THE ROLE OF SUBTERRANEAN CLOVER ON THE NORTHERN NSW SLOPES

R.D. (Des) FitzGerald
NSW Agriculture & Fisheries
Glen Innes

Almost 80% of grazing land on the Northern Slopes of NSW consists of native or naturalised perennial grasses. These grasses provide good quality feed during spring and summer, but quality declines during autumn to a generally low level during winter. It is this winter feed quality deficit that limits animal production. Hence, there is a potential to raise livestock productivity by provision of a high quality winter-green supplement at that time. Winter-active legumes such as subterranean clover (Trifolium subterraneum) can fill this role provided they can be maintained in a stable grass/legume association. Such a supplement may be expected to have a three-fold effect.

1. Improved nutritive value of the diet selected by the grazing animal (Curll et al. 1985).

2. Improved utilisation of associated high fibre grass residues (Minson and Milford 1967).

3. Through nitrogen transfer, increased nutritive value and acceptability of the associated grasses in subsequent years (Simpson 1967).

The three main ingredients for successful introduction and maintenance of legumes in natural grasslands are (1) selection of suitable species and cultivars, (2) provision of adequate fertiliser, and (3) adoption of necessary grazing management strategies. These points have been addressed in a research programme conducted from Glen Innes and Tamworth over recent years.

SPECIES/CULTIVAR SELECTION

In initial testing, subterranean clover emerged as the most reliable species over a wide range of climates and soils on the slopes. Therefore, subsequent work at both Glen Innes and Tamworth concentrated on subterranean clover cultivar adaptation, and at Glen Innes work commenced on developing appropriate grazing management strategies for subterranean clover growing in association with native perennial grasses. At Tamworth, the potential demonstrated by Clare subterranean clover, the only commercial line of brachycalycinum, a subspecies of subterranean clover, was pursued by collection and evaluation of a number of lines of the subspecies.

From the subterranean clover studies, it was found that the northern boundaries to the growing of subterranean clover were not related to a shortening of the growing season. This contrasted with the more clearly meditteranean environments in the south where, at the boundary of subterranean clover incidence, the growing season becomes too short to permit seed set. Bridging this boundary in the south requires the use of earlier flowering cultivars (Donald 1960, Rossiter 1978). In Northern NSW we found that the western boundary may be bridged by using earlier flowering cultivars as in the south, but the northern boundary was best extended by using later flowering cultivars which were able to

set more seed than earlier cultivars. These late flowering cultivars were able to achieve the extra seed yield because they could exploit the longer spring associated with the greater incidence of summer rain. Prolific seed production gave rise to large seed banks which, in turn, produced seedling populations of sufficient density to compete successfully with the naturally occurring perennial grasses.

Other characteristics of importance emerged in the evaluation experiments. It was found that cultivars with a capacity for rapid growth following summer germinations were better able to survive between summer showers, especially at higher altitudes where temperatures are less severe on seedlings. Vigorous seedling growth may also help the clover to compete with the native grasses. Seedlings of Woogenellup and Clare exhibit these capabilities and these cultivars are among the more persistent. Since they both have relatively large seeds, and since vigorous early growth has been associated with seed size (Black 1957), seed size may be a simple and useful selection character for cultivars tailored to the Northern Slopes.

Stands of the smaller-seeded cultivars, Dalkeith and Junee, were sparse in the first two years, but became increasingly more dense and productive in the third and fourth years. These cultivars are very hard-seeded. Although they may be slow to develop commercially useful stands, once established, they may be expected to persist. Clearly, they have a role in long-term pastures, but they need to be sown in a mixture with cultivars which can establish more rapidly, in order to provide more reasonable commercial returns in the initial years.

GRAZING MANAGEMENT

At Glen Innes we addressed the problem of grazing management for legume maintenance in tall summer-growing perennial grass pastures. An experiment was conducted in which four legumes were subjected to grazing in different seasons during the year (Table 1). It was established that, while all legumes benefited from a rest from grazing following germination in late summer/autumn, treatments which allowed grass to become rank at that time (nil grazing) inhibited development of subterranean clover stands. Subterranean clover germination and growth was enhanced when grasses were kept short in early autumn. By contrast, white clover (Trifolium repens) thrived under grazing regimes which allowed uncontrolled grass growth but was less tolerant of treatments with more constant defoliation. This may explain, in part at least, why white clover rather than subterranean clover has been the main pasture legume on the tablelands where pastures are mainly perennial grasses. Such pastures frequently become rank over summer, which renders them unsuitable for maintenance of subterranean clover but quite suitable for white clover.

CONCLUSION

Subterranean clover can successfully supplement native perennial grasses during winter/spring on the slopes providing appropriate cultivars are sown and adequate attention is paid to the grazing management principles indicated in this study.

Table 1. Contribution of four introduced legumes (%) to total dry matter on 3/8/88 under five grazing treatments

Grazing treatment	White clover	Sub. clover	Rose[1] clover	Barrel[2] medic	Mean
Continuous	33	71	51	29	45.9
Spring rest	34	71	46	21	43.0
Autumn rest	63	68	53	58	60.8
Summer rest	38	58	46	24	41.5
Nil grazing	66	21	7	0	23.6
	46.9	57.9	40.6	26.4	

[1] Trifolium hirtum; [2] Medicago truncatula; Standard error of differences: Species 6.0, Grazing treatment 6.7, Species x grazing treatment 13.5.

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