

Impact of cover type, tillage method, and insect management practices on the incidence of the green peach aphid (Hemiptera: Aphididae) and the tobacco flea beetle (Coleoptera: Chrysomelidae) on tobacco

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Introduction

The tobacco aphid, a tobacco-adapted form of the green peach aphid, *Myzus persicae* (Sulzer), is the most important insect pest of tobacco in Virginia (Fig 1a). Serious infestations can reduce tobacco yield and value by more than 25%. The tobacco flea beetle, *Epitrix hirtipennis* (Melsheimer), (Fig. 1b, 1c) is an important early-season pest that affects tobacco growth, stand uniformity, and may reduce yield.

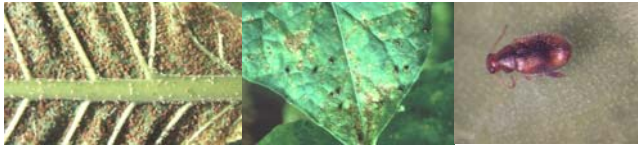


Fig. 1. a. Tobacco aphid (a), b. and c. tobacco flea beetles on leaf.

Conservation tillage has been used to reduce soil erosion in many crops over the past 40 years, but its use in tobacco production has been limited. Conservation compliance requirements with recent advancements in herbicides and tillage equipment has increased interest in conservation tillage.

Objective

To determine the impact of conservation tillage methods, cover crop, and insect management practices on the incidence of the tobacco aphid and the tobacco flea beetle on tobacco and to assess their impact on tobacco yield.

Materials and Methods

- Two field experiments were conducted in 2004, one in a wheat cover and one in a sorghum cover. Experiments were established in split-plot design with tillage method as the main plot and insect control methods as subplots.
- The 2005 experiment was arranged in a randomized strip split-plot design with three cover crops, three cultivation methods, and three insect management treatments.

Cover Crops: 2004

- Wheat:** seeded in the preceding October
- Sorghum:** crop residues from 2003

Cover Crops: 2005

- Wheat:** seeded in the preceding October
- Sorghum:** crop residues from the preceding year
- Soybean:** crop residues from the preceding year

Production system-cultivation method

- No-till:** Tobacco was transplanted directly into the cover crop or crop residue treated with paraquat to kill the cover and weeds (Fig. 2a). The crop was cultivated twice before layby cultivation (Fig. 2f).
- Strip-till:** Crop was transplanted into 30-cm cultivated strips within a killed cover crop or crop residue and cultivated twice before the layby cultivation (Figs. 2b, 2e, 2f).
- Conventional till:** Tobacco was transplanted flat into plowed field and cultivated three to four times (Fig. 2c).

Insecticidal treatments

- Aldicarb (Temik) 15G,** 22.4 kg/ha (2 bands) in 2004 and 2005 + **acephate (Orthene) 97WG,** 860 g/ha, foliar spray, 2005
- Acephate 97WG,** 860 g/ha in the transplant water + acephate 97WG, 860 g/ha, foliar spray, 2004 only
- Imidacloprid (Admire) 2F,** 244 ml/ha (tray drench), 2004 and 2005
- Untreated check,** 2004 and 2005

Insect counts

- Total flea beetles and flea beetle feeding holes** on the most damaged leaf were sampled on 10 plants per plot at 7-day intervals.
- Aphid populations** were estimated on four upper leaves of 10 plants per plot at 6- to 10-day intervals.

Statistical analysis

Data were analyzed using Proc GLM (SAS 1987) for a randomized strip split-plot design in 2004 and a randomized strip split-plot block design in 2005. Means were separated with Student-Newman-Keuls test (P=0.05).

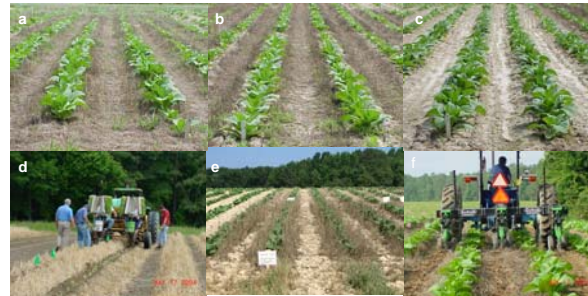


Fig. 2. a. No-till, b. strip-till, c. conventional till, d. transplanting into strip-tilled plot, e. wheat no-till plot after first cultivation, and cultivation of a no-till plot with a Sukup high-residue cultivator.

Results: Tobacco Aphid

- Aphid populations were very high in the 2004 (Fig. 3, 4) and very low in the 2005 (Fig. 5).
- In 2004, the no-till and strip-till plantings into wheat cover and sorghum residue had much lower aphid populations than conventionally-tilled tobacco from mid-June through 21 July (Fig. 3, 4).
- Aphid population trends were similar in the wheat covers in 2004 and 2005 (Fig. 3, 5).
- Aphid populations on tobacco grown strip-till in the sorghum and soybean residues were higher than those on tobacco transplanted into the wheat cover in 2005 (Fig. 5).
- In 2005, aphid populations were much lower on tobacco transplanted no-till or strip-till into the wheat cover than those on tobacco grown in sorghum and soybean residues (Fig. 6)
- Each year, soil applications of aldicarb, transplant drench applications of imidacloprid, and transplant water plus foliar applications of acephate excellent control of aphids each year.

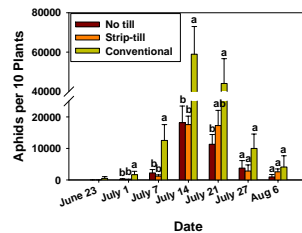


Fig. 3. Influence of tillage method on tobacco aphid populations on flue-cured tobacco following a wheat cover crop, 2004.

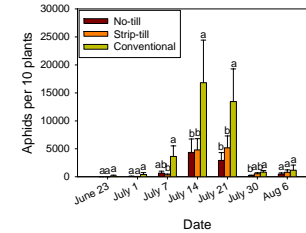


Fig. 4. Influence of tillage method on tobacco aphid populations on flue-cured tobacco following a sorghum cover crop, 2004.

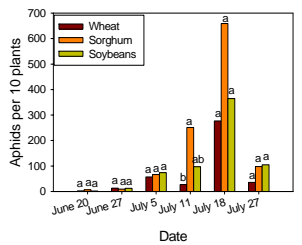


Fig. 5. Influence of cover crop on tobacco aphid populations on flue-cured tobacco, 2005.

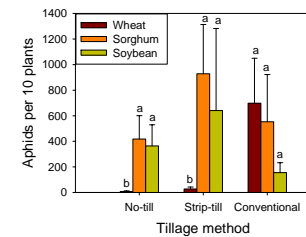


Fig. 6. Influence of cover crop and tillage method on aphid populations on flue-cured tobacco, 2005.

Results: Tobacco flea beetle

- Compared with conventionally-tilled tobacco, no-till and strip-till tobacco had significantly less early-season flea beetle feeding damage in wheat and soybean covers in 2004 (Fig. 7, 8).
- In 2005, flea beetle damage was lower on tobacco planted no-till than on strip-tilled and conventionally grown tobacco (Fig. 9).
- Tobacco transplanted as no-till and strip-till treatments into wheat covers had significantly less flea beetle feeding injury than that transplanted into sorghum and soybean residues (Fig. 10).
- In 2004, the imidacloprid tray drench treatment provided excellent early-season control of flea beetles, acephate gave moderate control and aldicarb was ineffective (Fig. 11).
- In 2004, no-till planting in the wheat cover reduced yield by 10% to 12% compared with strip-tilled and conventionally grown tobacco (Fig. 12).

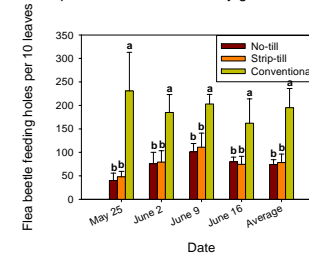


Fig. 7. Flea beetle feeding damage on untreated tobacco grown under three cultivation practices, in a wheat cover crop, 2004.

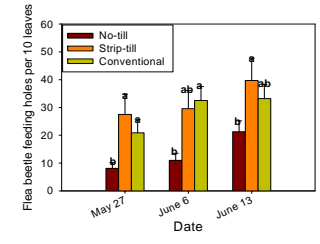


Fig. 8. Flea beetle feeding damage on tobacco grown under three cultivation practices, combined over 3 cover crops, 2005.

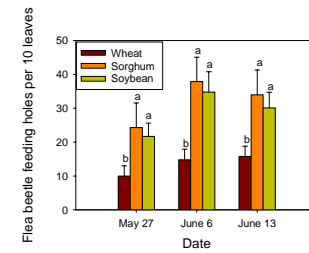


Fig. 9. Influence of cultivation practices and cover type on the incidence of flea beetle feeding damage on tobacco, 2005.

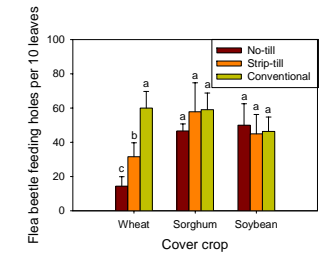


Fig. 10. Incidence of flea beetle feeding damage on flue-cured tobacco cultivated various ways in 3 sod types, 2005.

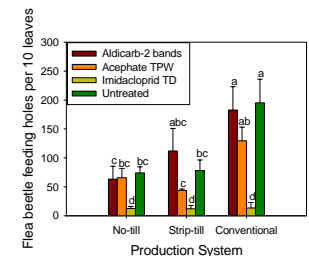


Fig. 11. Tobacco flea beetle feeding damage on flue-cured tobacco treated with various insecticides, 2004.

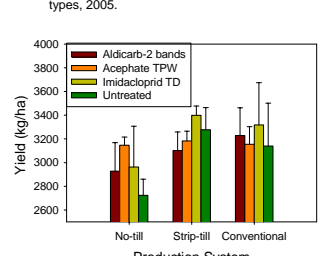


Fig. 12. Influence of tillage practices and insecticide treatments on the yield of flue-cured tobacco wheat cover, 2004.

Summary

- Conservation tillage, strip-till and no-till transplanting into a wheat cover was associated with low populations of the tobacco aphid and a reduction in tobacco flea beetle feeding damage.
- The use of a wheat cover in conservation tillage resulted in less flea beetle feeding damage and lower aphid populations than sorghum and soybean covers.
- Imidacloprid tray drench treatments, acephate foliar sprays, and aldicarb soil treatments gave excellent control of the tobacco aphid, but only imidacloprid provided adequate reductions in flea beetle damage.