

A wide-angle photograph of a sunflower field. The sunflowers are in full bloom, with bright yellow heads and green leaves. The field stretches to the horizon under a clear, light blue sky. The sunflowers are densely packed, creating a textured sea of yellow and green.

Double-Crop Sunflower Production

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Double Crop Sunflowers

	Oil SF	Wheat	Rotation
Yield/a	2500	70	
Price/unit	0.112	3.10	
Gov. Payment	16.27	16.27	32.54
Miscellaneous income	29.59	29.59	59.18
Returns/a	325.86	262.86	588.12
Total costs/a	282.39	274.71	557.10
Returns over costs	43.47	(11.85)	31.62

As of Friday Feb 11, T. Dumler



Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
 - **Choosing sunflower type to grow?**
 - **Fertility?**
 - **Populations?**
 - **Weed control?**
 - **Water?**
 - **Insect control?**
 - **Harvest?**

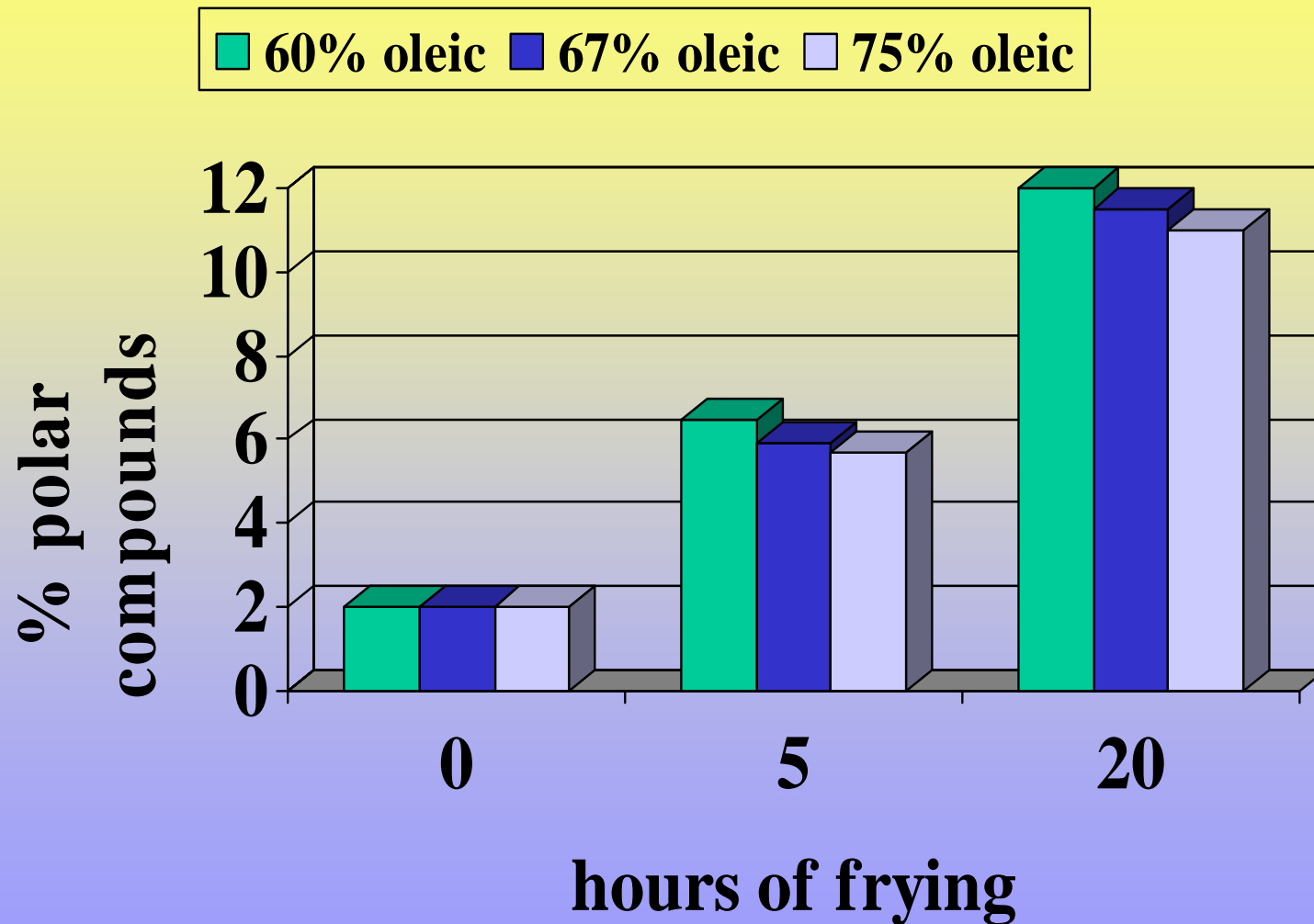


Selecting Sunflower Type

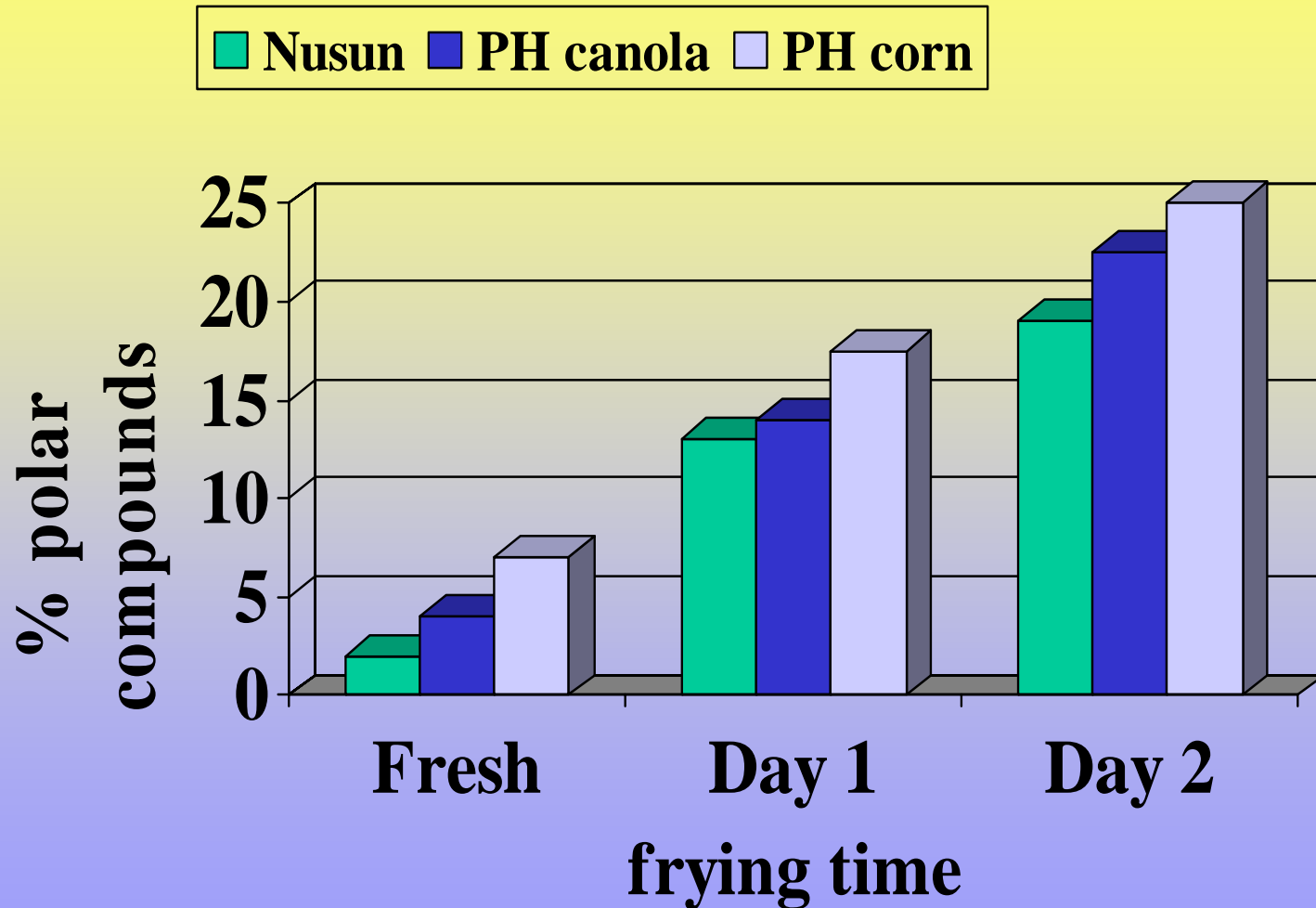
- **Oil**
 - **Traditional types**
 - **Must be market through elevator - ADMNS**
 - **NuSun (mid-oleic)**
 - **Must contain minimum of 65% oleic acid to receive premium**
 - **Yield potential is good on new hybrids**
 - **Unique quality oil**



Effect of frying time on oil quality



Effect of frying time on oil type



Effects of Sunflower Oil Content

Oil Content	Premium Or Discount	Net price per cwt	Gross Income	Net Income	Difference
46%	+12.0%	\$11.20	\$168.00	\$69.79	\$18.00
44%	+8.0%	10.80	162.00	63.79	12.00
42%	+4.0%	10.40	156.00	57.79	6.00
40%	0.0%	10.00	150.00	51.79	Base
38%	-4.0%	9.60	144.00	45.79	-6.00
36%	-10.0%	9.00	135.00	36.79	-15.00
34%	-16.0%	8.40	126.00	27.79	-24.00



Selecting Sunflower Type

- **Oil**
- **Confectionary ???**
 - **Seed size is critical (hybrid selection critical)**
 - **Insect free (seed weevil damage reduces quality) - spray program must be budgeted**
 - **Should have contract in hand, with act of God clause**
 - **May not be for beginners?**
 - **Price commonly runs above oils**



Current Confectionary Sunflower Prices

- **Spot: Colby and Goodland**
 - **Large seed (>20/64) = \$19/cwt**
 - **Small seed (<20/64) = \$13/cwt**



Effect of Confectionary Sunflower Seed Size

Sizing over 20/64 sieve	Net Price	Gross Income	Net Income	Net Difference
75%	\$17.50	\$236.25	\$116.25	\$8.10
65%	16.90	228.15	108.15	Base
55%	16.30	220.05	100.05	-8.10
45%	15.70	211.95	91.95	-16.20

* Base Price, Goodland&Colby = \$19/\$13 per cwt - dual scale, 1350 lb/a



Selecting Sunflower Type

- Oil
- Confectionary
- **Bird Seed**
 - **Know your market**
 - **Purchase on test weight & appearance and not oil content but often they go hand in hand**
 - **Contract could be handy, price often follows the oil market**



Hybrid Selection

- **Sunflower performance publication**
 - **Double crop information???????**
- **Information from seed companies**
- **Coffee shop discussions**



Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
 - Choosing sunflower type to grow?
 - **Fertility?**



Fertility

- **Sunflowers require fertility!!!!!!!!!!!!!!**
 - **From the soil (SOIL TEST)+ applied!**
- **Nitrogen requirement is 50 lbs/1000 lbs expected yield**
- **15 to 40 lbs P₂O₅ maybe required if your soils tests are in the medium or low range.**
- **Sunflowers root deep. Previous crop can make a difference**
- **DO NOT PLACE FERTIZER WITH SEED!**

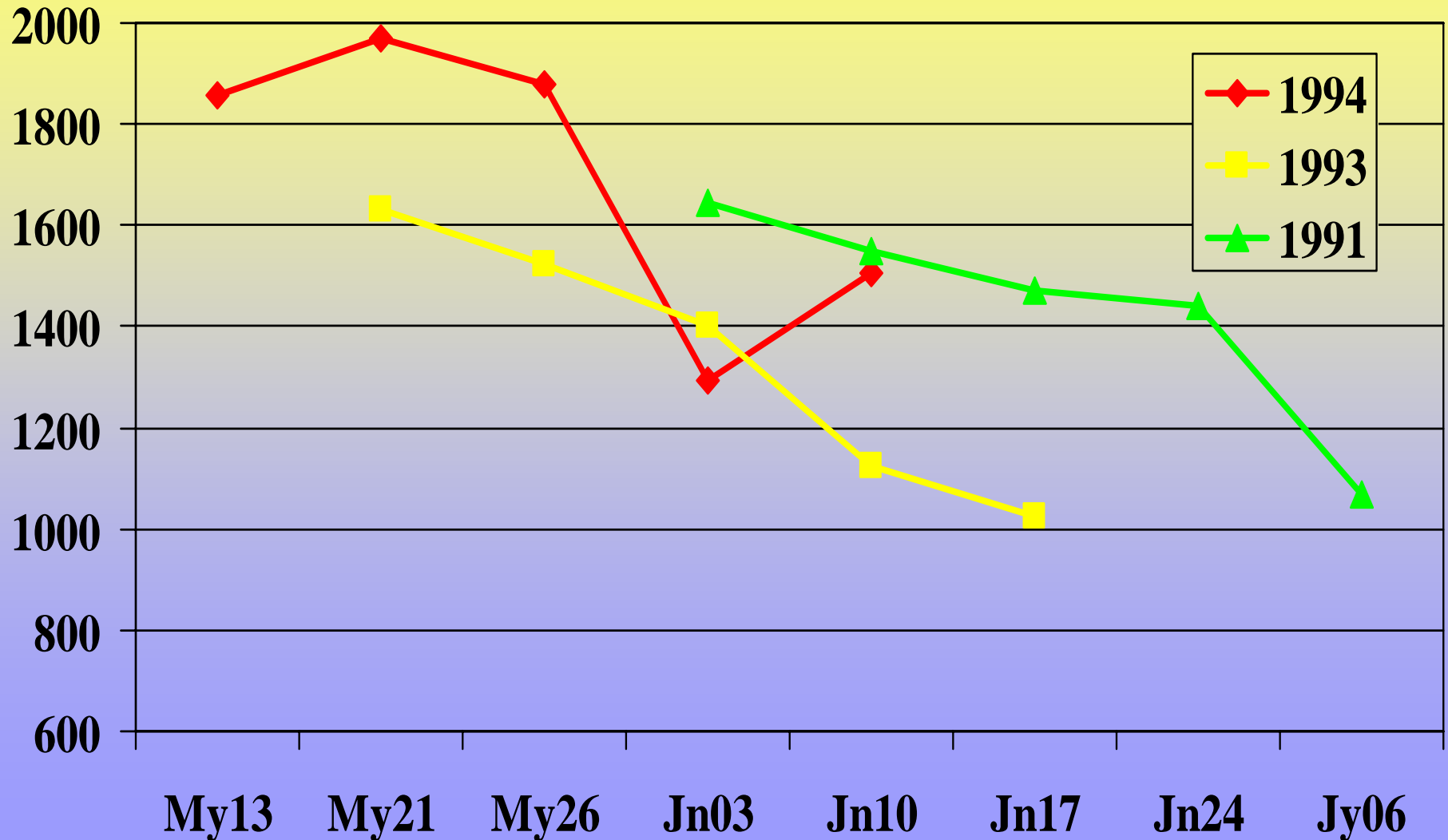


Double Crop Flowers

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 - **Populations?**



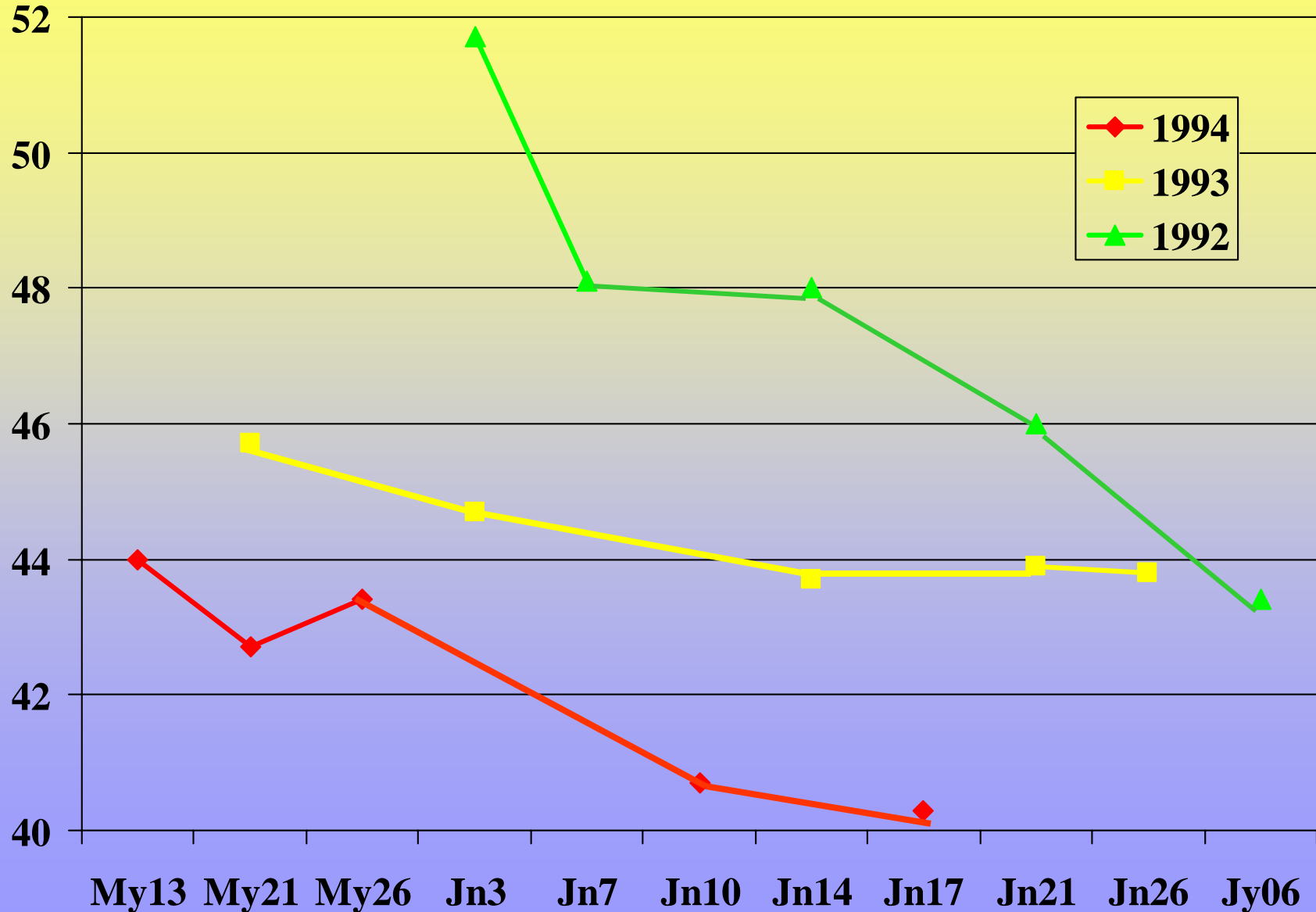
Planting date effect on oil sunflower yields, CSU, Meyer, Pilcher, Peairs, Shanahan, Hain



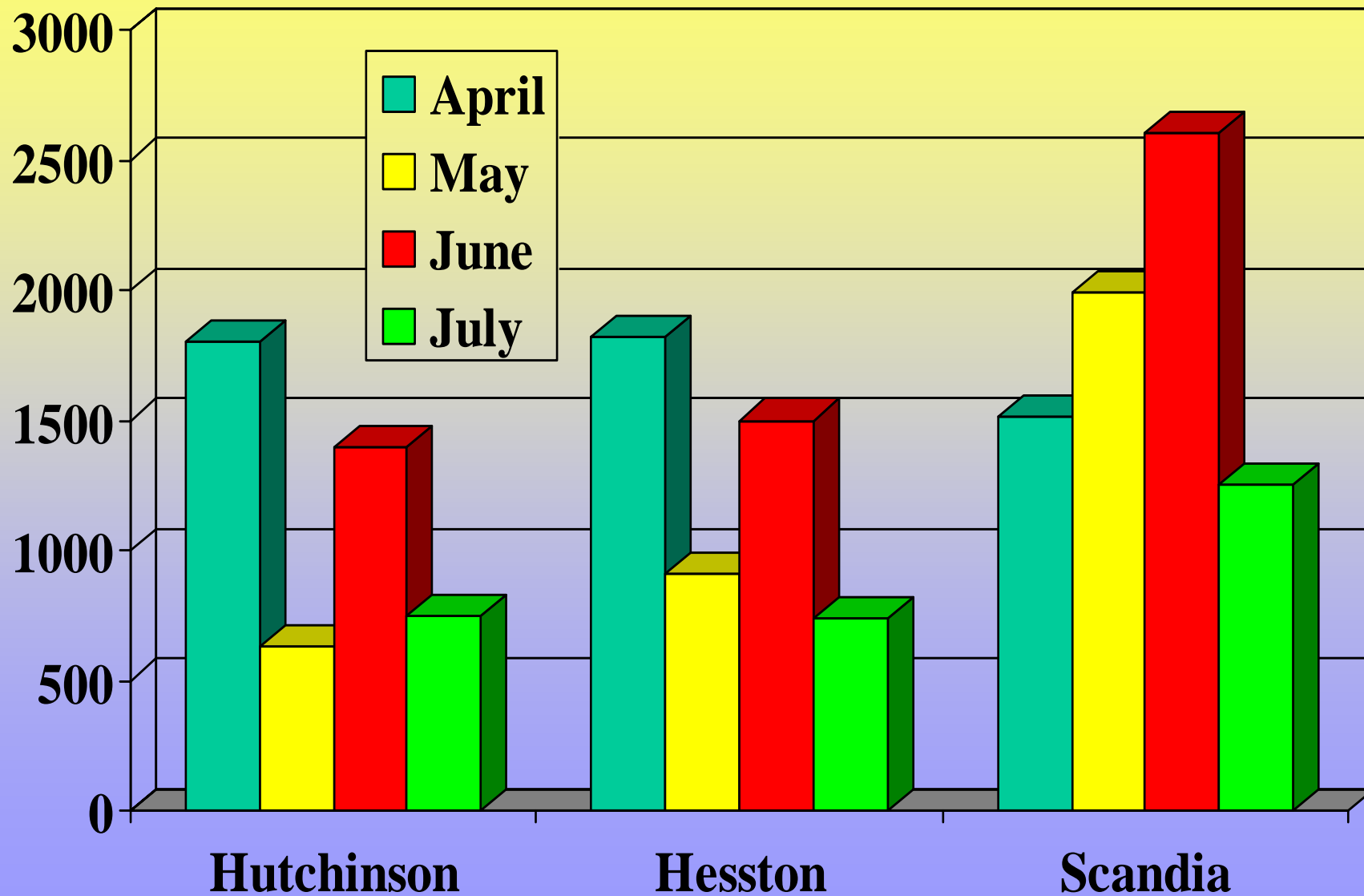
Sunflower Planting Dates Oil Content, 3-yr summary.

CSU Meyer, Pilchner, Peairs, Shanahan, and Hain

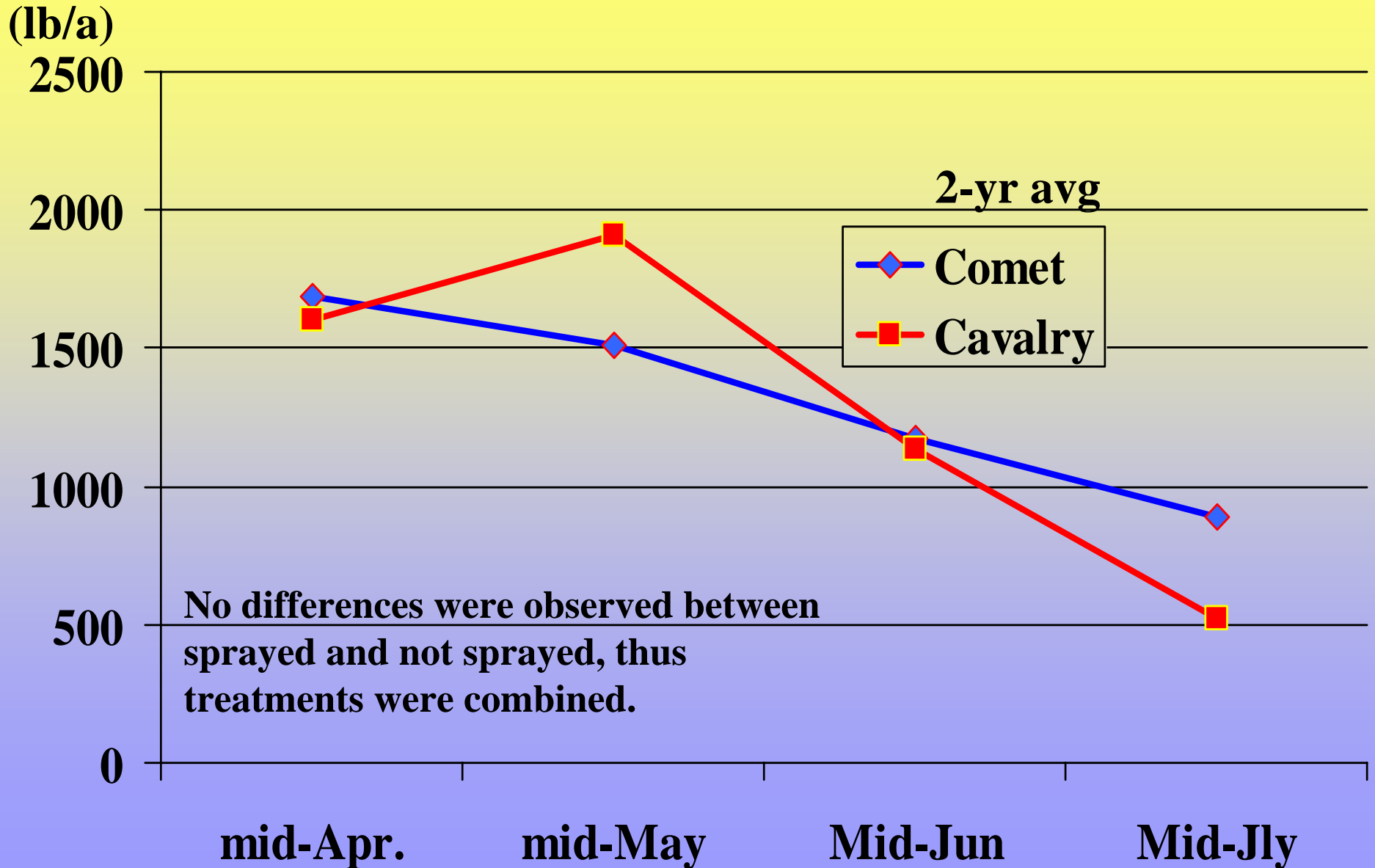
(%)



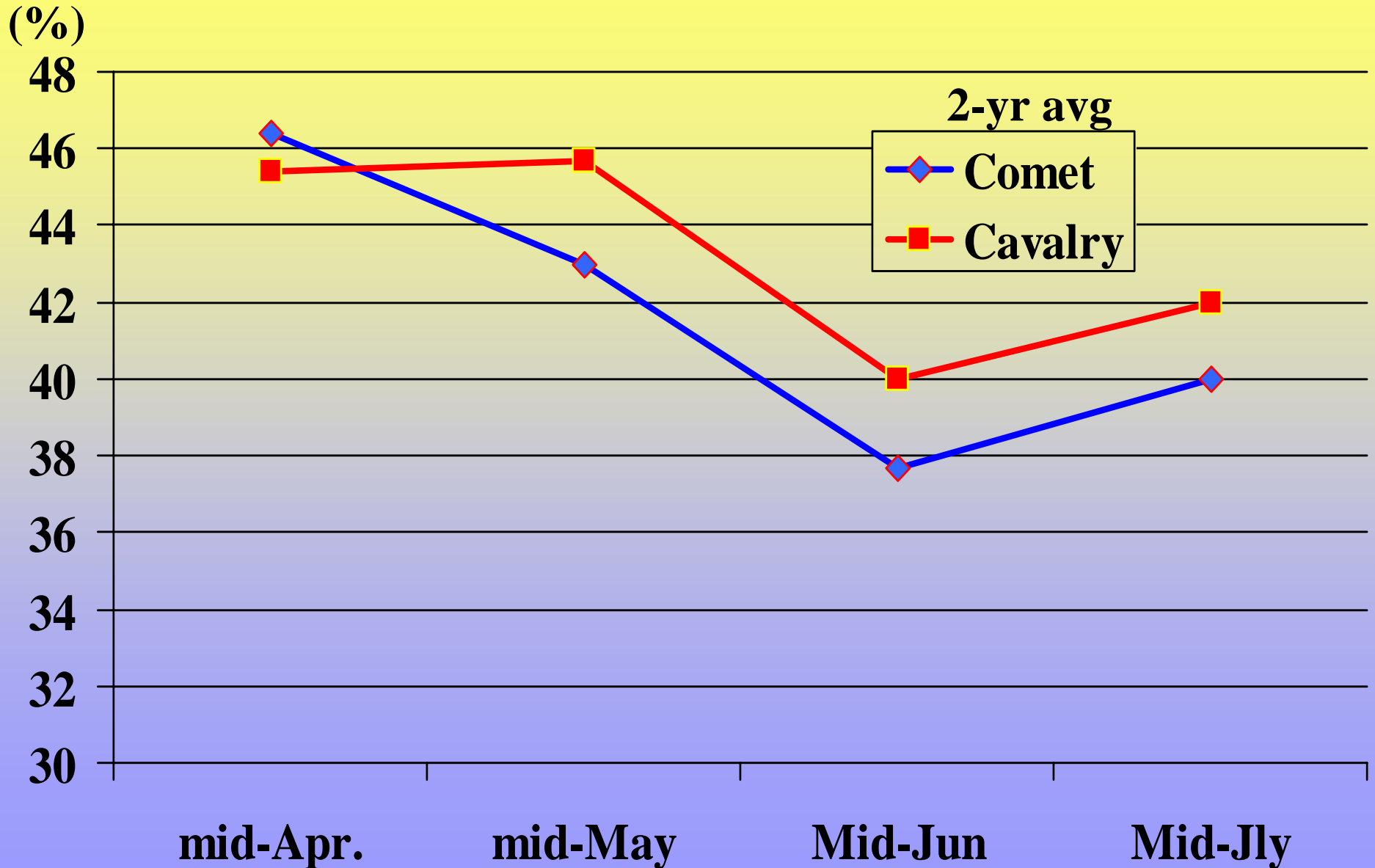
Planting Date Effect on Sunflower Yield



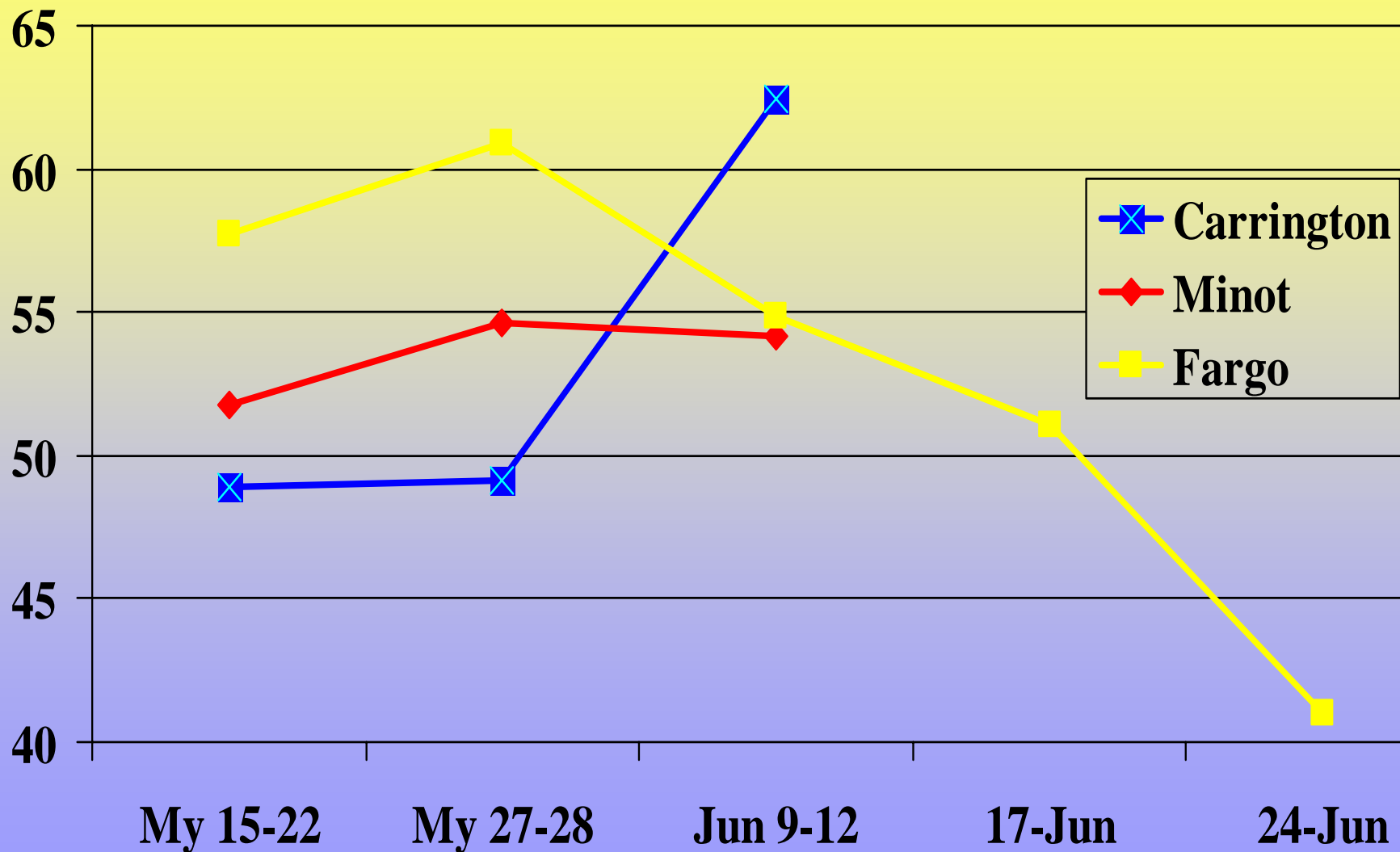
Effect of oil sunflower planting date on yield, Hesston KS, 1997-98. Duncan, Wilde, Staggenborg, Gordon, Heer, & Clausen



Effect of oil sunflower planting date on [oil], Hesston KS, 1997-98. Duncan, Wilde, Staggenborg, Gordon, Heer, & Clausen



Planting date effect on oleic acid concentration of NuSun sunflower oil, ND. Kirsch, Miller, and Charlet.



Planting Dates

- **Range – April 1 to July 10**
 - **Double crop sunflowers can work well!**
 - **Plant as soon as possible**



Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
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 - **Fertility?**
 - **Populations?**

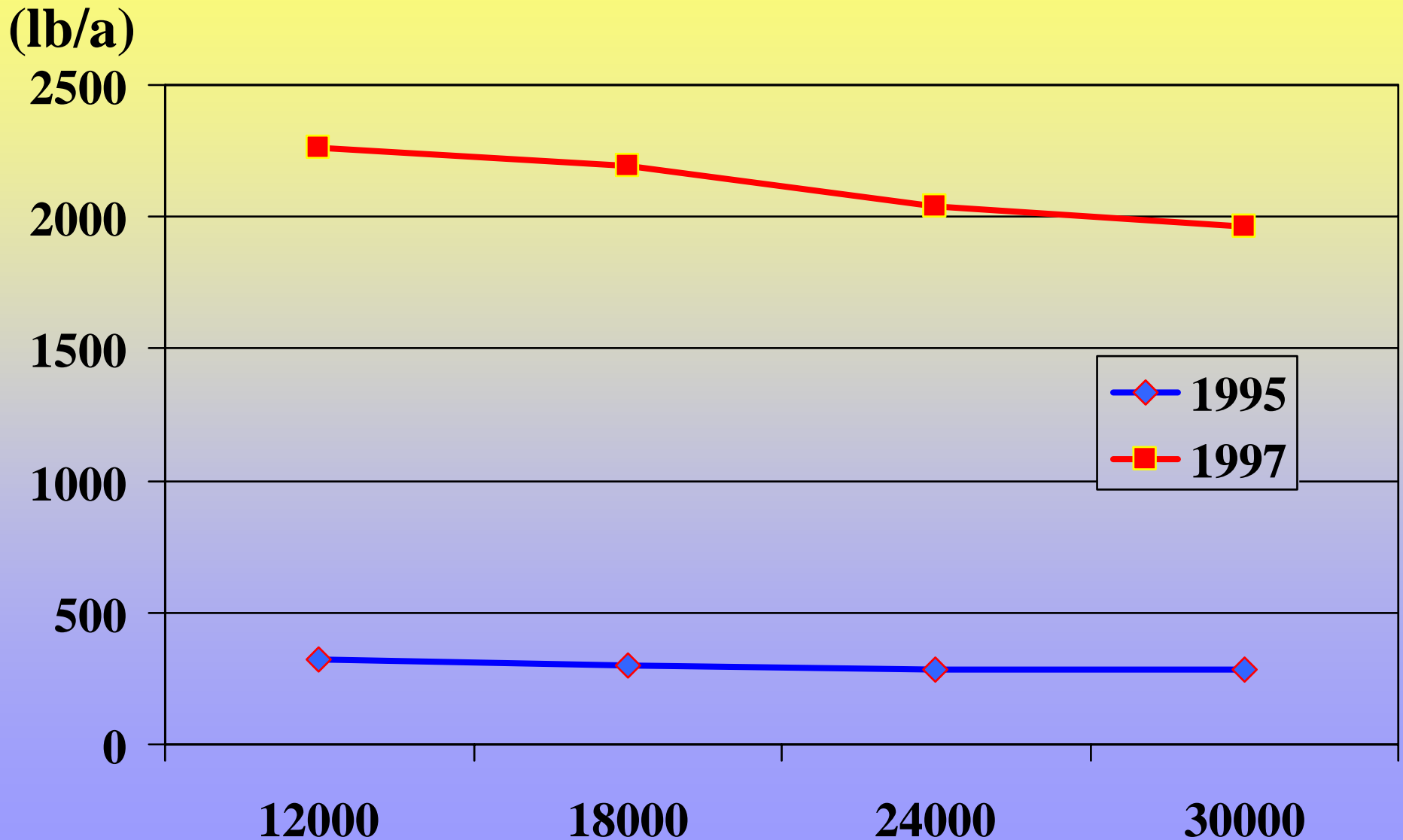


Affect of population on sunflower yield components. Robinson etal. 1976.

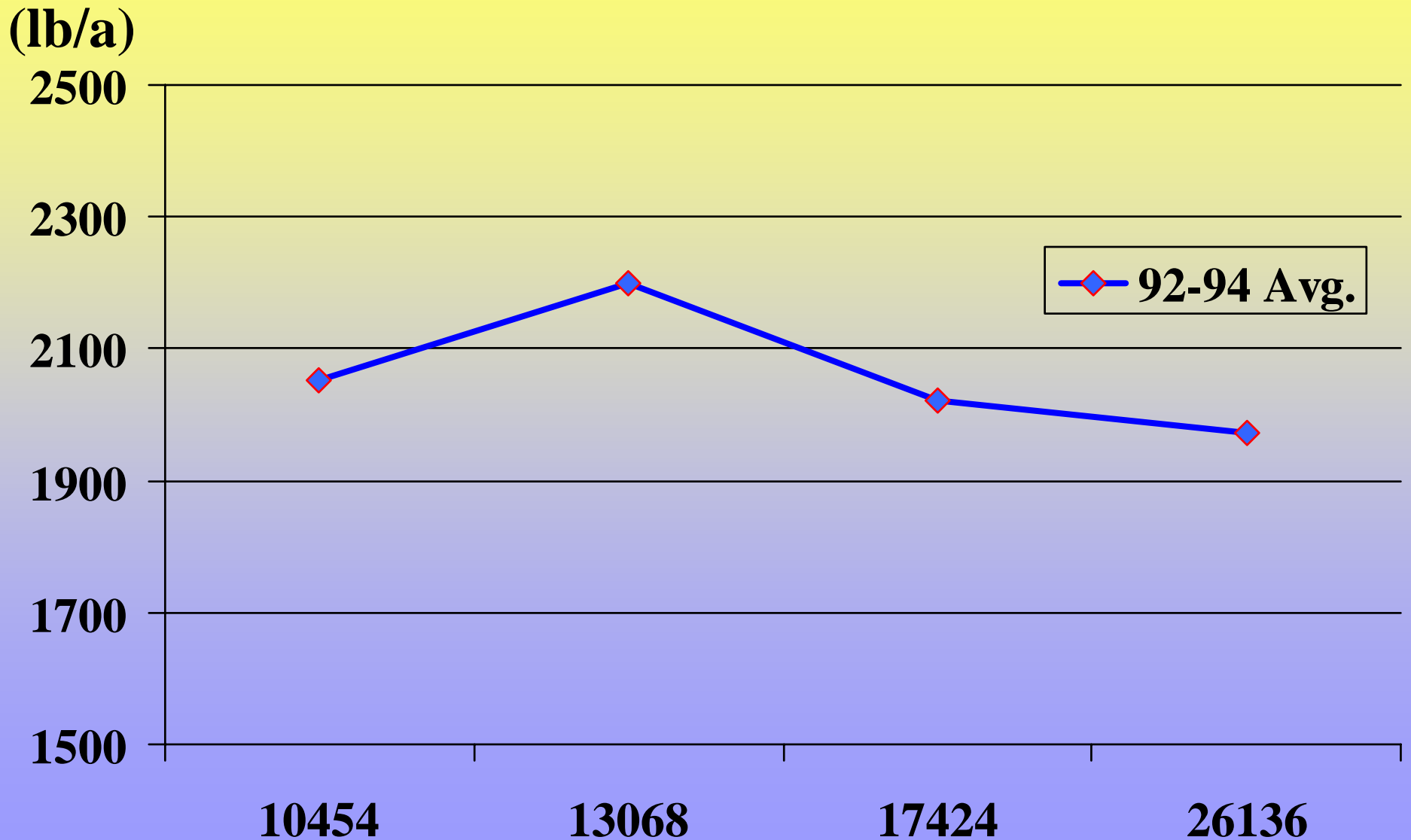
Heads /a	Seeds /head (#)	Seed Wt. (g/ seed)	yield Lb/a	Large seed (%)	[Oil] (%)	Lodge (score)
15000	831	0.073	2000	52	42.6	1.5
20000	727	0.067	2145	44	43.2	1.8
25000	632	0.062	2157	33	43.2	2.1
30000	548	0.060	2172	31	43.4	2.4
35000	501	0.058	2240	26	43.8	2.5

Source: Production and Cultural. P 89-143 *in* Sunflower Science and Technology. ASA/CSSA/SSSA monograph #19.

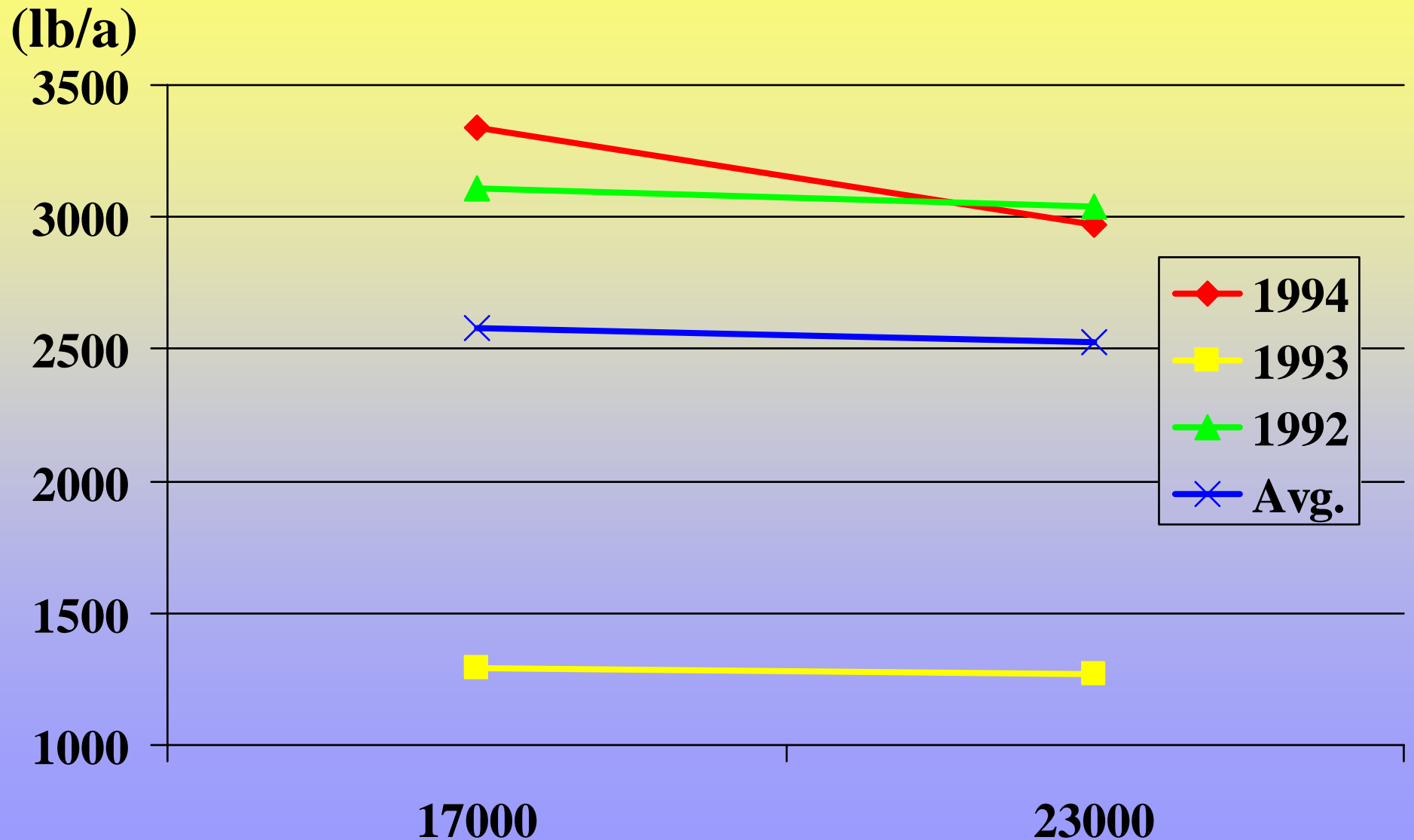
Effect of planting rate on oil sunflower yield, Tribune KS. Thompson and Schlegel



Effect of planting rate on oil sunflower yield, Colby KS 1992-94. Mikesell and Belshe

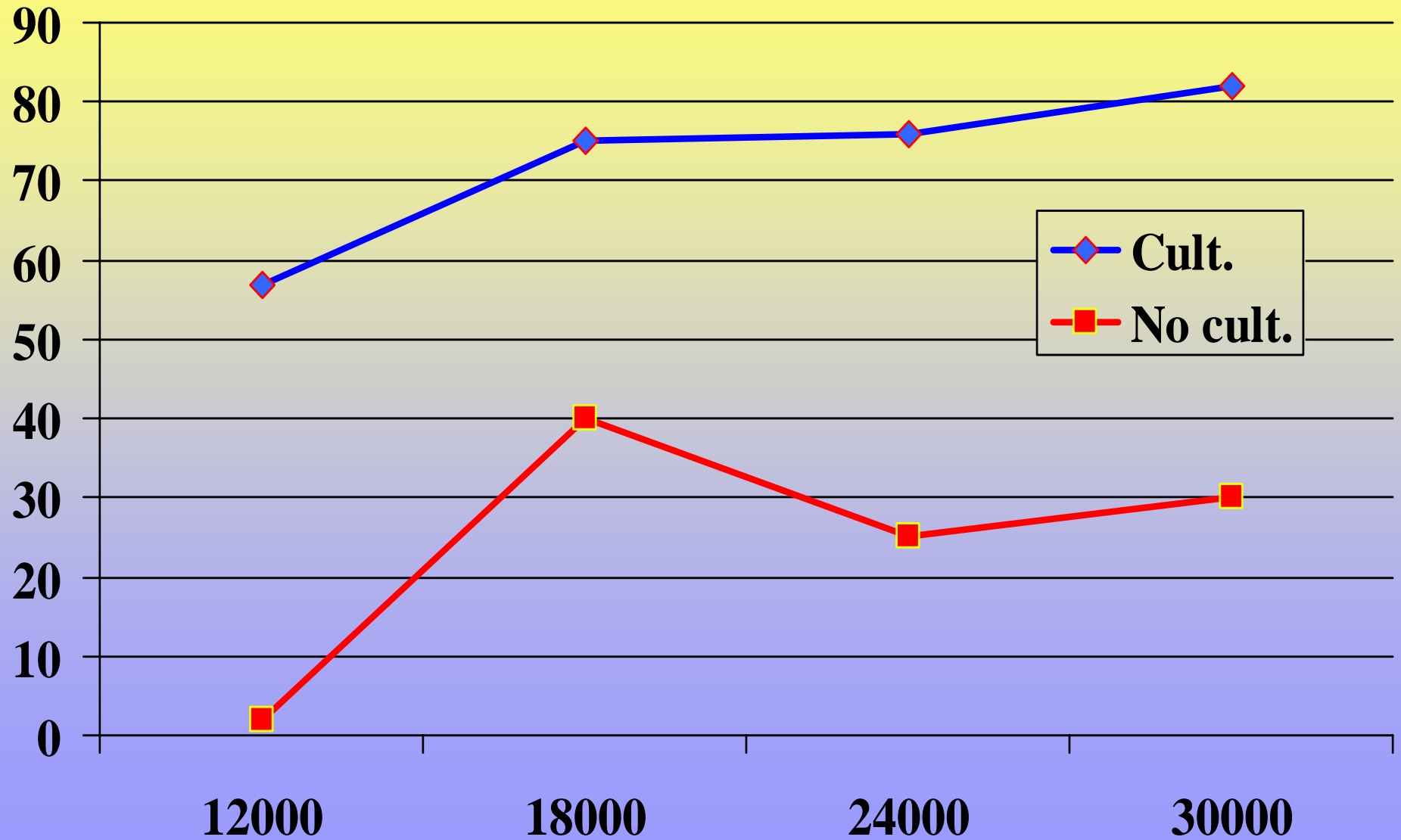


Effect of planting rate on irrigated oil sunflower yield, Colby KS. H. Sunderman et al.



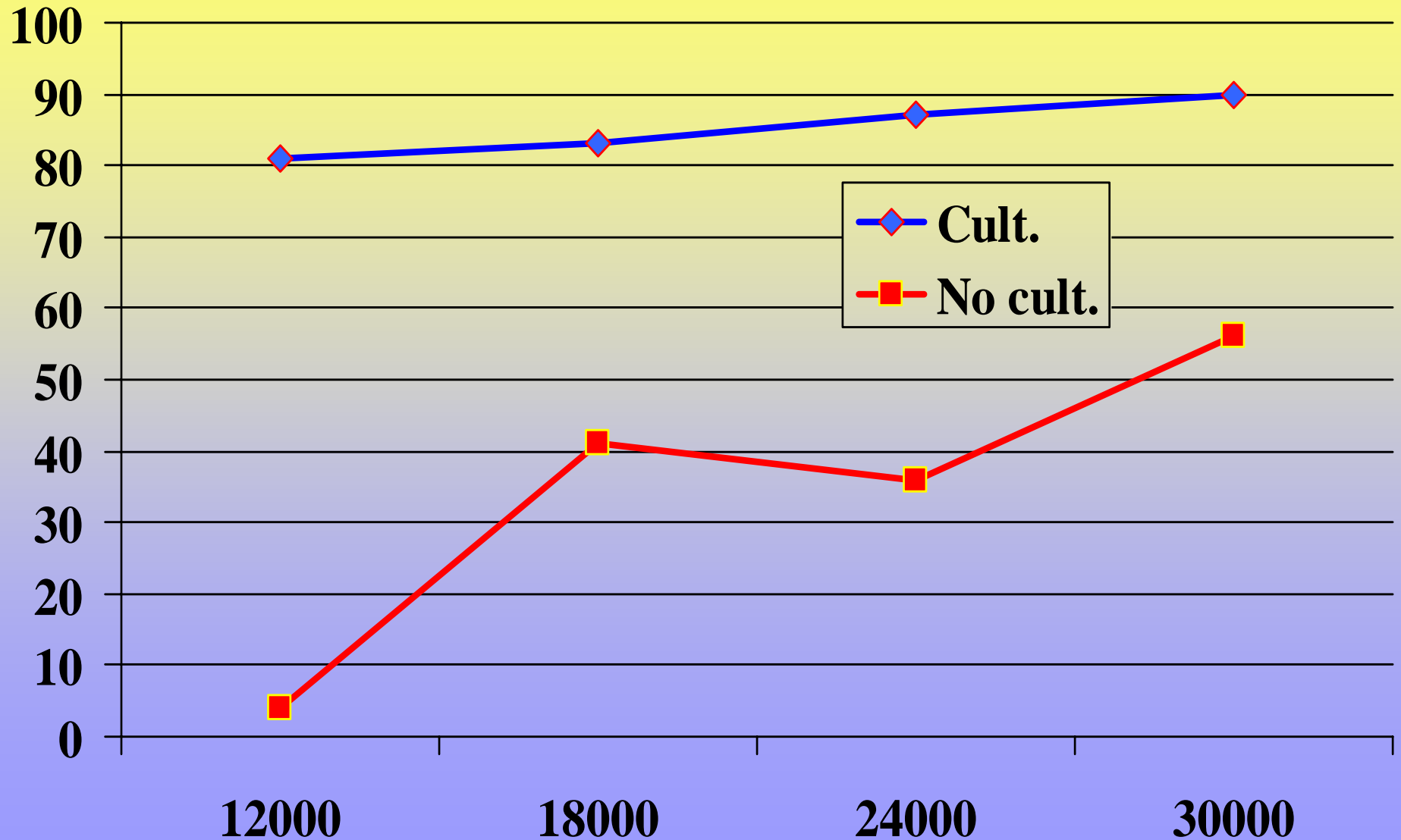
Effect of sunflower planting rate on kochia control, Tribune KS, 1995-97. Thompson and Schlegel

(% control)



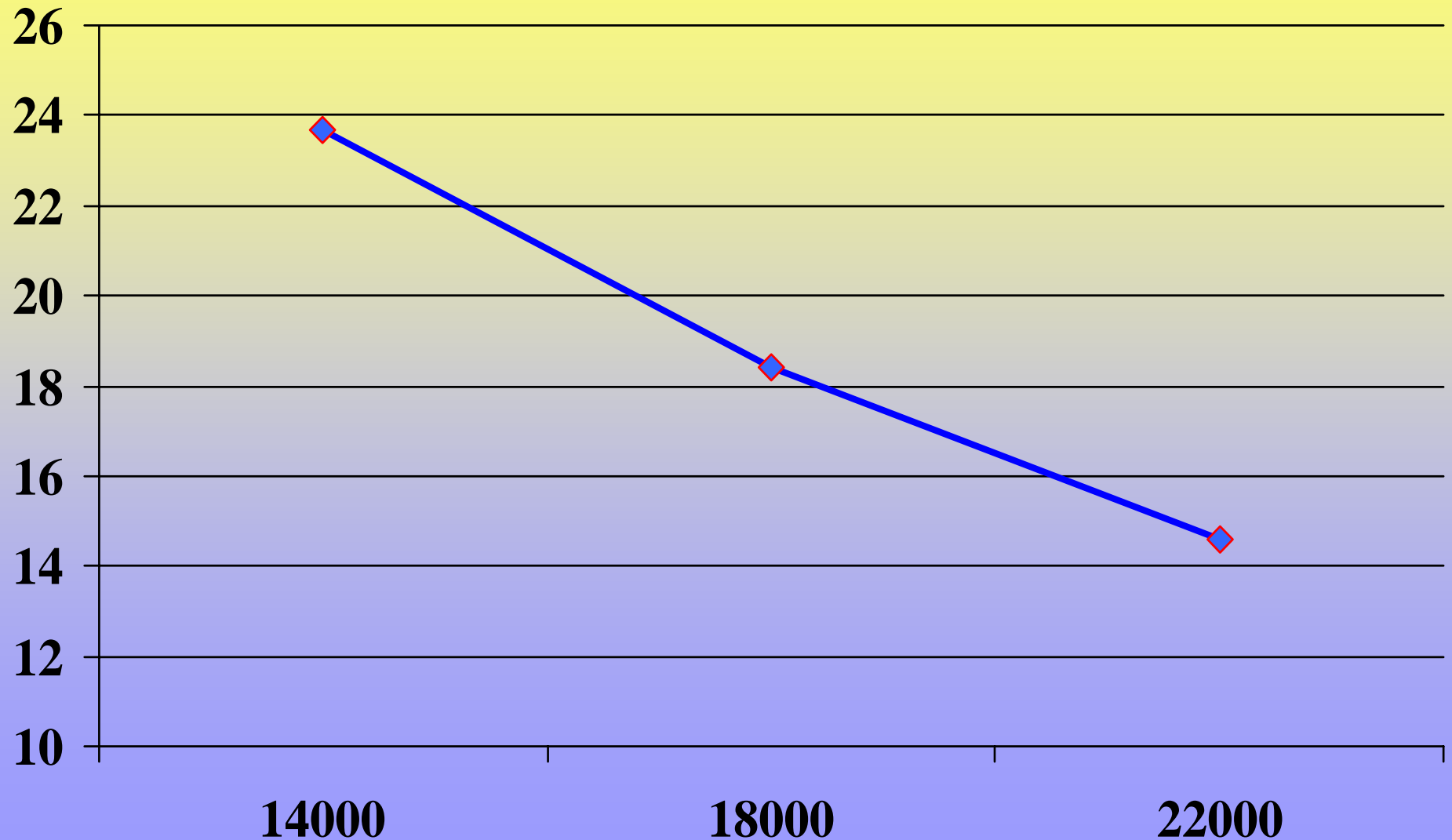
Effect of sunflower planting rate on grass control, Tribune KS, 1995-97. Thompson and Schlegel

(% control)



Effect of confectionary sunflower planting rate on seed size, Minot, ND, 1998. Zarnstorff, Johnson, and Miller

(% over 20/64)



Planting rates

- **Oil**
 - **20000 to 24000 plants/acre**



Planting conditions

- **1.5 to 2'' into firm moist seedbed**
- **Soil temperature 50 F or greater**
- **Soil temps can be too high with July double crop plantings?????**
- **Planting rate –**
 - **Oil , sufficient to attain 6-8'' head**
 - **Conf, sufficient to attain 8 to 10'' head**



Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
 - Choosing sunflower type to grow?
 - Fertility?
 - Populations?
 - **Weed control?**



Sunflower Insects

- **Head Moth**
- **Stem Weevil**
- **Seed Weevil**
- **Stem Borer**
- **Head clipper**



Sunflower Head Moth

- grayish-tan
- small dark spots on forewing
- 3/8 inch long
- 3/4 inch wing span
- Wings held tightly along the body when at rest.





Photo Taken By Phil Sloderbeck

Head moth

K-State Research & Extension



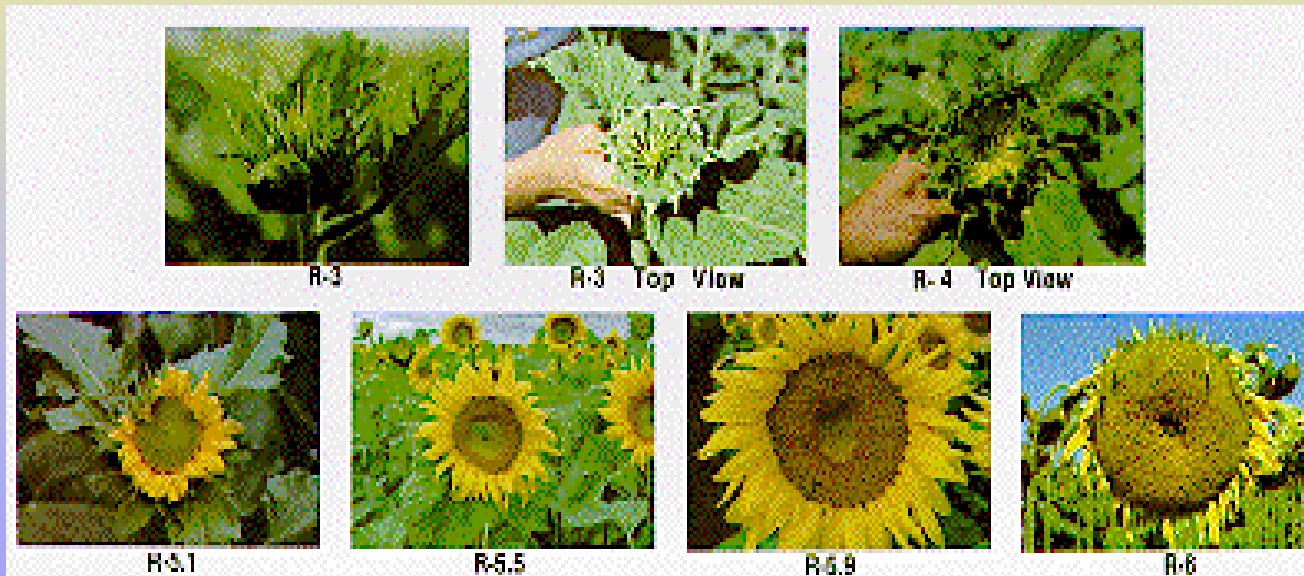
Sunflower Head Moth

- **Difficult to scout for.**
- **Active only at night.**
- **Threshold fairly low, less than one moth per head.**
- **Early planted flowers often better just to assume you are going to have a problem and work on timing the spray rather than checking for moth numbers.**
- **Later planted flowers generally have fewer problems. Pheromone traps may be useful in determining the need to spray.**
- **E. T. 4 moths per trap per day**



Sunflower Head Moth

- Treatment must be applied as flowers begin to bloom.



Sunflower Head Moth

- **Sprays**
 - **Baythroid**
 - **Warrior**
 - **Lorsban**
 - **Asana**
 - **Parathion**
 - **Thiodan**



Sunflower Head Moth Trial

Wilde - Manhattan, Ks -

1997

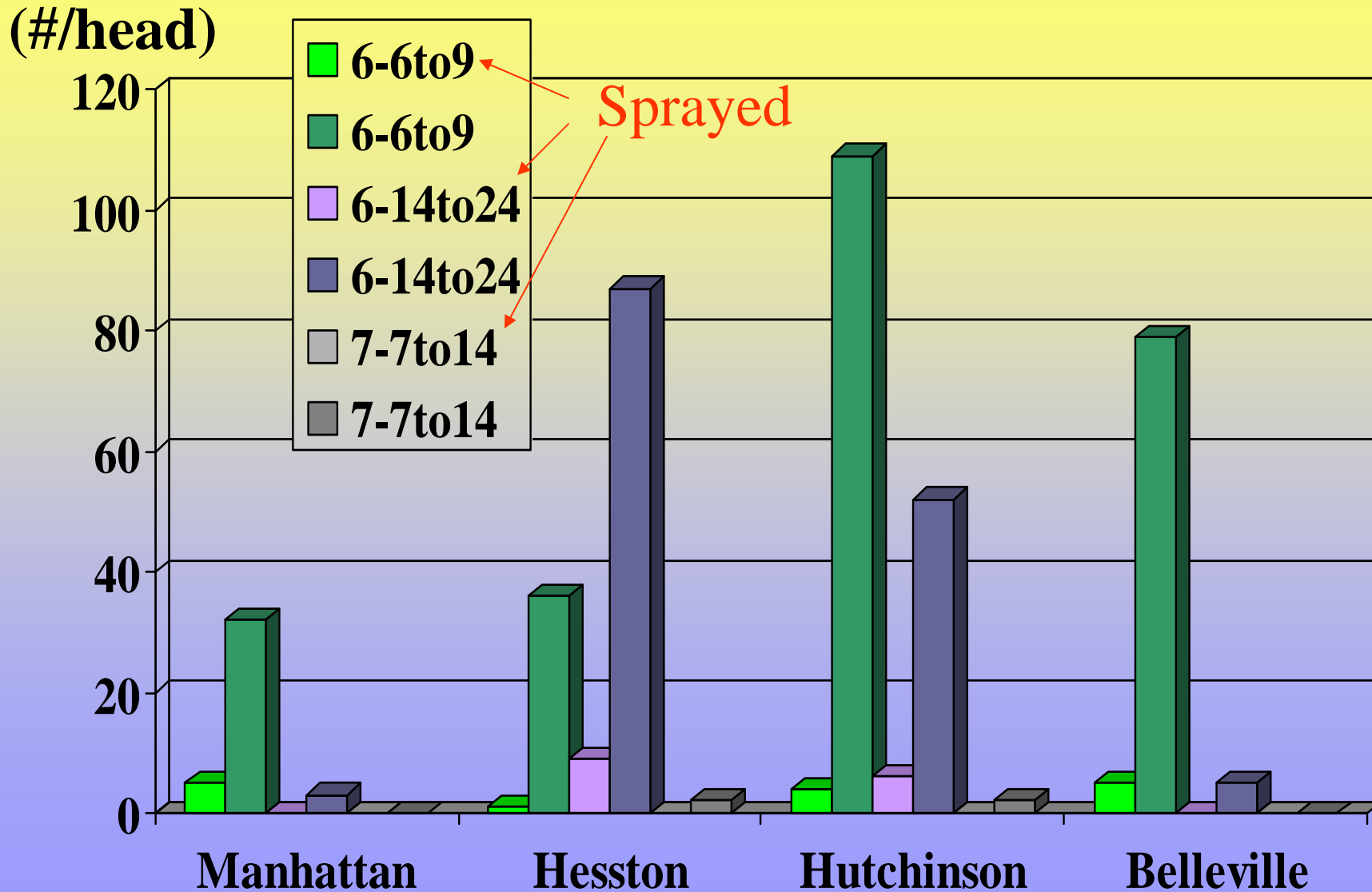
<u>Treatmnt</u>	<u>Rate ai/A</u>	<u>Worms/Hd</u>	<u>% Cntrl</u>
Baythroid	0.031	4.1	87
Warrior	0.03	4.1	87
Asana	0.03	4.5	86
Untreated	--	31.3	

- Hand Sprayer, 20 gal/A, 100 % bloom 7 July, treated 13 July,
- counted 31 July

* *slide prepared by PES 1/98, selected treatments only*



Effect of planting date on head moth larvae number, Wilde 1988



Sunflower Stem Weevils

- Scout when plants are at the 8- to 14-leaf stage, late June or early July. Fields planted before mid-June more likely to have problems.
- Scout must move through the field slowly to avoid having the adult stem weevils drop to the soil and “play dead”.
- Threshold for the sunflower stem weevil is one adult per three plants.



Sunflower Stem Weevils

- **If stem weevils were a serious problem in the area last year consider a planting time treatment:**
 - **Furadan**
- **If beetles are detected at threshold levels consider a foliar sprays.**
 - **Furadan**
 - **Lorsban**
 - **Asana**
 - **Warrior**
 - **Baythroid**



**Both Species feed on pollen.
Lay their eggs into the
premature seeds and larvae
consume the sunflower meat**

Gray Seed Weevil



Red Seed Weevil



*Treatment for head moth
will control seed weevil.*

**Confectionary sunflower
threshold is 1/head.**





Photo Taken By Phil Sloderbeck

Red Seed Weevil

K-State Research & Extension



Sunflower Stem Borer

- **Noticed at several locations in Kansas during 1999 and after.**
- **Evidently been around for a long time, possibly more than one species of borer involved.**
- **Increased sunflower acreage may be making problem worse.**





Photos Taken By Phil Sloderbeck

Head clipper weevil & damage



Sunflower diseases

- Hybrid selection (rust)
- Crop rotation*****
 - No more than 1 in 4 years




Residue Concerns!

Sunflowers

- Pounds of residue produce is adequate about 3 lbs/lb of seed
- Distribution is poor
- Must remain standing to provide benefit





Plant no-till into wheat stubble!?

Is it feasible?



Residue!

Weed control in sunflower



Soil applied herbicides

- **Dual Magnum**
- **Sonalan**
- **Treflan (trifluralin)**
- **Prowl (pendimethalin)**
- **Spartan**
- **Post Applied herbicides**
- **Poast**
- **Select**
- **Beyond**



Spartan

- **sulfentrazone - FMC**
- **soil applied herbicide 4 weeks before to 3 days after planting**
- **control pigweeds, kochia, Russian thistle, lambsquarters & some grass**



Spartan

- **Rates are 2.0 oz to 5.3 oz/a**
- **Soil type & pH are critical**
- **Timing & amount of moisture received can affect sunflower tolerance**
- **Planting depth (best at 1.5’')**



Spartan

- **Concerns with high pH and calcareous soils. pH greater than 7.8 and Ca levels greater than 4000 ppm in the top 6 inches of soil profile. White knobs or cut areas will create excessive injury**



Spartan - rotational restrictions

- **Soybeans - none**
- **Wheat & cereals - 4 mo***
- **Field corn or sorghum - 10 mo**
- **Milletts - 12 mo**
- **Sweet corn or cotton - 18 mo**
- **Canola - 24 mo**



Spartan

- **Registration received in 2004.**
- **Rates: 2 to 5.33 oz/A**
- **Time: from 30 days preplant to preemergence, 3 days after planting**
- **Weeds: kochia, pigweeds, lambsquarters, nightshade, and yellow nutsedge**
- **Can cause stunting and stand reduction, especially on coarse textured, low organic matter soils with high pH**
- **Herbicide likely not available for 2005 season**



Spartan Rates as affect by soil type

	<u>Coarse</u>	<u>Medium</u>	<u>Fine</u>
OM	Pr/a	Pr/a	Pr/a
>1.5%	2.0-2.67	2.67-3.0	2.67-3.0
1.5-2.0	2.67-3.0	3.0-4.0	3.0-4.0
>2%	3.0-4.0	4.0-5.33	4.0-5.33

***Do not use on coarse soils which have less than 1% OM**



Dual Magnum

- **Dual Magnum has a federal label in sunflower**
- **Timing: Preemergence**
- **Rate: 1.0 to 1.33 pt/A coarse soils
1.33 to 1.67 pt/A on medium & fine**
- **Do not graze or feed residue in treated areas**



Clearfield Sunflowers

- **Sunflower varieties with genetic tolerance to imidazolinone herbicides.**
- **“Imi” resistant gene originates from ALS resistant wild sunflowers discovered in eastern Kansas.**
- **Allows the use of Beyond herbicide for postemergence weed control in sunflower.**
- **Selected hybrids available in 2004.**

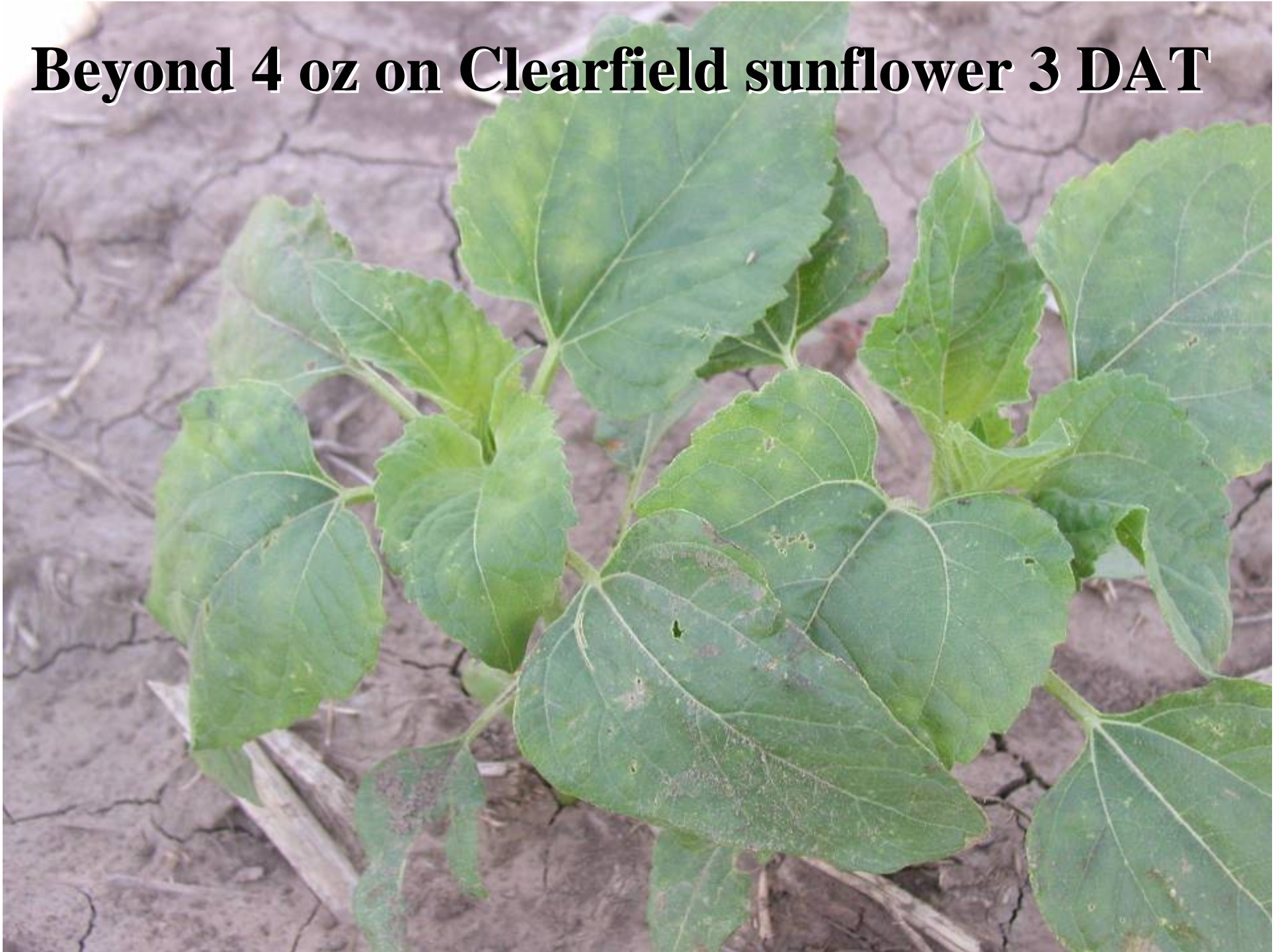


Beyond

- **Active Ingredient: Imazamox (same as Raptor)**
- **Apply only to Clearfield Sunflower**
- **Rate: 4 to 6 oz/A**
- **Timing: Small annual weeds**
- **Adjuvant: NIS + N fertilizer**
- **May not control ALS resistant biotypes of kochia, Palmer amaranth, or common waterhemp.**



Beyond 4 oz on Clearfield sunflower 3 DAT



Weed control in Clearfield sunflowers in Finney County, 2003 (Thompson&Schlegel).

Herbicide	Rate	Palmer amaranth	Puncture vine
	(Prod/a)	-----(% control)-----	
Prowl/Beyond	2pt + 4 oz	60	88
Beyond	4 oz	66	87
Beyond	6 oz	58	88
LSD(0.05)		20	14

Beyond treatments included surfactant and 28% N.



Weed response to Beyond treatments at Tribune, KS 2003 (Thompson&Schlegel).

Treatment*	Rate Prod/a	Russian Redroot Tumble			
		Kochia ----- (% control) -----	thistle	pigweed	pigweed
Beyond+NIS+UAN	4 oz	67	100	100	100
Prowl (PRE)	3.6 pt	80	85	75	79
Prowl/Beyond	2.4 pt / 4 oz	85	100	100	100
Spartan+Beyond	2 oz + 4 oz	100	100	100	100
Spartan+Beyond	3 oz+ 4 oz	100	100	100	100
Spartan+Prowl	2 oz + 2.4 pt	98	95	88	100
Spartan+Prowl	3 oz + 2.4 pt	98	100	100	100
LSD (0.05)		10	5	9	4

*All treatments included recommended adjuvants.

Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
 - Choosing sunflower type to grow?
 - Fertility?
 - Populations?
 - Weed control?
 - **Water?**



Full season sunflower yield response to irrigation timing, Tribune 1979-85.

Treatment	Water	Yield
	(inches)	(lb/a)
Preplant	15.1	1900
Preplant & Bud	19.6	2205
Preplant & Bloom	18.6	2202
PP & Bud & Petal D.	21.1	2512



Sunflower yield response to varying irrigation levels, Colby 1986-88.

ET Factor	Yield	Irrigat. Water	Water Use	WUE
inches	(lb/a)	---- (inches) ----	----	(lb/in)
1.40	2503	16.96	24.6	78
1.20	2276	13.35	22.3	86
1.00	2372	10.47	20.2	97
0.75	2279	7.01	17.9	110
0.50	2136	3.07	14.5	122
None	2020	0	12.5	145



Double Crop Flowers

- **Other than planting dates, how do the agronomics change from planting full season sunflower**
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 - Populations?
 - Weed control?
 - Water?
 - **Insect control?**
 - **DON'T BANK ON HAVING NO INSECTS!!!!!!!!!!!!!!**



Double Crop Flowers

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 - Weed control?
 - Water?
 - Insect control?
 - **Harvest?**



Harvesting Sunflower

- **With double crop sunflowers it will generally be later into the season often cooler and more humidity??**
 - **Fewer fires**
 - **Slower dry down**



Harvesting Sunflower

- **Cylinder speed slow – 250-450 rpm**
- **Concave open – ideally, heads remain in tack and seeds removed**
- **Air speed, sunflower are light, use only to keep trash floating on sieve, wet stem or head pieces will not float.**
- **Harvest at 8 to 10% moisture**



Harvesting Sunflower

- **Harvesting sunflower less than 8% moisture increase risk of combine fires!**
- **Stalks and heads when too dry simple destruct during the harvest process, fine dust collects and static electricity can ignite fires**
- **Harvest when humidity are high and temperatures are cool**



Harvesting fires!



Drying oil seeds using Aeration

Drying oilseed sunflower in October.
(47 F and 65 percent relative humidity).

NDSU Extension Bulletin 25

Moisture Content	Airflow (cfm/bu)	Fan Time Days
17%	1.00	27
15%	1.00	20
	0.75	30
	0.50	40
13%	1.00	14
	0.75	21
	0.50	28



Yields of Limited Irrigated Crops in 2004

Crop	Irrigation Water Applied		
	5"	10"	15"
Corn	204	245	260
Sorghum*	104	120	122
Soybeans	49	52	49
Sunflowers	2532	2607	2775

* 2003 Yields



Average Yields of Limited Irrigated Crops (2001-2004)

Crop	Irrigation Water Applied		
	5"	10"	15"
Corn	108.3	168.3	185.8
Sorghum	86.3	111.5	124.0
Soybeans	31.8	42.0	45.8
Sunflowers	1464	1866	1866

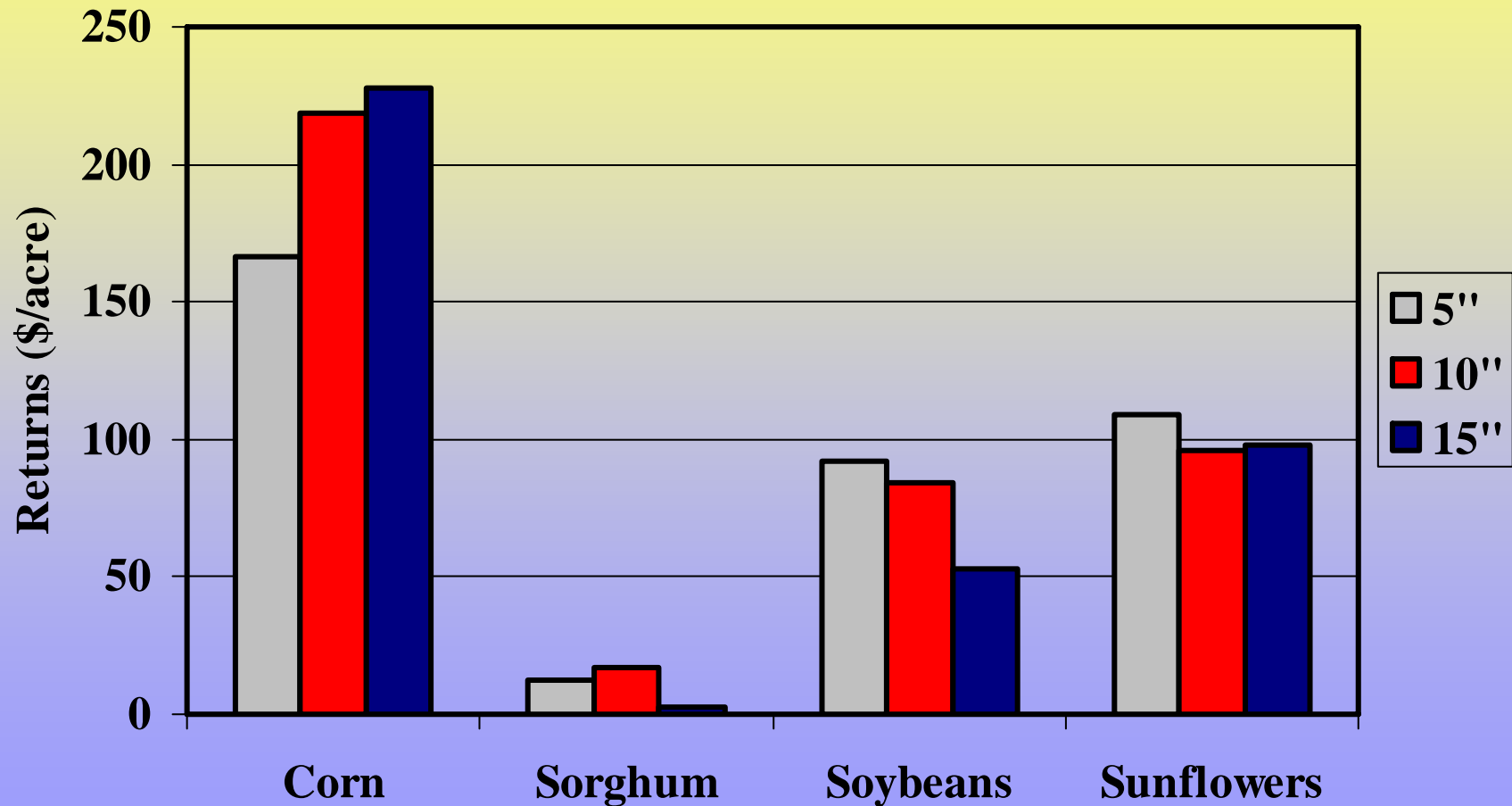


Average Yields of Limited Irrigated Crops (2001, 2003-2004)

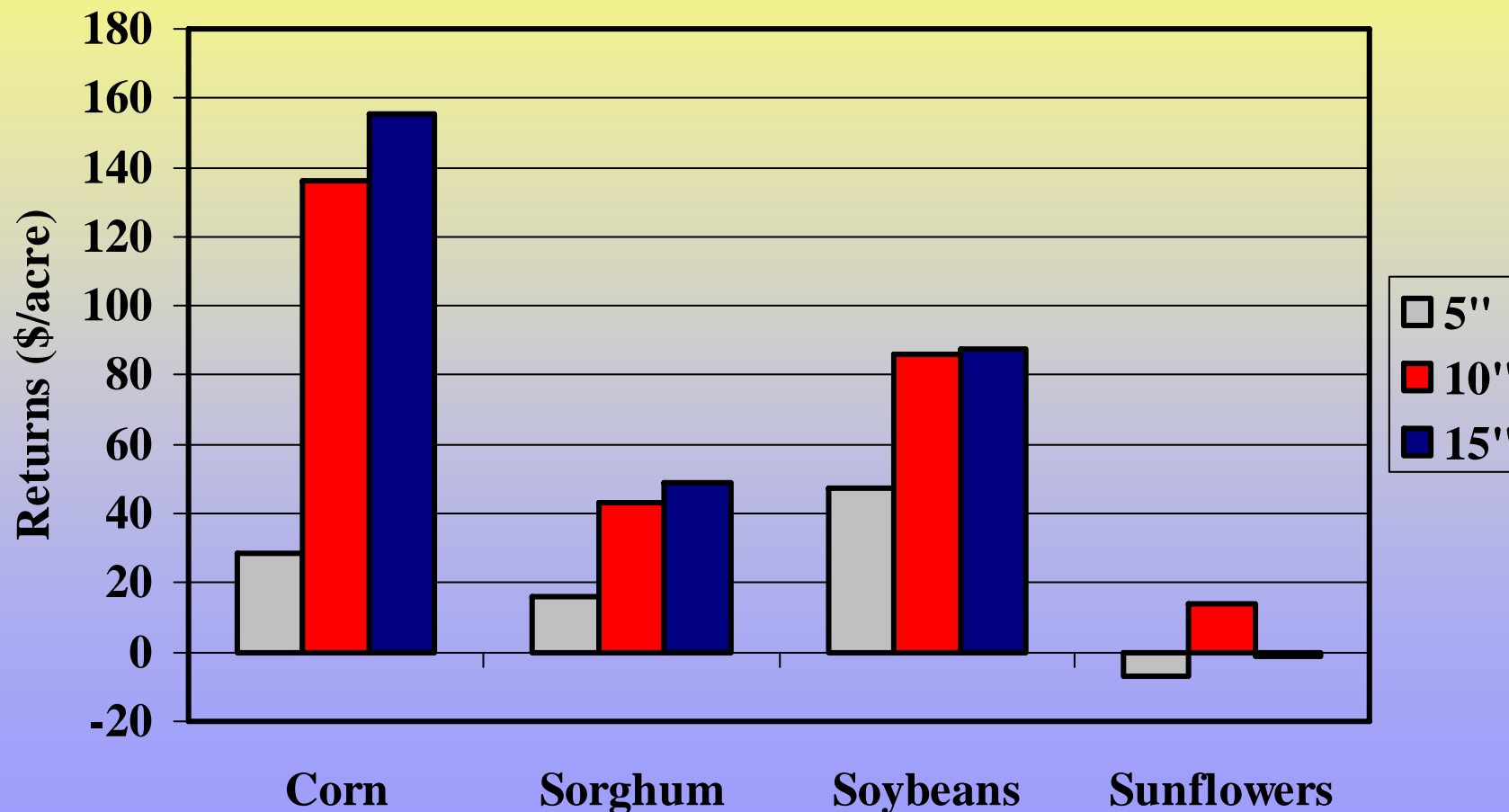
Crop	Irrigation Water Applied		
	5"	10"	15"
Corn	139.7	200.0	216.7
Sorghum	110.7	129.7	138.7
Soybeans	38.3	47.7	49.0
Sunflowers	1934	2430	2419



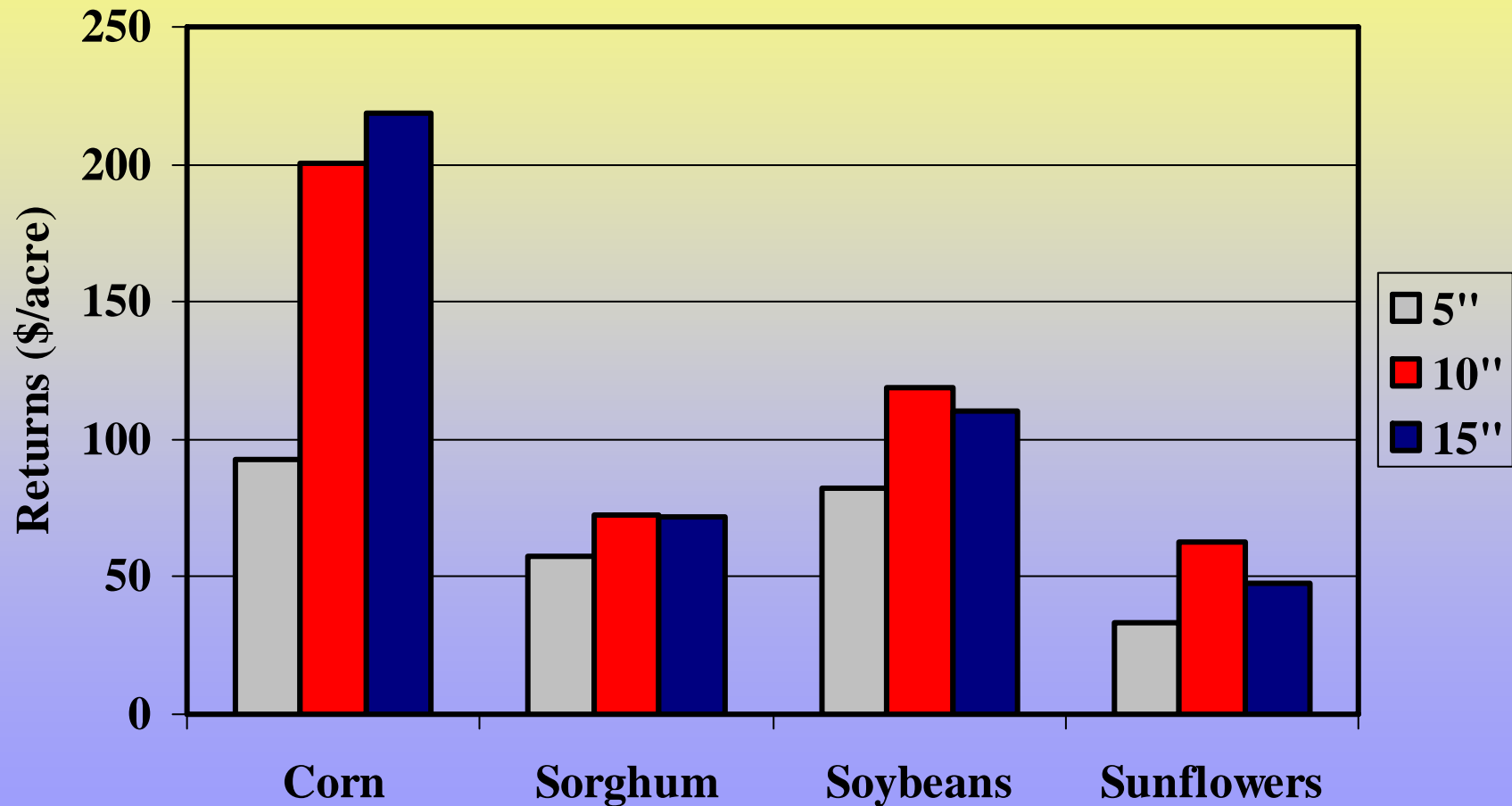
Returns to Limited Irrigated Crops in 2004



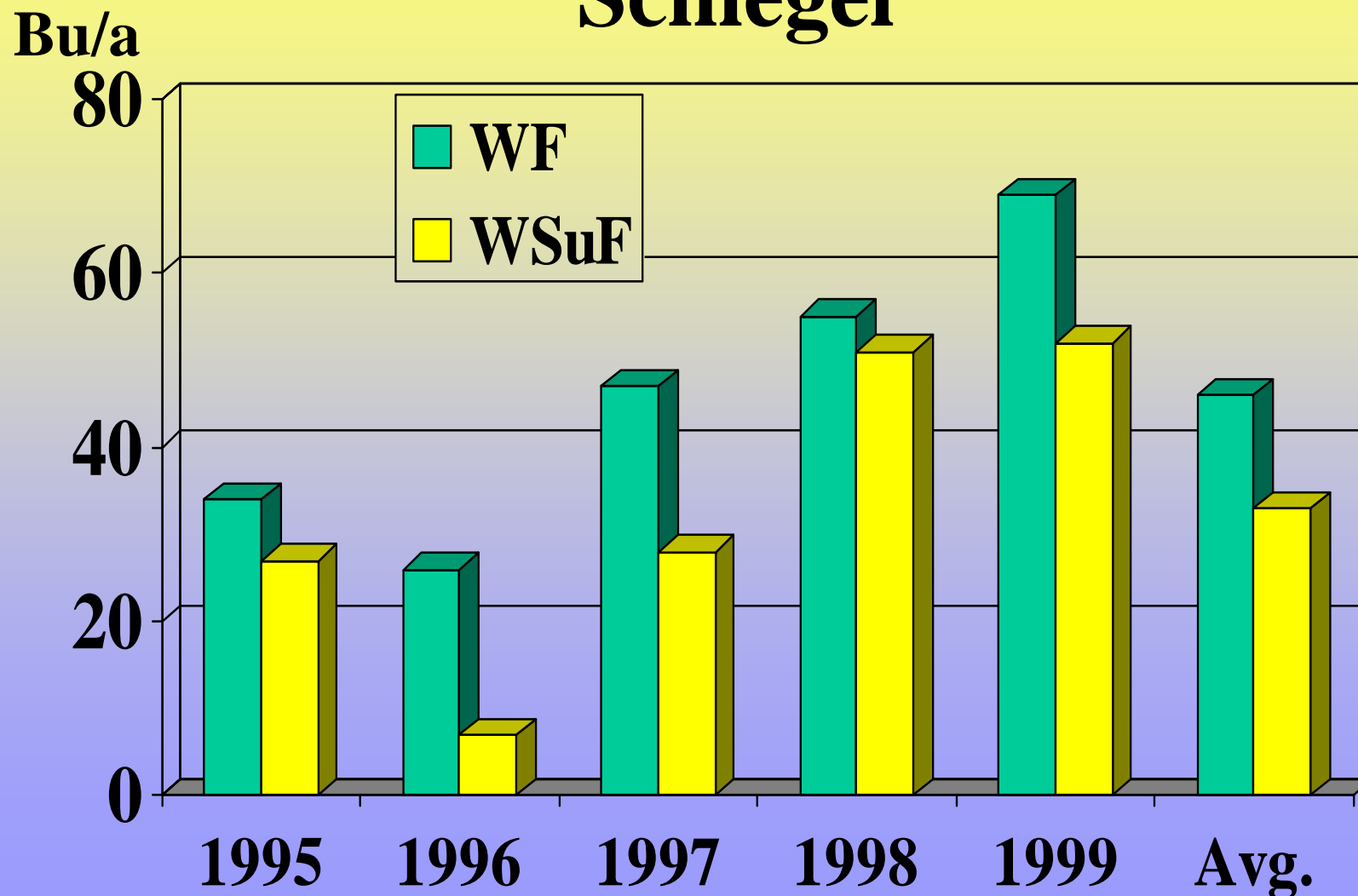
Average Returns to Limited Irrigated Crops (2001-2004)



Average Returns to Limited Irrigated Crops (2001, 2003-2004)



Wheat yields following sunflower in a WSuF rotation, SWREC Tribune. Schlegel



Double Crop Flowers Summary

- Choosing sunflower type to grow? Oil or Bird**
- Fertility? Soil test, 50 lbs N/1000 yield**
- Plant as early as possible**
- Populations? 20000-24000**
- Weed control? Notill into wheat stubble, DNA/Dual/Clearfield**
- Water? Essential for double crop**
- Insect control? yes**
- Harvest? Good luck, don't let seeds get too dry**





K-State Research and Extension

*Knowledge
for LIFE*

Questions?