

A Pattern of Root Distribution by Yellow Starthistle

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Abstract. Yellow starthistle is a late season non-native annual forb that is common throughout much of California. The roots of yellow starthistle begin growth in late fall and continue until late spring or early summer. The soil moisture use pattern of yellow starthistle may inhibit native perennial bunchgrasses and other deep-rooted native perennial species from establishing in mesic regions of California. Field studies were conducted near Davis, California to determine the annual rooting and soil moisture use pattern of yellow starthistle. Roots of yellow starthistle were monitored in the field using a rhizotron chamber with a viewing window covering about a two-meter square area below the soil surface. Root numbers were counted bi-weekly beginning in spring following the installation of the root chamber and the appearance of roots on the glass window and ending in mid-summer with senescence of yellow starthistle. Soil moisture was monitored with a neutron probe at 30, 60, 90, 120, 150 and 180 cm depths. The total number of roots (new and old) continued to increase from late April to early May, which coincided with rosette and bolting stages for yellow starthistle. As yellow starthistle plants went from bolting to flowering in late May to mid July, total number of roots declined from 827 roots/cm² to 636 roots/cm². Total root numbers in the 0 to 60 cm and greater than 60 cm depth declined after April and peaked in May, respectively. Soil moisture content declined at all depths from April to July. From April to May, the greatest decline in soil moisture content occurred between 60 to 150 cm, at the same time that a spike in root growth occurred. Soil moisture decline continued less dramatically at depths greater than 150 cm and after June. In this study, yellow starthistle is using a greater amount of water from deep in the soil profile during the short period between late spring and early summer when plants are bolting. The short period of high soil moisture use by yellow starthistle maybe a mechanism for quick re-generation when cut or grazed and faster use of available soil moisture compared to a slower absorbing native perennial bunchgrass.