Control of Clover Mite and Winter Grain Mite in Orchardgrass Hay fields and Pasture, 2009

Mylen Bohle, Glenn C. Fisher, Amy J. Dreves, Rich Affeldt

Introduction

Clover mite (CLM; *Bryobia praetiosa*), and winter grain mite (WGM; *Penthaleus major*) continue to be pests of grass pastures and hay fields in Deschutes, Jefferson and Crook counties in central OR. Populations of CLM can occur in combination with WGM and are most active during cooler periods of the year (mid-fall to late spring) with peak populations and corresponding damage occurring in late winter and early spring months. Mites feed at night and on cloudy days and are present on the soil surface during the day. They remain active for several months until temperatures routinely exceed 60ºF. Mite injury during spring re-growth results in stunted and chlorotic leaves. Portions of an entire Orchardgrass crowns are killed.

Clover Mite Life History: In central Oregon, CLM appear to primarily spend the summer months as eggs either in the soil or in the crowns of pasture grass. These eggs hatch in late September, producing adult mites by the end of October. Some of these mites survive the winter and become active in late February and March. Others produce eggs that will overwinter in the field and hatch the following spring. Clover mite populations build rapidly beginning in late March and peak in May, which is when crop damage occurs. Orchardgrass samples from central Oregon pastures consisting of 2.5- inch diameter cores from the crowns have revealed hundreds of mites per sample in April and May. Symptoms of activity in the spring for the clover mite includes little to no spring re-growth, yellowish-chlorotic leaves and dead areas in pastures. Effective products to control CLM have yet to be identified and labeled.

Winter Grain Mite Life History: WGM are most common on grasses and cereals in central Oregon in the fall and late winter. One generation occurs in the fall from eggs that over-summered in the field. A second generation occurs from late winter through early spring. Cereals, grasses and some broadleaf plants are hosts. Eggs hatch in October and resultant mites feed, mature and begin laying eggs in November. This mite can lay 2 to 3 eggs per day and up to 60 eggs, in a lifetime. Ideal temperatures for this mite are between 50 to 60 °F. Peak activity usually occurs in late fall and again in February and March. However the mites are present and cause damage through the winter. Feeding by this mite causes grasses to turn silver or dull gray; often the leaf tips brown and die. Winter grain mite has required control measures in grass seed crops, cereals, Orchardgrass and timothy pastures and hay fields. Effective products are available to control this pest in most crops, including pasture and hay fields, and should be applied in late October, late winter or early spring when populations build, but before damage is noticeable.

The objective of this trial was to evaluate potential products for the control of these two mites.

CLOVER MITE

WINTER GRAIN MITE

DAMAGE

Materials and Methods

Three products were evaluated for control of CLM infesting a 4 year old mixed grass species field in the Lower Bridge area (west of Terrebonne), Jefferson County, Oregon. The main grass species in the field was Orchardgrass, along with some smooth brome, timothy, bluegrass, and Quackgrass present. (These other grasses suffered much less damage than the Orchardgrass, with Timothy the exception.) The pasture was being grazed by horses at the start of the trial, but then the horses were removed from the field on May 15. The field was not fertilized or irrigated.

The field trial was designed as a randomized complete block with plots measuring 20 × 20 ft and replicated 4 times. At the time, treatments were applied on April 4, 2009, the Orchardgrass had already broken dormancy and new leaves were 1 to 3 inches long. Insecticides were delivered with a CO^2 powered backpack sprayer using a 6 nozzle (AM 11002 flat fan) hand held boom that covered a 10 ft swath. Spray pressure was set at 40 psi, and delivered an equivalent of 20 gpa.

Evaluation of plots consisted of extracting three cores for pre-treatment application, and four cores for post treatment. Cores were 2.5 inch diameter cores to a depth of 2 inches from randomly selected Orchardgrass crowns. Samples were placed in paper bags and then into plastic zip lock bags. The samples were transported in a cooler to a laboratory in Corvallis where Berlese funnels equipped with 25W bulbs extracted mites and other arthropods from the treated crowns into 70% EOH. All instar stages of CLM and WGM were counted and recorded for all plots on 9 sampling dates: April 2 (pre-), April 10 (6 Days after treatment (DAT)), April 13 (13 DAT), April 20 (20 DAT), May 1 (27 DAT), May 8 (34 DAT), May 15 (41 DAT), May 29 (55 DAT), and June 5 (62 DAT).

In addition, a visual assessment of mite damage in all plots was made on four sample dates, May 1, 8, 15, and 29. The subjective assessment was based on relative grass height, color, vigor, affected plants, and employed a scale of 1 to 5 (1 representing least regrowth and serious chlorosis; 5 representing greatest regrowth and least chlorosis). This was made more difficult by horses grazing in the trial area from time to time.

Each plot was harvested on June 23, 2009 for dry matter yield. A 34-inch x 18 feet swath was cut from the interior of each plot from east to west borders. Excessive growth areas resulting from horse urine and manure were avoided. One half to one pound samples were oven dried at 120°F until there were no changes in weights. Plot weights were converted to per acre DM yields.

Data were subjected to analysis of variance (ANOVA) and means were separated using Fishers LS Means (LSD) test at p-value =.05. All mite number values were transformed using square root transformation to equalize variance.

Results and Discussion

Cobalt® at 26 ounces per acre of product gave excellent control of both CLM and WGM through the duration of the trial, resulting in the least amount of visual damage from these mites, and produced the second greatest yield of dry matter weight, though not significantly different from the other treatments, but significantly higher than the untreated control (Table 1, 2, 3).

None of the other treatments resulted in reduction of CLM that was significantly different from the untreated control. Interestingly, the CLM population in the Brigade 2EC + Exponent 8L treatment tended to increase and persisted one week longer than the untreated check population. The CLM population steadily declined from April 2 and then completely crashed between May 29 and June 5, with the exception of the Brigade 2EC + Exponent 8L plots (Table 1).

The WGM population started declining after April 10 (6 DAT) and collapsed by May 1 (27 DAT). While there was a substantial decreasing trend for the Brigade and Brigade plus Exponent® treatments to reduce WGM populations below those of the untreated control at 6 and 13 and 20 DAT, the numbers were only significantly different at 20 DAT. The addition of Exponent® to Brigade did not improve control over Brigade alone with WGM (Table 2).

Oberon did not control either mite species at the rates evaluated in this trial. Numbers of mites remained statistically similar to those in the untreated control for the duration of the trial. However, there was a trend for fewer mites with the high rate Oberon compared to the UTC and the low rate of Oberon. This trend was noticeable beginning at 6 DAT. Visual ratings for damage between the two treatments was similar.

Brigade 2EC and Cobalt-treated plots produced the greatest dry matter forage weight of all plots, which were statistically higher than the UTC, but were statistically the same as the other treatments. Plots treated with Brigade 2EC and Cobalt produced the best visual grass rating scores for least amount of visible damage. Interestingly, although CLM numbers remained fairly high in the Brigade 2EC plots, feeding damage was not correspondingly great! The reason the mite population was high, but yet the feeding damage was not correspondingly high, is unknown. The addition of Exponent® to Brigade appeared to reduce CLM control, though not significantly, and damage symptoms were significantly increased with dry matter forage weight slightly reduced, compared to Brigade-alone treatment.

Numerical differences in dry weight yield between treatments were not great. The untreated check treatment produced the lowest yield (Table 3). Little differences in yield across treatments could be attributed to good moisture and fertility in the field, along with the even-grazing from the horses. There might have been greater forage production on the Cobalt and Brigade only plots, which would have been eaten by the horses, up to the time of removal of the horses on May 15. The Cobalt and the Brigade only plots may have had greater growth rates as they would not have been under as much stress from the mites, from April until May 15. The mite populations had rapidly decreased by this time, so the growth from the plots with little mite control, possibly had more moisture and fertility to help offset their possible earlier lack of growth (while under stress) and were recovering, and so compared somewhat favorably with the treatments that controlled the mites. Timely rains and cool weather did help to keep the grass growing relatively well throughout the trial period, until the week before harvest.

Acknowledgements

We gratefully acknowledge the cooperation of Steve and Kathy Simpson for allowing this research to take place on their farm.

Table 1. Mean number of clover mites per 2.5 inch diameter core through orchardgrass crowns to a depth of 2 inches by treatment and date, Jefferson County, OR in 2009.

		Mean number of clover mites per 2.5-inch grass core[3,4]								
	Rate	4/2/2009	4/10/2009	4/17/2009	4/24/2009	5/1/2009	5/8/2009	5/15/2009	5/29/2009	6/5/2009
Treatment[1,2]	fl oz/a	Pre-	6 DAT	13 DAT	20 DAT	27 DAT	34 DAT	41 DAT	55 DAT	62 DAT
Untreated Check	-	247.3 ±59.5	118.1 a ±28.9	84.4 a ±22.9	174.6 a ±67.3	99.2 a ±20.1	46.8 a ±4.8	80.8 a ±24.1	20.8 b ±4.9	0 b
Oberon 2SC Low	8	321.0 ±57.6	173.4 a ±39.0	94.7 a ±23.9	126.8 a ±38.8	64.1 a ±12.6	36.1 a ±19.1	67.4 a ±23.1	NA	NA
Oberon 2SC High	12	337.8 ±23.2	112.2 a ±26.5	61.9 a ±18.9	58.8 a ±13.9	35.0 a ±8.3	20.6 a ±3.9	20.9 a ±5.5	NA	NA
Brigade 2EC	6.4	298.0 ±97.3	127.5 a ±24.2	95.6 a ±24.7	92.8 a ±19.4	60.3 a ±33.5	34.5 a ±4.2	32.8 a ±14.5	NA	NA
Brigade 2EC + Exponent 8L	6.4	292.3 ±81.0	145.0 a ±33.6	185.9 a ±23.7	145.0 a ±11.9	52.1 a ±12.6	37.6 a ±11.6	66.3 a ±20.0	62.5 a ±18.5	2.0 a ± 0
Cobalt	26	250.0 ±54.6	13.8 b ±3.3	5.3 b ±1.9	2.8 b ±0.60	1.5 b ±0.3	0.5 b ±0.1	1.5 b ±1.2	NA	NA
F		0.33	15.98	17.94	39.04	23.21	36.78	1.48	19.48	Infty
P-Value		NS	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

[1] Treatments were applied on April 4, 2009.
[2] SuperSpread 7000L was added to all product tank mixes at an equivalent rate of 2 pt /100 gal.
[3] Means followed by the same letter are not significantly different (*P* = 0.05; Fishers LS Means Test).
[4] Data were transformed using (Log (x + 0.01)) to reduce variation. Original means are presented in table.
Plots not sampled at 55 DAT and 66 DAT are listed as NA, not applicable.
DAT – days after treatment

Table 2. Mean number of live winter grain mites per 2.5 inch diameter core through orchardgrass crowns to a depth of 2 inches by treatment and date, Jefferson County, OR in 2009.

		Mean number of winter grain mites per 2.5-inch grass core[3,4]						
	Rate	4/2/2009	4/10/2009	4/17/2009	4/24/2009	5/1/2009	5/8/2009	5/15/09[5]
Treatment[1,2]	fl oz/a	Pre-	6 DAT	13 DAT	20 DAT	27 DAT	34 DAT	41 DAT
Untreated Check	-	11.3 ±3.0	11.6 a ±3.1	8.8 ab ±3.1	10.6 a ±2.8	0.3 a ±0.3	0.1 ±0.1	0.6 ±0.4
Oberon 2SC Low	8	22.0 ±3.8	12.2 a ±2.8	13.8 a ±2.4	9.1 a ±1.6	1.3 a ±0.9	0.9 ±0.3	0.1 ±0.1
Oberon 2SC High	12	19.5 ±6.2	6.5 a ±2.5	7.5 abc ±3.7	7.2 a ±2.6	0.8 a ±0.1	0.5 ±0.4	0.3 ±0.3
Brigade 2EC	6.4	9.5 ±2.2	2.2 ab ±1.4	1.3 bc ±1.3	0 b	0 b	0.1 ±0.1	0
Brigade 2EC + Exponent 8L	6.4	10.8 ±3.3	0.94 ab ±0.31	1.3 bc ±0.9	0 b	0 b	0	0
Cobalt	26	13.8 ±4.6	0.31 b ±0.31	0 c	0 b	0 b	0	0
F		1.58	5.39	5.98	229.89	4.89	2.27	1.24
P-value		NS	<0.0033	0.0021	0.0059	0.0059	NS	NS

[1] Treatments were applied on April 4, 2009.
[2] SuperSpread 7000L was added to all product tank mixes at an equivalent rate of 2 pt /100 gal.
[3] Means followed by the same letter are not significantly different ($P = 0.05$; Fishers LS Means Test).
[4] Data were transformed using (Log (x + 0.01)) to reduce variation. Original means are presented in table.
[5] No winter grain mites were found in samples after 5/15/09.
DAT – days after treatment

Table 3. Equivalent per acre dry matter yield of orchardgrass hay and visual ratings of clover mite damage by treatment and date, Jefferson County, OR 2009.

Treatment	Harvest yield[1,2,3,4] lb/acre	Clover mite damage rating [3,4,5] (0 – 5; 1 = damage, 5 = no damage)			
	23-Jun	1-May	8-May	15-May	29-May
Untreated Check	893.1 b ±94.4	1.60 c ±0.20	1.88 c ±0.18	1.95 b ±0.18	1.95 b ±0.19
Oberon 2SC Low	1066.3 ab ±39.1	1.53 c ±0.31	1.78 c ±0.21	2.03 b ±0.20	2.03 b ±0.18
Oberon 2SC High	1030.2 ab ±68.1	1.48 c ±0.19	1.90 c ±0.24	1.70 b ±0.18	1.88 b ±0.18
Brigade 2EC	1183.8 a ±82.9	2.83 a ±0.18	3.10 a ±0.17	3.35 a ±0.37	3.28 a ±0.34
Brigade 2EC + Exponent 8L	1049.9 ab ±81.6	1.75 bc ±0.32	1.93 bc ±0.29	2.23 b ±0.34	1.95 b ±0.26
Cobalt	1139.9 a ±57.3	2.43 ab ±0.35	2.63 ab ±0.31	3.33 a ±0.47	3.18 a ±0.46
F	1.9	4.38	4.67	5.38	5.29
P-value	NS	< 0.0087	< 0.0066	< 0.0034	< 0.0037

[1] Orchardgrass was harvested on June 23, 2009. Samples were oven dried at 120°F until no further change in weights were observed.
[2] Treatments applied on April 4, 2009.
[3] Means followed by the same letter are not significantly different (*P* = 0.05; Fisher's LSD Mean).
[4] Data were transformed using Logarithm to reduce variation. Original means are presented in table.
[5] A rating of 1(least regrowth, serious chlorosis) to 5 (most regrowth least chlorosis) scale was used to quantify orchardgrass damage.