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Investigations on soil fertility of *Medicago varia* and *Bromus inermis* stands

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Key words: *Medicago varia*, *Bromus inermis*, Soil organic matter, Soil available nitrogen

Introduction The effects of forage cropping on soil fertility have not been well determined even though positive results have been reported for some species in certain areas (Cadisch et al., 1994; Jianguo Han et al., 2004). The objective of this study was to determine the changes of soil organic matter and soil available nitrogen of *Medicago varia* and *Bromus inermis* stands during the subsequent years after establishment.

Material and methods The plots were established at the experimental farm of Inner Mongolia University for Nationalities, in Tongliao, Inner Mongolia on May 8, 2003. The initial soil fertility of the 0-30 cm layer: organic matter 18.36 g/kg, available N 58.45 mg/kg, available P₂O₅ 38.66 mg/kg, available K₂O 123.67 mg/kg. *Medicago varia* was seeded at the rate of 15 kg/hm² in monoculture and 4.5 kg/hm² in the mixture; *Bromus inermis* was seeded at the rate of 22.5 kg/hm² and 15.75 kg/hm² in the mixture. Soil samples were taken on April 17, 2005 and April 12, 2007 and the soil organic matter and soil available N were tested in the laboratory.

Results The greatest soil organic matter accumulation occurred in the *Bromus inermis* stand, and the intermediate accumulation occurred in the *Medicago varia* and *Bromus inermis* mixture (Table 1). Soil organic matter of all three layers of all the three stands increased with the advancement of time, reinforcing the opinion that perennial forages (either legumes or grasses) have an important role in soil structure improvement.

Table 1 Contents of soil organic matter and available nitrogen of three stands.

Sampling time	Soil layer	<i>Medicago varia</i>		Mixture		<i>Bromus inermis</i>	
		OM	AN	OM	AN	OM	AN
2005-4-17	0-10cm	24.46bB	57.49aA	26.50aAB	56.80aA	27.4aA	49.93bA
	10-20cm	18.56bB	79.10aA	20.48bAB	78.51aA	23.31aA	73.64bA
	20-30cm	11.68aA	49.77aA	12.53aA	50.44aA	12.18aA	47.68aA
2007-4-12	0-10cm	26.39bA	65.41bA	28.75abA	70.09aA	32.28aA	57.73cB
	10-20cm	21.00bA	60.32abA	24.63aA	61.99aA	25.22aA	55.22bA
	20-30cm	17.14aA	40.60abA	16.82aA	45.80aA	18.43aA	37.18bA

Note: Means with different capital letters in same soil layer indicate extremely significant difference ($P < 0.01$) and small letters ($P < 0.05$) for significant difference. OM-soil organic matter (g/kg); AN-soil available nitrogen (mg/kg).

For soil available nitrogen accumulation, the *Medicago varia* and *Bromus inermis* mixture showed the greatest positive effect, and the *Bromus inermis* stand showed the least. In 2007, available nitrogen content in the 0-10 cm soil layer of *Medicago varia* and *Bromus inermis* mixture was 21.41% higher than that of *Bromus inermis* stand.

Conclusion Both soil organic matter and soil available nitrogen increased gradually in three stands with the advancement of time. Soil organic matter increased most in the *Bromus inermis* stand, whereas, *Bromus inermis* and *Medicago varia* mixture was more beneficial to the accumulation of soil available nitrogen.

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