Comparison of the effectiveness of broadcast fire ant baits used in pastures

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Red imported fire ants, *Solenopsis invicta* Buren, have caused major economic impacts on cattle production systems (Barr and Drees, 1996). In a survey of Texas ranchers, 71% reported economic loss due to red imported fire ants (Teal et al., 1998). Fire ants are documented to have cost Texas cattle producers around $67 million per year in losses to farm equipment, hay production and livestock injury and death. Levels of infestations vary greatly between areas of operation so hay producers use various methods to decrease fire ant populations to reduce damage to their equipment (Drees, et. al., 1998). Producers that have red imported fire ant infestations tend to use disk mowers instead of less expensive and more efficient sickle bar mowers (Bagley et al., 2003). If fire ants are not controlled in an area, farm equipment may require frequent maintenance. Due to the frequent maintenance, forage may not be harvested in a timely manner. While stockpiling forages is a management option, standing forage that is not ingested by livestock may suffer in nutrient and palatability losses. Over time, these losses can potentially affect the quality of hay. However if the fire ants are controlled in an area, then both forage yield and quality may be improved.

In some small operations, fire ant management may be subjective. The cost of eliminating fire ants from an entire operation may not be justified by economic losses. The land manager must be able to determine losses to equipment or impact on livestock, in order to justify treatments (Flanders and Drees, 2004).

Most of the current management techniques are based on preventing fire ant migration into pastures. This trial was conducted to determine the most effective fire ant bait for use in pastures and to determine the residual control of the treatments. The fire ant baits compared in this study were Amdro Pro® (0.73% hydramethylnon), Extinguish® (0.5% methoprene), Extinguish Plus® (0.250% methoprene and 0.365% hydramethylnon), Esteem® (0.5% pyriproxyfen) and Award® (1.0% fenoxycarb).

Materials and Methods

A field infested with red imported fire ants was located in Myers Park, McKinney, TX. Twenty four plots measuring 100 feet by 100 feet were established with a 20 foot buffer on all sides on May 22, 2008 (Figure 1). The treatments evaluated in this trial were Amdro Pro®, Extinguish®, Extinguish Plus®, Esteem® and Award® fire ant baits compared to an untreated control. Four replicates of each treatment were evaluated. The center of each plot was marked with a piece of rebar that created a 40 foot radius circular sub-plot for sampling mounds within the 100 by 100 foot square treatment plot. Pre-treatment counts of active fire ant mounds were taken within each plot beginning at 7am with temperatures at 72° F and winds 0-3mph. Active mounds were counted within each plot by disturbing suspected mound sites with a stick to determine activity. Mounds were considered active if many (dozens of) worker ants were observed within 15 seconds. All

active fire ant mounds within the plot were counted and recorded. The mound counts were blocked and arrayed from the highest to lowest mean number of mounds (Table 1). Then treatments were randomly assigned within each replication. The treatments were applied on May 22, 2008 from 6:00pm-8:00pm. Broadcast treatments of 0.25 lbs of fire ant bait were applied using a Scott's® Handy Green II hand-held spreader (US Patent No. 5, 285, 971). The plots were evaluated every two weeks over a four month period to determine the number of active fire ant mounds. For the evaluation process, the minimal disturbance method was used, where the mounds were disturbed by a stick to determine activity. Mounds were considered active if many (dozens of) worker ants were observed within 15 seconds.

Data were analyzed using SPSS Analysis of Variance (ANOVA) test with means separated using Duncan's Multiple Range Test at $P \leq 0.05$ (SPSS for Windows, Lead Technologies, Version 13.0).

Results and Discussion

The data indicated that at 2 and 4 weeks there were no significant differences between treatments (Table 2). However at 6, 8, 10, 12, 14 and 16 weeks, Amdro Pro®, Award®, Esteem®, and Extinguish® and Extinguish Plus had fewer active fire ant mounds than the untreated control. In this study, we found the Amdro Pro® treated plots to had significantly fewer active fire ant mounds than the other treatments at 6 weeks and continued to have fewer active mounds compared to the control throughout the trial. However at 14 weeks, the number of active fire ant mounds began to increase in the Amdro Pro® treated plots. According to the data found in this study, Amdro Pro® should be applied about three times a year for effective fire ant control. The Extinguish Plus® treated plots had significantly fewer active fire ant mounds at 6 and 8 weeks and continued to decrease in the number of active fire ant mounds found within each plot throughout the remainder of the trial. At 10 weeks, Extinguish®, Award®, and Esteem® had significantly fewer active fire ant mounds than the control and continued to have fewer active fire ant mounds at the conclusion of the trial. The insect growth regulators (IGRs) found in Extinguish®, Extinguish Plus®, Esteem®, and Award® fire ant baits resulted in a slower but extended reduction of active fire ant mounds. The data suggests that the fire ant baits containing IGRs should be applied twice a year for effective fire ant control.

The average daytime temperature throughout the study was 100°F with a total of inches of rain throughout the trial. The summer heat could have resulted in the loss of active fire ant mounds within the control plots.

Figure 1. Testing site for broadcast fire ant bait trial on a thirty acre field in Myers Park, McKinney, TX, with rebar marking the center of each ¼ acre plot.

Table 1. Treatment block assignments based upon number of mounds per plot for the trial in Myers Park, McKinney, TX.

Plot Number	Number of Mounds	Treatment
3, 12, 14, 19	11, 9, 8, 8	Amdro Pro®
5, 10, 15, 16	9, 10, 7, 8	Award®
2, 6, 7, 23	10, 9, 8, 7	Esteem®
1, 17, 21, 22	10, 8, 7, 8	Extinguish®
4, 8, 18, 24	10, 7, 9, 10	Extinguish Plus®
9, 11, 13, 20	10, 10, 8, 8	Untreated Control

Table 2. Number of active red imported fire ant mounds in the broadcast fire ant trial at the pre-treatment and at each post treatment observation in Myers Park, McKinney, TX.

Treatment	Precount	2 Weeks	4 Weeks	6 Weeks	8 Weeks	10 Weeks	12 Weeks	14 Weeks	16 Weeks
Award®	8.50a	8.00a	7.00c	5.75c	4.50bc	2.75b	1.00a	0.50a	1.00ab
Amdro Pro®	9.00a	6.25a	2.25a	**0.25a**	**0.25a**	0.50a	0.00a	0.75a	2.00b
Esteem®	8.50a	8.00a	7.50cd	6.50c	3.50b	2.50ab	1.50a	1.00a	1.00ab
Extinguish®	8.25a	7.75a	6.75bc	6.00c	5.75c	3.00b	1.25a	0.50a	0.50ab
Extinguish Plus®	9.00a	7.25a	4.50ab	**2.75b**	**1.50a**	1.50ab	0.50a	0.25a	0.25a
Control	9.00a	9.00a	9.00d	9.00d	9.00d	**8.25c**	**7.75b**	**7.75b**	**7.75c**

[a]Means followed by the same letter within the same column were not significantly different using Analysis of Variance (ANOVA) and means separated using Duncan's Multiple Range Test at $p \leq 0.05$ (SPSS, Windows 11.5).

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Appendix 1. Plot plan for fire ant bait used in pastureland tested in Meyer's Park from May to September 2008.