Options for improving subterranean clover pastures in short-term leys

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The increase in cereal cropping over the past 15 years in the mixed farming areas of W.A. has been achieved at the expense of the length of the pasture phase in the ley system. In the more favourable cereal growing areas a one year pasture/one year crop (1:1) rotation has been widely adopted. This system was reasonably successful over a run of good seasons. But a succession of poor seasons, which has not favoured good clover seed production, has resulted in deteriorated pastures of low clover content which are unable to supply adequate nitrogen for ensuing cereal crops.

Regeneration of clover after a crop depends on the presence of seeds which have survived the crop year as hard seeds. Unfortunately more than half the seeds produced by even the hardest seeded cultivars of subterranean clover in the wheatbelt environment soften during the summer following seed set. This soft seed germinates and is normally destroyed in the crop year. Consequently the 1:1 rotation is particularly inefficient in terms of clover seed utilization, as more than half the seed produced is inevitably wasted in an environment where seed production is already often limited by dry conditions. Tillage operations associated with the crop can make matters worse by burying a large proportion of the residual seeds below a depth from which seedlings are able to emerge (1). In a 1:1 rotation the minimum period of burial before uplifting is possible is two years. During this time a large proportion of the hard seeds of the softer seeded cultivars can soften and be lost (2). Burial of the seeds of harder seeded cultivars is not necessarily undesirable in the longer term, as the rate of softening of buried seeds of these cultivars is reduced to such an extent that it is possible for a soil seed reserve to accumulate which can provide a buffering effect against pasture years in which few clover seeds are produced.

Plant breeding and improved management techniques both offer potential improvements in clover pastures for rotation systems which retain a cropping rate of 50%. While there appears to be little scope for breeding new varieties capable of producing more seeds, the prospects of obtaining harder seeded varieties are considerably better. Such new varieties could go a long way towards improving pastures as it can he demonstrated mathematically that a variety with more than 60% hard seeds present at the end of the first summer can persist satisfactorily in a 1:1 rotation in the wheatbelt environment, just as present cultivars with about 40% hard seeds can persist reasonably well in a 2:1, and even better in a 3:1 rotation. Manipulating reserves of clover seeds in the soil with tillage operations aimed at burying and uplifting seeds according to the amount of seed set in the previous pasture year has also been suggested (2).

A further option which would retain a 50% cropping rate is a 2:2 rotation. The problem of an inadequate nitrogen supply to sustain two successive cereal crops could be overcome by sowing one cereal crop and one grain legume crop such as lupins. Tillage operations aimed at burying the clover seeds in the first crop year (to minimize seed softening during the summer between the two crops) and returning the seed to the vicinity of the soil surface in the second crop year would be essential for successful clover re-establishment in such a rotation.

1. Taylor, G.B. 1985. Aust. J. Exp. Agric. Anim. Husb. 25, (in press).

2. Taylor, G.B. 1984. Aust. J. Agric. Res. 35. 201-20.