

Optimum Seed Rate for Irrigated Confectionary and Oilseed Sunflower in the Texas High Plains

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TEXAS HIGH PLAINS SUNFLOWER

Sunflower production in Texas ranges from ~40,000 A/year to near 100,000 A/year. Producers may cite numerous reasons to not consider sunflower (negative prior experience, distance from markets, etc.). The drought tolerance and water scavenging abilities of sunflower, however, make it suitable for cropping, particularly when rainfall and irrigation are limiting.

Observations in Texas suggest that many producers appear to plant too much seed. In dry years individual plants appear to place more growth into vegetation and these same plants yield less. Numerous crops in the Texas High Plains benefit from limited plant population as an agronomic means to produce profitability even in near-drought conditions.

Furthermore, economic yields are of concern for confectionary sunflower—2/3 of Texas production—due to nearly twice the value of large seed. The value of any sunflower crop is compounded by the sporadic nature of rainfall, high evapotranspiration, and low soil moisture holding capacity in these sandy soils. Numerous producers, however, often gauge seeding rates based on states' Extension recommendations further north or what seem to be high seeding rates sometimes recommended by seed companies.

OBJECTIVES

- 1) Test a range of seeding rates for oilseed and confectionary sunflower production to determine agronomic rates for hybrid sunflower in the Texas High Plains.
- 2) Determine the economic seeding rate as a response to each year's cropping conditions due to drought, low rainfall, irrigation timing, etc.

HOW THE STUDY WAS CONDUCTED

A range of seeding rates was chosen in consultation with industry partners. Test sites of the Texas Agric. Experiment Station were used. Fields were fertilized before planting (Tables 1 & 2) and pre-watered if necessary. Seed was packaged per plot using a seed counter then dropped through cone planter units mounted on a John Deere Max Emerge 7100 planter. Irrigation timing responded to rainfall or lack thereof. In particular, irrigations were timed near initial bud (~0.5" diameter) and early bloom. All sites were sprayed with a pyrethroid/parathion mix at least once during early bloom.

Plant stands were noted. Field plots were hand harvested, then threshed through an Almaco thresher, and cleanout was determined. We thank Red River Commodities, Lubbock, TX for reporting confectionary seed sizing, and Triumph Seed Co., Ralls, TX for oil analysis. Statistical analysis was performed using Fisher's Protected LSD (ANOVA) at $\alpha = 0.05$.

Table 1. Methods and site description of Texas Panhandle (Etter) irrigated and oilseed sunflower seeding rate trial, 2001-2003.

Site Description	2001	2002	2003
Location	TAES-Etter	TAES-Etter	TAES-Etter
Soil Type	Sherman silty clay pH 8.0, OM 1.4%	Sherman silty clay pH 8.0, OM 1.4%	Sherman silty clay pH 8.0, OM 1.4%
Plots & Layout harvest middle 2 rows	10.0' X 50' 4 replications RCBD	10.0' X 33' 4 replications RCBD	10.0' X 33' 4 replications RCBD
Row Spacing	30"	30"	30"
NuSun Oil Hybrid Confectionary Hybrid	Triumph 652 RR 2213	Triumph 652 RR 2213	Triumph 652 RR 2213
Seeding Rate Confectionary / Oilseed (seeds/acre)	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000
Planting Date Harvest Date	12-Jun 17-Oct	10-May 9-Sep	2-Jun 16-Oct
P₂O₅ (lbs./A) N (lbs./A)	40 100	40 100	40 100
Furrow irrigation (in) Prewater?	3 for ~13" Yes	2 for ~8" No	3 for ~12" Yes
Rainfall (in.)	8.2"	6.5"	3.3"

Table 2. Methods and site description of Texas South Plains (Halfway) irrigated and oilseed sunflower seeding rate trial, 2001-2003.

Site Description	2001	2002	2003
Location Soil Type	TAES-Halfway Pullman clay loam pH 7.8, OM 0.5%	TAES-Halfway Pullman clay loam pH 7.8, OM 0.5%	TAES-Halfway Pullman clay loam pH 7.8, OM 0.5%
Plots & Layout harvest middle 2 rows	10.0' X 50' 4 replications RCBD	10.0' X 33' 4 replications RCBD	10.0' X 33' 4 replications RCBD
Row Spacing	30"	30"	30"
NuSun Oil Hybrid Confectionary Hybrid	Triumph 652 RR 2213	Triumph 652 RR 2213	Triumph 652 RR 2213
Seeding Rate Confectionary/Oilseed (seeds/acre)	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000	12,000 / 15,000 14,500 / 18,000 17,000 / 21,000 19,500 / 24,000 22,000 / 27,000
Planting Date Harvest Date	13-Jun 14-Oct	14-May 6-Sep	17-Jun 17-Oct
P₂O₅ (lbs./A) N (lbs./A)	40 100	40 100	40 100
Furrow irrigation (in) Prewater?	3 for ~11" Yes	2 for ~8" No	4 for ~15" Yes
Rainfall (in.)	6.6"	5.8"	1.6"

RESULTS AND DISCUSSION

Final economic analysis will be completed once 2003 confectionary seed data is available.

Confectionary Sunflower

Although trends both toward slightly higher yield as well as reduced yield were evident across the range of confectionary seeding rates, it appears that plant population did not have a consistent effect on yield in this trial (Figures 1 & 3).

Seeding rate had a major effect ($P < 0.0001$) in reducing the percentage of large seed confectionary sunflower (Figures 2 & 4). In both 2001 and 2002 (2003 not yet analyzed) large seed confectionary was reduced by as much 30% of the total seed.

Figure 1. Confectionary sunflower yield at five seeding rates, Halfway, TX, 2001-2003. For 'Year', $P < 0.0001$ (PLSD = 156 lbs./A), for 'Seeding Rate', $P = 0.1676$ (NS).

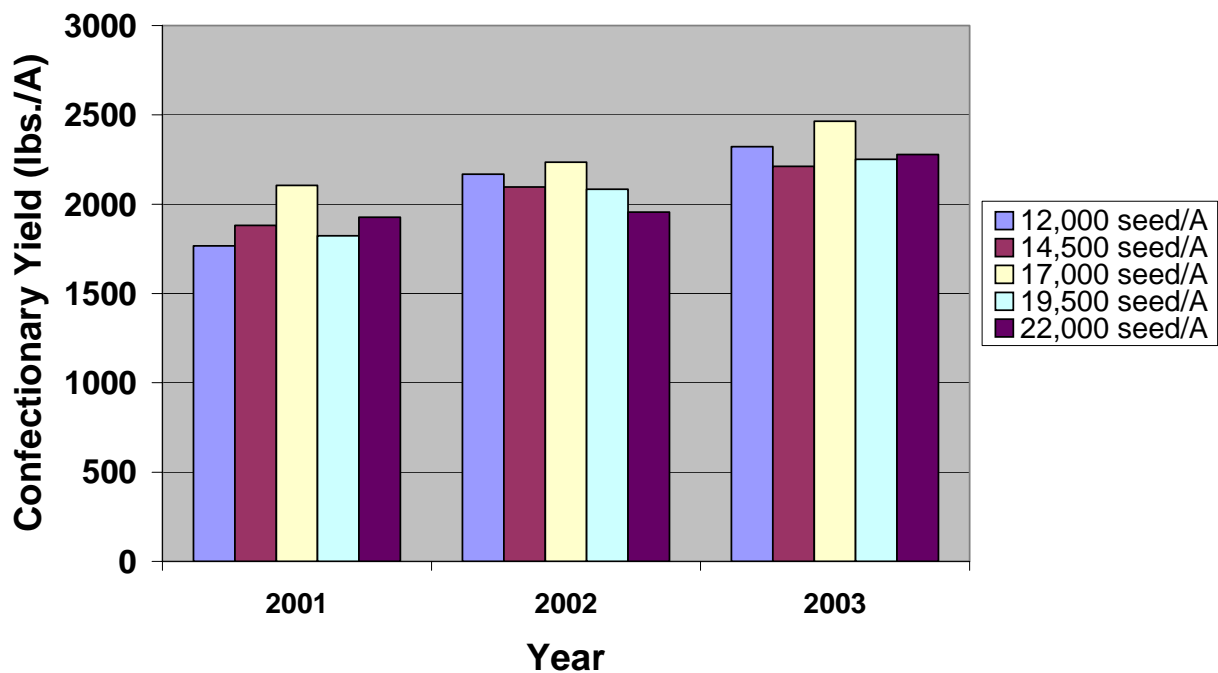


Figure 2. Confectionary sunflower seed size at five seeding rates, Halfway, TX, 2001-2003. For 'Year', $P < 0.0476$ (PLSD = 8.0%), for 'Seeding Rate', $P = 0.0105$ (PLSD = 12.7%). Year 2003 is not yet graded.

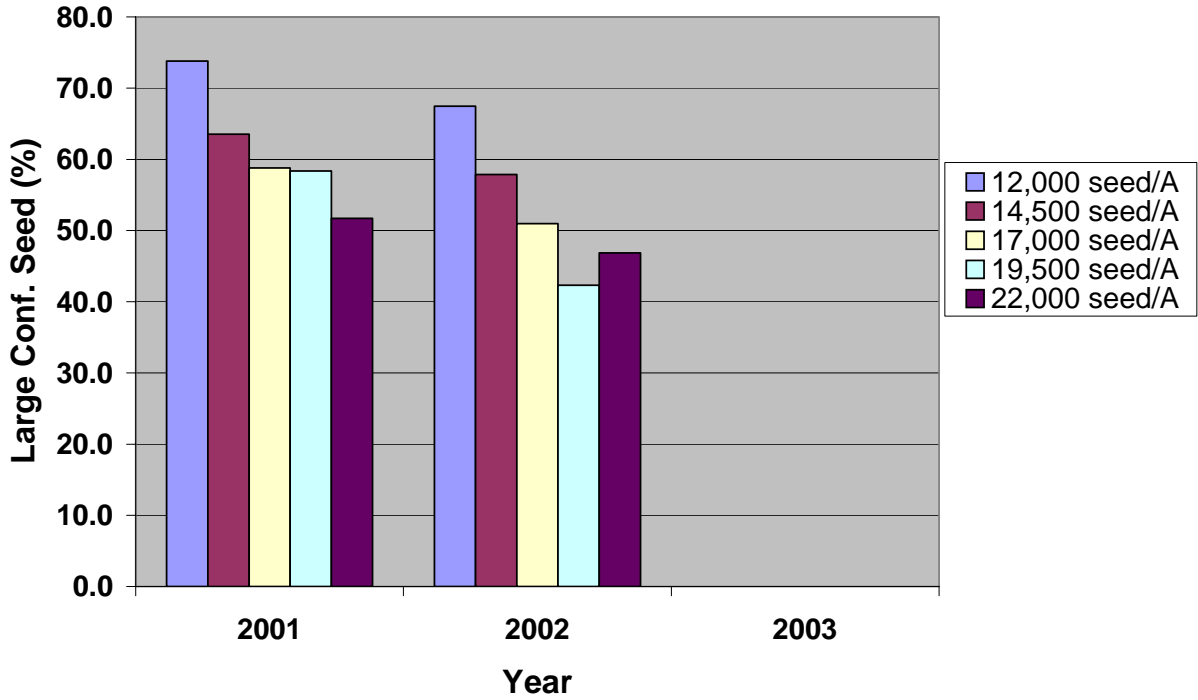


Figure 3. Confectionary sunflower yield at five seeding rates, Etter, TX, 2001-2003.
For 'Year', $P < 0.0001$ (PLSD = 190 lbs./A), for 'Seeding Rate', $P = 0.6668$ (NS).

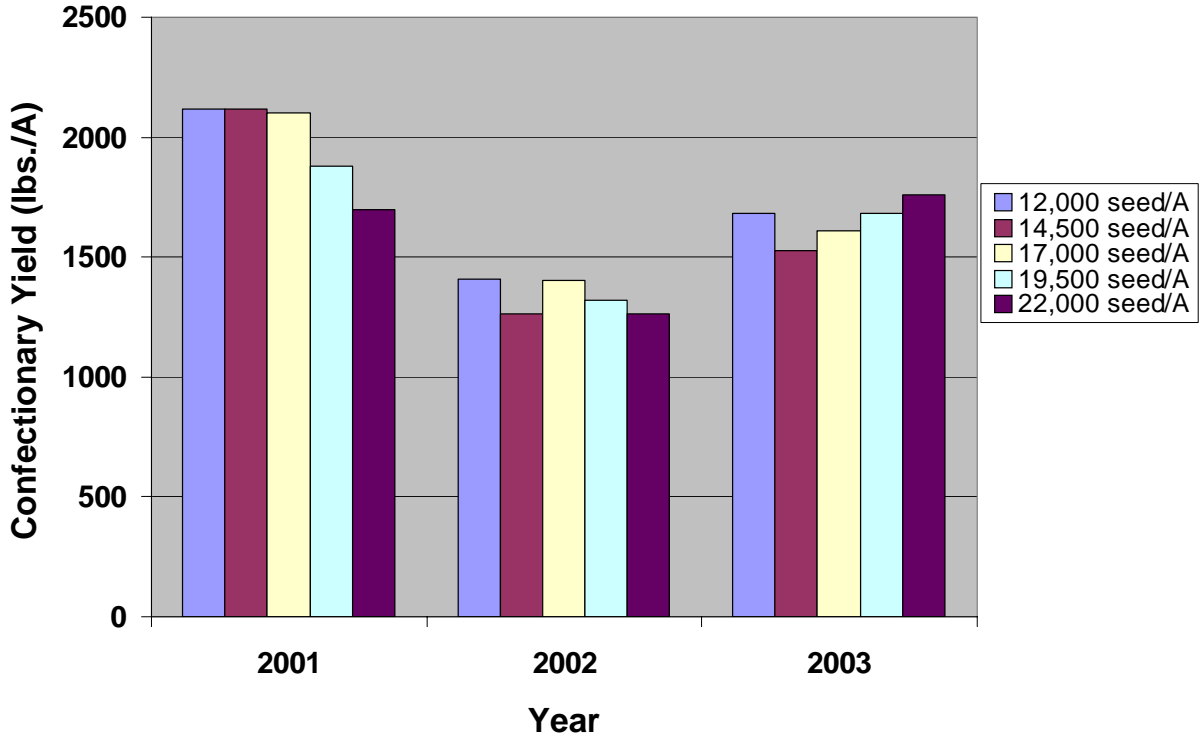
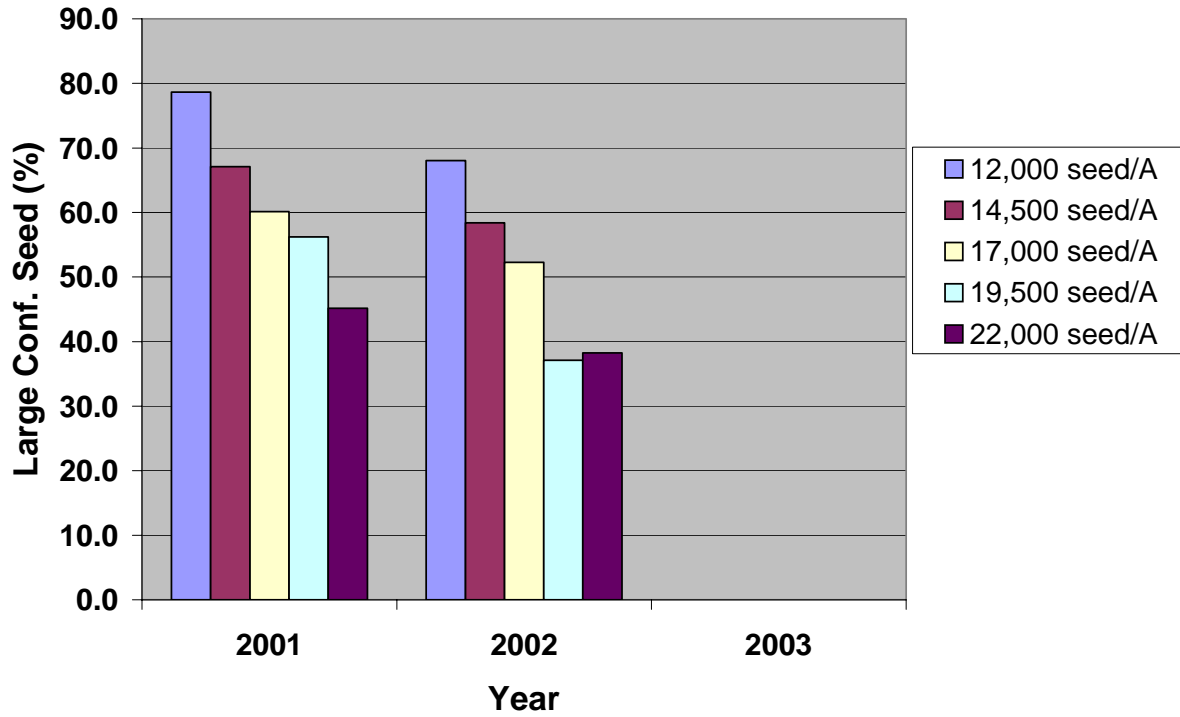


Figure 4. Confectionary sunflower seed size at five seeding rates, Etter, TX, 2001-2003. For 'Year', $P < 0.0109$ (PLSD = 8.0%), for 'Seeding Rate', $P = 0.0001$ (PLSD = 12.8%). Year 2003 is not yet graded.



Oilseed Sunflower

Overall, seeding rate (and the subsequent plant population) did not have a significant effect on oilseed yield (Figures 5 & 7). Among six site years, in only one year—when yields were the highest (Halfway, 2003) was a significant increase observed in oilseed yield with higher seeding rates.

Oil contents were mostly below 40% for this trial. A slight statistical trend was noted for oil content with increasing population (Figures 6 & 8).

Figure 5. NuSun oilseed sunflower yield at five seeding rates, Halfway, TX, 2001-2003. For 'Year', $P < 0.0001$ (PLSD = 186 lbs./A), for 'Seeding Rate', $P = 0.6363$ (NS).

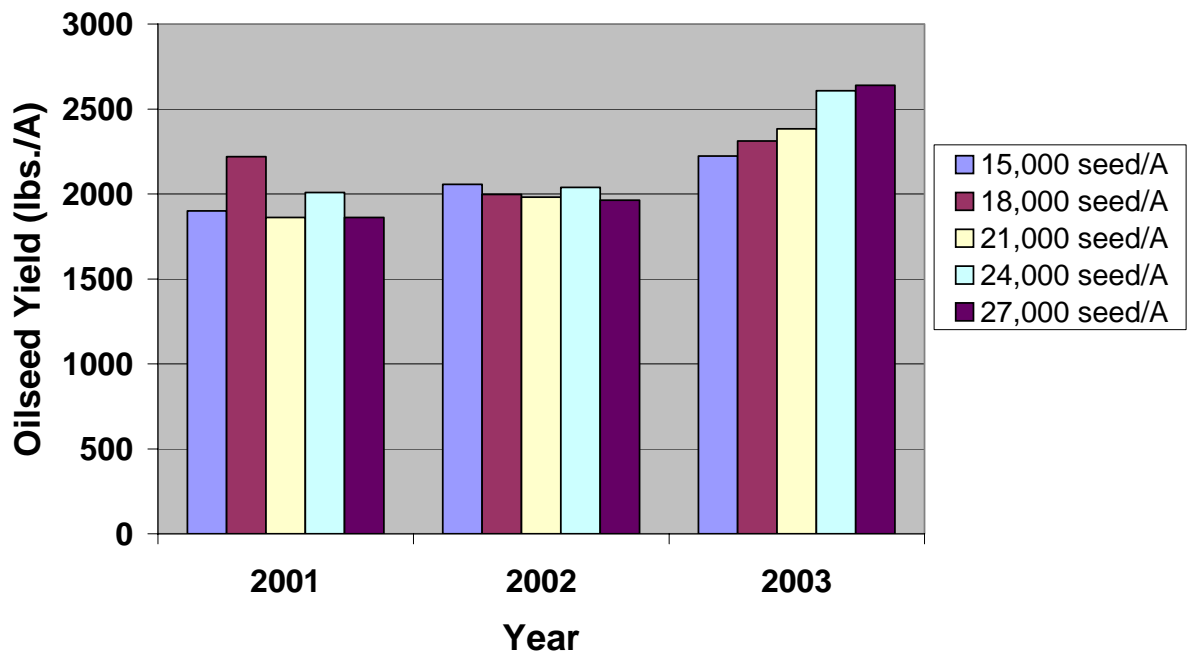


Figure 6. NuSun oilseed sunflower oil content at five seeding rates, Halfway, TX, 2001-2003. For 'Year', $P < 0.0001$ (PLSD = 0.6%), for 'Seeding Rate', $P = 0.0039$ (PLSD = 0.75%).

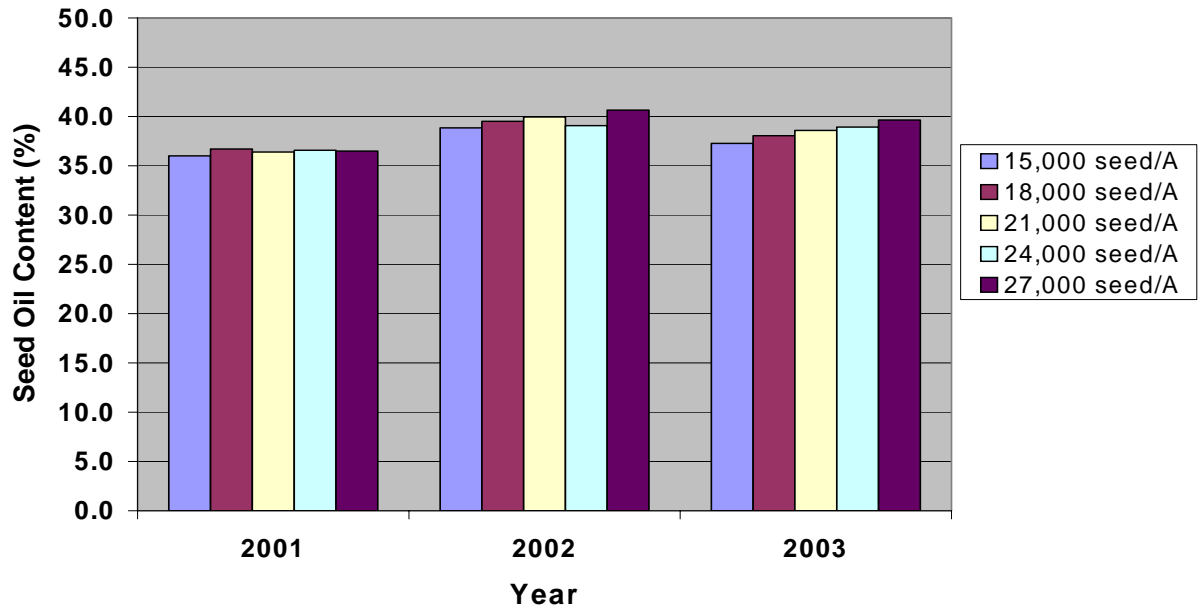


Figure 7. NuSun oilseed sunflower yield at five seeding rates, Etter, TX, 2001-2003.
For 'Year', $P < 0.0001$ (PLSD = 193 lbs./A), for 'Seeding Rate', $P = 0.6854$ (NS).

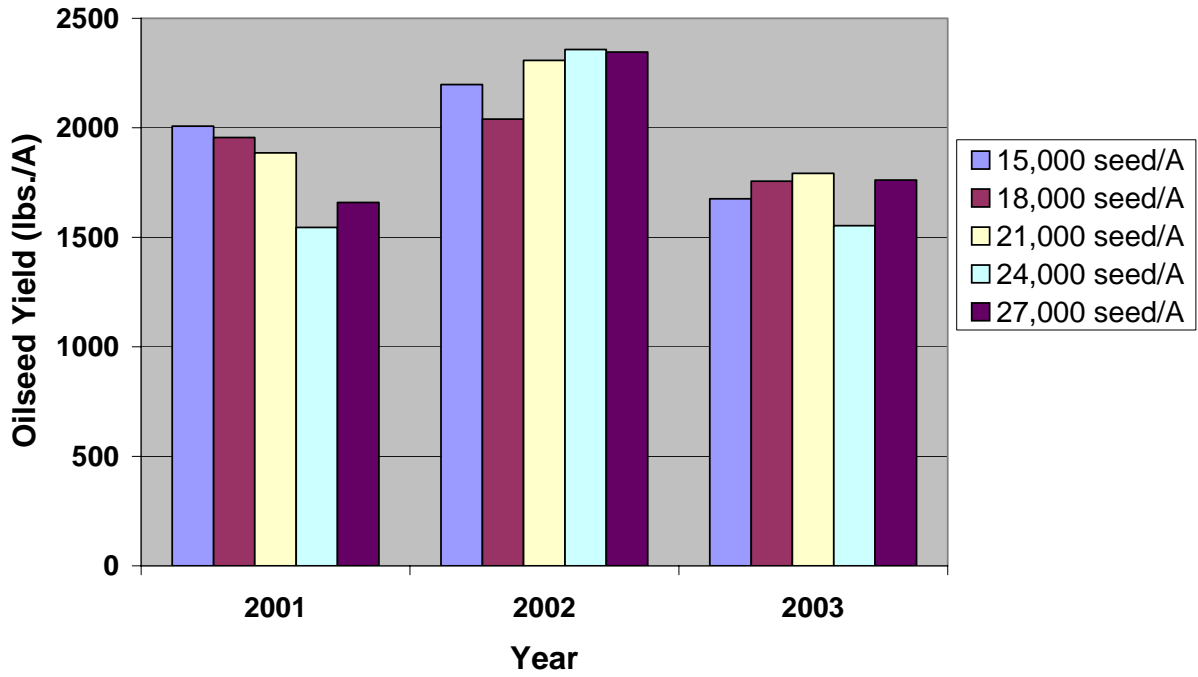
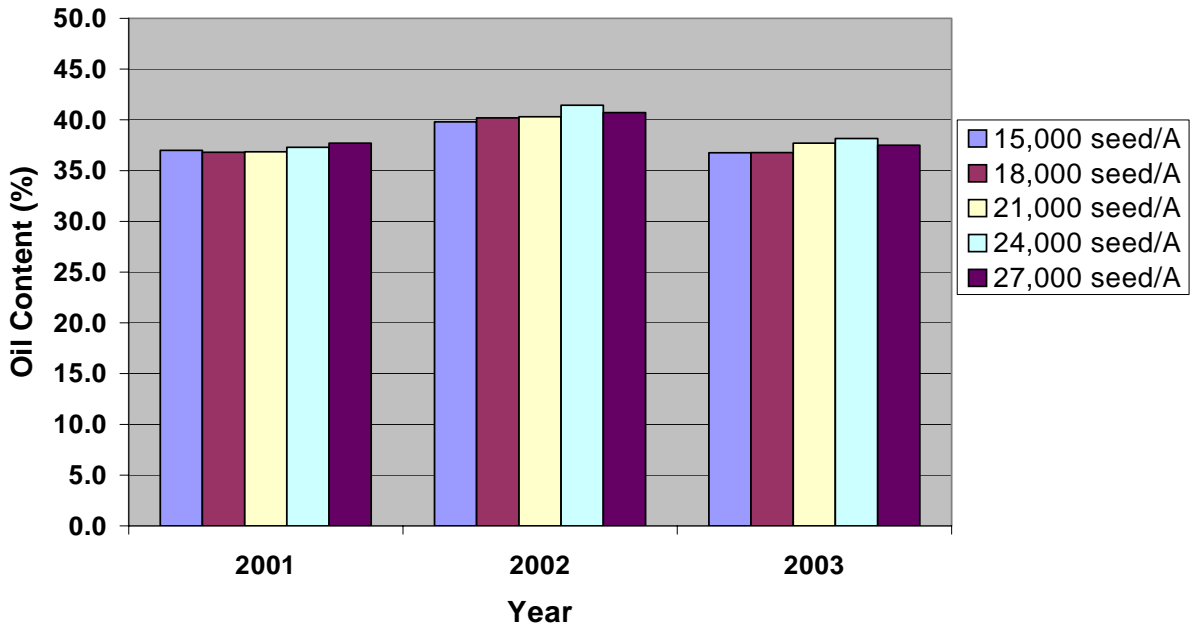


Figure 8. NuSun oilseed sunflower oil content at five seeding rates, Etter, TX, 2001-2003. For 'Year', $P < 0.0001$ (PLSD = 0.6%), for 'Seeding Rate', $P = 0.0208$ (PLSD = 0.8%).



BOTTOM LINE

Confectionary: It is extremely important to limit confectionary seeding rates to enhance large seed development. **“Less Is More”** explains how a lower yielding confectionary crop can have much more value, up to \$40/A more in this trial. In addition, the lower plant population confectionary crop can withstand droughty conditions better when they occur hence a lower seeding rate is a valuable risk management tool.

Oilseed: Management with reduced seeding rate in oilseeds appears to reduce seeding costs slightly, but does not appear to have a large effect on yield or economic return. Limited plant populations, however, may reduce risk in the driest of years, as more moisture per plant is available to make yield.