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Sunflower Date of Planting Study in Western North Dakota

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Summary

A mid-season NuSun sunflower (Helianthus annuus L. c.v. Mycogen 8242NS) cultivar was planted on four different dates at each of three different locations in southwest North Dakota. Hail, birds, and physiological problems affected the plantings at two of the three locations. At one location where the primary problem was hail, the first date of planting had completed the majority of seed development prior to the hailstorm and yielded more grain and oil than the remaining three dates. At the site that was relatively unaffected by these production problems, the May 23 date of planting produced the highest grain yields, seed oil content, and total oil produced per acre. Delaying seeding from May 23 to June 14 resulted in a $3.52 per acre per day reduction in gross revenue or $77.44 per acre.

Introduction

Sunflower is considered a late season crop in much of North Dakota with planting occurring as late as the last half of June. Late June plantings often result in lower yields and oil content. When harvest is delayed by weather, as seen in the fall of 1998, mechanical drying of seed is required thus adding to production expenses.

There has been minimal date of planting research in southwest North Dakota. Southwest North Dakota tends to have less snow cover, thus soils tend to warm and dry out earlier than in other parts of the state. Mandan Indians were known to plant sunflower in April in the Bismarck-Mandan area (Anonymous, 1989). Sunflower has been planted successfully in late April in parts of Minnesota and South Dakota (Robinson, 1970). Yields and quality of early-planted sunflower has generally been above average. Seeding date and the effect of plant density has been studied in Canada (Gubbels, 1989, and Dedio, 1985) and at Minot, ND (Zarnstorff, 1998).

No-till producers in southwest North Dakota promote the need for early closure of the crop canopy (Manitoba-North Dakota Zero Tillage Farmers Assoc., 1997). Early canopy closure produces a more favorable microclimate of humidity and cooler soils resulting in a more efficient use of available moisture for plant development. Early canopy closure also provides more competition to late germinating weeds when compared to late seeded crops that shade the ground later in the season. In date of seeding trials conducted at Mandan, ND and at Akron, CO when sunflower was seeded prior to peak weed emergence, the crop provided increased competition to the weeds (Tanaka and Anderson, 1998, 1997).

If sunflowers are seeded early in narrow rows and weeds are controlled early with pre-plant and post plant herbicide products, early canopy closure should control late germinating weeds, eliminating the need for herbicides or cultivation later in the season. Also early planting will provide producers the opportunity to harvest high quality seed earlier with less cost required for post harvest handling.

Increased yield and quality of sunflower planted at the proper date and cultural practices will improve producers' net returns. Sunflower planted in narrow row spacing may help producers in southwest North Dakota succeed in growing sunflower since sunflower may be more competitive than weeds when grown in narrow rows. Limited water would be used by the crop to increase marketable grain yield rather than by unwanted weed biomass. Soil moisture is usually the limiting factor for crop yields when grown in diverse rotations in southwest North Dakota. Early planted sunflower may be more effective in utilizing available moisture and precipitation than sunflower that is planted at the current recommended dates for the state. Early seeding should mean early harvest thus providing a greater chance for soils to be recharged with moisture prior to seeding the next crop in the rotation sequence.

The objective of this project is to determine and demonstrate the optimum planting date of sunflower for southwestern North Dakota.

Materials and Methods

Three sites were selected in southwestern North Dakota. These sites were at Beach, Bowman, and Dickinson. A randomized complete block design with four replications for each seeding date was used at each site. Size of the plot area at each location varied according to equipment utilized. Plot size at Beach was 30 feet by 500 feet (Figure 1); at Bowman, 40 feet by 2680 feet (Figure 2); and at Dickinson 30 feet by 80 feet. Each site was soil tested and fertilized according to soil test results for a 1500 to 2000 pound per acre yield. Anhydrous ammonia was used as the source of nitrogen at the Bowman and Dickinson sites while ammonium sulfate was used at Beach. Adequate levels of phosphorous and potassium were found in soils at the Dickinson and Beach sites. Additional nitrogen, phosphorous, potassium, and a micronutrient mix was applied through the drill at the Bowman site.

Sonalan 10 G (ethalfuralin) at the rate of ten pounds per acre was pre-plant incorporated and Poast (sethoxydim) was applied post-emergence at the rate of one pint per acre for weed control at all three sites. In addition to the herbicides used at Beach, plots were hand weeded on July 8, July 18, and August 5. Weed control at Bowman was considered good to excellent and no additional treatment was used.

The NuSun sunflower cultivar 8242NS was planted using a 10 foot John Deere 750 no-till drill at Beach and Dickinson; a 40 foot Concord air drill (Figure 3) with low disturbance points was used at Bowman. The target seeding rate at all three locations was 27,710 seeds per acre to obtain a final stand count of 23,000 plants per acre. Problems in adjusting drills, hail, excessively wet conditions and physiological factors made it difficult to obtain the target final stand count.

Fields were scouted on a regular basis for pests and beneficial insects. Sunflower beetle adults and larva population levels were initially medium to high but beneficial insect populations were sufficient to control this pest through the season. Sunflower moth (Homoeosoma

electellum) (Figure 4) adult flights infested the first date of seeding at Beach and Bowman. Adult moth populations required treatment at these locations. Treatment occurred after considerable damage had occurred to the first date of seeding but before the second date began to bloom. The Dickinson site was treated for grasshoppers and Red sunflower weevil (Smicronyx fulvus). Black sunflower stem weevil (Apion occidentale) were noted at all locations but populations were below the treatment threshold.

The center four rows of each plot at the Dickinson were harvested using a Massy Ferguson 8XP plot combine and analyzed. The center 30 feet of each plot at Bowman (Figure 5) and the center 20 feet at Beach were harvested using producer equipment and seed weight taken for each plot using an Arts-Way electronic weigh wagon. Seed samples from each plot were taken and adjustments made for moisture and dockage. Dr. Jerry Miller, ARS, NDSU, Fargo, ND performed oil content and fatty acid analysis.

Results and Discussion

The Beach and Dickinson sites were severely damaged by a hailstorm on August 15 (Figure 6). An adjacent spring wheat field at the Beach site was completely destroyed by this storm. Despite efforts made to shun black birds at the Beach and Dickinson sites, damage was noted at both sites. The severe problems caused by hail, excessively wet soils, black birds, and other physiological problems at Dickinson resulted in highly variable data (not shown) and are of little value in discussing seeding date effects.

The final stand count at Beach was well below the desired count (Table 1) with the fourth date being exceptionally low. At the time of planting, the soil was still wet and the slot that the planting disc made did not close sufficiently to have good soil seed contact. Severe stem breakage at the base of plants (Figure 7) was noted prior to flowering particularly in the first two dates and to a lesser extent in the third date. Plant pathologists could not isolate any primary causal organisms and entomologists did not find sufficient stem weevil damage in lodged stalks to attribute lodging to insects. The problem was thought to be a physiological rather than a pathogenic or insect related. There was no significant difference in final stand counts between the first, second, or third dates of seeding at Beach. Yield differences between these first three dates of seeding are thought to be the result of the relationship between the stage of development and timing of the hailstorm. Grain test weight from the first date of seeding was significantly heavier than the remaining dates at this site. The early seeded sunflower crop at Beach completed the majority of its development prior to the hail storm resulted in significantly more oil per acre than any other seeding date at this site.

Difficulty in adjusting the drill at the Bowman site was probably the primary cause for low plant populations for the first date of seeding, April 28 (Table 2). However, there is no significant difference in plant population between the second, third or fourth dates of seeding at this site. Grain yield for the first date was significantly less than the second and third dates of seeding but no statistical difference was noted between the first and fourth dates at this site. Though plant population varied between the first and remaining planting dates, it is unlikely that plant population would have affected yields (Bhatti, et. al., 1999). Losses from Sunflower moth larva feeding on the first date was estimated at between 20 and 25% but no adjustment was made to the yield reported in this table. Significant differences in test weight were noted between the first and second dates of seeding and between the third and fourth date of seeding but not between the second and third dates of seeding. No significant differences in oil content were noted between the first three dates of seeding but the fourth date oil content was significantly less than any of the previous planting dates. The second date produced more pounds of oil per acre than any

of the other three dates. Oleic oil content was not significantly different between planting dates at this site. However, oleic acid content of seed from both the first date and the last date was less than the minimum oleic acid levels of 50% accepted by the processing industry for mid-oleic sunflower.

Implications

Based on the limited data provided by the first year of this study at Bowman, for each day of delay in seeding between May 23 and June 14 and between June 4 and June 14 there was a 35.2 and 51.8 pound per acre reduction in yield respectively. If sunflower is valued at $0.10 per pound then the delay between May 23 and June 14 cost $3.52 per acre per day or a total of $77.44 per acre. A delay between June 4 to June 14 cost the producer $5.18 per acre per day or a total of $51.80 per acre.

This was the first year of a three-year study in southwest North Dakota. Extremely moist conditions early in the season prevent planting during a three week period thus missing the two week interval between planting dates originally planned. In 2000 the study will be conducted at the Hettinger Research Extension Center, Hettinger, ND and on the Miles Hansen Farm, Bowman, ND.

Cooperating Producers and Organizations

The authors wish to thank the following producers for cooperating in conducting this study. These cooperators shared their time, equipment, and knowledge to help move this study forward. Producers are Art Ridl, Dickinson, ND and Miles Hansen, Bowman, ND. Also we wish to thank the Golden Valley Soil Conservation District for the use of their land.

The authors wish to thank the North Dakota State Board of Agricultural Research and Education as well as the National Sunflower Association for their financial support.

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Report Tables & Figures

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Figure 2. View of sunflower date of planting plot on the Miles Hansen Farm, Bowman, ND, 1999. The first planting date is in the center of the photo is in flower. The second planting date is to the immediate right of the first date and the fourth planting date is to the immediate left of the first date. The third date is to the left of the fourth planting date in this replication.

Figure 3. Concord air drill used to seed sunflower date of planting study on the Miles Hansen Farm, Bowman, ND, 1999.

Figure 4. Sunflower moth (*Homoeosoma electellum*) adults at the Beach, ND, 1999. Infestation levels were high and treatment was required at both Beach and Amidon.

Figure 5. Harvesting of the fourth planting date on the Miles Hansen Farm, Bowman, ND, 1999. Note the border rows were not harvested for yield determination to avoid border affect.

Figure 6. Hail damage cause by the August 15 storm at the Golden Valley Conservation District Farm, Beach, ND, 1999.

Figure 7. Physiological stem breakage was partially responsible for reduced stand counts at the Golden Valley Conservation District Farm, Beach, ND, 1999.

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