The effect of fire on bone-seed and gorse germination

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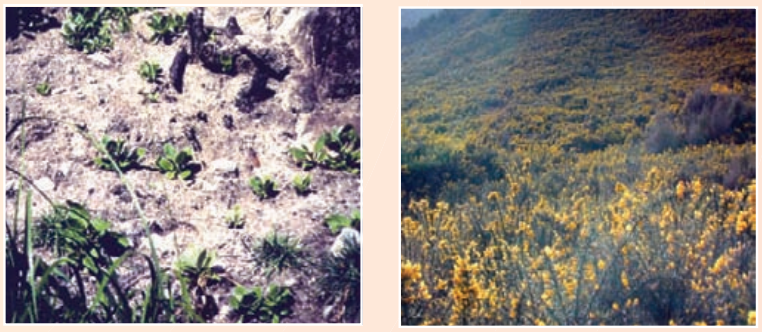
Gorse is one of the most flammable species in New Zealand.

Bone-seed (*Chrysanthemoides monilifera* ssp. *monilifera*) and gorse (*Ulex europaeus*) are environmental weeds in New Zealand. Both have been naturalised for almost 150 years, but gorse is much more widespread—largely because in the past it was often planted as a windbreak. Bone-seed is becoming more common, however, and sometimes grows as dense stands, excluding gorse and other species. So what conditions favour bone-seed over gorse?



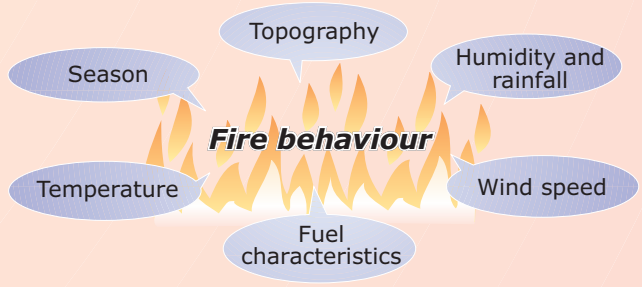
Bone-seed and gorse regenerate after fire.

Do cooler fires allow bone-seed (lighter yellow) to out compete gorse?

Is fire the key?

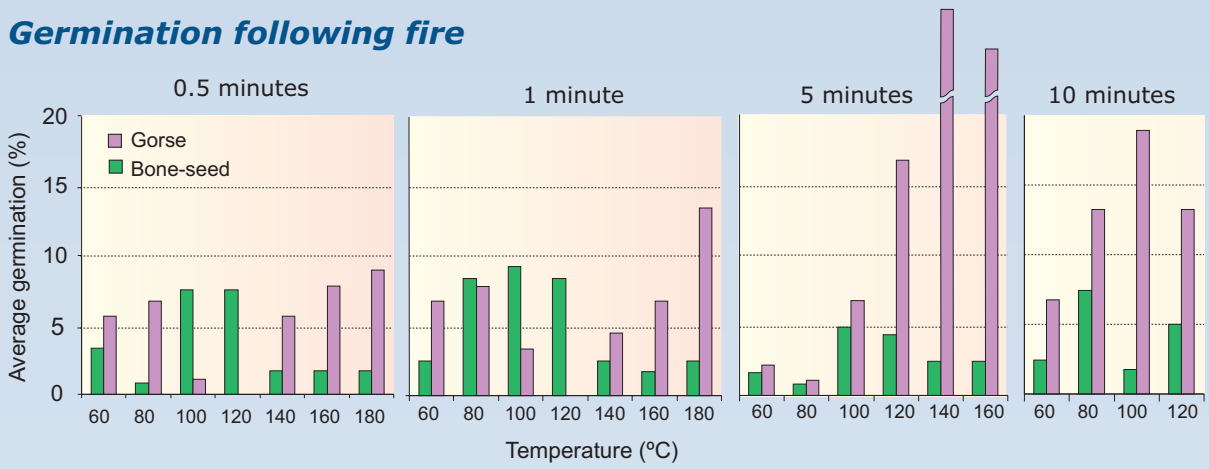
Both bone-seed and gorse germinate successfully following fire. But what sort of fire: hot or cool, fast or slow? And does it differ for the two species? If certain fires favour germination of one species over another, this may be an important influence on seedling competition and, hence, adult plant abundance. Is this the case for bone-seed and gorse? To test this we exposed seeds to a range of simulated fires (different temperatures and durations), and monitored their subsequent germination. We also germinated seeds that had not been exposed to fire.

All fires are not equal; they can burn hot or cool, fast or slow, depending on a range of conditions



Does fire give bone-seed an advantage over gorse?

Germination following fire

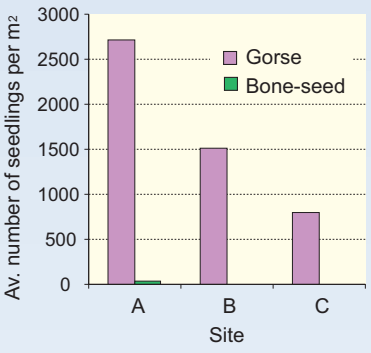


In winter 2002 we sowed seeds of bone-seed and gorse onto trays of sterile soil. Using a domestic oven to simulate the heat of a fire, we exposed the seeds to a range of temperatures, for set durations, then monitored subsequent germination.

This experiment is still running, but so far gorse has germinated significantly more successfully after exposure to higher temperatures for longer durations.

While bone-seed appears to germinate more successfully at lower temperatures for shorter durations, the difference in germination across the temperature range is not statistically significant. However bone-seed germination has been low (and variable) to date, and this may change as more seeds germinate (unfortunately the bone-seed hadn't heard that the conference was in September!).

Germination in the absence of fire



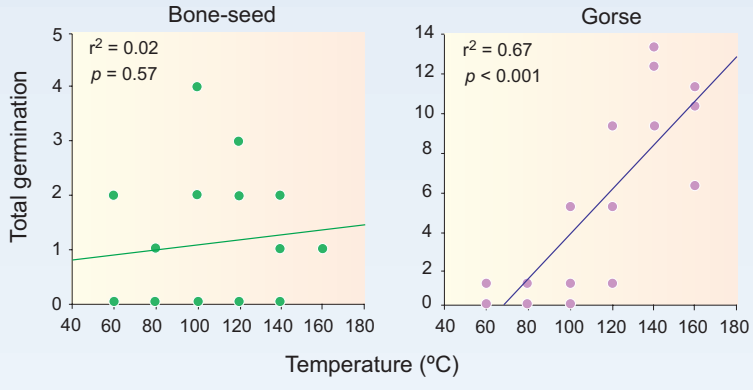
In the spring of 2001 we took 40 soil samples from each of three unburnt shrubland sites dominated by bone-seed and gorse. We spread the soil out on shallow trays, and monitored germination for 5 months.

Gorse germinated far more successfully than bone-seed under these conditions. Bone-seed germination was low, despite lots of seed being present.

Correlation between temperature and germination

Germination of gorse appears to be strongly promoted by high temperatures (in this example seed was heated for 5 minutes).

Preliminary results do not indicate a linear correlation between temperature and germination for bone-seed.



Conclusions

- Gorse germinates more successfully than bone-seed, both in the absence of fire, and also following hotter fires.
- Shorter, cooler fires may not favour gorse germination over bone-seed to the same extent as hotter fires, and may allow the larger bone-seed seedlings to out-compete gorse.
- But… other aspects of fire may also affect germination of these species: watch this space!

Factors that can affect the impact of fire on germination.

Conservation implications

If conditions that allow bone-seed to out-compete gorse become more common, then dense stands of bone-seed will become more common. Native species can eventually regenerate through gorse, but the dark environment beneath a dense bone-seed canopy may not offer the same opportunity for seedling establishment. Could bone-seed be a worse environmental weed than gorse?

Native species can eventually regenerate through gorse.

No seedlings were present beneath this dense stand of bone-seed.

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