Effectiveness of MAGISTER® SC miticide in controlling European Red and Two-Spotted Spider Mites and its Impact on Predatory Mites

Jaime C. Piñero, Tyler Bonin, Heriberto Godoy-Hernandez
Stockbridge School of Agriculture, University of Massachusetts Amherst

In apple production, controlling arthropod pests like the European red mite *(Panonychus ulmi*) and the two-spotted spider mite (*Tetranychus urticae*) is vital for high-quality yields. Originating from Europe and the Middle East respectively, these mites are notorious for causing significant damage to apple orchards. The European red mite (ERM) can lead to severe defoliation, particularly in cooler climates. The two-spotted spider mite (TSSM), found across Europe, Asia, and North America, is highly resistant to many miticides and can rapidly reproduce in a multitude of crops.

The New England Tree Fruit Management Guide lists 15 materials that can be applied against European red mite throughout the summer. One of those materials is Magister® SC (active ingredient: Fenazaquin; IRAC group 21A acaricide and group 39 fungicide**)**. Magister® SC is a miticide that, according to the label, can be used to control spider mites, broad mites, flat mites, Eriophyid mites, psyllids, whiteflies, and powdery mildew on a variety of crops. According to the manufacturer "*Magister SC is a suspension concentrate that works by contact to kill mites and some insects. It can control eggs by contact and immature and adult mites by both contact and ingestion. It also has fungicidal activity. Magister SC is active at both low and high temperatures and has a residual effect, but is soft on beneficial insects*".

Here, we sought to assess the efficacy of Magister® SC at controlling European red mites and two-spotted spider mites in two blocks of a commercial apple orchard with high populations of both mite species. We also assessed the impact of Magister® SC on beneficial arthropods.

Materials and Methods

This field study was conducted between July 3 and August 16, 2024, at C.N. Smith Farm in East Bridgewater, Massachusetts. Two apple blocks were selected for investigation: the 'Trellis' block (~3.5 acres) and the 'Honeycrisp' block (~1.9 acres). The 'Trellis' block comprised G.41 and G.11 rootstocks of various cultivars, including Gala, Honeycrisp, Ambrosia, Crimson Crisp, Ludacrisp, and Evercrisp. The 'Honeycrisp' block consisted entirely of M.26 rootstock, with Honeycrisp standard trees. Sampling occurred once before the application of Magister® SC miticide and three times afterward to evaluate the impact on pest mite and mite predator populations.

Miticide Application. Magister® SC (Gowan, Co.), a foliar miticide from the quinazoline chemical class, was applied to both blocks on July 13, 2024, at a rate of 32 oz/acre across all rows.

Foliage Sampling. Leaf samples were collected on four dates: July 3 (pre-spray), July 17 (1st post-spray), August 2 (2nd post-spray), and August 16 (3rd post-spray). On each sampling date, 25 leaves were collected per row, with 5 leaves taken from 5 evenly distributed trees within each row. From each tree, two fully developed leaves were selected from the lower canopy, two from the middle canopy, and one from the upper canopy. The sampling procedure ensured a representative distribution across different tree heights. The details of each sampling are as follows:

- **July 3 (pre-spray):** 6 rows from the 'Honeycrisp' block (rows 1, 3, 5, 7, 9, 11) and 13 rows from the 'Trellis' block (rows 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25).

- **July 17 (1st post-spray):** 4 rows from the 'Honeycrisp' block (rows 1, 5, 9, 12) and 6 rows from the 'Trellis' block (rows 1, 5, 9, 13, 17, 21).

- **August 2 (2nd post-spray):** 3 rows from the 'Honeycrisp' block (rows 3, 7, 11) and 6 rows from the 'Trellis' block (rows 3, 7, 11, 15, 19, 23)

- **August 16 (3rd post-spray):** 2 rows from the 'Honeycrisp' block (rows 1, 7) and 4 rows from the 'Trellis' block (rows 1, 7, 13, 19).

Leaf samples from each row were examined under a stereomicroscope. A 3.5 cm diameter circle was drawn on the underside of each leaf, and within this circle, mite eggs, nymphs, and adults of European red mite (ERM) and two-spotted spider mite (TSSM), as well as predatory mites and other natural enemies (e.g., lacewings), were counted.

Results

Apple cultivars differ in their susceptibility to mites, which is crucial for effective pest monitoring. In the mixed-cultivar 'Trellis' block, Magister® SC demonstrated consistent efficacy in controlling pest mites across all cultivars, so we present the results for the entire plot.

Pest Mite Populations. On July 3, prior to the miticide application, pest mite densities (adult and nymph motiles) were high: 13.7 per leaf in the 'Honeycrisp' block and 18.95 in the 'Trellis' block (Table 1), exceeding the action threshold of 5 mites per leaf for July, as per the New England Tree Fruit Management Guide. For ERM nymphs and adults, densities in the 'Honeycrisp' block were nearly 2.5 times higher than those of TSSM, whereas in the 'Trellis' block the reverse was observed, with TSSM densities exceeding ERM by 1.92 to 1.6 times (Table 1). The 'Trellis' block is comprised of at least 6 cultivars, so whole-block results are being presented.

The first post-application sampling (July 19) showed a significant reduction in pest mites: 60.9% in the 'Honeycrisp' block and 79.2% in the 'Trellis' block for mite eggs (Table 2). ERM nymphs and adults saw an 81.4% and 92% reduction, respectively, while TSSM nymphs and adults experienced 67.1% and 82.3% reductions in the 'Trellis' block. However, in the 'Honeycrisp' block, the reductions were less pronounced, with a 26.1% decrease for TSSM nymphs. By August 2, TSSM populations rebounded in the 'Honeycrisp' block, while reductions continued in the 'Trellis' block.
The relative differences in efficacy between the two blocks can be attributed to better spray coverage in the 'Trellis' block, where the G.41 and G.11 rootstocks allowed for more open canopies, compared to the denser foliage in the M.26 'Honeycrisp' block, which likely impeded coverage.

Table 1. Densities (mean number found per leaf) of European Red mite (ERM) and two-spotted spider mite (TSSM) eggs (both species combined), nymphs, and adults before (3 July sampling) and after the spray of Magister® SC. The densities of predatory mites and predatory lacewings (eggs and larvae combined) are also shown. Motiles refer to the combined adult and nymph stages of mites that are capable of movement.

TRELLIS block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings	MOTILES (number/leaf)
3-Jul	21.6	4.29	8.2	2.5	3.96	0.05	0.01	18.95
19-Jul	4.5	0.8	2.7	0.2	0.7	0	0.1	4.4
2-Aug	1.08	0.04	0.68	0.02	0.11	0.09	0.02	0.85
16-Aug	2.54	0.14	1.12	0.05	0.3	0.8	0	1.61

HONEYCRISP block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings	MOTILES (number/leaf)
3-Jul	18.59	6.03	2.41	3.77	1.46	0.04	0.01	13.67
19-Jul	7.26	1.7	1.78	0.43	0.58	0	0.03	4.49
2-Aug	17.03	1.17	4.89	0.21	0.48	0.4	0.04	6.75
16-Aug	10.32	0.66	2.18	0.06	0.64	0.68	0	3.54

Figure 1. From left to right: View of a lacewing egg (note the silken stalk which is attached to plants), two lacewing larvae, and a predatory mite (*Amblyseius* sp.).

Table 2. For the 'Trellis' and 'Honeycrisp' blocks, percentage change in pest and predatory mite and lacewing populations compared to those recorded on 3 July (pre-spray of Magister® SC). A positive percentage indicates a reduction in the number of mites and lacewings, while a negative percentage (highlighted in green boxes) reflects an increase in their population.

TRELLIS block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings
19-Jul	79.2	81.4	67.1	92.0	82.3	100.0	-900.0
2-Aug	95.0	99.1	91.7	99.2	97.2	-80.0	-100.0
16-Aug	88.2	96.7	86.3	98.0	92.4	-1500.0	100.0

HONEYCRISP block	Eggs	ERM Nymphs	TSSM Nymphs	ERM Adults	TSSM Adults	Predatory Mites	Lacewings
19-Jul	60.9	71.8	26.1	88.6	60.3	100.0	-200.0
2-Aug	8.4	80.6	-102.9	94.4	67.1	-900.0	-300.0
16-Aug	44.5	89.1	9.5	98.4	56.2	-1600.0	100.0

Natural Enemy Populations. The primary predators observed included lacewing eggs and larvae and predatory mites from the *Neoseiulus* (*Amblyseius*) genus (Figure 1). In the pre-application sampling, predatory arthropods were nearly absent. Post-spray, predatory mite numbers decreased, whereas lacewing numbers were unaffected by the miticide. Over time, predatory mite populations gradually increased, peaking by mid-August (Table 2).

Table 3 shows the pest-to-predator ratios. Before the spray, the ratio was 379:1 and 342:1 for the 'Trellis' and 'Honeycrisp' blocks, respectively. With such a ratio of pest-to-predators, it would have been impossible to rely on predatory arthropods for mite control.

Table 3. Ratio of pest mite motiles (European red mite and two-spotted spider mites combined) to predatory mites.

Sampling date	Trellis block	Honeycrisp block
3 July	379.0	341.8
19 July	All predatory mites were killed	
2 August	9.4	16.9
16 August	2.0	5.2

While the spray of Magister® SC killed predatory mites, by August 2 predator numbers were bouncing back. By August 16, these ratios had improved to 2:1 and 5.2:1, indicating a favorable balance between pest mites and their predators. The recommended ratio is 10 pest mites per predator (New England Tree Fruit Management Guide).

Conclusions

A single mid-July application of Magister® SC effectively reduced pest mite populations in two orchard blocks facing high densities of European red mites and two-spotted spider mites. While predatory mites were initially impacted by the spray, their numbers rebounded and peaked by mid-August, achieving a beneficial ratio of 2 and 5 pest mites per predatory mite—well within the recommended threshold for effective biological control. This suggests that the treatment provided adequate control of pest mite populations while allowing predatory mites to recover.

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Tyler is pursuing a bachelor's degree with Individualized Concentration and Heriberto is a Ph.D. student in the Plant and Soil Science at the University of Massachusetts Amherst.

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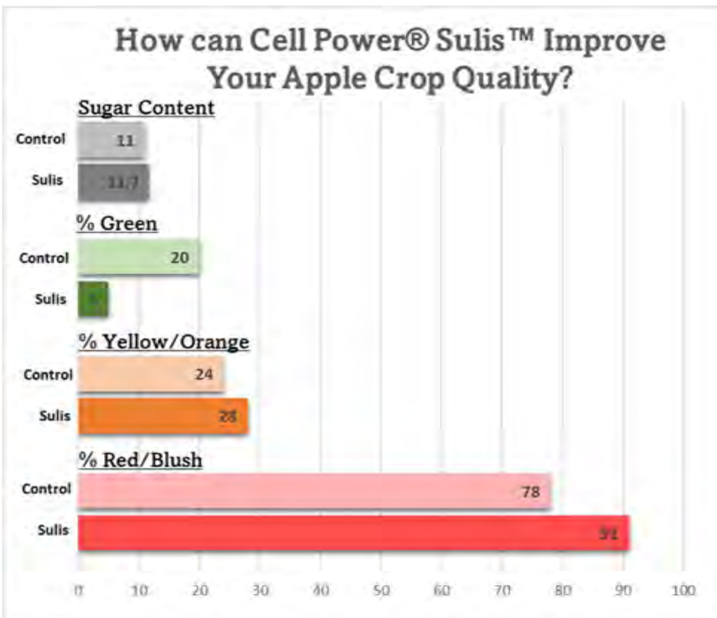

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