Bibliographic Data Sheet

1. Subject Classification INSECTS AND PESTS	2. Publication Number PN-AAA- 429
3. Title and Subtitle COMPARISON OF THREE BAITING METHODS FOR PHILIPPINES RICEFIELD RATS	
4. Author(s) F. NELSON SWINK et.al.	5. Report Date JANUARY 1973
6. Number of Pages 7 PAGES 9	7. ARC Number ARC-No. (RP-632.693233-S978)
8. Performance Organization Name and Address U.S. DEPARTMENT OF INTERIOR FISH AND WILDLIFE SERVICE DENVER, COL. 80225	
9. Supplementary Notes: (e.g. Sponsoring Organization, Publishers, Availability)	

10. Abstract

Three methods of baiting ricefield rats (Rattus rattus mindanensis) were tested on a 240-hectare rice-growing area in Central Luzon. A standard baiting of 0.75% zinc phosphide on broken rice during the dry season, a modified baiting of zinc phosphide and corn oil on whole rice during early booting of the rice crop, and a baiting of broken rice and diphacinone, an anticoagulant, during late booting and early flowering all reduced rat populations (as shown by live-trapping) in comparison with untreated areas. However, rat damage to rice was neglibible (less than 2%) throughout the study on both treated and untreated areas, and did not correlate with trapping results, indicating the need for further work on the relationships between rat density and rice damage.

11. Descriptors Luzon, zinc phosphide, diphacinone, anti-coagulant	12. Project No. 931-17-190-473
	13. Contract No. PASA-RA(ID)1-67
	14. Type of Report Research Bulletin

COMPARISON OF THREE BAITING METHODS FOR PHILIPPINE RICEFIELD RATS[1]

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Three methods of baiting ricefield rats (*Rattus rattus mindanensis*) were tested on a 240-hectare rice-growing area in Central Luzon. A standard baiting of 0.75% zinc phosphide on broken rice during the dry season, a modified baiting of zinc phosphide and corn oil on whole rice during early booting of the rice crop, and a baiting of broken rice and diphacinone, an anticoagulant, during late booting and early flowering all reduced rat populations (as shown by live-trapping) in comparison with untreated areas. However, rat damage to rice was negligible (less than 2%) throughout the study on both treated and untreated areas, and did not correlate with trapping results, indicating the need for further work on the relationships between rat density and rice damage.

The Philippines and other nations in Southeast Asia have for many years sustained sizeable losses on standing rice crops by rats (Crucillo et al., 1954). The Bureau of Plant Industry of the Department of Agriculture and Natural Resources in the Philippines is responsible for carrying our programs designed to reduce crop losses caused by rats. Over the years, the Bureau's Plant Pest Control Division has developed a system of large scale dry season rat control that affords a reduction of at least 70% of the 1967 rat populations, (Sumangil, 1967). However, the effect is usually short lived, presumably because there are sufficient numbers of surviving rats to repopulate the treated areas before harvest of the next rice crop (Alfonso et al., 1966). Modification of these methods appeared desirable and this study, a preliminary comparison of three baiting techniques, was undertaken as an initial step toward developing improvements and increased efficiency of Philippine rat control technology.

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MATERIALS AND METHODS

The study was conducted in 1969 on a 240-hectare area at Barrio Recuerdo, Nampicuan, Nueva Ecija, in Central Luzon, a rainfed rice-growing region. Varieties of rice grown on the study area were C-4, BE-3, IR-5, 12-36, Kennedy, and Raminad. The Maligaya silt loam, found in the area, is a moderately fertile soil which responds well to nitrogen and phosphorus but not to potassium. The study mainly involved the ricefield rat, *Rattus r. mindanensis.*

The study area was divided into eight 30-hectare plots each randomly assigned to one of four treatments; 100-meter buffer zones were included in each plot to reduce interchange of rats between plots (Fig. 1). Three days before each treatment, four traplines of 15 live-traps each, spaced at 25-meter intervals, were set on or along dikes in each plot (Fig. 1). The lines were separated by at least 75 meters. Traps were set for three consecutive nights; all captured rats were ear-tagged, sexed, aged, and released. Five days after each treatment, the traplines were again set and the same procedure was followed.

Plots I, III, V, and VII were baited in late March, during the dry season, using the current procedure of the Bureau of Plant Industry. Farmers baited dry paddies at 10-meter intervals with binlid (rice shorts) and rice bran treated with 94% zinc phosphide at about 0.75% by weight; in addition, bait was placed at entrances of active burrows. Each bait site contained about 8 g of treated binlid; about 2 kg of bait was used per hectare. Plots III and V were further treated in late October and early November, when rice was booting and flowering. A mixture of 19 parts freshly ground binlid and one part of one percent diphacinone (2-diphenylacetyl-1, 3-indandione) was exposed in four hundred 15-inch bamboo tubes which were alternately placed 15 meters apart on the sides of dikes in each plot. The bait (about 60 g per tube initially) was replenished every other day for 14 days.

Plots IV and VI were treated with a modified zinc phosphide bait in early October, when rice was beginning to boot. Banana leaf "torpedos", containing five grams of whole polished rice (variety C-4-63), treated with zinc phosphide at about 0.70% by weight and 0.5% corn oil by weight, were placed at five-meter intervals on top of dikes (Fig. 2). This application resulted in about 0.25 kg of treated bait per hectare. Plots II and VIII were left untreated as references.

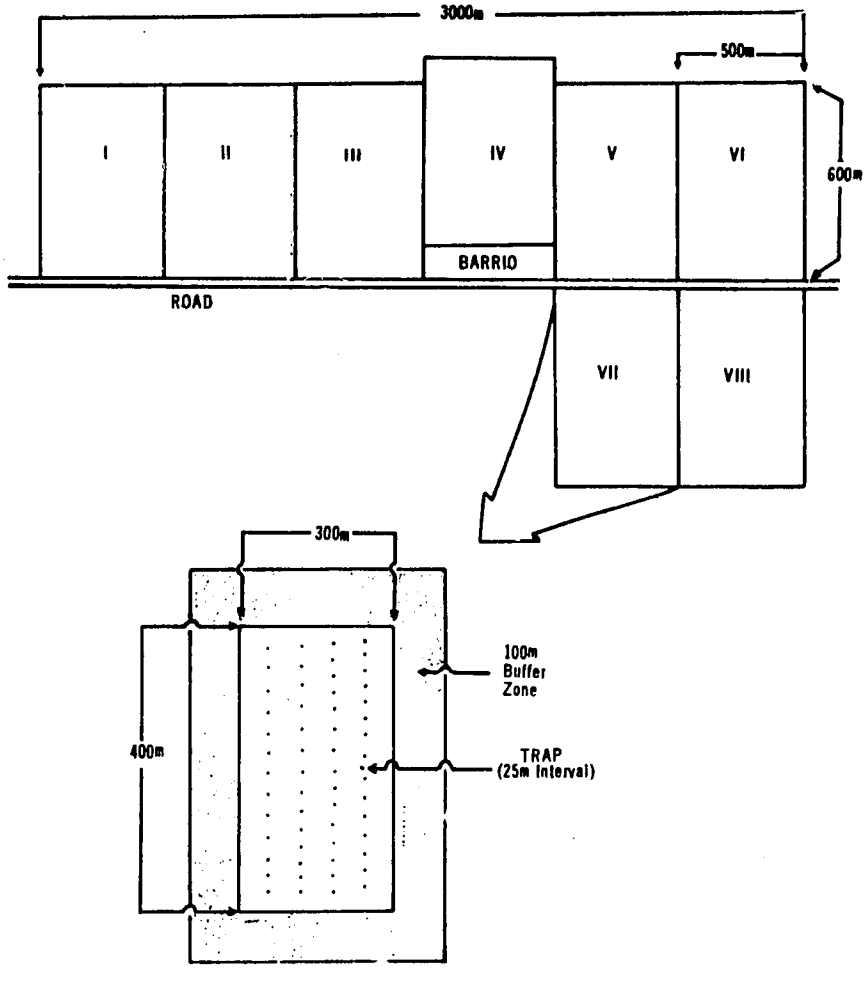

Figure 1. Design of the Barrio Recuerdo Study Area.

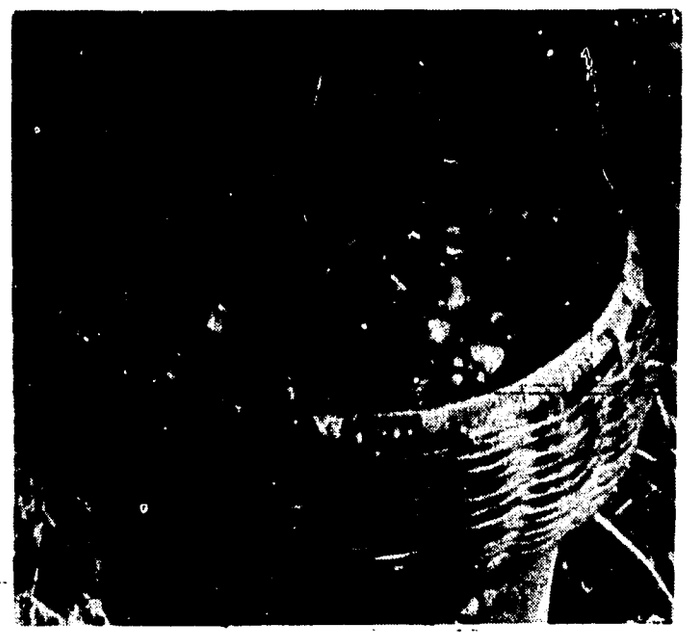

Figure 2. Banana leaf torpedoes used during modified treatment.

To determine the effect of the zinc phosphide bait on individual animals, limited radio-tracking studies were conducted on Plots I, VI, and VII. Rats were live-trapped, fitted with 0.5-watt miniature 30 MHz transmitters, described by Corner and Pearson, (1972), and released at the point of capture within 24 hours before baiting. Animals were then monitored for five days after baiting (Fig. 3).

Damage estimates were computed for five randomly selected paddies on each plot by counting rice tillers damaged in 10 hills within each of 10 rows. Measurements were made in October (before and during booting) on all plots, and in late November (immediately before harvest) on plots IV, VII, and VIII; early harvesting prevented final surveys on the other five plots.

Figure 3. Rat with a miniature transmitter attached. Protective cover was removed to show details of transmitter.

RESULTS AND DISCUSSION

Baiting results, as indicated by rats live-trapped before and after treatment, are summarized in Table 1. Recaptures averaged 6.9%, and showed no evident pattern between treatments. Although the standard and modified zinc phosphide treatments produced about the same indicated reduction in rats, the modified treatment did not appear practical because of the excessive labor required to prepare nearly 4000 torpedo baits. Because of the recovery potential of rodent populations, the timing chosen for baiting with the modified method (during booting) may be a better choice for crop protection than during the dry season, but supportive data are lacking. The diphacinone treatment, during late booting and early heading, was not conclusive because few animals were on the test plots.

Radio-tracking studies were conducted during and immediately after baiting of the two standard zinc phosphide plots (I and VII) and one modified zinc phosphide plot (VI). On plots I and VII, 20 animals were fitted with transmitters, but signals of five were not detectable before baiting. Of the remaining 15, 11 (73%) were recovered dead or presumed dead (did not move for three consecutive days after treatment) and four survived. Nine of the 15 test animals moved 50 meters or less from their original capture sites; however, two adult females were found dead at distances of 350 and 400 meters from the points of initial capture. On plot VI, 13 rats were instrumented, but five signals were not detectable

before baiting. Of the remaining eight, six (75%) were either recovered dead or presumed dead following treatment, and two survived. The longest recorded movement during this period was 300 meters, but the average range was 175 meters, considerably greater than the range during the dry season. However, it may be that longer movements occur during the wet season or that animals are disturbed by the procedure and behave abnormally.

Damage surveys of the plots were intended as a long-range evaluation of crop protection. Damage, however, was very slight before booting (Maximum, 0.3% on plot V, and not much greater in later stage (maximum during booting, 1.7% on plot V; maximum just before harvest, 1.1% on plot VII). Plot IV showed no damage at any of the three sampling periods. In addition damage measurements did not correlate with trapping results; the highest damage recorded was on the two diphacinone plots, which showed the greatest reduction in rats trapped after treatment. These results indicate a need to examine more closely the relationship between animal density and damage.

Table 1. *Summary of live-trapping results before and after three baiting treatments*

Treatment	Plots sampled	Rats Captured Before Baiting	Rats Captured After Baiting	Percent Reduction**
Standard zinc phosphide (Mar. 25)	I, III, V, VII	173	46	75
Reference	II, IV, VI, VIII	181	145	20
Modified zinc phosphide (Oct. 5)	IV, VI	28	5	82
Reference	II, VIII	33	34	— 3
Diphacinone (Oct. 22, Nov. 3)	III, V	19	0	100*
Reference	II, VIII	33	40	—23

* The diphacinone treatment during late booting and early heading was not conclusive because few animals were on the test plots.

** The authors do not assume that changes in trap success correlate directly with absolute population changes.

ACKNOWLEDGMENTS

This cooperative research was conducted with funds provided by the U.S. and Philippine Governments. United States Government funds were provided to the U.S. Bureau of Sport Fisheries and Wildlife by the Agency for International Development under the project Control of Vertebrate Pests: Rats, Bats, and Noxious Birds, PASA RA (ID) 1-67. Philippine Government funds were provided by the National Economic Development Authority, the Bureau of Plant Industry, and the University of the Philippines, College of Agriculture. We thank the staff of the Rodent Research Center for their help in conducting the study.

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