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Texas Agricultural Experiment Station
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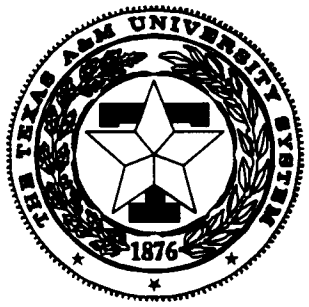

April 16, 1998

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EVALUATION OF WATERLOGGING TOLERANCE IN EIGHT CLOVER SPECIES

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Background. Clover roots are often damaged by low soil oxygen conditions imposed by flooding or waterlogging stress. Waterlogging occurs most frequently on sites with a combination of poor surface and internal drainage (clay soils in bottomland areas). Heavy winter rain can cause waterlogging under a wide range of soil conditions but the duration and severity of the flooding is dependent on the weather pattern. The waterlogging tolerance of white clover has been evaluated in detail and reductions in plant survival and forage production noted when exposed to flooding for 20 days or more. Rose clover is reported to be more susceptible to waterlogging stress than other annual clovers. More information is needed on the relative watelogging tolerance of clovers currently used in East Texas. The objectives were to evaluate waterlogging tolerance of crimson, arrowleaf, rose, red, white, ball, persian, and berseem clover.

Research Findings. Individual plants were grown in a sand-vermiculite (1:1.5) mix amended with P, K and lime and contained in plastic growth cells (1 x 1 x 5.5 in). Germinated seed of each clover entry (plus Rhizobium inoculum) were planted in a randomized block design with two replications of six plants. The factorial arrangement of treatments included ten clover entries and three flooding treatments. The flooding treatments were: CK = no flooding, harvest at 70 days; T0 = flooded, harvest at 70 days; T5 = flooded after 35 days, harvest at 70 days. In the flooding treatments, the growth cells were submerged in water for 5 in. of the 5.5 in. height. After 70 days of growth under greenhouse conditions, root growth was measured and expressed as a percent (100 = root growth to bottom of growth cell). Top growth was harvested, dried and dry weight per plant calculated. Root growth of persian and berseem clover were not affected by the flooding treatments but rooting of crimson and rose clover was severely reduced by waterlogging stress (Fig. 1).

Root growth of ball, white, arrowleaf and red clover was reduced by flooding from 20 to 50%. Root growth of crimson, rose and red clover was damaged more when flooding was delayed (T5 treatment) compared to continuous (T0 treatment). Under continuous flooding root growth of crimson, rose, and red clover exhibited some adaptation to the waterlogging stress. Top growth response of the clovers to flooding followed the same pattern as root growth (Fig. 2).

Application. Persian, berseem, and white clover are best choices for clovers to plant on wet, poorly drained sites. These clovers will grow and be productive under waterlogging conditions. Crimson, rose, arrowleaf, red, or ball clover should not be planted on sites that can become severely waterlogged or flooded.

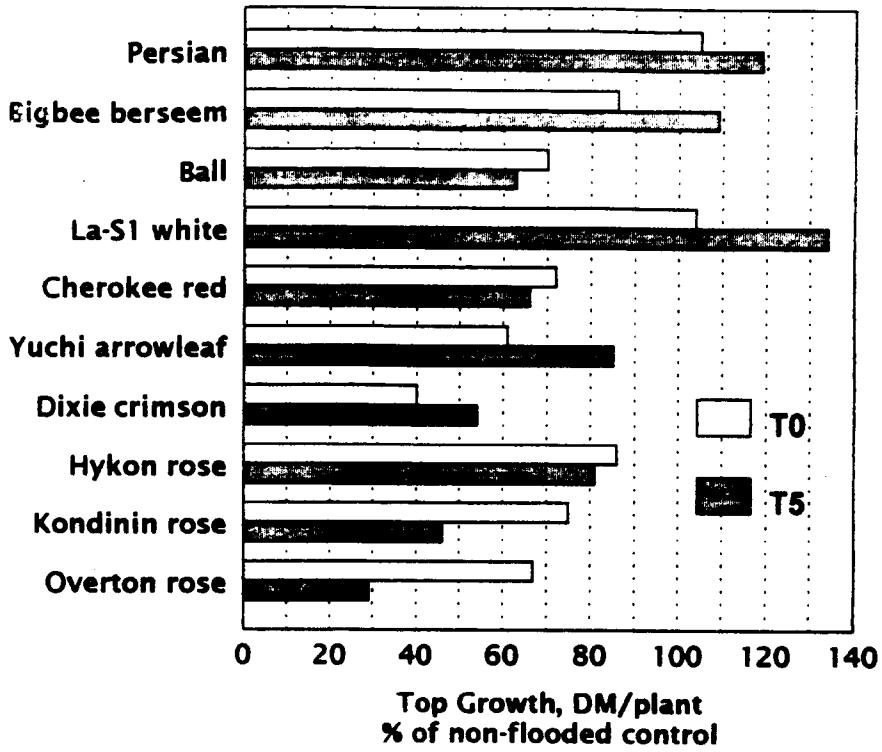

Figure 1. Top growth of eight clover species in two flooding treatments. T0 = continuous flooding, harvest at 70 days. T5 = flooded after 35 days, harvest at 70 days.

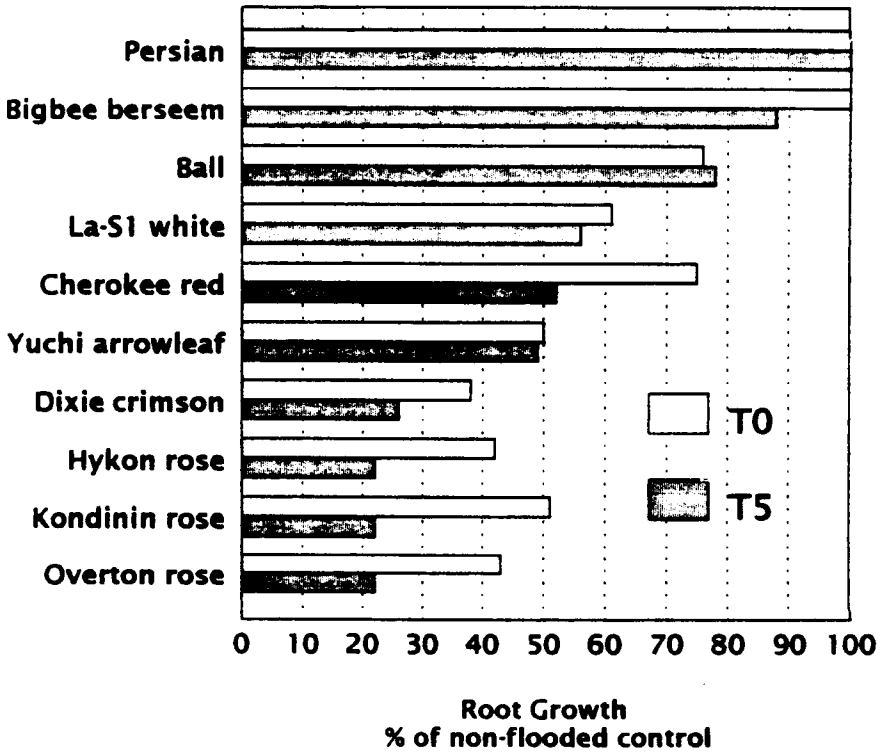

Figure 2. Root growth of eight clover species in two flooding treatments. T0 = continuous flooding, harvest at 70 days. T5 = flooded after 35 days, harvest at 70 days.