During recent years, there has been a great increase in knowledge of digestive functions in ruminants. Several examples are now known where microbial activity in the rumen reduces the harmful effects of toxic substances in the ingesta; *per contra*, relatively harmless substances may be converted to toxic products. Techniques are now available for quantitative measurement of digestive processes; these offer promise for fruitful application to the study of the fate of toxic substances in the gut.

In addition to toxic effects, plants may be responsible for a variety of mechanical injuries to animals or to fleece wool. Grass seeds may interfere with feeding or cause injury to the eyes of sheep; some seeds can even migrate through the skin into muscles, thus rendering carcases unfit for human consumption. The most serious source of loss is through the so-called 'vegetable fault' in wool; some material (e.g. medic burr) is readily removed from wool during textile processing, but other plant fragments are extremely difficult to remove and may pass through all processes and appear in the woven fabric. The view has been expressed (M. Lipson, pers. comm.) that the presence of plant fragments is a major defect in wool as a natural fibre in competition with synthetic fibres.

A REVIEW OF THE STATUS OF SOME PLANTS AS ANNUAL PASTURE WEEDS IN SOUTH-EASTERN AUSTRALIA

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Most plants, at some time or other, are condemned as weeds. The term is now used rather loosely and the meaning is varied and often obscure. This attitude has led to an overemphasis on the value of herbicides in managing annual pastures.

Pastures in the annual pasture zone of south-eastern Australia are based mainly on subterranean clover and Wimmera ryegrass. These provide high-quality stock forage and will persist and produce well at low stocking rates. However, under higher stocking rates Wimmera ryegrass, and to a lesser extent subterranean clover, are lost from the pasture. The common volunteer annuals in these pastures, *Vulpia bromoides* (silver grass), *Hordeum leporinum* (barley grass),

Poa annua (winter grass), *Arctotheca calendula* (capeweed), *Erodium botrys* (long storksbill), and *Echium lycopsis* (Paterson's curse), are traditionally 'weeds' as they are assumed to be of inferior value to grazing stock. Undoubtedly they have shortcomings; however, they continue to persist and produce as stocking rates are increased and their value as useful pasture species must be considered.

Research in south-eastern Australia has shown there is little relation between forage or stock production and the botanical composition of annual pastures. Cameron and Cannon (1970) have found that, although changes may occur in pasture composition as stocking rate increases, they do not necessarily affect wool production. On an irrigated pasture, containing 32% by weight of Paterson's curse, at Deniliquin, N.S.W., 10 sheep per acre have been maintained producing more than 100 lb of wool per acre (Squires and Myers, unpublished data). Thistles are usually considered 'weeds' in pastures, although Michael (1968) maintains that pasture production is little influenced, if at all, by thistles except at rather high densities when access to other pasture species is limited.

Direct control of these 'weeds' in pasture by herbicides is not likely to be economic. Apart from the cost of the herbicide and its application, there are hidden costs of loss of herbage production due to (a) removal of 'weeds' that produce edible dry matter, and (b) lowered production of sown pasture species due to herbicidal damage. McGowan (1965) has found that autumn spraying of a weedy pasture at Rutherglen, Vic., with herbicides resulted in a consistent reduction in winter yield. Reduction was virtually 100% for a very weedy pasture containing silver grass, barley grass, capeweed, and long storksbill and ranged from 30 to 70% for a moderately infested to almost weed-free pasture. McGowan (1970) also found that dry matter yields of virtually weed-free pastures of subterranean clover, phalaris, and Wimmera ryegrass were reduced following autumn spraying with herbicides frequently recommended for use on pastures.

Management practices designed to utilize the advantages and minimize the disadvantages of the 'weedy' species is likely to be more economical than any direct control measures. Cayley (1968) has found that long storksbill can provide worthwhile feed for sheep during winter and early spring. The problems of its awned fruit becoming entangled in the wool and penetrating the skin can be largely overcome by keeping the pastures grazed short. Smith (1968*a*, *b*, *c*, and *d*) has shown barley grass to possess many characteristics that make it a persistent and useful pasture plant. However, its sharply awned seeds cause

many stock problems. These too can be much reduced by grazing heavily in spring.

Undoubtedly some volunteers that invade these annual pastures of south-eastern Australia are undesirable. Poisonous and prickly species could fit into this category. However, the economics of their control are a different matter and are usually difficult to determine. The papers reviewed suggest that control measures for removal of 'weeds' in annual pasture may be unwarranted and uneconomic.

COMPETITION BETWEEN *HELIOTROPIUM EUROPAEUM* AND DRYLAND LUCERNE

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The control of herbaceous perennial weeds in southern Australia through the establishment of competitive, cool-season pasture species has been well documented. The position with annual weeds is less clearly defined and other ecological factors such as the grazing strategies employed (e.g. Myers and Squires 1970), the pasture cultivars sown, changes in soil fertility, and so on,may assume increasing importance.

Common heliotrope (*Heliotropium europaeum*) is a summer-growing annual weed of Mediterranean origin which has become widely established on well-drained, texture-contrast soils in southern Australia, particularly in the Riverina of New South Wales. Crossbred sheep eating this weed are subject to the disease complex known commonly as toxaemic jaundice or 'yellows' and heavy mortalities can occur when these sheep are exposed to heliotrope for two consecutive seasons. The result is usually chronic copper poisoning, either separately or in combination with the liver damage resulting from heliotrope poisoning.

This weed was found to be controlled by certain pasture treatments sown originally in dryland pasture establishment trials on Cobram loam in the western Riverina. Species sown included annual medics (Cyprus barrel and Harbinger), Geraldton subterranean clover, lucerne, and Sirocco phalaris which were sown with and without a wheat cover crop at four seed rates (viz. 0.6, 2, 5, and 14 kg per hectare) (0.6, 2, 5, and 14 lb per acre). These trials were repeated over three consecutive years (1967-9) to provide seasonal replication where seasonal conditions ranged from a severe drought in 1967 (127 mm total annual rainfall) to