Evaluation of bait uptake by ricefield rats using Rhodamine B as a bait marker under enclosure conditions

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Abstract

Oral delivery of fertility control agents requires information on rates of bait consumption by the target species. In this study, the consumption of cereal bait by wild ricefield rats (*Rattus argentiventer*) was assessed under enclosure conditions using Rhodamine B (RB) as a bait marker in two baiting rounds. Total bait consumption increased during the first 4 to 5 days of the initial feeding period. After the first round of RB application, high proportions (84.6-100%) of animals were consuming baits in all enclosures. The average daily consumption per individual was around 10.5g/100g body weight. Similarly, following the second round of RB application (14 days after the 1st round) high proportions (93.8-100%) of animals were consuming the bait, and the average daily consumption per individual of 9.8g/100g body weight. The acceptance of bait with respect to sex was not significantly different ($p > 0.05$) between male and female rats.

Keywords: bait-marker, bait uptake, enclosure, *Rattus argentiventer*, Rhodamine B

Introduction

Ricefield rats (*Rattus argentiventer*), one of the most important pests in rice production areas in SE Asia, are considered a potential target for the application of fertility control (Jacob et al., 2008). The efficacy of an orally delivered anti-fertility agent in the field depends largely on bait acceptance by the target species. Trials to assess bait consumption under field conditions can help to define the parameters for effective delivery of anti-fertility agents in baits. This study was conducted to assess the bait uptake of wild ricefield rats using Rhodamine B as a bait marker under enclosure conditions.

Materials and methods

This study was conducted at the Indonesian Centre for Rice Research at Sukamandi, West Java, using 3 enclosures (25 m x 50 m), which were under fallow conditions. Water was freely available, the soil was moist and weeds were allowed to grow during the course of the experiment. Ricefield rats were caught from the fields, and weighed, sexed and tagged before release into the enclosures (24 females, 16 males per enclosure). The bait used in this study had been defined from a series of laboratory trials and contained 25% vegetable oils, 5% sugar, 10% broken rice, 30% wheat flour, and 30% rice flour. After preparation, this bait was coated with Rhodamine B (0.3% w/w). In each enclosure, 18 bait stations (covered plastic boxes, 30 cm x 21 cm x 12 cm) were employed. Initially, rats were acclimatized for 3-4 days with unhulled rice available in the bait stations. The cereal bait was then offered and uptake monitored until the daily consumption reached an asymptote (>5 days). After that, bait coated with RB was offered overnight. To obtain an estimate of the proportion of animals consuming bait (Eberhard, 1982; Cowan et al., 1987), approximately 50% of the animals from each enclosure were caught (population sampling) and killed to collect whiskers for detecting the presence of RB. The remaining animals were fed with cereal bait again for another 4 days, and daily bait consumption was recorded. For 2 enclosures, a second round of RB application was then conducted. At the end of the experiment, all animals were caught and killed to collect whiskers for RB detection using a fluorescence microscope. The method of RB detection in whiskers was as described by Fisher (1998).

Results

The daily bait consumption by ricefield rats increased during the first 4 to 5 days of the feeding period and reached an asymptote thereafter. As expected, after population sampling to remove animals, bait consumption by the remaining animals sharply declined in all enclosures. After the first round of RB exposure, analysis of RB bands in whiskers indicated high proportions of animals (84-100%) were consuming baits in all enclosures. The average daily bait consumption per individual was 10.5g/100g body weight. Following the second round of RB application in 2 enclosures, a higher proportion of animals (93.8-100%) were shown to consume RB bait and bait consumption per individual (9.8 g/100 g body weight) remained high. The acceptance of bait with respect to sex was not significantly different ($p > 0.05$) between male and female rats.

Discussion

Increases in bait consumption by ricefield rats occurred during the first 4-5 days of exposure in each enclosure. Similar increasing bait uptake over the first 5-8 days of exposure has also been reported in rabbits (Cowan et al., 1987). The initial rise in bait consumption may be due to all animals eating baits from the time of first exposure and thereafter increasing their consumption over time. Alternatively, it is possible that, over time, an increasing number of animals began to eat the bait. We are unable to determine which behavioural response is occurring in this study, but can conclude, on the basis of estimated quantities consumed per day once asymptote consumption was achieved, that the majority of rats were eating approximately 10% of their body weight per day.

As rodent species are known to exhibit neophobic responses (Barnett, 1958; Mitchell, 1976; Lund, 1988), increasing the exposure period to a new food could reduce the neophobic effect on feeding behaviour. Therefore it is important to understand changes in bait uptake in order to determine the optimal pre-baiting period that might be required prior to application of baits containing control agents. This will maximise the bait uptake by target species. In all enclosures, there were no differences in consumption of cereal bait alone and the cereal bait coated with RB (0.3% w/w). These results suggest that RB did not influence bait acceptance by ricefield rats, and therefore can be successfully used for further bait uptake studies in ricefield rats. The results from this study suggest that the tested bait was highly preferred by ricefield rats and therefore could potentially be used as a carrier of control agents.

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