Growing Sunflowers for Biodiesel

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Rationale:

There is growing interest in pressing oil both for powering equipment on the farm and for off farm use as a biofuel. Reports indicate that sunflower has potential for these uses, but has not been grown widely in Massachusetts. We have developed a research project to study the feasibility of growing sunflowers as biodiesel in Massachusetts. Preliminary research in 2009 sustained considerable bird damage, so that has become a focus of current work. Other subjects under study are cultivar selection, appropriate time of planting, disease, seed moisture as harvest approaches, and time of harvest.

Research Goals:

The main objectives of this research are to evaluate sunflower seed yield, bird damage percentage, and dry down rates of varieties differing in maturity and planted on varying dates.

Treatments:

Three cultivars of sunflower, one short season, one mid-length season, and one full season were planted on three dates, May 4th, May 18th, and June 1st, 2010. Harvest of the first two dates of planting was September 9th, and harvest of the last planting was October 4th, 2010. Plant density was 22,550 plants per acre. Plants were monitored for time of flowering, seed moisture, and bird damage. Head size, seed size, and seed yield were measured at harvest.

Results:

Flowering dates of sunflower cultivars are presented in Table 1.

Table 1. Time to 50 % flowering as influenced by cultivar and time of planting. Date of 50% flowering is followed by days after planting in parentheses.

Cultivar	Date of Planting		
	May 4	May 18	June 1
Early (Defender Plus)	July 19 (76)	July 21 (64)	August 5 (65)
Mid (3080)	July 19 (76)	July 22 (65)	August 7 (67)
Late (Sierra)	July 22 (79)	July 26 (69)	August 8 (68)

During the period following seed fill, seed moisture was monitored. Seed moisture monitoring ended when seed heads were harvested. Figure 1 shows the trend of moisture loss in the weeks before harvest (August and September). Seeds contained approximately 20% moisture at harvest, except for the late-maturing variety, Sierra, whose first and second dates of planting were harvested October 4th

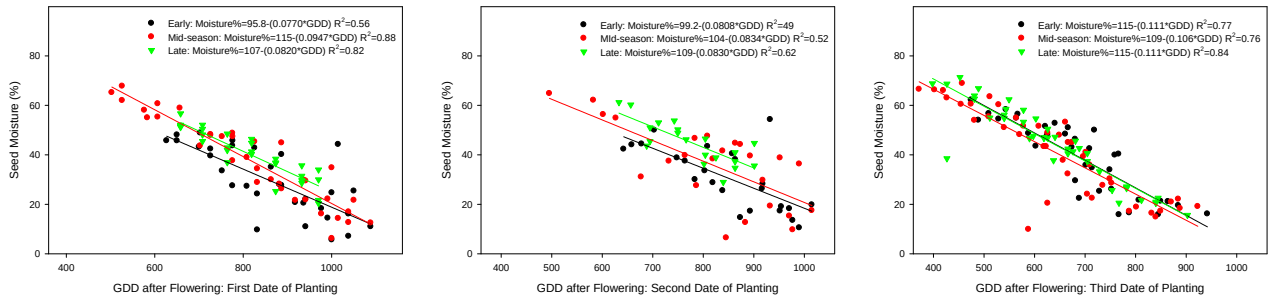

Figure 1. Seed moisture loss in early, mid, and late cultivars sowed May 4th, May 18th, or June 1st.

with moisture contents of 26 and 38 percent, respectively. Seed moisture at harvest is important, because post-harvest seed drying is an expensive, energy consuming process.

Yields of dry seed, as well as other characteristics related to seed yield are shown in Table 2.

Table 2. Effects of cultivar and date of planting on harvested sunflower.

	DOP 1	DOP 2	DOP 3	
	May 4	May 18	June 1	Average
Yield. lb acre^{-1}				
Early	3787	3331	3327	3842 A[z]
Mid-season	2500	1530	2991	2340 B
Late	4152	2630	3754	3512 A
Average	3479 A	2497 B	3357 A	
Moisture percent at harvest				
Early	20	17	20	19 B
Mid-season	14	20	18	18 B
Late	26	38	20	28 A
Average	20	25	19	
Bird damage at harvest[y]				
Early	5	8	11	8
Mid-season	50	63	19	44
Late	20	44	12	25
Average	25	38	14	
Average seed head diameter, inches				
Early	7.3	6.9	8.0	7.4 AB
Mid-season	6.6	5.6	7.9	6.8 B
Late	7.6	7.6	9.0	8.1 A
Average	7.2 B	6.8 B	8.3 A	
Average seed size (milligrams)				
Early	64	54	56	58 A
Mid-season	42	40	51	44 C
Late	50	51	54	52 B
Average	52	48	53	

[z] Different letter indicates difference at p=0.05

[y] Average percent of seed head empty.Bird damage was influenced by cultivar and date of planting, and

also by their interaction, $P < 0.0001$

Yield of the mid-season cultivar, 3080, was significantly lower than the other two cultivars primarily due to the greatest bird damage. Bird pressure appears to have been a large factor in determining yield.

Future work will investigate the relationships among cultivar, time of planting, bird damage, time of bird damage, and whether physical characteristics of cultivar (such as head position at maturity) influence bird damage.

2011 Experiment:

Nine sunflower cultivars have been planted at three dates, May 10th, May 23rd, and June 2nd. As time of harvest approaches, flowering, seed development, bird damage, and seed moisture will be monitored, with the goal being to optimize time of harvest to maximize yield, while minimizing bird damage and the need for further seed drying before pressing oil.

For more information about this research project contact Masoud Hashemi, masoud@psis.umass.edu.