FIELD DAY 2004

Southwest Research–Extension Center

Report of Progress
927

Kansas State University
Agricultural Experiment Station
and Cooperative Extension Service

EFFICACY OF MITICIDES APPLIED EARLY TO CONTROL SPIDER MITES IN CORN, TRIAL #2, 2003

by

Larry Buschman, Randall Currie, and Phil Sloderbeck

SUMMARY

Spider mite populations increased to 1,496 mites per 2 plants at 32 days post treatment and caused sever leaf damage by the middle of September, killing an average 8 leaves per plant. Comite treatments gave some early control, but little season-total spider mite control. Corn treated with Comite suffered leaf damage similar to that of the untreated control and Comite treatment at late-whorl and tassel added only 2.5 and 12.2 Bu/A grain yield, respectively. The higher rate of Oberon applied at late-whorl and tassel seemed to give excellent, 72 and 92%, season-total spider mite control, but leaf damage at the end of the season on corn treated with Oberon was moderate, and there were about the same number of green leaves as on the control. The higher rate of Oberon applied at late-whorl and tassel,increased grain yield 38.4 and 40.7 Bu/A, respectively, relative to the untreated control. Oberon plus Capture and Capture alone applied at dough stage gave good, 66 to 70%, spider mite control, but leaf damage on corn from these treatments was severe at the end of the season, and there were about the same number of green leaves as in the control. The Capture treatments increased grain yield 17.7 and 25.7 Bu/A, respectively, relative to the untreated control. The Agri-Mek plus Oberon treatment applied at dough stage gave excellent, 84%, spider mite control, and corn treated with Agri-Mek had the least amount of leaf damage at the end of the season. The Oberon plus Agri-Mek treatment increased grain yield 75.1 Bu/A relative to the untreated control. Predator mite populations increased during the trial, but did not seem to affect spider mite populations until August. Thrip populations were large during the whorl stage, and mite populations seemed to increase as thrip populations declined. Predator-mite and thrip populations did not seem to be affected by the miticide treatments.

PROCEDURES

Field corn, DKC60-10 (RR/YGCB) (110-day maturity), was planted May 5with a John Deere MaxEmerge 6 row planter at a rate of 36,000 seeds/ acre in a furrow-irrigated field (Finnup #8) at the Southwest Research-Extension Center, Finney County, Kansas. A test with 10 treatments was set up in a randomized complete block design with four replications. Plots were four rows (10 ft) wide and 50 ft long with a 4-row (10-ft) border of untreated corn on each side and a 10-ft alley at each end. Treatments #2 through 5 were applied July 5, when the corn was in late-whorl stage (4 ft). Treatments #6 through 9 were applied July 16, when the corn was just starting to tassel. The last treatment #10 was applied July 28, when the corn was in the soft-dough stage. The treatments were applied with a high-clearance sprayer using a 10-ft boom with two nozzles directed at each row (one nozzleon each side of the row on a 16-inch drop hose). The nozzles were directed up into the plant for the first treatment and at the ear zone for the other applications. The sprayer was calibrated to deliver 14 gal/acre at 2 mph and 40 psi.

Banks grass mites infested the plots naturally from an adjacent wheat field to the west. In May, spider mites were sampled by collecting 3 row-ft of wheat from 6 locations around the experimental field. Then spider mites were sampled during the summer in corn by collecting half the leaves from 4 plants (4 half plants = 2 plants) from the two center rows in each plot. The plant material was placed in large paper bags and transported to the laboratory, where it was placed in 76-liter Berlese funnels. A light bulb was used to dry the vegetation and to drive arthropods down into a collecting jar containing 70% methanol. The alcohol samples were filtered on ruled white filter paper, and spider mites, predator mites, and thrips were counted under a binocular microscope. A subsample of spider mites (about 20) was mounted on a microscope slide. The slides were examined to determine the proportion of Banks grass mites and spider mites in the populations from each plot. Pre-treatment spider-mite samples were collected June 27 from 20 areas across the field (before the plots were established) and post-treatment samples were collected July 9, 16, 23, 30 and August 6. Spider-mite counts were transformed according to Taylor's power transformation for statistical analysis and were converted to mites per 4 half-plants for presentation. On September 12, the plots were rated for number of green leaves still present. The best treatments still had green leaves down to the ear or lower (10 or more leaves), whereas the check plots had very few green leaves. Grain yield was collected by machine-harvesting two rows from each plot. Because the field was furrow irrigated from one end of the field, there was a significant gradient in the yield going down the field. Therefore, we calculated the "field yield trend" by calculating the average yield across 6 plots at each position down the field. The position means were smoothed by using rolling averages. Then this "field yield trend" was used as the covariate in the ANOVA of grain yield and number of green leaves.

RESULTS AND DISCUSSION

In May, spider mite populations in wheat averaged 0.4 mites per square foot. Spider mite populations averaged 2.7 mites per 2 plants on June 27. The mite populations increased to an average of 1,496 mites per 2 plants by August 4. The spider mite populations were 100% Banks grass mites during the pretreatment samples, but the twospotted spider mite populations had increased to 12.6 % in some treatments by August 6 (Table 3). The weather changed in mid-August and seemed to cause a further shift toward twospotted spider mites. In this region, the species complex is often observed to shift from Banks grass mites early in the season to twospotted spider mites later in the season (Sloderbeck et al. 1987). We were unable to take further samples after August 6 to verify that this shift continued, but it can be inferred from the leaf damage recorded in September and from the grain yields recorded at harvest. By September 12, the mites had killed an average of 8 more leaves per plant in the untreated control than in the best treatment (Table 3). There was also 75.1 Bu/A of grain yield lost in the untreated control, compared with the best treatment (Table 3).

The standard early-season miticide, Comite, applied at the whorl stage, averaged only 37% season-total spider mite control (Tables 1 & 2). The highest percentages of twospotted spider mites in the populations did not differ much across treatments (Table 3). Comite applied at the tassel stage gave as much as 82 % control early, but averaged only 28% season-total spider mite control because of the large early mite populations. Leaf damage at the end of the season on corn treated with Comite was severe, however, about 6 leaves killed, and the number of green leaves did not differ from the control (Table 3). This damage seemed to be caused by the late-season twospotted spider mites. Comite treatments at whorl and tassel increased grain yield only 2.5 and 12.2 Bu/A, respectively, relative to the untreated control. These treatments did not seem to suppress the late-season twospotted spider mite populations.

The two rates of Oberon applied at whorl stage gave good, 57 and 92%, season-total spider mite control (Table 2). But leaf damage at the end of the season, 9.5 weeks later, on corn treated with Oberon was moderate to severe, about 6 leaves killed, and the number of green leaves was significantly less than the best treatment, and only the higher rate was significantly better than the control (Table 3). The two rates of Oberon applied at the tassel stage took 4 weeks gave 6 and 77% season-total spider mite control, respectively (Table 2). But leaf damage at the end of the season, 8 weeks later, was moderate to severe on corn treated at tassel with Oberon, about 4 to 6 leaves killed, the number of green leaves was significantly fewer than the best treatment, and only the higher rate was significantly better than the control (Table 3). The higher rate of Oberon (both timings) seemed to give excellent, 72 and 92%, season-total spider mite control. Applying this rate of Oberon increased grain yield 38.4 and 40.7 Bu/A, respectively, relative to the untreated control (Table 3). The higher rate of Oberon seemed to suppress the late-season twospotted spider mite populations (Table 3). (See Post-Tassel Oberon treatments reported in the Post Tassel Trial.)

When applied at the dough stage, the Oberon plus Agri-Mek, Oberon plus Capture, and the Capture-alone treatments gave 84, 66, and 70% season-total spider mite control, respectively (Table 2). Leaf damage at the end of the season, 4 weeks later, in corn from these treatments was lowest (most green leaves) for the Oberon plus Agri-Mek treatment, and it was significantly higher (fewer green leaves) than in corn from many of the other treatments (Table 3). The two

Capture treatments had 6 or 7 dead leaves. The Oberon plus Agri-Mek treatment increased grain yield 75.1 Bu/A relative to the untreated control (Table 3). The Capture treatments increased grain yield 17.7 and 25.7 Bu/A relative to the untreated control. The Oberon plus Agri-Mek treatment seemed to be the best treatment in suppressing the late-season twospotted spider mite populations.

Predator mite populations in wheat in May averaged 0.47 mites per row-foot. On June 27, predator mite populations averaged 0.05 mites per 2 plants, and populations remained small until August 4, when their numbers had increased to 2.5 mites per 2 plants in some plots (Table 3). The predator mite numbers were too small to suppress spider mite populations until mid-August. Predator mite numbers were fewer in most of the miticide treatments, but this was probably correlated with availability of spider mite prey populations (Table 3).

Thrip populations averaged 23 thrips per 2 plants on June 27, and were still high on July 7. They decreased rapidly as the plants reached tassel stage (Table 3). The thrips seemed to be important early-season facultative predators of the spider mites. The spider mite populations increased rapidly when the thrip populations declined during the corn reproductive stage.

Henderson, C.F., and W. Tilton. 1955. Tests with Acaricides against the Brown Wheat Mite. Journal of Economic Entomology 48: 157-161.

Sloderbeck, P.E., W.P. Morrison, C.D. Patrick, and L.L. Buschman. 1988. Seasonal shift in species composition of spider mites (Tetranychidae) in corn. Southwestern Entomologist 13: 63-68.

Table 1. Spider mites per 4 half plants (=2 plants) and late-season green leaves on plants in plots treated with miticides, SWREC, Garden City, Kansas. Miticide Trial #2, 2003.

				Spider Mites per 2 plants [1]						
	Treatment Chemical	Rate lb/acre	Timing	6/27 Pre-treat	7/9 4 d PT	7/16 11 d PT	7/23 18 d PT	7/30 25 d PT	8/6 32 d PT	Season-total
1	Check	—	—	**2.7**	**5**	**34 ab**	**158**	**365 a**	**1496 a**	**2173 a**
2	Comite II 6EC	1.5	Whorl		**8**	**47 ab**	**128**	**349 a**	**692 ab**	**1360 ab**
3	Oberon 240 EC	0.089	Whorl		**2**	**5 bc**	**79**	**207 ab**	**562 abc**	**944 ab**
4	Oberon 240 EC	0.133	Whorl		**1**	**1 c**	**33**	**15 c**	**104 d**	**176 c**
5	Comite II 6EC	1.5	Tassel		24	58 a	**29**	**326 ab**	**808 ab**	**1560 ab**
6	Oberon 240 EC	0.089	Tassel		11	31 ab	**115**	**236 ab**	**616 ab**	**1088 ab**
7	Oberon 240 EC	0.133	Tassel		11	94 a	**114**	**199 ab**	**349 bcd**	**813 b**
8	Oberon 240 EC +Capture 2EC	0.089 0.08	Dough		19	45 ab	205	**189 ab**	**388 bcd**	**964 ab**
9	Oberon 240 EC +Agri-Mek 0.15EC	0.089 0.089	Dough		19	63 a	270	**126 b**	**126 cd**	**636 bc**
10	Capture 2EC	0.08	Dough		12	66 a	201	**282 ab**	**621 ab**	**1268 ab**
	F-test-Prob.				0.245	0.0357	0.186	0.0009	0.0186	0.0105
	CV %				37	33	26	16	21	16

[1] Means within a column that are followed by the same letter are not significantly different (P < 0.05, LSD). Treatments 2 through 4 were applied July 5, when corn was in late-whorl (4-ft) stage. Treatments 5 through 7 were applied July 16, when corn was beginning to tassel. Treatments 9 and 10 were applied July 28, when the corn was in the soft-dough stage. Post-treatment counts are in bold. Leaf ratings were made September 12.

Table 2. Spider mite percentage of control in plots treated with miticides, SWREC, Garden City, Kansas. Miticide Trial #2, 2003.											
				Spider Mite Percentage Control [1]							
	Treatment Chemical	Rate per acre	Timing	6/27 Pre-Treat	7/9 4 d PT	7/16 11 d PT	7/23 18 d PT	7/30 25 d PT	8/6 32 d PT	Season-total
1	Check	—	—	—	—	—	—	—	—	—
2	Comite II 6EC	1.5	Whorl	—	**-60**	**-38**	**19**	**4**	**54**	**37**
3	Oberon 240 EC	0.089	Whorl	—	**60**	**85**	**50**	**43**	**62**	**57**
4	Oberon 240 EC	0.133	Whorl	—	**80**	**97**	**79**	**96**	**93**	**92**
5	Comite II 6EC	1.5	Tassel	—			**82**	**11**	**46**	**28**
6	Oberon 240 EC	0.089	Tassel				**-36**	**-21**	**23**	**6**
7	Oberon 240 EC	0.133	Tassel				**55**	**66**	**86**	**77**
8	Oberon 240 EC	0.089	Dough					**61**	**80**	**66**
	+Capture 2EC	0.08								
9	Oberon 240 EC	0.089	Doug					**81**	**95**	**84**
	+Agri-Mek 0.15EC	0.089								
10	Capture 2EC	0.08	Dough					**60**	**79**	**70**

[1] Percentage of control calculated according to the method of Henderson & Tilton (1955).

Table 3. Summary of spider mite data in plots treated with miticides during the season, together with end of season observations on the plants, SWREC, Garden City, Kansas. Miticide Trial #2, 2003.

	Treatment Chemical	Rate lb/acre	Timing	Season-total Spider Mites per 2 plants	% Control [1] season-total	% TSM [2,3] 8/4	No. Green Leaves/plant 9/12[2]	Yield bu/acre
1	Check	—	—	**2173 a**	**—**	**0.0 c**	**1.8 d**	**100.5 e**
2	Comite II 6EC	1.5	Whorl	**1360 ab**	**37**	**2.3 bc**	**2.4 cd**	**112.7 de**
3	Oberon 240 EC	0.089	Whorl	**944 ab**	**57**	**6.8 ab**	**2.4 cd**	**117.7 de**
4	Oberon 240 EC	0.133	Whorl	**176 c**	**92**	**11.5 a**	**3.9 bc**	**138.9 bc**
5	Comite II 6EC	1.5	Tassel	**1560 ab**	**28**	**6.3 abc**	**3.1 cd**	**103.0 e**
6	Oberon 240 EC	0.089	Tassel	**1088 ab**	**6**	**0.0 c**	**2.1 d**	**120.4 cde**
7	Oberon 240 EC	0.133	Tassel	**813 b**	**77**	**0.0 c**	**5.6 b**	**141.2 b**
8	Oberon 240 EC	0.089	Dough	**964 ab**	**66**	**12.6 a**	**3.3 cd**	**126.3 bcd**
	+Capture 2EC	0.08						
9	Oberon 240 EC	0.089	Dough	**636 bc**	**84**	**6.3 ab**	**9.5 a**	**175.6 a**
	+Agri-Mek 0.15EC	0.089						
10	Capture 2EC	0.08	Dough	**1268 ab**	**70**	**4.4 abc**	**2.5 cd**	**118.2 de**
	F-test-Prob.			0.0105	—	0.0266	≤0.0001	≤0.0001
	CV %			16%	—	33%	33%	11%

[1] Percentage of control calculated according to the method of Henderson & Tilton (1955).
[2] Means within a column that are followed by the same letter are not significantly different (P < 0.05, LSD).
[3] Data for two replicates only.

Table 4. Numbers of thrips and predator mites per 4 half plants (=2 plants) in plots treated with miticides, SWREC, Garden City, Kansas. Miticide Trial #2, 2003.

	Treatment Chemical	Rate lb/acre	Timing	Thrips per 2 plants: 6/27 Pre-Treat	7/7 2 d PT	7/14 9 d PT	7/21 16 d PT	7/28 23 d PT	8/4 30 d PT	Predator Mites/2 pl 8/4
1	Check	—	—	**23**	**27**	**8**	**5**	**4**	**1**	**0.75**
2	Comite II 6EC	1.5	Whorl		**29**	**8**	**4**	**3**	**1**	**0.25**
3	Oberon 240 EC	0.089	Whorl		**17**	**4**	**5**	**5**	**1**	**2.5**
4	Oberon 240 EC	0.133	Whorl		**10**	**3**	**3**	**0**	**1**	**0.5**
5	Comite II 6EC	1.5	Tassel		16	10	**2**	**5**	**0**	**0.0**
6	Oberon 240 EC	0.089	Tassel		26	8	**3**	**4**	**1**	**0.0**
7	Oberon 240 EC	0.133	Tassel		14	8	**5**	**4**	**1**	**0.5**
8	Oberon 240 EC	0.089	Dough		21	6	7	**1**	**0**	**0.0**
	+Capture 2EC	0.08								
9	Oberon 240 EC	0.089	Dough		18	9	6	**2**	**0**	**0.0**
	+Agri-Mek 0.15EC	0.089								
10	Capture 2EC	0.08	Dough		10	8	5	**3**	**1**	**0.75**
	F-test-Prob.				0.553	0.557	0.306	0.361	0.877	0.6414
	CV %				76		60	99	153	328

Treatments 2 through 5 were applied July 5, when corn was in late-whorl (4-ft) stage. Treatments 6 through 9 were applied July 16, when corn was beginning to tassel. Treatment 9 was applied July 28, when the corn was in the soft-dough stage. Post-treatment counts are in bold.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan 66506

SRP 910 **May 2004**

400