Effects of Phosphorus and Potassium on Alfalfa Seed Quality

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Introduction Previous research showed that potassium increased soybean seed germination rate (Jeffers et al ., 1982) , while nitrogen and phosphorus decreased hard seed percentage of Egyptian clover (Bagoury and Niyazi , 1975) . However , the effects of macronutrients fertilization on alfalfa seed quality have not been determined . The experiment was designed to determine the effects of combined application of phosphorus and potassium on alfalfa seed germination and hard seed percentage .

Materials and methods A field experiment was conducted at Grassland Research Station of China Agricultural University located in Northwestern China's Jiuquan District (39°37′N , 98°30′ , altitude 1480m) during 2003 and 2004 . WL232HQ" alfalfa stand was seeded with 0 .60 m row space and 45 g m^{-2} seeding rate in autumn of 2002 . Five treatments (including CK) were evaluated in a randomized block design with four replications (Table 1) . Individual plot size was 6 x 9 m . The fertilizers were applied in mid to late April .

Table 1 *Alfalfa seed quality responses to combination of phosphorus and potassium fertilization .*

	Treatments (kg/hm^2)		Seed yield (kg/hm^2)		First count (%)		Normal seedling (%)		Hard seed (%)		Germination (%)
	P_2O_5	K_2O	2003	2004	2003	2004	2003	2004	2003	2004	2004
CK	0	0	469 .0a	1164a	62 .4c	56 .8bc	64 .4c	60 .1bc	27 .5a	37 .6a	91 .9b	97 .7a
PK1	60	60	542 .3a	1259a	73 .6ab	63 .8ab	75 .0ab	67 .1a	19 .9b	31 .6a	94 .9a	98 .7a
PK2	90	60	482 .5a	1102a	72 .8b	54 .8c	73 .7b	57 .3c	21 .7b	40 .4a	95 .4a	97 .7a
PK3	120	60	530 .0a	1039a	77 .1a	58 .2abc	77 .9a	61 .3abc	17 .4b	36 .7a	95 .3a	98 .0a
PK4	150	60	435 .2a	1194a	77 .4a	64 .8a	77 .9a	66 .4ab	17 .8b	31 .9a	95 .6a	98 .3a

Note : Different letters in a column indicate significant differences at 0 .05 level(LSD)

Results The combination of phosphorus and potassium did not significantly effect the alfalfa seed yield in both years ($P > 0.05$) . In contrast , the hard seed percentage was significantly decreased by fertilizer application and the highest germination rate and lowest hard seed percentage were obtained by high fertilizer rates (PK3 and PK4) in 2003 . Phosphorus and potassium application in 2004 increased the first count , normal seedlings and germination rates by 14% , 11 .64% , and 15 .2% respectively . (Table 1)

Conclusion The combined application of phosphorus and potassium significantly increased alfalfa seed germination and seedling establishment through decreasing hard seed percentage .

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