

LEGUME TOLERANCE

A review by B. D. Robinson and I. McL. Eadie.

All legumes are susceptible to damage by hormone type weedkillers but damage can be minimised by careful application of the weedicides at the right time and concentration. This fact is of considerable importance where legumes are grown in improved pastures and especially where they are undersown in cereal crops.

CEREALS: In undersown cereal crops, where only 4 oz. of acid equivalent as sodium or amine 2,4-D or sodium MCP is applied for the control of the easy-to-kill weeds such as Wild Turnip, the damage to undersown legumes is small especially where crop and weed growth protect the young clover from direct contact with the spray. Even so, spraying should not take place until the young clovers have at least passed the 4 to 5 leaf stage, or, preferably until they have started to put out runners.

The problem is more acute where more difficult to kill weeds are present such as Saffron Thistle, Skeleton Weed and Hoary Cress where $\frac{3}{4}$ lb. acid equivalent is required to give good control of the weeds. In such cases it is often wise to compromise and apply a lower rate of acid equivalent to obtain reasonable control of weeds which at the same time will minimise legume damage. Again, crop and weed growth can be utilised to protect the clover although with weeds such as Saffron Thistle which become more resistant with age, it is often better to apply only Sodium MCP at 6 oz. per acre to control Saffron Thistle at an early age and lose only a small proportion of the legumes which will then be in the 3 to 5 leaf stage.

Subterranean clover, lucerne and barrel medic are the principal legumes undersown in cereal crops and are listed above in increasing order of susceptibility. The most important factor however is stage of growth. At the one true leaf stage all these legumes can suffer almost 100% mortality where rates exceed even 6 oz. of acid equivalent per acre. Resistance increases rapidly as the clovers pass through the 2nd, 3rd, 4th and 5th true leaf stages.

PASTURES: In pastures where weeds such as Variegated Thistle are reasonably easy-to-kill with $\frac{1}{2}$ -1lb. of acid equivalent per acre there is little damage to clovers which are well established. Again, susceptibility appears to be greatest for white clover, less for subterranean and practic-

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ally non-existent of red or strawberry clover - the latter can withstand up to 2 lbs. of acid equivalent per acre with little apparent harm. Again, stage of growth determines susceptibility which decreases with age.

Most species of dock which appear commonly in white clover and rye grass pastures are relatively resistant, and under these circumstances 1 lb. of acid equivalent is generally applied to obtain a 50% kill of docks and some clover damage is sustained. More than one treatment is necessary to give more complete control of docks.

SELECTIVITY: Research work in Australia and overseas indicates that Sodium or Potassium MCP shows a greater selectivity in their action towards clovers than equivalent 2,4-D compounds; of the latter the sodium 2,4-D appears more selective than the amine and ester 2,4-D which are almost equally toxic to clovers. Species variation and selectivity become more important in low rainfall areas where most medicago spp. are affected by hormone weedicides at herbicidal rates.

English research work indicates that there is little or no difference between sodium or potassium MCPA and that either is more selective on *Trifolium pratense* than amine 2,4-D. Overseas research work (Bockmann, 1953) shows that MCPA applied at 1.3 lbs/acre on clover undersown in Oats caused an increase of 42% in green weight of clover at the growing away period, whilst sodium and amine 2,4-D both caused reductions in green weight. Unfortunately, very little research work on clover tolerance has been undertaken on pure stands of clover and the work, naturally, does not indicate allowances for the following variables.

1. Percentage germination of seeds from treated plants.
2. The effect of removal of competing weeds.
3. The effect of subsequent germination of clover seeds already in the soil.
4. Yield assessment on dry weight rather than green weight.

The volume of spray applied per acre also determines the susceptibility of clovers except when the latter are definitely protected from low volume sprays (5 to 10 gallons per acre) by crop, pasture or weed growth, but where the clover is openly exposed to the spray then semi-high (40 - 60 gallons per acre) volume sprays seem more selective than low volume sprays. The reason for this action is not clear although there may be a critical spray droplet size and pattern which will coalesce and run off the clover leaves and not run off the weed leaves. The addition of wetting agents

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decreased the selectivity of Sodium MCP and 2,4-D and this may be one reason why the amine and ester formulations of 2,4-D are, in general, more phytotoxic to clovers since most commercial formulations of amine 2,4-D contain wetting agents in addition to excess triethanolamine which has some wetting properties. In ester 2,4-D formulations, the emulsifying agents also act as wetting agents.

SEED VIABILITY: The viability of seed can be effected by hormone type weedkillers applied to clover pastures and this is particularly important where the seed is harvested. Indications are that the viability is more affected by late applications of the weedicides, i.e. just prior to or at flowering; from experimental work it appears that viability of seeds from treated plants is affected less by MCPA than by other forms of 2,4-D

Most hormone type weedkillers are dissipated within the soil under warm, moist conditions within the period of a month so that subsequent germination of clover seeds is not generally affected by the early application of hormones.

Since clovers set a large proportion of hard seeds, it is often found that even after spraying with relatively high rates of application, the regeneration of clovers may be considered satisfactory even though a large proportion of clover plants at the time of spraying may have been killed.

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