

Sunflower Production for Biofuel in Massachusetts

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Sunflower is a high oil content seed and can produce up to 600 pounds of oil per acre, considerably more than soybeans. There is an increasing interest from local area farmers in cultivation of sunflowers for construction of small biofuel processing facilities in Massachusetts.

In 2009, research was initiated at UMass Crop and Animal Research and Education Center in South Deerfield to collect basic cultivation information about sunflower in Massachusetts. In this study, seven sunflower hybrids; 1) Siera (High Oleic), 2) Teton (High Oleic), 3) Firebird (express NuSun), 4) Blazer CL (Clear Field NuSun), 5) Defender Plus (NuSun), 6) 803, and 7) 3080 were planted at four seeding rates; 15,000, 20,000, 25,000, and 30,000 plants/acre. The experiment was replicated 4 times.

Experimental plots consisted of 3 rows 2.5 feet apart and 25 feet long. The experimental site received 606 lb/ac of 15-4.5-7.5 (equal to 100 lb N, 30 lb P₂O₅, and 50 lb K₂O per acre) preplant fertilizer mixed with 394 lb per acre lime. All cultivars were planted on May 18th, using a cone type distributor mounted on a double disc opening planter in a conventionally prepared seed bed. Weeds were controlled by using Prowl, a pre-emergence herbicide (1.5 pints/ac a.i.), and POAST (2 pints/ac), a post-mergence herbicide to control grasses. Sunflower hybrids were grouped into three groups based on their flowering time. Harvesting began on Sept. 3 for earliest maturity group, and ended on Sept. 14, 2009 for latest maturity group.

Results showed that seed yields in replications were significantly different mainly because of differences in bird damage (Table 1). For unknown reason(s) the northern part of the research area where replications 4 and 3 were located received more damage from birds. No significant difference was found in flowering time among the replications.

Results of seed yield, seed to head ratio, bird damage (%), mortality (%), and GDD required reaching 50% flowering stage as affected by hybrids and seeding rates are presented in Tables 2 and 3.

Table 1: Variation in seed yield, bird damage, and GDD required for 50% flowering among replicated areas.

Rep	Seed Yield (bu/ac) ¹	Bird Damage (%)	Flowering GDD
1	91.7b	13.7	1071
2	89.0b	13.5	1080
3	72.3a	19.7	1088
4	71.3a	28.3	1076

¹ There is 27 lb of sunflower seed per bushel.



Table 2: Seed yield, seed:head ratio, bird damage, mortality, and GDD required to reach 50% flowering stage as affected by sunflower cultivars.

Cultivars	Seed yield ² (bu/ac)	Seed/head Ratio	Bird Damage (%)	Mortality ³ (%)	Flowering GDD ⁴
Sierra	102.5 c ¹	60.9 a	24.4 c	38.7 b	1142 c
Teton	82.4 bc	60.2 a	16.0 b	21.3 a	1074 b
Firebird	87.2 bc	60.2 a	6.4 a	33.4 b	1143 c
Blazer	84.7 bc	63.1 a	11.4 b	37.7 b	1129 c
Defender	81.7 bc	64.6 a	17.4 b	34.3 b	1036 b
803	56.6 a	59.1 a	44.5 d	38.3 b	967 a
3080	72.3 b	59.4 a	11.6 b	33.5 b	1060 b

¹ Within columns, means not followed by a common letter differ ($P \leq 0.05$).

² There is 27 lb of sunflower seed per bushel.

³ Mortality is the percent of plants lodged and/or infested by fusarium.

⁴ Growing Degree Days was calculated as: $GDD = \sum(T_{max} + T_{min})/2 - 50$

Table 3: Seed yield, seed:head ratio, bird damage, and mortality as affected by planting density.

Density (plants/ac)	Seed yield ² (bu/ac)	Seed/head Ratio	Bird Damage (%)	Mortality ³ (%)
15,000	88.4 b ¹	63.5 a	14.7 a	21.0 a
20,000	81.7 a	61.8 a	17.2 a	33.6 b
25,000	78.9 a	59.2 a	20.8 b	35.9 b
30,000	75.3 a	59.8 a	22.6 b	45.1 c

¹ Within columns, means not followed by a common letter differ ($P \leq 0.05$).

² There is 27 lb of sunflower seed in bushel.

³ Mortality is the percent of plants lodged and/or infested by fusarium.