IRB BRANCH REVIEW - TSS

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EFFICACY

FILE OR REG. NO. 64471-1

PETITION OR EXP. PERMIT NO.

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TYPE PRODUCTS(S): I, D, H, F, N, Rx S

DATA ACCESSION NO(S). 425292-01

PRODUCT MGR. NO. 14

PRODUCT NAME(S) BYE DEER

COMPANY NAME Stoll Road Associates, Ltd.

SUBMISSION PURPOSE registration

CHEMICAL & FORMULATION 85% Sodium salts of mixed fatty acids and related products

Efficacy Review: BYE DEER, 64471-R
Stoll Road Associates Ltd.
Woodstock, NY 12498

200.0 INTRODUCTION

200.1 Uses

An 85% "Sodium salts of mixed fatty acids and related products" formulation proposed for registration to "Protect perennial/annual shrub bed gardens" from being "grazed" by deer. Essentially, the product consists of soap in a bag which is to be hung in plantings at approximately the level where deer damage would be expected to occur.

200.2 Background Information

The current submission, dated 9/23/92, represents the first formal application for registration of this product. In the Spring of 1993, PM Team 14 had some discussions with the applicant regarding the status of this product as a pesticide. The applicant, who apparently had started to sell the product without looking into pesticide registration, had tried to persuade EPA that the product should be considered to be a "device."

Submitted by John W. Kennedy Consultants, Inc., the application includes a cover letter, a proposed label, a Confidential Statement of Formula (CSF) dated 9/21/92, and a collection of

"Articles on the General Efficacy of Sodium Salts of Fatty Acids (Soap)"

which is intended to support the claims made for this product.

201.0 DATA SUMMARY

The CSF submitted for this product is somewhat confusing and does not indicate the material from which the "bag" portion of this product is made.

The various articles intended to support the claims made for this product are discussed individually below.

1. Brooks, A. (1992) Bye-bye Bambi. The New York Times, "Consumer's World" section. March 21, page not indicated.

In this article, it is claimed that "hotel-sized" soap bars (with wrappers still on) or pieces of larger soap bars placed in mesh sacks, if hung by string about 3 feet above the ground, will deter deer from feeding over an "effective radius" of one yard. The article also states that "(r)esearch at several universities" indicates that "soap or egg-based products work best." This article contains no actual efficacy data or citations of published studies, although Cornell University Cooperative Extension is mentioned as the "Source."

The article is essentially a second- or third-hand testimonial and is of no value in establishing the validity of the claims proposed for this product.

2. Mattern, V. (1991) Soap opera for deer. Organic Gardening, November issue, p. 16.

This article also advises hanging up bars of soap to limit deer damage, citing Dr. Ross Byers of VPI and State University's Winchester, VA, field station as a source of information. Dr. Byers is quoted as saying that bars of soap

> "hung every 10 feet along a row of fruit trees will repel deer for up to six months"

if local deer pressure is "low to medium." Byers advised building fences in areas where deer pressure was heavy. Byers also was claimed to have said that most soaps will work but that his researchers preferred to use LIFEBUOY because it held up well in the rain.

Athough Dr. Byers is a well-known name in the field of protecting fruit trees from damage by vertebrate animals, it would be necessary for EPA to inspect the data upon which the generalizations attributed to him were based to determine whether such conclusions were warranted.

3. Byers, R.E. and Scanlon, P.F. (1987) Keep deer away with soap. American Fruit Grower, 107, p. 8.

In this article, Byers and Scanlon present brief accounts of experiments conduced with LIFEBUOY soap. The authors state that bars of this soap staked 4 feet high and placed at 15-foot intervals in rows in an apple tree nursery

> ". . . prevented deer damage into leaf fall in October 1986, even though fruit trees in adjacent nursery rows were severely damaged in September within 150 feet of where the soap was placed."

The authors also describe a subsequent experimental trial in which young trees grown in 1-gal metal cans were placed in an area with a high deer population. One group of 30 trees was not treated in any way. A second group of 30 had four 2-foot strands of barbed wire wrapped around their main stems. The third group had a bar of LIFEBUOY suspended from their main forks. The authors reported the following results:

TREATMENT	PERCENT TREES BROWSED	PERCENT SHOOTS DAMAGED
None	43%	35%
Barbed Wire	30%	16%
LIFEBUOY	0%	0%

These results suggest that LIFEBUOY worked very well. The authors briefly alluded to possibly developing "a sprayable product" but discouraged growers from using unregistered soap products. Byers and Scanlon also noted that subsequent trials has suggested that soaps lacking perfume additives worked as well as perfumed soaps.

4. Ball, J. and Ball, L. (1989) Rodale's Landscape Problem Solver, Rodale Press, Emmaus, PA, p 340.

Under the heading "Using Scent to Repel Pests," these authors recommend a variety of practices for repelling vertebrate pests including putting kitty litter on the ground or in burrows to repel rabbits, moles, or "gophers" and using human hair hung in bags to keep deer away. Ball and Ball also recommend hanging wrapper-enclosed bars of "strongly scented soap" 4 feet above the ground and at 3-foot intervals to discourage damage by deer. No data are presented to support this recommendation.

5. Byers, R.E., Carbaugh, D.H., and Presley, C.N. (1990) Screening of odor and taste repellents for control of white-tailed deer browse to apples or apple shoots. Journal of Environmental Horticulture, 8:4, 185-189.

This report describes eleven tests in which applies or apple shoots were placed on stakes 1 m high and spaced in rows of 6 with stakes being 1 or 3 meters apart (text is vague on this point). Golden Delicious apples were impaled upon nails driven into the tops of stakes. Apple shoots were 50-100 cm long and were placed in water in 0.5-1 containers wired to the stakes. Each row of six stakes constituted one plot. A total of 40 plots were set up, but not all plots appeared to have been used in each test. Test subjects were free-ranging white-tailed deer (Odocoileus virginianus).

In the apple and apple-shoot tests, it is stated that four plots were used per treatment. However, the results presented in the tests with apple shoots suggest that numbers of shoots per treatment differed from 24 in many cases. In one test, the authors compared the attractiveness of untreated apples to that of untreated broccoli heads. In tests with apples, apples usually were dipped into the repellent for 5 sec. In tests with shoots, shoots either were sprayed with repellents or materials were tied to the stakes supporting the shoots.

The results of the various tests reported by Byers, et al (1990), are summarized in Tables 1-11. In these tables, percent damage results that reportedly were statistically significantly different ($p < 0.05$) from those obtained for untreated material are marked with an asterisk (*).

As can be seen from Table 1, deer preferred apples to broccoli heads absolutely. (Perhaps deer would have been welcomed to dinner at the White House during the Bush Administration.) However, broccoli extract seems to have no value as a deterrent to keep deer from eating apples (Table 4).

TABLE 1. Results of comparison between attractiveness of apples and broccoli heads (Experiment 1).

TREATMENT	FRUITS FED UPON (%)	
	Day 1	Day 3
None (apples)	54%	100%
None (broccoli)	0%*	0%*

Initial tests of the "taste" repellent Thiram and the soap-based product Hinder suggested that they had little of no value in keeping deer from eating apples (Table 2). Although a significant effect for Day 1 was reported for Hinder, the level of damage was nearly two-thirds that observed for untreated apples.

Table 3 includes results of the first test reported which involved a Lifebuoy product (Lifebuoy perfume). That material significantly reduced feeding on apples on the first day, while 2.5% capsaicin (Hot Sauce) produced a far more pronounced effect for one day, but the effects of both materials were gone by the fourth day. The fatty alcohol product Off Shoot T appeared not to work at all.

TABLE 2. Results of comparisons of Hinder (15% ammonium soaps of higher fatty acids and Thiram (65% wettable powder at a 1:4 dilution) with no treatment on apples (Experiment 2).

TREATMENT	APPLES FED UPON (%)			
	Day 1	Day 2	Day 3	Day 6
None	100%	100%	100%	100%
Thiram	100%	100%	100%	100%
Hinder	63%*	88%	100%	100%

TABLE 3. Results of comparisons of Hot Sauce (2.5% capsaicin), Off Shoot T (85% a.i. fatty alcohol mixture: 42% C_8, 56% C_{10}), and Lifebuoy perfume with no treatment on apples (Experiment 3).

TREATMENT	APPLES FED UPON (%)	
	Day 1	Day 4
None	100%	100%
Hot Sauce	4%*	96%
Off Shoot T	100%	100%
Lifebuoy Perfume	39%*	100%

In the fourth set of experiments reported by Byers, et al (1990), only Hot Sauce at full strength or at a 1:3 dilution (presumably with water) produced one-day feeding reductions of greater than 60% (Table 4). The effects of the diluted material waned more rapidly than did those of the 2.5% capsaicin concentration without further dilution ("full strength).

The only soap-related product used in these tests was Lifebuoy perfume. A weak but significant, ephemeral effect was reported for this material.

In the fifth series of experiments, no soap-related products were tested. In these trials, full strength Hot Sauce was the only material used which had dramatic repellent effects on the first day (Table 5). This material also produced a significant, but far less reduced, effect after two days, but all but one of the apples treated with it were fed upon by the end of the third day.

TABLE 4. Results of comparisons of 65% Thiram at a 1:4 dilution, Hot Sauce at full strength (2.5% capsaicin) and at 1:3 and 1:9 dilutions, Lifebuoy perfume, bubble gum flavor, baby powder fragrance, and broccoli extract with no treatment on apples (Experiment 4).

TREATMENT	APPLES FED UPON (%)		
	Day 1	Day 2	Day 3
None	100%	100%	100%
Thiram	96%	100%	100%
Hot Sauce (full strength)	17%*	29%*	75%*
Hot Sauce (diluted 1:3)	38%*	100%	100%
Hot Sauce (diluted 1:9)	96%	100%	100%
Lifebuoy Perfume	67%*	100%	100%
Bubble Gum Flavor	92%	100%	100%
Baby Powder Fragrance	58%*	88%	96%
Broccoli Extract	96%	100%	100%

TABLE 5. Results of comparisons of Hot Sauce (2.5% capsaicin), diallyl sulfide at full strength and 20% piperine at a 1:4 dilution with no treatment on apples (Experiment 5).

TREATMENT	APPLES FED UPON (%)		
	Day 1	Day 2	Day 3
None	89%	100%	100%
Hot Sauce	7%*	53%*	96%
Diallyl Sulfide	74%*	94%	100%
20% Piperine (diluted 1:4)	100%	100%	100%

Effects of the various candidate repellents applied to apple shoots were somewhat more dramatic and longer lasting that was the case when these materials were applied to apples impaled on nails on 1-m stakes.

The results reported in Table 6 suggest that tying half a bar of Lifebuoy soap to an apple shoot's stake offered better protection than did "painting" Lifebuoy perfume on the stem itself. The soap-on-a-stake approach produced significant and rather dramatic effects for three days, but repellency was gone by Day 6.

TABLE 6. Results of comparisons of Lifebuoy perfume painted on stem (25 g perfume per 100 g paint) and 1/2 bar of Lifebuoy soap tied on the stake with no treatment to apple vegetative shoots (Experiment 6).

TREATMENT	SHOOTS FED UPON (%)		
	Day 1	Day 2	Day 3
None	33%	38%	38%
Lifebuoy Perfume	38%	38%	46%
Lifebuoy Soap	0%*	0%*	8%*

TABLE 7. Results of comparisons of 1/2 bar of Lifebuoy soap on stake, tree paint (3.5 g per piece of tape), tree paint (3.5 g) plus Lifebuoy perfume (0.9 g), non-perfumed Lifebuoy chips in cheese cloth bag on stake, baby powder (1%) plus Hot Sauce (1%), Hot Sauce alone (0.5% spray), Lifebuoy perfume (1% spray), and Pine Sol (4% spray) with no treatment to apple vegetative shoots (Experiment 7).

TREATMENT	SHOOTS FED UPON (%)			
	Day 1	Day 2	Day 3	Day 6
None	42%	71%	79%	92%
Lifebuoy Soap	13%*	38%*	54%	88%
Tree Paint	67%	71%	71%	100%
Tree Paint + Lifebuoy Perfume	25%	63%	63%	88%
Lifebuoy Chips	0%*	25%*	38%*	92%
Baby Powder + Hot Sauce	25%	46%	63%	71%
Hot Sauce	13%*	33%*	46%*	71%
Lifebuoy Perfume	0%*	17%*	33%*	75%
Pine Sol	38%	42%*	46%*	88%

Lifebuoy soap-on-a-stake produced significant reductions in damage, when compared to untreated apple shoots, for 2 days in the seventh set of experiments (Table 7). Several materials or combinations of materials used in these trials produced significant reductions for 3 days, but no significant reductions remained 6 days after treatment. The agents which produced significant reductions for 3 days included 0.5% capsaicin, 1% baby powder + 1% capsaicin, and Lifebuoy perfume sprayed directly on the shoots.

TABLE 8. Results of comparisons of baby powder (1%) plus Hot Sauce (1%), Hot Sauce alone (0.5% spray), Lifebuoy perfume (1% spray), Off-Shoot (1% spray), and Thiram (5% spray) with no treatment to apple vegetative shoots (Experiment 8).

TREATMENT	SHOOTS FED UPON (%)			
	Day 1	Day 2	Day 3	Day 6
None	50%	54%	83%	92%
Baby Powder + Hot Sauce	13%*	21%*	38%*	58%*
Hot Sauce	0%*	25%*	46%*	75%
Lifebuoy Perfume	4%*	50%	54%*	58%*
Off Shoot T	25%	25%*	54%*	67%*
Thiram	17%*	42%	54%*	71%

TABLE 9. Results of comparisons of Lifebuoy perfume (0.7 g soaked in cheese cloth bag), Lifebuoy soap chips (70 g) in cheese cloth bag, and Lifebuoy perfume and soap chips combined in cheese cloth bag with no treatment to apple vegetative shoots (Experiment 9).

TREATMENT	SHOOTS FED UPON (%)			
	Day 1	Day 2	Day 3	Day 6
None	31%	56%	61%	83%
Lifebuoy Perfume	15%*	59%	53%	76%
Lifebuoy Soap Chips	19%	39%	39%	63%*
Lifebuoy Perfume + Lifebuoy Soap Chips	22%	61%	65%	78%

In Experiment 8, several agents produced significant reductions on various test days. The baby powder/Hot Sauce combination, Lifebuoy perfume, and Off Shoot T (all sprayed on shoots) were significantly less likely to be damaged (if one believes that Chi-Square tests can show direction) six days after treatment. However, in none of these cases was the incidence of damage to treated shoots less than 60% of the incidence of damage (92%) to untreated shoots.

In the ninth series of tests (Table 9), all treatments tested involved Lifebuoy products. Relatively few significant effects were reported, and in no case was the incidence of damage to treated shoots much below that of untreated shoots.

TABLE 10. Results of comparisons of Big Game Repellent (37% "putrescent whole egg solids"), Hot Sauce at full strength (2.5% capsaicin), ICI L-22 (an experimental, trade secret material), scented Lifebuoy soap chips, scented Lifebuoy soap chips plus Hot Sauce, deer blood, dried cabbage plus Vapor Gard (96% di-1-p-menthene), cedar leaf oil, and Vapor Gard (by itself) with no treatment on apples (Experiment 10). Three-day scheduled test was shortened to one day because apples were frozen on days 2 and 3.

TREATMENT	APPLES FED UPON (%)		
	Day 1	Day 2	Day 3
None	92%	-	-
Big Game Repellent	4%*	-	-
Hot Sauce (full strength)	4%*	-	-
ICI-L22	25%*	-	-
Scented Lifebuoy Chips	0%*	-	-
Scented Lifebuoy Chips + Hot Sauce	4%*	-	-
Deer Blood	50%	-	-
Dried Cabbage + Vapor Gard	79%	-	-
Cedar Leaf Oil	83%	-	-
Vapor Gard	100%	-	-

In experiments 10 and 11, Byers, et al (1990), again attempted to protect impaled apples with various treatments. In experiment 10, Big Game Repellent (a "rotten eggs" product the activity of which probably is related to release of hydrogen sulfide), 2.5% capsaicin, ICI L-22 (an experimental material of unidentified composition), unscented Lifebuoy soap chips, and scented Lifebuoy chips plus Hot Sauce all produced significant effects on the one day of the test for which usable data could be collected.

Of the materials used in Experiment 11, only scented and unscented Lifebuoy chips produced significant effects that lasted as long as two days. No agent produced a significant effect for three days.

TABLE 11. Results of comparisons of Big Game Repellent (37% "putrescent whole egg solids") at full strength, Hot Sauce at full strength (2.5% capsaicin), ICI L-22 (an experimental, trade secret material), scented Lifebuoy soap chips (full strength), unscented Lifebuoy soap chips (full strength), Big Game Repellent diluted 1:9, Hot Sauce diluted 1:9, ICI L-22 at 13% if full strength, and scented Lifebuoy chips diluted 1:9 with no treatment on apples (Experiment 11).

TREATMENT	APPLES FED UPON (%)		
	Day 1	Day 2	Day 3
None	100%	100%	100%
Big Game Repellent	28%*	100%	100%
Hot Sauce (full strength)	4%*	100%	100%
ICI-L22	75%	100%	100%
Scented Lifebuoy Chips	0%*	50%*	75%
Unscented Lifebuoy Chips	4%*	21%*	100%
Big Game Repellent diluted 1:9	100%	100%	100%
Hot Sauce diluted 1:9	88%	100%	100%
13% ICI L-22	83%	100%	100%
Scented Lifebuoy Chips diluted 1:9	33%	100%	100%

Of the various materials tested by Byers, et al (1990), the Lifebuoy products performed about as well as the best of the non-soap products (except, perhaps, for full-strength Hot Sauce) and better than many of them. In as much damage reductions were short-lived in all cases, however, it is difficult to conclude that any of these materials would a useful deer repellent, at least under the conditions of deer high pressure (no hunting, possible stunted growth) which occurred in the area where this study was run. None of these studies lasted more than six days, and the few statistically significant repellent effects reported after six days probably were not important effects as incidences of damage to shoots treated in such trials were more than 60% of those for untreated shoots monitored in the same tests.

The agents which produced some repellent effects probably did bother the deer for a while and, in the cases of the material applied directly to shoots or apples, might have altered their palatibities. However, there come times when novelty wears off and/or deer are faced with choices between less palatable substances and starvation. Most deer (and other vertebrates with which I am familiar) chose the former. For these reasons, effects of repellent materials which do not actually make the pest species sick tend to be transitory.

Based upon the results reported by Byers, et al (1990), I could probably justify a claim for short-term repellent effects for Lifebuoy soap hung in bags or tied to stakes near plants in need of protection. However, the submission for BYE DEER does not establish a link between its composition and that of Lifebuoy soap. Whether any soap would work as well as Lifebuoy is debatable. There really are no reasons, other than remarks attributed to Byers, to find that any soap will do. Reasons to suspect that there is something special about Lifebuoy soap come from the fact that the soap-based product Hinder performed poorly in tests by Byers, et al (1990), from Byers' remarks that Lifebuoy holds up better than other soaps in the rain, and from my own experience with Lifebuoy which suggests to me that it is harder and less "soluble" than typical bath soaps. [(Lifebuoy also is the only soap to which I am slightly allergic.)]

The label proposed for BYE DEER bears a claim that the product will repel deer for up to six months and includes no qualifying statements concerning levels of deer pressure. If we were to accept such a claim, we would be accepting a misbranded label. The proposed label also claims that the product "'marks'" plantings "to protect them from being grazed." Such inappropriate terminology must be removed from the label. Detailed comments on the label appear under "CONCLUSIONS."

202.0 CONCLUSIONS

1. Of the various items submitted to support the claims proposed for this product, we have found only the papers by Byers and Scanlon (1987) and Byers, et al (1990), to be useful. These articles do not effectively make the case that soaps in general repel deer as there are reasons to believe that Lifebuoy differs from other soaps in significant ways and the only soap-based formulation other than a Lifebuoy product that was tested did not appear to have been very effective. The effectiveness that was reported for Lifebuoy and various other products was found to wane within a few days in the tests run in areas where deer pressure was very high. Such areas are where interest in repelling deer is likely to be greatest.

2. Your application does not demonstrate effective repellency resulting from applications of the soap that you intend to use in this product identity, nor does it show similarity between your product and Lifebuoy soap sufficient to permit us to infer that your product would produce results similar to those reported by Byers and his associates. To resolve this problem you must show that your product contains Lifebuoy soap, that it contains the chemical equivalent of Lifebuoy soap, or that it contains ingredients which repel deer. Unless you are able to furnish data which show that the type of soap that you intend to use repels deer, you will have to have new field efficacy trials run with your product.

3. The claim made directly below the product's name on the front panel of your proposed label is incorrect in that your product, as it is to be used, would not "mark" any plantings and because the type of damage typically associated with deer (and which your product is claimed to "protect" against) is more properly characterized as "browsing" rather than "grazing." Assuming that your product works as you claim that it does, a more appropriate statement would be

   "Use **BYE DEER** to protect shrubs, small trees and flowers from being damaged by white-tailed deer."

4. There are several minor problems with your proposed "DIRECTIONS FOR USE" and three major ones: the target species is not mentioned in this section; the effectiveness claim is virtually open-ended; and the directions do no note that intensity of deer pressure would be likely to shorten drastically the duration of effectiveness of this type of product. The only evidence

suggesting that a soap product could repel deer for as much as four months was a practically anecdotal account by Byers and Scanlon (1987). In more thoroughly reported tests run under conditions of high deer pressure, the periods of little no damage where soap-based products were usually were only 1-2 days.

In light of these considerations and assuming that it will be possible for you to substantiate that this product works as well as Lifebuoy, the "DIRECTIONS FOR USE" for this product should be modified to read as follows:

"DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

USE RESTRICTIONS

This product may be used to protect established and new plantings of shrubs, small trees, and flowers from damage cause by white-tailed deer (Odocoileus virginianus). Under conditions of low to moderate deer pressure, this product may remain effective for several months. When deer pressure is intense, the effectiveness of this product may diminish markedly after a few days.

APPLICATION DIRECTIONS

New Plantings and New Growth: Hang sachets of BYE DEER from stakes at height of bud level. Place stakes at intervals of one meter (3.3 ft). Elevate sachets as plants grow to keep repellent at bud level.

Clusters of the Same Flora (e.g., Day Lilies): Hang sachets of BYE DEER throughout planting at random heights on stakes at intervals of one meter (3.3 ft).

Shrubs and Small Trees: Hang sachets of BYE DEER from stakes or from the plant itself, if appropriate, at various browsing levels around the shrubs and trees. Sachets should be spaced about one meter (3.3 ft) apart."

Clearly, the directions for spacing placements should be modified appropriately as additional information regarding the effective use of this product becomes available.

5. We infer that this product is to be subpackaged in individual bags which would be contained within a larger outer package. The statement of contents on this product's label must indicate the amount of BYE DEER in each "sachet," which should remain constant, and the number of sachets in each package, which may vary with the size of the outer container. The full text of the label must appear on all amounts of product sold or transferred in commerce. This means that if the product is to be sold in individual sachets, the entire label text must appear on the sachet itself or on the container in which it is sold. If the sachet is only to be sold within fully labeled outer containers, the label for the sachet may be bear "DIRECTIONS FOR USE" abbreviated to read:

"DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Read entire label on outer package before using this product. It is illegal to sell this product with incomplete labeling,"

Labels for outer containers and for sachets must be received and accepted by our office before this product can be registered.

William W. Jacobs
Biologist
Insecticide-Rodenticide Branch
January 15, 1993