

2008 National Sunflower Association Survey: YIELD, CULTURAL PRACTICES AND YIELD LIMITING FACTORS

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Introduction:

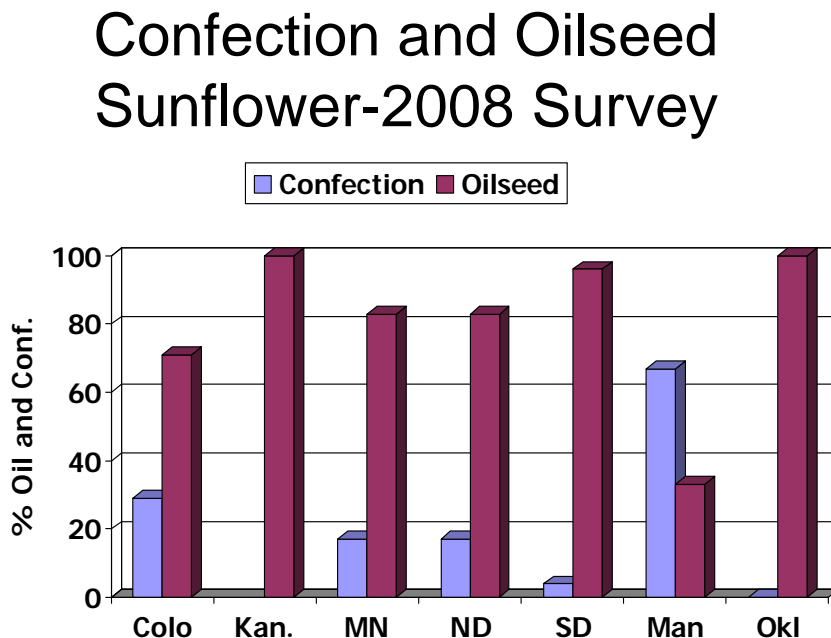
A sunflower field survey was conducted in September and early October in 2008 over six states in the Great Plains region which was similar to surveys in 2003, 2005, 2006 and 2007. Texas was not included in this years survey but Oklahoma was included with only limited data. Manitoba, Canada also was included in this year's survey for the second time. Yield and plant population were estimated and class (oil or confection), use of certain cultural practices, weed intensity, insect damage, bird damage, lodging, and disease levels (incidence or severity) were recorded. Seeds from each field surveyed were sampled for subsequent laboratory determination of seed damage.

One field was surveyed for every 10,000 acres in each state and county, based on the planted sunflower acres in 2008 as determined by Farm Service Agency-USDA and other state estimates.

The major yield limiting factors were determined for each field. Yield-limiting factors included: no problem, birds, disease, drought, drown-outs, hail, herbicide damage, insects, lodging, plant spacing, population and weeds. Diseases surveyed included Sclerotinia (wilt, head rot, mid stalk rot), Phomopsis, Phoma, Rhizopus head rot, Downy mildew, charcoal rot, Verticillium wilt and red rust.

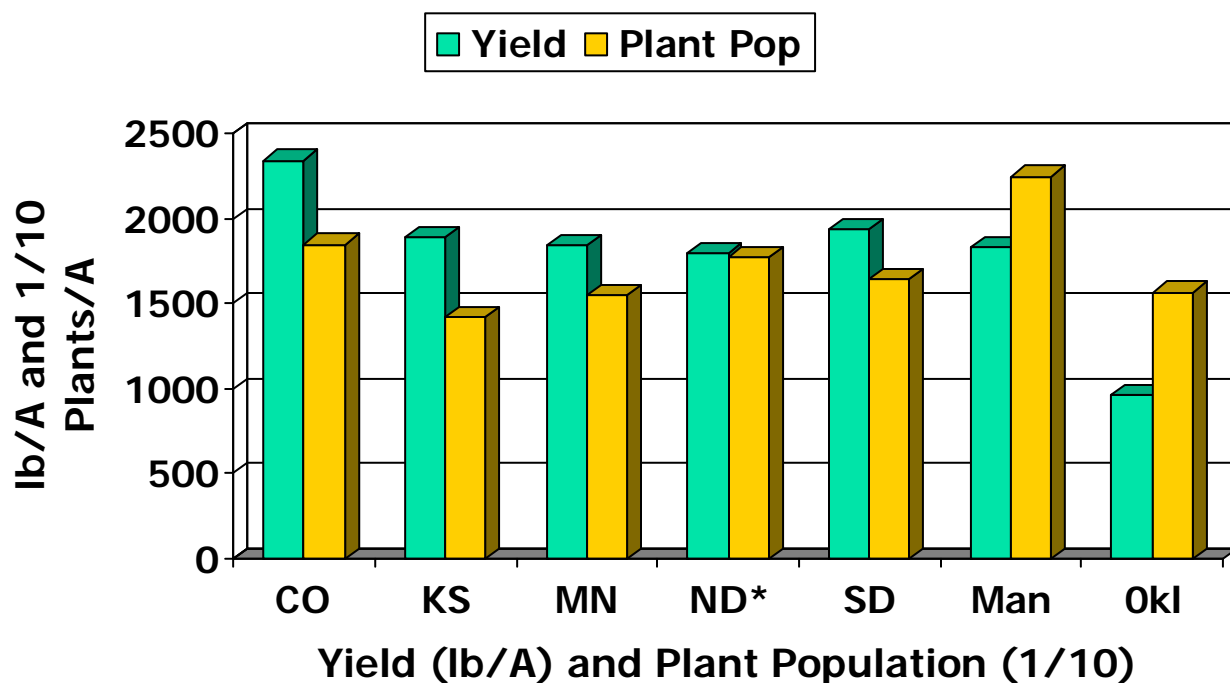
All States: A total of 162 fields were surveyed in 2008 compared to 157 in 2007. The percent oilseed fields surveyed was 100% in Kansas and Oklahoma which were the highest, followed by 94% in South Dakota, 83% in North Dakota, 83% in Minnesota and 71% in Colorado. The percent of confection fields surveyed was highest in Manitoba at 67% and with only 33% of sunflower planted to oilseed.

Oilseed and Confection Sunflower Acres-2008



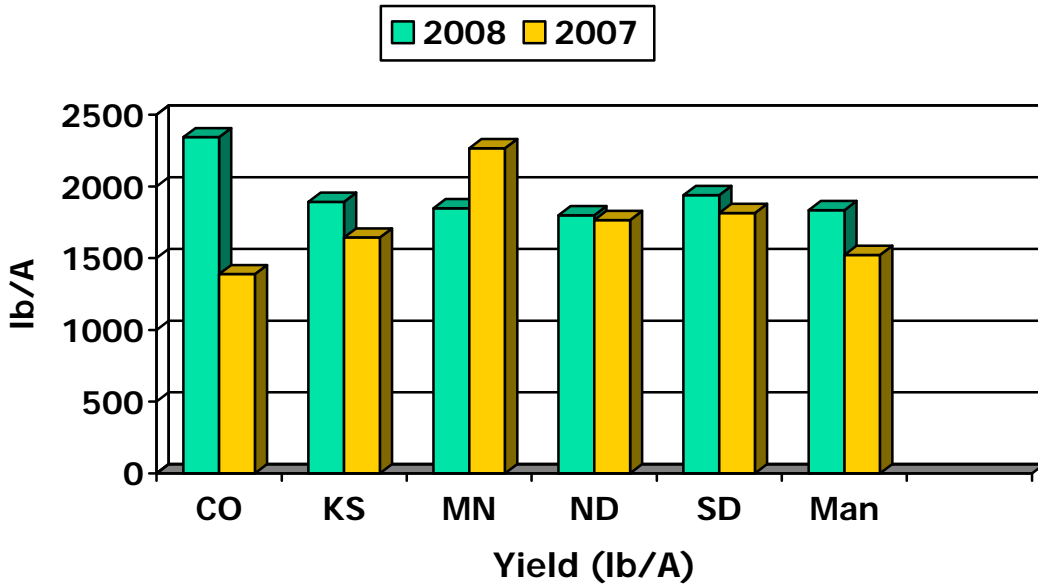
Estimated yields and plant populations: State average yield estimates in 2008 were 1798 lbs/A in North Dakota, 1847 lbs/A in Minnesota, 1938 lbs/A in South Dakota, 2343 lbs/A in Colorado, 1892 lbs/A in Kansas, 960 lbs/A in Oklahoma and 1835 lbs/A in Manitoba. In general, 2008 yields were higher in Colorado, Kansas, South Dakota and Manitoba than in 2007. In North Dakota the two years were nearly the same with 2008 being slightly higher. In Minnesota the yields were down because of disease. Plant populations at harvest in Manitoba, Colorado, North Dakota and South Dakota were highest with Kansas having the lowest plant populations. Manitoba had a large share of its sunflower planted to confection type yet still reported the highest plant populations.

Sunflower Yields and Plant Population 2008

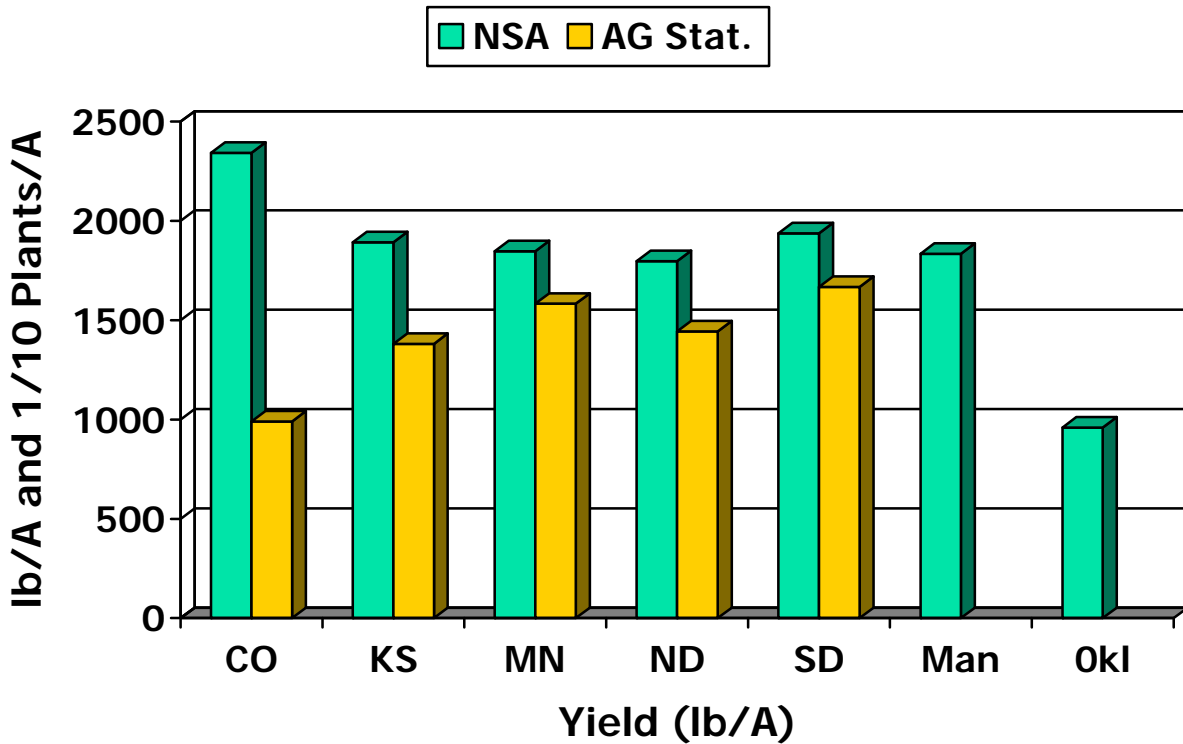


*North Dakota had a large number of surveyed fields with yields estimates well over 2000 lbs. per acre.

Sunflower Yields Compared for 2007 vs 2008



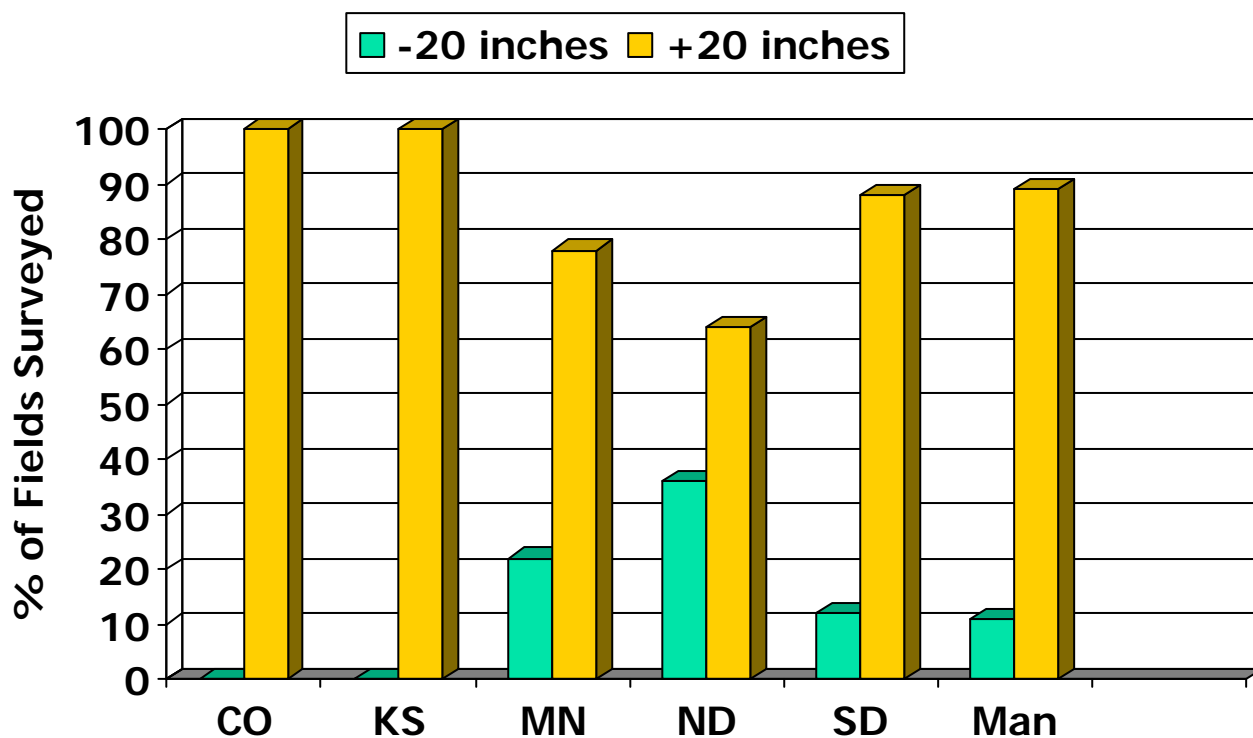
2008- USDA-AG. Statistics and National Sunflower Association Surveys Compared



When comparing the USDA- Ag. Statistics data and the NSA survey data for 2008, it shows that the NSA fall survey usually was reported at higher state average yields than the USDA survey as reported in October 2008. The NSA survey had less data points and usually the survey is not taken in some of the most arid areas of the northern Great Plains. The NSA survey is usually taken earlier than the USDA survey. The yield reducing factors such as bird pressure and disease can lead to lower yields if NSA survey was delayed later into the fall season. However, the yield trends tend to agree with each other when compared with-in years with NSA usually being slightly higher.

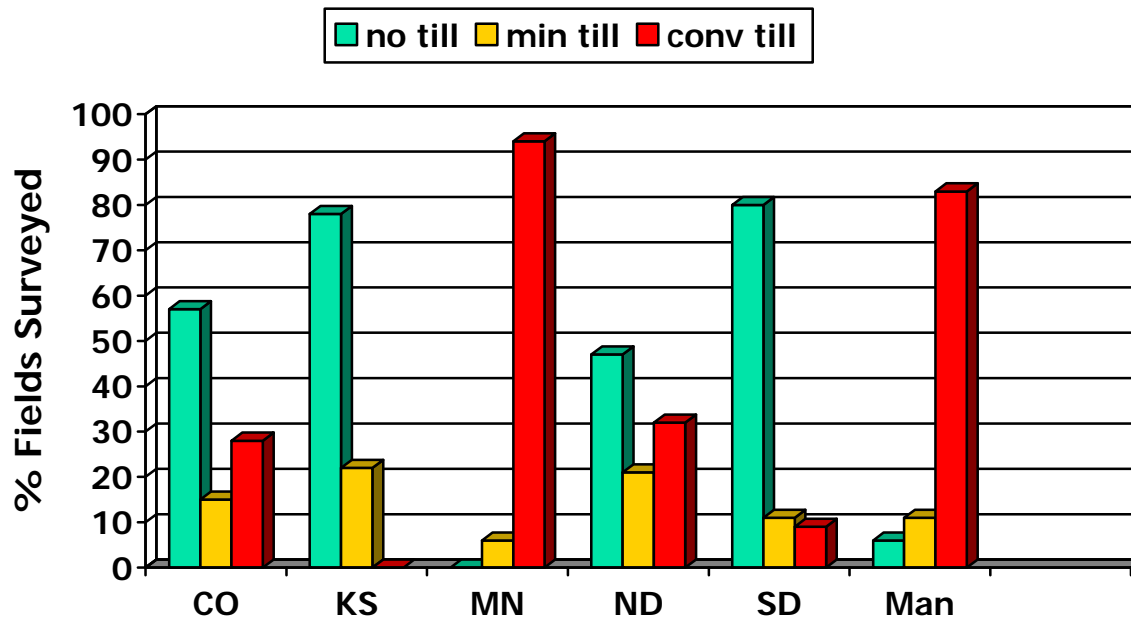
Row spacing: The majority of fields surveyed were planted with wide row spacings greater than 20 inches. North Dakota and Minnesota were the leading states with narrow rows. In Colorado and Kansas all fields had row spacing greater than 20 inches. In North Dakota, approximately 36% of fields surveyed had narrow row spacing < 20 inches. In Minnesota about 22% of the fields had narrow rows. In South Dakota and Manitoba both reported less than 11% of sunflower planted in narrow row spacing.

Row Spacing in Sunflower-2008



Tillage Practices: Conventional till was greatest in Minnesota at 94% and Manitoba a close second with 83% of the fields surveyed. Minimum till was reported as 15 % in Colorado, 22% in Kansas, 21% in North Dakota, and 6% in Minnesota. South Dakota led all states again for the third consecutive year with 80% of its sunflower acres under no-till. Kansas had a large increase from prior years with 78% reported on no-till and Colorado and North Dakota reported 57% and 47% of the acres planted to no till, respectively. There has been a positive trend for more sunflower acres to be planted under no-till farming practices.

Tillage Practices in 2008 Sunflower Survey



Yield-limiting Factors: The number one yield-limiting factor had a common thread in several of the states. In North Dakota it can be noted that disease and plant spacing were the major problems and limiting factor to higher yields. Disease was reported as the major number one problem in 22 % of all fields surveyed. Plant spacing was reported as the problem in about 16 % of all fields surveyed. They were followed by weed problems, bird damage and lodging as being other factors that limited yield potential. In Minnesota, as shown below, disease was the most critical yield limiting factor in 2008 with over 55 % of the fields having this problem. It should be noted that in South Dakota, plant spacings and weeds were the two primary yield limiting factors. In Kansas and Colorado the major yield limiting factors were drought and weed problems, followed by plant spacing in Colorado and disease in Kansas. Manitoba, in the survey for the second time, identified disease and weed problems as the two major yield limiting factors in 2008.

Major Yield Limiting Factors in Sunflower-2008
North Dakota

1 Yield Limiting Factors- N. Dak.
(77 Fields)

- Disease 17
 - Plant spacing 12
 - Weeds 8
 - Birds 6
 - Lodging 6
 - Other 6
 - Drought 5
 - Hail 2
 - Insects 1
 - Herb. Dam. 0
 - Drowned outs 0
 - No Problem 13
-

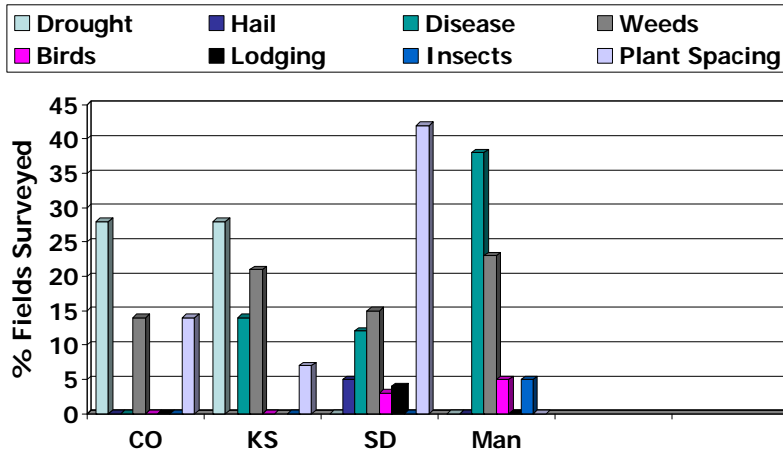
Minnesota -2008

Number 1 Yield Limiting Factors- Minnesota
(18 Fields)

- Disease 10
- Plant spacing 1
- Weeds 2
- Birds 0
- Lodging 0
- Other 2
- Drought 0
- Hail 0
- Insects 1
- Herb. Dam. 0
- Drowned outs 0
- No Problem 2

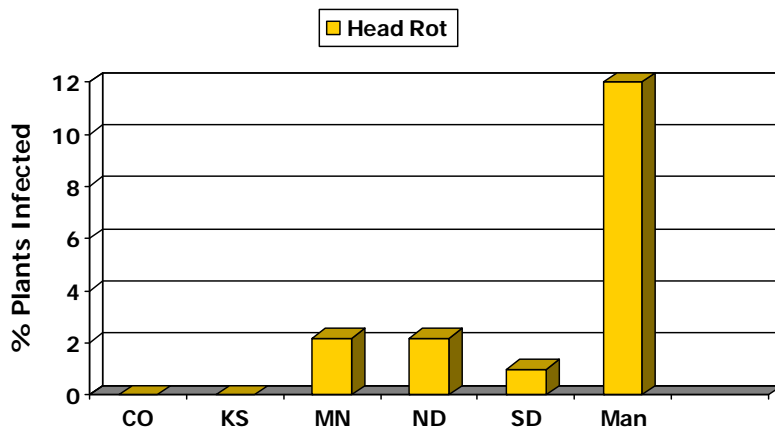
Major Yield Limiting Factors in Sunflower- 2008
South Dakota, Kansas, Colorado, and Manitoba

Number One Yield Limiting Factors-2008



Sclerotinia Disease: Sclerotinia (wilt, head rot and mid stalk rot) was not a serious problem in 2008 due to the dry weather in many sunflower production areas. However, reports of additional head rot did come in after this survey ended because of the warmer, late fall and some rainy periods. Head rot was highest in Manitoba this year with an average infection reported at 16%. North Dakota and South Dakota each had 2.2 % head rot reported. Most states reported a low incidence of the wilt and mid stalk rot.

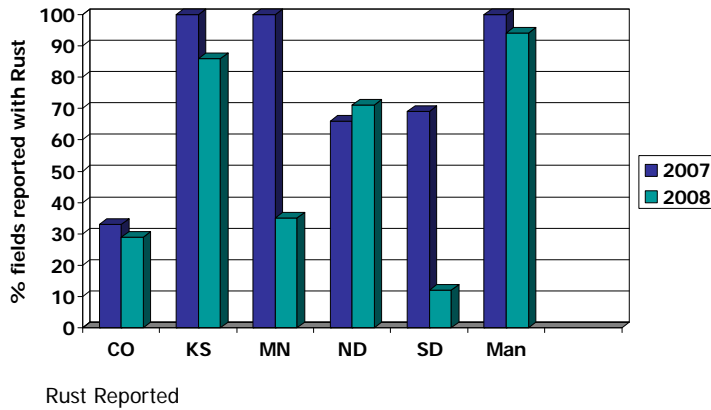
Sclerotinia Head Rot in Sunflower 2008



Red Rust Incidence and Severity in 2008: Red rust in sunflower was reported in all states surveyed ranging from 12 % of the fields in South Dakota to as high as 94 % in Manitoba. This disease continues to show up in more fields each and every year. When considering the severity of infection, it was most severe in Minnesota at 3.8 %, Manitoba with 1.3 % and all the other states under 1% severity. Rust infected leaf samples were sent to the USDA-ARS laboratory to test for new strains. Most of the sunflower rust infestation and infection appeared late in the season and thus had no great impact on yields. If the rust infection does occur early like in mid-July to early August then economic losses can occur.

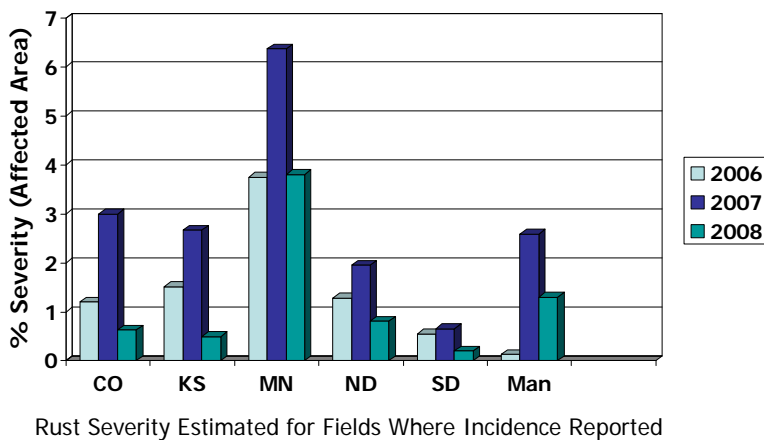
Red Rust Incidence- 2008

Red Rust Incidence in Sunflower



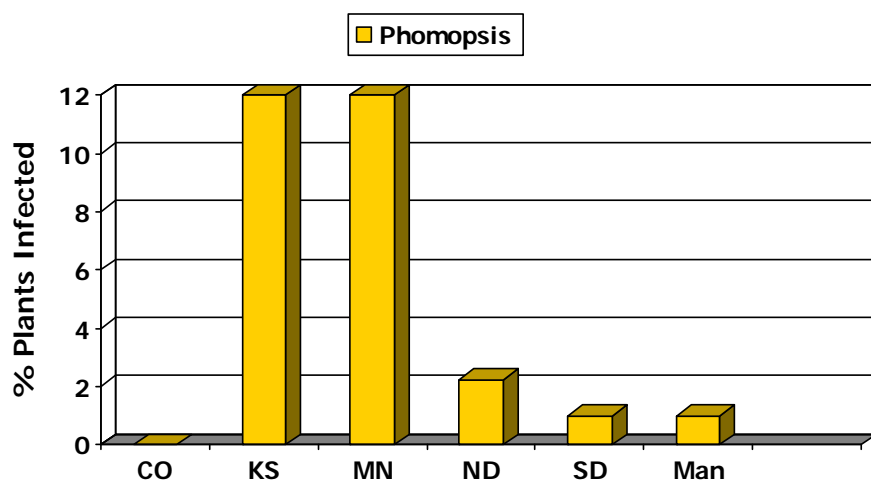
Sunflower Red Rust Severity - 2008

Red Rust Severity in Sunflower



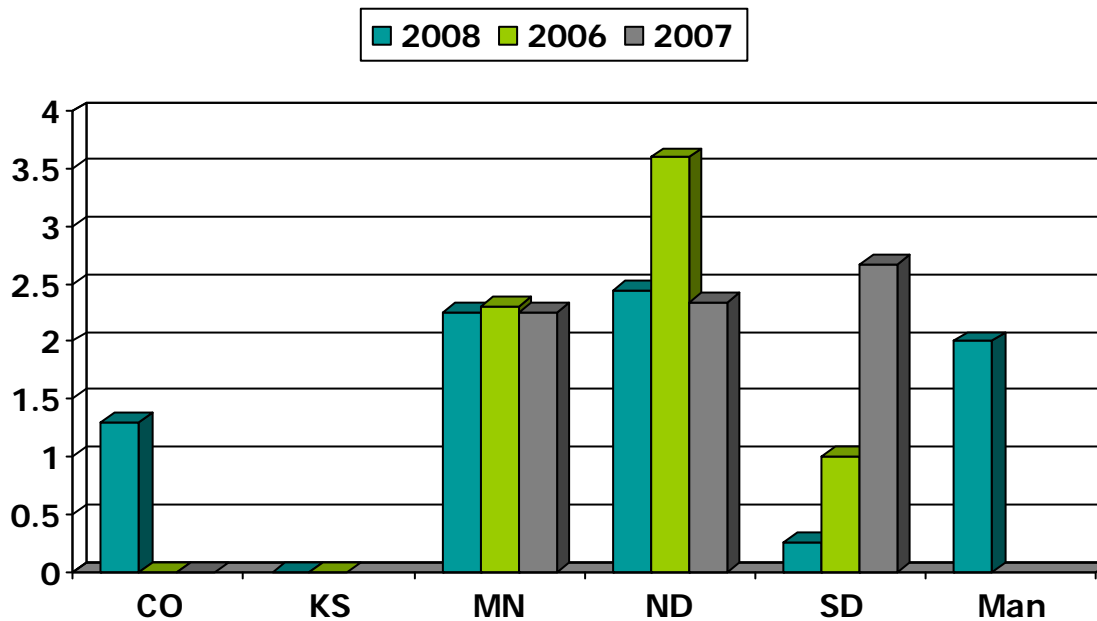
Other Sunflower Diseases: Rhizopus was reported in all states surveyed but was not a serious problem. Phomopsis continues to be a very serious problem in Minnesota with 18.9% , followed closely by Kansas with 18% of plants infected. Phomopsis in North Dakota was a 2.4% and only 1% in South Dakota and Manitoba. Colorado reported no Phomopsis. Phoma was down in most states and of low incidence in states reporting. Downy mildew was reported in the survey but was somewhat mixed since a lot of the early infection levels were difficult if not impossible to detect during survey time in late Sept. to early October.

Phomopsis in Sunflower 2008



Bird Damage: Bird damage continues to be a problem for many sunflower growers in the Great Plains. The average field damage in North Dakota from blackbirds (the primary pest species) was similar in both 2007 and 2008 at 2.3 % and 2.4 %, respectively. Highest state average damage in North Dakota during the past three years was reported in 2006 at 3.5 %. In 2008, there were 28 out of 77 fields reported with bird damage. The average damage in these reported fields was 6.7 %. It should be noted that Minnesota and Manitoba had the second highest average damage estimated at 2 % in the survey. Minnesota has just been over 2 % damage or loss over the past three years. In South Dakota the damage reported from birds was very low in 2008 compared to 2007. Bird damage in Colorado was at or below 1.3 %. Kansas reported little or no bird damage this past growing season. If one doesn't average the bird losses over all surveyed fields but only take into account those that had birds present and observed damage, the losses are much higher. Bird damage found in North Dakota continues to be most severe in the NC and SC regions of the state.

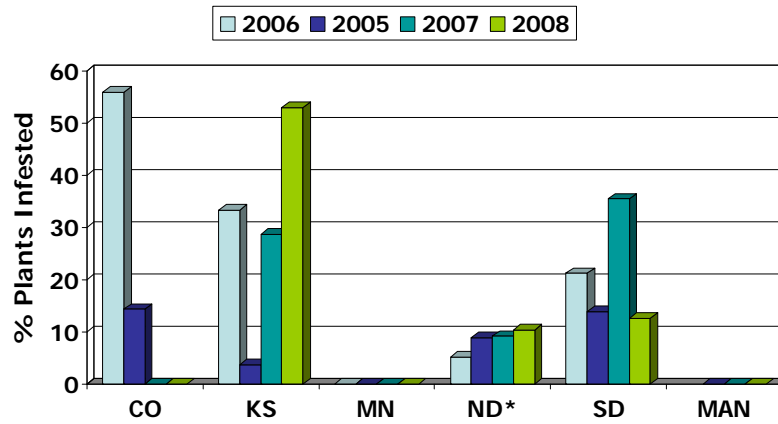
Bird Damage in Sunflower Surveys



Insect Damage in Sunflower Fields- Sunflower plants including stalks were examined for damage by the Long Horned beetle. The highest number of Long horned beetle were reported in Kansas with over 50% of the plants infested, South Dakota the second highest with 13% infested plants and North Dakota averaged over 10 % of plants infested. North Dakota's number of Long Horned beetles has more than doubled since the 2005 survey. Colorado had no reports of this insect in 2007 or 2008 nor did Minnesota or Manitoba.

Infestation of Long Horned Beetle in

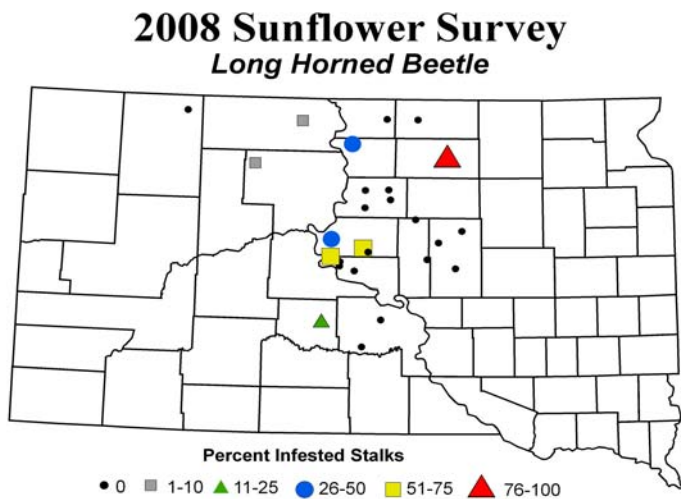
Insect: Longhorned Beetle



Sunflower

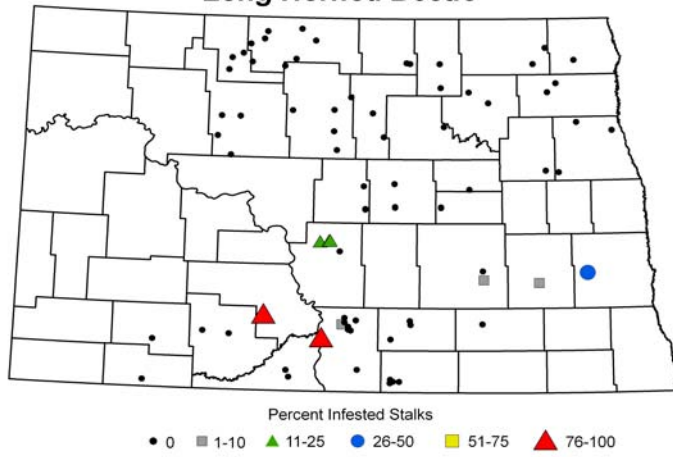
Below are maps showing the highest infestation regions of each state with the greatest numbers of Long Horned Beetles observed in the 2008 survey.

South Dakota



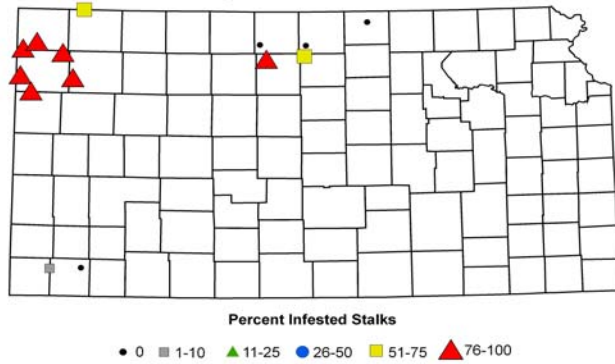
North Dakota

2008 Sunflower Survey *Long Horned Beetle*



Kansas

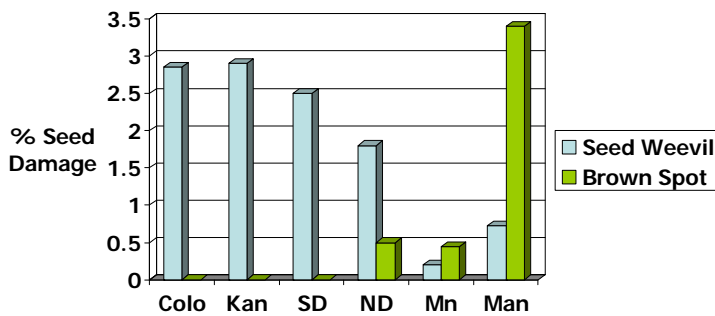
2008 Sunflower Survey *Long Horned Beetle*



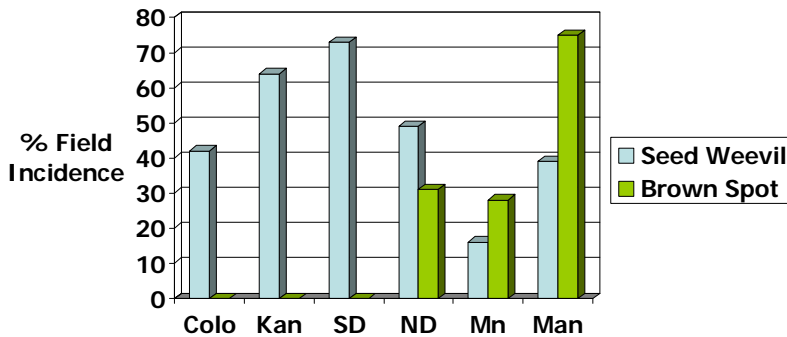
Other Insects: Sunflower seed weevil, banded SF moth, SF moth and Brown Spot damage were determined from seed samples taken in the fields in each state and sent in by survey teams. Serious damage by seed weevil was 2.75 % in both Kansas and Colorado, 2.5 % in South Dakota, and under 2% in North Dakota. Seed weevil damage was very low in both Minnesota and Manitoba. Seed weevil incidence in fields sampled was highest in South Dakota at over 70 % followed by Kansas at 64%. Another major insect problem occurred in Manitoba as brown spot was found in 74% of seed samples with damage average of 3.4 %. A large portion of the Manitoba seed produced was confection sunflower.

Damage by banded moth and sunflower moth was limited in most areas. Seed damage by banded moth was highest in North Dakota, Manitoba and Colorado but all were at or under 2 % damage.

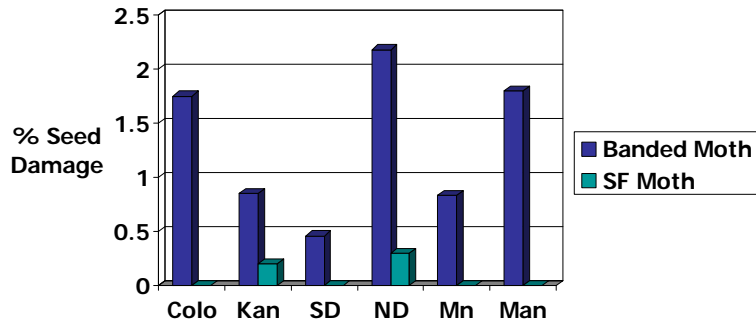
Insect Seed Damage-2008



Insect Seed Damage Incidence-2008



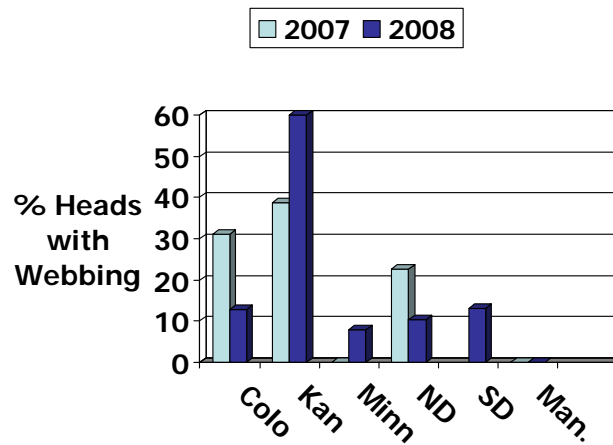
Insect Seed Damage by Moths-2008



Webbing in Sunflower Heads:

Webbing was most severe in Kansas at 60 % followed by lower levels of incidence in South Dakota 13 %, Colorado 12.7%, North Dakota 10 %, and Minnesota 7.8 %. No webbing was observed in Manitoba.

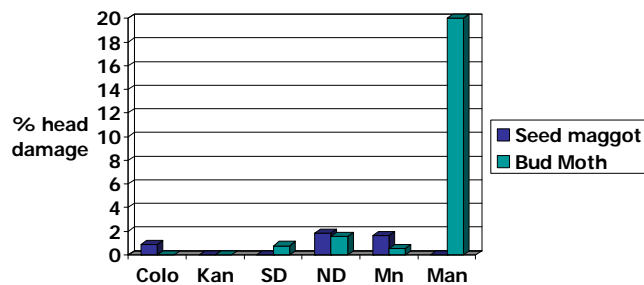
Webbing in Sunflower Heads



Sunflower Bud Moth Damage

The damage to heads caused by the sunflower bud moth was very severe in Manitoba at 20 % followed by very low damage levels in North Dakota, South Dakota and Minnesota. No bud worm damage was observed in either Colorado or Kansas. Seed maggot damage was under 2 % in both North Dakota and Minnesota.

SF Head Damage in 2008 Sunflower Survey



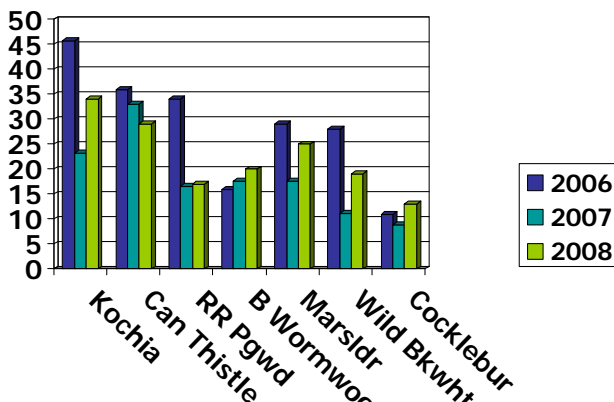
Weed problems in 2008 Survey in North Dakota and Minnesota - Twenty-nine common weeds were evaluated in the survey with the various infestation levels recorded. The ratings were: none, light, moderate and heavy. The data below indicates the percent of fields found with the following weed species being present. For broadleaf weeds in North Dakota and Minnesota, kochia, Canada thistle, marshelder, biennial wormwood and redroot pigweed were the most prevalent. Canada thistle was found in over 29 % of the fields surveyed while kochia was found in over 34 %. Marshelder was the third most prevalent weed specie with it being reported in 25 % of the fields. **In most of the fields the infestation levels were listed as very light and only present in the field and with little if any contribution toward reduced yields.** The main grassy weeds present in North Dakota and Minnesota were: green foxtail (23 %) and volunteer grains (13 %). Wild oats were present at under the 5% level.

Top Weeds Observed: 2008

- **North Dakota**
- Kochia
- Canada Thistle
- Marshelder
- Green Foxtail
- Wild Buckwheat
- Biennial wormwood
- **Minnesota**
- Common ragweed
- Biennial wormwood
- Redroot pigweed
- Kochia

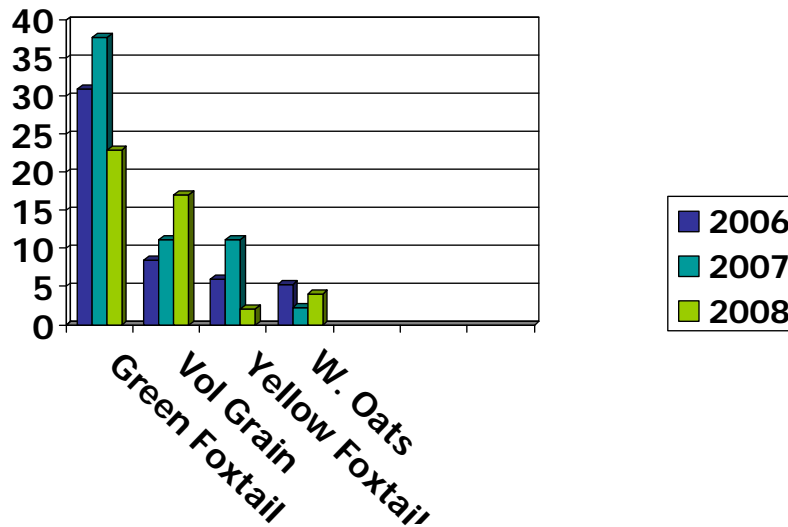
Sunflower Fields with Broadleaf Weeds in 2006, 2007 and 2008 in North Dakota and Minnesota.

Incidence of Broadleaf Weeds
ND/MN 2006, 2007 & 2008



Percent of Sunflower Fields with Grassy Weeds Present in 2006, 2007 and 2008 in North Dakota and Minnesota.

Incidence of Grassy Weeds In Sunflower: ND/MN 2006, 2007 & 2008



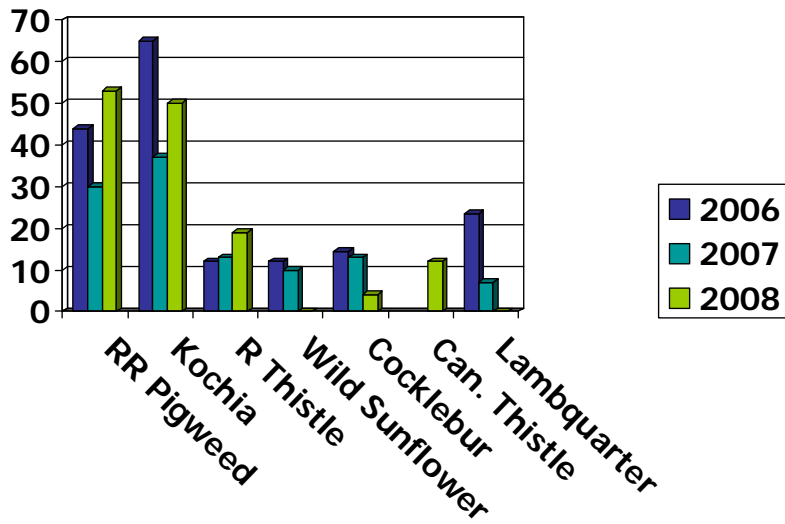
Weeds in South Dakota and Manitoba: In South Dakota, kochia, redroot pigweed and Russian thistle were found to be the most prevalent broadleaf weeds. Kochia and redroot pigweed were present in over 50 % of the fields survey but were usually in very small numbers. Whereas, green foxtail at 31 % was by far the most abundant grassy weed reported. Yellow foxtail was found this year and was noted in 12 % of the surveyed fields. The presence of volunteer grains was only minimal.

In Manitoba, the prevalent broadleaf weed was Canada thistle, followed by kochia, redroot pigweed, and common ragweed. Canada thistle was reported in 70% of the fields surveyed. Kochia was found in 38% of the fields, whereas cocklebur, redroot pigweed and wild mustard were also found in over 30 % of the fields surveyed. Usually the weed numbers present were quite small and didn't have any real influence on yield reduction.

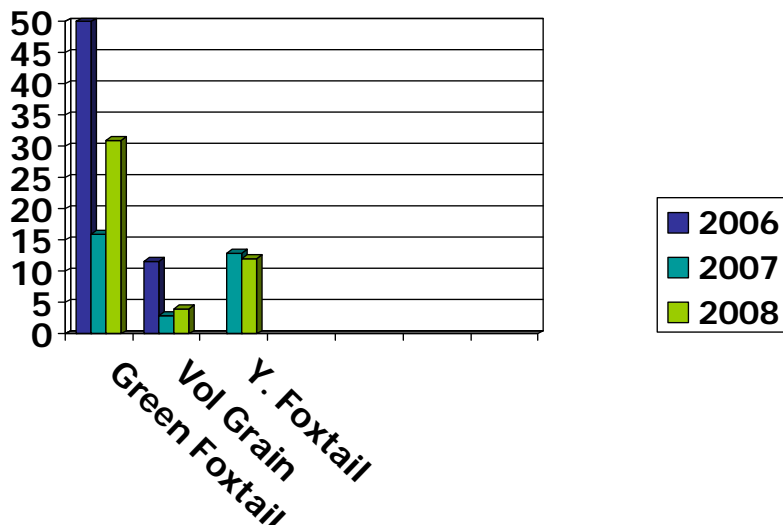
Top Weeds in South Dakota and Manitoba: 2008

- | | |
|--|--|
| <ul style="list-style-type: none"> • South Dakota • Redroot pigweed • Kochia • Green foxtail • Russian thistle | <ul style="list-style-type: none"> • Manitoba • Canada thistle • Kochia • Redroot pigweed • Common ragweed • Wild mustard |
|--|--|

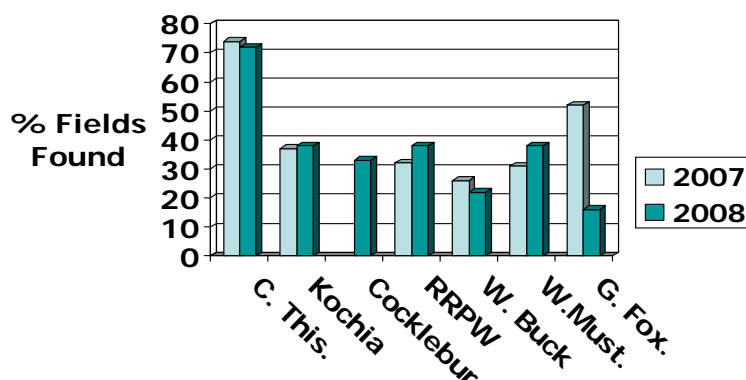
Incidence of Broadleaf Weeds South Dakota 2006, 2007 & 2008



Incidence of Grassy Weeds South Dakota 2006, 2007 & 2008



Incidence of Weeds Observed in Manitoba



Weeds in Kansas and Colorado-

In Kansas, Palmer Amaranth was once again the number one broadleaf weed found and was identified in over 90 % of fields surveyed. Other broadleaf weeds found were kochia in 70 %, Puncture vine in 63 % and Devils Claw in 27 % of the fields surveyed. The primary grassy weed found in Kansas was volunteer grain in 58 % of the fields visited.

In Colorado, the number one weed was redroot pigweed in 58 % of the fields surveyed, followed by Russian thistle and Puncture vine in over 40 % of the fields. It was noted that this is one of first years that Russian thistle has been reported in Colorado at this high of an incidence. Green foxtail was the primary grassy weed reported in 28 % of the fields surveyed.

Top Weeds Observed: 2008

• Kansas weeds

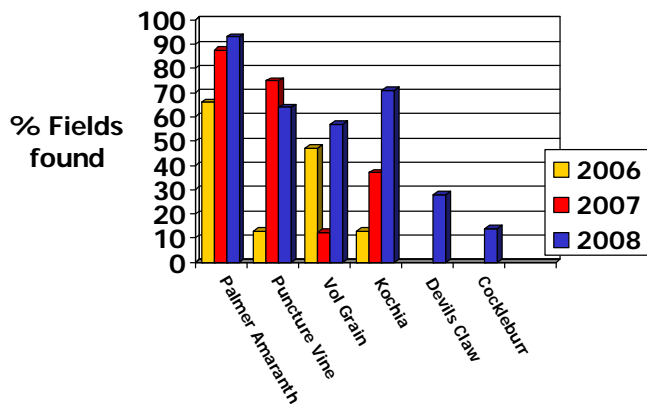
- Palmer Amaranth
- Kochia
- Puncture vine
- Volunteer Grain
- Devils Claw

• Colorado Weeds

- Russian thistle
- Redroot pigweed
- Puncture vine
- Lanceleaf sage
- Cocklebur

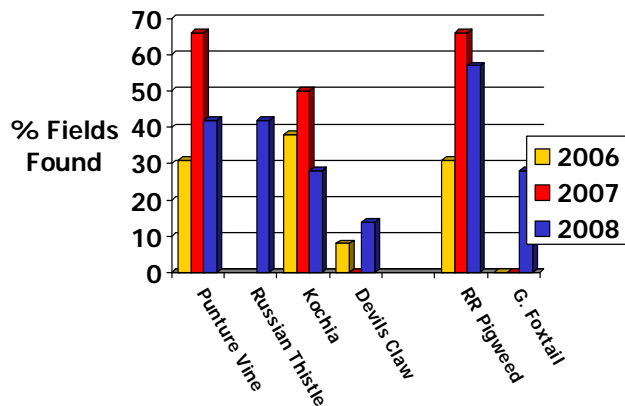
Incidence of Weeds in Kansas in 2006, 2007 and 2008

Incidence of Weeds in Kansas



Incidence of Weeds in Colorado in 2006, 2007, and 2008-

Incidence of Weeds in Colorado



Sunflower Survey Summary: The 2008 survey was conducted in the same five states as the 2002, 2003, 2005, 2006 and 2007 sunflower surveys with the exception of Texas. Oklahoma was included this year but only limited data was reported from two fields. Manitoba in Canada was also included for the second year to this survey.

In 2007, the number one and number two major yield limiting factors were as follows:

In North Dakota it was disease, lower plant spacings and low populations, Minnesota had diseases as the major factor, South Dakota had low plant populations and insects, in Kansas the major problems were weeds, drought and low plant population, and in Colorado it was drought, weeds and disease and in Manitoba major issues were weeds, bird pressure and diseases.

The 2008 sunflower survey in North Dakota found the major issues identified were diseases, and poor plant spacing which were followed by weeds, birds and lodging. In Minnesota, diseases were once again the major issue contributing towards yield reduction. In South Dakota, the major problems encountered were plant spacing issues and weed pressure. In Kansas, the major problems were drought and weeds, in Colorado, the major yield limiting factors were drought, and weeds, whereas in Manitoba the major sunflower production problems reported were disease and weed pressure.

Over the Great Plains states however it was a very good production year for sunflower with yields being slightly above the five year averages and pest problems in most respects were limited to few new problem issues. Red rust needs to be monitored closely on any changes, increases or new strains developing. Long Horned beetle in some growing regions must be monitored more closely and as always the bird problem in the Northern Great Plains must be watched and monitored.

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