

## **STEEP PROGRESS REPORT-2004**

**RESEARCH PROJECT TITLE:** Identifying Alternate Rotation Crops for Eastern Oregon

**INVESTIGATORS:**

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**INTERIM OR FINAL REPORT:** Interim

**PROJECT OBJECTIVES:**

1. Obtain alternate crop seed from areas with similar climate to eastern Oregon and from breeders at OSU, WSU and UI.
2. Evaluate the adaptability of alternate crops to growing conditions in eastern Oregon
3. Establish basic agronomic practices of commercially promising alternate crops under reduced tillage systems.

**KEYWORDS:** Alternative crops, rotation

**STATEMENT OF PROBLEM:** Detrimental effects of the wheat/fallow rotation can be alleviated by the introduction of alternate crops that reduce or replace the fallow. Research is needed to screen and evaluate alternate crops such as chickpeas, winter pea, lentil, faba beans, sunflowers, safflower, soybean, millets, buckwheat, linola, grasses, and other crops with industrial and pharmaceutical uses. These crops have been tried before and screening of some of these crops dates back to the 1930s. However, the screening had problems with stand establishment, agronomy, and other problems associated with vernalization and day-length requirements of some of the crops. Given the improvement in germplasm and the agronomy over the years, it is worthwhile to have another round of screening in eastern Oregon. Benefits of these crops to wheat-based rotations are not fully known and research should be done to obtain this information.

**AGRONOMIC ZONE OF INTEREST:** Research will be targeted for Agronomic zones 3 and 5.

**ABSTRACT OF RESEARCH FINDINGS:**

Alternative crops that include chickpea, buckwheat, flax, lentils, linola (flax), lupin, millet, mustard, safflower, and sunflower, were evaluated for adaptability to eastern Oregon conditions over three years (2002 to 2004) at the Columbia Basin Agricultural Research Center (CBARC). The *desi* chickpea (Myles), safflower and sunflower produced high yields under both fallow and re-crop conditions at both sites. The benefits of these crops to wheat in rotation are now being evaluated.

**RESULTS AND INTERPRETATION**

Alternative crop species were evaluated at CBARC, in Pendleton and Moro, in 2002, 2003, and 2004. At Pendleton, crop year precipitation was 13, 16, and 20 inches in 2002, 2003, and 2004,

respectively. At Moro, crop year precipitation was 8, 9, and 12 inches in 2002, 2003, and 2004, respectively. The crops were grown after fallow at Moro and as a re-crop at Pendleton.

In 2002, safflower and chickpea (*Myles-desi*) produced the highest grain yields at both Pendleton (Fig. 1) and Moro (Fig. 2). The safflower yields were higher at Moro than at Pendleton and the reverse was true for chickpea. The actual yields of sunflower could not be determined because of bird damage. Buckwheat is indeterminate and grains do not mature uniformly. As a result it was difficult to harvest the grain. The millet was late-maturing and experienced more drought stress than the other crops. Lupin was too short and made harvesting very difficult. Linola yields were low probably due less than optimum plant population. Linola covers the ground really slowly and weed competition can be a problem. Mustard produced better yields at Moro than at Pendleton.

In 2003, safflowers and sunflowers produced the highest grain yields at both sites (Fig. 1 and 2). For some reason, sunflower bird damage was minimal in 2003. The chickpea variety *Myles* was not evaluated in this trial in 2003 because it was included in an adjacent chickpea variety trial. In that trial *Myles* produced about 1000 and 800 lbs/a at Pendleton and Moro, respectively. Grain yields of mustard, linola, and flax were higher at Pendleton than at Moro (Fig. 4, 5).

In 2004 only crops with the greatest potential were evaluated. Lentils were also included. Lentils produced the highest grain yield at Pendleton, where precipitation was high (20 inches) but yielded relatively low yields at Moro where the precipitation was 8 inches less (Fig. 5). Chickpeas produced high grain yields at both sites, but yields were slightly less at Moro than at Pendleton. Yields of safflower were reduced because of low plant population. Bird damage on sunflower was severe and no yields were obtained. Mustard yields were higher in Pendleton than in Moro (Fig. 5).

After three years of evaluating alternative crops, our results indicate that chickpea (*Myles*), safflower, and sunflower have the greatest potential for growing in eastern Oregon under the conditions of our study. These crops produced high grain yields even under low moisture conditions. Lack of markets, however, is the main constraint in growing these crops. Bird damage is a big problem when growing sunflower. A rotation experiment that evaluates the benefits of safflower and chickpea to wheat has been initiated at Moro. Buckwheat may not be suitable for grain production but can be used as a cover crop; it is fast growing and covers the soil quickly. Lupin is a promising crop but it is too short for combine harvesting. Flax and linola have the potential to be high value alternative crops but they are poor competitors with weeds. Grain yields can probably be increased by agronomic manipulations (increased seeding rates and narrow row spacing).

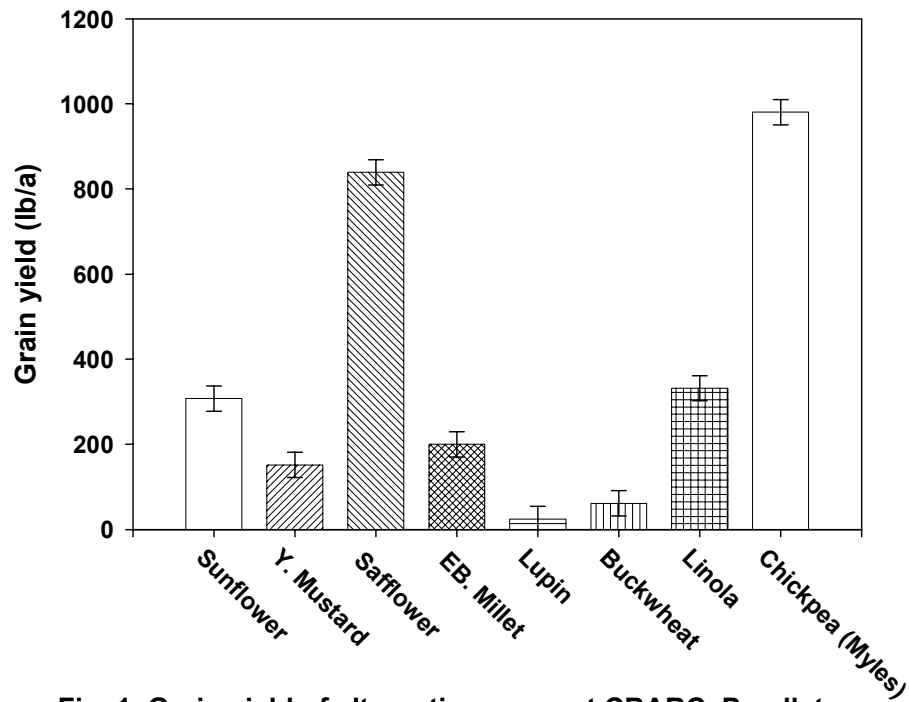


Fig. 1. Grain yield of alternative crops at CBARC, Pendleton in 2002.

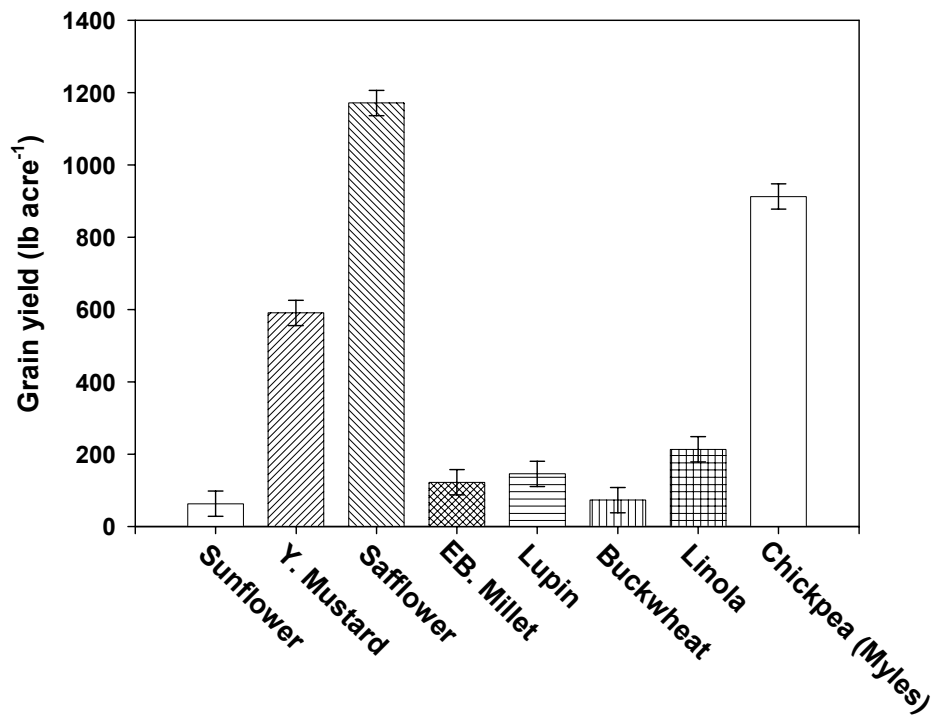


Fig.2. Grain yield of alternative crops at CBARC, Moro in 2002

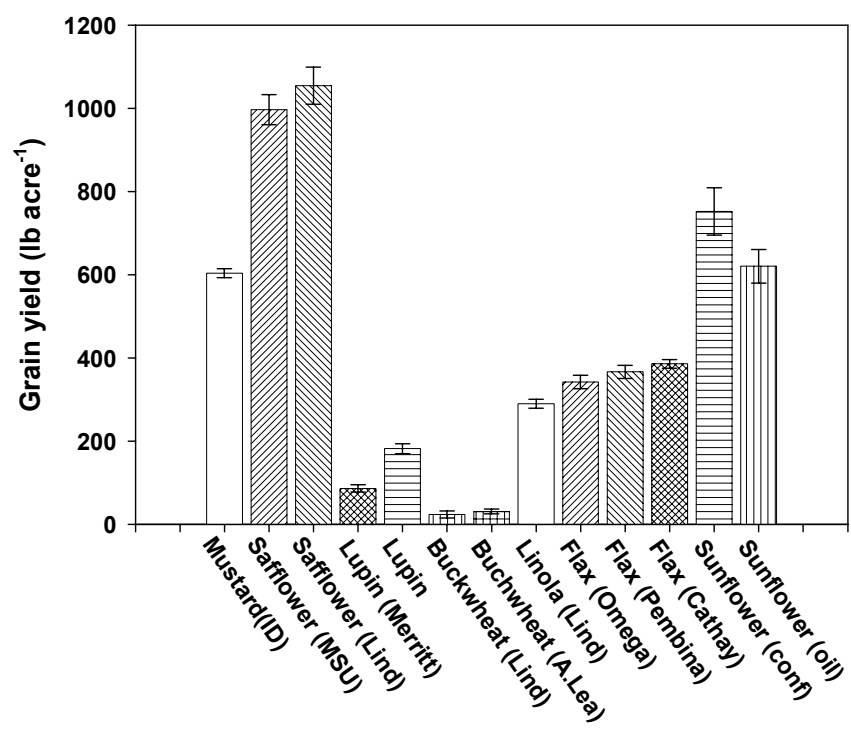


Fig. 3. Grain yield of alternative crops at CBARC, Pendleton, 2003

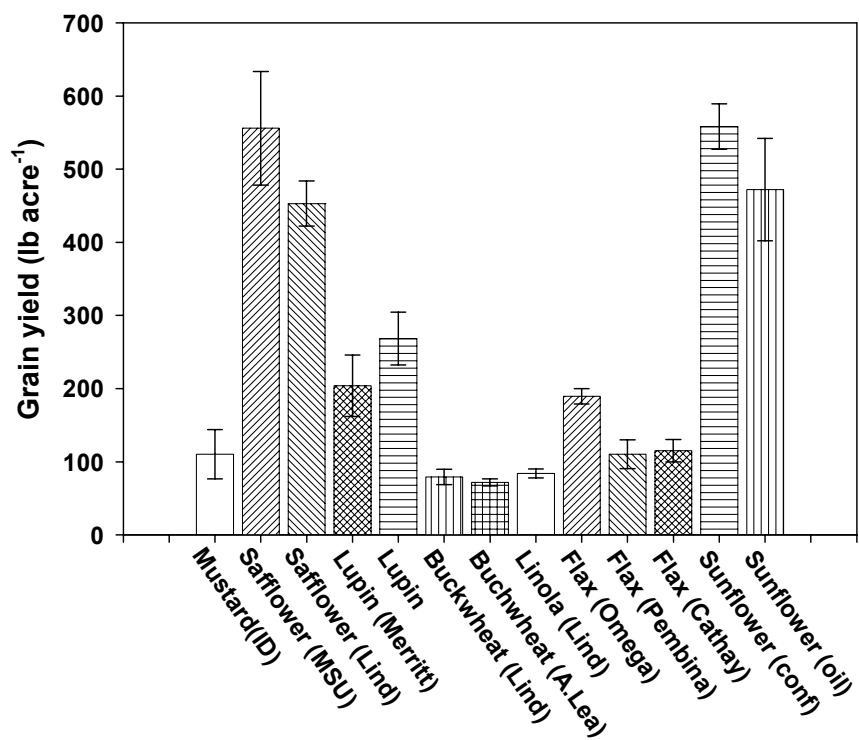
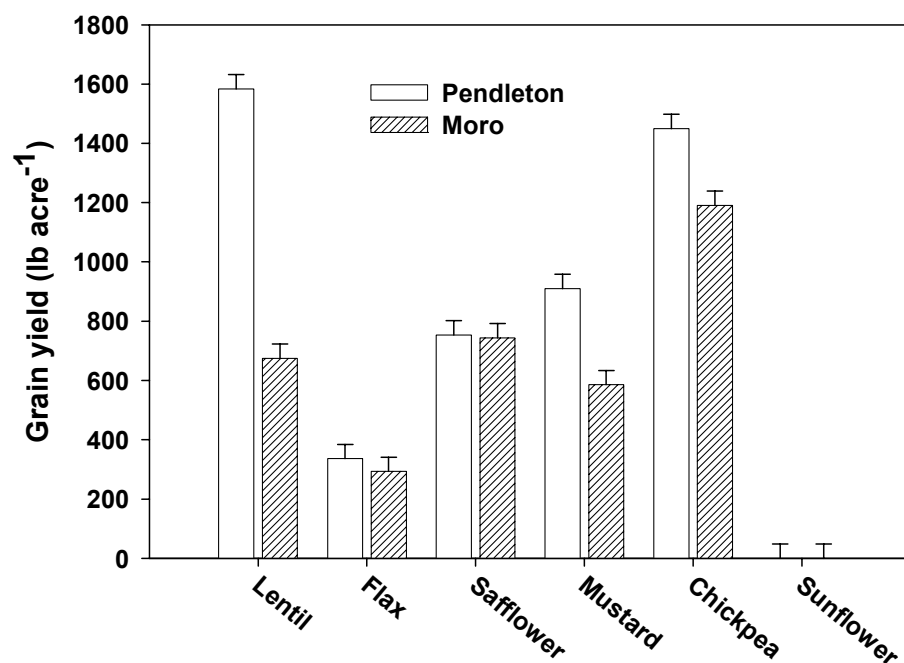


Fig. 4. Grain yield of alternative crops at CBARC, Moro, 2003



**Fig. 5. Grain yield of alternative crops grown at Pendleton and Moro in 2004**

**INTERACTION WITH OTHER SCIENTISTS CONDUCTING RELATED**

**ACTIVITIES:** The PI is cooperating with: Brian Tuck, Wasco County Extension Agent, OSU, Sandy Macnab, Sherman County Extension Agent, OSU, Jordan Maley, Gilliam County Extension Agent, OSU on evaluating alternate crops in eastern Oregon; ICARDA scientists on the Legume International Nursery, Syria.

**PUBLICATIONS AND PRESENTATIONS:**

**Machado, S.** 2004. Potential Alternative Crops for Eastern Oregon. Oregon Agricultural Experiment Station Special Report 1054: 84-102.

**Machado, S.,** Christopher Humphreys, Brian Tuck, and Mary Corp. 2004. Evaluating Chickpea (Garbanzo Bean) for Adaptability to Eastern Oregon. Oregon Agricultural Experiment Station Special Report 1054: 35-43