

2010 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 2010 over eight states in the Great Plains region which was similar to surveys in 2003, 2005, 2006, 2007, 2008, 2009. Oklahoma was included with only limited data. Manitoba, Canada was included in this year's survey for the fourth time. Table 1 provides the number of fields surveyed. This year is the first time that data is included from Vermont. 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 approximately every 10,000 acres in each state and county, based on the planted sunflower acres in 2010 as determined by Farm Service Agency-USDA and other state estimates. The author wants to thank all the contributing agriculturalists. Over 50 professionals participated in recording the survey data.

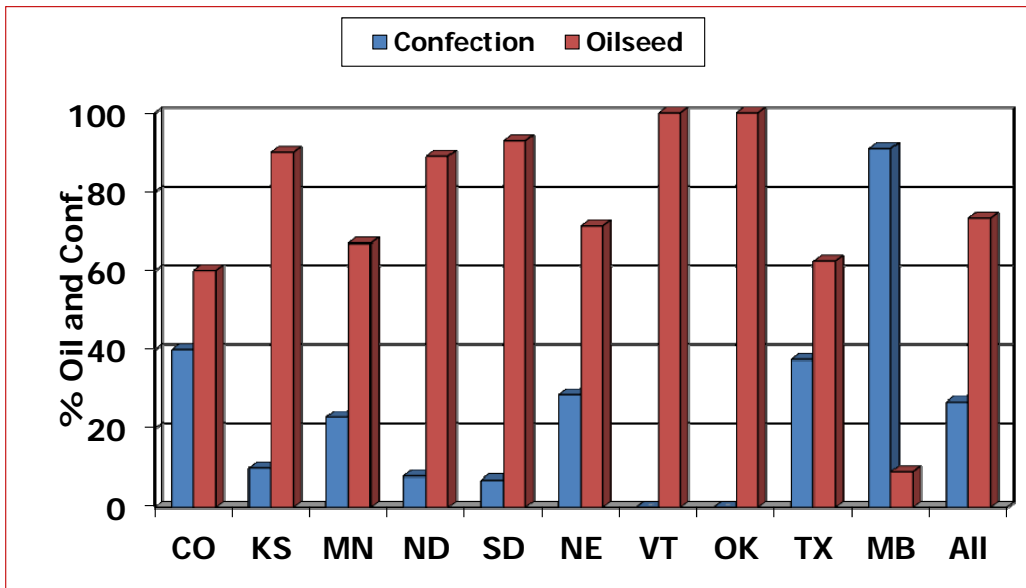
Table 1. States in which the 2010 survey took place and number of fields surveyed.

State	Field Surveyed
North Dakota	96
Minnesota	15
South Dakota	36
Kansas	9
Colorado	13
Nebraska	7
Oklahoma	2
Texas	8
Vermont	10
Manitoba	11
Total Survey	207

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.

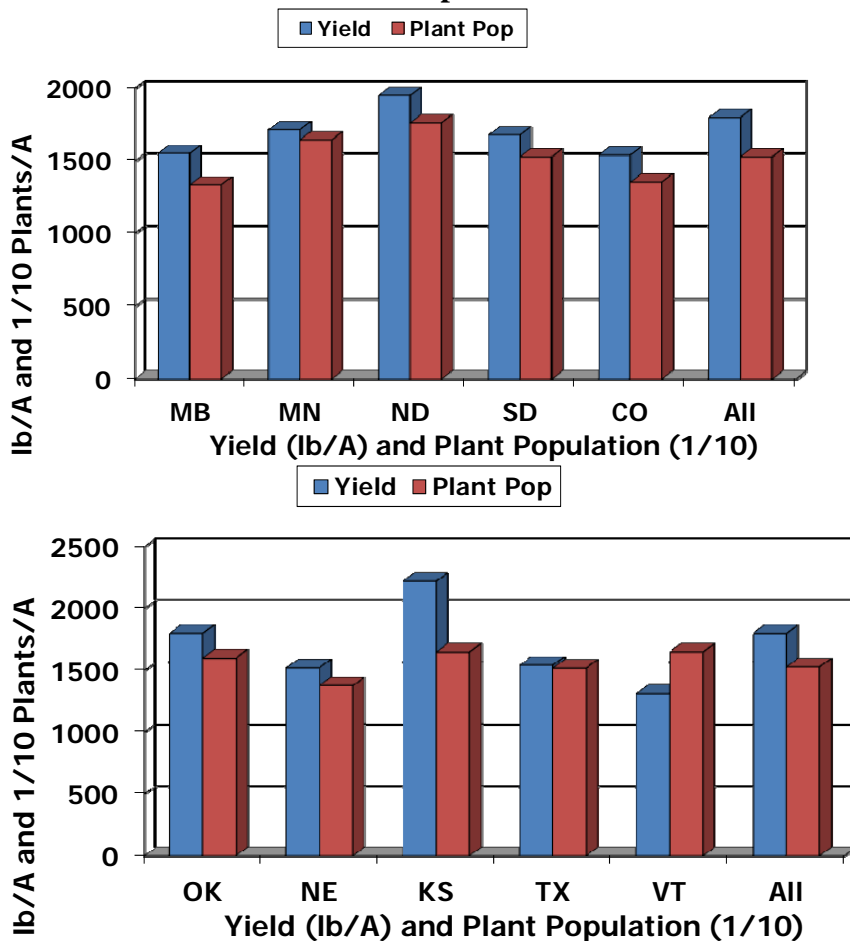
All States: A total of 207 fields were surveyed in 2010 compared with 177 fields in 2009 and 162 fields in 2008. Percent oilseed fields surveyed was highest at 100% in Vermont and Oklahoma. South Dakota had 93% oilseed fields in 2010. The percent of confection fields surveyed was highest in Manitoba at 91%, followed by Colorado (40%) and Texas (37.5%). Figure 1 provides the percent oilseed and confection sunflower fields surveyed in 2010.

Figure 1. Percent of Oilseed and Confection Sunflower Fields Surveyed 2010.



Estimated yields and plant populations: State average yield estimates in 2010 were 1949 lb/a in North Dakota, 1715 lb/a in Minnesota, 1679 lb/a in South Dakota, 1541 lb/a in Colorado, 2222 lb/a in Kansas, 1520 lb/a in Nebraska, 1543 lb/a in Texas, 1312 lb/a in Vermont and 1715 lb/a in Manitoba. In general, 2010 estimated yields were higher in Kansas and North Dakota than in 2009.

Fig 2 Sunflower Yields and Plant Populations 2010.



Sunflower Survey Yields Compared for 2008, 2009 and 2010

Yields were higher in Colorado, Kansas and North Dakota when compared over the past several years. However, yields in South Dakota and Manitoba were down when compared to 2008 or 2009. Yields in Minnesota were about the same over the past two years.

Figure 3. Sunflower Yield in Selected States in lb/a for 2008-2010.

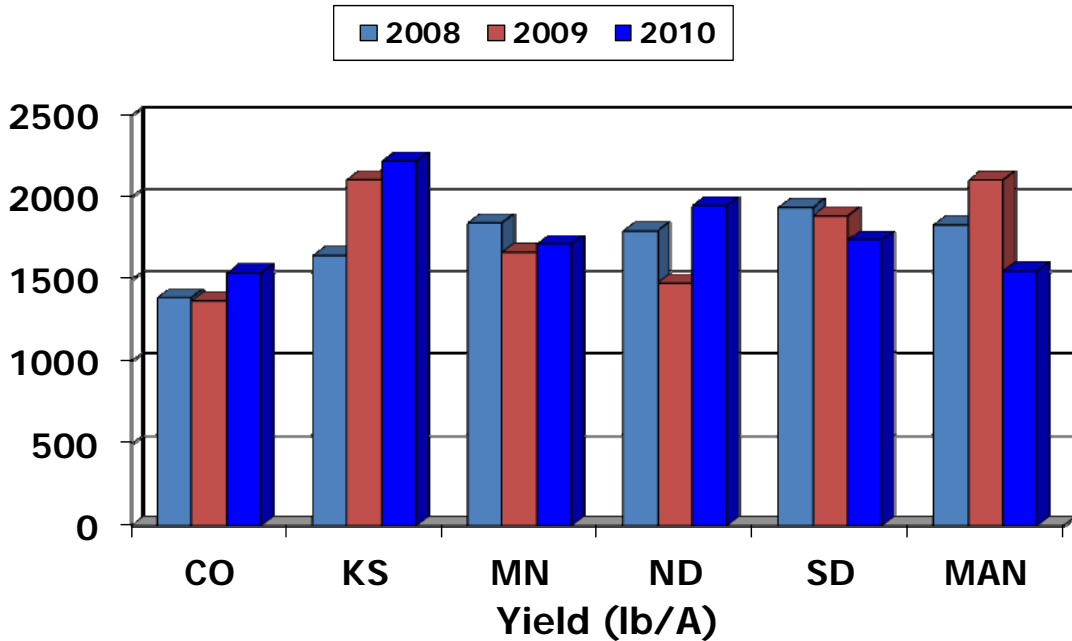
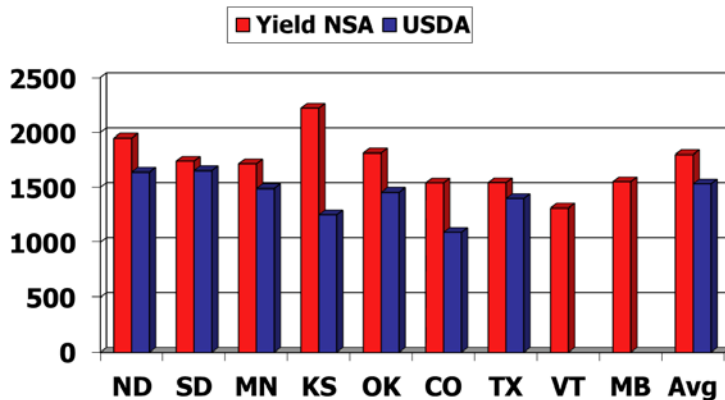


Figure 4. 2010- USDA-AG. Statistics and National Sunflower Association Surveys Compared.



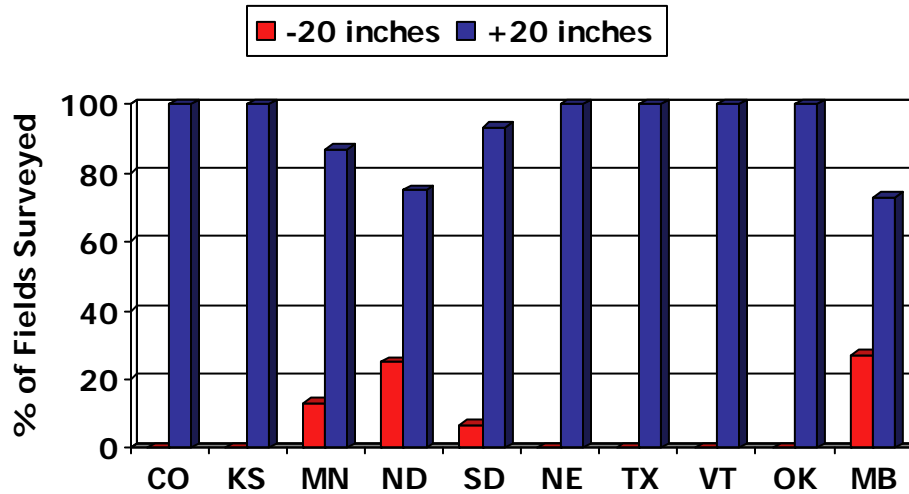
*Note: Some of Kansas, Colorado, and Texas NSA surveyed fields were irrigated fields.

When comparing the USDA- Ag. Statistics fall estimates and the NSA estimates for 2010, it indicates that the NSA fall survey was reported at higher state average yields than the USDA survey as reported in the fall of 2010. 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 estimates if the NSA survey was delayed later into the fall season. Head diameter is measured and is one component for the yield estimate. Head diameter will be slightly less when taken later in the season due to the dry down process. Therefore earlier measurement is overestimating the

yield potential by a few percent. However, the yield trends tend to agree with each other when compared with-in years with NSA usually being slightly higher. There was no USDA estimate available for Vermont.

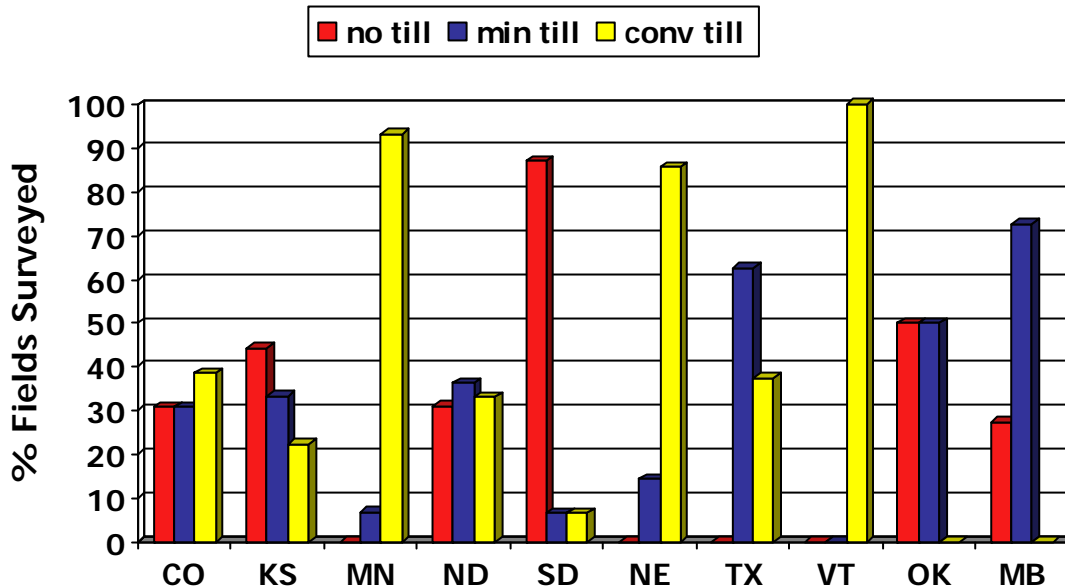
Row spacing: The majority of sunflower fields surveyed in the central Great Plains region were planted in wide row spacings greater than 20 inches. Manitoba, North Dakota, Minnesota, and South Dakota were the leading states with narrow rows. In Colorado, Kansas, Nebraska, Texas, Vermont, and Oklahoma all fields had row spacing greater than 20 inches (mostly 30 inch).

Figure 5. Row Spacing in the 2010 NSA Survey.



Tillage Practices in Sunflower : Conventional till was greatest in Vermont at 100%, Minnesota with 93% and Nebraska with 86% of the fields surveyed. Minimum till was reported at 73% in Manitoba, 63% in Texas, and 50% in Oklahoma. South Dakota led all states again for the fifth consecutive year with 87% of its sunflower acres under no-till. Oklahoma had the second highest reported no-till with 50%. 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 years of the NSA survey for more sunflower acres being planted using no-till farming practices in the Great Plains region.

Figure 6. Tillage Practices in 2010 Sunflower Survey.



2010 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 factors to higher yields. Disease was reported as the number one problem in 15.6% of fields surveyed, while poor plant spacing problem was reported in 17.7% of fields surveyed in North Dakota.

In South Dakota, plant spacing was a major number one problem, followed by lodging as major yield limiting factor.

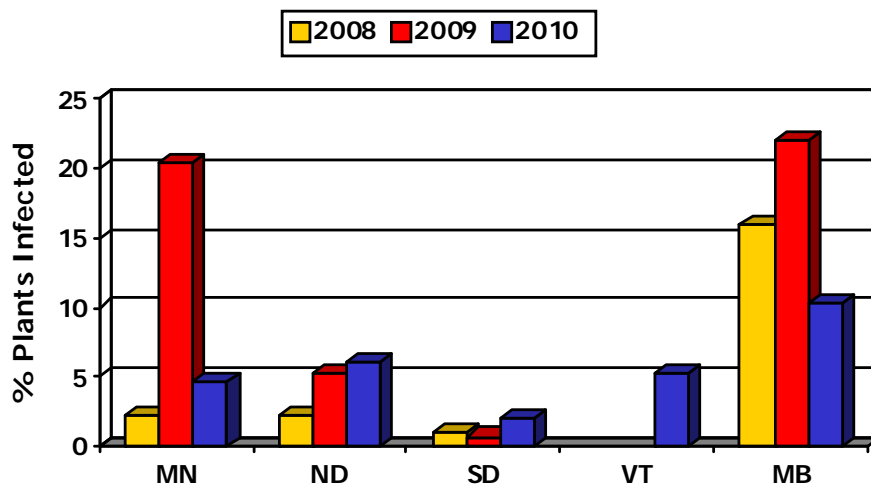
In Minnesota, disease was the most critical yield limiting factor again in 2010 with over 73% of the fields having infestation levels which would reduce yield potential. Plant spacing was only listed as a problem in 7% of the fields. Table 2 provides the number one and number 2 limiting factors as a percent averaged across the whole survey.

Table 2. First and Second Major Yield Limiting Factors 2010 NSA Survey.

Yield limiting factor	No 1 limiting factor Percent of the 207 surveyed fields	No 2 limiting factor Percent of the 202 surveyed fields
Disease	20.7	8.4
Plant spacing within row	18.4	14.9
Lodging	8.7	4.5
Weeds	9.7	11.4
Birds	6.8	5.4
Insects	6.3	10.4
Drought	4.8	1.5
Drown out	3.4	2.5
Hail	1	1
Other (many mentioned population)	8.7	4.9
No Problem	11.6	35.1

Sclerotinia Disease: Sclerotinia diseases (wilt, head rot and mid stalk rot) in 2010 were not a serious problem in some regions due to dry weather in many sunflower production areas. Nebraska , Kansas, Oklahoma, and Texas reported very little if any sclerotinia problems. However, sclerotinia head rot was found in Manitoba (10.3%), North Dakota (6.1%), Vermont (5%), Minnesota (4.7%) and South Dakota (2%). The percent is based on infected heads in fields where Sclerotinia head rot was found. In North Dakota and South Dakota the levels were slightly higher than last year. Minnesota and Manitoba had lower infection levels compared with 2009. This is the first year Vermont data are collected so no historical comparison is available.

Figure 7. Sclerotinia Head Rot in Sunflower 2008-2010.



Red Rust Incidence and Severity in 2010: Red rust of sunflower was reported in all states surveyed except Oklahoma and Vermont (see figure 8). The incidence (percent of the fields with Rust) ranging from 20% of the fields in Minnesota to as high as 100% in Manitoba. There was high incidence in Colorado, Kansas, North and South Dakota and Nebraska. In 2010 rust disease show up in more fields in Manitoba and South Dakota. In North Dakota the incidence has remained approximately the same range (50 to 70%) the past four years. When considering the severity of rust infection (see figure 9), it was most severe in Manitoba at 1.5 % and North Dakota at 1.4% , Colorado at 1.1% and all the other states had under 1% severity. 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. Some fields may have received a fungicide application to protect the crop from the rust fungus, however surveyors could not determine if a field was sprayed or not.

Figure 8. Red Rust Incidence-2010.

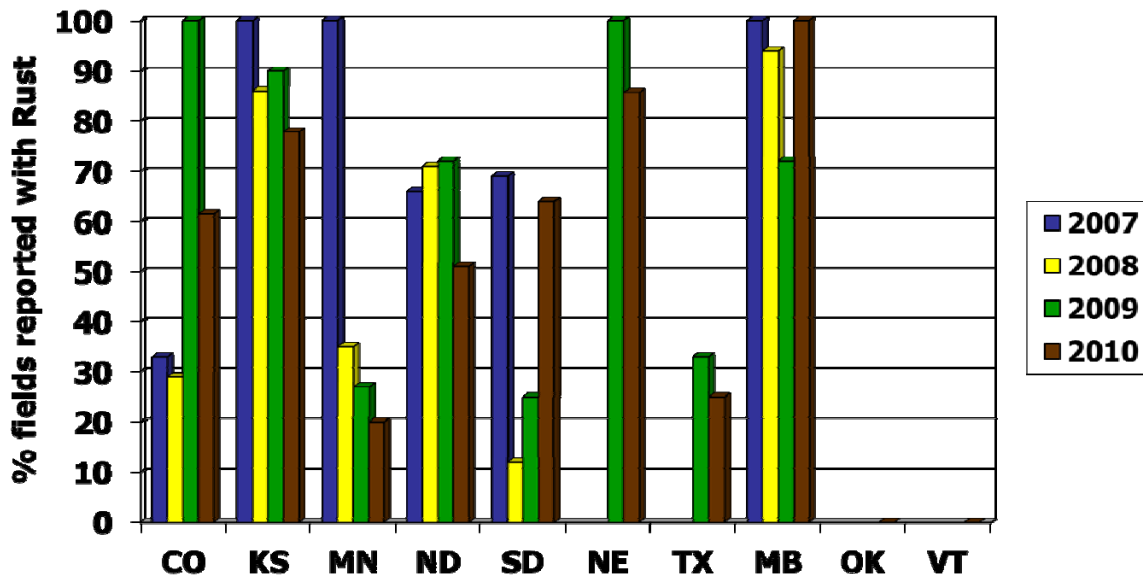
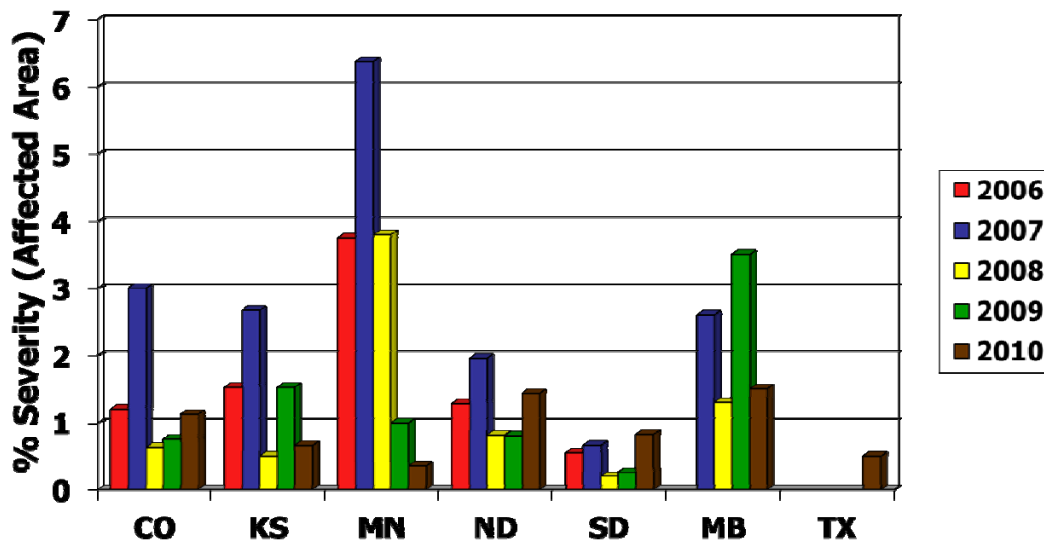


Figure 9. Sunflower Red Rust Severity – 2006-2010.



Other Sunflower Diseases: Phomopsis continues to be a very serious problem in Minnesota and Manitoba with both 52% and Kansas with 46% of plants infected. Colorado and Texas reported no Phomopsis in 2010 (Figure 10).

Phoma incidence (Figure 11) was very high this year in Manitoba, which reported 100% incidence in surveyed fields while Colorado, South Dakota, North Dakota Minnesota and Nebraska all reported Phoma in >55% of surveyed fields or higher. Kansas, Vermont and Oklahoma reported no incidence of Phoma.

Figure 10. Phomopsis Incidence and Severity in Sunflower 2008-2010.

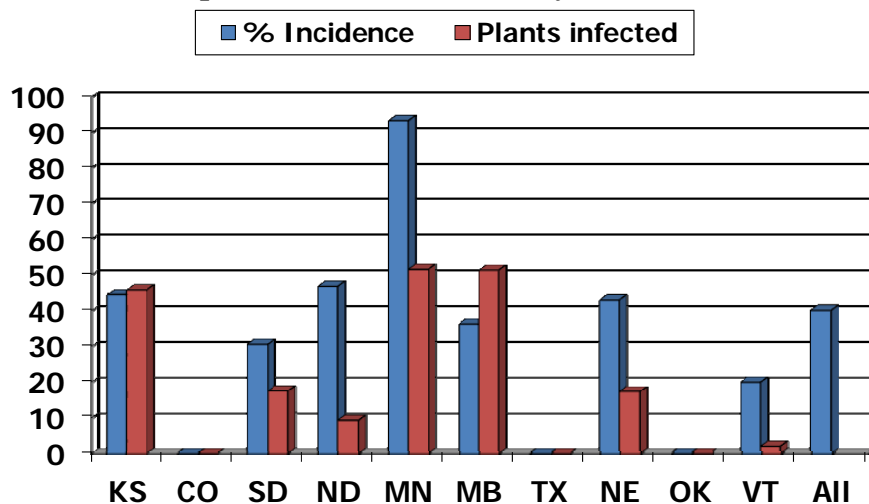
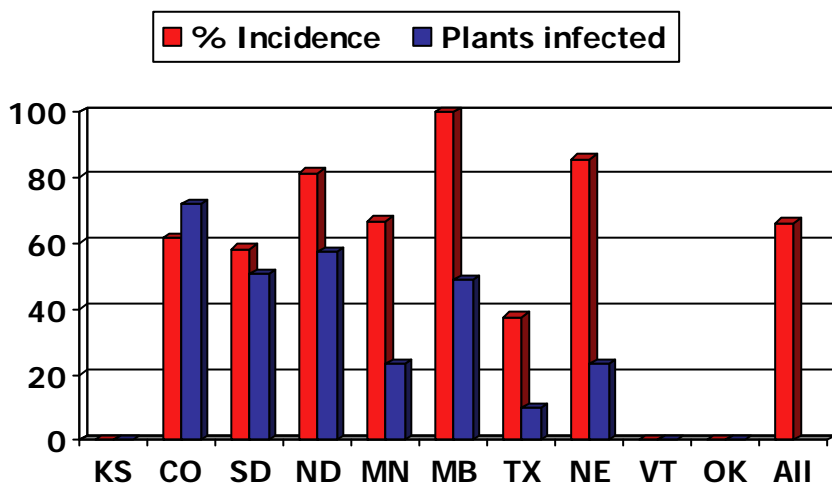
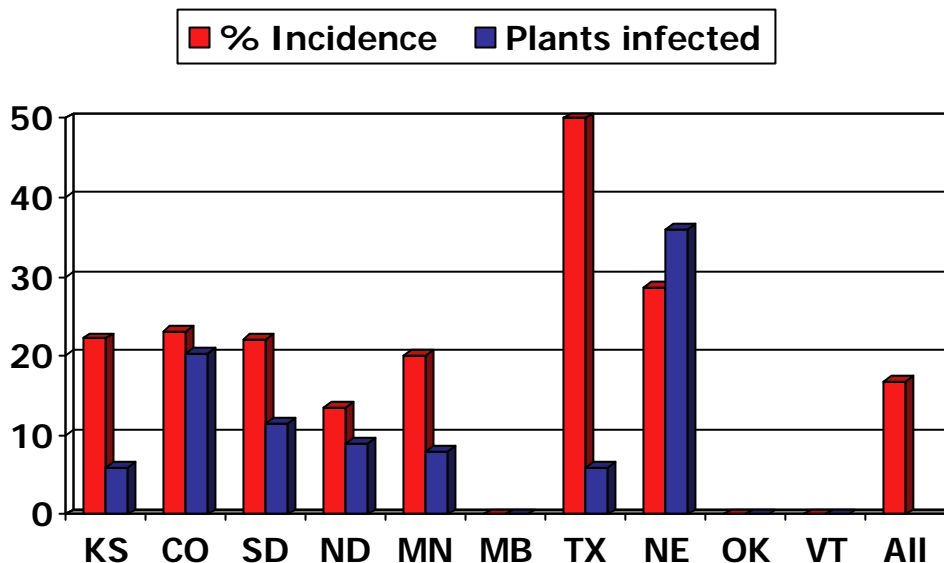


Figure 11. Percent Phoma Incidence and Severity in 2010.



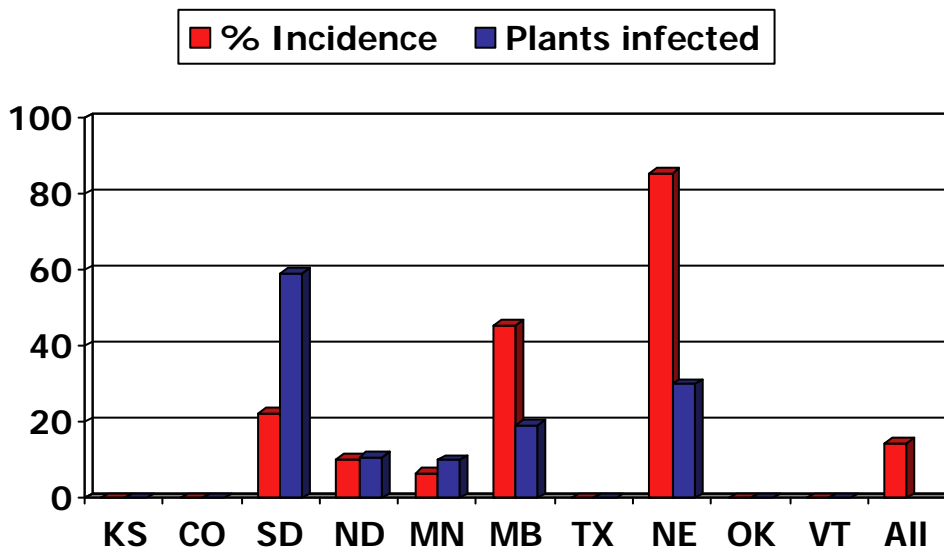
Rhizopus head rot was noted in the survey to be highest in Texas, with 50% of the fields showing Rhizopus. However the percent plants infected in Texas was not as high as in most other states where Rhizopus was reported. Nebraska had close to 30% of the fields with Rhizopus and about 35% of the plants infected in those fields. No Rhizopus was reported in Manitoba, Oklahoma and Vermont (see Figure 12).

Figure 12. Percent Rhizopus Head Rot Incidence and Severity 2010.



Verticillium is not easy to diagnose in the field. The data reported in 2010 should be interpreted with caution as these are field observations and not necessarily confirmed by lab testing. Nebraska reported the highest incidence and South Dakota the highest severity.

Figure 13. Percent Verticillium Incidence and Severity 2010.



Bird Damage: Bird damage continues to be a problem for many sunflower growers in the Great Plains (Figure 14). The average field damage in North Dakota from blackbirds (the primary pest species) was higher than last year (Figure 15).

In 2010, 100% of the fields in Nebraska and 80% of the fields in Vermont had bird damage. On average slightly more than 40% of the fields had bird damage. The percent damage per field was the highest in Nebraska (13%).

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.

Figure 14. Bird Damage Incidence and Severity in 2010.

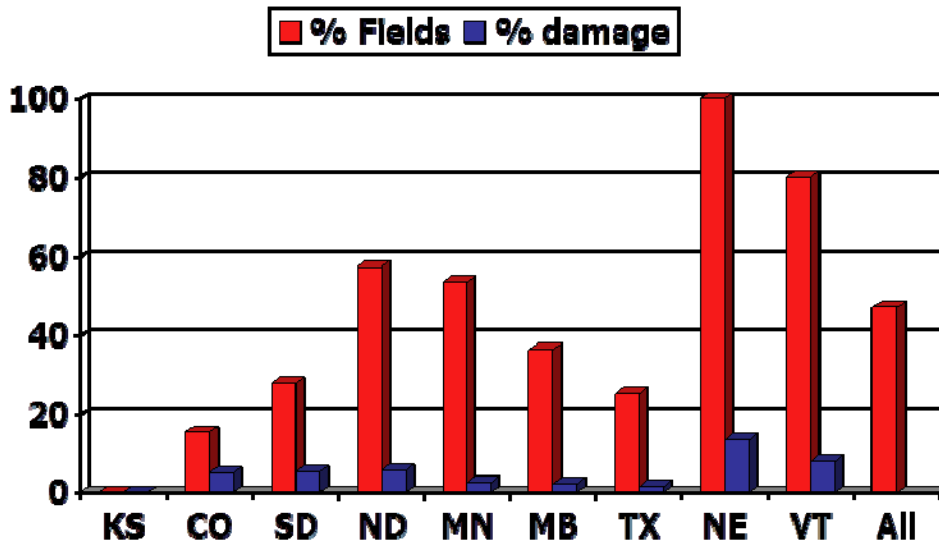
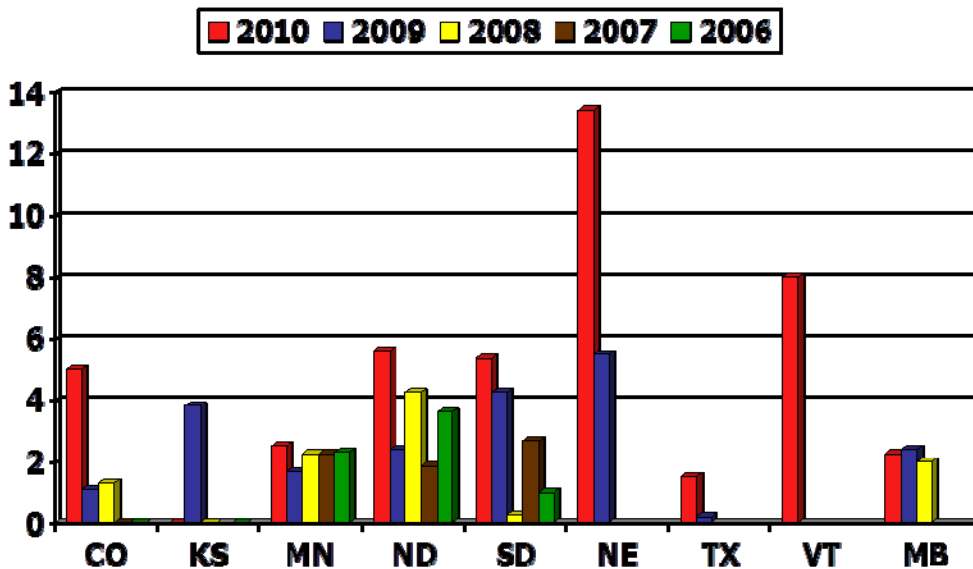
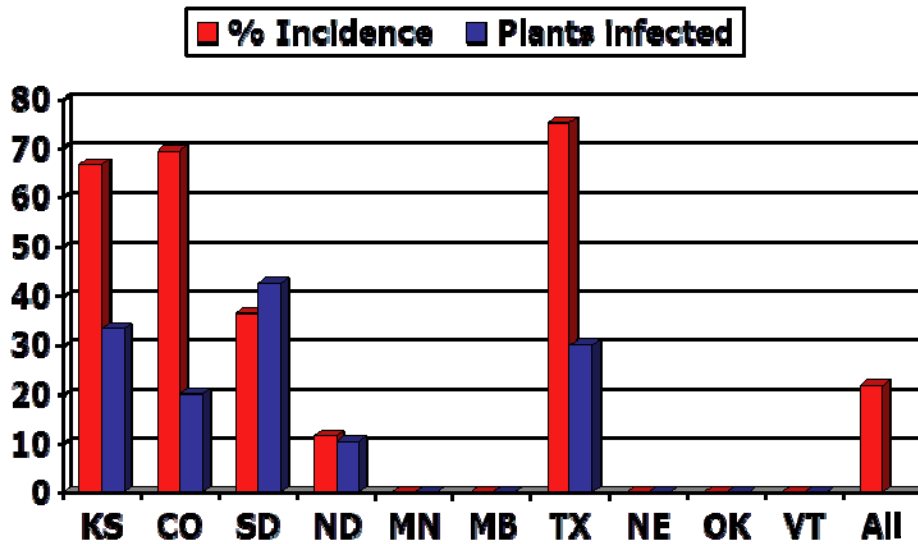


Figure 15. Percent Bird Damage in Sunflower Fields, Surveys 2006-2010.



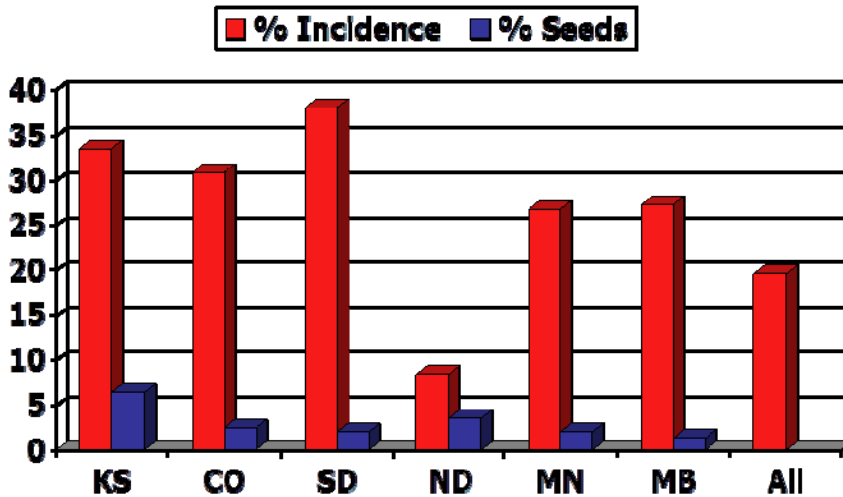
Long Horned Beetle: Sunflower plants including lower stalks were examined for damage by the Long Horned beetle. Incidence was high in Kansas, Colorado and Texas (Figure 16). The highest number of Long horned beetle infested plants were reported in South Dakota with over 40% and Texas and Kansas around 30% of the plants. Both Colorado had high incidence and 20% severity. Over the whole survey about 20% of the fields had some Long Horned Beetle activity. No Long horned beetle was reported in Minnesota, Manitoba, Nebraska, Oklahoma and Vermont.

Figure 16. Long Horned Beetle Incidence and Severity-2010.



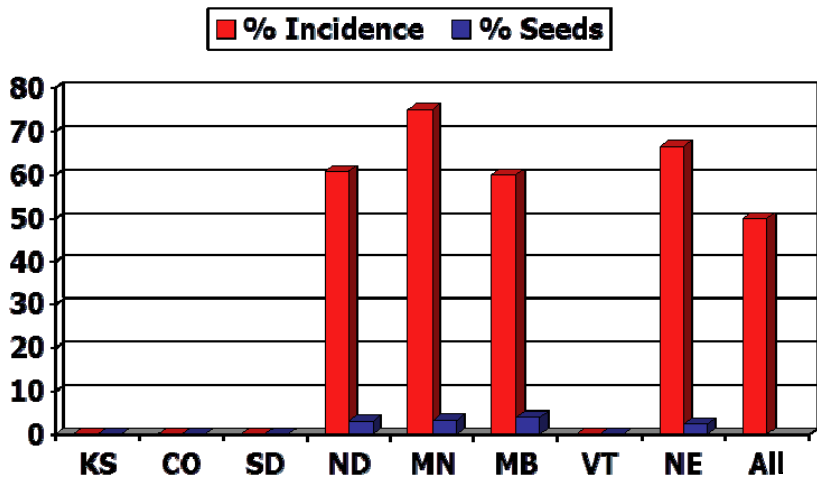
Other Insects: Sunflower seed weevil, Banded SF moth, SF moth and Brown Spot damage were determined from seed samples taken in the fields in each state and sent in to the USDA/ARS laboratory in Fargo, ND. Damage by seed weevil was evident in Kansas, Colorado, South Dakota, North Dakota, Minnesota and Manitoba. No damage was reported in the other states (Figure 17). Seed weevil incidence in fields sampled was highest in South Dakota, Kansas and Colorado.

Figure 17. Seed Weevil Incidence and Severity-2010.



Another seed damage problem, Brown Spot is found in confection sunflower and is caused by the lygus bug (Figure 18). It was found in samples from Minnesota, Nebraska, North Dakota and Manitoba. A large portion of the Manitoba production is confection. Percent damaged seeds were 3, 3.3, 4, and 2.5 for samples from ND, MN, MB and NE respectively.

Figure 18. Brown Spot Incidence and Severity 2010.



Banded Sunflower moth damage was observed in the seed samples 70% of the samples from Vermont had BSF damage and the percent of the seeds damaged was also the highest reported (Figure 19).

Figure 19. Banded Sunflower Moth Incidence and Severity 2010.

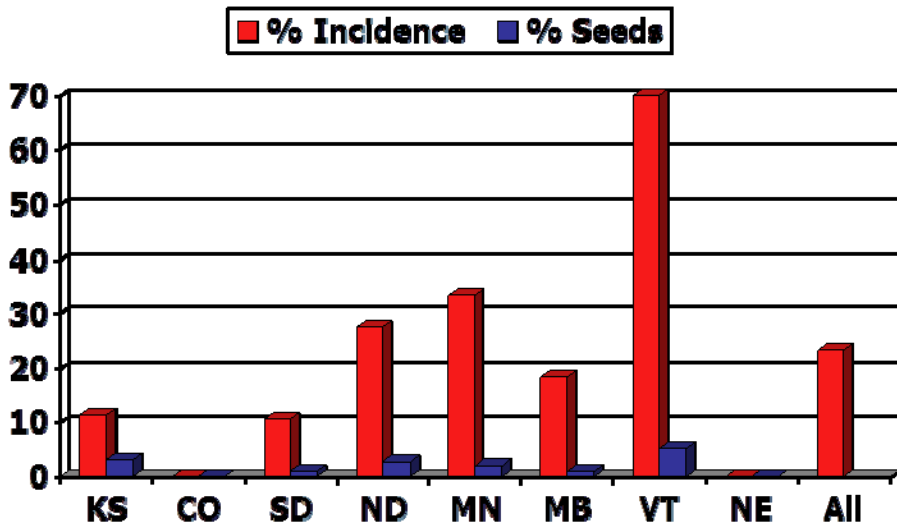


Figure 20. Sunflower Moth Incidence and Severity 2010.

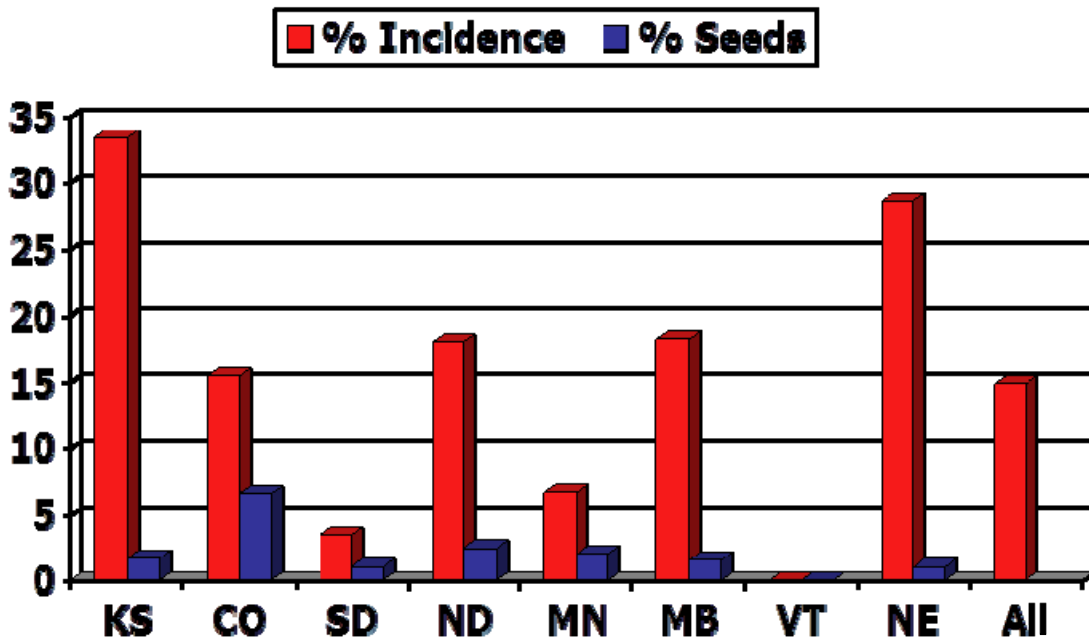
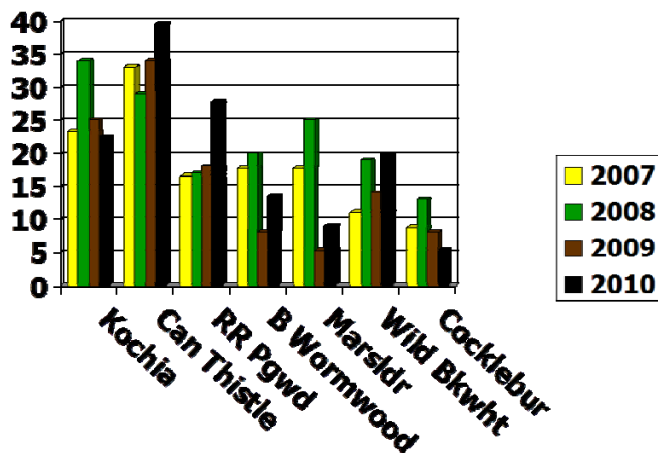


Figure 20 shows that about 15 percent of all sunflower seed samples had sunflower moth damage. One third of the samples from Kansas had sunflower moth damage and 29% of the samples from Nebraska. Colorado had the highest incidence with 6.5% damaged seeds. No samples from Vermont had any sunflower moth damage.

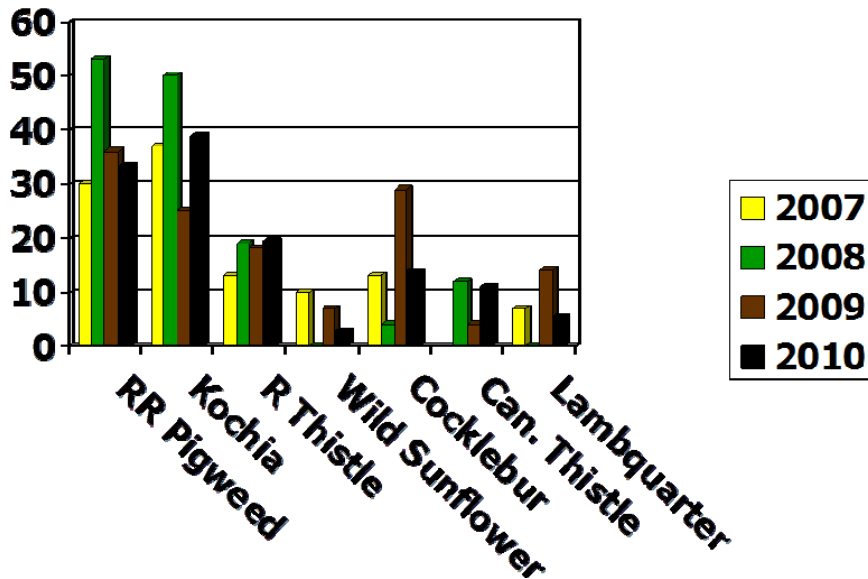
Weed problems in North Dakota and Minnesota in 2010: Over 29 common weeds were evaluated in the survey with the various infestation levels recorded. The ratings were: none, light, moderate and heavy. The data below indicates the percent of fields found with the following weed species being present. The most prevalent broadleaf weeds in North Dakota and Minnesota were Canada thistle, redroot pigweed, kochia and wild buckwheat. Canada thistle was found in close to 40% of the fields surveyed while redroot pigweed was found in 28% of the fields. Kochia was the third most prevalent weed species with it being reported in 23% of the fields. It is noted that the levels of marshelder, biennial wormwood, and wild buckwheat were up from the 2009 survey (Figure 21). **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.

Figure 21. Incidence of Broadleaf Weeds in ND and Minnesota 2007-2010.



Weeds in South Dakota: In South Dakota, kochia, redroot pigweed, Russian thistle and cocklebur were found to be the most prevalent broadleaf weeds. Green foxtail at 47% was the most abundant grassy weed reported. Yellow foxtail was found this year and was noted in over 11% of the surveyed fields. The presence of volunteer grains was 8.3% of the fields.

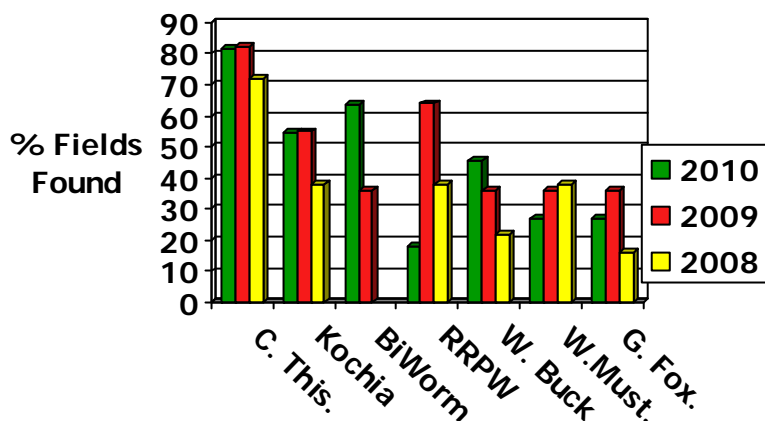
Figure 21. Incidence of Broadleaf Weeds in South Dakota 2007-2010.



Weeds in Manitoba:

In Manitoba, the prevalent broadleaf weed was Canada thistle, followed by Biennial wormwood, kochia, and wild buckwheat. Canada thistle was reported in 82% of the fields surveyed, while kochia was found in 55% of the fields. Redroot pigweed was found in 18% of surveyed fields compared with 64% in 2009. Biennial wormwood, was found in 64% of the fields compared to 36% in 2009.

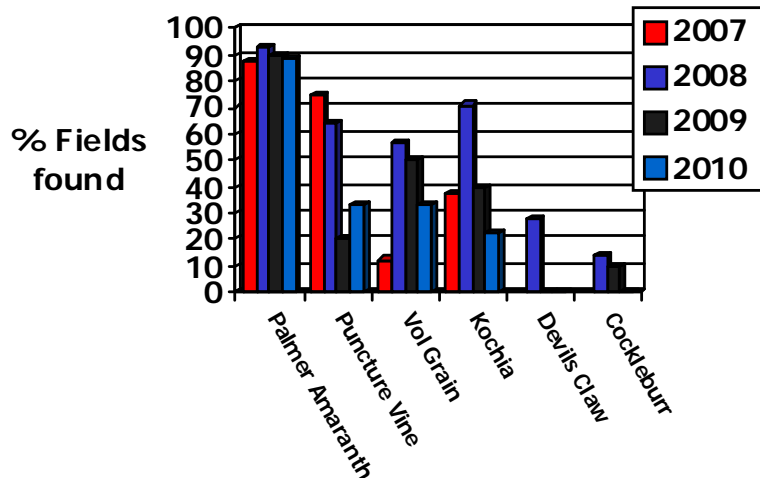
Figure 22. Incidence of Broadleaf Weeds in Manitoba 2008-2010.



Weeds in Kansas

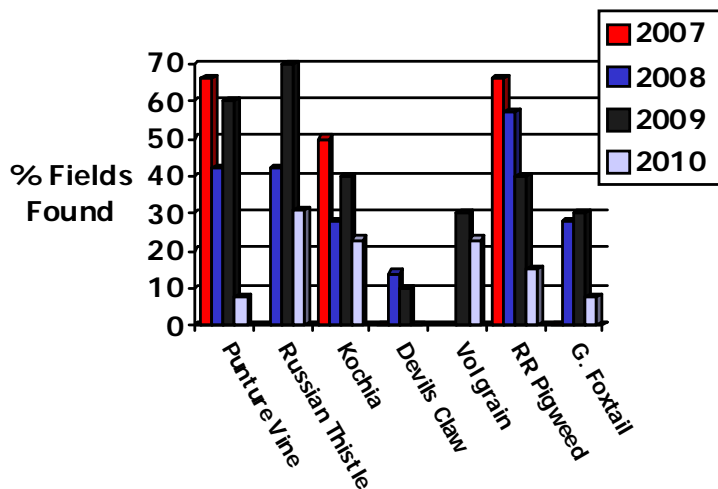
In Kansas, palmer amaranth was once again the number one broadleaf weed found and was identified in 89% of fields surveyed. Other broadleaf weeds found were kochia in 22%, and Puncture vine in 33% of the fields surveyed. The primary grassy weed found in Kansas was volunteer grain in 33% of the fields visited.

Figure 23. Incidence of Broadleaf Weeds in Kansas 2007-2010.



In Colorado, the number one weed was Russian thistle found in 31% of the fields surveyed, followed by kochia and volunteer grain both found in 23% of the fields. It should be noted that all weeds were found at a lower percentage of the fields compared with 2009.

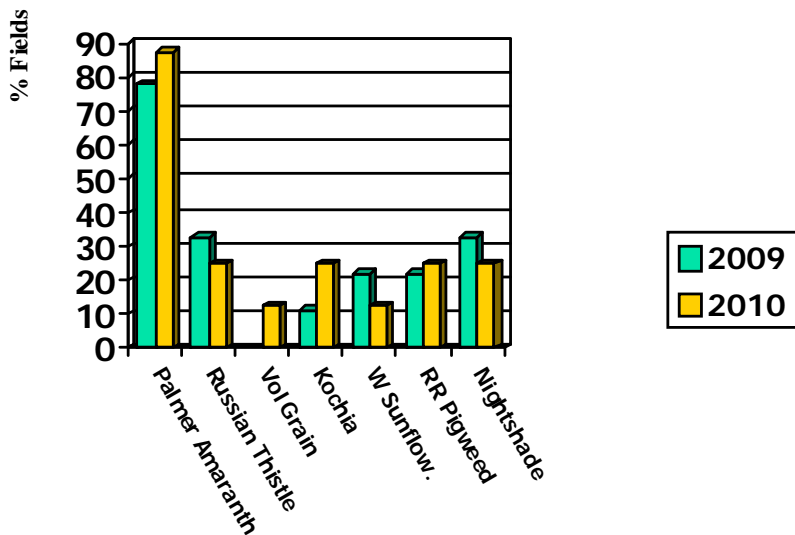
Figure 24. Incidence of Broadleaf Weeds in Colorado 2007-2010.



Weeds in Texas

In Texas, the major broadleaf weed was palmer amaranth which was found in 88% of the fields. This was just slightly higher than observed in the 2009 survey. Other broadleaf weeds found were Russian thistle (25%), kochia (25%), Redroot pigweed (25%) and nightshade (25%). The major grassy weeds identified were barnyard grass, yellow foxtail volunteer grains each in 12% of fields surveyed.

Figure 25. Incidence of Broadleaf Weeds in Texas 2009-2010.



Sunflower Survey Summary:

The 2010 survey was conducted in the same major sunflower producing states as in prior years of 2002 to 2009 with the exception being 2004 in which a survey was not conducted. Nebraska was included this year for the second time and Vermont for the first time. Oklahoma had only two fields in the survey. States in the survey in 2010 were North Dakota, Minnesota, South Dakota, Kansas, Nebraska, Colorado, Oklahoma, Texas and Vermont. Manitoba, Canada also was included again for the fourth 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.

In **2010** the Great Plains states had 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.

- Yield limiting factors in ND were plant spacing (within the row), diseases, lodging, birds and weeds.
- Yields limiting factors in SD were plant spacing, lodging, and variety of other problems.
- Minnesota also had issues with diseases.
- Plant spacing, drought and weeds were holding back yields KS and CO.
- Drought and weeds were holding back yields in CO.
- ND had the most sunflower planted in narrow row spacings while SD led all states with No-till plantings
- Rust incidence was higher in both SD and Manitoba than in 2009.

- ND rust incidence was lower than the past 2 years whereas, SD and MN incidence was higher in 2010.
- Sclerotinia Head rot was higher in ND and Lower in MN and Manitoba compared with 2009.
- Phomopsis was high in MN, Manitoba, North and South Dakota.
- Phoma incidence ranged from 0% in KS to over 90% in Manitoba.
- Verticillium was high in NE, Manitoba and SD.
- Banded moth incidence was highest in MN followed by ND, Manitoba and SD.
- Sunflower moth incidence was high in KS.
- Seed weevil incidence was highest in SD followed by CO.
- Brown spot damage in Conf. Sunflower was most severe in MN followed by ND and Manitoba.
- Long horned beetle damage appeared to be much greater in 2010 with highest severity in TX, SD, CO, KS and ND.
- Bird damage reported was higher than the previous year and was around 5% in fields where birds were doing damage in NE, ND, SD and VT and CO.
- Broadleaf weeds continue to be more of a problem than most grassy weed species.
- Palmer Amaranth is a major problem weed in KS and TX.

Literature

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](http://www.sunflowernsa.com/research/research%20workshop/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
8. Berglund, Duane R. 2009. National Sunflower Association Survey. Yield, Cultural Factors and Yield Limiting Factors. *On* National Sunflower Association Web page:
http://www.sunflowernsa.com/uploads/2009_NSA_Crop_Survey.pdf
9. Kandel, Hans. 2011. National Sunflower Association Survey 2010 PowerPoint pdf.
http://www.sunflowernsa.com/uploads/resources/554/2010_nsa_crop_survey.pdf