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WHAT YOU WANTED TO KNOW ABOUT ALL YOU EVER HEARD CONCERNING SNAKE REPELLENTS

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by Gary J. San Julian and David K. Woodward/1/

INTRODUCTION

Have you ever heard about a way to keep snakes away from your house? Many people in North Carolina have been told by their elders of various ways to repel snakes. When we first started working on this problem in North Carolina, we were amazed at the number of "home remedies" that people believed would protect their property from snakes; and we began to keep a record of these remedies. In 1981, a grant from the Pesticide Impact Assessment Program allowed us to begin to test some of these remedies to determine their value.

Other investigators have tried to repel snakes from buildings and have had mixed results. Flattery (1949) tried to repel snakes from the Village of Inwood, Manitoba. He tried chlorine gas, coal gas, cyanogas, DDT, rotenone, Antu, arsenic, chlordane, and nicotine sulfate. Although nicotine sulfate placed in a vessel of water was effective in killing snakes, none of the products were reported to repel them. An information circular produced by the North Carolina State Museum (Anonymous 1953) suggested that "odors such as creosote and naptha flakes seem to deter them (snakes) from entering the premises." Cowles and Phelan (1958) reported that mercaptan would cause a fear reaction in snakes. Fitzwater (1974) reported on a study by Whitmire and Stout (1965) that mercaptan would not repel poisonous snakes but did make nonpoisonous snakes leave an area. Secoy (1979) tested 10 products such as ammonium carbonate crystals, ammonium hydroxide, formalin, crushed garlic and a commercial fumigant containing pyrethrum. He placed containers of these materials in a glass aquarium with plains garter snakes (Thamnophis radix). He measured the rate of tongue flicks to determine if the snakes' movements were affected by the products. No correlation was found between the number of tongue flicks and movement. Pyrethrum smoke caused an increased movement away from the dish. However, since only 2 of the 5 snakes tested showed this behavior, no strong conclusion was made.

The primary goal of the present investigation was to observe snakes in the presence of various tactile and olfactory materials and determine if snakes were repelled by these materials. The criteria for testing were that the material (1) must be relatively easy to obtain by the public, (2) must be reasonably safe for use around the home, and (3) would not permanantly harm or kill a snake. We tested some of the same products that Secoy used, but we employed a closed test chamber to reduce the influence that the observer had on the behavior of the snakes.

METHODS

Using telephone records from the summer of 1981 and responses that arrived by mail as a result of several stories about snakes in the major newspapers of the state, we collected suggestions about snake repellents. In addition, several ideas for testing were found in the literature on snake repellents. We attempted to test all the suggestions that were feasible and met our criteria. Some, like the burning of old shoes and rags in the homeowners' yard each week, could not be evaluated.

Our first concern was to design a method to evaluate suggested materials. These materials were supposed to affect the snake through either their sense of smell or touch. Both of these senses are well developed in snakes. Their tongues pick up scent particles from the air and deposits them on the roof of their mouth close to the Jacobson's Organ, which is the primary olfactory organ in the snake. The Jacobson's organ is large in snakes and the exact way the system functions is not clear. Snakes have a good tactile system for

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sensing environmental stimuli. Areas on the tails, flanks, back, and sometimes the head, have a thinner layer of skin and respond to tactile stimuli very effectively.

In order to test different types of stimuli, we designed a test chamber constructed of 3/4 inch plywood (Fig. 1).

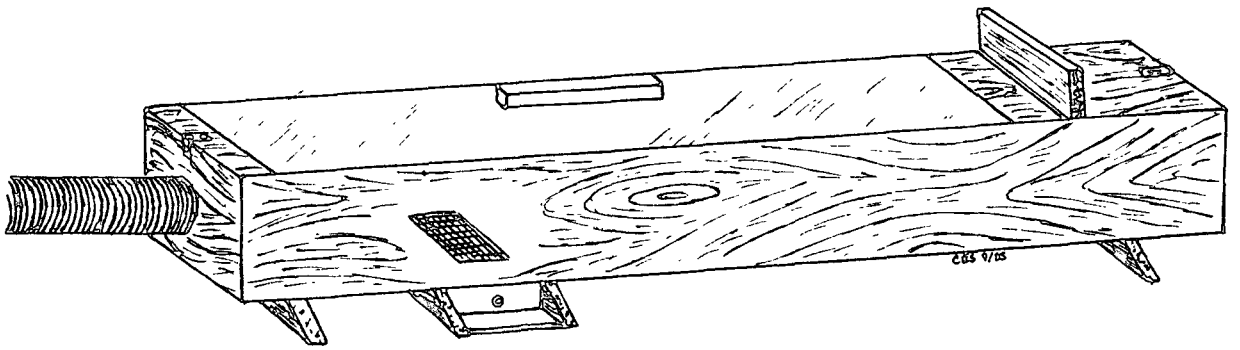

Fig. 1. Test chamber for evaluating snake repellents.

The chamber was 8 feet long, 1 foot high and 1 foot wide. At one end was a door that could be opened to remove the snake after the test. A small exhaust fan was mounted into this door and vented to the outside of the building through a flexible plastic hose. At the other end of the chamber was a small enclosure (approximately 1 x 1 x 1 foot) that could hold a snake in a relatively dark environment. This was fitted with a sliding door that connected with the main chamber. The inside of the test chamber was covered with plastic contact paper to facilitate cleaning after each test. The top of the main chamber was originally covered with plexiglass but was replaced with a one way mirror so the snake could not see the observer. The design change required that a small fluorescent light be placed along one wall of the chamber for observing the snakes. It was mounted near the top of the chamber. A rectangular opening, approximately 2 inches by 10 inches, was cut out of the floor of the main chamber and covered with a metal grid. This slot was located 2 feet from the fan end of the chamber. A drawer was constructed below the grid to hold the materials with an olfactory quality that was to be tested. The odors then would be pulled into the chamber through the grid by the exhaust fan. Materials were placed in an aluminum pan for testing and the pans were cleaned or changed for each product. Tactile materials were placed on paper towels which were laid across the grid. Once released from the holding box, a snake's normal investigatory movements would cause it to cross the gridded panel.

The black rat snake (Elaphe obsoleta) was chosen for the experiment because it is a common snake in North Carolina and the species about which we receive the most calls. Most of the snakes used in the tests were caught on University property or donated to the project. The number of snakes held in captivity varied throughout the tests depending on the number we could obtain and the general health of the captive snakes. A total of 18 snakes were used during the tests, 7 in 1981, 9 in 1982 and 2 to finish the tests in 1983. All snakes were released following the experiments.

The experiment was designed to be used as a screening device for the test materials. If the snake's behavior indicated that it was reluctant to cross the test areas or if any negative reactions were found, a complete and comprehensive testing program would be instituted to fully evaluate the material.

The materials most often recommended by the public were gourd vines, mothballs and sulphur. Other materials that were tested included cedar oil, Bird

Tanglefoot, lime, cayenne pepper spray, sisal rope, coal tar and creosote, liquid smoke, artificial skunk scent and musk of the Eastern chain king snake (Lampropeltis getulus). These materials were tested several times in both the olfactory and tactile mode where appropriate (Table 1).

During the control tests, each snake used in the experiment was placed in the holding box for 5-10 minutes and allowed to become accustomed to the box. Then the door to the main chamber was opened and the snake's behavior noted. While the snake was in the chamber, both the light and the fan remained on. Each snake was observed twice in the control phase of the experiment. If the snake did not move into the main test chamber after several minutes it was gently prodded. Snakes that did not move following these attempts were removed from the test chamber and not used again that day.

During the testing period, snakes were fed a maintenance diet of adult laboratory mice. Any snake that would not eat or behaved abnormally was released. Snakes that were shedding were not used in the test until the process was completed.

RESULTS AND DISCUSSION

Mothballs were recommended by many individuals as a good method of keeping snakes out of a dwelling or away from property. They suggested placing them around the foundation of the house or around the boundary of their yard. We tested both types of mothballs (naphthalene and para-dichlorobenzene) in the olfactory and tactile modes. In these trials, there was no reluctance by the snakes to cross the grid through which the odor was coming or to crawl through the materials placed in the chamber on a paper towel.

Sulphur was another material that was recommended by many people. Flour sulphur was the material used in this test. It was tested as an olfactory and as a tactile material and neither seemed to have any effect on the snakes. Some individuals suggested that sulphur be burned in a house to repel snakes. This suggestion was not tested because it violated the criteria of the experiment. This process creates a toxic gas harmful to humans and probably the snakes.

The pepper spray was made by boiling a large clove of garlic and an onion in a quart of water. Several teaspoons of cayenne pepper were added to the mixture and allowed to steep for a half hour. Several drops of dish washing detergent were added as a sticker. The liquid was then strained. A paper towel was soaked in the mixture and placed over the metal grid in the test chamber. Snakes freely passed over the mixture.

Bird Tanglefoot (polybutenenesand hydrogenated castor oil), a sticky material used to repel birds, was placed in the test chamber on a paper towel. It was noted that the progress of the snake was slowed while passing through the material, but they made no effort to arch over the material on the return trip. This material might be used as a physical barrier; however, other studies indicate that there are better products for this purpose (Johnson 1983).

In many areas of our state, individuals believe gourd vines will prevent snakes from entering chicken houses. As there are many varieties of gourds, it required several inquiries to determine the right type of gourd for our tests. Bat, caveman club and purple martin gourds were suggested as having the needed properties. Both the smell of the plants and the texture of the vines were said to deter snakes. We grew several of these varieties and used fresh cut vines for the tests. A mass of vines were placed in the test chamber across the metal grid. The vines were not piled so high that they would make a physical barrier for the snake. Finally, the vine was crushed and the extract placed on a paper towel in the drawer below the test chamber. Neither of these preparations had any obvious effect on the snakes.

Stanley's Crow Repellent was used as a test product because it contained the recommended ingredients of coal tar and creosote. This liquid was poured onto a paper towel and placed on the metal grid. It did not seem to irritate or

make the snake uncomfortable in any way and did not deter movements. Snakes were cleaned after this test to ensure that no long term harm would come to them. This particular product, along with other creosote products, are now restricted in their use by the Environmental Protection Agency (EPA).

Many people have been told that a fiber rope placed in the path of a snake will cause it to go around the rope. This belief is responsible, in part, for stories about cowboys that placed a rope around their bed roll before they went to sleep. In our state, several people suggested a similar method. A length of sisal rope was placed across the floor of the test chamber on the grid. The snakes were not stopped or slowed down by this material.

A building contractor told us that he used oil of cedar to keep snakes away from a job site. He indicated that this type of product was employed particularly in areas where the clearing of land took place prior to a building start. He dripped the oil around the outer edge of the site in order to protect his workers from snakes. We put the oil on a paper towel and laid it across the floor of the test chamber on the metal grid and, in a separate test, placed it in the drawer below the test unit. Neither method of application had any observable effects on the snakes.

Several farmers indicated that agricultural lime would keep snakes out of buildings. When outdoor toilets were the rule rather than the exception, calcium hydroxide (lime) was put in the pits to help break down fecal material. These farmers said that additional lime was placed around the perimeter of the outhouse to keep out snakes. In our tests, we used laboratory grade calcium hydroxide. The material was placed on a paper towel and laid across the metal grid in the test chamber. The snakes crawled through it, and we could not detect that it had any effect on them.

Eastern king snakes secrete a musk from cloacal glands. It was reasoned that this material might give their prey a clue to the king snakes' presence in an area and cause other snakes to behave abnormally. The musk from several king snakes was collected by applying firm, gentle pressure at the base of the tail and placing the excretions on a paper towel (Oldak 1976). It was then placed in the drawer beneath the chamber and the odor pulled into the chamber by the exhaust fan. Following the completion of that phase, the towels were placed on the metal grid inside the chamber. Neither procedure seemed to cause any noticeable behavior change in the test animals.

Wood smoke was suggested as a way to drive snakes from a building. In order to determine if the smell of smoke would act as a repellent to a snake, a product called Wright's Liquid Hickory Smoke was used. This type of product was used instead of smoke because the odor would be retained on buildings and other materials longer. A paper towel soaked in this product was placed in the drawer below the chamber and the odor pulled into the chamber through the metal grid. Again this material had no visible effect on the snakes.

Finally, it was reported that skunk scent would deter snakes. A chemical called Stench (3-mercapto-2-butano) was as close a chemical match as could be found. This liquid was dropped on a cotton pad and placed in the drawer under the test chamber. This was the last test conducted, and the results were the same as previously tested materials. There were no visible changes in the snakes' behavior.

CONCLUSIONS

The results of our tests support the general conclusions of other investigators. The products that were tested did not seem to alter the normal, investigatory behavior of the black rat snakes we used or prevent them from crossing the test area in the chamber. This is consistent with the lack of products registered by the EPA for the control of snakes; this includes lethal or nonlethal materials. There will be continued claims for these materials and others because of the interest and fear created by snakes. Recently, several products have been recommended to

control snakes. Tack Trap, a polysiobutylene compound which is very sticky, has been used to protect wood duck (Aix sponsa) nests from snakes (Johnson 1983). Rodent glue boards have been used in the crawl space of structures to catch snakes. Both of these products are not, in our opinion, snake repellents but should be considered physical barriers.

We feel that the only way to reduce the number of snakes found in and around houses is to remove or reduce their habitat. Snakes are attracted to areas that have rodent populations or provide needed cover and shelter. The removal of log or trash piles close to houses or frequently used buildings will help reduce cover for snakes and their prey. Keeping the vegetation adjacent to houses closely mowed or trimmed will reduce food and cover for rodent populations. Tight fitting screens and doors along with the sealing of all cracks and holes into the crawl space or basement will keep snakes out of the house. Learning the difference between poisonous and nonpoisonous snakes will help ease the worry an individual may feel about their safety concerning snakes. Teaching youngsters to leave all snakes alone unless they know what kind of snake it is will reduce the interaction between children and snakes. These suggestions have been the standard for years and because to date there is no chemical way to repel snakes, we endorse these suggestions as the best options for the home owner.

Use of trade names does not imply endorsement by the North Carolina Agricultural Extension Service or the North Carolina Agricultural Research Service of the products named or criticism of similar products not mentioned.

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Table 1. Materials and methods used in the snake repellent tests.

		TACTILE	OLFACTORY
1.	Mothballs (Para-Dichlorobenzene, napthalene)	X	X
2.	Flour sulphur	X	X
3.	Garlic, onion and cayenne pepper liquid	X	
4.	Bird Tanglefoot (polybutenes and hydrogenated castor oil)	X	
5.	Gourd vines	X	X
6.	Stanley's Crow Repellent (coal tar and cresote oil)	X	
7.	Sisal rope	X	
8.	Cedar oil	X	X
9.	Lime (calcium hydroxide)	X	
10.	Chain king snake musk		X
11.	Wright's Liquid Hickory Smoke		X
12.	Stench (3-mercapto-2-butanol)		X