(4) Skeleton weed is regarded as a weed of cultivation, in that cutting of the underground organs will lead to an increased regeneration of new rosettes from below the cut. However, these and other of our results from Wagga show a marked reduction in numbers of rosettes under the 1969 crop compared with those under the 1968 crop. We invoke seasonal rainfall and density of the 1968 wheat crop to explain this result. Numbers of skeleton weed plants may increase only with long-term, continued cultivation.

ANALYSIS OF COMPETITION FOR LIGHT IN MIXED COMMUNITIES

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Analysing the effect light relationships have on the fate of individual species in mixed communities has met with only limited success. In fact, it is apparent from a survey of the extensive literature on plant competition that only a particular situation has lent itself to interpretation; this is the situation exemplified in the work of Stern and Donald for a community composed of two species of contrasting stature, in that case subterranean clover (*Trifolium subterraneum*) and ryegrass (*Lolium temulentum*). In this situation it is possible to account for the success or failure of the species of lower stature on the basis of comparatively crude measurements of the proportion of incident light penetrating the foliage of the taller species down to the position in the canopy occupied by the lower species. It is clear that few situations in crop and pasture communities are represented by this extreme example. Rather the general case is where two or more species occupy more or less the same vertical displacement in the canopy, although within it they may individually have distinctly different foliage arrangements.

The study of community photosynthetic behavious has developed rapidly over recent years to the extent that the analysis and understanding of the relation between foliage display and light

penetration into a plant community has proceeded to the point at which biologically-respectable mathematical models of the photosynthetic behavious of simple plant communities have been produced. These models are designed to predict the photosynthetic rate of entire communities for which data on foliage geometry, radiation geometry, and photosynthetic response of individual foliage elements are available. They have been evaluated by comparison both with dry matter accumulation obtained by simple harvesting techniques and with the gasometric determination of photosynthetic rate using the portable field chamber system. It has been shown for communities for which water and nutrients are non-limiting that models of this type give acceptable predictions of community photosynthesis.

It is reasonable, therefore, to extend this approach to the analysis of communities comprising more than one species and to interpret the results not simply in terms of total community photosynthesis, or even as the contribution of the component foliage layers, but to consider the photosynthetic behaviour of individual species within the canopy. A prediction of the relative photosynthetic activity of component species obtained by analysing the effect of one species presence on the illumination of the foliage of another is an analysis of the competition for light within the community.

Applying such a model-building approach to the relationships of weeds in crops and pastures will have considerable impact on our ability to understand the competitive situation. In the first place it can be used as a means of testing a particular situation. Given information on the foliage structure of a community, the radiation conditions, and the photosynthetic response of individual leaves, it is possible to estimate the estent of a growth response which could be attributed to light relationships alone. In view of the difficulties associated with this single step in the past, it is itself a significant advance. Secondly, and more importantly, it forms the basis of a conceptual tool which will interact with continuing practical field and laboratory experience to improve the approach to weed problems. A competitive growth model would have great value in allowing rapid assessment of the importance of a range of real or postulated weed situations, in helping to decide between alternative strategies of weed control, and also in ensuring that weed research maintains the necessary close links with crop and pasture physiology.