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**A STUDY OF THE FACTORS INFLUENCING  
THE EMERGENCE AND ESTABLISHMENT  
OF RAGWORT (*Senecio jacobaea* L.) SEEDLINGS  
IN PASTURES**

**A thesis presented in partial  
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## Abstract

This study was designed to help understand the factors determining the emergence and establishment of ragwort seedlings in pastures. To achieve this it was necessary to determine (a) whether the germination of seeds was affected by the presence of light; (b) the influence of herbage cover on the emergence of seedlings; (c) the seasonality of seedling emergence; (d) the impact of treading on the emergence of seedlings and (e) the behaviour of seedlings in a real farm situation.

In the first experiment, soil containing ragwort seeds was collected from a dairy pasture and subjected to constant light or dark conditions in growth chambers. Seeds subjected to light produced significantly more seedlings (55.6% seedling emergence) than those left in darkness (13.8% seedling emergence). It was concluded that germination is positively affected by light. Apparently, seeds which germinated in the dark were those originally close to the soil surface.

In the second experiment, a hill country pasture near Woodville was either denuded of herbage cover or left intact once every month. For one year, ragwort seedlings were counted to provide information on the seasonality of seedling emergence. Seedling emergence was constantly higher on bare soil than under the pasture canopy, except in summer when no germination was observed for lack of moisture. Peaks of seedling emergence occurred in September (bare soil and intact pasture) and in June (bare soil). Seedling emergence (bare soil) was high even at low temperatures in winter. Seed germination was strongly checked by either the lack of moisture over summer or the presence of herbage cover at any time of the year.

The third experiment was carried out at the same site. A number of defoliation treatments were imposed involving combinations of the presence and absence of herbage cover, treading and grazing. Any form of disturbance to pasture caused a significant increase in seedling emergence. The greatest emergence was found where soil had been denuded of herbage cover, whether trodden or untrodden. Treading generally stimulated germination through damage to the vegetation cover, and some increase in emergence also resulted from soil movement by hooves. Seedling emergence was minimal where pasture was undisturbed.

The fourth experiment was carried out on a commercial dairy farm near Palmerston North over a 12 month period. Without interfering with the normal management system, several pasture attributes were monitored every week at three different sites within the farm to help explain the emergence and mortality of ragwort seedlings. Seedlings were counted every week in permanent quadrats and mapped every fortnight. Seedling emergence and survival varied greatly both between sites and throughout the year. The major determinant of seedling emergence was found to be the proportion of bare soil. Bare soil was largely caused by treading in wet months and by drought during summer/early autumn. No emergence was observed over summer when soil moisture levels were low. Depending on the site, peak emergence occurred in June, August and November. The major causes of seedling mortality were water stress, earthworm casts, treading damage and competition from neighbouring plants. Although autumn emergence was small compared to the emergence observed in winter and in spring, it is apparently the most important period of emergence during the year, since seedlings which emerge in winter and in spring are prone to die over summer from water stress. Ragwort seedlings survived longer periods when the sward height was between 2 and 7 cm (approx.) and when herbage mass was between 500 and 2000 kg DM ha<sup>-1</sup>.

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