

## Impact of P and K Nutrition on Alfalfa Taproot Gene Expression, Shoot Growth, and Plant Survival

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Fertilization of alfalfa (*Medicago sativa* L.) with P and K enhances growth and plant survival, but imbalanced P and K nutrition may be more detrimental than deprivation of both nutrients. During the summers of 2002 and 2003, extensive plant death occurred in plots fertilized with P but not K, while survival was excellent in plots fertilized with 200 kg K/ha/yr with P or in plants left unfertilized (Fig. 1). Our objective was to determine how gene expression was altered in taproots of alfalfa provided contrasting P and K nutrition. Total RNA was extracted from roots sampled in May 2002 and 2003, and in December 2002 from plots receiving 0 kg K/ha/yr with 0, 25, 50, and 75 kg P/ha/yr and those receiving 200 kg K/ha/yr with 25, 50, and 75 kg P/ha/yr. Differential display was used to ascertain the impact of P and K nutrition on transcript abundance. cDNAs of differentially expressed genes were eluted from gels, amplified, and ligated to the pGEM vector. Dot blots, using RNA collected from the 0K/75P and the 200K/75P plots in May and December as probes, verified cDNAs that were differentially transcribed. Preliminary results indicate that imbalanced (0K/75P) nutrition increases expression of cold acclimation responsive (*CAR*) genes in taproots in December, and balanced P and K (200 K/75 P) nutrition enhances expression of vegetative storage proteins (32 kd VSP) in May. Dot blot analysis also shows that a serine protease gene has higher expression in May in plots receiving balanced nutrition. Additional comparisons of differentially expressed genes will be done using Northern blots. The cDNA inserts will be sequenced, and full-length clones will be obtained by screening cDNA libraries.

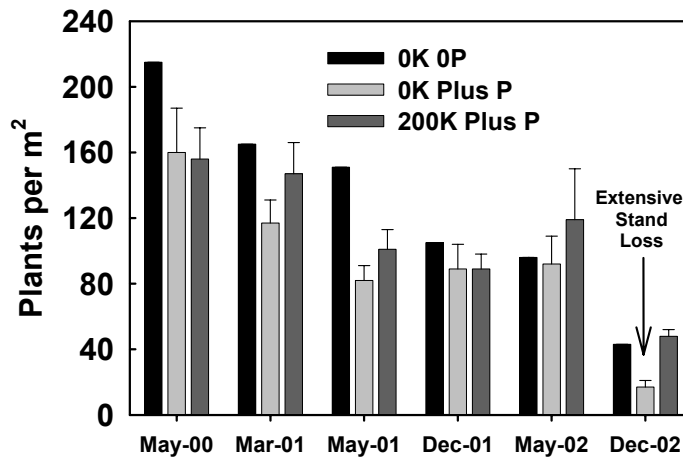


Figure 1. Impact of P and K nutrition on alfalfa persistence. Plants fertilized with P but not K had greater stand losses between May and Dec. of 2002 than did plots provided 200 kg K/ha with P or plots left unfertilized.