

Plant arrangement effects on dry matter production and nitrogen fixation of berseem clover: annual ryegrass mixture

C. Attardo, G. Di Miceli, A.S. Frenda, D. Giambalvo and C. Scarpello

Dipartimento di Agronomia Ambientale e Territoriale, Università di Palermo, 90128 Palermo, Italy, Email: giardo@unipa.it

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Introduction Agronomic factors affect the productivity and efficiency of cereal-legume intercropping systems (Ofori & Stern, 1987). This research aimed to determine the effects of different plant arrangement on hay yield, nitrogen (N) content and N fixation of berseem clover-annual ryegrass mixture in a Mediterranean semi-arid environment.

Material and methods The site was a hilly area of Sicily (37°30'N; 13°31'E; 178m a.s.l.) in a deep, clayey, well structured soil, previously cropped for wheat. The experiment in 2002/03 was a complete randomized block design with 4 replicate. Treatments were: berseem clover (*Trifolium alexandrinum* L. cv Lilibeo) in pure stand (B); annual ryegrass (*Lolium multiflorum* Lam subsp. *wersterwoldicum* cv Elunaria) in pure stand (R); and their mixture arranged in alternate rows (BRa), or in the same row (BRs). Pure stands were seeded at 50kg seeds/ha. The intercrop design was based on replacement principle sown with in 50:50 berseem:annual ryegrass. The ¹⁵N isotope dilution technique was used to estimate N fixation by berseem clover (10 kg N/ha as ammonium sulphate at 10 at.%¹⁵N excess). All plots were cut at the start of berseem flowering; total above-ground dry matter yield (DM) and N concentration (as % DM) were determined for each species.

Results and Conclusions The pure berseem clover stand and its mixtures had similar DM yields. DM yields of both mixtures were significantly higher than annual ryegrass in pure stand (Figure 1). The arrangement of plants in the mixture (BRs vs. BRa) had no significant effect on DM yield but the contribution of berseem was significantly higher in BRs (75.4%) than in BRa (63.5%).

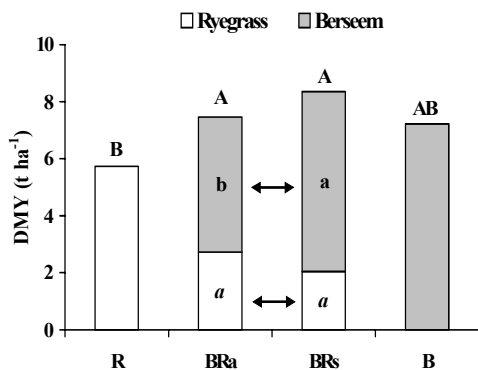


Figure 1 DM yield of berseem and ryegrass in pure stands (B and R) and in mixture with different spatial arrangement (BRa alternate rows; BRs same row)

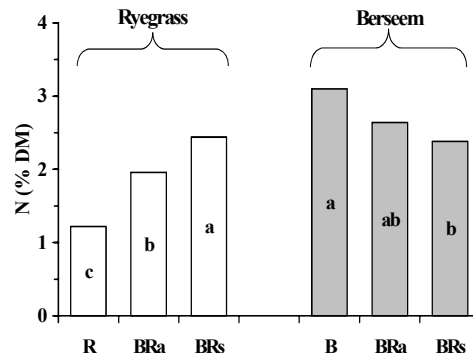


Figure 2 N concentration (%DM) of the harvested berseem and ryegrass in pure stand and in mixture (BRa alternate rows; BRs same row)

Intercropped berseem always had a significantly higher percentage of N derived from N₂ fixation (Ndfa), than monocropped berseem clover (90.1, 87.4 and 77.4% Ndfa respectively in BRs, BRa and B). Annual ryegrass intercropped with berseem had a consistently higher N% than ryegrass grown in pure stand (Figure 2). Moreover, mixing the components within the row, compared to sowing in alternate rows, significantly increased the N% in annual ryegrass. In contrast, the N% of berseem was much higher in pure stand than in mixtures, particularly when it was intercropped in the same row with annual ryegrass. Plant arrangement in the same row can improve the efficiency of berseem clover-annual ryegrass intercrop system.

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References

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