DETERMINATION OF WATER USE COEFFICIENTS OF COMMON LAMBSQUARTERS, FIELD PENNYCRESS AND HENBIT AS AFFECTED BY FRACTION TRANSPIRABLE SOIL WATER LEVEL AND GROWTH STAGE. Venkatarao Mannam, Mark L. Bernards, John L. Lindquist and Timothy J. Arkebauer, Graduate Research Assistant, Assistant Professor, Associate Professor and Associate professor, department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68588.

Water use efficiency is the ratio of total crop biomass (B) to water consumed, expressed as transpiration (T). The transpirable soil water is the amount of water available for plant growth and development and represents the difference between field capacity and the permanent wilting point. Water stress can be imposed by maintaining the soil water level of an experimental unit at a predetermined Fraction of Transpirable Soil Water (FTSW). A variable that defines the relationship between B and T is the crop water use coefficient (Kc). A crop water use coefficient can be calculated using cumulative transpiration, total dry biomass accumulation and seasonal day time vapor pressure deficit. Water use coefficient values are available for some crop species, but they are not available for most weed species. If we know the Kc value for a weed species we can then calculate how much it transpires for a given biomass. Little data is available describing the relationship of water stress or plant growth stage on the Kc. A greenhouse experiment was conducted at Lincoln, NE, in a completely randomized factorial design with 6 replications, 4 FTSW levels (0.3, 0.4, 0.7 and 1) and 2 harvesting times (first bloom and seed maturity) and was conducted twice for each species. Environmental conditions (temperature, relative humidity and photosynthetically active radiation) were recorded by a Watchdog model 2475 plant growth station. Three species (field pennycress, common lambsquarters and henbit) were planted individually in plastic pots filled with soil mixture and were thinned to one per pot. Once plants reached a predetermined growth stage, they were bagged at the base to eliminate evaporation from the soil and a syringe was inserted to allow access for daily watering. Daily transpiration was measured by weighing each pot, and water was added to bring the experimental unit back to the predetermined FTSW level. Cumulative transpiration was calculated by adding the daily transpiration rates. Plants were harvested either at first bloom or seed maturity. Leaf area, plant height and total dry biomass (shoots and roots) were recorded at the time of harvest. Kc values were higher at the time of flowering compared to seed maturity for a given level of water stress. In addition, as the FTSW increased from 0.3 to 1.0, Kc values decreased.

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