# Barley Grass Distribution
## *Influence of the Biological Environment*

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The dynamic interaction between the barley grasses and other plant and animal species can, to a large extent, explain the local distribution of barley grass.

### Relationships with other plant species

#### *Communities*

Grant and Ball (1970) examined the botanical composition of barley grass areas and of nearby pasture. They found that in the barley grass areas ryegrass, *Lolium* spp., white clover, *Trifolium repens,* and barley grass were the commonest species.

Examination of tiller plugs from those areas showed a positive correlation between the incidence of barley grass and ryegrass and a negative correlation between barley grass and white clover. Other species common in the surrounding pastures, but absent from the barley grass areas, *included Yorkshire fog, Holcus lanatus, crested dogstail, Cynosurus cristatus, sweet vernal, Anthoxanthum odoratum, and browntop, Agrostis capillaris.*

Davison (1971) found that in Britain the commonest associates of *Critesion murinum* were perennial ryegrass, *Lolium perenne,* and poa annua, *Poa annua.* Other associated species included cocksfoot, *Dactylis glomerata,* white clover, creeping bent, *Agrostis stolonifera,* poa pratensis, *Poa pratensis,* and a range of weedy species such as dandelion, *Taraxacum officinale,* and broad-leaved plantain, *Plantago major.*

Observations on barley grass sites in New Zealand by Popay (unpublished) (Table 1) have shown that ryegrass is almost always present, that white clover is often present and that other associated species include a range of weedy annuals such as poa annua, goosegrass. *Bromus hordeaceus,* and shepherd's purse, *Capsella bursa-pastoris.*

#### *Site descriptions for Table 1*

[1] Shade of pine trees, dairy pasture, Flock House Training Farm, [2] Shade of macrocarpa trees, dairy pasture, Flock House Training Farm, [3] Shade of gum tree, sheep pasture, Maraekakaho, Hawke's Bay, [4] Sheep pasture, Maraekakaho, Hawke's Bay, [5] Shade of ash trees, sheep pasture. Maraekakaho, Hawkes Bay, [6] Cattle pasture, Pakipaki, Hawke's Bay, [7] Near fence in sheep pasture, Kakariki, Rangitikei, [8] Sheep pasture, near Waihao Downs, Waimate, [9] Sheep pasture, Hakataramea end of Meyers Pass, South Canterbury, [10] Sheep pasture on hilltop near Waikouaiti, Otago, [11] Stony sheep pasture, Ahuriri, near Motukarara, Lake Ellesmere.

The Domin scale was used in Table 1 for estimates of species cover and abundance as follows:

P: Present in 3 $m^2$ adjacent to 1 $m^2$ plot
x: Isolated, cover small
1: Scarce, cover small
2: Very scattered cover small
3: Scattered, cover small
4: Abundant, cover about 5%;
5: Abundant, cover about 20%
6: 25 - 33% cover
7: 33 - 50% cover
8: Cover 50 - 75%
9: Cover over 75%
10: Cover about 100%

**Table 1:** Species cover-abundance values on Domin scale (Poore 1955) in communities containing *Critesion murinum* at eleven sites. Plot size 1 $m^2$.

| **Site number** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Slope (°) | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 5 | 5 | 0 | 5 |
| Aspect (°) | - | - | - | - | 360 | 22 | - | 90 | 180 | - | 22 |
| Altitude (m) | 9 | 9 | 30 | 30 | 35 | 35 | 90 | 100 | 300 | 60 | 15 |
| Height of veg (cm) | 45 | 42 | 10 | 8 | 5 | 15 | 8 | 10 | 20 | 10 | 20 |
| No. of spp. in 1 $m^2$ | 7 | 5 | 8 | 9 | 5 | 10 | 9 | 8 | 14 | 4 | 7 |
| *Amaranthus powellii* | | | x | | 4 | | | | | | |
| *Bromus hordeaceus* | | | | 4 | | 4 | 3 | 8 | 4 | | p |
| *B. tectorum* | | | | | | | | | 8 | | |
| *B. wildenowii* | 3 | | | | | | | | | | |
| *Capsella bursa-pastoris* | | | | | | p | p | 1 | | 1 | 7 |
| *Carduus nutans* | | | | | | | | x | x | | |
| *Cerastium glomeratum* | | | | | | | | | | | p |
| *C. holosteoides* | | | | | | | 1 | p | | | |
| *Chenopodium album* | | | | | | | | | | | p |
| *Cirsium arvense* | | | | | | | | p | | | 1 |
| *C. vulgare* | p | | | | | | p | | | | p |
| *Coronopus didymus* | p | | | | | | | | | | |
| *C. squamatus* | | | | | | | | | | | x |
| *Critesion glaucum* | | | | | | | | | 5 | | |
| *C. murinum* | 8 | 8 | 9 | 5 | 8 | 7 | 7 | 7 | 3 | 9 | 7 |
| *Dactylis glomerata* | 3 | | | | | | | x | | | |
| *Erodium cicutarium* | | | | | | | | | 2 | | |
| *E. moschatum* | | | 1 | 3 | | 2 | | | | | p |
| *Geranium spp.* | | p | | p | | 2 | p | p | | | |
| *Gypsophila sp.* | | | | | | | | | x | | |
| *Hypochaeris radicata* | | | | | | | | | | | p |
| *Leontodon taraxacoides* | | | | | | | | p | | | |
| *Lolium perenne* | 7 | 3 | 1 | 4 | 5 | 4 | 4 | 3 | | 6 | 4 |
| *Lotus sp.* | | | | p | | | | | | | |
| *Malva.spp.* | p | | p | | 1 | | | | | | |
| *Marrubium vulgare* | | | | | | | | p | 1 | | p |
| *Medicago arabica* | | | 5 | 8 | | 8 | | | | | |
| *M. polymorpha* | | | 3 | 3 | | 2 | | | | | p |
| *Poa annua* | 3 | | 1 | 5 | p | | 7 | | | | |
| *P. pratensis* | | | | | | | | | 3 | 3 | |
| *Polygonum aviculare* | | | | | | | | p | | | 3 |
| *Ranunculus bulbosus* | p | | | | | | | | | | |
| *Rhytidosperma spp.* | | | | | | | | | 4 | | |
| *Rumex obtusifolius* | p | | | | | | | p | | | |
| *R. pulcher* | | | | p | | 1 | 1 | | | | |
| *Sisymbrium officinale* | | | | | | | | | | | |
| *Sonchus oleraceus* | p | | | | | | | | | | p |
| *Stellaria media* | | 1 | 4 | 3 | | | | | | | |
| *Taraxacum officinale* | | | | | | | | p | | | |
| *Trifolium arvense* | | | | | | | | | 3 | | |
| *T. dubium* | | | | | | | | 1 | 3 | | |
| *T. fragiferum* | | | | | | | p | | | | |
| *T. glomeratum* | | | | | | | | | 2 | | 3 |
| *T. micranthum* | | | | | | | 1 | | | | |
| *T. repens* | 3 | 1 | p | p | 4 | 3 | 3 | 3 | | | |
| *T. subterraneum* | | | | 3 | | 3 | p | | | | p |
| *Urtica urens* | | 7 | 1 | | p | | | | | | |
| *Veronica arvensis* | | | | | | | 2 | p | | | |
| *Vulpia bromoides* | | | | | | | | | 4 | | |

***Competition and its effects***

Barley grass, by virtue of its very quick germination and its rapid early growth, is well adapted to be a component of annual pasture. Research work in both Australia and New Zealand has shown that when it is grown in mixtures with seedling ryegrass, it usually competes strongly with the ryegrass. Cocks (1974), in Australia, showed that competition between *C. murinum subsp. leporinum* and Wimmera rye- grass (*Lolium rigidum*) was affected by nitrogen levels and the density of sowing. At low levels of nitrogen, barley grass was the better competitor, especially when its own density was lower. At high levels of nitrogen, barley grass competed best when its density was high.

When barley grass is sown in the autumn into a still green pasture or into one which recovers quickly in response to autumn rains, most of the seedlings succumb to the intense pasture competition and relatively few survive to produce seed (Table 2).

**Table 2:** Seed head and seed production by barley grass, *Critesion murinum* subsp. *murinum.* One hundred seeds were sown in the autumn into 1 $m^2$ plots in pasture either untouched or sprayed with paraquat at sowing. Some plots were protected from grazing, whilst others were grazed during winter and spring.

| | ***No. seed heads produced per 100 seeds sown*** | | | |
|---|---|---|---|---|
| | ***Untouched pasture*** | | ***Sprayed pasture*** | |
| ***Site and year of sowing*** | ***Grazed*** | ***Fenced*** | ***Grazed*** | ***Fenced*** |
| Milson 1974 | 1 | 48 | 50 | 238 |
| Takapau 1975 | 12 | 25 | 128 | 155 |
| Flock House 1975 | 1 | 0 | 72 | 46 |
| Masterton 1975 | 0 | 3 | 16 | 208 |
| Milson 1975 | 0.3 | 2 | 268 | 309 |
| | ***No. seeds produced per 100 seeds sown*** | | | |
| | ***Untouched pasture*** | | ***Sprayed pasture*** | |
| ***Site and year of sowing*** | ***Grazed*** | ***Fenced*** | ***Grazed*** | ***Fenced*** |
| Takapau 1975 | 216 | 533 | 2342 | 3286 |
| Flock House 1975 | 16 | 0 | 1629 | 855 |
| Masterton 1975 | 0 | 25 | 277 | 6781 |
| | 3 | 46 | 5574 | 9301 |

Originally, before the advent of topdressing, most of New Zealand's pastures, in lower rainfall areas, consisted of perennial, mat-forming and relatively drought-resistant species such as browntop, danthonia, *Rhytidosperma* spp. and fescues, *Festuca* spp. Intensified topdressing, oversowing and increased stocking rates have led in many places to the replacement of these species by a more productive, fertility-demanding community composed of perennial ryegrass, cocksfoot, crested dogstail. white clover and subterranean clover, *Trifolium subterraneum.* This community is susceptible to drought, especially under conditions of high fertility and hard summer grazing.

Under dry summer conditions, perennial ryegrass, becomes dormant, i.e., with no green leaves, and although regrowth takes place in the autumn there is a delay of 2 - 3 weeks between the onset of effective autumn rains and the beginning of new tiller formation (Silsbury 1964). Additional stresses placed on the ryegrass plants lead to their death. Lucanus *et al.* (1960) showed that the survival rate of perennial ryegrass over the summer was reduced by low soil moisture and by high temperatures. Survival was further reduced if soil nitrogen was at a high level. Soil salinity imposes extra physiological drought stresses on pasture plants, especially during the summer. Physical damage by insects or stock to already stressed plants will further reduce survival rates.

All of these factors, which tend to lead to death of perennial pasture species, are at their most intense on stock camps. In pastures they are likely to have their greatest effect in areas subject to summer drought and overgrazing. Autumn recovery of pastures is from regrowth of dormant plants and from seedlings. In such situations, barley grass is strongly competitive and its density will depend on the availability of its seed, soil fertility and the recovery potential of perennial pasture species.

Barley grass is present on stock camps almost everywhere in New Zealand. After dry summers, it tends to spread out into the surrounding pasture. Once barley grass has invaded pasture, it tends to be a self-perennating problem because its seeds germinate in the litter left by the dead parent plants. Thus, in dry summers barley grass spreads into pastures and, even if subsequent summers are wet, it is only slowly replaced by perennial species.

## Animal/plant relationships

### *Grazing*

Hard grazing of pastures during the summer helps to kill or weaken perennial pasture species and therefore encourages invasion by barley grass.

Repeated hard defoliation of young barley grass seedlings will kill them (Hartley. unpublished), especially if there is some competition from other, unpalatable species (Myers and Squires 1970).

The effects of grazing barley grass during the winter are not well known, although there is some evidence (Table 2) that in the presence of a competitive sward, barley grass is weakened or killed by grazing.

Hartley (1977) and Hartley *et al.* (1978) has shown that continuous hard grazing during the spring and early summer can sometimes drastically reduce the production of barley grass seed heads. There are a number of published reports (Gunning 1966; George 1972; Campbell-et al 1972) of high stocking rates suppressing barley grass. Regular spring mowing of barley grass prevents flower head formation and can lead to eradication of barley grass (Atkinson 1970).

Once flower emergence has begun, barley grass is usually left alone by stock although, if forced, they will eat it even at this stage.

Cox *et al (1967)* reporting the effects of rabbit eradication on the vegetation of Motunau Island, Canterbury, found that one result was a great increase in the density, cover and size of barley grass plants, which became established on ground previously kept bare by grazing and treading.

### *Treading and other stock effects*

Congregation of stock leads to considerable pasture damage through treading, digging, etc. This, together with the effects of fertility concentration, leads to denudation of some areas and weakening of the pasture in others.

Dairy pastures in some places tend to be invaded by barley grass. Part of the reason for this is the open nature of dairy pasture, but treading and pugging in winter must also reduce the competitive pressure exerted on barley grass by other pasture species.

## Pests and diseases

### *Insects*

Cereal aphid, *Rhopalosiphum padi*, overwinters on pasture grasses, including barley grass, and can transfer barley yellow dwarf virus between barley grass and cereals. Other aphids are sometimes found on barley grass.

Noctuid caterpillars feed on the leaves, and the nysius bug, *Nysius huttoni*, attacks late seed heads.

Barley grass is almost certainly susceptible to pasture pests such as grass grub, *Costelytra zealandia*, porina, *Wiseana* spp., and Argentine stem weevil, *Hyperodes bonariensis.* However, these pests destroy or weaken other pasture species and create sites for barley grass invasion.

### *Fungi and virus*

Dingley (1969) listed the following recorded on *C. murinum:*
*CIaviceps purpurea*
*Puccinia grammis*
*P. hordei*
*Rhynchosporium secalis*
Barley yellow dwarf virus

### *Vertebrates*

Both birds and small rodents readily eat barley grass grain and are probably responsible for quite large seed losses.

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