Reasons for the premature decline in *Astragalus adsurgens* stands in Kerqin sandy land

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Introduction Diseases partly account for reductions in *Astragalus adsurgens* stand longevity. The effect of some cultural practices on the control of pests and diseases have been reported (Hou, 1986; Nan, 1996), but few reports have detailed the relationship among soil fertiliser status, diseases and premature stand decline. This study was conducted to investigate these relationships in order to extend the longevity of *Astragalus adsurgens* stands.

Materials and methods *Astragalus adsurgens* for this research was established in 1993 at 6-7kg/ha. No irrigation or fertilisers were applied after establishment. Disease incidence was calculated as

$$\text{Disease incidence} = \frac{\text{The number of infected plants} \times 100\%}{\text{The total number of investigated plants}}$$

Plants infected index was divided into 5 classes based on symptoms according to Flood & Isaac (1978) and Latunde-dada & Lucas (1982). Disease index of the stands was calculated according Liu Ruo (1998) as

$$\text{Disease index} = \frac{\sum (\text{Plant infected index} \times \text{plant number}) \times 100\%}{5 \times \text{total number of plants}}$$

Results In the third and fifth year after establishment, phosphorus content in soil, plant leave and stem significantly decreased compared to the first year (Table 1); however, root rot diseases and plant mortality increased. The pathogens accounting for the root rot disease were *Fusarium solani, Fusarium oxysporum* and *Fusarium moniliforme*. The stand showed premature degradation in the 5th to 6th year after establishment.

Table 1 The changes of phosphorus in soil and in *Astragalus adsurgens* plants

Years after establishment	Phosphorus content (P_2O_5 mg/ 100g)			Stand condition (%)	
	Soil	Leaf	Stem	Plant mortality	Disease index
0	1.86 a	—	—	—	—
1	1.54 a	0.5401 a	0.0710 a	66.3	54.8
2	—	—	—	78.9	55.6
3	0.54 b	0.1407 b	0.0291 b	100.0	77.7
4	—	—	—	100.0	86.2
5	0.11 c	0.1066 c	0.0233 c	100.0	92.6
6	—	—	—	100.0	95.0

Note: data in a column followed by different letters are significantly different ($p<0.05$)

Conclusion Premature degradation of *Astragalus adsurgens* were attributed to phosphorus deficiency in soil and root rot diseases caused by the fungi *Fusarium solani, F. oxysporum*, and *F. moniliforme*.

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