Development of No-till Pumpkins for the Great Plains
Kimberly Oxley1, Peter Tomlinson1, Megan Kennelly1, Jason Griffin1, Rhonda Janke1, DeAnn Presley2, Richard Wynia3, Marlin Bates4, Cary Rivard5
1 Kansas State University, 2 National Resources Conservation Service, 3 University of Missouri

BACKGROUND & OBJECTIVES

Pumpkins are a primary vegetable crop in the Great Plains for producers catering to agritourism markets and represent significant acreage within Kansas and Missouri (>2400 acres).

Soil conservation is of critical concern in the Great Plains, as our soils are highly productive and provide valuable soil health and stability. Unfortunately, pumpkin production utilizing conventional tillage can be highly disruptive to soil health, particularly when significant cultivation is used. This can ultimately lead to severe compaction and erosion as little residue is left to provide cover during winter months.

Cover crops can be utilized to provide high-residue mulches for larger-acreage vegetable production systems like pumpkins. The cover crop is rolled in the spring and the pumpkins are planted through the mulch residue. Soil health and other environmental benefits include:

- Weed suppression
- Water conservation
- Increases in soil health and aggregate stability
- Crop productivity and/or quality
- Nutrient retention

A collaborative project was initiated in 2012 to demonstrate the viability of no-till systems for pumpkin, snap bean, and sweet corn that is supported by the Natural Resources Conservation Service Conservation Innovation Grant. The results of the 2012 pumpkin trials are shown here. The specific objectives of the overall project are:

1) To demonstrate the effectiveness of no-till production systems for pumpkin, sweet corn, and snap bean.
2) To provide vegetable growers with "hands-on" experience growing no-till crops by initiating a mini-grant incentive program for vegetable growers to conduct demonstration trials in Kansas and Missouri.
3) To assess the impact of different cover crop species and no-till systems on soil health, productivity, and profitability of pumpkins, sweet corn, and snap bean.
4) To engage growers and others in university/extension with current knowledge of minimum tillage systems and disseminate the results of this project through established extension networks and outlets.

METHODS

The focus of this study is to determine the impact of different cover crop species and no-till systems on pumpkin production and soil health. The trial was conducted at two university locations: the Olathe Horticulture Research and Extension Center (OHREC, Olathe, KS) and the John C. Pain Horticulture Center (JCPH, Wichita, KS), as well as at the NRCS Plant Materials Center, Manhattan, KS. The plots included seven different cover crop mixes/mixtures and one conventional tillage plot. All replicates were utilized in a randomized complete block design. The plots were utilized to assess the effects of no-till vegetable production on crop yield and soil health. Fall cover crops (rye, radish, hairy vetch, pea) were planted October 8 and spring cover crops were planted April 1. Cover crops were planted at the various sites from June 6-13 at the various sites and a gynophase was applied (1.5 oz/acre). The pumpkins were planted 10-14 days later via direct-sowing (Wichita) and plugs (Olathe). Plots were treated similar to commercial pumpkin production in the region. All fruit were weighed and counted at Olathe on September 25. At the Wichita location, fruit were counted and 10 randomly sampled fruit were weighed to determine estimated yield on September 26.

RESULTS

- At both locations, the cover crop treatment with the highest total fruit yield was winter rye (40 lbs/acre) and hairy vetch (35 lbs/acre) in combination. Total pumpkin production was 20 and 16 tons per acre in Wichita and Olathe, respectively, and was statistically similar to the conventional tillage treatments.
- In the Wichita trial, fruit size and number were relatively similar among all of the fall-planted cover crop mixtures in comparison to the conventional tillage treatment.
- At the Olathe site, the use of no-till systems significantly increase average fruit size, but reduced total fruit number. Mean average fruit size ranged from 14.6 lbs (fruit in the conventional tillage treatment) to 18.4 lbs/fruit in the rye/hairy vetch treatment.
- Fruit marketability (%) was not significantly affected at Olathe, but was reduced in the spring out treatment at the Wichita location.
- The spring cover crops performed poorly at both locations, possibly due to the late spring, which resulted in little biomass accumulation by the spring cover crop prior to termination. Furthermore, the biomass was not mature enough for the roller-crimper process to occur properly (Fig. 5B).
- Nutrient management of no-till pumpkins is different than conventional tillage systems and nutrient immobilization by the mulch residue may be problematic for growers new to no-till systems.

Hey Growers!

Want to tryout a no-till and/or minimum tillage system at your farm? Participate in the demonstration trial and receive a $500 incentive. The trial supplies use of a roller-crimper, high-speed flail mower and cover crop seed in addition to the honorarium. Your site could be selected for "twilight tours" in your growing region. For more information, contact Kimberly Oxley at koxley@ksu.edu.

DISCUSSION & FUTURE WORK

The use of no-till systems for pumpkin production in the Great Plains shows significant promise. However, further research is being conducted to verify the viability of these systems in local climates. Although spring cover crops would be useful for growers that are not able to plant fall cover crops, our work suggests that they do not perform as well as fall-planted cover crops. Furthermore, trial observations showed that fertilizer management is critical and fertigation is probably ideal for no-till systems. Nitrogen management is a critical component to successful no-till systems. Further work will be conducted in 2014 and 2015 to assess the soil health benefits as well as crop production aspects of no-till and minimum tillage pumpkin production using various cover crop mixtures.

Figure 2 A) Pumpkins at Clerk Farm, B) Rolling of hairy vetch cover crop at JCPH

Acknowledgments: The authors would like to thank Mark Gowin, Vicente Mascote, Lani Meyer, Molly Fusselman, Richard Ryker and the JCPH Center, Karen McQuilten and the Master Gardeners. Funding provided by the NRCS Conservation Innovation Grant and KSCARE for making this project possible.