

2011 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 2011, in seven states in the Great Plains region, which was similar to surveys conducted in 2003, 2005-2010. In 2011 Oklahoma was not included due to the dry growing conditions. Manitoba, Canada was included in this year's survey for the fifth time. This is second year that data from Vermont is included. Table 1 provides the number of fields surveyed in 2010 and 2011. In the surveyed fields, yield and plant population were estimated. The sunflower 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 mailed to Fargo 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 2011 as determined by Farm Service Agency-USDA and other state estimates. The exception is Vermont where most of the extension project fields were surveyed. Over 50 professionals participated in recording the survey data, and the author would like to thank all of the contributing agriculturalists.

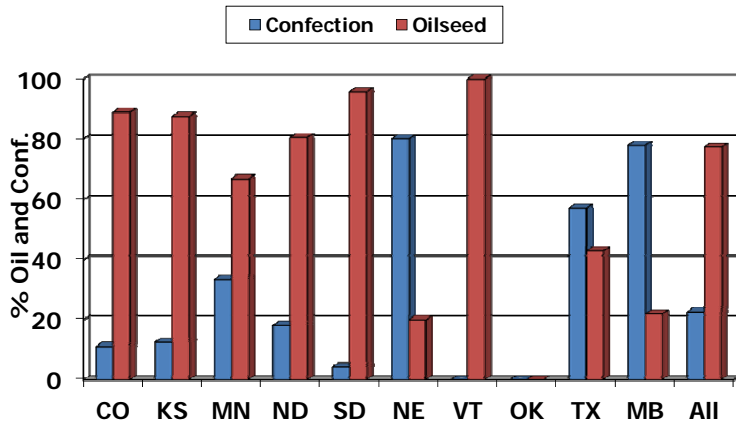
Table 1. States in Which the 2010-2011 Survey Took Place and Number of Fields Surveyed.

State	Field Surveyed 2010	Fields Surveyed 2011
North Dakota	96	77
Minnesota	15	9
South Dakota	36	23
Kansas	9	8
Colorado	13	9
Nebraska	7	5
Oklahoma	2	0
Texas	8	7
Vermont	10	8
Manitoba	11	9
Total Survey	207	155

The major yield-limiting factors were determined for each field. Yield-limiting factors included: no problem, birds, diseases, drought, drown-outs, hail, 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.

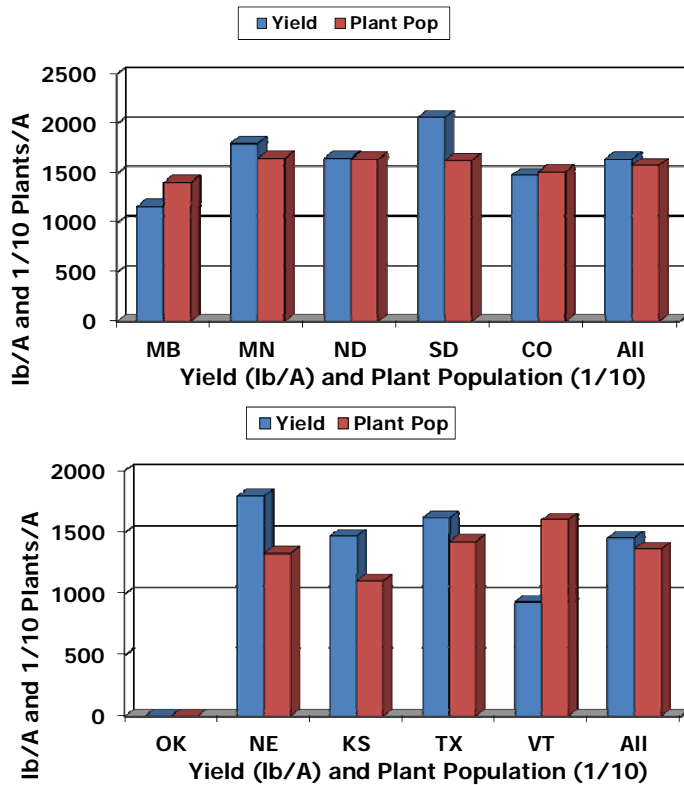
All States: A total of 155 fields were surveyed in 2011, compared with 207, 177 and 162 fields in 2010, 2009, and 2008 respectively. The percentage of oilseed fields in the survey was the highest at 100% in Vermont. South Dakota had 96% oilseed fields in the surveyed of 2011. The percentage of confection fields was the highest in Nebraska (80%), followed by Manitoba at 78%. Figure 1 provides the percentages of oilseed and confection sunflower fields surveyed in 2011.

Figure 1. Percent of Oilseed and Confection Sunflower Fields Surveyed 2011.



Estimated yields and plant populations: State average yield estimates in 2011 were 1,651 lb/a in North Dakota, 1,798 lb/a in Minnesota, 2,061 lb/a in South Dakota, 1,476 lb/a in Colorado, 1,465 lb/a in Kansas, 1,792 lb/a in Nebraska, 1,614 lb/a in Texas, 931 lb/a in Vermont and 1,163 lb/a in Manitoba. The average yield was 1,642 lb/a with an average stand of 15,770 plants per acre (Figure 2).

Fig 2 Sunflower Yields and Plant Populations 2011.



Sunflower Survey Yields for 2009, 2010 and 2011: Yields were higher in South Dakota when compared with the past several years. However, yields in Kansas, North Dakota and Manitoba were down when compared to 2010. Yields in Colorado and Minnesota were about the same over the three year period (Figure 3).

Figure 3. Sunflower Yield in Selected States in lb/a 2009-2011.

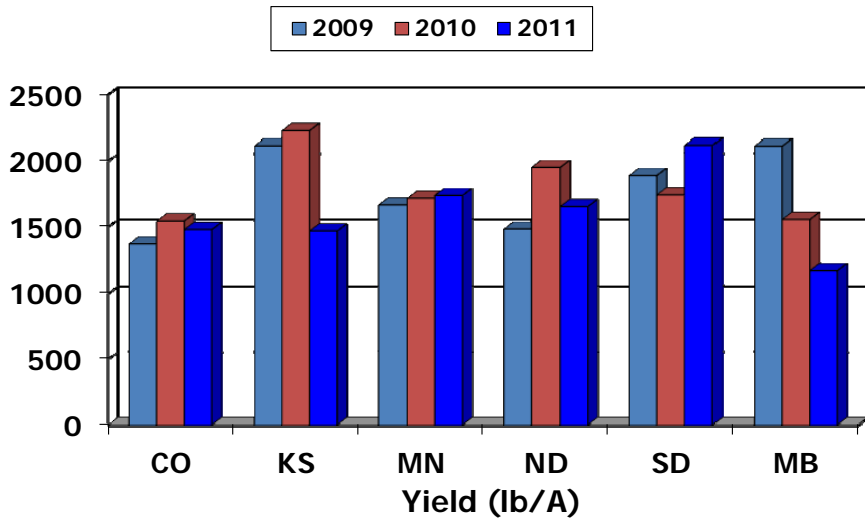
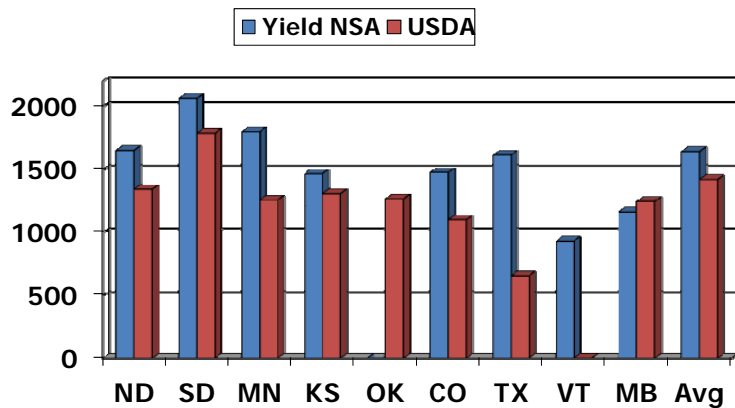


Figure 4. 2011- USDA-AG. Statistics and National Sunflower Association Surveys Yield in lb/a.

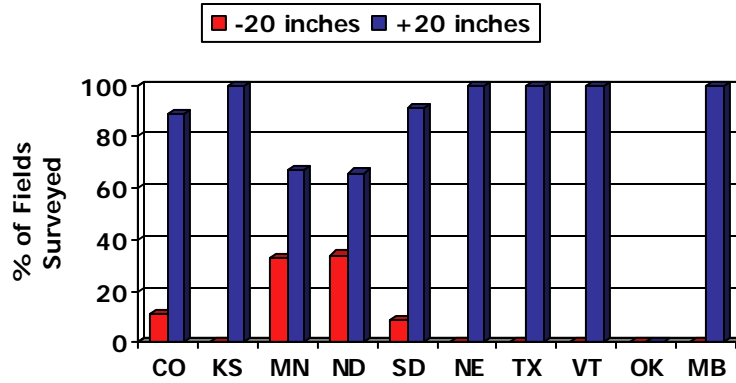


***Note:** Some of Kansas, Colorado, and Texas NSA surveyed fields were irrigated fields. Oklahoma was not surveyed by NSA. There was no USDA estimate available for Vermont. Canada based on total production divided by planted acres. Average is based on US data only.

When comparing the USDA-Ag. Statistics yield estimates and the NSA estimates for 2011 (Figure 4), it indicates that the NSA fall survey reported higher state average yields than the USDA. The NSA survey is taken earlier in the fall than the USDA survey. The yield reducing factors such as bird pressure and disease may lead to lower yields estimates if the NSA survey was delayed later into the fall season. However, a survey at harvest would not pick up some of the disease issues which can be observed before the crop is mature. Head diameter is one component for the NSA yield estimate. Head diameter will be slightly less when taken later in the season due to the dry down process. Therefore, earlier measurements (NSA compared with USDA) overestimate the yield potential by a few percent. However, in the states with enough sampled fields, the yield trends between states seem to be similar.

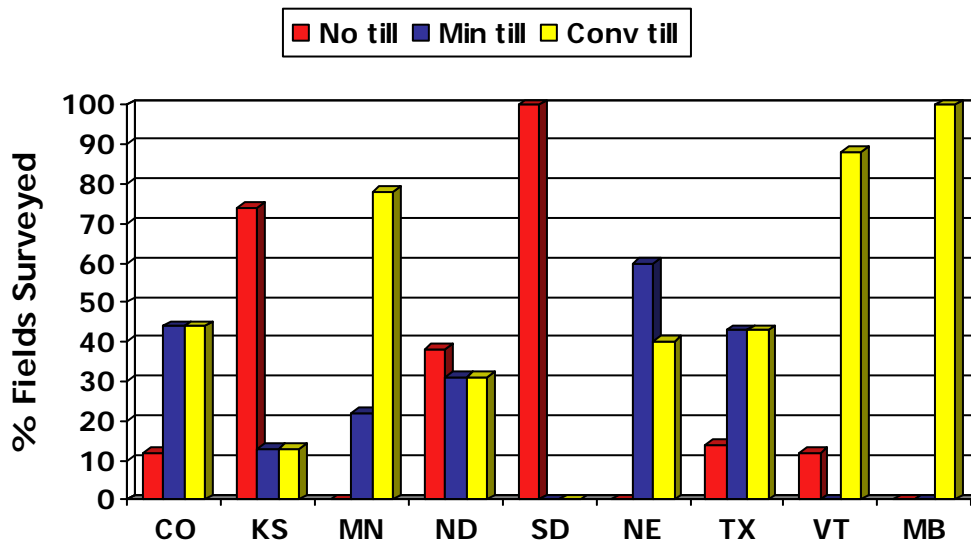
Row spacing: The majority of sunflower fields surveyed in the central Great Plains region were planted in wide row spacings greater than 20 inches (Figure 5). North Dakota, Minnesota, and South Dakota were the leading states with narrow rows. In Kansas, Nebraska, Texas, Vermont, and in Manitoba all fields had row spacing greater than 20 inches (mostly 30 inch).

Figure 5. Row Spacing in the 2011 NSA Survey.



Tillage Practices in Sunflower: Conventional till was greatest in Manitoba at 100%, Vermont with 88%, and Minnesota with 78% of the fields surveyed (Figure 6). South Dakota led all states again for no till sunflower plating for the sixth consecutive year with 100% of its surveyed sunflower acres under no-till in 2011. 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 in the NSA survey for more sunflower acres being planted using no-till farming practices in the Great Plains region.

Figure 6. Tillage Practices in 2011 Sunflower Survey.



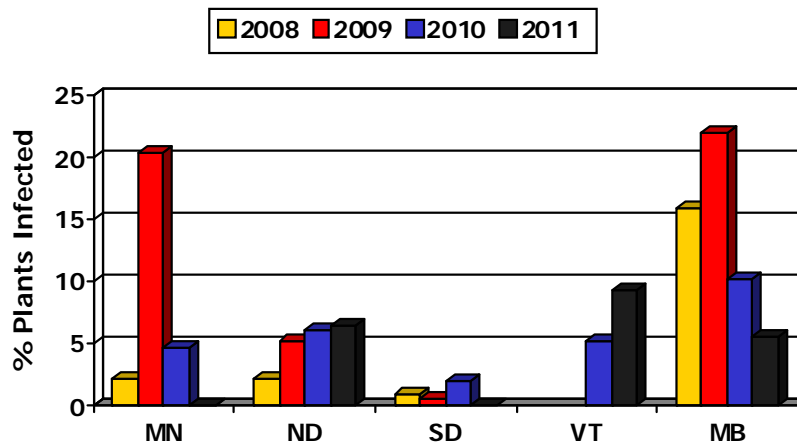
2011 Yield-limiting Factors: The number one yield-limiting factor for 2011 was plant spacing within the row (18.1% of the fields) followed by disease (15.5%). Both, in reverse order, were also the most limiting factors in 2010. In 2011 the second most limiting factors were also plant spacing within the row (16.8%) and disease (10.3%). Table 2 provides the number one and number two limiting factors as a percent averaged across the whole survey.

Table 2. First and Second Major Yield Limiting Factors 2010-2011 NSA Survey.

	No 1 limiting factor	No 2 limiting factor	No 1 limiting factor	No 2 limiting factor
Yield limiting factor	2010 Percent of the surveyed fields		2011 Percent of the surveyed fields	
Disease	20.7	8.4	15.5	10.3
Plant spacing within row	18.4	14.9	18.1	16.8
Lodging	8.7	4.5	10.3	7.7
Weeds	9.7	11.4	8.4	9.7
Birds	6.8	5.4	8.4	3.2
Insects	6.3	10.4	5.2	3.9
Drought	4.8	1.5	8.4	3.2
Drown out	3.4	2.5		
Hail	1	1	2.6	0
Uneven plant growth			3.2	0.6
Other (many mentioned population)	8.7	4.9	6.5	14.2
No Problem	11.6	35.1	13.5	30.3

2011 Sclerotinia Disease: Sclerotinia diseases (wilt, head rot and mid stalk rot) were not a serious problem in some regions due to dry weather. South Dakota, Nebraska, Kansas, Oklahoma, and Texas reported very little if any sclerotinia problems. However, sclerotinia head rot was found in Manitoba (55.6% of the fields), North Dakota (23.4%), Vermont (75%), and Minnesota (22.2%). The percent severity, based on infected heads in fields where sclerotinia head rot was found, are indicated in Figure 7. In North Dakota and Vermont the levels were slightly higher than last year. Minnesota and Manitoba had lower infection levels compared to 2010.

Figure 7. Sclerotinia Head Rot in Sunflower 2008-2011.



2011 Red Rust Incidence and Severity: Red rust of sunflower was reported in Kansas, North Dakota, South Dakota, Nebraska, Manitoba and Vermont (see figure 8). The percent of the fields with rust ranged from 21% of the fields in South Dakota to as high as 100% in Manitoba and Vermont. When considering the severity of rust infection (see figure 9), it was most severe in Kansas where 2 % of the top leaf area showed rust, followed by Vermont at 0.6%, Manitoba 0.3%, North Dakota 0.3% , and South Dakota 0.2% 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 occurs earlier, such as 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-2007-2011.

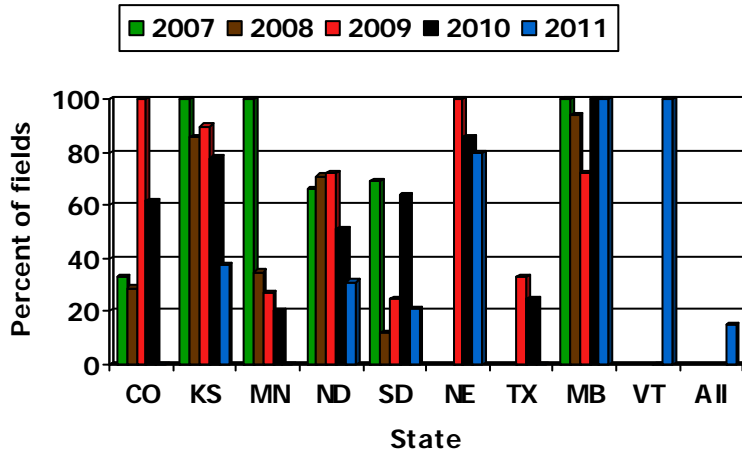
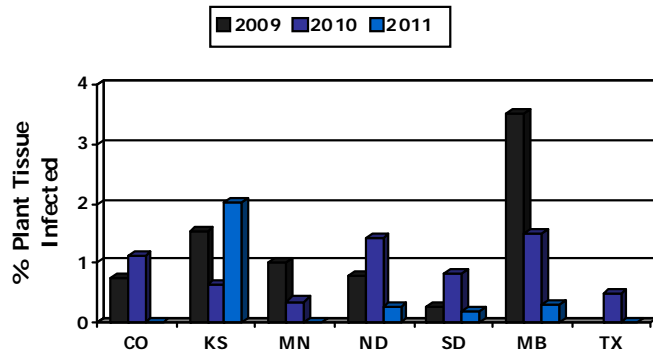
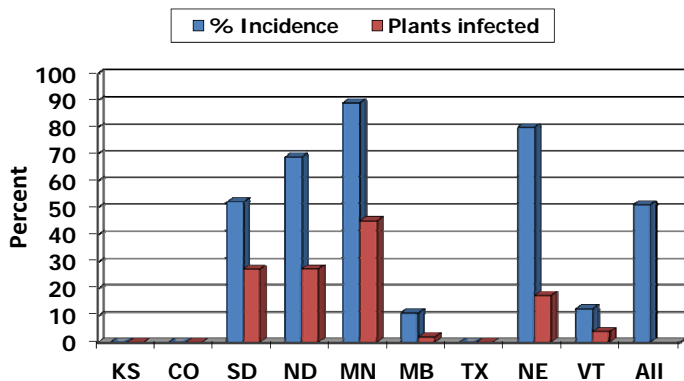


Figure 9. Sunflower Red Rust Severity – 2009-2011.



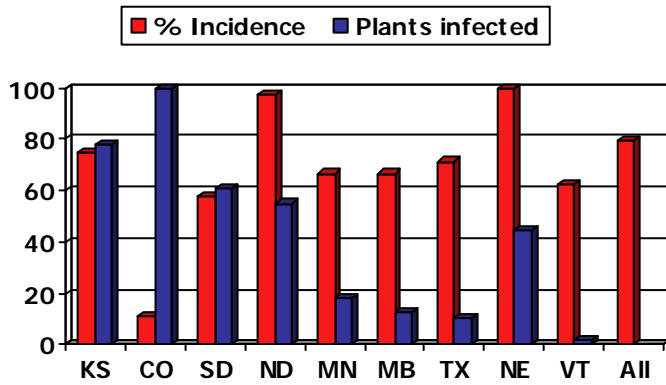
2011 Other Sunflower Diseases: **Phomopsis** continues to be a very serious problem in Minnesota, Nebraska, North and South Dakota. Kansas, Colorado and Texas reported no phomopsis in 2011 (Figure 10).

Figure 10. Phomopsis Incidence and Severity in Sunflower 2011.



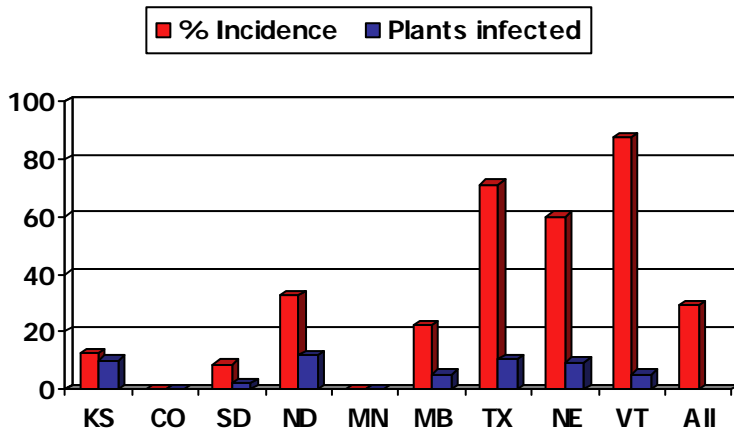
Phoma incidence (Figure 11) was very high this year in Nebraska, which reported 100% incidence in surveyed fields. In North Dakota the incidence rate was 95% while Kansas, South Dakota, Minnesota, Manitoba, Texas and Vermont all reported phoma in >55% of surveyed fields. Colorado had low incidence, but in the fields with phoma severity was 100%.

Figure 11. Percent Phoma Incidence and Severity in 2011.



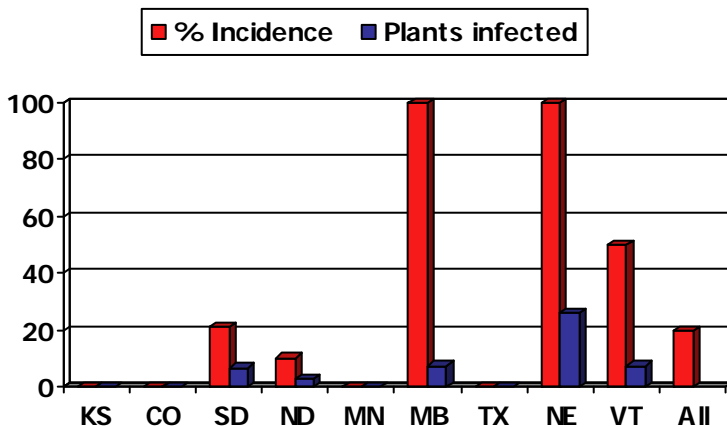
Rhizopus head rot was noted in the survey to be highest in Vermont, Texas, and Nebraska with >60% of the fields showing rhizopus. However, the percent of plants infected in Vermont was not as high as in most other states where rhizopus was reported. No rhizopus was reported in Colorado or Minnesota (see Figure 12).

Figure 12. Percent Rhizopus Head Rot Incidence and Severity 2011.



Verticillium is not easy to diagnose in the field. The data reported in 2011 should be interpreted with caution as these are field observations and not necessarily confirmed by lab testing. Nebraska and Manitoba reported the highest incidence, and Nebraska the highest severity (plants infected in the fields with verticillium).

Figure 13. Percent Verticillium Incidence and Severity 2011.



2011 Bird Damage: Bird damage continues to be a problem for many sunflower growers in the Great Plains and Vermont (Figure 14). The average field damage in North Dakota and Vermont from blackbirds and other birds was higher than last year (Figure 15).

In 2011, 100% of the fields in Vermont and 67% of the fields in Manitoba had fields with bird damage. On average, in the entire survey, 38% of the fields showed bird damage. The percent damage per field was the highest in North Dakota (15%).

Note: In some states surveys were taken early. Much of the bird damage and losses occur after the NSA survey and before harvest of sunflower.

Figure 14. Percent Bird Damage Incidence and Severity in 2011.

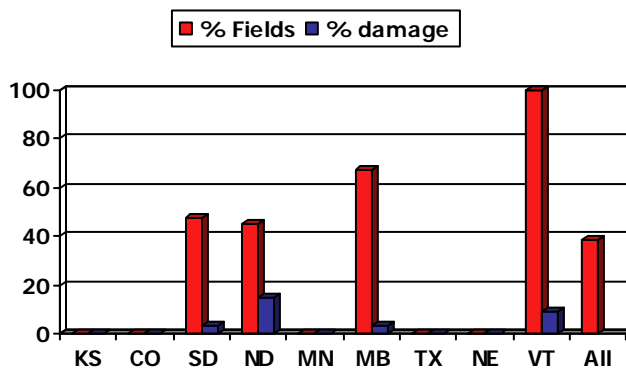
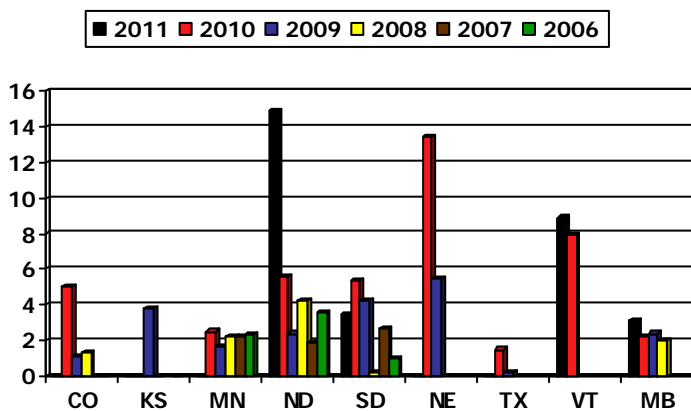


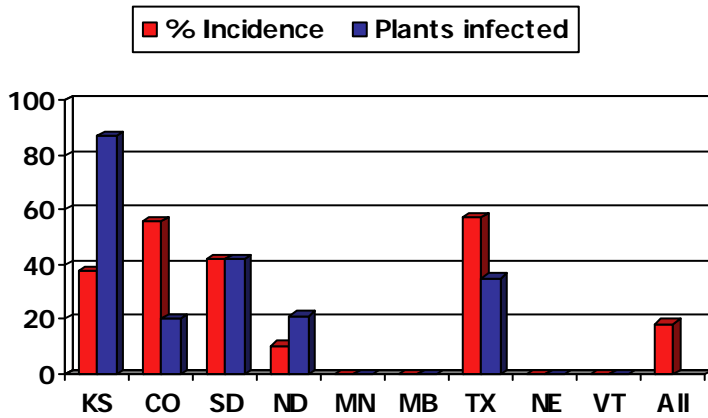
Figure 15. Percent Bird Damage in Sunflower Fields, Surveys 2006-2011.



2011 Long-horned Beetle (Dectes): Sunflower plants, including lower stalks, were examined for damage by the long-horned beetle. Incidence was high in Colorado, Texas, South Dakota and Kansas (Figure 16).

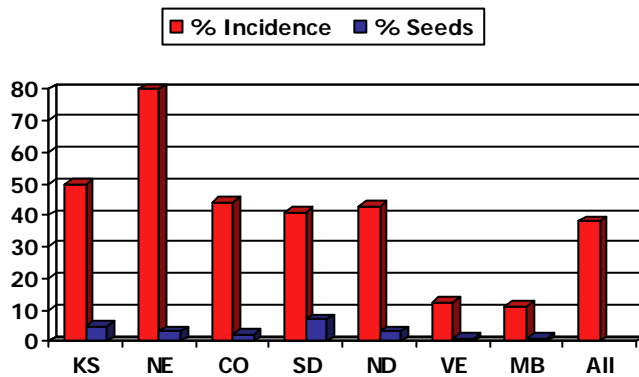
The highest number of long-horned beetle infested plants was reported in Kansas with an incidence of 87%, South Dakota had over 42%, and Texas 35% damaged plants. Over the whole survey about 20% of the fields had some long-horned beetle activity. No long-horned beetle was reported in Minnesota Manitoba, Nebraska, and Vermont.

Figure 16. Percent Long-horned Beetle Incidence and Severity-2011.



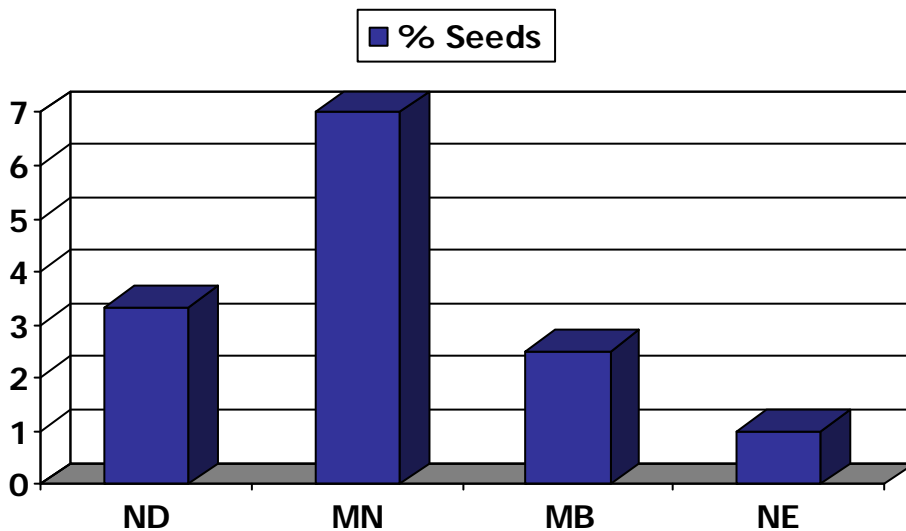
2011 Other Insects: Sunflower seed weevil, banded sunflower moth, sunflower moth and brown spot damage were determined from seed samples taken in the fields in each state and sent in to the USDA/ARS laboratory in Fargo, ND. Damage by seed weevil was evident in all states except Minnesota, where no seed weevil damage was observed (Figure 17). Seed weevil incidence in fields sampled was highest in Nebraska and Kansas. Seed weevil was found in 38% from all surveyed samples.

Figure 17. Percent Seed Weevil Incidence and Severity-2011.



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, North Dakota, Manitoba and Nebraska. Severity (number of seeds in a sample with brown spot) was 7, 3.3, 3.5 and 1% for samples from MN, ND, MB and NE respectively.

Figure 18. Percent Brown Spot Severity 2011.



Banded Sunflower Moth damage was observed in 63% of the seed samples from Vermont. Of the seed samples with banded sunflower moth the percent of the seeds damaged in Vermont was 17%. (Figure 19).

Figure 19. Percent Banded Sunflower Moth Incidence and Severity 2011.

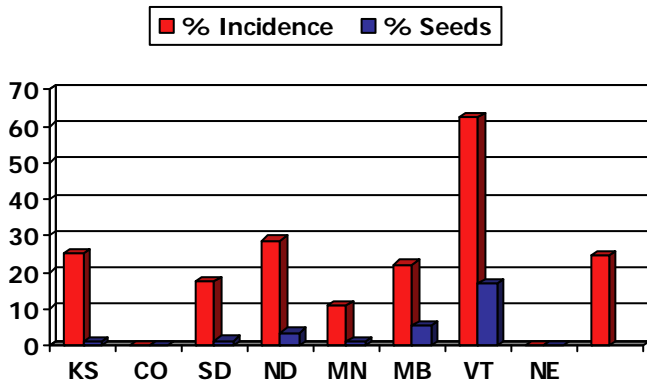
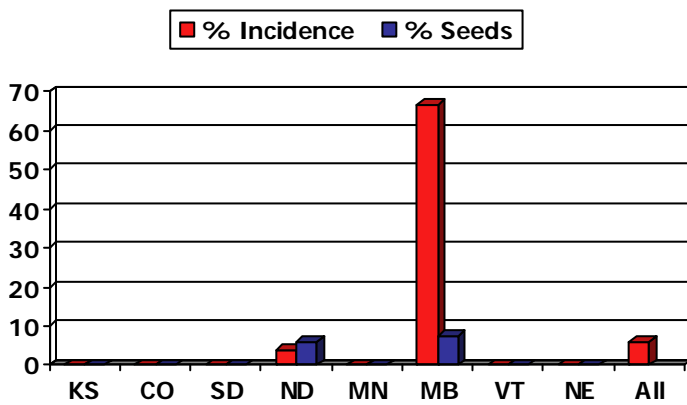


Figure 20. Percent Sunflower Moth Incidence and Severity 2011.



2011 Sunflower Moth: Figure 20 shows that about 6 percent of all sunflower seed samples had sunflower moth damage. In Manitoba 67% of the samples had sunflower moth damage and 4% of the samples from North Dakota. The other states samples did not show sunflower moth damage. Manitoba had the highest incidence with 7.6% damaged seeds and North Dakota 6%.

2011 Weed problems: 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 in Table 3 indicates the percent of fields found with the different weed species. Canada thistle, kochia, redroot pigweed, green foxtail, and volunteer grain were the weeds most commonly found in the survey. Palmer amaranth is a major problem in Texas and Kansas.

Table 3. Weeds Found 2011 NSA Survey.

Weed	ND	MN	SD	MB	NE	VE	CO	TX	KS	Survey
	Percent of the fields with weeds									
Annual smartweed	3	11	0	22	0	13	0	0	0	4
Biennial wormwood	12	22	0	78	0	0	0	0	0	12
Canada thistle	45	44	17	67	0	13	0	0	0	32
Cocklebur	12	0	17	11	40	13	0	14	0	12
Common lambs quarter	12	11	0	67	40	75	0	0	0	15
Devils claw	0	0	0	0	0	0	0	0	25	1
Kochia	21	0	61	33	0	0	11	29	63	26
Lanceleaf sage	0	0	22	0	0	0	0	0	0	5
Marshelder	6	0	0	0	0	0	0	0	0	3
Nightshade	6	0	0	0	20	25	0	29	0	6
Palmer amaranth	0	0	0	0	0	0	0	71	100	8
Prickly lettuce	1	0	0	11	0	13	0	0	0	2
Puncuture vine	0	0	0	0	0	0	11	0	75	5
Redroot pigweed	23	0	43	44	40	25	0	14	38	26
Russian thistle	1	11	22	22	0	0	11	14	0	7
Ragweed common	5	0	0	33	0	50	0	0	0	7
Ragweed giant	0	0	0	22	0	0	0	0	0	1
Waterhemp	0	0	0	0	0	0	0	0	0	0
Wild buckwheat	25	0	17	67	0	0	0	0	0	19
Wild mustard	14	0	0	0	0	50	0	0	0	10
Wild sunflower	4	0	4	0	0	13	0	0	0	3
Woollyleaf bursage	0	0	0	0	0	0	0	14	0	1
Barnyard grass	4	0	0	33	0	88	0	29	0	10
Downy brome	1	0	13	11	0	0	0	0	0	3
Field sandbur	0	0	13	0	0	0	0	0	0	2
Foxtail green	36	0	26	67	20	25	0	0	13	28
Foxtail yellow	12	0	4	44	0	38	0	0	13	12
Quackgrass	3	0	0	56	0	50	0	0	0	7
Volunteer grain	48	0	30	89	0	0	11	0	63	37
Wild oat	5	0	0	33	0	13	0	0	0	5

An Overview of Previous Sunflower Surveys:

The 2008 sunflower survey in North Dakota found that the major production issues identified were diseases and poor plant spacing, which were followed by weeds, birds and lodging. In Minnesota, diseases were 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 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 yield reducing 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.
- 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 2008-2009 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.

2011 Sunflower Survey Summary

The 2011 Sunflower survey was conducted in the same major sunflower producing states as in prior years of 2002 to 2010, with the exception being 2004 in which a survey was not conducted. Nebraska was included this year for the third time and Vermont for the second time. Oklahoma had no field surveyed in 2011 and only two fields in 2010. States in the survey in 2011 were North Dakota, Minnesota, South Dakota, Kansas, Nebraska, Colorado, Texas and Vermont. Manitoba, Canada also was included again for the fifth year in a row.

2011 was a challenging crop year with many of the northern sunflower acres planted late. Dry conditions occurred in the south and hurricane damage on the east coast (Vermont).

The main yield limiting factors for the whole survey were in order of importance: plant spacing within the row, diseases, lodging, weeds, drought, and bird damage.

- Main yield limiting factors in North Dakota were plant spacing (within the row), diseases, lodging and birds.
- Main yield limiting factors in SD were plant spacing, diseases and lodging.
- Main yield limiting factors in Minnesota were diseases and few fields with plant spacing within the row issues.
- ND had the most sunflower fields planted with narrow row spacings.
- SD had 100% no-till seeding.
- ND had equal acres in no-till, minimum till and conventional till.
- Rust incidence was high in Nebraska, Manitoba, and Vermont.
- ND rust incidence was lower when compared to the past 4 years.
- Rust incidence was lower in Kansas, Minnesota, and South Dakota compared with 2010.
- Sclerotinia head rot incidence was highest in Vermont and Manitoba.
- No head rot was found in surveyed fields in South Dakota, Nebraska, Texas, Colorado, and Kansas.
- Phomopsis incidence was high in North Dakota, Minnesota, Nebraska, South Dakota, and Manitoba.
- Of the phomopsis infected fields in Minnesota, 45% of the plants had the disease.
- Phoma incidence ranged from 11% in Colorado to over 95% in Nebraska and North Dakota.
- Verticillium incidence was reported in all surveyed fields in Manitoba and Nebraska, however the disease is not easy to diagnose and a better diagnostic approach may be needed than field observations.
- Banded moth incidence was highest in Vermont followed by North Dakota, Kansas, Manitoba, and South Dakota.
- Seed weevil incidence was highest in Nebraska, followed by Kansas, Colorado, North and South Dakota.
- Sunflower moth incidence was severest in Manitoba.

- Long-horned beetle with the highest percent severity was found in Kansas, followed by Texas and South Dakota.
- Bird damage was reported in 100% of the Vermont fields surveyed, followed by 67% in Manitoba, 46% in North Dakota, and 39% in South Dakota.
- Broadleaf weeds continue to be more of a problem than grassy weed species.
- Palmer amaranth is a major weed in Kansas and was recorded in 100% of the surveyed fields.
- Palmer amaranth was found in 71% of the Texas fields.

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