Journal of Entomology

ISSN 1812-5670

Academic Journals Inc.

www.academicjournals.com

Journal of Entomology 3 (2): 189-193, 2006
ISSN 1812-5670

Relative Effect of Color Mulches to Potato/Tomato Psyllid, *Paratrioza cockerelli* (Sulc) (Homoptera:Psyllidae), on Garden Tomato Plants

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Abstract: A 2-year study was conducted to evaluate relative effect of color mulches to potato/tomato psyllid, *Paratrioza cockerelli* (Sulc.) (Homoptera: Psyllidae), on tomato plant in Fort Collins, Colorado (USA). In the first year, an aluminum mulch and white plastic mulch resulted in significant reduction on potato/tomato psyllids on tomatoes (c.v. 'Celebrity') comparing with the black plastic mulch and untreated check. The white plastic mulches continued to suppress psyllids in the second evaluation. In the second year, an aluminum mulch significantly decreased number of psyllid on tomato plants (c.v. 'Roma') comparing with other treatments (straw, black plastic, bare ground control). In conclusion, the aluminum and white plastic mulch can be used as an alternative cultural control to the chemical control for controlling potato/tomato psyllid in home garden tomato plants in Colorado.

Key words: Potato/tomato psyllid, *Paratrioza cockerelli* (Sulc.) (Homoptera: Psyllidae), Color mulches, tomato, *Lycopersicon esculentum* Mill

Introduction

The potato/tomato psyllid, *Paratrioza cockerelli* (Sulc) (Homoptera: Psyllidae), is one of the most important insect pests of tomato and potato in the Western United State (Cranshaw, 1993, 1998). Adults, called " jumping plant lice", resemble tiny cicadas, about 1.33 to 1.66 mm long, greenish to black, with a white band around the first abdomen and clear wings held over the back when at rest (Knowlton and Janes, 1931; Wallis, 1955). They jump and fly readily when disturbed. Females lay around 330 eggs over their lifetime (Wallis, 1955). The yellow-orange and bean shaped eggs on short stalks are deposited singly on the upper and lower surfaces of the leaves along the margins (Knowlton and Janes, 1931; Pletsch, 1947; Wallis, 1955). The potato/tomato psyllid has a very wide host range and most of them members of Solanaceae plants (Essig, 1917; Knowlton and Thomas, 1934; Wallis, 1955). As the nymphs feed on the leaves, they inject toxic saliva into the leaves that cause "pysllid yellow" (Richards, 1928; List, 1939; Daniels, 1954).

The psyllids also commonly occur in gardens and has proved difficult to control (Cranshaw, 1998; Demirel, 1998; Al-Jabar, 1999). Relatively few insecticides are effective and most of these are not

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available for home garden use (Cranshaw, 1998). Furthermore, there is resistance to insecticide use among some gardeners, particularly those seeking to grow produce "organically". Thus there is need for development of alternative cultural controls for this insect. Mulches, particularly reflective mulches, have thus been used to control several insects from vegetables. For example, Use of UV-reflecting aluminum mulch has been shown to reduce the number of landing aphids and has delayed virus incidence on several crops (Lamont *et al*., 1990). In addition, a silver sprayed mulch repelled aphids and delayed the onset of viruses vectored by the insects by ten days to two weeks in a zucchini study in California (Mosher, 1994). In Alabama, silver colored plastic mulch delayed the onset of the foliar mosaic virus symptoms in summer squash by 10 to 13 days, compared to black plastic mulch (Brown *et al*., 1993).

The purpose of this study was to evaluate relative effect of colored mulches that could be used for controlling the potato/tomato psyllid on the garden tomato plants.

Materials and Methods

Two mulch trials were conducted at the Colorado State University Horticulture Research Center in Ft. Collins, CO in 1997 and 1998. In an initial trial, plots were established 14 July using tomato transplants (cv 'Celebrity') started from seed 28 April 1997. In a second trial, plots were established 29 May using tomato transplants (cv 'Roma') started from seed 28 April 1998. Each of plot was the same 2.43×2.43 m sizes in both years and contained 9 plants arranged in three plant per row. The distance between both within and across rows was 60.96 cm long. All tomato plants were irrigated and fertilized through drip irrigation system. Experimental design was randomized complete block (RCB) with 4 replications. In an initial trial included five treatments; the black landscape plastic mulch, white landscape plastic mulch, a woven aluminum fabric mulch, straw mulch and bare ground as the untreated control. In a second trial contained four treatments except for white landscape plastic mulch. Each of mulch treatment size was 2.6×2.6 m and contained nine holes for each tomato plants. Both years, the straw mulch was maintained in place using bird netting to prevent wind from blowing it away. Due to sprouting of volunteer grain, all straw treatments also were treated with fluazifop-butyl, a post-emergence grass herbicide. Samplings were taken from plots on 13 and 19 August 1997 and 11 and 18 August 1998. Data from trial was analyzed by analysis of variance (ANOVA) with using the SAS software and means were separated by using Student-Newman-Keuls (SNK) Multiple Comparison Tests (SAS Institute Inc, 1990).

Results and Discussion

Mulches had significant effect on potato/tomato psyllid population density on tomato. An aluminum and white plastic mulch had significant effects on psyllids comparing to an untreated check on 13 August 1997 ($F = 8.049$, $df = 4,15$, $p = 0.001$) (Table 1). In addition, white plastic mulch had a significant effect on psyllids on 19 August comparing with the black plastic mulch and the untreated check ($F = 3.944$, $df = 4,15$, $p = 0.022$). Moreover, the aluminum mulch had significant effects on psyllids on 19 August comparing to the black plastic mulch. Aluminum mulch had a significant effect on psyllids comparing to black plastic mulch on 11 August 1998 ($F = 1.484$, $df = 3,12$, $p = 0.0269$) (Table 2). In addition, Aluminum mulch had a significant effect on psyllids on 18 August comparing with the untreated check and black plastic mulch treatments ($F = 2.147$, $df = 3,12$, $p = 0.0148$).

Table 1: Effect of mulch treatments on numbers of potato/tomato psyllid infesting tomato (c.v. 'Celebrity'). Horticultural Research Farm, Ft. Collins, Co 1997

	No. of psyllids (Mean±SE)/6 plants[y]	
Treatments	13-August	19-August
Aluminum mulch	4.0±2.1c	6.5±3.5bc
Black plastic mulch	11.3±1.4ab	16.5±5.2a
White plastic mulch	2.5±0.6c	2.0±0.7c
Straw mulch	10.5±3.0bc	5.5±3.0bc
Untreated check	30.8±7.9a	17.8±3.7ab

[y]Numbers within a column not followed by the same letter (s) are significantly different, ($p<0.05$) by SNK

Table 2: Effect of mulch treatments on numbers of potato/tomato psyllid infesting tomato (cv. 'Roma'). Horticultural Research Farm, Ft. Collins, Co 1998

	No. of psyllid (Mean±S.E)/3 plants[y]	
Treatments	11-August	18-August
Black plastic mulch	135.3±79.7a	161.5±58.3a
Aluminum mulch	13.5±8.0b	38.0±27.5b
Straw mulch	52.3±14.6ab	93.0±12.5ab
Untreated check	55.3±20.39ab	140.5±36.1a

[y]Numbers within a column not followed by the same letter (s) are significantly different, ($p<0.05$) by SNK

The mulch can affect differently the population density of insect pest on cultivated crops. There were not much study about effecting of mulch treatment for the potato/tomato psyllid and yet there were many studies about effecting of mulch treatment on different insect pests. For example, aluminum and silver mulches repelled green peach aphids, *Myzus persicae* (Sulzer) (Adlerz and Everett, 1968; Wolfenbarger and Moore, 1968). In addition, fewer aphids and higher yields were observed in tomatoes plots mulched with aluminum compared to black plastic (Schalk and Robbins, 1987). Moreover, the reflective properties of aluminum-faced plastic mulch have been shown to interfere with the movement of the aphids, which spread the watermelon mosaic virus II (Sanders, 1996). An aluminum-colored mulches reduced number of thrips on several of the vegetable crops (Brown and Brown, 1992; Greenough *et al*., 1990, Scott *et al*., 1989). For example, fewer adult thrips were observed on tomato grown on aluminum-colored plastic mulch than on tomato grown on black plastic mulch and untreated plots (Greenough, 1985). In addition, six different colored mulches on tomato were conducted by Csizinsky *et al*. (1995) to monitor populations of whiteflies, aphids and thrips. Thrips were the least numerous on plants growing surrounded by aluminum and red mulch.

In conclusion, previous studies with colored mulches on the different insect pests indicated that the aluminum mulch was efficiently used for control of significant insect pests on different cultivated plants. The current study also supported previous study that the white plastic and aluminum mulch can significantly decrease the population density of potato/tomato psyllid on tomato plants. Therefore, they can be alternative cultural control to chemical control for decreasing the population density of potato/tomato psyllid on tomato plants.

Acknowledgements

We would like to thank valuable assistance of Daniel Gerace, Karen Kramer, Mohammed Al-Doghairi, Ahmed Al-Jabar, Andrea Tupy, Sally McElwey, Jason Bishop, Zana Jevremovic and Loretta Mannix for my field work. This project was supported by Colorado Agricultural Experiment Station. ND was supported by the Ministry of National Education of Republic of Turkey.

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