Fire Ant Control: Feasibility Study

Plans to develop a commercial campground on a 10-acre plot in western Bastrop County are contingent on establishing a fire ant control program to allow people and domestic animals to use the land for recreational purposes. This report describes the current fire ant problem on the property, lists the criteria set by the potential developer, gives the reasons for a limitation of the study to a comparison of broadcast treatments, compares two fire ant control programs, outlines conclusions based on the comparisons, and offers recommendations.

Current Fire Ant Infestation Levels

Fire ant infestation rates on the 10-acre property average 80 visible mounds per acre. In the most heavily infested areas, more than 100 mounds per acre are visible. Since mounds are not visible during the first 30 days of the development of the colony [3] , the total infestation rate should be assessed at a level higher than the visible mounds suggest. Without treatment, the infestation can be expected to increase. At current levels, development as a campground is not feasible.

Fire Ant Control Criteria

Criteria for the fire ant control program are based on the needs of the potential developer. The goal of the study is to identify a program that will:

- Reduce fire ant population by 90% or more.
- Maintain fire ant population at a level appropriate for safe, continuous use of camping facilities from April through October.
- Maintain environmental toxicity levels well below those allowing recreational use of the property.
- Minimize costs.
- Minimize frequency of product application.

Limitations of the Study

Two types of fire ant control treatments are available: individual mound treatments and broadcast treatments. The most common treatments for individual mounds include chemical drenches, surface dusts, injected toxicants, fumigants, and baits [11:20]. Broadcast treatments are baits composed of corn grits coated with soybean oil and a toxicant. With the exception of bait, treatments for individual mounds are fast-acting pesticides designed to kill high numbers of fire ants [12:144]. Since the only way to destroy a fire ant colony is to kill the queen [5,7], the individual mound treatments often fail because they do not affect the queen. Although thousands of ants may be killed, the queen is whisked to safety deep in the mount. A queen can lay up to 1,500 eggs a day [12:143] and quickly repopulate the colony or she can simply move to a new location and establish a new colony. Another disadvantage of individual mount treatments,

including bait products used to treat individual mound, is that developing colonies are not visible and, therefore, may not be treated [11:20]. In addition, locating the mounds takes more time than broadcasting a product over the entire area.

Given the shortcomings of individual mound treatments, this study is limited to a comparison of the two existing types of broadcast treatments, most commonly marketed as Amdro and Logic. These bait products are based on theknowledge that both the larval stage and adult ant stores liquid food and regurgitates it to feed other ants, including the queen. The baits include slow-acting chemical agents which are passed along until they reach the queen and kill her to eradicate the colony.

Comparison of Fire Ant Broadcast Treatments

Amdro and Logic represent different types of fire ant broadcast treatments. The two products will be compared on the basis of the following factors:

- Chemical actions
- Application requirements
- Environmental hazards
- Effectiveness
- Cost

Chemical actions of Amdro and Logic. The active ingredient in Amdro, tetrahydro-5,5-dimethyl-2(1H)- pyrimidinone(3-(4-(trifluoromethyl)phenyl)-1-(2(4-(trifluoro methyl)phenyl)-2-propenylidene)hydrazone, is an insecticide that is activated slowly to allow time for it to reach the queen [8:122]. The active ingredient in Logic is fenoxycarb, a growth regulator, that, when consumed by the queen, prevents her from laying eggs that normally would develop into worker ants. As the number of worker ants diminishes by natural death and no new workers take the place of the dead ants, the queen dies from lack of care and feeding [3]. Logic also affects eggs that would normally develop into themales which swarm and mate to produce new queens. These swarmers are born with deformed wings, preventing them from swarming and mating [3]. Both Amdro and Logic are designed to eradicate a fire ant colony by killing the queen, but do so by different chemical actions. Amdro kills the queen with a poison; Logic inhibits normal ant development.

Application requirements of Amdro and Logic. All bait treatments should be applied when ants are active and the ground temperature is between 7005 and 9505 F. The ground must be dry, with no rain forecast for the next few hours [7]. Amdro is designed for broadcast application on pastures, range grass, lawns, turf, and noncrop areas [8:122] at a rate of 1 to 1-1/2 pounds per acre [1]. It may also be distributed around the base of an individual mound at a rate of 5 tablespoons per mound, not to exceed a total of 1-1/2 pounds per acre, including any bait broadcast in the area [1].

Logic is recommended for controlling fire ants around homes, office buildings, city utilities, on roadsides, in parks, cemeteries, school yards, and on golf courses at a rate of 1 to 1-1/2 pounds per acre. For best results, both mound and broadcast treatment are recommended [3]. The

application rates of Amdro and Logic are the same. Both products are designed primarily as boardcast treatments on turf but individual mount treatment is recommended in conjunction with the broadcast method.

Environmental hazards of Amdro and Logic. Environmental hazards can be assessed on the basis of toxicity of the product, the range of organisms affected, and product accumulation in the environment.

- *Toxicity.* The toxicity of a substance is generally expressed in terms of its lethal dosage, the amount of the substance which, when ingested, results in the death of 50% of the test animals [2]. Lethal dosage is abbreviated as LD50. The lower the LD50 number, the more toxic the substance [5]. The LD50 is 1131 mg per kg of body weight for the active ingredient in Amdro [8:122]. The LD50 of the active ingredient in Logic is 9220 me per kg of body weight [8:49]. The active ingredient in Amdro is approximately eight times more toxic than that of Logic. However, a lethal dosage ratio of 1131 (Amdro) to 8813 (Logic) more accurately compares the difference in toxicity between the two products because Amdro contains 0.88% active ingredient and Logic contains 1% active ingredient. As purchased, the commercial product Amdro is approximately seven times more toxic than Logic.

  In practical terms, a lethal dosage for a medium-sized dog (weighing approximately 35 pounds) is more than 3 pounds of the active ingredient of Amdro. Since a one pound bag of the product contains only 1% active ingredient, the entire amount of Amdro purchased to treat a 10-acre camp ground would not constitute a lethal dosage for a medium-sized animal. Smaller animals are in greater danger of ingesting a lethal dosage. However, non-fatal health effects, such as diarrhea, can result for any size animal from consumption of a tablespoon of Amdro [6]. Logic, by virtue of its lower toxicity level, would need to be consumed at a much higher rate to produce comparable effects.

- *Organisms affected.* In addition to killing fire ants, Amdro kills harvester ants. At a higher concentration, the active ingredient in Amdro kills cockroaches. Amdro may attract pets and rodents [8:123] and, if consumed in sufficient amounts, can kill pets. Amdro is toxic to fish [1]. When used as recommended, Logic affects only ants, including harvester ants and other ant species that compete with fire ants. Since it has the same corn grit and soybean oil base as Amdro, it is attractive to pets and rodents [2], but must be consumed in greater amounts to be fatal, due to its lower toxicity. Logic is also toxic to fish.

- *Environmental accumulation.* Amdro does not accumulate in the environment and is not systemic in plants [8:123]. Logic dissipates rapidly in soil. No residues can be detected three days after application [10:3]. Neither product remains toxic for an extended period of time in the environment.

Effectiveness of Amdro and Logic. The initial effects of Amdro are noticeable 1 to 2 weeks after application and theproduct reaches maximum effectiveness in 1 to 1-1/2 months [2]. In a study conducted by Texas Department of Agriculture (TDA) personnel [9:2-3], 8 weeks after a single broadcast application of Amdro on 4 test plots, the number of fire ants and colonies had

been reduced by 88% and the toal ant population by 92%. After 35 weeks, 86% fewer colonies existed, compared to pretreatment levels. Ant population had been reduced by 98%. One year and 13 days after the Amdro application, the number of mounds on the test plots ranged from 47% fewer than pretreatment level to 32% more than that level. Population reduction averaged 35%.

Initial effects of Logic are not apparent until 2 to 3 months after application [2]. In the TDA study [9:2-3], 50% of the fire ant colonies had been eradicated and the ant population had been reduced by 92% at 8 weeks after a broadcast treatment of Logic. At 35 weeks, Logic-treated plots averaged an 81% reduction in the number of fire ant colonies and a 98% reduction in fire ant population. One year and 13 days after the application of Logic, levels of mound reduction ranged from 91% to 46%, depending on the plot. Ant population reduction was 87%. Table 1 is a summary of the results of the study.

Table 1. Table of fire ant mound and population reduction rates for a single application of Amdro and Logic.

Product	*8 Weeks*		*35 Weeks*		*1 Year, 13 Days*	
	Population	Mound	Population	Mound	Population	Mound
Amdro	88%	92%	86%	98%	47-32%	35%
Logic	50%	92%	81%	98%	91-46%	87%

Early spring application (as soon as soil temperatures reach acceptable levels) of Amdro would bring fire ant population levels into the range desirable for recreational use of the 10 acre property in 8 weeks or less. An additional fall application of Amdro would be required to maintain acceptable fire ant population levels. Early spring application of Logic would bring fire ant population levels under control in 8 weeks. A single annual application in early Spring would maintain desirable fire ant population levels.

Cost. Both Amdro and Logic have a com grit and soybean oil base [7] and must be used within three months after opening to be effective [1]. Baits are available in large 25 pound and 50 pound quantities for a low price per pound but, for the purposes of this study, large purchases are not cost effective due to the short life of the open product. For the purpose of treatment of the 10-acre property, purchases of quantities of 15 pounds or less are appropriate. Therefore, this cost survey is limited to retail prices of small quantities. Only the lowest prices are reported, excluding taxes. A 1-pound container of Amdro costs $7.99 at HEB grocery stores. At application rates of 1 pound per acre, broadcast twice a year, the cost is $159.80 per year. At application rates of 1-1/2 pounds per acre, the annual cost is $239.70. B&G Company sells 4-pound bags of Logic for $28.79. At application rates of 1 pound per acre, the annual cost of Logic is $86.37. At rates of 1-1/2 pounds per acre, the annual cost is $115.16.

Product costs for Logic are significantly lower than costs for Amdro. Additionally, only one annual application of Logic is required, compared to two aplications of Amdro, so labor costs for Logic are half those of Amdro.

Conclusions

From a business perspective, the comfort and safety of campers are probably the most important factors in the consideration of fire ant control measures. If campers are not relatively free from ant bites (most people expect a few--this IS Texas) and protected from harsh chemicals, they will not return to the campground or recommend it to friends and family. Once comfort and safety are achieved, cost effectiveness becomes an important factor. The following conclusions can be drawn from the preceding comparison of chemical action, application requirements, environmental hazards, product effectiveness, and cost of Amdro and Logic:

- Amdro and Logic have identical application requirements and rates.
- Amdro is approximately 7 times more toxic than Logic. Neither product accumulates significantly in the environment. At recommended application rates, neither product poses a serious threat to people or pets.
- Amdro acts more quickly than Logic, but Logic has better long-term control capabilities. One annual spring application of Logic maintains approximately the same level of fire ant control as two applications of Amdro per year.
- The annual product cost for application of Logic at a rate of 1 pound per acre is 47% lower than the cost of Amdro appliced at the same time. At rate of 1-1/2 pounds per acre, the cost of Logic is 53% lower than the cost of Amdro.
- Labor costs for Logic application are half those of Amdro.

A factual summary of these conclusions is presented in Table 2.

Table 2. Factual Summary of Comparisons of Amdro and Logic.

CATEGORY	AMDRO	LOGIC
Application rates in pounds/acre	1 - 1.5	1 - 1.5
Lethal dosage of active ingredient in mg per kg	1131	9220
Initial effects	1 to 2 weeks	2 to 3 months
Duration of effects at desirable levels	35 weeks	1 year
Number of annual applications	2 times	1 times

Annual product costs	$159.80 -239.70	$86.37 - 115.16

Recommendations

To achieve long term fire ant control on the proposed campground, a single annual application of Logic in the early spring is recommended as the most effective, least toxic, and most cost-effective long-term method. However, since spring has already passed, I recommend a broadcast treatment with Amdro now to control fire ants immediately and allow development of the campground. If the property can be treated with Amdro and left undisturbed for 6 to 8 weeks, the fire ant population should be brought to and maintained at a level allowing recreational use of the property for the remainder of this year's camping season. A single application of Logic early next spring and each subsequent spring should maintain the level of fire ant infestation within the desired level for the proposed use of the property.