CONTROL OF PASTURE WEEDS IN RELATION TO CLOVER TOLERANCE

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WHEN weeds are growing in association with plants of value, whether pasture or crop, weed control measures must take into account the effect of treatment on the desired plants as well as on the unwanted weeds. There is no special magic about weedkillers—be they hormone or otherwise—that will ensure their selecting only those plants we do not want for destruction or damage. With pastures it is the effect of weedkillers on clover with which we are most concerned, and, more precisely, the effect of hormone weedkillers. I will, therefore, confine my remarks to two main topics, namely:—

1. The importance of temporary (or permanent) clover suppression to a pasture, and
2. The effect of the various types of hormone weedkiller on different clover plants and how the damage they cause can be reduced to a minimum.

In a weed-free sward it is too much to expect pasture stimulation from treatment with weedkiller. The best we can expect is that the quality and production of such a sward are not impaired—in other words, that our best treatment equals the “control” or “no treatment” plots. It is only when weeds are present to a significant extent that their reduction or elimination will benefit the sward. If such elimination can be secured by a treatment which does no harm to the pasture, it is all to the good. In many cases, however, we have to balance the fact of weed suppression against that of pasture damage. If this pasture damage is excessive then the weed must be one of major importance before its elimination is worth while. An example of this latter case might be an infestation of seedling gorse into a pasture. It may be possible to kill such gorse but at the expense of severe clover damage. Whether one sprays or not will depend on how seriously the gorse infestation is regarded.

A case such as the one I have mentioned directs attention to other methods of weed control such as pasture stimulation by fertilisers, and pasture and stock management. It is not my intention to deal with these matters in any detail, but it is obvious that in most cases such methods, if practicable, are to be preferred to the use of weedkillers causing pasture damage. In the majority of cases, however, it will be necessary not to consider one or the other method of weed control, but to adopt some or all methods according to circumstance. Spraying alone will not usually give permanent weed control, but spraying with weedkillers may help to make the effects of good management more rapid, more certain, and more payable.

THE EFFECT OF CLOVER DAMAGE TO A PASTURE

Little or no precise information is available concerning the effect of temporary clover suppression on a pasture. Some trials are being planned at the Marton Experimental Area to investigate this point and in a year or two we may be able to produce some factual data on this matter. However, I think, with our present knowledge, we may classify certain types of damage and tentatively assess the importance of these.

Perhaps the following classification may help to evaluate this matter:—

1. Young pasture, say, up to 6 months old. Here clover damage, if severe, is likely to be serious and have a long-lasting detrimental effect on the pasture. Seedling clovers are more likely to be killed than are established plants. The early stages in the life of a pasture are critical and it is only in exceptional cases that chemical weed control with materials liable to damage clovers will be worth while.
2. Established pasture on reasonably fertile land with adequate clover present. There will be many cases where severe clover damage may be accepted as a desirable price to pay for weed control. An example of this might be dock control with PEG esters of 2,4-D. In a great number of cases the conditions of fertility are such that clover recovery will be rapid and complete.
3. Established pastures where clovers are not present in sufficient amount for maximum pasture production. Many experiments have shown the importance of clover in pasture production. Perhaps the best known are trials at the Grasslands Division from which I have taken the following figures:—

**Yields of Pastures in Pounds.—Dry Matter per Acre
(Period 1946-50)**

Clover-free pasture	11,980
Mixed sward with adequate clover	45,240
(3cwt. of superphosphate plus lime were applied to both treatments)	

Obviously we cannot risk elimination of clover from a sward already weak in clover. A decision whether to spray or not in such circumstances will depend on some or all of the following features:—

1. The seriousness of the weed.
2. The spray required to eliminate the weed (if 2,4,5-T is required to kill gorse under these conditions, it is a much more serious matter than using MCP to control buttercup).
3. Whether or not it is possible and economic after spraying to re-introduce clover by some means such as oversowing. If clover seeding is possible, the cost of the operation may need to be added to that of spraying when assessing the cost of weed elimination.

No hard and fast rule is possible, but spraying a pasture already weak in clover should not be lightly entertained.

4. Clover seed-production areas:—

Probably the most important factor here is time of spraying, for clover damage must not occur at a time when the subsequent seed crop is likely to be much reduced in yield. Some yield reduction may be considered to be a worthwhile price to pay for clean seed or a crop that is easy to harvest.

We have much research work to do in the control of weeds in seed crops and need to find answers to many of the special problems that arise.

HOW TO REDUCE CLOVER DAMAGE

The foregoing discussion may have served to indicate how serious the problem is and to focus attention on the need for investigating ways and means of reducing clover damage from weedkillers. We can profitably discuss this from three points of view:—

1. The effect of different formulations of weedkillers.
2. The susceptibility of different clover species, and
3. Management methods which will reduce clover damage.

The first two points need to be considered together as the different clover species differ in their tolerance to the various types of weed-killers. I have attempted to show this in the following table:—

Species of Clover	Stage of Growth of Clover	Order of Susceptibility to		
		MCP	2,4-D	2,4,5-T
White	Seedling	2	3	1
	Established plant	3	2	1
Red	Seedling	3	2	1
	Established plant	3	2	1
Subterranean	Seedling	3	2	1
	Established plant	3	2	1

1. Weedkiller has most severe effect.
3. Weedkiller has least severe effect.

This table is based on work done at the Invermay Research Station by Mr. Fitzgerald and reported to the last Weeds Conference, as well as a number of other Departmental trials, particularly some at the Marton Experimental Area.

In conjunction with the above table, trial work also indicates that:—

1. Seedling clovers are more susceptible to all forms of hormone weed-killers than are established plants.
2. The order of susceptibility of established clovers to hormone weed-killers is:—

Subterranean, most resistant

Red, most susceptible

White, intermediate
3. 2,4,5-T is lethal to clovers. It is, in fact, easily the best material we have for eliminating clover from bowling greens.
4. The formulations of hormone weedkillers can be listed as follows in respect of severity of effect:—

Esters = most severe

Amine salts = somewhat less severe

Metallic salts = least severe

Unfortunately the water-based PEG esters and esters of MCP cause as much damage as do the more common ester formulations. There is not much difference in effect between the volatile esters, such as the butyl and ethyl esters, and the so-called "non-volatile" esters of which the butoxy ethanol ester is the best known.

To sum up therefore the hormone weedkiller which does the least damage to established clovers is the sodium or potassium salt of MCP with the sodium salt of 2,4-D being only slightly more toxic than this under most conditions. White clover alone seems more susceptible to MCP in the young stages, but once past, say, 6 months growth, white clover falls into line with the other clover species and MCP has less effect on it than has 2,4-D.

Other factors to be considered are the rate of application of the weedkiller and the time of spraying. To a considerable degree the weeds treated will decide these matters but from the clover damage point of view the lowest effective rate should be employed at the time when it is most effective on the weeds. If possible, weedkillers should be applied before the weeds have smothered out extensive areas of the pasture. Clover damage through weed smother is often more serious than clover damage from weedkillers. This has particular application with annual weeds such as annual buttercups, which should be sprayed early in the spring before they cause extensive pasture damage.