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Dryland pasture and animal evaluation of Gasslands Gala grazing brome

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Abstract

Grasslands Gala grazing brome, the first cultivar bred from *Bromus stamineus (B. stamineus* Desv.), was selected from plant material collected in central Chile. Small-plot evaluations have indicated Gala has agronomic characteristics appropriate to dryland grazing systems. This trial was designed primarily to evaluate the seasonal production, persistence and animal performance obtainable from Gala under dryland conditions. Gala was compared with cultivars from three different *Bromus* species, Grasslands Matua *(B. willdenowii* Kunth.), Grasslands Hakari *(B. sitchensis* Trin.) and Grasslands Tiki *(B. inermis* Leyss.) and an endophyte ryegrass Grasslands Pacific *(Lolium perenne* L.). Gala established rapidly, and under a long rotation lax grazing management, had seasonal yields similar to Grasslands Pacific, Matua and Hakari. Hogget liveweight trials indicated Gala produced quality forage in all seasons with weight gains similar to those on Matua and surpassing those on Pacific during summer and autumn. Under a short rotation hard grazed management Gala was more competitive and yielded at a similar level to Pacific and Matua, and showed the least sign of tiller depletion. Hakari became severely depleted under this management and along with Tiki was eliminated from this evaluation at the end of the first year. These initial results (3 years' data) indicate that Gala compares favourably with existing cultivars, and its broad range of tolerances should make it a desirable option as a perennial in South Island dryland pastoral systems.

Keywords: *Bromus,* dryland, liveweight change, pasture production

Introduction

Grasslands Gala grazing brome, the first released cultivar from *Bromus stamineus (B. stamineus* Desv.), was bred from plant material collected on the light dry soils of central Chile, where it is grazed as a natural grassland. Early observations suggested Gala has strong cool-season growth and may tolerate drought and hard grazing (Stewart 1992).

Perennial grasses that can survive dry summer/autumn seasons, and the inevitable hard grazing associated with these conditions, and recover to produce quality forage from cool-season moisture, are valuable options on dryland sheep properties. Grasses with this capability can relieve feed shortages and provide for the critical feed deficit periods of early autumn (ewe flushing), late winter (pre-lambing), and provide quality forage for early summer (lamb finishing).

The three Bromus cultivars already available in New Zealand are characterised by the production of out-of-season forage, but have both strengths and weaknesses in other aspects critical to dryland management, and remain relatively minor species in dryland systems of the east coast of the South Island.

Grasslands Tiki smooth brome *(B. inermis* Leyss.) is summer active and can tolerate hard grazing, but is winter dormant. Grasslands Hakari mountain brome (B. sitchensis Trin.) is summer active but can be depleted by hard grazing. Grasslands Matua prairie grass *(B. willdenowii* Kunth.) has strong winter production but can be depleted by set stocking. Gala grazing brome is related to prairie grass (Demanet & Contreras 1988). Both species are hexaploid with 42 chromosomes, and can cross to form sterile hybrids (Stebbins 1949). Compared with prairie grass types such as Matua, Gala has a more prostrate habit and supports approximately twice as many tillers per unit area (Langer 1962). Gala flowers earlier with fewer aftermath seed heads, its seed is of similar size but supports a larger awn, and unlike Matua, Gala is resistant to smut *(Ustilago bullata)* (Stewart 1992). Early observations from small-plot evaluations suggest that Gala is a perennial that is palatable and winter active, and tolerates drought and Argentine stem weevil *(Listronotus bonariensis)* (ASW), and which may tolerate hard grazing, attributes which should make it a viable option in dryland regions (Stewart 1993).

This paper reports on the initial 3 years (the pre-perennial phase) of a trial designed primarily to evaluate the seasonal production, palatability and persistence of Gala under dryland sheep grazing, but also to measure the relative performance of the three existing bromes, and a new endophyte ryegrass cultivar, to assess their suitability to this environment.

Methods

To evaluate its attributes, Gala was compared with the three existing Grasslands *Bromus* cultivars, Matua Hakari and Tiki, and the newly released perennial ryegrass, Grasslands Pacific (*L. perenne* L.), an ASW-tolerant, general-purpose ryegrass (hosting 187BB endophyte).

The trial was sown in autumn 1991 near Lincoln, (average annual rainfall 660 mm) into a 3.5 ha block of fallowed (one year) medium/light soil (Templeton silt loam, pH = 5.7, Olsen P = 15). A randomised complete block design was used with each of the 5 species sown into 3, 0.2 'ha fenced replications.

The four brome species were treated with the Easy Drill seed coating and sown at 2 cm depth at equal numbers of viable seed relative to Matua at 30 kg/ha. Gala was sown at 31 kg/ha, Hakari 22 kg/ha, Tiki 15 kg/ha, and Pacific at 10 kg/ha. All species were sown as pure grass swards; legumes were excluded to avoid confounding liveweight trials.

As a substitute for legume-derived nitrogen, mineral N was applied as urea in split applications of 50 kg N/ha in spring summer and autumn. Superphosphate was applied conservatively at 125 kg/ha of standard super phosphate (9%P) in alternate years. Gesapon 20G was applied each autumn to control grass grub and porina.

The first three years' measurements concentrated on the seasonal dry matter (DM) production and the hogget liveweights obtainable from that production. A long rotation, lax grazing management was implemented to accommodate the seasonal weight gain trials. Pastures were allowed to regrow to about 2000 kg DM/ha before 30-day hogget weight gain trials were imposed as a tangible measure of forage quality. Pasture production was measured before these liveweight trials, which were conducted during the critical feed deficit periods of late winter (July/Aug), spring (Oct), summer (Dec/Jan), and early autumn (March).

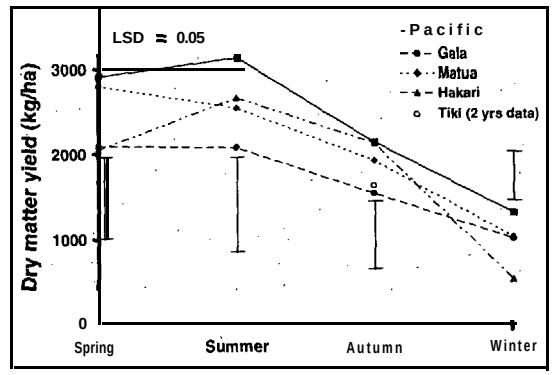
Individually tagged and fasted (24 hours), Coopworth ewe hoggets were weighed then allocated to each plot at an allowance of 2.0 kg DM/head/day. Individuals were drawn from across a narrow weight range to achieve a similar mean mob liveweight for each plot. Rarely were fewer than 20 hoggets allocated to a treatment, and each liveweight trial ran for approximately 30 days before the sheep were weighed off after a 24-hour fast. After each liveweight trial ungrazed forage was mown down to sampling height, eliminating any carryover of rank or dead residual matter into the subsequent seasonal evaluation.

From the third year, a short-rotation hard-grazed management was imposed on a 15 m x 30 m section of each main plot, as a simulated test of pasture persistence. Under this management the pastures were allowed to regrow until 2-3 species had produced about 500 kg DM/ha before all were hard grazed to a nil residue over about 48 hours. The long rotation management with seasonal liveweight change trials was continued on the remainder of each plot.

Results and discussion

An excellent establishment resulted in good seedling numbers in all species. Gala seedlings were first to emerge, ahead of Matua, Pacific, Hakari, then Tiki. Gala displayed similar iigour to Matua and Pacific and more than Hakari until the onset of seedhead production when its growth slowed relative to these three. Gala was the first species to flower and this slump in yield, which has been noted elsewhere, was probably linked to reproduction (Betin 1982). This phenomenon was not noted in the two subsequent springs.

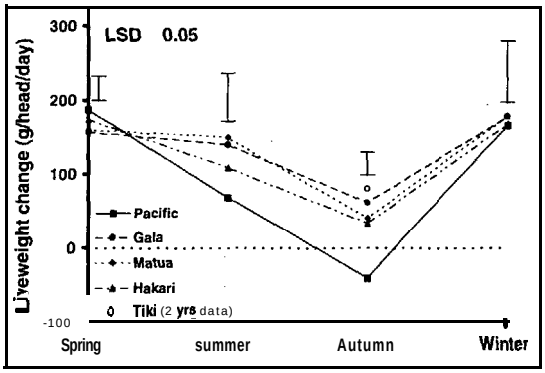
Figure 1 Mean seasonal DM yield under long rotation lax grazing – 3 years.



Seasonal pasture regrowth (3 years' data) between the critical feed periods of early autumn (March liveweight trial) and early spring (August liveweight trial), and for the lamb finishing periods (October and December trials) did not differ significantly between the four main species (excluding Tiki) (Figure 1). However, trends indicate Pacific produced the highest yields for all seasons followed by Matua and Gala for the late winter and spring grazings and Hakari during the summer and autumn. Tiki produced adequately only for the first two autumn grazings after sowing; yields during the other seasons were less than 500 kg DM/ha. Tiki was eliminated from this management after the second autumn grazing due to the ingress of weeds. Pasture growth during the liveweight trials is not

included in these data; however, exclosure cage data indicated there was no significant difference in the yields of the four main species during these periods. Measurement of total annual DM will be carried out in years 4-6 (the perennial phase of this evaluation), under a more typical dryland grazing frequency.

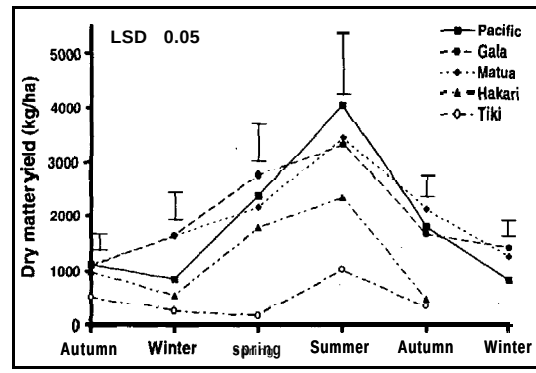
Figure 2 Mean seasonal hogget liveweight change - 3 years.



Results of the seasonal liveweight trials (3 years' data) highlight the quality of the *Bromus* species in all seasons, and reflect the poor quality of drought-stressed endophyte ryegrass (Figure 2). Herbage digestibility analysis supported the liveweights achieved on the bromes quite closely but not those of Pacific. Hoggets grazing Pacific consistently produced the highest weight gains in spring (not significant), but produced lower weight gains in the summer (significant), and lost weight during the early autumn trials (significant). Hoggets grazing Gala grew at a similar rate to Matua (a cultivar recognised for its quality (Fraser 1985)) in all seasons. With the exception of spring, there was a trend for hoggets grazing Hakari to grow at a slower rate than those on Matua and Gala. Tiki produced sufficient forage to sustain enough sheep for a liveweight trial only for the first two autumns; however, the weight gains achieved were similar to those of the other bromes. Exclosure cage data indicated there was no significant difference between the pasture species yields during the weight gain trials. Similarly, there was no significant difference in the reproductive component of the spring and summer allowances. However, there was a trend towards more dead material in the autumn allowance of Pacific and more in Matua and Gala during winter.

Pasture regrowth measured under the short-rotation hard-grazed treatment (1 year's data) shows significant differences in seasonal yield between species (Figure 3). Hakari and Tiki produced significantly less than Pacific, Matua and Gala in all seasons except summer when Hakari yielded at a similar level. Hakari in particular suffered substantial tiller mortality under this management and, like Tiki, which displayed slow tiller replacement, was eliminated from this evaluation after the first year. Tiller counts suggest Gala will be more productive and persistent than the other bromes under hard grazing, and should tolerate the often inevitable dryland 'mismanagement'.

Figure 3 Seasonal DM yields under short rotation hard grazing.



Summary

Results from the initial 3 years of this 6-year evaluation demonstrate the good out-of-season herbage production (Tiki excepted) and relative quality of the *Bromus* species under east coast South Island dryland conditions. However, the good year-round production and tolerance to extremes of grazing management demonstrated by Pacific (a key cultivar in this evaluation) hinted at the potential of endophyte ryegrasses in dryland systems, if animal health problems can be controlled. No endophyte-related clinical problems were observed in sheep grazing Pacific on this trial, but their summer/autumn weight gains were poor.

Matua confirmed its suitability to dryland systems, particularly on free-draining soils where a lax or rotational management can be maintained. Its inherent ASW tolerance, cool-season production and quality make it a useful option in dryland farming systems.

Hakari's modest cool-season yield and demonstrated intolerance to hard grazing may explain its limited use in east coast areas of the South Island where hard grazing is often inevitable, and winter temperatures will allow growth of cool-season-active grasses. However, its good palatability and summer production provided a useful standard by which to measure Gala.

Tiki appeared to tolerate hard grazing, but its extreme winter dormancy and open, sparsely tillered habit

resulted in its domination by cool-season-active weeds. Lowland properties probably lack the scope to accommodate the long-rotation, lax-grazing management required to maintain Hakari, or the poor cool-season production of Tiki.

These initial results indicate that Gala, the first cultivar selected from B. *stumineus,* when compared with the other perennials, has a combination of characteristics desirable in a perennial for east coast South Island dryland farms.

Gala established quickly and performed as a winter-active perennial with good year-round production and no dormant season -all important attributes for dryland farmers.

Despite seasonal pasture stresses Gala produces palatable, safe forage year round (as reflected in the good hogget liveweights achieved in all seasons), and there has been no indication of any animal health problems often associated with other species under dryland conditions. These attributes are enhanced by Gala's inherent ability, once established, to survive ASW and drought.

Gala's performance to date under the short-rotation hard-grazing management highlights its ability to recover from hard summer grazing and yield from winter moisture, and suggests it should persist under the often inevitable dryland mismanagement.

This broad range of tolerances and apparent lack of a need for special management must make Gala a desirable option as a general-purpose perennial in South Island dryland sheep systems

Based on these results its range should include the free-draining, low to moderately fertile soils of eastern South Island and extend inland to where low winter temperatures reduce its cool-season advantage.

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