

UC Agriculture & Natural Resources

Proceedings of the Vertebrate Pest Conference

Title

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Journal

Proceedings of the Vertebrate Pest Conference, 15(15)

ISSN

0507-6773

Author

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Publication Date

1992

ReJeX-iT™ BRAND BIRD AVERSION AGENTS

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ABSTRACT: ReJeX-iT™ brand bird aversion agents have been formulated from non-toxic, food-grade ingredients that meet or exceed US Food Chemical Codex (FCC) and US Pharmacopeia (USP) specifications. The products, based on methyl anthranilate (MA) as the active ingredient have been developed in liquid and powder form to cover the widest possible range of applications. EPA/FIFRA registration is being actively pursued for all products.

Proc. 15th Vertebrate Pest Conf. (J. E. Borrecco & R. E. Marsh, Editors) Published at University of Calif., Davis. 1992

INTRODUCTION

PMC Specialties Group, a Division of PMC Inc., the successor of Sherwin-Williams' chemical operation is a marketer and manufacturer of performance chemicals. We are the only western producer of saccharin. As such, we are the largest producer of methyl anthranilate, a non-toxic, GRAS listed (generally recognized as safe) product (Jenner 1964), that is the key raw material for the production of saccharin (Fig. 1). Methyl Anthranilate (MA), a naturally occurring compound in jasmine, acacia, gardenia, hyacinth, concord grapes, orange blossoms, and others (Bedoukian 1967, Arctander 1969), is sold as a feed additive, into the food & flavoring market, to the fragrance market, and is used in polymers and as a chemical intermediate. For example chewing gum can contain up to 2,200 ppm of MA (Arctander 1969). This means humans and animals consume considerable amounts of MA without any known problems.

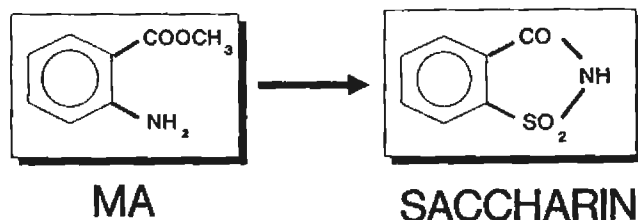


Figure 1. Synthesis of saccharin from methyl anthranilate.

The objective of this paper is to focus on MA's use in ReJeX-iT™ brand bird aversion agents - the development, production, and their intended use, status of EPA/FIFRA registration and future outlook. While the use of methyl anthranilate as a bird aversion agent has been known for over 30 years (Kare 1961), it has not yet led to any significant commercial use as a bird aversion agent. Naturally, the question arises "Why MA now?" Did it not work as claimed in the patent? Why has nobody pursued it despite the numerous positive field studies (Mason et al. 1988, 1989a, 1989b, 1991, Cummings et al. 1991)? Is the market too small or too splintered? Some are still unanswered questions.

Nevertheless, the researchers at Monell Chemical Senses Center, Philadelphia, specifically R. Mason and L. Clark, convinced us to take a closer look and pursue yet another market for our MA. Also, several things have happened that changed our society, its view of the environment and therefore the market place making the development of MA as a bird repellent worthwhile:

- Increased population worldwide and competition for living space

- Increased environmental awareness, especially for wildlife
- Protection of birds through the Migratory Bird Treaty Act
- Cancellation of existing aversion agents (e.g. Mesurol®)

There is no question that there is now a need for non-toxic bird aversion agents that do not harm birds, people, other animals, and the environment. Beside MA there are other chemicals and products like dimethyl anthranilate (DMA), ortho-amino acetophenone (OAAp) and more (Clark 1991, Mason 1989, 1991) that are active as aversion agents and some are even more active than MA. However, we focused on MA because it is widely used in the food and fragrance industry. Also, there are sufficient quantities of MA available and we have the most data.

In its pure form, MA is not very suitable as a bird aversion agent and difficult to apply. MA requires formulation to enhance and prolong its properties as a useful bird aversion agent. Thus, from MA we make ReJeX-iT™, the performance product. ReJeX-iT™ is a trademark of PMC Specialties Group for aversion agents including avian aversion agents.

MA is heavier than water and only soluble up to 3000 ppm in water. It is also fairly reactive once exposed to the environment. Thus, due to its degradation MA does not persist and accumulate. However, at the same time as the concentration drops it functionally becomes less active as a bird aversion agent. Even some commonly used solvents such as acetone can render MA inactive as a bird aversion agent. Sunlight initiates photochemical reactions and turns the product brown to purple. Corresponding stability and environmental fate studies are outlined and planned to start later this year.

This reactivity and behavior has considerable impact on the formulation and can be used to advantage in the various applications. Complete encapsulation has been considered but in most cases reduces the repellent activity and is not cost effective. The problem is to determine how to formulate and apply a product so that the birds get exposed at a sufficient concentration in order to be repelled. Also, birds are a problem in many different surroundings and products have to be developed to perform under these varied conditions.

PRODUCTS/USE

Our work originally was directed towards airports and golf courses, and has spread to many lesser known problem areas.

From many formulations developed, all using strictly

food grade non-toxic ingredients, we have selected 3 formulations with the best overall characteristics, ReJeX-iT™ AP-50, ReJeX-iT™ TP-40, and ReJeX-iT™ AG-12, with a 4th one under development. EPA registration and the costs associated with it, which can run as high as \$1 million per formulation, naturally limit the number of formulations that can be developed and brought to the market.

ReJeX-iT™ AP-50, is a free flowing powder with a bulk density of 3.7 lbs/gal. It can be applied as such with a spreader and forms a slurry in water that settles fast. It may be applied at a rate of 1.2 lb/100 gal of water (1.5 parts/1000 parts water w/w) at 3-4 week intervals as increased bird activity might require. It was developed for the reduction of bird activity in temporary pools of standing water on airports and for use on golf courses and ornamental turf. It is more active than ReJeX-iT™ AP-75 (Ref# CN123), which has been used in an open field test in Ohio (Dolbeer et al. 1991) on ring-billed gulls (*Larus delawarensis*) and mallards (*Anas platyrhynchos*) with very good results (Fig. 2-4). The same formulation was also used at JFK Airport from May - August 1991 with encouraging results. (Dolbeer et al. 1992).

ReJeX-iT™ TP-40, is a clear violet colored liquid,

which is lighter than water and forms a thin film on the water surface. It can be applied directly with any spray equipment without any further dilution. Initially we suggest a rate of application of 20 lb/acre on land or water surface as is. It was developed for the use on tailing ponds and waste lagoons, but would also be applicable for landfills. The N. Y. State EPA has issued the permit for a large scale test (Curtis 1991) at the Broom county, NY landfill to be run later in the year. Other applications under consideration for testing are small ponds and lakes on airports or golf courses and use on feed lots, and in localized wood treatment against woodpeckers. Initial tests with mallards (Dolbeer 1991) show excellent results (Fig. 5 and 6). It appears that with prolonged exposure no reduction in activity was noticed and the product maintained its activity during the complete test period.

ReJeX-iT™ AG-12, is a thick white emulsion, miscible with water at any ratio. It forms a clear sticky polymer film on plants and fruits and can be applied with any spray equipment after proper dilution with water. Initial suggestion is to use the formulation at a rate of 60 lb/acre and a dilution rate of anywhere between 1:1 to 1:4.

A previous formulation AP-25/WP, using agricultural clay as a dispersant showed repellency but the fruit treated did not look very appealing. It also clogged spray nozzles and

ReJeX-iT™ AP-75 BILL CONTACTS OF GULLS W/WATER

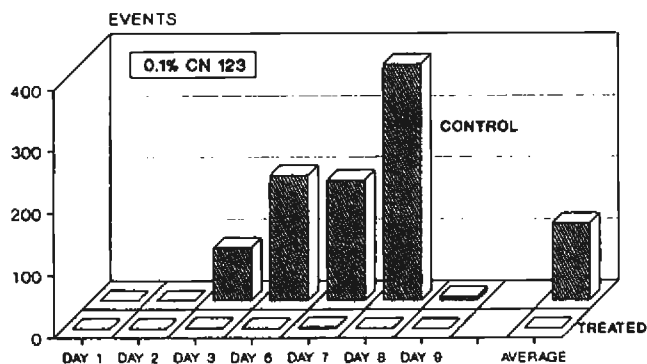


Figure 2. Bill contacts of gulls in treated and untreated pools of water in a pen trial in Ohio. ReJeX-iT™ AP-75 added as a powder to the treated pools, settled on the bottom.

ReJeX-iT™ AP-75 GULL ACTIVITY

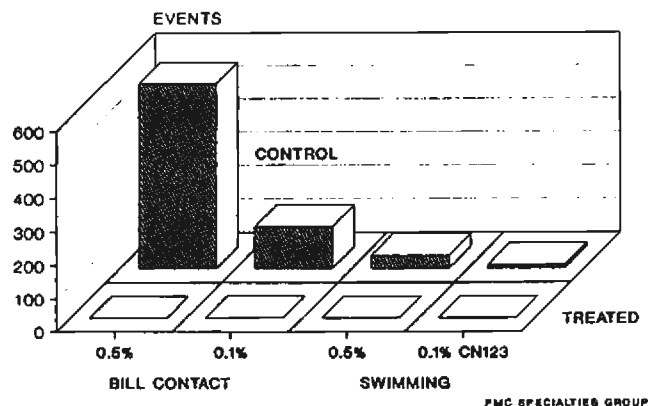


Figure 3. Bill contact and swimming activity of gulls in pools of water treated with 0.1% and 0.5% ReJeX-iT™ AP-75 (CN123) in a pen trial versus a control pool.

DUCK & GULL ACTIVITY

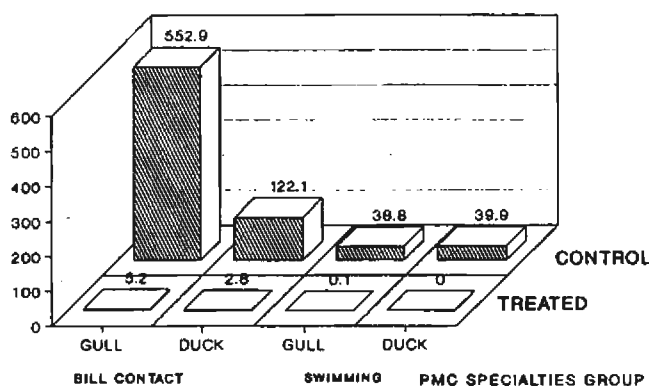


Figure 4. Activities of mallards and gulls in pools of water, treated with 0.1% ReJeX-iT™ AP-75 in a pen trial versus control pools.

ReJeX-iT™ TP-40 POOL ENTRIES FOR MALLARD DUCKS

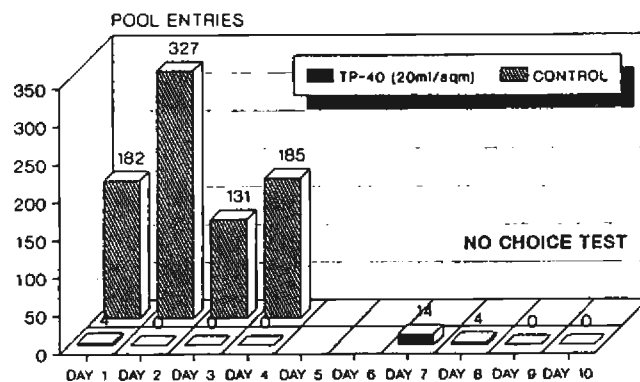


Figure 5. Pool entries of mallards over a 10 day period in two choice and no-choice tests in a pen trial. ReJeX-iT™ TP-40 was applied as a thin film to the surface of the treated pool.

ReJeX-iT™ TP-40

BILL DIPS OF MALLARD DUCKS

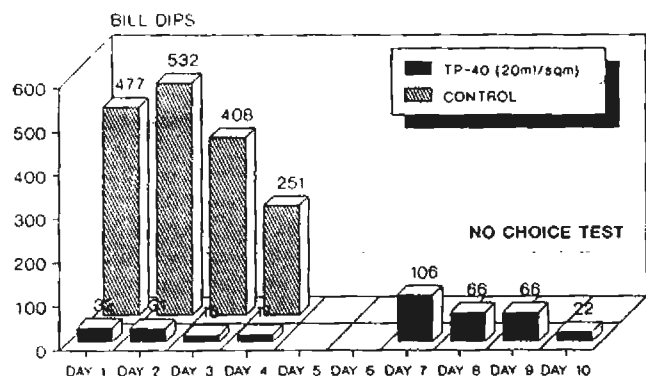


Figure 6. Bill dips of mallards over a 10 day period in two choice and no-choice tests in a pen trial. ReJeX-iT™ TP-40 was applied as a thin film to the surface of the treated pool.

was not easy to apply (Curtis 1991). AG-12 is intended for fruit trees, berries, golf courses, ornamental turf areas, seed heads and other agricultural applications.

While some use of bird repellents is for aesthetic reasons only, many are for economic reasons, and others are for safety considerations, such as airport use, where we first concentrated our efforts. Whatever the reason, the combined market potential is sufficiently large and diversified to warrant our continued commitment.

ANALYSIS

To allow better effectiveness in the field and also to be able to test for any potential runoff, we are developing a test kit for use in the field. It should allow the operator to determine if his concentration of ReJeX-iT™ is sufficient without going to a laboratory for standard analysis.

EPA/FIFRA

Without EPA/FIFRA registration there is no product. Even long-time food products require registration if used in the environment as a pesticide. In October 1991 we met with EPA to discuss our existing data and outline additional requirements for registration. So far, the dialogue is proceeding as planned and we expect to receive Experimental Use Permit (EUP) for use of ReJeX-iT™ AP-50 on selected airports by the middle of this year with conditional registration expected by the end of 1992. The documentation for additional application and the other formulations are in progress. Full registration for each application requires environmental fate studies, which can be very costly.

SUMMARY

So far all tests we have conducted have been positive and sufficiently encouraging to continue with the development work and the EPA registration. Still many questions need to be answered. The need for antioxidants and/or UV stabilizer can be determined. Fish toxicity also needs to be established. As long as there is interest in the market place, we will pursue the development of new or existing formulations for additional uses and work with any interested party as a partner in wildlife management to make this a safer and more pleasant place to live.

ACKNOWLEDGEMENTS

I like to thank R. Mason, L. Clark and R. Dolbeer from Monell and Denver Wildlife Research Center for many fruitful discussions and suggestions and the opportunity to work with them. My gratitude goes also to the many researchers at the Denver Wildlife Research Center in Denver and their field stations that enabled us to proceed this far in the project.

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