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IMPROVEMENT OF ROSE CLOVER WINTER FORAGE PRODUCTION

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Background. Rose clover is a winter annual forage legume with potential for increased use in Texas and the entire U. S. southern region. Commercial cultivars of rose clover include 'Hykon', 'Kondinin', 'Monte Frio' and 'Overton R18'. Hykon and Kondinin are Australian cultivars and both have very little winter dormancy or cold tolerance. Monte Frio is a cold-tolerant cultivar developed in California. Overton R18 rose clover was released in 1991 by the Texas Agricultural Experiment Station, and was selected for a high level of cold tolerance and improved forage production.

Overton R18 has survived winters and been productive in central Oklahoma and in some years southern Kansas and southern Missouri. However, Overton R18 is probably more cold tolerant and more winter dormant than is needed for northeast Texas climatic conditions. Overton R18 reseeds well and is cold tolerant in Old World bluestem (*Bothriochloa* spp.) pastures in the Southern Great Plains. In this study, two-month-old seedlings of Overton R18 survived record Oklahoma low temperatures in December with minimum temperatures reaching -27 C. In the same study, plant counts 3 and 4 years after the initial seeding averaged 22 plants/m² for rose clover, compared to 3 plants/m² for vetch.

A rose clover with less winter dormancy and better cool-season forage production than Overton R18 is needed. This reduction in winter dormancy must be balanced with enough cold tolerance to survive the winter season in the U. S. southern region.

Hand crosses were made between Overton R18 and Hykon or Kondinin. Actual crosses were identified using a leaf mark gene and seed were produced of four F₂ families. Seed of the F₂ families were germinated and plants grown in the greenhouse for six weeks. In mid Nov. 1994, 150 plants of each F₂ population and 50 plants each of the three parent cultivars (750 total plants) were transplanted to a field site near Overton, Texas. The plants were grown in rows with each plant on a 4 ft. center. Lime and fertilizer were applied prior to transplanting according to soil test recommendations. Plant size was measured on 3 Feb. and 10 Mar. 1995. Flowering notes were taken at weekly intervals on each plant beginning 20 Mar.

Seed of 37 selected F₃ lines and four check cultivars of rose clover were germinated and plants grown in the greenhouse for seven weeks. In mid-December 1995, a minimum of 11 plants (actual number ranged from 11 to 28) of each line was transplanted into a dormant bermudagrass

(*Cynodon dactylon* [L.] Pers.) sod near Overton, Texas. Plant size was measured and cold damage recorded on 9 Feb. 1996. Cold damage was reported as percent of plants in an entry that exhibited moderate to severe leaf damage due to cold injury. Stand loss due to cold damage was evaluated on 12 April 1996.

Research Findings. The F₂ generation was evaluated in 1995. All Hykon and Kondinin plants reached full bloom during the two-week period of 20 Mar. to 4 April 1995. Hykon was slightly earlier to flower than Kondinin. Overton R18 reached full bloom during the 6-day period of 26 April to 2 May. On 27 Mar., Overton R18 was vegetative, most of the Hykon and Kondinin plants were in full bloom, and the F₂ populations had some plants in each flowering stage from vegetative to full bloom. All plants of the four F₂ families reached full bloom during the 5-week period from 20 Mar. to 26 April. This presented an excellent opportunity to select late flowering in combination with high winter growth. The average size (diameter) of Overton R18 plants on 2 Feb. was about 25% less than the cultivars Kondinin and Hykon. This illustrates the poor winter growth of Overton R18 and shows the potential for improvement using selections from the F₂ families. A wide range of selections with different combinations of seasonal growth and flowering were made among F₂ plants for continued evaluation in later generations.

The F₃ generation was evaluated in 1996. Average plant diameter for each entry, measured on 9 Feb., ranged from 4.7 to 12.0 cm for Overton R18 and F₃ line R17-14, respectively. Hykon had the best winter growth of the rose clover cultivars evaluated with a diameter of 9.8 cm. Fourteen F₃ lines were identified with winter growth equal to, or better than Hykon.

Minimum temperatures dropped below -8 C on 3 days in Jan. 1996 and below -6.5 C on 3 days in Feb. 1996. These low temperatures caused severe damage to Hykon and Kondinin rose clover and resulted in stand losses of 69 and 46%, respectively. Cold damage to Overton R18 was moderate and stand loss was 28%. Four rose clover F₃ lines were identified with less than 10% winter damage, less than 20% stand loss and winter growth equal to Hykon.

Application. These experiments indicate that there is genetic potential in rose clover for improved combinations of late maturity, full season forage production and tolerance to northeast Texas winter temperatures. A new cultivar release of rose clover is planned using the germplasm identified in these experiments.