

**Evaluation of fatty acids in roots and crowns of alfalfa genotypes  
contrasting in winter hardiness and ploidy level**

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Alfalfa (*Medicago sativa* L.) is widely cultivated throughout the world because of its high yield, forage quality, and persistence. However, winter and its associated cold temperatures can reduce persistence and consequently yield. Linking knowledge about the genetic basis of winter hardiness to physiological mechanisms and metabolite profiles can lead us to develop better breeding strategies and improved cultivars that will have reduced risk of severe winter damage. The objective of this experiment was to evaluate the fatty acid composition of ten alfalfa genotypes contrasting in fall dormancy (FD=2 to 9), subspecies (*falcata* and *sativa*), and ploidy level (diploid and tetraploid), during a two year experiment (Fall 2000 - Spring 2002). Clones of each of the ten genotypes were planted into the field at Ames, IA in May 2000 and 2001. A randomized complete block design with 3 replications and 3 harvest dates (August, November, and April) arranged in a split plot design was used in each year. At each harvest date, five plants per plot were dug at 25-cm depth and shoots, crowns, and taproots were hand separated, frozen in liquid nitrogen, and freeze dried. One step methylation in hexane was used to extract free fatty acids (FA), which were analyzed by gas chromatography (GC). GC-MS was used to verify the elution order of free FA. The results showed a broad range of free FA in both roots and crowns, which differed among alfalfa genotypes. Linoleic, linolenic, palmitic, palmitoleic, oleic, stearic and myristic were the most prominent free FA found in the alfalfa entries. Statistical comparisons showed that fatty acids vary among entries and genotypic groups. To our knowledge, this study provides the first documentation of free FA concentrations in roots of diverse alfalfa genotypes, and suggests that FA may play a role in the winter survival. The genetic control of fatty acid concentration and other metabolites of alfalfa possibly associated with winter hardiness are being analyzed by genetic mapping in a structured population.

References

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