

## SURVEY OF TUNGRO AND OTHER VIRUS DISEASES IN THE CENTRAL REGION OF SRI LANKA

I. D. R. PERIES, G. A. W. WIJESEKERA, C. M. BANDARANAYAKA  
*Central Agricultural Research Institute, Peradeniya, Sri Lanka*

Unusual yellowing of rice leaves was observed in the last few years in many parts of Sri Lanka. A yellowing disorder occurred in an epidemic form in Hambantota District in the 1984 *Yala* season. Alerted by this epidemic we conducted a preliminary roving survey of yellowing malady in the central region of Sri Lanka in the 1984/85 *Maha* season. Rice fields were surveyed every 5 km along the main roads of the region. The region includes the administrative districts of Kandy and Matale. Age, variety, level of crop management, and any unusual yellowing condition were noted for each location. At each field visited green leaf hopper (GLH) density was assessed by collecting insects in ten 180° sweeps with a 50 cm diameter net. Ten hills were selected randomly in each field for observation. If there were unusual yellow patches in the field the ten hills were chosen in the patches. The second youngest leaf/tiller, and five leaves/hill were selected and subjected to the starch accumulation test using a 0.2% solution of iodine in potassium iodide.

A few plants of which leaves that gave intense darkening at the cut end were brought to the laboratory and used for transmission test with GLH. Rice varieties Bg 94 — 1 and Bg 379 — 2 were used as test plants. Forty-two leaves that were positive to  $I_2$  test, plus three leaf samples that did not show any darkening, were subjected to ELISA\* for the presence of rice tungro bacilliform virus (RTBV), rice tungro spherical virus (RTSV), grassy stunt virus (GSV), and ragged stunt virus (RSV). The results indicated that 53% of the field samples were infected with GSV, 49% with RSV, 58% with RTSV and only 4% with RTBV. Typical symptoms of any viruses were not observed during the survey. This could either be due to late infection of the plants, or due to viruses being latent in them. The yellowing disorder observed in the field could not be transmitted in glasshouse *via* GLH. This does not eliminate tungro disease altogether since RTSV is known to be asymptomatic in the Philippines. We suspect that the widespread yellowing disorder observed in our survey was due to a severe strain of GSV. Our results also showed that the reliability of  $I_2$ -test is in doubt, since 16 locations were  $I_2$ -positive yet no RTBV nor RTSV was detected in the leaf samples. This preliminary survey confirmed for the first time the presence of RTBV and RTSV in Sri Lanka.

\* ELISA = enzyme-linked immunosorbent assay

Table 1. Occurrence of green leaf hoppers and rice virus diseases in the central region

<i>KANDY DISTRICT</i>							<i>MATALE DISTRICT</i>						
<i>Location</i>	<i>I<sub>g</sub> test</i>	<i>GLH density (no.)</i>	<i>RTBV</i>	<i>RTSV</i>	<i>RSV</i>	<i>GSV</i>	<i>Location</i>	<i>I<sub>g</sub> test</i>	<i>GLH density (no.)</i>	<i>RTBV</i>	<i>RTSV</i>	<i>RSV</i>	<i>GSV</i>
Pilimalawa	+	13	—	+	—	—	Udaththwa	+	09	—	+	—	+
Kadugannawa	+	06	—	+	—	—	Yatawara	+	06	—	+	+	—
Madawela	+	20	—	+	—	—	Matale	+	06	—	—	+	+
Yatirawana	+	13	—	+	+	—	Bodikotuwa	+	70	—	+	—	+
Wattegama	+	08	—	—	+	—	Rattota	+	16	—	—	—	—
Kahalla	+	11	—	+	—	—	Hunukete	+	20	—	+	—	—
Ampepitiya	+	06	—	—	—	+	Narangolla	+	75	—	+	—	—
Arambepola	+	16	—	—	—	+	Kuruwewa	+	88	—	+	—	—
Doluwa	+	20	—	+	+	+	Udupihilla	+	26	+	—	—	+
Ganegoda	+	17	+	—	—	+	Mandandawela	+	27	—	+	—	+
Kalugoda	+	26	+	+	+	+	Walawela	+	65	—	+	—	+
Bulugahapitiya	+	02	—	—	+	—	Deewilla	+	37	—	—	—	—
Diyabubula	—	09	—	+	+	+	Mahawela	—	18	—	—	—	+
Podiwela	+	26	—	+	+	+	Paldeniya	+	40	—	—	—	+
Mahawela	+	01	—	+	+	+	Kobbehara	—	14	—	+	+	—
Urugala	+	12	—	+	+	+	Kobbehara	+	NA*	—	+	+	—
Hunnasgiriya	+	17	—	+	—	+	Enakalpota	+	16	—	—	+	—
Hunnasgiriya	+	NA*	—	+	+	—	Ellawela	+	10	—	+	+	+
Madugoda	+	35	—	+	+	+	Talatiriyagama	+	32	—	—	+	+
Kovilmada	+	40	—	—	+	—	Pallegama	+	20	—	—	+	+
Madaketiya	+	06	—	+	+	—	Kaakawela	+	06	—	—	—	—
Hasalaka	+	06	—	—	—	—							
Hasalaka	+	76	—	—	+	+							
Hasalaka	+	NA*	—	—	—	+							

\*NA = not available

## ACKNOWLEDGEMENT

The authors wish to express their thanks to Dr. H. Hibino for critical reading of the manuscript, and to the International Rice Research Institute, for carrying out the ELISA.

## RESEARCH NOTE

### Acceptability of rodenticide-bait impregnated wax blocks for rat control in rice fields in Sri Lanka

*I. D. R. Peries, Entomologist, Division of Entomology,  
Central Agricultural Research Institute, Peradeniya; and  
M. Nillegoda, Agricultural Instructor, Plant Protection Service, Peradeniya.*

The rice field mole rat, *Bandicota benghalensis* (Rodentia: Muridae) is one of the important pests of rice in Sri Lanka. Anti-coagulant chronic rodenticides of the coumatetralyl group are recommended by the Department of Agriculture against this vermin. The current recommendation is to use the 0.05% dust formulation administered *via* any acceptable bait.

Some rodenticides are presently manufactured as a mixed bait impregnated in paraffin wax. These are in blocks, cubes, cylinders, pellets or flakes ready for field application. Such ready-made rodenticide-bait wax blocks obviate the need for measuring out the correct proportions of the mixture. Chief advantages of using such wax blocks are the ease of application, and their enhanced stability under different climatic conditions.

A simple non-replicated field test was carried out in Maha 1985/86 to evaluate the acceptability of two such rodenticide impregnated wax blocks. The product Klerat<sup>(R)</sup> contained brodifacoum (0.005%), and Racumin<sup>(R)</sup> contained coumatetralyl (0.0375%). Wax blocks containing only the cereal grain bait were used in the control plot.

A 5 ha rice field with a recent history of extensive rodent damage was selected at Aladeniya near Kandy. The experiment consisted of three adjacent plots about 1 ha each. Baiting stations were established 15m apart along the field bunds. Each baiting station consisted of a c. 40cm long, c. 10cm diameter piece of hollow bamboo. Each piece was held firm on the side of the bund, about 15cm above water level, with four pegs driven into the bund.

Baiting commenced about 5 weeks after transplanting. All stations were prebaited initially with four blank bait cubes (5g each) of the type used in the control plot. Observations made during the first ten days of prebaiting indicated gradually increasing rate of acceptance of the cubes

offered. By the tenth day of prebaiting the rate of acceptance was 100% in all three plots. Active cubes were introduced at the second charge and observations were made 3 or 4 days later. Number of missing cubes were noted and replaced with new cubes. This procedure was adopted until the rate of acceptance dropped very low and thereafter observations were made weekly.

Damage to the crop was assessed only once during the earhead ripening stage by direct counts of the gnawed tillers. One hundred hills were chosen at random in each plot and the number of damaged and undamaged tillers were recorded. Estimations of tiller damage and crop loss were computed as follows :

$$a. \text{ Tiller damage (\%)} = \frac{\text{Number of damaged tillers}}{\text{No. of damaged + undamaged tillers}} \times 100$$

$$b. \text{ Crop Loss (\%)} = \frac{\text{No. of damaged hills} \times \text{No. of damaged tillers}}{\text{No. of damaged tillers + undamaged tillers.}}$$

## RESULTS AND DISCUSSION

Overall acceptability of the baits were 64.6, 70.0 and 91.8% for brodifacoum, coumatetralyl and the control cubes respectively (Fig. 1). Unpoisoned cubes were fed upon throughout the experiment maintaining an overall 95% rate of acceptance, disregarding the last observation. Both poisoned cubes exhibit a cyclical pattern of high and low acceptances. During the first seven days of poison-baiting the rates of acceptance were very close to that of the control plots. This dropped very sharply over a period of three days to 40% for coumatetralyl, and more gradually over ten days to about 20% for brodifacoum. Low activity phases may be due to bait-shyness, but are more probably the result of death of rats in the immediate vicinity of poison-baiting. Rat carcasses were found by the authors and by the farmers during the study. Farmers also reported at least three domestic cats killed during the same period. It is highly probable they died after feeding on poisoned rats. It is also very likely that some other dead or dying rats were removed from the test area by scavenging animals.

## RODENTICIDE-BAIT IMPREGNATED WAX BLOCKS

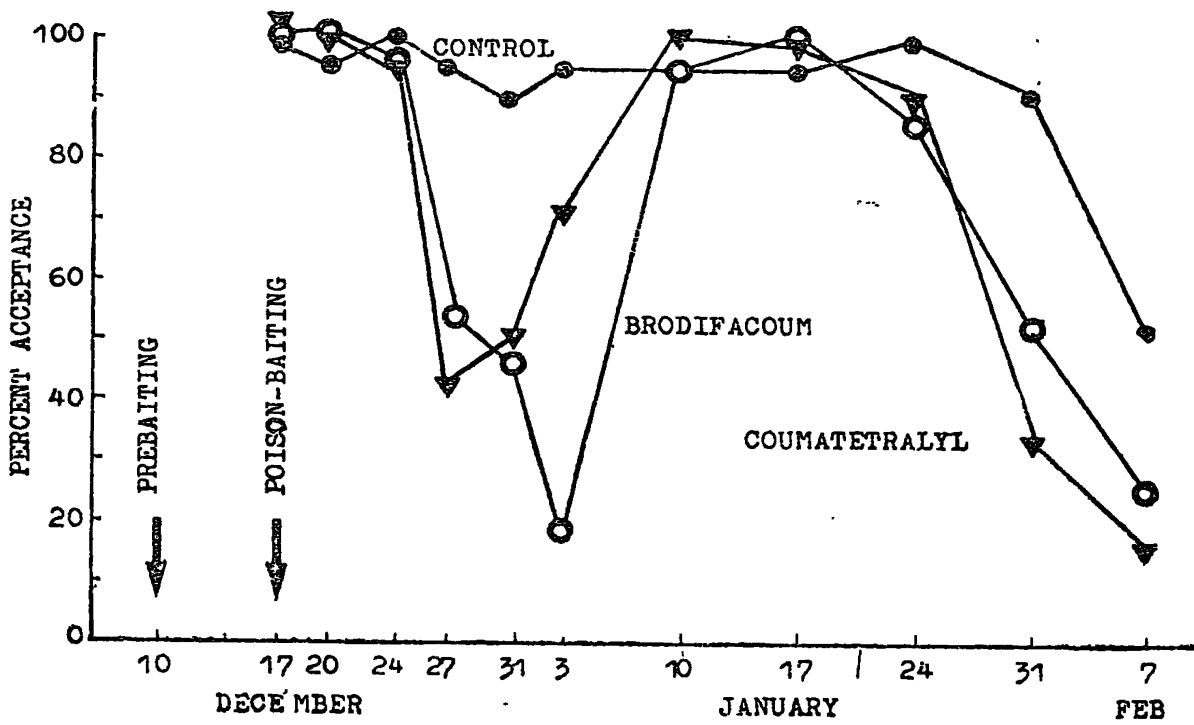
Second high acceptance phase indicates immigration of rats from the adjacent check plot and/or surrounding fields, uncultivated land, channel bunds, drainage ditches, road embankments, etc. Acceptance of poison-baits during this period of two weeks was almost as high as for blank cubes. Bait acceptance dropped to 16.1, 21.9 and 53.6% for coumatetralyl, brodifacoum and check plots respectively when the experiment was terminated during the panicle ripening stage (first week of February).

Low acceptance of blank cubes during the first week of February stands in contrast to the high acceptance of the same between December 24th and January 10th. The latter indicates an initial high population of rats in the field. This acceptance dropped to a relatively low level towards the end of the crop indicating a successful reduction in rat numbers in the entire experimental area.

An attempt was made to evaluate this reduction in rodent population by estimating tiller damage and crop loss. Results are thoroughly inconsistent with the levels of bait acceptance and the discrepancy is attributed neither to the rodenticide efficacy nor to rat population. Evidently it is not possible to arrive at any firm recommendation based on the results of this unreplicated experiment. Acceptance of coumatetralyl is apparently equal to that of brodifacoum. Yet this experiment alone is insufficient to arrive at a valid conclusion, considering the mobility patterns of a rodent population and the unexplained inconsistency of the rodenticide efficacy data.

Rice fields attacked by rats usually have large patches of damaged plants in the middle of the fields. The authors found no such symptoms in the test area. Co-operating farmers too unanimously vouched for the severe reduction in crop damage during that cultivation season. Nevertheless, considering the past history of the paddy tract, high rate of bait acceptance during the experiment (both indicating sizeable rat population), and the relatively low level of crop loss observed in the experimental area, one could infer that more detailed experiments need to be conducted to determine the efficacy of the two products. It would be logical to continue this simple experiment as a statistically replicated one. Unfortunately such an experimental protocol calls for a 50 ha plot per treatment with 5 ha census area. The authors believe that such a large extensive experiment would not be possible within their geographical region, nor feasible with the resources available to them.

Fig. 1. Percent acceptance of wax impregnated rodenticide formulations.



**National Digitization Project**

***National Science Foundation***

Institute : Department of Agriculture

1. Place of Scanning : Department of Agriculture, Peradeniya

2. Date Scanned : 2018/01/20

3. Name of Digitizing Company : Sanje (Private) Ltd, No 435/16, Kottawa Rd,  
Hokandara North, Arangala, Hokandara

4. Scanning Officer

Name : N. S. Karunaratna

Signature : Silhana

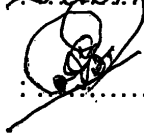
Certification of Scanning

*I hereby certify that the scanning of this document was carried out under my supervision, according to the norms and standards of digital scanning accurately, also keeping with the originality of the original document to be accepted in a court of law.*

Certifying Officer

Designation : Chief Librarian

Name : Saumya Upamalika

Signature : 

Date : 2018/01/20

*"This document/publication was digitized under National Digitization Project of the National Science Foundation, Sri Lanka"*