CRITERIA FOR RODENT BAIT SELECTION

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ABSTRACT: World food shortages become more acute each year, and all too often, rodents are present to take their unwarranted share. To counter this, we must refine our rodent control methods to make them more efficient. To this end, correct bait selection is essential. Grain baits must be selected for purity and acceptability. Grain alterations must be carefully controlled, as well as any additives. Multi-ingredient or composition baits must be checked for size, hardness, protein content and additives. The selection of trap baits is critical for the success of trapping program. In general, fresh coconut is the best bait, but on-site local baits must be checked.

INTRODUCTION

In recent years, the world food shortage problem has intensified and will continue to do so for the forseeable future. This problem makes the protection of foodstuffs increasingly important during growth, storage and processing. All too often, rodents are present during each stage, taking a share we can ill afford to lose.

Basically, rodent control methods have changed little over the past several decades. In fact, due to environmental problems, the use of some effective toxicants has been severely restricted. This, in turn, has made rodent control in some areas difficult. Now, new safer toxicants are being developed. But progress is slow due to the ever-rising costs of research, development and testing.

What has to be done now, is to further refine our present rodent control methods to make them both more efficient for us, and more appealing to rodents. There are no simple and elegant solutions to rodent problems, just hard work.

This paper is a basic collection of information that will aid in bait selection for a rodent control program.

GENERAL COMMENTS

In any program, correct identification of the problem rodent is extremely important. From this starting point, information about feeding habits and perhaps bait preferences can be obtained from the literature or others in the field.

Since many rodents that are economic or health hazards to man are grain feeders, grain has been the basis of most baits for hundreds of years. Grains are cheap and, in some cases, of a proper size without modification. In selecting a grain as a toxicant carrier, several questions must be answered. First, does the target specie like the grain offered? This is of paramount importance overseas. For example, a wheat or oat-based bait is not well accepted in an area where rice is the staple food grain. This makes on-site bait testing very important.

BAIT PARAMETERS

Of equal importance are the physical characteristics of the grain. Bait grain must be of a quality suitable for human or animal consumption. All too often, a baiting program is ineffective because of poor quality grain. Rodents do not like grain that is rodent contaminated, dirty, old, stale or musty.

New varieties of grains are now being developed that have a higher protein content, and which are better accepted than previous standard varieties.

Too frequently the only criteria for a bait is that it is cheap. Poor baits give poor control, and the result is an expensive control program because it has to be repeated.

A minor problem in America, but a major one overseas, is the availability of bait grain because quantity and quality are often seasonal, and therefore they may be limited. If this is the case, advance purchase and storage is necessary, and alternate baits

should be investigated. Storage conditions for both prepared baits and bait materials is important. Overseas, prepared baits are sometimes stored with other public health or agricultural chemicals. Baits or bait materials so stored may become tainted by chemical smells and become unattractive to rodents. Many rodent control toxicants are non-poisonous to insects and prepared baits can be rendered unfit for use by insect damage over a period of time.

BAIT MODIFICATION

Mechanical treatment of grains may enhance their acceptability to rodents. There are various forms of crushing, cutting, cracking, crimping, rolling or grinding of grains to achieve better rodent take. In general, grains so treated do not keep as well as whole grains, so such treatments should be done as close to use as possible. Degerming of some grains is essential for some treated grains, for if this is not done, the grains become rancid in storage.

In addition, whole grains used as baits must have any husks or hulls removed. Rodents, in feeding, remove husks or hulls, and any topically applied toxicants, in the most part, will be removed thus. One problem with toxicants topically applied to whole grain baits is that the 1% by weight toxicant is outside of the bait grains. The inside is unpoisoned. So when a rodent bites into such a bait, the first contact is not with a 1% toxicant concentration, but one much higher. This may lead to bait shyness.

Bait treatments are many, varied and performed for various purposes. A primary group contains those agents used to apply a toxicant onto a bait. Oils, starches, synthetic latexes, or sugars may be used. It is first necessary to determine whether the target specie likes, dislikes or tolerates additives. With the use of oils, for immediate application, any edible oil will do, but they become rancid quickly in storage and in use. Mineral oil, of a medical grade, is a good compromise, as is linseed oil in some cases.

In tropical areas, molding of baits is a frequent problem. However, bait treatment with a fungicide must be carefully checked. In general, fungicides are rat repellents. Some will work, such as para-nitrophenol, but the treatment level is critical for each type of bait and target rodent. The latter two items must be checked by laboratory and field testing.

PHYSICAL ASPECTS

Bait tests have indicated a definite particle-size preference among rodents. As stated earlier in this paper, rodents are basically grain-feeders. This does not mean that they won't eat anything in sight, but rather that they do have basic feeding habits. While some rodents are primarily fruit, root, or fodder feeders, grains and combination baits can still be used for their control. Tests conducted by the author for Monsanto using wild Norway rats, Rattus norvegicus, indicated a particle-size preference for adult Norway rats of 0.4 to 0.7 mm in diameter. This seemed to be a size suitable for holding in the forepaws while eating. There seemed to be a supra-normal stimulus for bait particles of 2x to 3x, but the significant portion of the feeding was in the optimum range. The size was proportionally smaller for the smaller rats. And with rodents that have a hoarding reflex, the larger bait pieces may be hoarded. It was also noted that the fines and flour-like dusts were the last to be consumed.

Hardness plays a part in bait preference, too. Again, rodents will gnaw on anything. But, baits with a hardness between that of soft wheat and water-soaked corn are near optimum; the problem being that moist baits spoil quickly.

Some of the above-mentioned criteria are difficult to achieve in a baiting program, but the more that can be satisfactorily met, the more efficient and effective will be the program.

COMPOSITION

Another large group of baits are those of mixed composition or ingredients. They are baits made from any combination of grains, meat meals, fish meals, fats, flours, starches, and sugars. These, in turn, take the form of biscuits, pellets, meals or cakes. They, in turn, may be formed by extrusion, pelletizing, baking, frying, drying or being mixed with waxes and they are then cast into blocks. There are a great number of these baits, and most of the commercial baits are in this category. They have several advantages. They

can be tailor made to fit a specific rat problem, the toxicant is evenly distributed throughout the bait pieces, particle size can be controlled, and if wax is used, a weather-proof bait can be developed. The major disadvantages are the costs of manufacture, and the fact that they often look like pet foods. In fact, a bait the hardness and composition of dog biscuits is good. Most pet foods make good rodent baits, but the hazards of accidental poisoning is great.

Composition baits can have an enhanced protein content. Such a content of 25% is near optimum. It can be a combination of vegetable and animal proteins.

For indoor use, baits do not have to be weather resistant. But, in many areas of the world, as well as in America, field baiting is necessary. This is of great importance where anti-coagulant baits are used outside in exposed areas. Such baits have to be acceptable to rodents for weeks at a time. Two things can be done to protect such baits. One is to place them in weatherproof stations. The other is to make the bait weather resistant.

Some fat fried or baked composition baits are weather resistant if they don't set in a puddle of water. However, paraffin or wax, is the principle weather-proofing agent in many baits. Acceptability of wax baits must be checked since, in Hawaii for example, rats have an aversion to wax baits. Waxes used must be of food grade quality, and different hardnesses of waxes should be checked for rodent preference. In general, wax-treated baits are not as well accepted as a similar untreated bait, but they will work in exposed situations where the others spoil. In some instances, spoiling is an advantage. When acute toxicants are used, spoiling and loss of bait attractiveness lessens long-term environmental hazards.

ADDITIVES

Bait additives have a long, if not ancient history. But, to my knowledge, no rat attractant, or "Rat-Nip", so to speak, has ever been developed. The best "attractant" so far is just a good bait. Rats seem to have a taste preference similar to man. If it doesn't appeal to you, it is highly probable that rats won't like it either. Rodents do seem to have a preference for sugars. Their preferences fall between 1 and 5% by weight in bait. Sucrose is well accepted, but the invert sugars like maltose, dextrose, fructose and levulose are also acceptable. A good mixture of the above invert sugars is found in corn syrup. Invert sugars also tend to make composite baits a bit softer, an advantage as long as baits aren't allowed to pack or stick in storage. Sugars also help preserve baits and increase shelf, or storage, life.

TRAP BAITS

Shuyler (1974) reports on an extensive trap bait program conducted in the Philippines. Many strictly local baits were tested, and it is evident that rodents favor what is in their local environments.

Some trap baits have a fairly universal appeal and, contrary to popular belief, cheese is not one of them. One that works well in many environments is fresh white, mature, coconut meat. It has worked well in the Sierra Nevada Mountains of California, the deserts of New Mexico, a grain warehouse in Colombia, markets in Brazil, and grainfields in West Pakistan. Other trap baits will work as well, but the coconut meat is a good starting one. Nuts, dried meats, fresh and dried fruits are good, as well as local bakery products. Trap baits are generally expensive to buy, prepare and use, due to high quality and labor costs.

In tropical areas, baits must be changed daily; less often in temperate areas. As a general rule, the variety of bait should be changed weekly. An additional factor is how easily the bait can be affixed to the trap's trigger system. If the physical characteristics of the bait such as softness make it hard to do so, the rodents may be able to remove it without tripping the trap. The rule is, try a variety of baits, use those that are easy to affix and change, and switch baits frequently.

ATTRACTANTS

As stated before, there seem to be no rat attractants, but there seems to be a phenomenon exhibited by some additives, probably best termed "curiosity enhancers". One of these is a powerful, persistent synthetic grape flavor. When added to a bait, there

was no significant increase or decrease in consumption. But, when used as a coating on plastic bags containing bait, the bags so treated were significantly selected over untreated bags. Other scents may possibly have a similar effect.

CONCLUSION

In summary, a rodent control program is no more effective than the bait used. A poor bait means poor acceptance and poor rodent kill. This results in time, materials and labor being wasted in a vain effort to control rodents. In some instances, program repetition is necessary at an additional expense.

LITERATURE CITED

SHUYLER, H.R. and R.F. SUN, JR. 1974. Trapping: a continuous integral part of a rodent control programme. Proc. 6th Vertebrate Pest Control Conference. (Anaheim, Ca.) pp. 150-160.