With seed production, however, both species produced many more seed at the middle temperatures of 10-20$^{o}$C. The reason for this appeared to be a burning of terminal growth on stems at 25/20$^{o}$C and 30/25$^{o}$C, thus inhibiting seed production since major seed production is dependent on stem growth. This effect appeared at all photoperiods.

At the end of the experiment, when plants at the middle temperatures of 10-20$^{o}$C had senesced, plants of both species at the lowest and the highest temperatures still had not produced mature seed.

*E. spinosa* produced approximately three times as many seeds as *E. australis* under identical conditions. *E. spinosa* produced approximately three times as many seeds under 16 hours of light as under 8 hours; similarly *E. australis* produced twice as many seeds under 16 hours as under 8 hours. The response to daylength appeared to be a quantitative rather than an absolute photoperiodic one, at least for the photoperiods studied.

It appears that *E. spinosa* is somewhat more precocious in development than *E. australis* but similar climatic conditions give optimum growth in both species. *E. spinosa* can thus be regarded as potentially able to occupy the same wide distribution as *E. australis*, as far as climatic limitations are concerned.

The poor growth at the highest and lowest temperatures tested may partly explain the much smaller populations of *Emex* spp. in the northern, hotter parts of Australia and the colder areas such as the tablelands of New South Wales. Other factors such as soil type and farming practices are also likely to influence the distribution of *Emex* spp.

## POPULATION DYNAMICS OF SPINY EMEX

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In any study of population dynamics of an annual weed species, the following should be known: the level of soil seed populations, the proportions of that level germinating, of seedlings surviving and of plants producing seed, and the amount of seed produced. Since an attempt at biological control of *Emex* *australis* (spiny emex) has begun in Australia, it is important to know something of these dynamics in various populations of *E. australis* and subsequently how biological control may affect them.

Work is in progress on these aspects, firstly by regular sampling of soil at various depths under pasture, roadside and cropping conditions. Seed is divided into empty (which may have germinated), dead and dormant seed, the latter being further divided into induced and enforced dormant seed.

Most plants in a particular season appeared to come from the previous season's seed since the amounts of older viable seed in the soil generally appeared small. Numbers of viable seeds in the soil declined with soil depth, this being most marked under pasture or uncultivated conditions.

The emergence and survival of seedlings is monitored by mapping the positions of individual plants in permanent quadrats at 3-weekly intervals, again under pastures, roadside and cropping conditions. Mapping is necessary, otherwise germination and/or mortality may be underestimated. The coordinates of each plant are recorded, as well as the date of flowering and stem initiation of individuals.

The first flush of germination appeared to provide the main population throughout the season, subsequent germinations being low. Generally, the higher the density, the higher was the seedling mortality. However, the micro-environment appeared to be a factor in mortality - plants in hollows in cultivated soil survived better than those on ridges where the soil dried out faster.

Plant mortality occurred at a comparatively steady rate throughout the growing season. This is likely to be influenced by soil moisture conditions. A similar steady mortality was, however, observed under glasshouse conditions at high densities. Thus densities ranging from 1 to 64 plants per pot resulted in approximately 75% mortality at the highest density. Surviving plants at this density were comparatively small but nevertheless produced the highest number of seeds per pot. There were no significant differences in seed numbers per pot between densities of one, two or four plants.

Seed production per unit area is also being measured at several sites in the field. Generally it was directly proportional to density, being more marked than under glasshouse conditions, so that if biological control reduces plant density below a certain level, seed production per unit area may be also reduced. These results apply only to one season and may of course vary between years depending on climatic conditions. It is intended therefore to continue this type of study.