NO-TILL PUMPKIN PRODUCTION

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ABSTRACT

Although vegetable growers in the Southeast US have successfully cultivated pumpkins, no-till pumpkin production has not been pursued by many growers due to lack of surface applied herbicides, no-till planting equipment, and knowledge of conservation tillage methods. All of these conservation-tillage production aides are now present for successful no-till vegetable plantings. The primary reason reasons to use no-till technologies for pumpkins include improved soil moisture conservation, cleaner fruit and similar yields, and long-term improvements in soil chemical, microbial, and physical properties of the soil. The objectives of the two experiments were to evaluate the influence of surface residue type and amount on yield and quality of no-till pumpkins, and to establish planting date and nitrogen (N) rate recommendations. Results suggest that a minimum amount of residue is required for good no-till pumpkin yields, but increasing residues beyond 5000-6000 lbs/acre will not affect pumpkin yield. Although this range will vary with location, weather conditions, and soil type, a vegetable grower should expect to successfully grow no-till pumpkins at these residue rates. Plant date and N rate greatly influenced no-till pumpkin yields. Planting dates that were earlier than traditional planting dates increased yields at one location where cooler weather conditions persist, but had minimal affect at a second warmer mountain region location. The highest rate of 105 lbs N/acre produced the greatest yields, suggesting that a greater N rate may have further increased yield.

INTRODUCTION

Selecting appropriate planting dates and fertilization rates are critical for producing high yields of marketable no-till pumpkins. In the Piedmont and Mountain regions of North Carolina it is especially challenging to produce a profitable crop due to variations in landscape position and growing season conditions. Much of the land available for use to grow pumpkins in these regions is located on soils classified as highly erodible and may be droughty (especially in the Piedmont) during some periods of the growing season. Conditions of low rainfall, poor weed control, and high pest pressures in the southeastern U.S. can reduce pumpkin yields and profitability (Stanghellini et al., 2003). In the United States, most commercial pumpkin production occurs in the central and northern states (Pierce, 1987). As urbanization expands into rural areas in the Piedmont and Mountain region of North Carolina many consumers of farm products look to local markets for fresh vegetables and value added farm products. North Carolina farmer markets and retail food chains currently are supplied with many out of state pumpkins. In North Carolina local consumer use of pumpkin fruit for both jack o' lanterns and baking provides a market in the fall for growers to increase production of this commodity.

In the Midwest regions of the United States pumpkin growers commonly produce pumpkins under no-tillage. The use of previous crop residues and cover crop residues for no-till planting protects the soil surface from erosion by absorbing the impact energy of raindrops, thus reducing soil particle detachment. No-till systems, which leave the greatest amount of surface residue, reduce erosion by

as much as 95% of that occurring from clean tilled systems. The residue from no-till planting also may improve growing conditions by increasing soil moisture compared to conventional tillage (Johnson and Hoyt, 1999). Tillage systems leaving 30% residue or more after planting generally increase growing season soil moisture due to increased infiltration and decreased evaporation. Growers are reluctant to intensively manage a pumpkin crop; thus, irrigation can often be lacking (Stanghellini et al., 2003). The aspect of no-till planting is especially beneficial for vegetable crops not receiving irrigation (Hoyt, 1999). Surface applications of preemergence or postemergence herbicides have become available for weed control in many vegetable systems (Hoyt and Monks, 1996; Hoyt et al., 1996). Weed pressure in no-till pumpkins has become easier to control with the recent introduction of a surface applied herbicide that does not require incorporation into the soil. Many growers are still reluctant to use no-till management due to lack of equipment and experience with no-till production.

The objectives of these experiments were to evaluate the yield potential and fruit quality of no-till pumpkins for the Piedmont and Mountain regions of North Carolina. The production factors evaluated were N rates, planting dates, and cover crop residue amounts and type.

MATERIALS AND METHODS

No-till pumpkin experiments were evaluated from 2001-2003 at four locations in North Carolina. The Mountain Research Station (MRS) near Waynesville, the Upper Mountain Research Station (UMRS) near Laurel Springs, the Mountain Horticultural Crops Research Station (MHCRS) near Fletcher, and the Piedmont Research Station (PRS) near Salisbury. The pumpkin cultivar was 'Magic Lantern' which is a large 18 lb, powdery mildew-resistant variety. Soil types were Toxaway loam (a Fine-loamy, Mixed, Nonacid, Mesic Cumulic Humaquept) at UMRS, French loam (a Fine-loamy, over sandy or sandy skeletal, Mixed, Mesic Fluvaquentic Dystrochrepts) at MRS, Comus fine sandy loam (a course-loamy, Mixed, Mesic Fluventic Dystrochrepts) at MHCRS and Hiwassee clay loam (clayey, kaolinitic, thermic Rhodic Kanhapludults) at PRS.

Plots were 20 feet wide and 25 feet long. For the 2001 and 2002 experiments, various varieties of rye, wheat, barley, triticale, and ryegrass were fall planted (120 lbs/acre for small grain and 30 lbs/acre for ryegrass) and these cover crop residue treatments were no-till planted with pumpkins. This experiment compared the type and amount of residue with pumpkin yield. Nitrogen fertilizer rate for this experiment was 90 lbs N/acre for each location. In 2003, the MRS and UMRS locations had experiments using N rate X planting timing as treatments, with a small grain cover crop of rye seeded at 100 lbs/acre in the fall of 2002. All residues were killed between two and four weeks before pumpkin planting. All plots were sprayed with a burn down herbicide on the small grain winter cover crop and summer herbicide applied the day of planting. A John Deere Maxi-merge no-till corn planter was used to open the furrows and simulate the use of a no-till planter within the plots. Two to three seeds were direct seeded by hand at an in-row spacing of 36 inches at each planting date and thinned to one plant per hill after seedling emergence. Between-row spacing was 6 feet resulting in 12 plants per plot with 18 ft^2 per plant.

There were three planting dates at each location for the 2003 experiments. The planting dates for the Mountain Research Station location were June 10, June 24 and July 11. Normal planting dates for this mountain region is the third week in June. The planting dates for the Upper Mountain Research Station were June 11, June 26, and July 9, with an average earlier planting date of around the second week of June for this cooler mountain location. At each planting date four N treatments (0, 35, 70, and 105 lbs N/acre) were surface broadcast applied by hand. There were no other preplant fertilizers applied to the plots. All locations had either 3 or 4 replications.

The following pest management practices were used in these experiments at the suggested label rates. A single application of preplant ethalfluralin and clomazone (Strategy) herbicide was used to control weeds. Insecticide pest control used esfenvalerate (Asana) applied once a week after fruit emergence. Fungicides azoxystrobin (Quadris), and chlorothalonil /mefenoxam (Bravo) were rotated between applications weekly starting mid-July.

Pumpkin fruit were harvested at all locations between the third week of September and the second week of October. All fruit within the plots were measured to calculate number and weight of fruit produced per acre. The experiments were randomized complete blocks at all locations.

RESULTS AND DISCUSSION

In the first experiment, residue amounts varied among locations and years, with the greatest mulch residue at the MHCRS (Mtn. Hort. Crops Res. Station) in 2001 and the MRS (Mtn. Res. Station) in 2002 (Figure 1). Overall, there was no effect of residue type (rye, wheat, triticale, barley, or ryegrass) on pumpkin yields (data not shown). For most locations, there was no increase in pumpkin yield with increasing residues weights where residue weights were greater than 5000 lbs/acre (Figure 1). Two locations (MHCRS2002 and UMRS2002) had lower amounts of residue, which resulted in increased pumpkin yields with increasing residue. Data for these locations indicate that a minimum amount of residue is required for good no-till pumpkin yields, but increasing residues beyond a certain range will not affect pumpkin yield. Although this range will vary with location, weather conditions, and soil type, a vegetable grower should expect to successfully grow no-till pumpkins at residue rates of 5000-6000 lbs/acre. In this experiment only 90 lbs N/acre were applied to all residue treatments and locations. Where high residue amounts were measured, a considerable amount of N could have been accrued by the small grain cover crop. For this reason, it is possible that the amount of N applied may have been insufficient for attaining greater pumpkin yields as residue increased, thus the non-response of increasing pumpkin yields at the higher residue rates.

Additional experiments were conducted in 2003 at two locations (MRS and UMRS) to examine the planting date and N rate needed for no-till pumpkin production (Figure 2). The UMRS location (Laurel Springs) is in the upper Mountain region of North Carolina; where cool nights and early fall weather conditions persist. The late July 9 pumpkin planting date shows the effect of this cooler climate, with low yields observed at any N rate. No-till pumpkin yields overall are low for this location, with the greatest yields at the earliest planting date and greatest N rate. No-till pumpkin yields at the MRS location, Waynesville reflect very good conditions for pumpkin production. At this location, planting date did not influence pumpkin yields, and again, the highest N rate produced the greatest yields. These experiments may confirm the need for more N than the recommended 90 lbs N/acre rate that is currently suggested for cultivated pumpkins (Schultheis, 1998).

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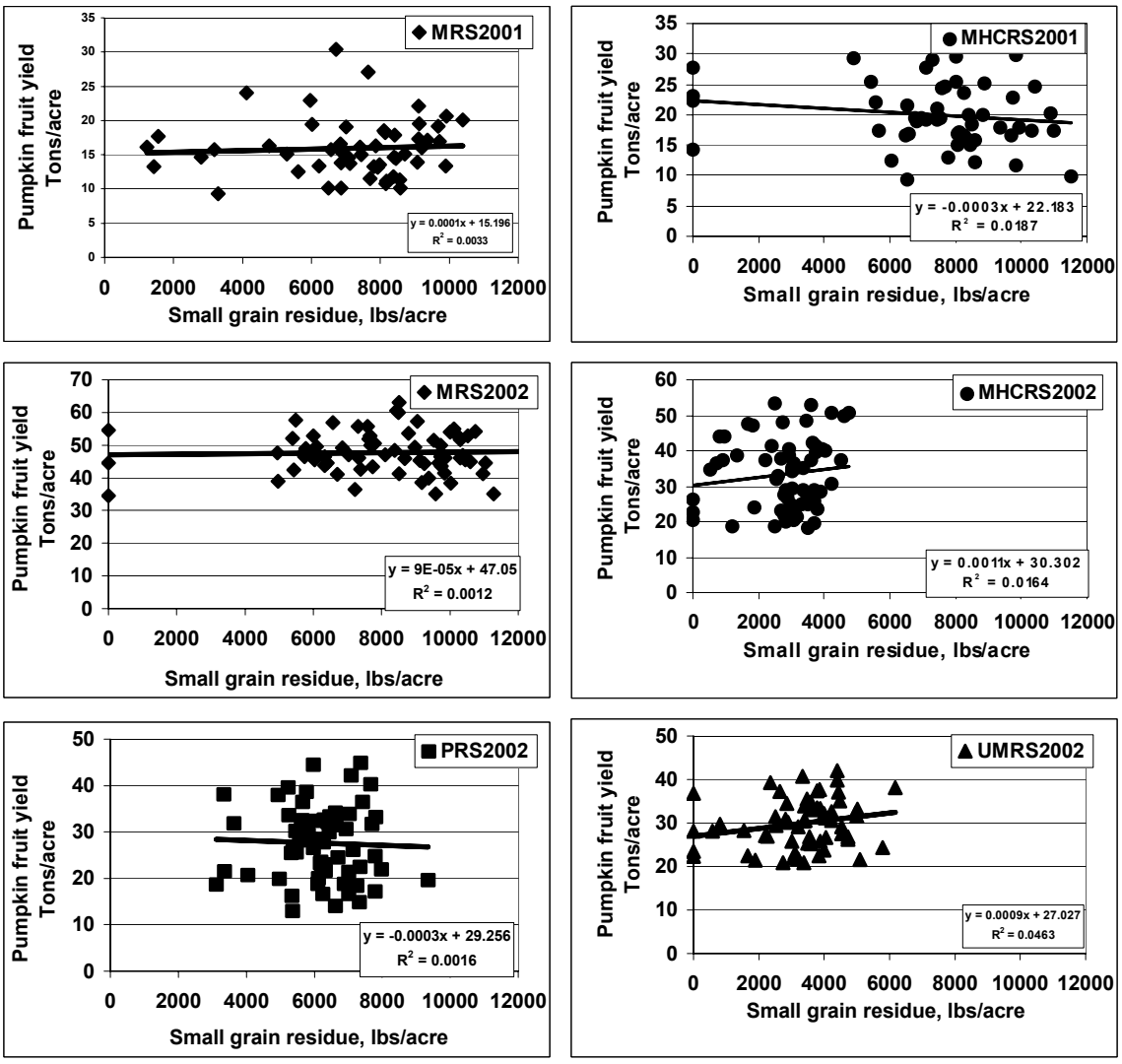

Figure 1. The effect of small grain cover residue on no-till pumpkin yields.

PRS=Piedmont Research Station, Salisbury; MRS=Mountain Research Station, Waynesville; UMRS=Upper Mountain Research Station, Laurel Springs; MHCRS=Mountain Horticultural Crops Research Station, Fletcher.

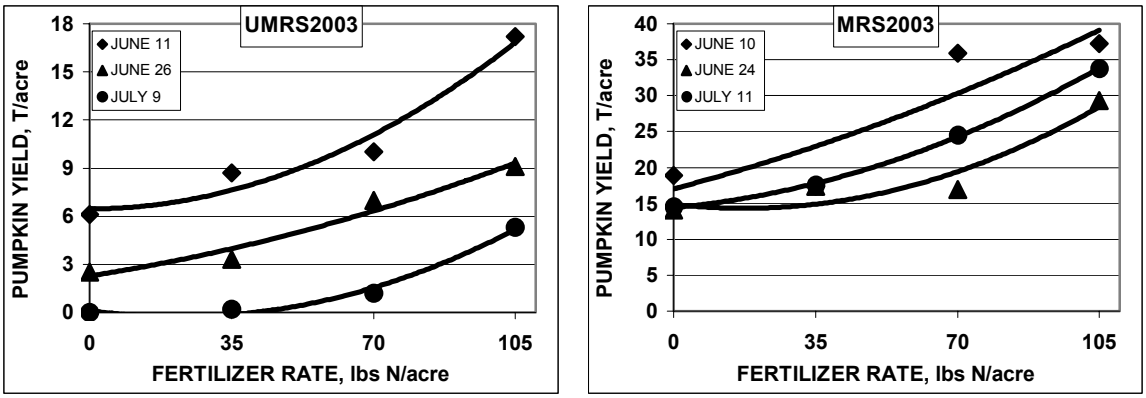

Figure 2. The effect of planting timing and nitrogen rate on no-till pumpkin yields.

MRS=Mountain Research Station, Waynesville; UMRS=Upper Mountain Research Station, Laurel Springs.