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

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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 P<sub>2</sub>O<sub>5</sub>/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 <sub>2</sub> O <sub>5</sub> +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 P<sub>2</sub>O<sub>5</sub>/ha + 15 kg N /ha at the time of sowing is recommended in order to increase winter survival.

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