SESSION 6B

CONTROL OF BULBOUS PERENNIALS.

WITH PARTICULAR REFERENCE TO THE CAPE TULIPS.

(Homeria spp.)

By A.J.K. Walker, Senior Agronomist,

S.A. Department of Agriculture.

The published work relating to weeds propagated by corms, bulbs and tubers covers only a relatively small number of species. Nut grass (Cyperus rotundis) and wild onion and garlics (Allium spp.) have been the subjects of most attention. Such weeds are, however, of major importance in Australia. The Cape tulips, soursobs (Oxalis pes-caprae), Guildford grass (Romulea cruciata), Watsonia spp. and the above species are probably the most serious at present.

The general principles of weed control are of course applicable to plants in this group. In this paper the special problems of and aspects of control applying, particularly to bulbous plants, are dealt with.

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I. CONTROL BY MECHANICAL MEASURES:

1. Tillage.

The control of annual weeds is achieved by prevention of seed setting. In simple perennials there is an additional requirement, viz. killing the crown of the plant. With rhizomatous perennials the plant possesses considerable food reserves and regrowth may occur from small segments of the underground system. Eradication by tillage may therefore be difficult and expensive, particularly in the case of deep-rooted plants.

With most bulbous perennials it is much easier to obtain a kill. These plants are more vulnerable because there is usually a well-defined period at which food reserves are at a very low level. This period is that at which the food reserves of the parent organ are almost exhausted while the development of the new organ has only just commenced. This critical growth stage in the one-leaved Cape tulip (Homeria collina) has been shown to be of major importance in relation to the timing of mechanical control methods.

In this species the critical period occurs about 8 weeks

before flowering commences. This growth stage can be easily identified in the field so that variations in its incidence (usually early June) are readily detected. Ploughing to just below corm depth during this period is highly effective, the percentage of growing plants killed by a single working approaching 100. Early workings in April say, are not effective unless followed by further cultivation. At that time, the parent corm has sufficient food reserves to promote further growth. This is either regrowth of the original plant or the formation of a new plant from a lateral bud. In either case a second working is needed to prevent the formation of a new corm.

On the other hand if ploughing is not done until flowering begins (a frequent practice) the development of at least one new corm is nearly complete so that there is little if any reduction in the corm population of the area.

Cultivation when the corms are dormant, i.e. during late spring and summer - has little effect. A few corms are left on the surface but the numbers killed by heat, drying and bird attack, are too small to justify the practice.

These results with Cape tulip emphasise the importance of correct timing of mechanical control measures. It must be pointed out, however, that a single tillage operation can be highly effective only if sprouting takes place over a sufficiently short period so that the operation can be timed when at least the great majority of plants are in the "critical" stage. In such species as the one-leaved Cape tulip, Guildford grass, thread iris and bugle lily, this condition usually obtains. In the case of the two-leaved Cape tulip (H. miniata) the recommendation for control by tillage must be modified because of the later sprouting of cormils; a second and sometimes a third working must be given to prevent corm formation by these plants.

Cultivation does not give good kills of nut grass. Under favourable conditions, sprouting occurs more or less continuously over a period of some months so that at any one time all stages of the plant's life cycle are represented. An additional factor is that the formation of new tubers may be completed 3 weeks after sprouting of the parent tubers. The critical period is therefore of very short duration.

In the one- and two-leaved Cape tulips and nut grass we

have examples of plants against which:-

(a) a properly timed cultivation is highly effective,
(b) a properly timed cultivation is highly effective only if one or two subsequent cultivations are given,
(c) cultivation is ineffective.

These differences are explained in terms of differences in the plant's life cycles. It is considered that the above constitutes sufficient evidence to make a detailed knowledge of life history a prerequisite for work on the control of bulbous plants.

2. Mowing

A trial with the two-leaved Cape tulip showed that monthly mowings, which were closer than could be obtained in the field, had little effect on the numbers of new corms produced. The period of critically low food reserves was prolonged and advantage may be taken of this if ploughing is delayed by wet conditions.

The colonisation of new areas depends mainly on seeds and aerial bulbils and cormils and the mower can therefore assist materially in reducing spread of the weeds, e.g. one-leaved Cape tulip.

II. CONTROL BY PLANT COMPETITION:

The conclusions formed after field surveys and trials with the Cape tulips are briefly as follows:

A high level of plant competition is a barrier to colonisation of new areas from seeds or stem cormils raising the level of competition in an infested area, by superphosphate application for example, has little effect on plant density. In a dry year, the vigour of individual plants is reduced and stem cormil or seed formation may be virtually prevented; corm replacement still occurs, however.

Both tulips grow well on soils of low fertility. Pasture species show a greater response to increased fertility than the tulip species do, but there is little tendency for Weed suppression in years of good rainfall.

In other words, plants arising from full-sized corms have adequate food reserves to make vigorous early growth and they complete the formation of new corms in the winter

when there is ample soil moisture. Seed or stem cormil maturation occurs later, at a time when competition for moisture may be critical.

It is considered that moisture supply is the critical factor in competition between useful species and bulbous weeds generally. The latter are, generally speaking, adapted to conditions of low fertility and their production of dry matter is not high; competition for nutrients is less likely to be critical. Competition for light may be important in some cases but many species with an erect habit and vigorous early growth would be at an advantage; low palatability would increase this advantage in some instances.

On the basis of the above argument, the season of growth, the length of the growing period and the time of maturation of underground storage organs, seed and aerial bulbils and cormils of a species would vitally influence its susceptibility to competition from crop or pasture plants.

III. CONTROL BY CHEMICAL METHODS:

As a group, bulbous plants present some difficulties. They have a comparatively small area for interception and retention of sprays. In many species, the penetration of sprays is reduced by a Waxy cuticle. The growing point is frequently some inches below the soil surface so that translocation of substances applied to the leaf or relatively heavy applications of a soil sterilant are required to affect it. Some species are able to round off viable corms after contact sprays have killed the above-ground portion of the plant.

Satisfactory results have been obtained in some cases, however, by the use of hormone-type weedicides M.C.P.A. and different forms of D.C.P.A., for example, have given complete kills of one-leaved Cape tulip.

It is not possible to generalise concerning the effectiveness of this type of herbicide on bulbous plants. For example, thread iris (Gynandiris setifolia), a plant closely resembling o-1 Cape tulip, is highly resistant; the addition of an activator, sodium chlorate has markedly increased effectiveness against soursob but not o-1 Cape tulip.

The following seems worthy of mention, however. Contact sprays must be applied to o-1 Cape tulip during the

critical period; later sprays do not prevent small but viable corms being rounded off. With hormone-type weedicides, however, this timing is less important. Indeed there is some indication that later sprayings - after emergence of the inflorescence - are more effective. Possible reasons for this include a greater area for spray interception and better penetration at higher temperatures. Another possibility is that at the later stage, translocation of carbohydrates is taking place from the leaves to the new corms, under conditions more favourable for photosynthesis. If translocation of growth-regulating substances depends largely on the movement of food materials, this stage would be more favourable in terms of both direction and amount of translocation.

IV. DORMANCY:

While tillage and herbicides give good kills of some species, their over-all effectiveness is often seriously reduced by the presence of dormant organs.

In one-leaved Cape tulip, the percentage of dormant corms is frequently over 60%. There is good evidence that ground cover during the summer months has a marked influence on subsequent dormancy; difference in diurnal temperature variations at corm depth is probably the important factor. Following summer burns, dormancy is very low, but is high where a heavy cover remains. The difference in effectiveness of control measures applied in the following season is quite spectacular.

Dormancy has been recognised for some years as a major problem in nut grass control. The system of tubers, connected by rhizomes, shows apical dominance and the breaking of rhizomes by cultivation therefore promotes sprouting.

An investigation of the factors associated with dormancy is a most important aspect of research relating to control of any bulbous weed.

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