2009 National Sunflower Association Survey:
YIELD, CULTURAL PRACTICES AND YIELD LIMITING FACTORS

Duane R. Berglund, Professor Emeritus and former Extension Agronomist, Dept. of Plant Sciences, North Dakota State University, Fargo, ND 58105

Introduction:

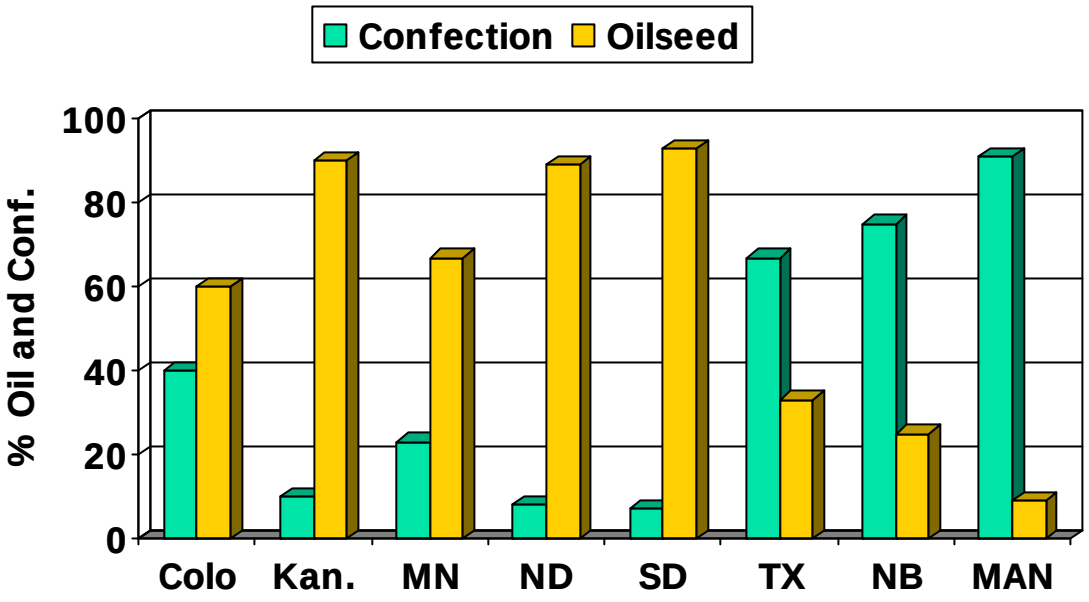
A sunflower field survey was conducted in September and early October in 2009 over six states in the Great Plains region which was similar to surveys in 2003, 2005, 2006, 2007 and 2008. Nebraska was included with only limited data. Manitoba, Canada also was included in this year's survey for the third time. Yield and plant population were estimated and class (oil or confection), use of certain cultural practices, weed incidence, insect damage, bird damage, lodging, and disease levels (incidence or severity) were recorded. Seeds collected 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 2009 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.

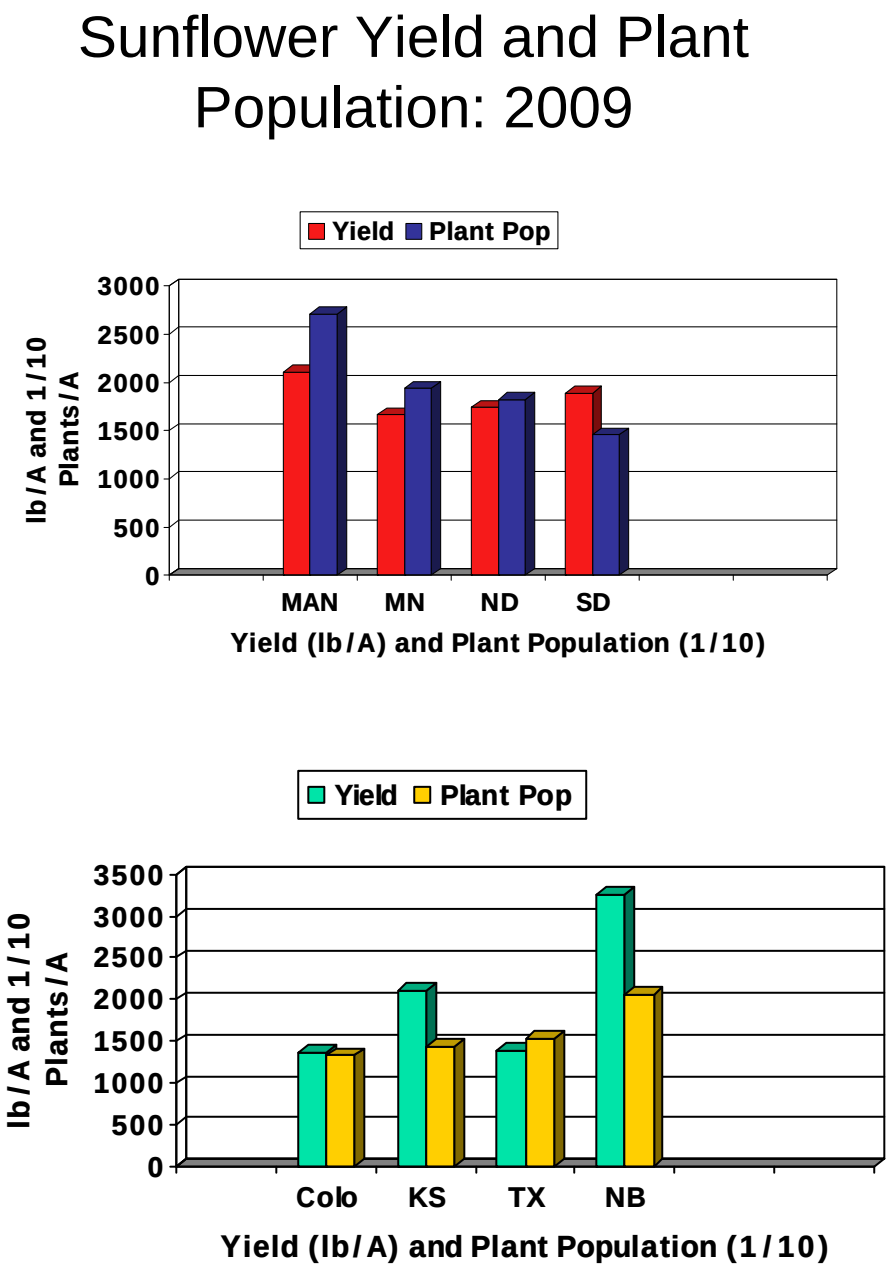
All States: A total of 177 fields were surveyed in 2009 compared to 162 in 2008. Percent oilseed fields surveyed was highest at 93% in South Dakota, followed by 90% in Kansas, 87% in North Dakota and 67% in Minnesota. The percent of confection fields surveyed was highest in Manitoba at 91%, Nebraska 75% and Texas 67%.

Percent of Oilseed and Confection Sunflower Acres-2009



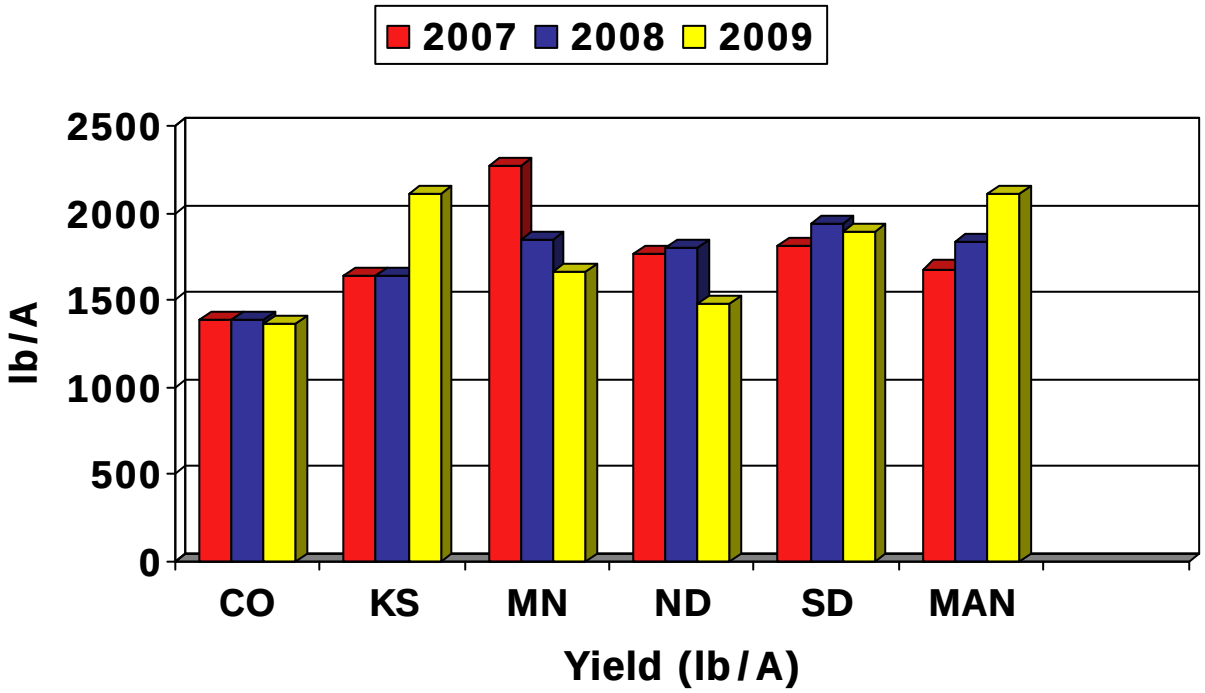
Estimated yields and plant populations: State average yield estimates in 2009 were 1480 lbs/A in North Dakota, 1663 lbs/A in Minnesota, 1888 lbs/A in South Dakota, 1367 lbs/A in Colorado, 2111 lbs/A in Kansas, 3250 lbs/A in Nebraska, 1392 lbs/A in Texas and 2109 lbs/A in Manitoba. In general, 2009 estimated yields were higher in Kansas and Manitoba than in 2008. In North Dakota and Minnesota, yields were down due to diseases while in Colorado yields were slightly down because fewer irrigated fields and lower plant populations plus weeds. Plant populations at harvest in Manitoba, Kansas, and Nebraska were the highest. North Dakota and South Dakota were similar to 2008. Colorado and Texas had lower plant populations than in recent survey years.

Sunflower Yields and Plant Populations 2009

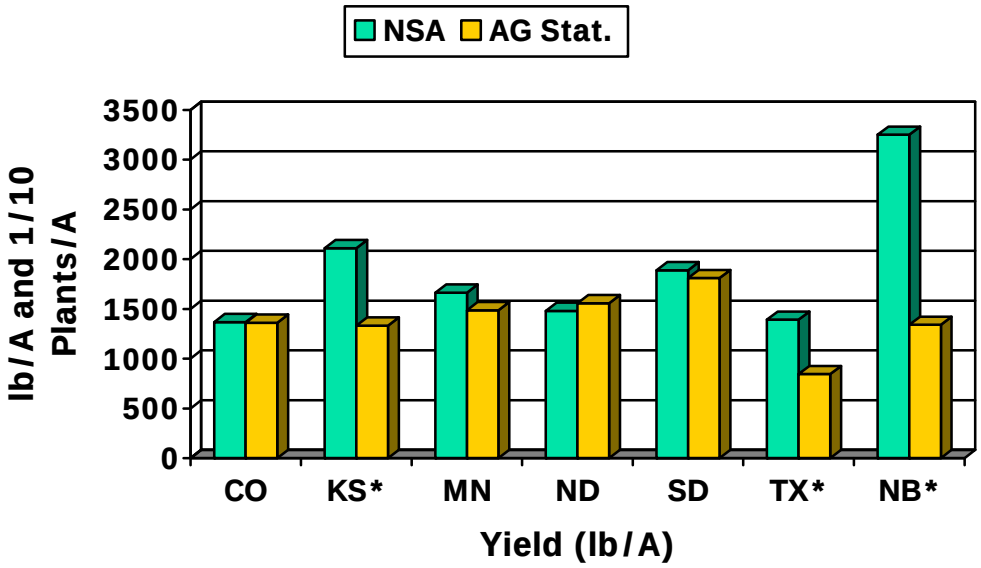


Sunflower Survey Yields Compared for 2007, 2008 and 2009

Yields were higher in Manitoba and Kansas when compared over the past several years. However, yields in North Dakota and Minnesota were down when compared to 2007 or 2008. Yields in South Dakota and Colorado were all about the same over the past two years.



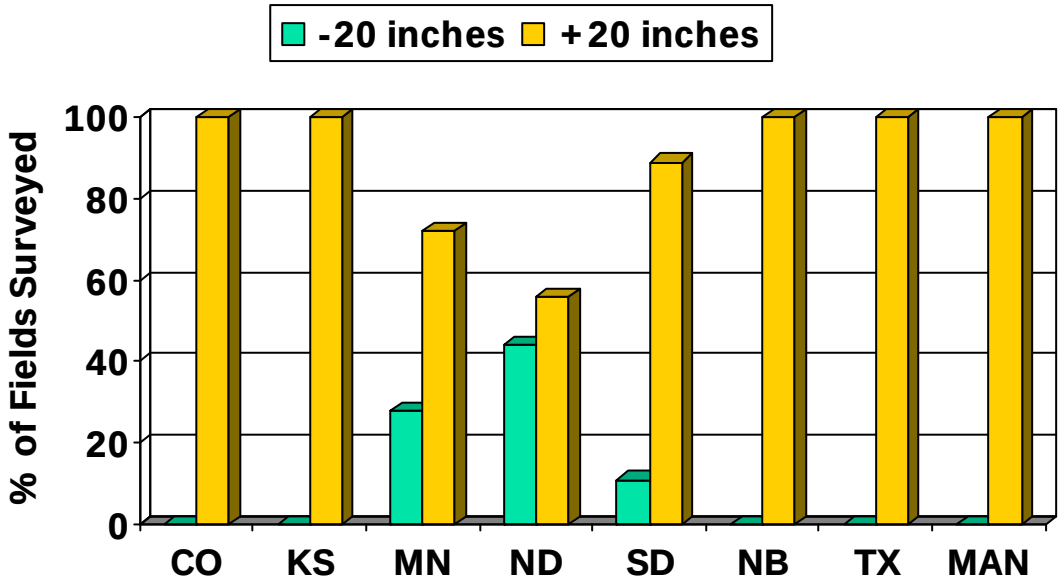
2009- USDA-AG. Statistics and National Sunflower Association Surveys Compared



***Note: Kansas, Nebraska and Texas NSA surveyed fields were primarily irrigated fields.**

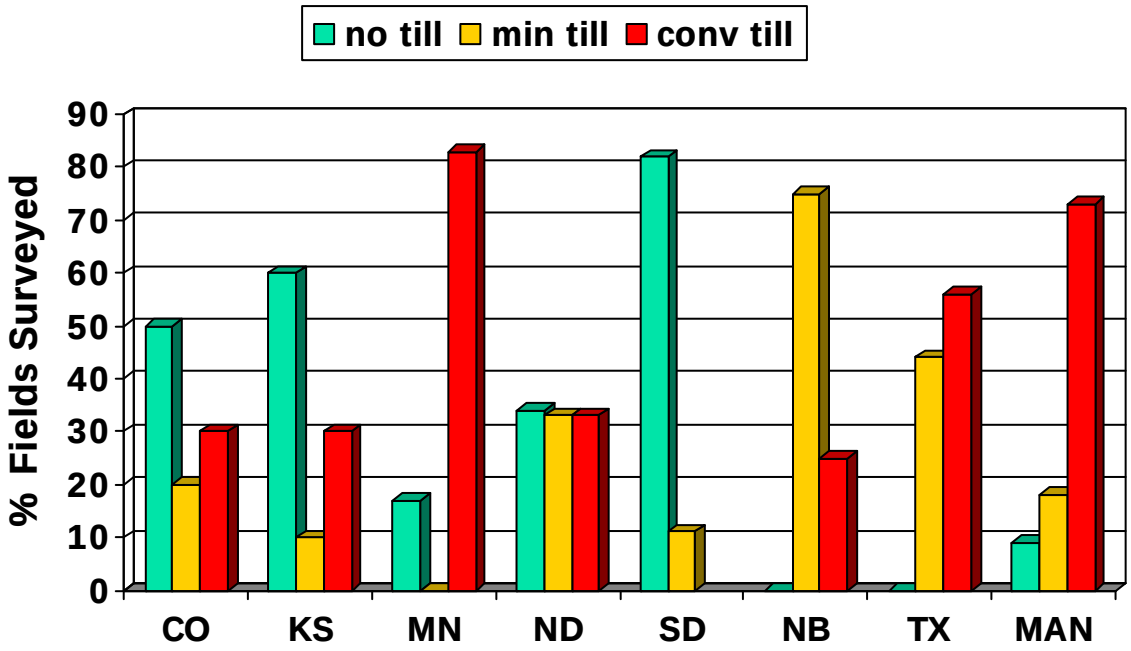
When comparing the USDA- Ag. Statistics fall estimates and the NSA estimates for 2009, it indicates that the NSA fall survey was reported at higher state average yields than the USDA survey as reported in October 2009. The NSA survey had less data points and usually the survey is not taken in some of 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 could 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 sunflower fields surveyed in the central Great Plains region were planted in wide row spacings greater than 20 inches. North Dakota and Minnesota were the leading states with narrow rows. In Colorado, Kansas, Nebraska, Texas and Manitoba all fields had row spacing greater than 20 inches. In North Dakota, approximately 44% of fields surveyed had narrow row spacing < 20 inches. In Minnesota about 28% of the fields had narrow rows and in South Dakota approximately 11% were planted in narrow row spacings.



Tillage Practices in Sunflower : Conventional till was greatest in Minnesota at 83%, Manitoba with 73% and Texas with 56% of the fields surveyed. Minimum till was reported at 20% in Colorado, 10% in Kansas, 33% in North Dakota, and 75% in Nebraska. South Dakota led all states again for the fourth consecutive year with 82% of its sunflower acres under no-till. Kansas had the second highest reported no-till with 60% and Colorado and North Dakota reported 50% and 34% of the acres planted to no till, respectively. In North Dakota there is a fairly even ratio of all three types of tillage practices. There has been a positive trend during the past 4 years of the NSA survey for more sunflower acres being planted using no-till farming practices in the Great Plains region.

Tillage Practices in 2009 Sunflower Survey

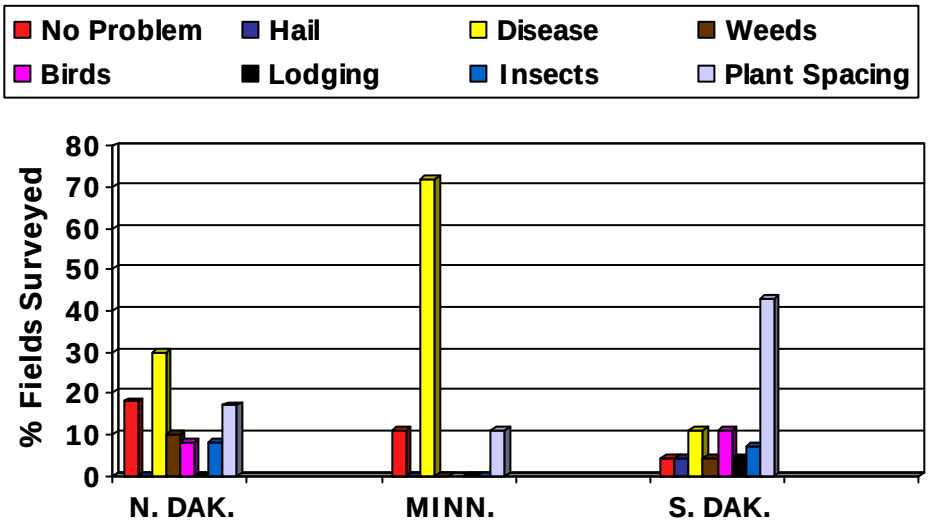


2009 Yield-limiting Factors: The number one yield-limiting factor had a common thread in several of the states. In North Dakota it can be noted that disease and plant spacing were the limiting factor to higher yields. Disease was reported as the number one problem in 30% of fields surveyed, while poor plant spacing problem was reported in 17% of fields surveyed in North Dakota. They were followed by weed problems, bird damage and insects as being other factors that limited yield potential.

In South Dakota, plant spacing was a major number one problem, followed by bird damage and diseases as major yield limiting factors.

In Minnesota, as shown below, disease was the most critical yield limiting factor again in 2009 with over 72 % of the fields having infestation levels which would reduce yield potential. Plant spacing was only listed as a problem in 10% of the fields.

Major Yield Limiting Factors in North Dakota, Minnesota and South Dakota- 2009



North Dakota – Number of fields with problems out of 87 surveyed

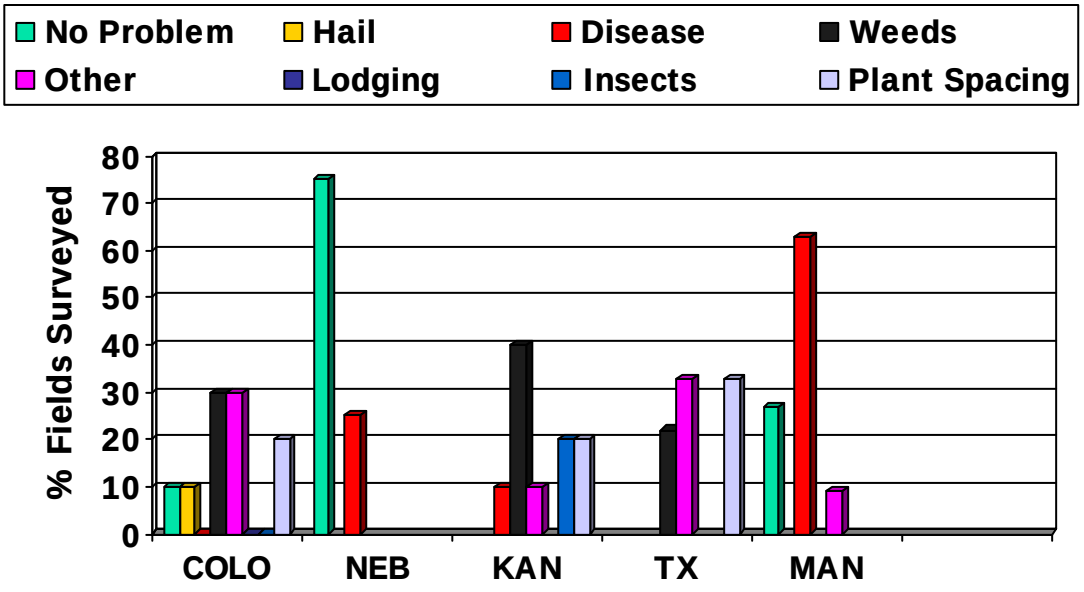
- Disease 26
- Plant spacing 15
- Weeds 9
- Birds 7
- Insects 5
- Other 7
- Drought 1
- Herbicide Damage 1
- No Problem 16

South Dakota- Number of fields with problems out of 28 surveyed

- Plant Spacing 12
- Birds 3
- Disease 3
- Insects 2
- Weeds 1
- Drought 1
- Hail 1
- Lodging 1
- Other 3
- No Problem 1

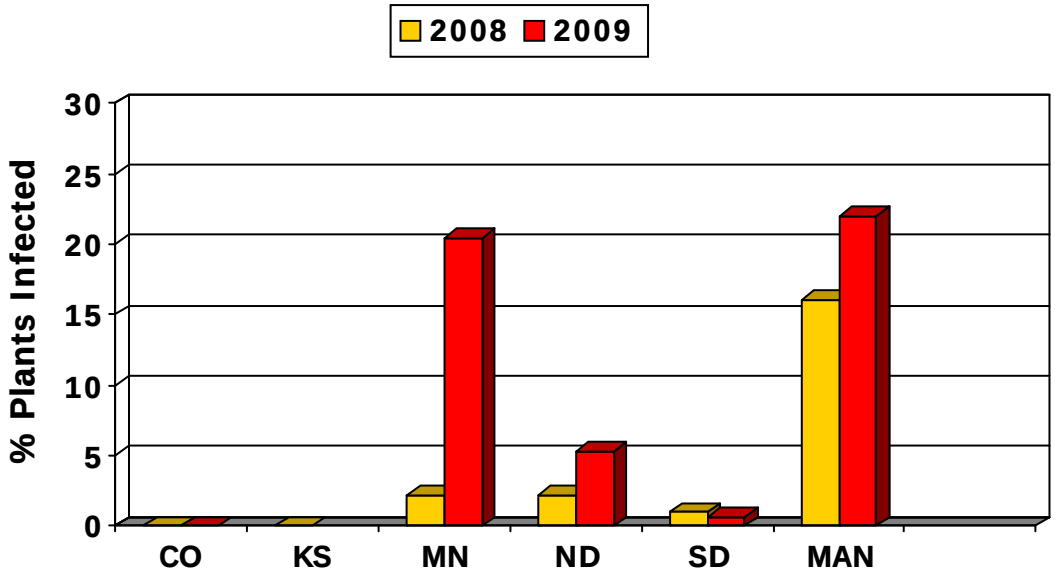
In Colorado the major yield limiting factors were weeds and plant spacing. While in Kansas the major problem was weeds followed by insects and plant spacing problems. Nebraska and Manitoba both reported diseases to be the major problem in reaching yield potential. Texas reported that plant spacing and weeds were the major issues.

Major Yield Limiting Factors in Sunflower- 2009
Kansas, Colorado, Nebraska, Texas and Manitoba



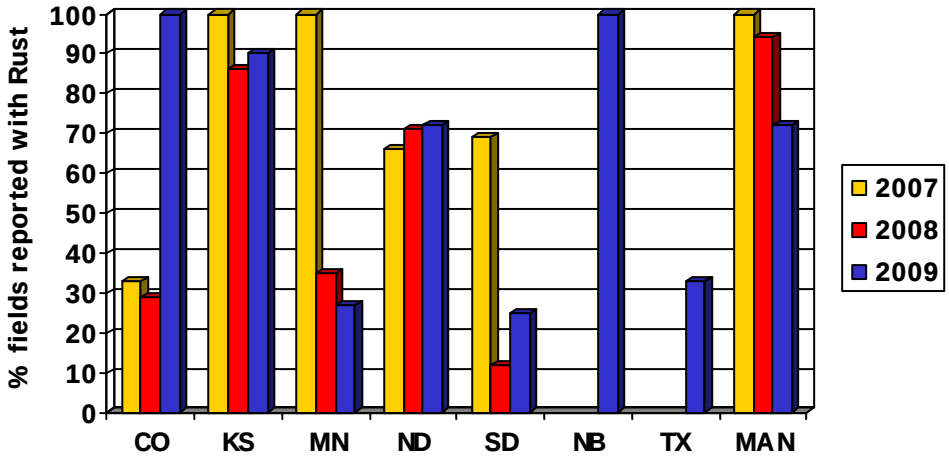
Sclerotinia Disease: Sclerotinia diseases (wilt, head rot and mid stalk rot) in 2009 were not a serious problem in some regions due to dry weather in many sunflower production areas. South Dakota, Colorado, Nebraska , Kansas and Texas reported very little if any sclerotina problems. However, sclerotinia head rot was very high in Manitoba (22%) and Minnesota (20%) with heads infected. In North Dakota the levels were down to only 5% head rot but double that of last year. Minnesota levels were much higher than in 2008 and in Manitoba the infection level was about 5% greater that last year. South Dakota reported only a very small amount of head rot and has been under 1% during the past two years.

Sclerotinia Head Rot in Sunflower 2008 & 2009

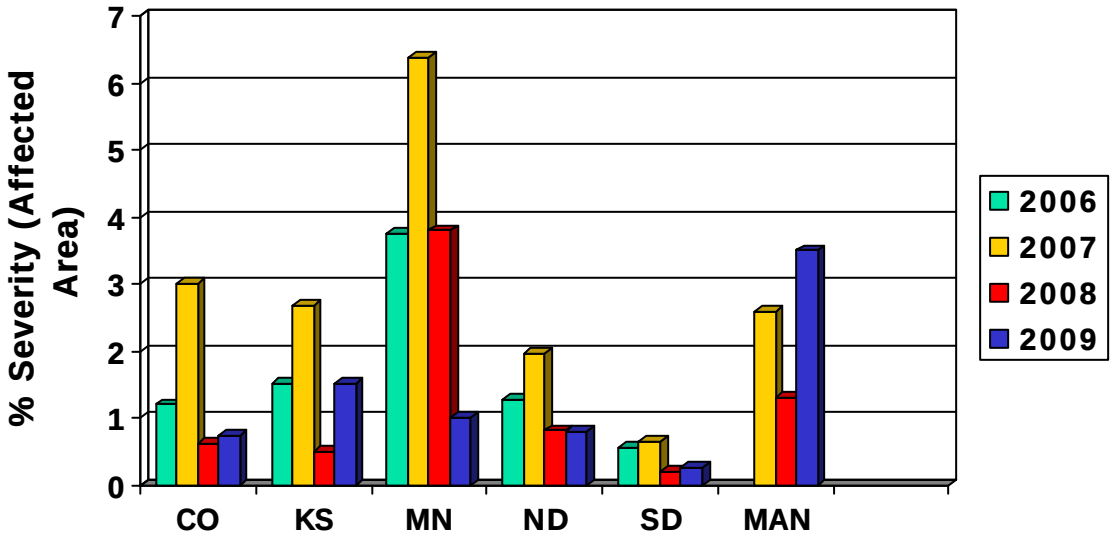


Red Rust Incidence and Severity in 2009: Red rust of sunflower was reported in all states surveyed ranging from 25% of the fields in South Dakota to as high as 100 % in Colorado and Nebraska. There was high incidence also in Kansas at 90%, North Dakota 72%, and Manitoba 72%. This disease continues to show up in more fields each and every year. In North Dakota the incidence has remained approximately the same over the past three years. When considering the severity of rust infection, it was most severe in Manitoba at 3.5 %, Kansas at 1.5 % and all the other states under 1% severity. Rust infected leaf samples were sent to the USDA-ARS laboratory in Fargo, North Dakota 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 earlier like in mid-July to early August then economic losses may occur. Currently there is now increased fungicide spraying for rust in some areas but was not part of this survey.

Red Rust Incidence- 2009

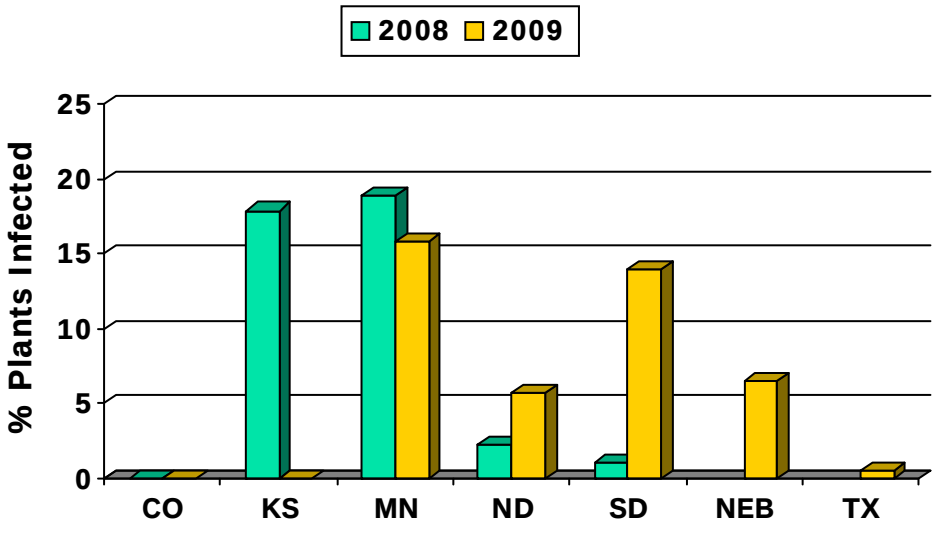


Sunflower Red Rust Severity - 2009

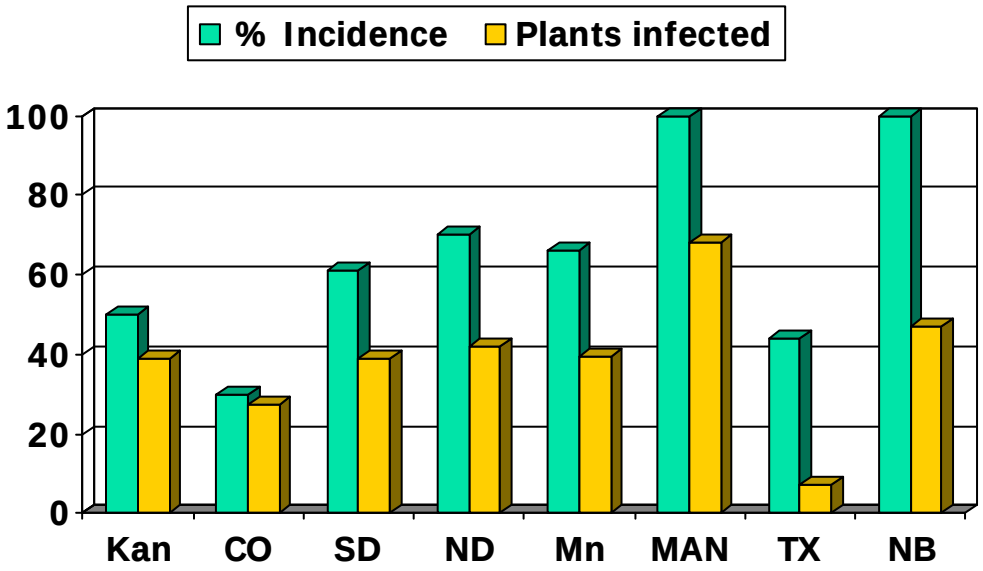


Other Sunflower Diseases: **P**homopsis continues to be a very serious problem in Minnesota with 16 % , followed closely by South Dakota with 14% of plants infected. Phomopsis infected plants was 5.7 % in North Dakota and 6.5 % in Nebraska. Colorado and Kansas reported no Phomopsis in 2009. Phoma incidence was very high this year compared to prior years. Manitoba and Texas had 100% incidence in surveyed fields while Kansas, South Dakota, North Dakota and Minnesota all reported Phoma in >50% of surveyed fields or higher. Colorado had the lowest incidence and infection levels of Phoma of all states. Rhizopus head rot was noted in the survey to be highest in Nebraska, Texas, Kansas and South Dakota. In North Dakota this disease was only found in 18% of the fields and less than 6% in Minnesota surveyed fields.

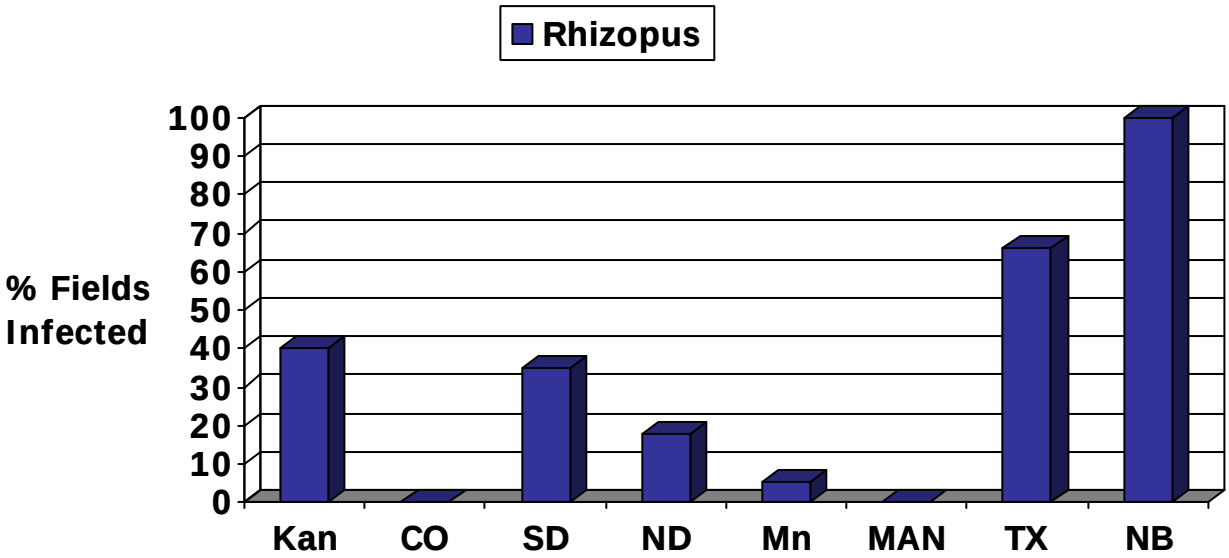
Phomopsis in Sunflower 2008 & 2009



Phoma Incidence and Infection levels in 2009

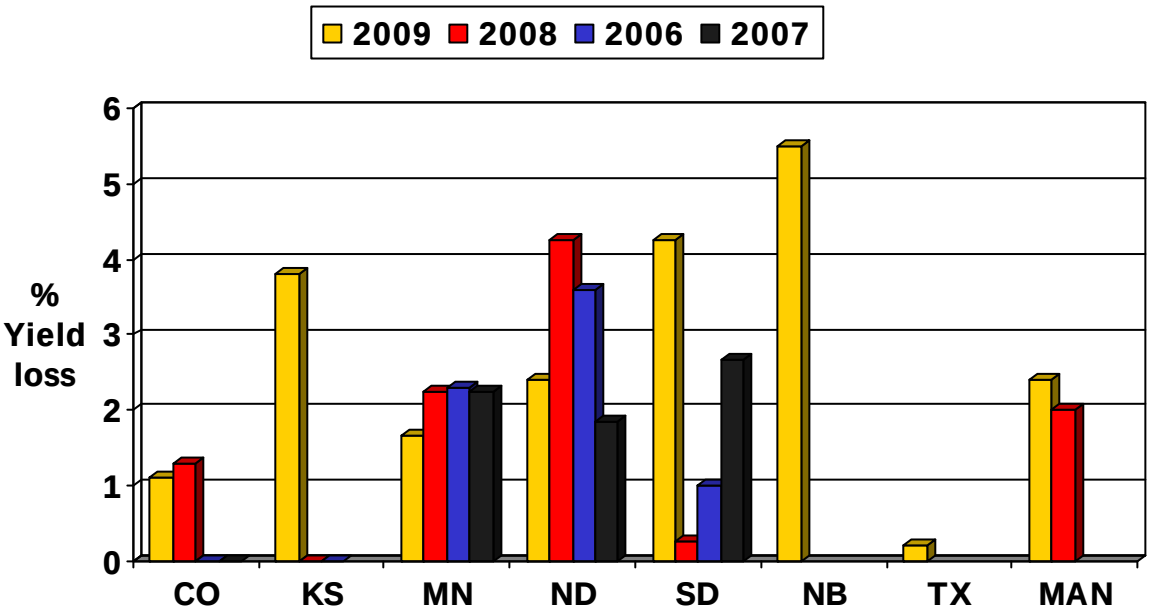


Rhizopus Head Rot % Incidence in 2009



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 less than last year. Highest state average damage in North Dakota during the past four years was reported in 2008 at 4.2 % while losses this year were at 2.4%. Nebraska, South Dakota and Kansas reported the highest bird damage in 2009 with losses at 5.5%, 4.25% and 3.8 %, respectively. South Dakota had the greatest losses reported in the last four years. Kansas was much higher in bird damage than ever reported and Manitoba is about the same as last year. **Note**: In some states surveys were taken early and much of the bird damage and losses do occur after the NSA survey and before harvest of sunflower.

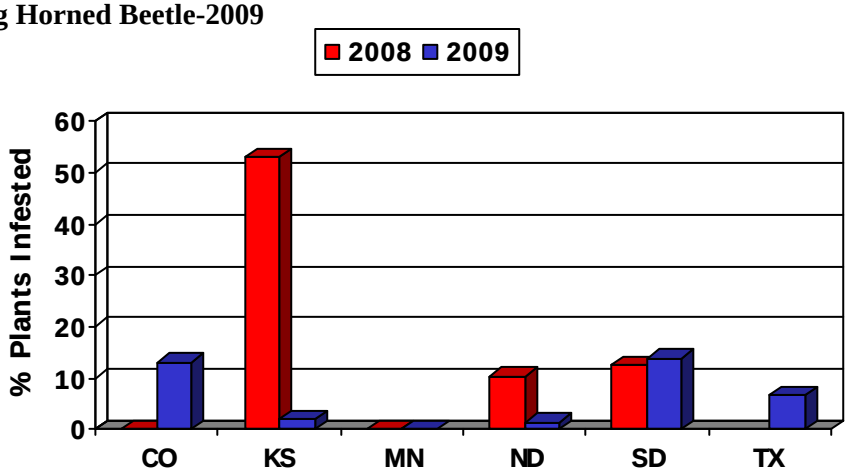
Bird Damage in Sunflower Surveys



Insect Damage in Sunflower Fields-

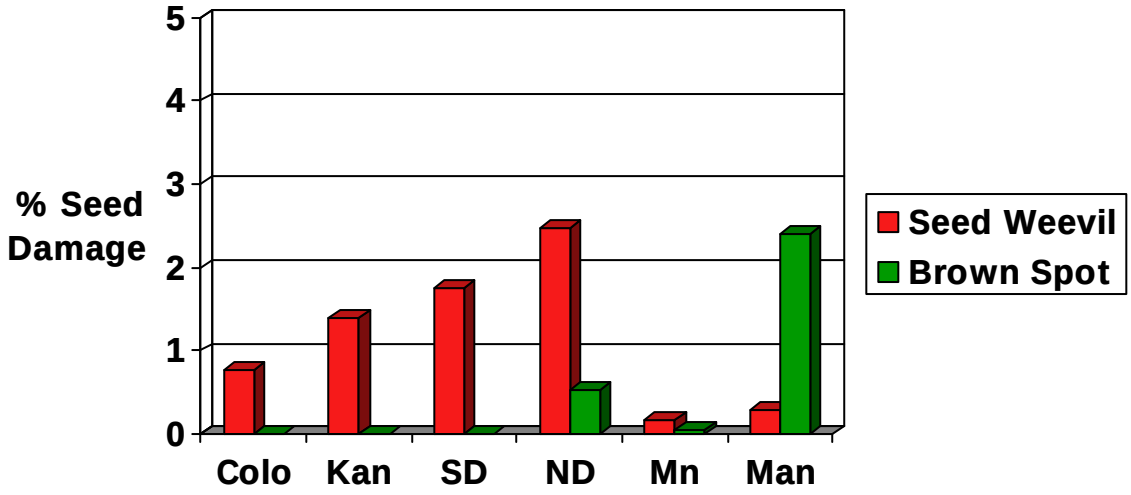
Long Horned Beetle: Sunflower plants including lower stalks were examined for damage by the Long Horned beetle. The highest number of Long horned beetle infested plants were reported in South Dakota with 14% and Colorado with 13% infected plants in 2009. Kansas which is the usual leader with Long horned beetle problems was down this year with only 2% in 2009, while over 50% in 2008. North Dakota was down from previous years surveys. Texas reported an infestation level of 6.7 % while no Long horned beetle were reported in Minnesota or Manitoba.

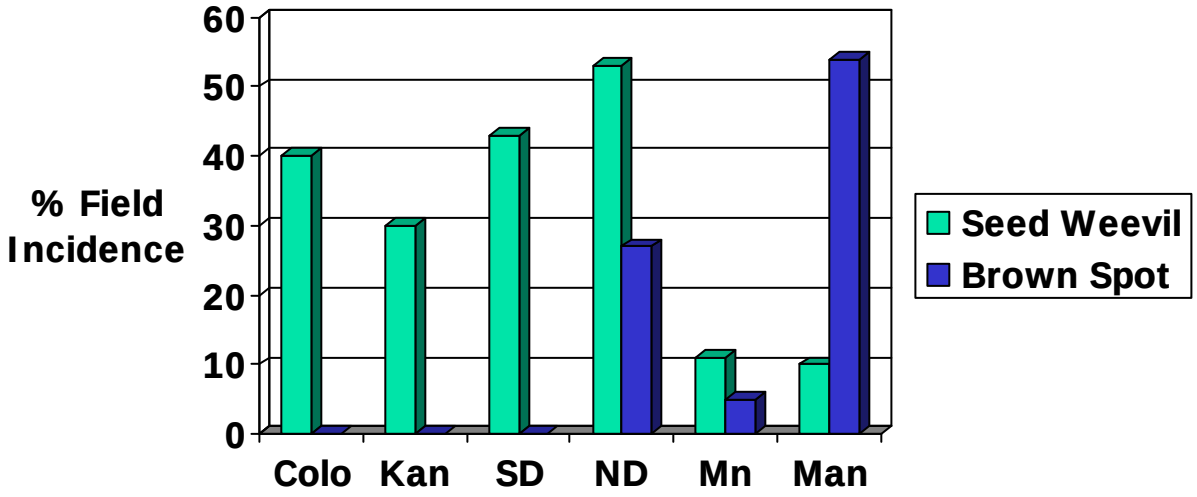
Incidence of Long Horned Beetle-2009



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 to the USDA/ARS lab. in Fargo, ND. Serious damage by seed weevil was evident in North Dakota (2.5 %), South Dakota (1.8 %) and Kansas (1.4 %). Seed weevil damage was very low in both Minnesota and Manitoba and under 1% in Colorado. Seed weevil incidence in fields sampled was highest in North Dakota, South Dakota, Colorado and Kansas. Another seed damage problem, Brown Spot is found in confection sunflower and is caused by the lygus bug. It was found to be severe in Manitoba and to some limited extent in North Dakota. It was detected in 54% of the confection samples sent from Manitoba. A large portion of the Manitoba production is confection. Brown Spot incidence in North Dakota confection samples was 27 %.

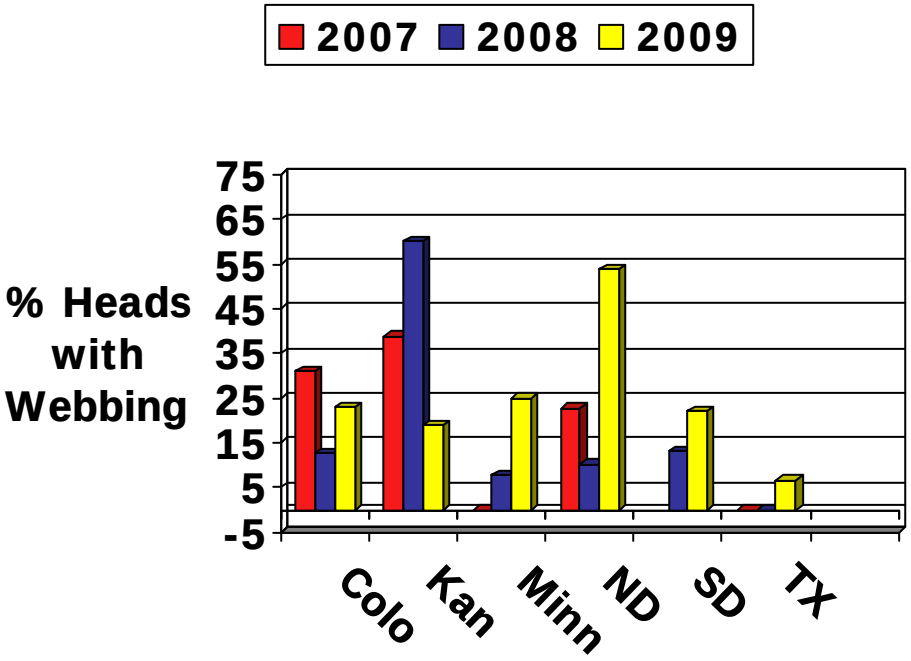
Seed Damage by Seed Weevil and Lygus Bug





Webbing in Sunflower Heads:

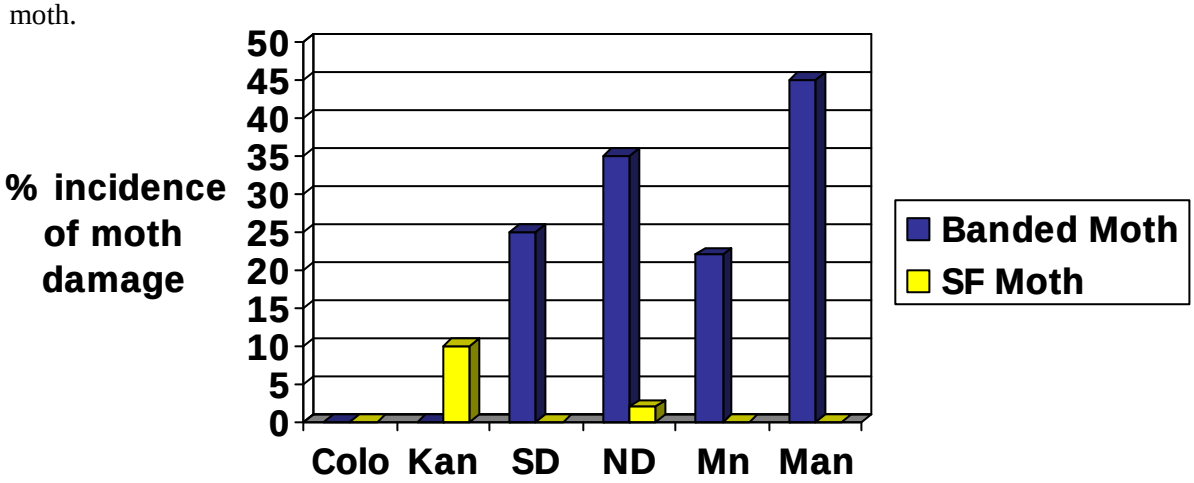
Webbing was most severe in North Dakota at 54 % followed by Minnesota 25 %, Colorado 23 % and South Dakota 22 %. Texas and Kansas reported some webbing but was under 20% range. Manitoba and Nebraska reported no webbing in sunflower heads in 2009. It should be noted that Kansas reported a very high level of webbing of over 60% in 2008 and was considerably less this year. North Dakota was much higher this year than in past years.

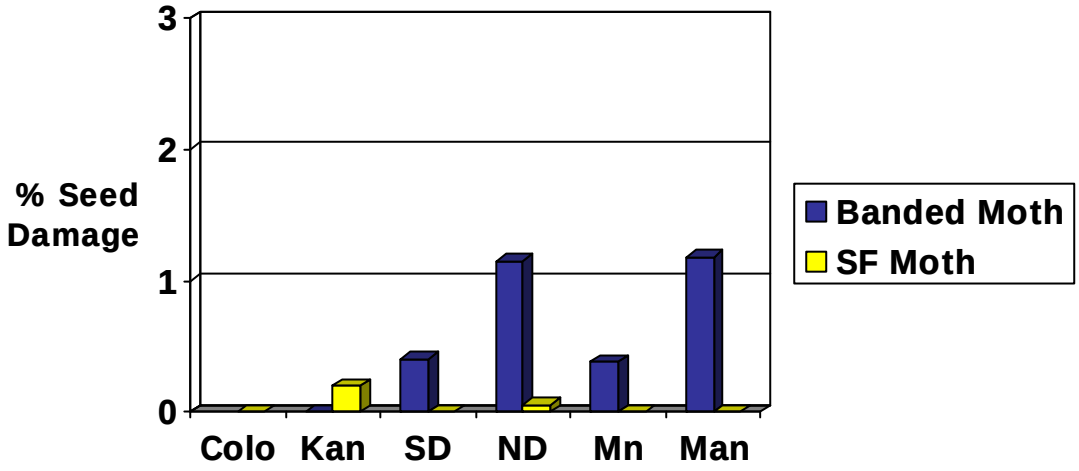


Sunflower Moth Incidence and Seed Damage

Incidence of banded moth was highest in Manitoba at 45 %, North Dakota 35 %, South Dakota 25 % and Minnesota 22 %. It was not found in seed samples from other states. Sunflower moth incidence in seed samples was only at 10% from Colorado and 2 % from North Dakota. Other state seed samples did not show any sunflower moth damage or presence.

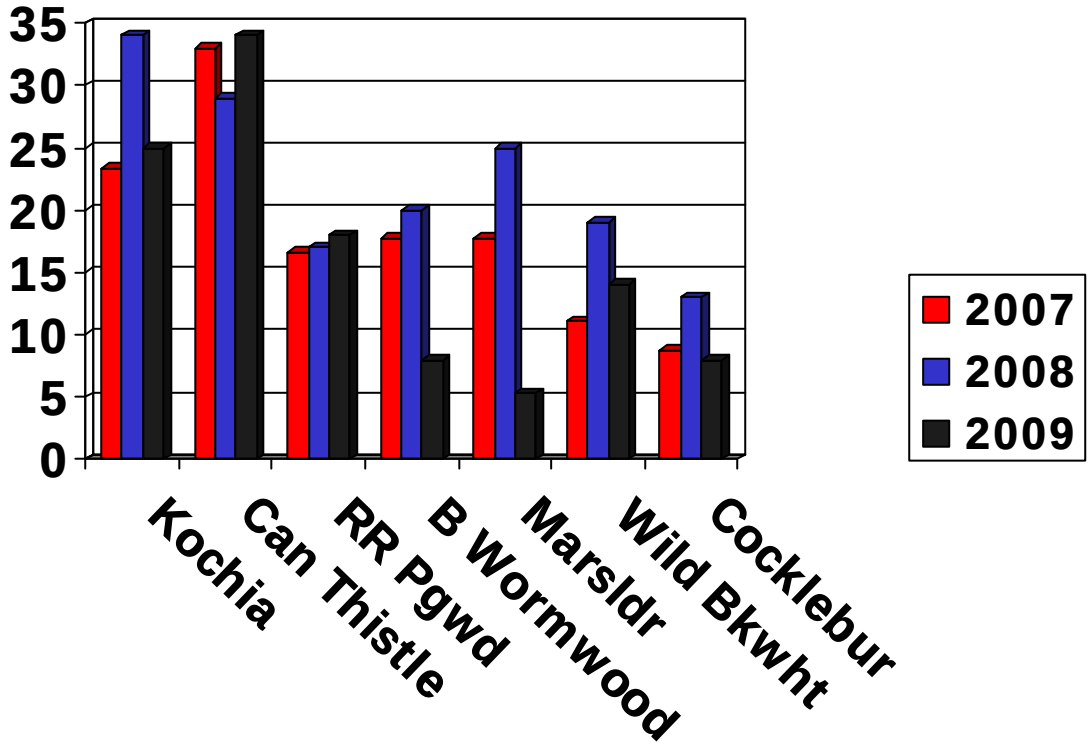
Damage by banded moth and sunflower moth was limited in most areas. Seed damage by banded moth was just over 1 % in both North Dakota and Manitoba. Kansas samples showed only slight damage from the sunflower moth.



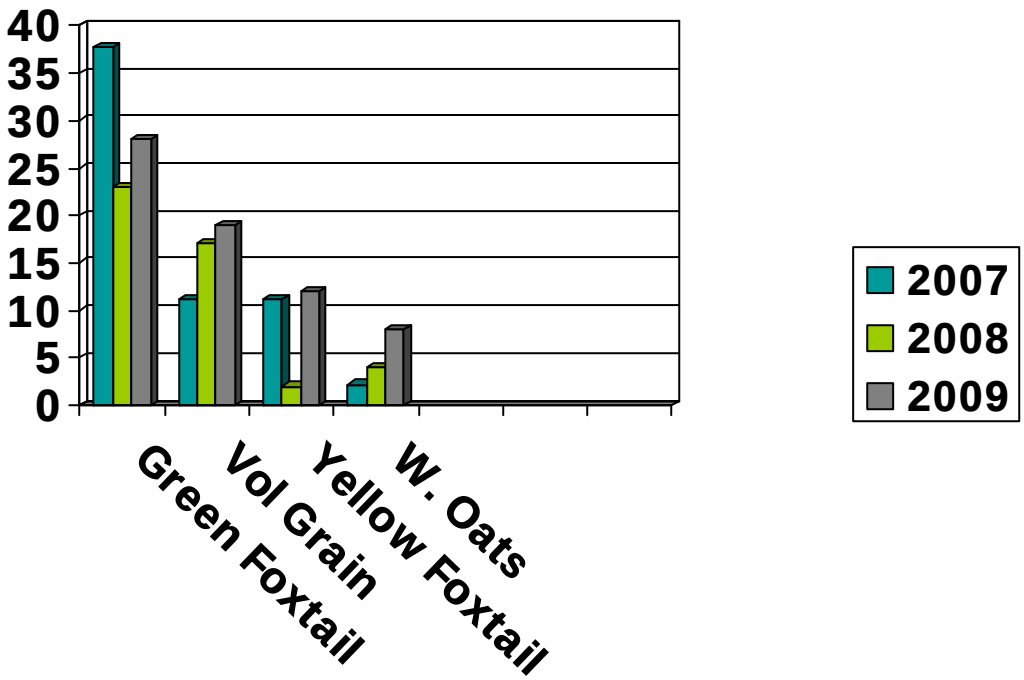


Weed problems in North Dakota and Minnesota in 2009: Twenty-nine common weeds were evaluated in the survey with the various infestation levels recorded. The ratings were: none, light, moderate and heavy. The data below indicates the percent of fields found with the following weed species being present. The most prevalent broadleaf weeds in North Dakota and Minnesota were Canada thistle, kochia, and redroot pigweed. Canada thistle was found in over 34 % of the fields surveyed while kochia was found in 25 %. Redroot pigweed was the third most prevalent weed specie with it being reported in 17 % of the fields. It is noted that the levels of marshelder and biennial wormwood were down from the 2008 survey. **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 and volunteer grain. Yellow foxtail and wild oats were higher than last year but still at a very low incidence.

Incidence of Broadleaf Weeds in North Dakota and Minnesota.

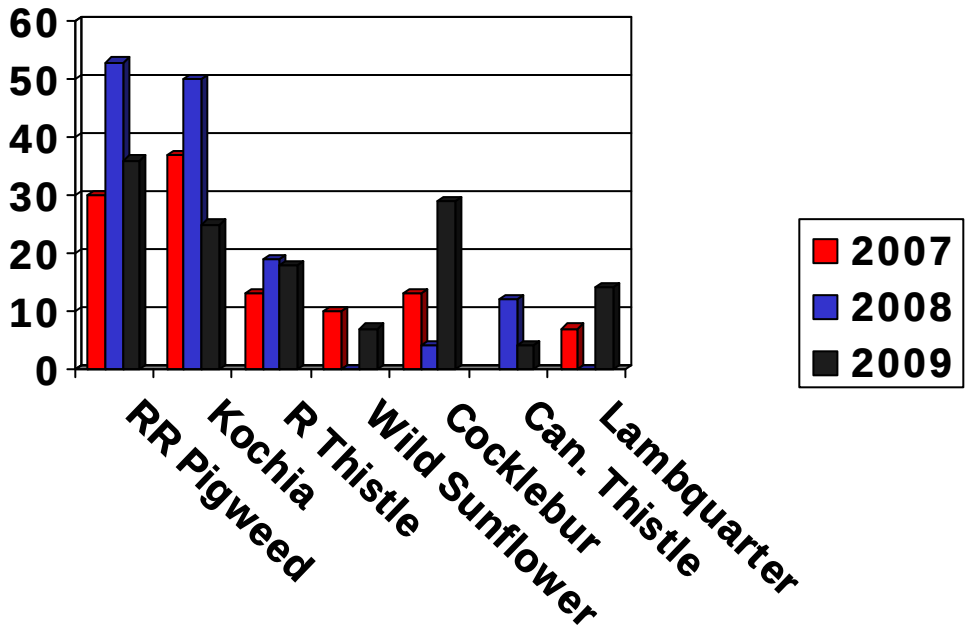


Incidence of Grassy Weeds in North Dakota and Minnesota

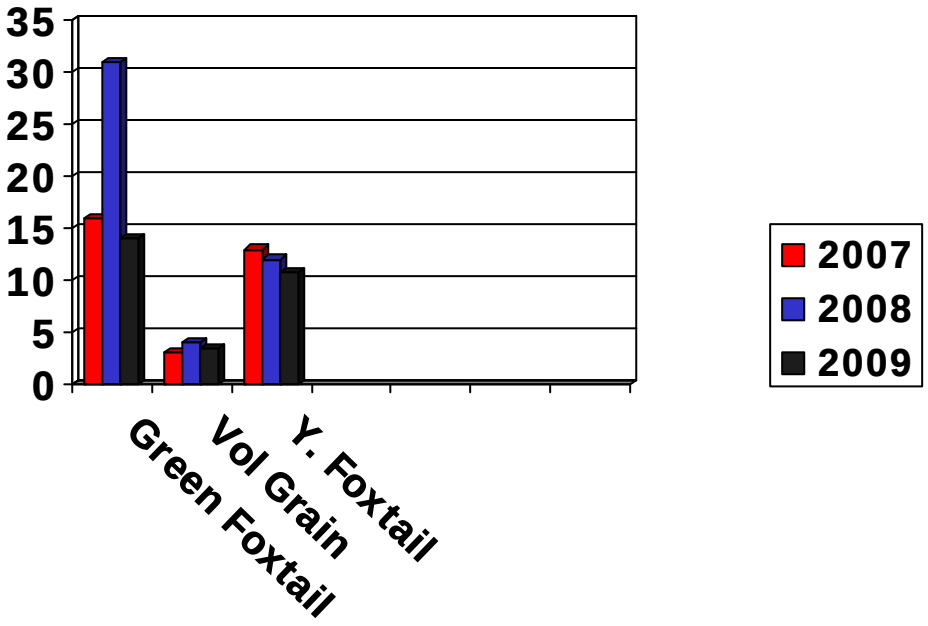


Weeds in South Dakota: In South Dakota, redroot pigweed, kochia and cocklebur were found to be the most prevalent broadleaf weeds and were present in over 25 % of fields surveyed. Russian thistle was under 20%, lambsquarters at 14 % and Canada thistle under 5 % incidence in the 2009 survey. Whereas, green foxtail at 14 % was the most abundant grassy weed reported. Yellow foxtail was found again this year and was noted in over 10 % of the surveyed fields. The presence of volunteer grains was only minimal.

Incidence of Broadleaf Weeds in South Dakota



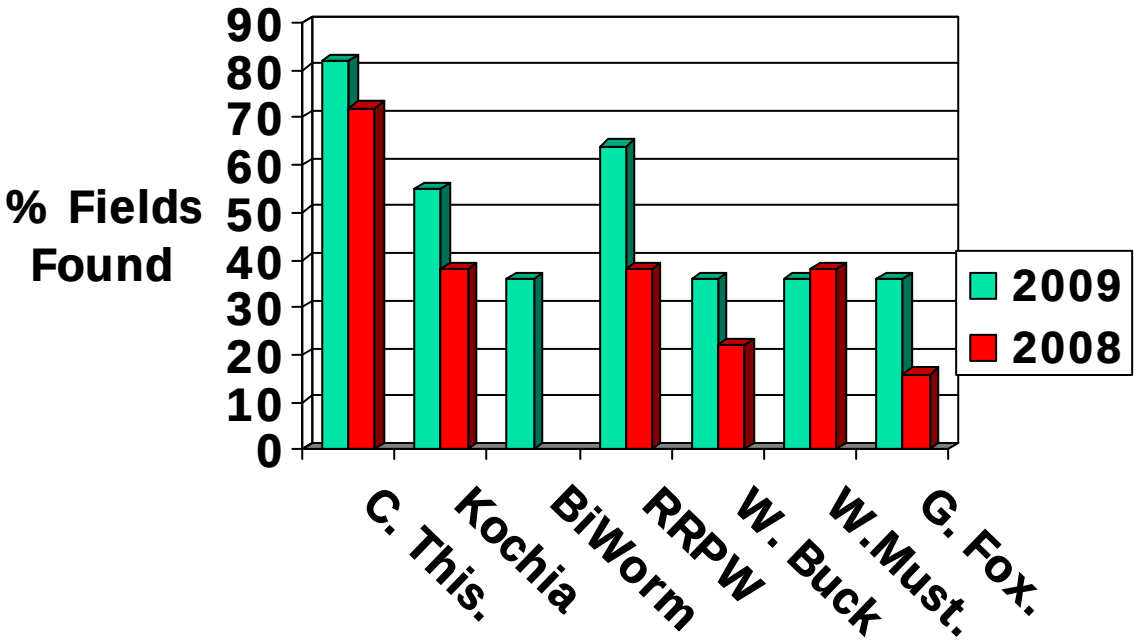
Incidence of Grassy Weeds in South Dakota



Weeds in Manitoba:

In Manitoba, the prevalent broadleaf weed was Canada thistle, followed by kochia, and redroot pigweed. Canada thistle was reported in 82 % of the fields surveyed, while kochia was found in 55 % of the fields and redroot pigweed in 64 % of surveyed fields. Biennial wormwood, wild buckwheat, wild mustard and yellow foxtail were all reported in approximately 35 % of fields surveyed in 2009.

Incidence of Weeds in Manitoba

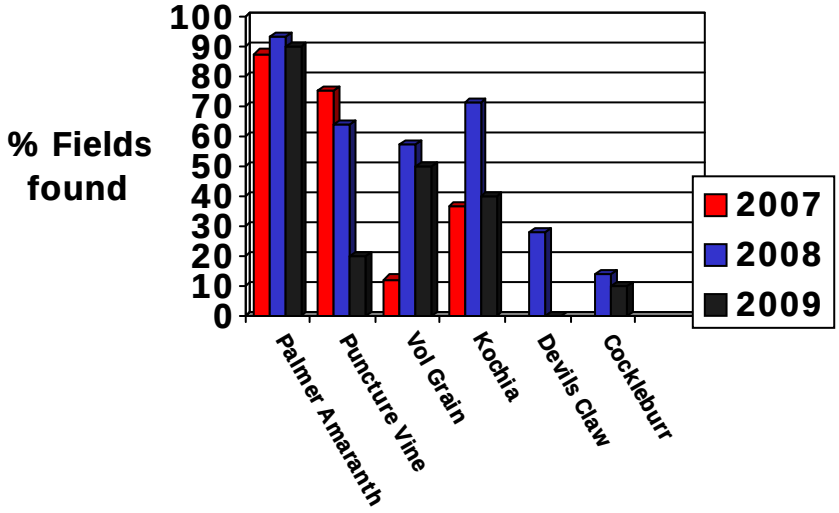


Weeds in Kansas and Colorado

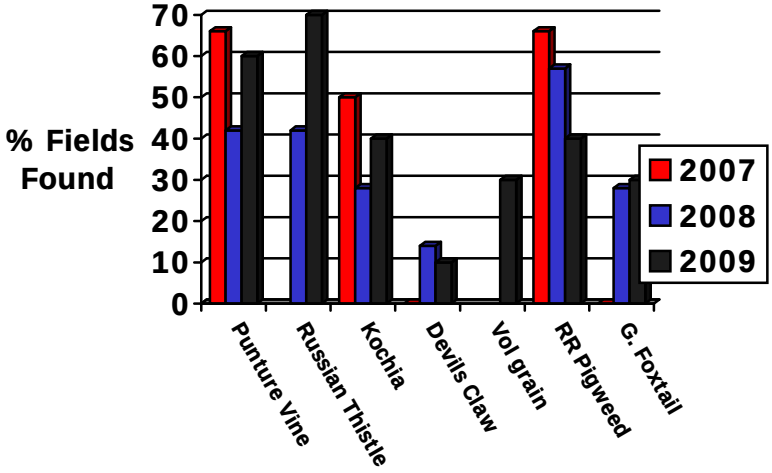
In Kansas, palmer amaranth was once again the number one broadleaf weed found and was identified in over 90 % of fields surveyed. Other broadleaf weeds found were kochia in 40 %, and Puncture vine in 20 % of the fields surveyed. The primary grassy weed found in Kansas was volunteer grain in 50 % of the fields visited.

In Colorado, the number one weed was Russian thistle found in 70% of the fields surveyed, followed by puncture vine in over 60 % of the fields. Other broadleaf weeds such as kochia and redroot pigweed were both found in 40% of surveyed fields. It should be noted that Russian thistle continued to increase this year over last year and may become more of a problem weed in Colorado. The primary grassy weed was volunteer grain at 40 % followed by green foxtail at 7%.

Incidence of weeds in Kansas in 2007, 2008, and 2009



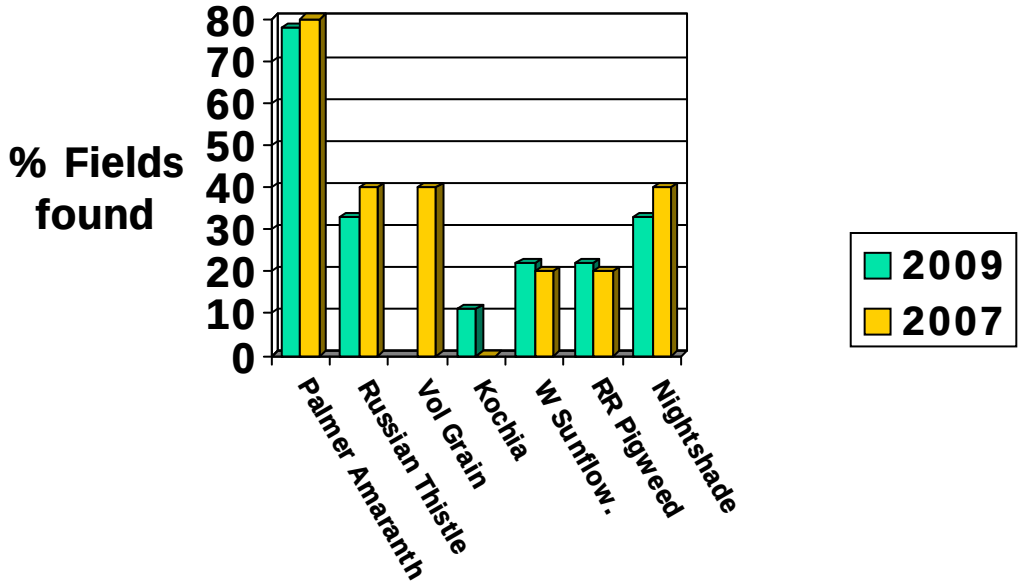
Incidence of weeds in Colorado in 2007, 2008, and 2009



Weeds in Texas

In Texas, the major broadleaf weed was palmer amaranth which was found in 80 % of the fields. This was just slightly higher than observed in the 2007 survey. Other broadleaf weeds found were Russian thistle and nightshade in 40 % of the fields, while wild sunflower and redroot pigweed were found in 20 % of the fields. The major grassy weed identified was volunteer grains in 40 % of fields surveyed.

Incidence of weeds in Texas in 2007 and 2009



Sunflower Survey Summary:

The 2009 survey was conducted in the same major sunflower producing states as in prior years of 2002 to 2008 with the exception being 2004 in which a survey was not conducted. Nebraska was included this year for the first time but only limited data was reported. States in the survey in 2009 were North Dakota, Minnesota, South Dakota, Kansas, Nebraska, Colorado and Texas. Manitoba, Canada also was included again for the third year in a row.

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 and Colorado, the major problems were drought and weeds, whereas in Manitoba the major sunflower production problems reported were disease and weed pressure.

In 2009 the major problems and issues identified were as follows: North Dakota's major limiting factors to yields were diseases, plant spacing issues, followed by weeds and birds. Minnesota once again had diseases as the major issue plus problems of plant spacing and bird pressure. Yield limiting factors in South Dakota were plant spacing, birds and disease. Weeds were not as big an issue as in prior years. In Colorado and Kansas, weeds and plant spacings were the major issues identified, followed by disease in Colorado and insects in Kansas. Nebraska listed its major production issue as disease as also did Texas which had weeds listed as a second major factor. In Manitoba, diseases were the major issues in reduction of yield and quality. Damage from blackbirds was less in North Dakota and Minnesota compared to recent years but greater in states south such as South Dakota, Kansas and Colorado. Palmer amaranth, which is in the pigweed family, continues to be a major weed in sunflower in the Southern Great Plains states of Kansas, Colorado and Texas. With the cool wet season in the northern growing areas, disease again was a major issue in North Dakota, Minnesota and Manitoba. Sunflower red rust and sclerotinia appear to be the major diseases reported in the northern areas. Verticillium is an emerging disease found commonly the past two years but hardly reported nor observed in 2009.

Over the Great Plains states, 2009 was a 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 emerging problems.
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 problems and damage in the Northern Great Plains must be watched and monitored.

Literature Cited

1. Lamey, Arthur, Max Dietrich and Martin Draper. 2002. Sunflower crop survey in North Dakota and South Dakota. *In* Proceedings of the 24th Sunflower Research Workshop, January 17-18, 2002, pages 1-11. Also *On* National Sunflower Association Web Page:
http://www.sunflowernsa.com/research/research-workshop/documents/45.PDF

2. Lamey, Arthur, and Max Dietrich. 2003. Sunflower crop survey in the Prairie States: yield and management practices. *On* National Sunflower Association Web Page:
http://www.sunflowernsa.com/research/research-workshop/documents/82.PDF.

3. Berglund, Duane R. 2005. National Sunflower Association Survey: Yield, Cultural Factors and Yield Limiting Factors. On National Sunflower Association Web Page:
http://www.sunflowernsa.com/research/research workshop/documents/Berglund_2005 NSASurvey.pdf

4. Berglund, Duane R. 2006. National Sunflower Association Survey: Yield, Cultural Factors and Yield Limiting Factors. On National Sunflower Association Web Page;
http://www.sunflowernsa.com/uploads/2006_NSA_Crop_Survey_Narrative.pdf

5. Knodel, Janet. 2007. Mapping of 2007 National Sunflower Survey
IPM Web site:
http://www.ag.ndsu.nodak.edu/aginfo/ndipm/index.htm

6. Berglund, Duane R. 2007. National Sunflower Association Survey. Yield, Cultural Factors and Yield Limiting Factors. On National Sunflower Association Web page:
http://www.sunflowernsa.com/uploads/2007_NSA_Crop_Survey_Narrative.pdf

7. Berglund, Duane R. 2008. National Sunflower Association Survey. Yield, Cultural Factors and Yield Limiting Factors. On National Sunflower Association Web page:
http://www.sunflowernsa.com/uploads/2008_NSA_Crop_Survey_Narrative.pdf