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IMPROVEMENT OF ROSE CLOVER WINTER GROWTH

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Background. Winter forage production and cold tolerance are critical traits for cool season annual clovers. Rose clover cultivars differ in winter forage production, flowering date and cold tolerance. 'Overton R18' rose clover is cold tolerant but is also low in winter forage production. 'Kondinin' and 'Hykon' rose clover are productive during the winter season but are not cold tolerant relative to Overton R18. Seed dormancy has been used to predict cold tolerance in alfalfa. High levels of seed dormancy in alfalfa are generally associated with high cold tolerance. Experiments were conducted to quantify seed dormancy in three rose clover cultivars and to determine the relationship between seed dormancy and low temperature growth.

Research Findings. Petiole growth of the rose clover cultivars Kondinin, Hykon, and Overton R18 was evaluated in growth chambers under WARM (80/60 F, 11/13 hr) and COLD (60/39 F, 9/15 hr) environmental treatments. The effects of temperature, water soaks, ethylene, and osmoticum on rose clover seed dormancy were investigated using petri dish and blotter paper germination tests. Factorial combinations of rose clover cultivar (Kondinin, Hykon, and Overton R18), ethephon (0 and 5 ppm), pre-germination water soak (0, 4, and 8 h), and pre-germination chilling (0 and 12 h at 39 F) were arranged in a completely random design with three replications of 50 seed each. A second experiment was conducted using the same rose clover cultivars and a 4 h pre-germination soak. Factorial combinations of cultivar, pre-germination chilling (0 and 12 h at 39 F), and osmotic potential (0, -0.1, -0.2, -0.3, -0.4MPa) were arranged and replicated as described above. Seed dormancy ratings were based on germination of imbibed seed at 72 F after five days.

No differences in petiole length were noted between cultivars of rose clover grown eight weeks in the WARM treatment (Fig. 1). Hykon had the longest petioles (2.3 in) when grown in the COLD treatment, followed by Kondinin (1.9 in) and Overton R18 (1.4 in). Both Kondinin and Hykon showed an upright growth in response to the COLD treatment in contrast to the prostrate growth of Overton R18. Seed dormancy of the rose clover cultivars evaluated can be summarized as follows: Overton R18 > Kondinin > Hykon (Fig. 2). Seed dormancy of Overton R18 could be broken by storage at 39 F for 4 hr, water soak for 4 hr, or treatment with 5 ppm ethephon (data not shown). Seed germination is promoted by ethylene and inhibited under water stress conditions. The rate of rose clover seed germination decreased with increasing osmotic concentration, but this decrease was more pronounced on Overton R18 than the other rose clover

cultivars tested. Differences in seed dormancy were magnified when seed were germinated under high osmotic (-0.4MPa) conditions and only this treatment allowed the separation of Kondinin and Hykon (data not shown).

Application. Seed dormancy appears to have a direct relation to low temperature growth of rose clover and may be useful in screening rose clover germplasm. Exposing rose clover to low temperature growing conditions or germinating seed under low osmotic potential differentiated among the three cultivars in this study. Studies are in progress to correlate rose clover seed dormancy with cold tolerance and winter survival.

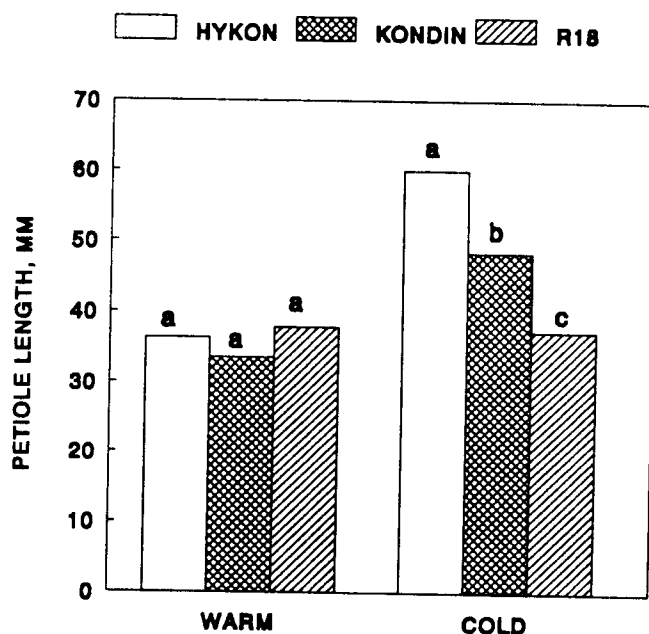


Figure 1. Petiole growth of three rose clover cultivars under warm and cold conditions. WARM treatment = 80/60 F, 11/13 hr. COLD treatment = 60/30 F, 9/15 hr.