Proposal Category: Research

Title: Determining the Impact of Early and Late Summer Broad Mite Infestations and Evaluating New Products for Potential Registration.

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Abstract

Late-summer broad mite infestations are becoming commonplace in blackberry across the Southeast. It is not currently understood how damage to first-year canes could affect floricane production in the following year. Additionally, both labeled miticides have a PHI of 7 days, meaning that control of broad mite infestations could be complicated. This study aims to better understand damage by both early and late-summer infestations of broad mites by comparing damaged and undamaged plots, and to generate data on currently unregistered pesticides against broad mites to support expanded labels in the Southeast. After observing little damage in 2020, a second trial was established at the Clarksville Fruit Research Station to determine the effect of a broad mite infestation on 1st-year canes. Four replications of the following treatments were established on 5 plant plots: treated plots with one well-timed miticide application when damage symptomology was first observed, and untreated plots where no broad mite control is utilized. Damaging levels of broad mite were observed for 2 months in untreated plots, which was confirmed with observations of cane damage. Plots that received a miticide application exhibited much lower damage and little broad mite numbers. We plan to compare bud break timing and overall yield differences in the 2022 growing season. Additionally, new blackberry plantings were established in 2021 to place a miticide efficacy trial in the 2022 growing season after no spot could be found for "off-label applications."

Introduction

Broad mite, *Polyphagotarsonemus latus* (Banks), was first reported as a pest of blackberry in the United States in 2007 and was further realized as a serious threat to commercial blackberry production in 2014. In 2019, serious late-summer broad mite infestations were observed in Arkansas and other states across the Southeast (NC, SC, and VA). Many of these infestations were far more serious than previously observed across much of Arkansas. Some plants exhibited heightened forms of the typical broad mite symptomology; extreme leaf distortion and curling, stacking of nodes on all canes of a plant, and even tip die-back (growth at cane tips becomes necrotic). Infestations of broad mite were not yet recorded to occur this late in the season, and the overall population dynamics and effect on crop are still not well understood.

Currently Agri-Mek (abamectin) and Magister (new in 2020) are the only registered and effective products for use in Southeast commercial blackberries for broad mite. The combination of these products allows three total applications across a growing season with all applications warranting a 7-day pre harvest interval (PHI). Considering the potential for both early and late season infestations, and that infestations were observed in 2019, 2020, and 2021 during primocane fruit harvest, an increased variety of control options with lower PHI's are needed.

We proposed to assess the impact of yield by both early and late-summer broad mite infestations in AR and NC, and screen additional unregistered miticides in AR and NC to support expanded labels in Southeastern commercial blackberry production.

Objectives

1. To determine the impact on yield of both early-summer and late-summer broad mite (*Polyphagotarsonemus latus*) infestations in AR and NC.

2. To generate data on currently unregistered pesticides against broad mites to support expanded labels in the Southeastern US.

Materials and Methods

Yield Impact Trial

A field trial was initially established at the University of Arkansas Fruit Research Station in Clarksville, Arkansas in 2020. This trial was abandoned going in 2021 due to a lack of damage observed in untreated plots after initial miticide applications. A new blackberry planting was established for 2021 that was isolated from other blackberry research trials and potential drift. A yield impact trial was established across two rows of first year "Ouachita" blackberries that consisted of 5 plant plots with 5 ft. bare ground buffers between each plot. Treatments were replicated four times and consisted of the following two treatments: **treated** plots with one well-timed miticide application when damage symptomology was first observed, and **untreated** plots where no broad mite control was utilized. Plots consisted of 5 plants and a buffer of 5ft

between each plot (Figure 1). The trial was laid out as a randomized complete block design with 2 blocks being present on each of two rows of blackberries. Within each block 4 untreated and 2 treated plots were established (16 untreated and 8 treated plots total). A large number of plots were left untreated to minimize the impact of the miticide treatment on the total present population and to maximize the potential damage to untreated plots. Excess plots within each block will be treated as pseudo-replication, with 4 total reps of each treatment being used in the final analysis.

Broad mite infestation numbers were monitored at least weekly by pulling 5 leaflets per plot and quantifying the number of adult mites. These leaflets were pulled from leaves near the ends of canes, where broad mites are known to feed. Plots were monitored before treatments were initiated until adults were no longer observed in the Fall (Figure 2). Additionally, the amount of broad mite damage was also observed by calculating a broad mite damage rating (BMR) number which quantified the average number of canes exhibiting broad mite damage symptomology in new growth. Ten canes were observed in each plot and the BMR was determined as the number of canes exhibiting "fresh" broad mite damage in the newest growth, with a potential score of 0-10.

This trial was initiated once broad mite populations were observed to be established at damaging levels across the station on August 16, 2021. Agri-Mek at 3.5 fl oz/acre + 1% non-ionic surfactant was applied at an output of 40 GPA using a single nozzle hand boom after initial leaf count observations on 8/16/2021. It is important to note that all surrounding blackberry plantings at the Clarksville Fruit Station were sprayed with the same rate of Agri-Mek on 8/30/2021 to suppress infestations present in breeding and production trials.

Miticide Alternative Trial

Plans were made to initiate a miticide trial in Searcy, AR on a block of "Ouachita" blackberries scheduled to be pulled out the following year using several miticides with potential efficacy (Table 1). A positive control of 3.5 oz of Agri-Mek and a negative untreated control was planned along with the pesticides listed below.

Table 1. Pesticides with potential use in controlling broad mite infestations in Blackberry.

Trade Name (Active Ingredient)	Rate Range	Pre Harvest Interval
Portal (fenpyroximate)	32 fl oz	1 day
Oberon (spiromesifen)	12 – 16 fl oz	3 days
Assail (Acetamiprid)	4 – 6.9 oz	1 day
Nealta (cyflumetofen)	13.7 fl oz	1 day
Kanemite (Acequinocyl)	31 fl oz	1 day
Magister (Fenazaquin)	32-36 fl oz	7 days
Zeal (Etoxazole)	2-3 fl oz	7 days

Results and Discussion

Yield Impact Trial

Treatments were initiated once broad mites were found across the Clarksville Fruit Station and damage began to appear. Leaf samples from directly before the miticide application indicated that plots were averaging over threshold (1-5 adults per leaflet) at the time of the first application on 8/16/2021, which is a typical situation for most growers (Figure 2). Directly after the miticide application, treated plots dropped below threshold levels within 7 days. Treated plots continued to stay around 1 broad mite adult per leaf except for a 2-week period where numbers spiked to upper threshold levels, and then quickly collapsed again. Untreated plots remained above threshold limits throughout the entire sampling period until populations collapsed at the end of October. This collapse was associated with the first true cold temperatures (<40°F) observed on the station.

Broad mite damage (BMR) ratings closely followed a similar trend to the number of broad mite adults observed (Figure 3). Untreated plots consistently exhibited more damage than treated plots and damage began to increase as broad mite numbers increased. Although broad mites were at damaging levels throughout the trial, this damage was initially hard to find due to the intense amount of growth exhibited in the heat of late summer. Plants grew out of the initial damage that was observed in mid-August, but plots that were untreated exhibited a much larger increase in damage than treated plots. Treated plots never averaged above 20% cane damage (BMR=2) whereas untreated plots stayed above this level throughout most of the trial and reached 50% cane damage (BMR=5) by the end of the fall when plants began to slowdown in growth.

Plans for 2022 include monitoring bud break and harvest in these plots. Our aim will be to determine if undamaged plots break bud any quicker, and if there was an impact on yield from high levels of broad mite numbers and damage, compared to plots that received a miticide. We also plan to replicate this trial again after harvest to get another year of data.

Miticide Alternative Trial

The miticide alternative trial was not successfully initiated in 2020 or 2021. We were limited on the potential places for this trial due to the nature of using off-label products. We were able to find blackberries on a grower field that was scheduled to be pulled out in the Fall for this trial in both 2020 and 2021, but no broad mites were ever observed in this block. In 2021, we established a new row of blackberries at two different research stations where we plan to setup this trial.

Figure 1. Ouachita blackberries where the yield impact trial was established. This picture shows the plot layout of 5 plants per plot with a 5 ft buffer between plants.

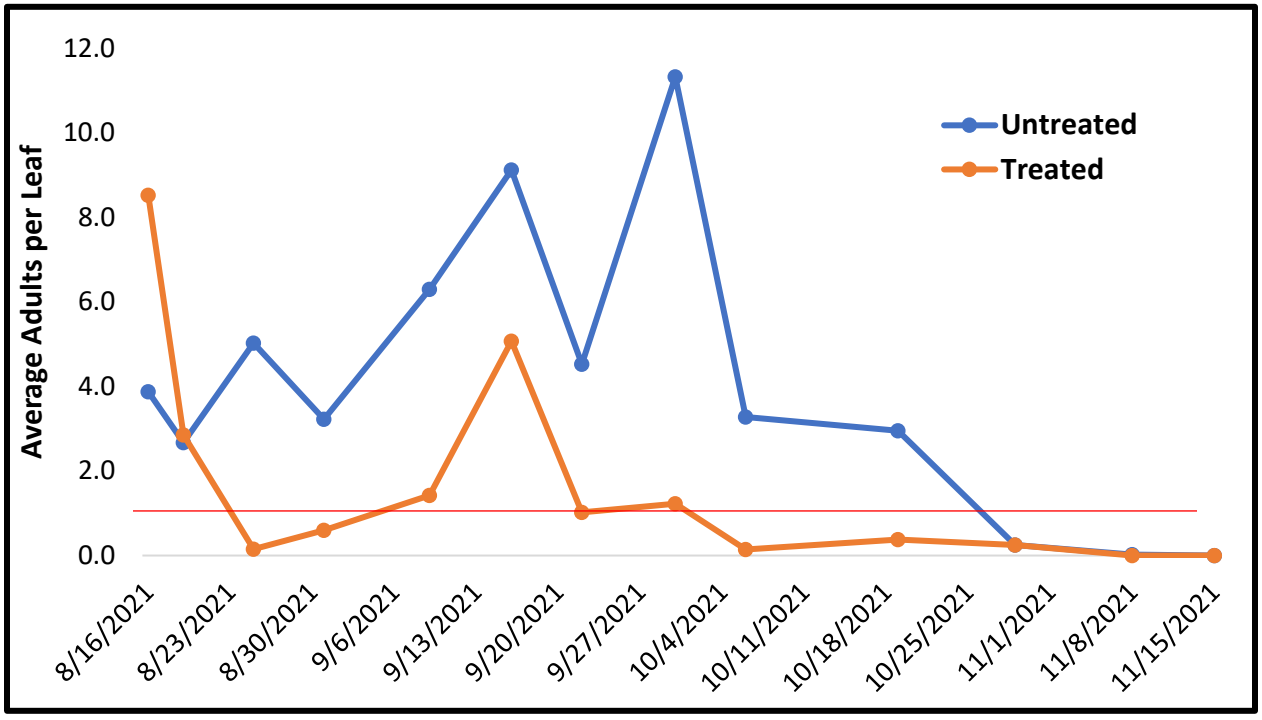

Figure 2. Average number of broad mite adults observed per leaf in treated and untreated plots.

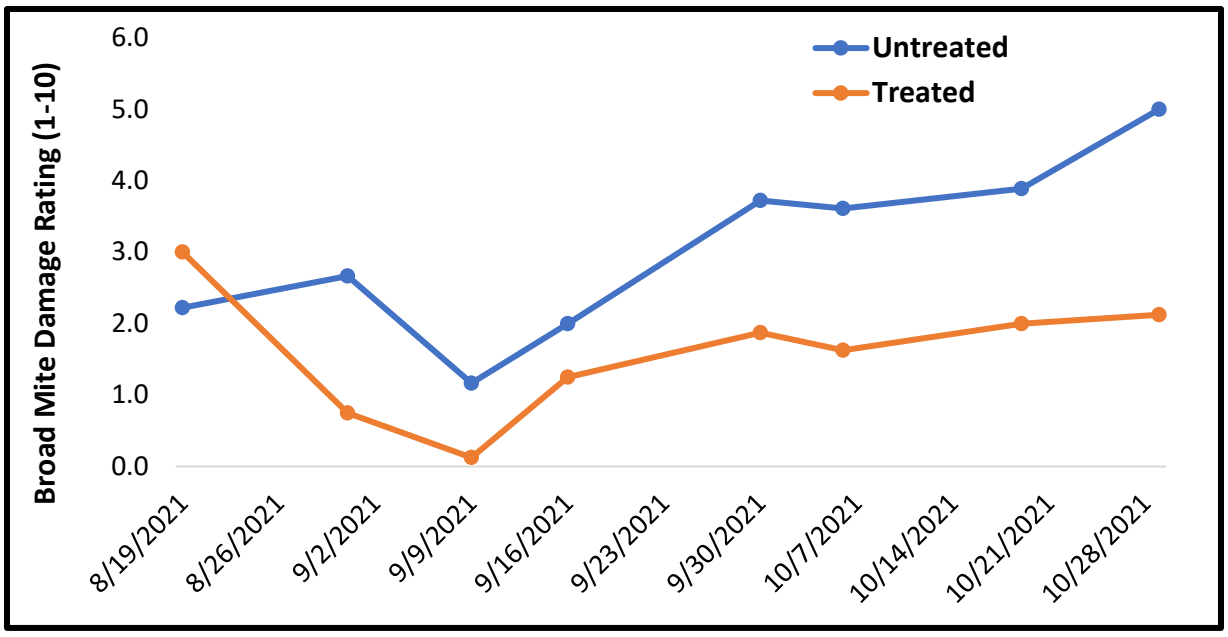

Figure 3. Average broad mite damage rating (BMR) of treated and untreated plots following a single application of a miticide to treated plots on 8/16/2021.