STRIP TILLAGE FOR SINGLE AND TWIN ROW PEANUT

Kipling S. Balkcom*[1], R. Scott Tubbs[2], and Kris B. Balkcom[3]

USDA-ARS, Auburn, AL[1], Univ. Georgia, Tifton, GA[2], and Auburn Univ., Headland, AL[3]

* Corresponding author: kip.balkcom@ars.usda.gov

ABSTRACT

Soil degradation and rising production costs have prompted grower interest in conservation tillage with high residue cover crops for peanut (*Arachis hypogaea* L.). The objective was to evaluate single and twin-row peanut production across three different strip tillage implements with and without a cover crop. Surface residue following planting, peanut yield, and total sound mature kernels (TSMK), for the cultivar 'Georgia 06G', were compared across cover crop treatments [fallow; rye (*Secale cereale* L.)], tillage implements (KMC, Orthman, Unverferth) and row configurations (single, twin) at two locations (Headland, AL; Tifton, GA) during the 2012 to 2014 growing seasons. Soil types were a Dothan sandy loam and Orangeburg loamy sand in Headland and a Tifton loamy sand in Tifton. Surface residue counts varied by location and cover crop treatment with values ranging from 15 to 83% at Headland and 1 to 81% at Tifton. In the fallow treatment at Headland, the KMC implement retained 36% more residue than the Orthman and Unverferth implements, while retaining 11% more residue than the Unverferth in the rye treatment. Peanut yields averaged 6% and 19% greater for twin-rows compared to single rows at Headland and Tifton over all three growing seasons. A significant year X row configuration interaction (P = 0.0190) was observed at Tifton that was attributed to a 29% yield decrease for single rows compared to twin rows in 2014. Average TSMKs all were above 72 each year at both locations. Results indicate successful peanut production can be achieved with conservation tillage and high residue.

OBJECTIVE

Evaluate single and twin-row peanut production across three different strip tillage implements with and without a rye cover crop.

MATERIALS AND METHODS

- Experimental plots were established in a 2 x 3 x 2 factorial treatment arrangement in a randomized complete block design with four replications at Headland, AL and Tifton, GA during the 2012 to 2014 growing seasons.
- Treatments consisted of cover crop (fallow and rye), strip tillage implements (KMC, Orthman, Unverferth) (Fig. 1), and row configuration (single vs twin rows).
- Surface residue counts were determined using the line transect method (Morrison et al., 1993) immediately after planting with two 7.6-m-long transects placed at a 45º angle across peanut rows to form an 'X' in each plot.
- 'Georgia 06G' peanut yields were determined with typical peanut plot harvest equipment (bagging attachments) with reported yields adjusted to a moisture content of 100 g kg^{-1}.
- Lowercase letters in figures are used to distinguish among different treatments based on Tukey-Kramer Grouping at the 0.05 level of significance.

Fig. 1. Strip tillage implements, corresponding shanks, and attachments used in the cover crop, row pattern study for peanut during the 2012-2014 growing seasons at Headland, AL and Tifton, GA. Tillage depths were ~33 cm for the implements.

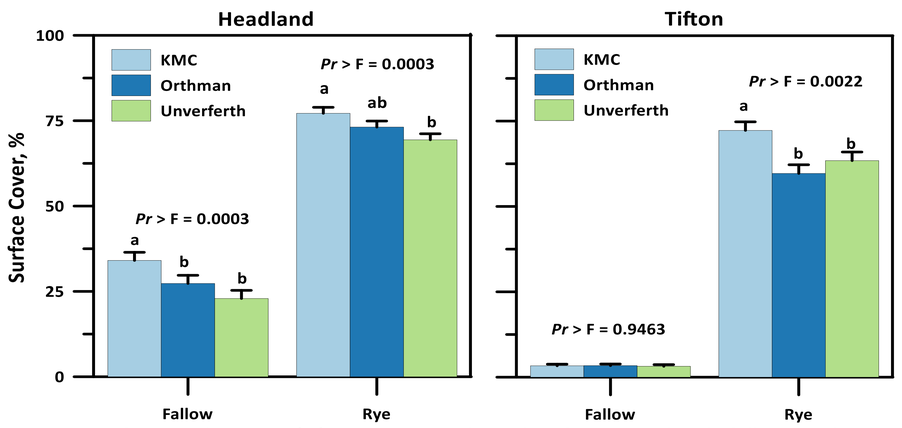

Fig. 2. Surface residue cover (%) remaining on the soil surface immediately following planting for three tillage implements in the fallow and rye cover crop treatments at Headland, AL and Tifton, GA averaged over three growing seasons (2012-2014). Error bars represent standard errors of the mean.

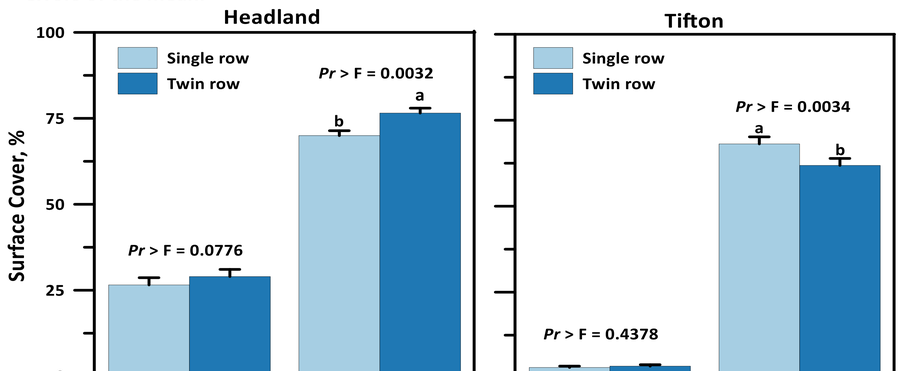

Fig. 3. Surface residue cover (%) remaining on the soil surface immediately following planting for single and twin rows in the fallow and rye cover crop treatments at Headland, AL and Tifton, GA averaged over three growing seasons (2012-2014). Error bars represent standard errors of the mean.

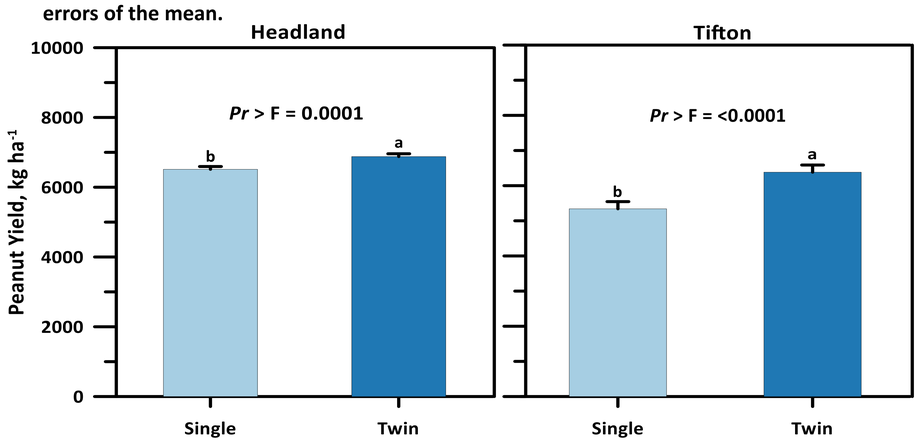

Fig. 4. Peanut yield for single and twin rows at Headland, AL and Tifton, GA averaged over cover crop treatments and tillage implements for three growing seasons (2012-2014). Error bars represent standard errors of the mean.

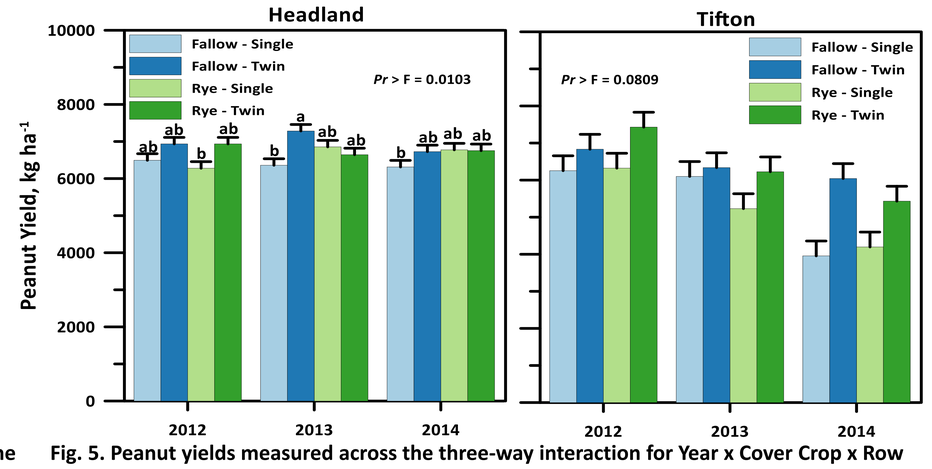

Fig. 5. Peanut yields measured across the three-way interaction for Year x Cover Crop x Row Pattern at Headland, AL and Tifton, GA. Error bars represent standard errors of the mean.

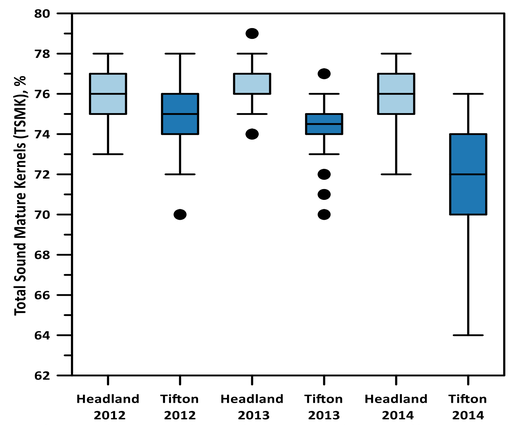

Fig. 6. Total sound mature kernels averaged over all treatments at Headland, AL and Tifton, GA for three growing seasons (2012-2014).

RESULTS AND DISCUSSION

- Cover crop biomass levels varied by Year and Location. Tifton biomass averaged 2555 kg ha^{-1} (SE = 116), while Headland biomass averaged 6193 kg ha^{-1} (SE = 228) over all three growing seasons.
- As a result of differences in cover crop biomass for locations, surface residue counts were presented by location and cover (Fig. 2). The KMC implement generally left the most surface residue on the ground compared to the Orthman and Unverferth implements.
- Surface residue counts were different between single and twin rows for the rye cover crop treatment at both locations (Fig. 3). At Tifton, surface residue was 10% greater in single rows compared to twin rows, while surface residue was 9% greater in twin rows compared to single rows at Headland.
- Twin row peanut yields, averaged across all treatments, for the 2012-2014 growing seasons were ~6% greater at Headland and ~20% greater at Tifton compared to single rows (Fig. 4).
- At Tifton, a Year x Row Configuration interaction (*Pr* > F = 0.0190) was observed for peanut yields, indicating a yield decrease for the 2014 growing season compared to the 2012 growing season (data not shown). Single row peanut yields decreased 35%, while twin row peanut yields decreased 20%. Yield differences among years were likely attributed to growing season precipitation.
- At Headland, a Cover x Row Configuration interaction (*Pr* > F = 0.0124) was observed for peanut yields with twin row peanut yields 9% greater than single row peanut yields in the fallow treatment, while twin row peanut yields were only 2% greater than single row peanut yields in the rye treatment (data not shown).
- At Headland, a Year x Cover Crop x Row Configuration interaction was observed and the same interaction was also shown from Tifton for comparison (Fig. 5). At Headland, the highest yielding treatment changed each year with twin rows consistently yielding higher at Tifton.
- Increased peanut yields for twin rows agree with recent research (Balkcom et al., 2010) indicating feasibility of twin row peanut production in conservation systems.
- TSMKs averaged above 72 across each year and location with the greatest variability observed at Tifton in 2014 (Fig. 6).

CONCLUSIONS

- Tillage implements had no effect on peanut yields, but surface residue tended to be more preserved on the soil surface for the KMC compared to the other implements.
- Twin row peanut yields were superior at Tifton, regardless of cover crop treatment, while single row peanut yields were more comparable to twins rows at Headland.

REFERENCES

Balkcom, K.S., F.J. Arriaga, K.B. Balkcom, and D.L. Boykin. 2010. Single- and twin-row peanut production within narrow and wide strip tillage systems. Agron. J. 102:507-512.

Morrison, J.E., C.C. Huang, D.T. Lightle, and C.S.T. Daughtry. 1993. Residue measurement techniques. J. Soil Water Conserv. 48:478-483.