2012 Sunflower Population and Nitrogen Rate Trial

Dr. Heather Darby, UVM Extension Agronomist
Hannah Harwood, Erica Cummings, Rosalie Madden, and Susan Monahan
University of Vermont Crops and Soils Technicians
(802) 524-6501

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2012 SUNFLOWER POPULATION x NITROGEN APPLICATION RATE TRIAL

Heather Darby, University of Vermont Extension
heather.darby[at]uvm.edu

Sunflower (*Helianthus annus* L.) is a warm-season crop with the potential to add high value to diversified farms in the Northeast as a rotation crop, an on-farm fuel production source, and an added-value retail crop. Production of high-yielding sunflower crops is highly influenced by plant population and adequate nitrogen (N). Applying excessive N to sunflower can have detrimental effects to the crop and environment as well as decreasing profits for farmers. Sunflower populations can also have a significant impact on yield and quality. In Vermont where a more temperate climate prevails, higher plant populations may be advantageous compared to the more arid sunflower-growing regions in the U.S. Plains. As target populations increase, N application recommendations generally increase as well. With the need for regionally-specific recommendations, the University of Vermont Northwest Crops & Soils Program has initiated a yearly study since 2010 to determine the effects of target population and N application rate on plant stand characteristics, pest damage, and seed and oil yields of sunflower. The following are results from the 2012 study.

Table 2. Cultural practices for the 2012 sunflower population by N rate trial.

Location	Alburgh, VT
Soil type	Swanton fine sandy loam

Table 4. Summarized weather data for sunflower growing season, 2012, Alburgh, VT.

Alburgh, VT	May	Jun	Jul	Aug	Sep	

Plant height was significantly impacted by the population treatments (Figure 2). The sunflower population of 20,000 plants per acre were significantly shorter than all other treatments (68.6 inches). Head width was also significantly different among population treatments (Figure 3). Head width was greatest in the lowest population, 20,000 plants per acre (6.26 inches). Harvest moisture did not vary according to population and was 10.9% on average.

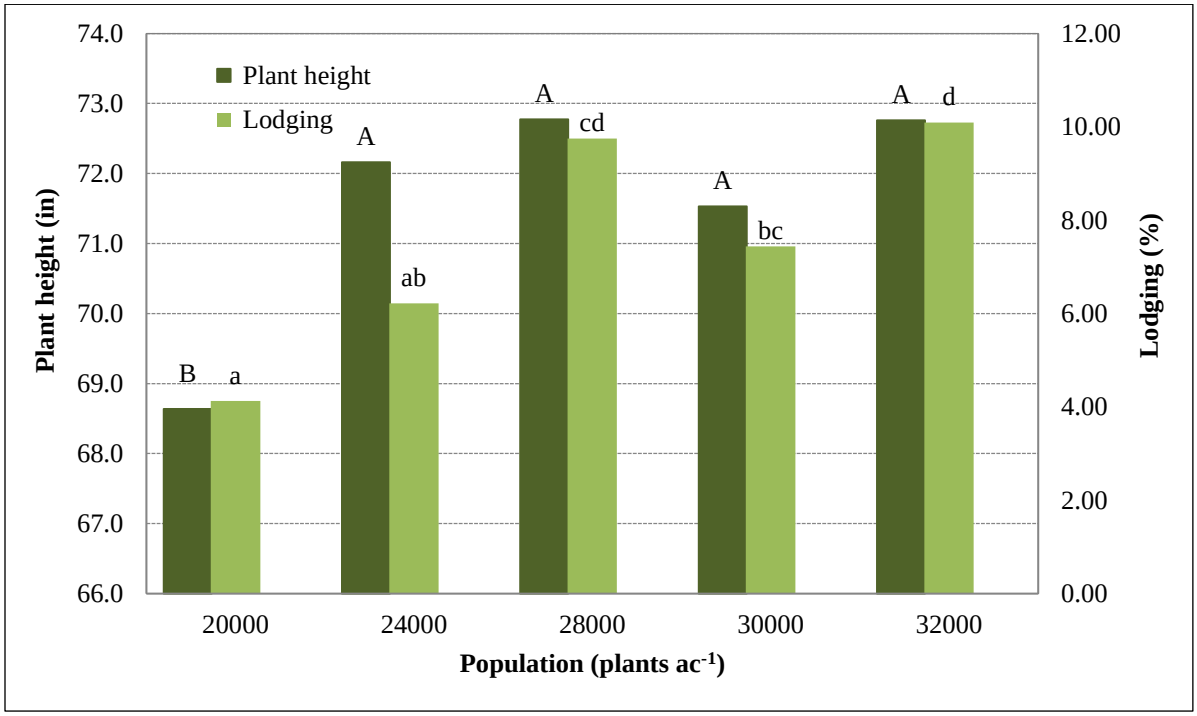

Figure 2. Impacts of population rate on plant height and lodging. Treatments that share a letter were not signficantly different from one another (p=0.10; compare capital letters for plant height and lower-case letters for lodging).

Figure 3. Impacts of population rate on sunflower head width. Treatments that share a letter were not signficantly different from one another (p=0.10).

Sunflower population significantly impacted seed yield and test weight but not oil yields (Table 6). The highest seed yield was observed at the plant population of 20,000 plants per acre (5203 lbs per acre). This was not statistically greater than the yield for treatments of 30,000 and 24,000 plants per acre (Figure 4). Test weight was highest in the most densely-populated sunflowers at 32,000 plants per acre (30.6 lbs per bushel). This was not statistically greater than the test weight of sunflowers with population of 28,000 plants per acre (30.2 lbs per bushel).

Table 6. Impact of population rate on yield and quality of sunflowers, 2012.

Population	Seed yield	Test weight	Oil content	Oil yield	
plants ac^{-1}	lbs ac^{-1}	lbs bu^{-1}	%	lbs ac^{-1}	gal ac^{-1}
20,000	**5203***	29.7	41.6	2287	300
24,000	4886*	29.7	43.0	2222	291
28,000	4398	30.2*	43.2	2000	262
30,000	4926*	29.3	44.1	**2301**	**301**
32,000	4469				

Impact of Nitrogen Rate

Oil content was significantly greatest without side-dress application (Figure 7). Oil yields were statistically greatest in sunflowers with 0 lbs N applied per acre (2635 lbs or 345 gallons of oil per acre). This was statistically greater than sunflowers fertilized at all other N application rates.

Figure 7. Effects of N application rate on oil content of sunflower across population treatments. Treatments that share a letter were not statistically different from one another (p=0.10).

DISCUSSION

The lack of significant interactions between population treatments and N application rates signifies that the effect of both variables was consistent. Hence during this year of study, increasing seeding rates did not necessarily indicate that higher rates of N were required to support the crop.

Population impacted lodging, plant height and head width. As plant population increased, so did plant height and the incidence of lodging. Sunflowers grew taller to compete with their neighboring plants in densely-populated plots, and as their stalks weakened,

management that takes into account the variable needs of the crop. The development of an adaptive test similar to a PSNT (Pre Side-dress Nitrate Test) for corn would greatly improve the ability to make nutrient recommendations for a crop like sunflower. Growers have the opportunity to save money and energy by applying only what is needed by the crop to yield well under specific conditions.

Interestingly, neither population nor N application rate had any significant impact in pest pressures (disease and bird damage incidence). Overall, sunflower seed yields were very impressive; the trial average for seed yield was 4776 lbs, or 2.38 tons. Oil content was, on average, 43.2%, which is above the goal of 40% oil for sunflowers. Sunflower can be a productive and valuable crop in the Northeast, and developing recommendations for regionally-appropriate management practices