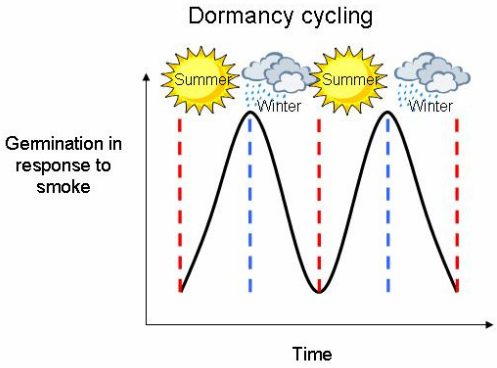
Germination of fire ephemerals requires dormancy release by temperature and then exposure to smoke

Fire ephemerals

Fire ephemerals are a functional group of plants that germinate after fire, grow rapidly, reach reproductive maturity early and are short-lived. For most of the time they exist only as a soil seedbank. These species can be found within a number of families including the Gyrostemonaceae, Apiaceae, Malvaceae, Solanaceae and Poaceae. Here the dormancy characteristics and germination requirements of two south-western Australian fire ephemerals, *Tersonia cyathiflora* (Gyrostemonaceae) and *Actinotus leucocephalus* (Apiaceae) are outlined. *Tersonia cyathiflora* has physiological dormancy and *Actinotus leucocephalus* seeds have morphophysiological dormancy.

Dormancy Cycling

Freshly collected seeds do not germinate in response to smoke and/or heat pulses although these species primarily germinate after fires *in situ*. Seeds do, however, germinate in response to smoke water in autumn after a period of burial. Seeds only respond to smoke in autumn because they exhibit dormancy cycling in the soil. Dormancy is released over summer by warm temperatures and re-imposed during cold winter temperatures. Laboratory experiments using *Actinotus leucocephalus* confirmed that temperature is the main factor that drives dormancy cycling, and that its effect is modulated by moisture levels.

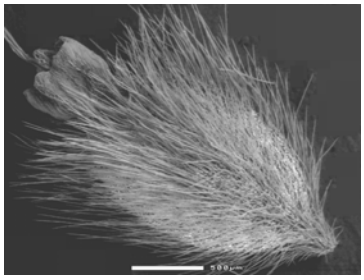


Smoke as a Germination Stimulant

Seeds only germinated in response to smoke water after dormancy had been alleviated by temperature. This indicates that smoke is operating as a germination stimulant. Many species that germinate after fire but do not respond to smoke water when freshly collected may require dormancy alleviation by warm or cold storage before seeds become smoke responsive.

Ecological Implications

Dormancy cycling ensures that seeds only germinate in autumn which is the start of the wet season in south-western Australia where the study species occur. Germinating at the start of the wet season enables seedling recruitment and establishment before the hot dry summer. Also requiring a smoke cue ensures that these species germinate in a post-fire environment where there is increased nutrient availability and less competition from other plants.



Actinotus leucocephalus seed ⊂ and flower ⊃

Information sourced from
Baker *et al.* (2005) *Annals of Botany* 96, 1225-1236.
Baker *et al.* (2005) *Seed Science Research* 15, 339-348.
Baker *et al.* (2005) *Plant and Soil* 277, 345-358.

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