Establishing Ley Legumes in the Northern Grain Belt - Undersow or Sow Alone

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Abstract

The suitability of environmental conditions in the northern grain belt for either undersowing the ley legumes, lucerne (*Medicago sativa*) and snail medic (*M. scutellata*), with wheat, or sowing them alone, were investigated in a series of experiments on cracking clay soils in southern inland Queensland. Undersowing was successful at locations where antecedent fallow water, in-crop rainfall and soil nitrate were low. These conditions occur in drier environments with a lower probability of rain, on soils that have been cropped for a long period, and with the crop established after a short fallow. In wetter environments, establishment of both legumes was more successful after sowing them alone.

Key words: establishment, sowing, undersowing, Medicago sativa, Medicago scutellata

Continuous cropping of cracking clay soils in the northern grain belt for, in some cases , more than 100 years, has now depleted their nitrogen fertility (1). This has resulted in lower crop yields and grain protein levels, and a loss in the premium paid for prime hard wheat. Crop/pasture rotations using the legumes, lucerne (*Medicago. sativa*) and annual medic (*M. scutellata*) are now being employed as an option to improve soil nitrogen fertility and to provide an additional break in the rotation (2).

This research compared the effectiveness of sowing the legumes snail medic cv. Sava and lucerne cv. Trifecta, alone or undersown with wheat. Three sites, located along a transect of increasing aridity from the eastern Darling Downs at Kingsthorpe (27^{o}33?S, 151^{o}52?E, annual average rainfall (aar) 727 mm, with 259 mm May-October), to the western Downs at Warra (26^{o}47?S, 150^{o}53?E, 686 mm aar, with 239 mm May-October), to the Maranoa at Roma (26^{o}33?S, 148^{o}46?E, 596 mm aar, with 217 mm May-October)(3) were sown between 1992 and 1996 by drilling into wet soil. In each experiment, lucerne was sown at 1, 2, 4, and 10 kg/ha, and snail medic at 2, 4, 8, and 48 kg/ha, either undersown with wheat at 20, 40 and 60 kg/ha, or alone. The treatments were randomised and replicated three times.

This paper reports comparisons of undersowing and sowing alone both snail medic (Kingsthorpe and Warra in 1993, medic at 4 and 8 kg/ha only), and lucerne (Kingsthorpe and Roma in 1995, lucerne at 2 and 4 kg/ha only). Comparisons of fallow water and soil nitrate, in-crop rainfall, grain and medic seed yield, lucerne plant survival and medic and lucerne biomass in the season following establishment were made.

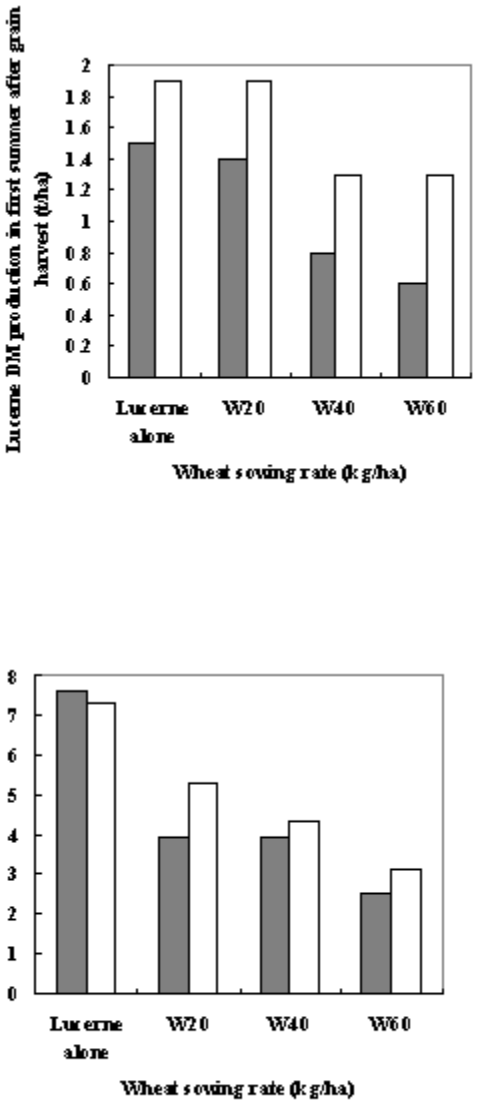
Results

Studies with lucerne

The number of lucerne plants to establish at both sites was unaffected by the other component at each sowing rate. At the wetter site, Kingsthorpe, there was more antecedent fallow water, soil nitrate and in-crop rainfall than at the drier site. There was no consistent effect of lucerne on grain yield , lucerne plant survival at grain harvest was lower when undersown than when sown alone, lucerne biomass production in the first summer after sowing was lower following undersowing than after sowing alone, and the competitive effect of wheat was exacerbated by high soil nitrate.

At the drier site, Roma, wheat grain yield was reduced slightly when lucerne was sown at 4 kg/ha. Most establishing lucerne plants survived until the wheat was harvested, and lucerne biomass in the first summer after sowing was as high after undersowing with wheat at 20 kg wheat/ha as if sown alone (Figure 1).

Figure 1. Lucerne biomass produced in the first summer after sowing at 2 kg/ha (shaded bars) and 4 kg/ha (clear bars) at Roma (left graph) and Kingsthorpe in 1995.



Studies with snail medic

As with lucerne, the numbers of wheat and medic plants were both unaffected by the other component at each sowing rate at both sites. At the wetter site, Kingsthorpe, there was more antecedent fallow water and soil nitrate, and in 1993, similar in-crop rainfall compared with the drier site. Wheat yield was unaffected by undersown medic, but medic seed yield was substantially reduced by the associated crop. Medic biomass production in the regeneration year was lower in the undersown than the sown-alone treatment. Wheat/undersown medic competition was enhanced by high soil nitrate.

At the drier site, Warra, wheat yield was reduced slightly by undersown medic, medic seed yield was depressed but not to the same extent as at the wetter site, and medic biomass production in the regeneration year following undersowing was no less than when sown alone. The antecedent soil nitrate was lower at this site than at Kingsthorpe.

Conclusion

To establish mono-specific swards of the ley legumes lucerne and snail medic on cracking clay soils, undersowing with wheat is most likely to be successful in drier parts of the northern grain belt on soils that have been cropped for many years and have not been subjected to long fallow. Productive leys can be established at commercial sowing rates (4 kg/ha snail medic, 2 kg/ha lucerne, 35-45 kg/ha wheat), though a reduction in the sowing rate of wheat is recommended, for example to 20 kg/ha. Higher wheat sowing rates will reduce the legume stand more than higher sowing rates of the legume will affect grain crop yield. The greatest depression of crop yield was less than 17% in these studies. At the same time, the seed reserves of annual medics and the surviving lucerne populations were adequate to regenerate productive ley stands. In the wetter parts of the grain belt, better leys are likely to be established by sowing the legumes alone.

Acknowledgments

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