PROJECT TITLE: 2014 Chemical/Chemical-free spring wheat and safflower (4W4640)

PRINCIPAL INVESTIGATOR:
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OBJECTIVES: To evaluate and compare spring wheat and safflower production under chemical-free conditions with conventional production practices which uses chemical fertilizers and pesticides.

PROCEDURE: This study began in 1990 to compare production of safflower and spring wheat using chemicals (pesticides and fertilizers) with chemical-free production. The chemically produced wheat and safflower were planted in eight-inch rows and chemicals were used as needed. Chemical-free wheat and safflower were planted in 24-inch rows, and cultivated for weed control. In 1994 and 1995, strips of black medic and common yellow sweet clover were included in both the chemical and chemical-free spring wheat and safflower. The legumes were used to provide nitrogen to the crop, and to provide a green manure crop in the fallow year. Sweet clover is a biennial that is low-growing in the crop year, and has good regrowth early in the fallow year. Black medic is an annual that easily reseeds itself in the fallow year. Thus, both legumes can be planted with the crop without planting in the fallow year. Common yellow sweet clover was eliminated from the study in 1996, but black medic was included in 1996 and 1997. Black medic was eliminated from the study in 1998. In 1999, chemical-free spring wheat was planted in 8-inch rows that were planted in perpendicular directions so that the wheat could compete with the weeds. This weed control was very successful, and eliminated cultivation. The chemical-free wheat has been planted this way ever since. In 2001 and 2002, spring wheat was planted where the safflower had previously been planted and safflower was planted where the spring wheat had previously been planted, so that the chemical-free spring wheat planted in two directions could out-compete weeds in the chemical-free safflower plots. This helped control some of the weeds in the chemical-free safflower. Greenfix chickling vetch was planted on May 4, 2005, in part of each chemical and chemical-free area, and incorporated as green manure in mid-June of 2005. In 2012, the rotation was changed to fallow/spring wheat/safflower. The safflower was planted in perpendicular directions for weed control. In 2013, a very wet spring prevented planting of safflower and hail badly damaged the spring wheat. In 2014, weeds were very bad in the safflower, even the safflower that had been chemically treated.

Precipitation April – August, 2014: 10.57 in
Ave (65 yr) precipitation April – August: 9.67 in
Precipitation September 2013 – August 2014: 13.59 in
Ave (65 yr) precipitation September – August: 14.11 in
Comments:
Conditions were wet at planting. May and August had much above average rainfall.

Table 1. Site information for 2014.

treatment	Chemical spring wheat	Chemical-free spring wheat	Chemical safflower	Chemical-free safflower	Chemical peas	Chemical -free peas
Soil N to 36 in, lb/a	54.5	54.5	54.5	54.5	54.5	54.5
Soil P to 6 in, ppm	32.3	32.3	32.3	32.3	32.3	32.3
Applied fertilizer	50 lb N/ac	none	30 N/ac	none	none	none
Weed control	Full Deck 16 oz/a Axial 16 oz/a, Jun 10	perpendicular rows	Sonolan 2 pt/a Apr 17	perpendicular rows	Sonolan 2 pt/a Apr 17	disk
Fungicides	none	none	none	none	none	none
Variety	Duclair	Duclair	Cardinal	Cardinal	Cruiser	Cruiser
Planted	Apr 25	Apr 25	May 12	May 12	May 9	May 9
Harvested	Aug 12	Aug 12	Sep17	Sep 17	disked Jul 3	

RESULTS: Conventional spring wheat had significantly lower test weight and higher protein than chemical-free spring wheat (Table 2). The chemical spring wheat was taller and had greater yield than chemical-free spring wheat, but these differences were not significant.

Conventional safflower was taller and had greater yield then chemical-free safflower. The chemical-free safflower had higher test weight.

Table 2. Yield and quality of Duclair spring wheat grown with and without chemicals in 2014.

	height, cm	test wt, lb/bu	grain protein, %	yield, bu/ac
chemical	74.3	59.8a	11.92 b	41.7
chemical-free	69.5	61.5 b	8.52a	34.2
probability	0.137	0.001	0.004	0.175

Values in the same column with different letters are significantly different at a probability of 0.05.

Table 3. Yield of Cardinal safflower grown with and without chemicals in 2014.

treatment	height, cm	test wt, lb/bu	Yield, lb/ac
chemical	50.5	39.3	534
chemical-free	45.0	41.0	283
probability	0.279		0.133

SUMMARY: This is a long-term study evaluating spring wheat and safflower production under chemical and chemical-free conditions. A green-manure crop was incorporated into the study to provide nitrogen for the chemical-free treatment.

FUNDING SUMMARY: Expenditure information to be provided by OSP. No other grants support this project.

MWBC FY2015 GRANT SUBMISSION PLANS: It is planned to submit this project for funding consideration in the next fiscal year.