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CONTROL OF AGRICULTURAL RODENTS THROUGH THE SUSTAINED BAITING METHOD

FERNANDO F. SANCHEZ
National Crop Protection Center
University of the Philippines at Los Baños
College, Laguna, Philippines

RUSSELL F. REIDINGER, JR.
U.S. Fish and Wildlife Service, Denver Wildlife Research Center
Section of International Programs
Bldg. 16, Federal Center, Denver, Colorado 80225.USA.

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ABSTRACT

Sustained baiting program in the Philippines evolved from several field tests that proved effective in protecting rice crops from rat damage. Developing a workable baiting procedure needs understanding of the pest's bionomics, particularly its behavior. This modified continuous baiting requires only a small part of the farmer's activities, about 10 weeks during a crop season. Beyond 4 WAT, maturing grains are more attractive to rats than any bait offered. The method features the use of anticoagulant rodenticides, continuous baiting 3 to 4 WAT, proper bait placement and periodic adjustments. The advantage of sustained baiting is expressed in terms of its minimal cost, efficient control, and relative safety to man and his environment.

INTRODUCTION

Rodents constitute one of the major pest problems of Philippine agriculture. We have had repeated outbreaks in the past and in certain instances, rats have threatened people with starvation due to widespread devastation of food crops.

More than five years of testing by the Rodent Research Center have established the usefulness of a baiting method, commonly called sustained baiting, in protecting growing rice from rat damage under various ecological conditions. The sustained baiting method is characterized by the continuous use of anticoagulants along with specific bait station design and placement patterns in the ricefield habitat. In this paper, we will trace the events leading to the development of the sustained baiting method as presently recommended and used in Philippine national rice production program called Masagana '99. Much of the information presented here were taken from the 1971 to 1976 Annual Reports of the Rodent Research Center.

BACKGROUND STUDIES

Damage Surveys

National damage surveys on rice crops near harvest covering a period of several years (1970 to 1972 and 1974) have been conducted through the collaborative efforts of the Rodent Research Center and the Department of Agriculture's Bureau of Plant Industry. These surveys have established the provinces with high damage potential, and that the overall tiller cutting average near harvest was about five percent. While we have not established an accurate translation of damage index on growing rice to yield reduction, a yearly loss projection of 10 percent would appear reasonable. This loss approximation would include early damage which are no longer apparent near harvest when cut tillers are counted.

Biosystematics

A great deal of work went to the biosystematics of Philippine rats in order to identify the major damaging species and gain insight into their biology, ecology and behavior. This information is vital to the development of appropriate control measures.

Out of the 30-odd species of Philippine rodents we know now, only four are of major importance to the country as agricultural pests (Barbehenn *et al.*, 1973). Particularly common as pests of rice are *Rattus rattus mindanensis* and *R. argentiventer*, the latter being found primarily on the islands of Mindanao and Mindoro. The two other species are *R. exulans* and *R. norvegicus*. Our current control recommendation has been tested in fields where *R. r. mindanensis* and *R. argentiventer* are the most common species, and provided effective results in both situations.

Rat harborage

An understanding of rat habitats or harborages is quite crucial in developing any control method against rats. Studies have shown that uncleared areas bordering ricefields serve as sanctuaries of rats between rice crops and a good control program should recognize this consideration. Quite often, croplands cleared of rats are quickly reinvaded, which may lead farmers to conclude that attempts at control are futile.

Rat Movement Patterns

Radio telemetry studies indicated that rats under relatively undisturbed situations or under sparse vegetative cover movement may extend up to 250 meters from capture location. This finding explains our results showing the applicability of the sustained baiting method even under small farm situations. It was widely believed that baiting with anticoagulants would not work unless done on a community-wide basis. This has now been shown to be not only really necessary. Farmer action on his own initiative can protect his rice crop from damage using sustained baiting, as demonstrated by the results of several field trials.

Baiting Procedures

The development of a workable baiting procedure would largely be dependent on a clear understanding of the pest's bionomics, particularly the aspect of behavior. Our studies have shown that rats manifest characteristic damage (cut tillers) at relatively low and high density population levels. When populations are low, damage tends to occur along dikes but when population is high, damage appears in the interior of the paddy. The tiller cutting behavior of the rats are more pronounced during the vegetative growth stages of the rice plant. When rice heads begin to ripen there is marked reduction in the tiller-cutting activity of rats as they now feed on the maturing grains.

The use of an infrared-TV camera has proved to be a boon in our study of rat behavior at night under field conditions, specifically their interaction at feeding sites and how various types of feeding containers and how they are laid out in the field influence bait consumption. Information gained from these studies has helped us in developing and evaluating several of the critical features of the sustained baiting method, including the placement of bait stations on the dikes and in the paddy, and the geometric adjustment of bait stations at feeding points.

Toxicological Evaluations

Results of relatively extensive laboratory evaluations of anticoagulant poisons have established that locally available materials such as warfarin, diphacinone, chlorophacinone, coumachlor and coumatetralyl are about equally effective at recommended concentrations for practical purposes. It would seem that the choice for a particular material would be determined largely by availability and cost.

Although at present we do not have any reason to suspect the existence of anticoagulant resistance (particularly warfarin) in the country, it is quite reasonable to expect that with widespread use, the same thing that happened in Europe and the United States will be repeated here. This points to the need for a continuing testing program to identify toxicants that could be used as replacements, and the development of efficient monitoring and surveillance programs.

In any rodent control program revolving mainly around the use of rodenticides, the question of using acute or chronic toxicants presents itself. We have tested the use of these two types of toxicants over a period of many years in baiting programs to protect growing rice from rat damage. Our early evaluations centered on the use of an acute toxicant (zinc phosphide) mixed with cereal baits. Baits are placed in small piles along paddy

dikes or near burrows, in attempts to control these pests under small farm situations. Results of our evaluations indicate that it is practically useless in protecting the rice crop, even with carefol prebaiting for three successive days before commencing exposure of the poisoned bait. The rats soon become "bait shy" and will not feed on the poisoned bait, and fields are quickly reinvaded by rats from the surrounding areas.

In 1971, we began to evaluate chronic toxicants (anti-coagulants) in bait preparations for protecting growing rice from rat damage. In marked contrast with our experience with zinc phosphide, an acute toxicant, our results with the use of anticoagulants were successful that year. From that time onwards, one refinement led to another until we have the sustained baiting method as presently recommended. While we are not the first to recommend the use of anticoagulants to protect growing rice, the manner in which it is recommended for use in sustained baiting is indeed a new development and a new contribution in rodent control.

HIGHLIGHTS OF SUSTAINED BAITING

The sustained baiting method, a modified form of continuous baiting, calls for a definite but relatively short period of activity on the part of the farmer, usually about 10 weeks during a crop season when damage would be greatest. The baiting program begins soon after transplanting to as late as 4 weeks after transplanting (WAT) and ends when the grains begin to mature. Beyond this period, there is no longer any need to bait as the maturing grains are more attractive to the rats than any bait you can offer.

Critical features of the sustained baiting method include: use of anticoagulant rodenticides; continuous baiting from about 3 to 4 WAT until the crop matures; placement of bait stations at about five feeding points per hectare which are located in paddies, not on dikes; and periodic adjustment of numbers of bait stations at each of the feeding points according to the intensity of rat activity.

The magnitude of operation involved in continuous baiting and in organizing groups of farmers is quite a serious drawback of the method. Because of small farm size (1-2 ha) in the Philippines and most parts in Southeast Asia, organizing farmers into working units could prove very difficult. With sustained baiting, we have shown that individual farmers applying the method in small farms could protect his crop from damage economically (less than US$.7/hectare). In fact the benefits of control extends beyond his farm, benefiting his neighbors as well. When everyone becomes involved in sustained baiting, cost and control efficiency is improved.

Sustained baiting is not only effective, economical and practical in preventing crop damage but also meritorious when measured along the lines of such parameters as relative safety to humans and adverse effect to the environment.