the undissociated molecules of the parent compounds and accomplishes the same object as using an ammonium or amine salt.

Field use has shown that much less water is required per acre than with the sodium salt. The increased solubility of the diethylamine salts aids its dispersion, since it does not sediment readily in the storage tank or block the nozzles. Low-volume application further makes the amine salt more toxic per unit than the sodium salt, particularly for thin-leaved weeds such as spurrey (*Spergula arvensis*).

The main use of this chemical is considered to be for the control of crop weeds that are too tolerant to be checked by the more selective DNBP preparations. It will replace the sodium salt preparation of DNOC, but should be complementary to DNBP preparations.

The method employed in testing a new chemical is to lay down trials against weeds of known tolerance to standard formulations. Standard formulations are those that have been tested thoroughly in the past, such as DNBP preparations and the common hormone preparations. In this way information on the toxicity of the chemical is soon gained, for its effect on the weed is tested as well as being compared with standard formulations. Amine DNOC was tested in this way in a series of complex trials on clovers. In this case the tolerance of clovers and weeds was taken into account and the result compared with that of DNBP, sodium MCP, ethyl ester 2,4-D, and butyl ester of 2,4,5-T.

Effect on Clovers

At the 2 to 3 true leaf stage, 6lb. per acre killed all plants except subterranean clover. These were checked. DNBP at 1 gallon (2.0lb.) per acre applied at the same time, at a temperature of 62 degrees F., checked slightly the clover species. All clovers recovered and were similar to the control plants at an inspection 2 months later.

Effect on Weeds

At the 6lb. rate half-grown plants of *Poa annua* were eradicated. The tips of the leaves were burnt off in the DNBP plots. Annual broad-leaved

weeds were killed in all DNBP and amine DNOC plots and spurrey seemed particularly susceptible. All annual weeds were not taller than 4in. Plants arising from suckers, all docks, and potatoes were severely checked by amine DNOC, but were little affected by the DNBP treatments.

In trials on established Montgomery red clover stands 6lb. per acre applications of amine DNOC had little effect on the clover. Seedling grasses and annuals were eradicated; docks, mainly *Rumex obtusifolius*, were severely checked. The basal regrowth leaves were dried up, but repeat applications would be required to eradicate species arising from root suckers.

Penetration and Absorption

In the trials excellent control of spurrey (*Spergula arvensis*) and chickweed (*Stellaria media*) was obtained with the phenols. Mature plants grown under moist conditions or treated when wet even under low temperature of 60 degrees F. were killed by rates of up to 1 gallon (2.0lb.) per acre of DNBP preparation. Mature plants treated after several days of fine weather were killed with amine DNOC at 4 to 6lb. per acre.

Even under moist conditions rates of up to 2lb. of acid equivalent per acre of water-based hormone preparations only checked the growth of spurrey. The spurrey later seeded. However, where the spurrey had been crushed slightly or even a small section of it had been crushed, sufficient penetration was secured with water-based hormone preparations to kill the spurrey. Oil-based esters of 1lb. of acid equivalent per acre in the trials depressed the spurrey, but did not eradicate it.

From these results it would appear that the phenols are not repelled to the same degree as the water-based hormone preparations and are equal or better than the ester preparations of hormone in penetrating waxy cuticles. This indicates that the non-polar groups (the diethylamine chain) serve the same function as the butyl chain in DNBP preparations, making the molecule oil-like and as such causing ready penetration of the cuticle. This may contribute to the greater toxicity of the amine salt over the sodium salt of DNOC.

In the trials on the clovers at the 2 to 3 true leaf stage the order of tolerance to DNBP and amine DNOC preparations was: subterranean clover, most resistant; red clover, intermediate in tolerance; and finally white clover, most susceptible. This suggests that the DNBP and amine DNOC preparations were repelled by the hair of the subterranean clover plants. The waxy cuticle of white clover did not offer sufficient resistance to the amine DNOC application and all white clover plants were killed in this treatment.

Similar effects were obtained with the water-based salts of hormones, though these were less marked than for the phenols. With the oil-based esters greatest damage was done to the subterranean clover and red clover plants. White clover appeared fairly resistant. This indicates that the hairs of the subterranean clover repelled the water-based preparations of hormones and phenols but not the oil-based equivalents. The waxy leaf of the white clover plants, however, did not repel the DNOC preparations, but had sufficient cuticle to shed the esters of 2,4-D. It would appear then that a hairy leaf is a bigger factor in inducing selectivity with phenols than is cutinisation of leaves.

Toxicity

At the rates employed 4 to 6lb. per acre of amine DNOC was more toxic than 1 gallon (2.0lb.) per acre of DNBP. It appeared less volatile than DNBP preparations and less affected by rain. It is less selective than DNBP for control of weeds in legumes.