Response of an Improved Pasture to Different Phosphoric Fertilisation Strategies in Basaltic Soils

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Introduction Phosphoric fertilisation and broadcast seeding of a legume is a valuable technology to improve native pastures . Phosphorus (P) represents the main input cost for these pastures , with a large impact on their productivity . The objective of this trial was to evaluate sources and levels of P fertiliser on such pastures .

Materials and methods The trial was conducted on a medium to deep basaltic soil (Molisol) , at Glencoe Experimental Farm in a temperate to subtropical climate . The main properties of the selected soil , from 0-10 cm depth were : pH (water) : 5 .7 , organic carbon : 45 .3 g/kg and available P (citric acid) : 3 .8 mg/kg . The native canopy was sprayed (glyphosate) , and white clover (*Trifolium repens*) cv . Zapic n was broadcast seeded . A factorial arrangement of 3 P fertilisers (superphosphate , SP , 23% P_2O_5 ; Gafsa phosphate rock , GPR , 28% P_2O_5 ; Hyperfos , a mixture of superphosphate and rock phosphate , Hy , 27% P_2O_5) and 4 initial levels (0 , 40 , 80 , 160 kg P_2O_5/ha) with 4 replications in a split plot design was used . At the beginning of the second year , split plot received 2 levels (0 , 40 kg P_2O_5/ha) of an annual application of each source for every initial dose . The main evaluation consisted of botanical composition (BC) and forage dry matter (DM) measurements from harvests with an experimental rotary mower . The plots were cut every time pasture reached 18-20 cm , leaving a stubble residue of 4-5cm . Analysis of variance was performed on data recorded and adjusted regression equations were developed for legume production to the initial treatments . Relative efficiencies (RE) with reference to superphosphate , were estimated using significant regression equations .

Results and discussion Average cumulative white clover forage yield during the 4 year period , for the 3 P fertilisers , varied between 3617 and 13898 kg DM/ha depending on initial dose , without any annual P application . This represents a legume increase of 58 kg DM/kg P_2O_5 . On average , RE was 134 for GPR and 122 for Hy , relative to SP (100) . In the refertilised situation (initial plus annual applications of 40 kg P_2O_5/ha) , legume forage yields during the 4 year period , for the 3 P fertilisers averaged , varied between 13842 and 24990 kg DM/ha depending on initial dose . This represents a white clover increase of 67 kg DM/kg P_2O_5 . The average RE , was 135 for GPR and 167 for Hy , relative to SP (100) . When only the effect of the annual applications was considered , 87 .3 kg DM/kg P_2O_5 were produced on average . Even though the soil considered does not offer optimal pH conditions for the use of GPR and Hy , it is possible that differences among plants in their ability to utilize P from such sources explain the response , in agreement with Khasawneh and Doll (1978) . White clover would have a higher capacity of rhizosphere acidification and calcium and P absorption . Previous national results show a similar behavior of white clover in other soils , when GPR is utilized (Mor n , 2002 ; Risso y Mor n , 2002) .

Conclusion There was a significant effect of the initial P doses and of the annual refertilisation in the legume yield . GPR and Hy fertilisers were significantly more efficient compared to SP , for both the initial fertilisation and the refertilisations . Such RE , combined with responses higher than 50 kg DM/kg P_2O_5 , present important practical connotations .

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