

Effects of sowing date and phosphorus fertiliser application on winter survival of lucerne cv. Aohan in the northern semi-arid region of China

Z.L. Wang¹, Q.Zh. Sun¹, Y.W. Wang², Zh.Y. Li¹ and Sh.F. Zhao³

¹Grassland Research Institute, Chinese Academy of Agricultural Sciences, Huhhot, 010010, Email: wangzongli@sina.com, ²Department of Grassland Science, College of Animal Science and Technology, China Agricultural University, Beijing, 100094, ³Grassland Service Station of Linxi County, Linxi County, 024550

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Introduction In the northern semi-arid region of China, winter survival is always a limiting factor for lucerne production, because low temperatures and a dry climate in winter (Zhou *et al.*, 1993; Ma, 2000; Sun & Gui, 2001; Sun *et al.*, 2003). An experiment was conducted to find an appropriate sowing date and P application rate in order to improve lucerne winter survival.

Materials and methods The study was conducted in Linxi county, Inner-Mongolia. The experimental design was a randomised block with 3 replications, which included sowing time, and fertiliser application rates. Each plot measured 5.0 m × 2.0 m. Sowing of lucerne cv. Aohan occurred on 28 May, 1997 and at eight dates in 1998. Two levels of P fertiliser were applied with 15 kg/ha N on 30 May, in 1997 and on 25 June, in 1998, respectively.

Results Sowing date influenced winter survival significantly (Table 1). Shoot number per plant, buds per plant before winter and winter survival decreased at dates later than early June. P and N fertilisers applied at sowing increased winter survival in both years and winter survival increased with P application rate (Table 2). Compared to the control treatment, 75.0 kg P₂O₅/ha + 15 N kg/ha increased lucerne winter survival by 15.1% and 45.9% in 1997 and 1998, respectively.

Table 1 Responses of seeding dates in 1998 on winter survival of alfalfa

Sowing date	Shoot numbers per plant	Buds per plant	Winter survival rate (%) *
18 May	3.5-4.0	5.0-5.7	98.6
30 May	3.5-4.0	5.0-6.3	95.5
5 June	3.0-3.5	4.5-6.0	91.8
12 June	1.0-2.0	2.0-2.5	63.7
25 June	1.0-1.5	1.5-2.2	47.2
4 July	1.0	1.0-2.3	38.2
16 July	1.0	0.0-1.5	18.4
27 July	1.0	0.0-1.0	6.5

*Effects of seeding date on winter survival rate were significant ($p < 0.01$)

Table 2 Effects of fertiliser on lucerne winter survival

Sowing date	Fertiliser rates (P ₂ O ₅ +N kg/ha)	Plant crown diameter (m)	Winter survival rate (%)
	0	0.47	81.5
30 May, 1997	37.5 + 15.0	0.53	89.6
	75.0 + 15.0	0.72	96.6
25 June, 1998	0	0.26	47.2
	37.5 + 15.0	0.51	78.3
	75.0 + 15.0	0.67	93.1

Conclusion In the northern semi-arid region of China, seeding date of lucerne cv. Aohan should not be later than early June. The application of 75.0kg P₂O₅/ha + 15 kg N /ha at the time of sowing is recommended in order to increase winter survival.

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