

Development of Safflower (*Carthamus tinctorius* L.) as a New Winter Crop for the Texas High Plains

¹J.S. Oswalt, ^{1,2}D.L. Auld, ^{1,2}C.W. Bednarz, ³R.C. Johnson, ¹Zach Hinds, ⁴Paxton Payton

¹Plant and Soil Science Department, Texas Tech University, Lubbock, TX 79409-2122; ²Texas AgriLife Research, Lubbock, TX 79403; ³USDA-ARS, Western Regional Plant Introduction Station, Pullman, WA 99164-6407; ⁴USDA-ARS Plant Stress & Water Conservation Laboratory, Lubbock, TX 79415.

A need for crops that produce vegetable oil for biofuel, as well as a crop that is water use efficient is imperative, especially if that crop could be grown during winter months to reduce demand on the Ogallala aquifer during peak summer months. The purpose of this research is to evaluate eight accessions of safflower exhibiting winter hardiness for water use efficiency under variable irrigation rates, while determining oil yield and quality potential for biofuel production. Data gathered will be used to establish safflower as a new winter crop for the Texas High Plains. On September 15, 2007, eight accessions of safflower were planted in a randomized split block design. Irrigation rates were established as water replacement in approximately 10 mm increments above natural rainfall. The trials were planted on subsurface drip irrigation, with tape injected 20-25 centimeters below root zone on one meter centers. Irrigation rates were 67mm, 82mm, 94mm, 106mm, and 139mm. The purpose of the irrigation regimes was to determine water use efficiency as a function of seed yield. Also, each accession was evaluated for winter survivability, maturity date, oil content, and fatty acid profile for each irrigation treatment. The selected safflower accessions demonstrated high water use efficiency as well as significant winter survivability, with maturity comparable to winter wheat, harvest occurring in late June and early July. Seed yields were significantly higher, as much as four times the yield of summer safflower grown under similar irrigation rates in summer. Oil content demonstrated lower oil percentages than summer grown safflower, with comparable fatty acid profiles. This research will allow farmers to incorporate a new winter crop into their crop rotation strategy that is profitable as well as high in water use efficiency.