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Biological Control of Rats (Rattus tiomanicus MILLER) Using Barn Owls (Tyto alba)

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ABSTRACT

The potential of barn owl, T. alba, as a predator of rats was considered by a number of authors (Medway and Young, 1970; Wood, 1985; Dukett, 1976,1980,1982,1984; Lenton, 1978, 1980a, 1980b, 1980c,1983,1984). Trials on the biological control of rats carried out at Tumuggi Perkasa Oil Palm Plantation, Air Moleh, Pekanbaru, Riau, since 1995, have proven that (i) T. alba is able to reduce the level of rat damage from 33 % to 0.14 %. (ii) The population growth of Talba is easily encouraged over a large area by the provision of relatively cheap nest boxes (US$10 - US$21 per box). (iii) The cost of biological control is 60,4 % cheaper than bait control. (iv) The management of biological control of rats is easier since the manpower required is significantly lower compare with that baiting control. (v) Biological control of rats maintains biodiversity, ecological balance and is environment friendly. Having now recognized T. alba is an efficient predator of rats in a large area of oil palms; the oil palm industry should, therefore, direct its efforts towards protecting them with suitable nesting sites which will ensure their population and distribution.

Key words: Barn owl, rat, oil palms

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INTRODUCTION

In oil palm plantations, rat (Rattus tiomanicus MILLER) is a serious pest that feed mainly on the ripe and unripe fruits of mature palms. Recently, they have adapted to feed on grubs of pollinating weevils (Elaedobius kamerunicus) that are developing on post anthesized palms by chewing at their bases in order to reach the apical growing points and feed on them.

Crop losses caused by feeding on the mesocarp of fruits by Rattus have been calculated to be about 5 % of the oil yield (Wood, 1976; Wood and Liu, 1978).

Rodenticides of the anticoagulant type of the first and the second generation (Eq; Klorgan, Warfarin, Bromadiolone) have been satisfactorily used to control rats (Wood and Nicol, 1973; Wood, 1976; Wood and Liu, 1984 a,1984b). However, the cost is not small and is environment unfriendly.

Biological control of rats using barn owls, T. alba, have been suggested by many authors (Medway and Young, 1970; Wood, 1985; Dukett, 1976,1981,1982,1984; Lenton, 1978, 1980a, 1980b, 1980c,1983,1984). There are several reasons why Tyto alba is the most efficient predator among natural predator of rats (Dukett, 1976, 1982).

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1. *T. alba* has superiority on the selective of rat species, *R. tiomanicus Miller*.

2. *T. alba* eats large quantity of rats (700-800 rats per annum) and breeds rapidly in response to a plentiful food supply.

3. The population development of *T. alba* is easily encouraged over a large area by the provision of suitable nest boxes as breeding site.

4. The spread of the barn owl was very closely related with the spread of the oil palm plantations.

The main approach of this trial is to control the population of rats below the economic threshold using *T. alba*.

**METHODS**

Tunggal Perkasa Oil Palm Plantation (PT TPP) which is located at Air Molek, Pekanbaru, Riau, was selected as a suitable area for establishment of the trial, since it previously had a history of fairly high rat population. A requirement for regular baits had been carried out on a regular six monthly basis in the area.

In this area six nest boxes were placed at a density of one box to every 30 Ha. The nest box should be situated in shade of tree canopy and the entrance door should face down the interrow to make the owls have a clear flight line. Any fronds interfering with the box should be pruned as this will help to keep any predators (e.g., snake) away.

In setting the box the floor must be dead level otherwise the eggs will roll into one corner and the adult will not be able to incubate them. A light layer of fibrous material may be placed on the floor of the box initially will help to prevent such eggs movement.

Initially, six pairs of adult *T. alba* were taken from Indonesian Oil Palm Research Institute (IOPRI), Medan and they are introduced into six nest boxes. The nest boxes utilized in this trial is originally designed by Lenton (1980b) with some modification on its pole (See App 1).

In order that *T. alba* may adapt to new nest boxes, they were put in the nest boxes for seven days and released them on day 8th. Four rats will be supplied in every nest box as their daily food source.

![Graph](image)

**Figure 1.** The number of *T. alba* and the intensity of *R. tiomanicus* Miller damage (%) at TPP (14,134,44 Ha) period 1996 – 2002.
Fresh bunch damaged by rat were observed to describe the effectiveness of rat control achieved at P.T. TPP. The rat damage census was recorded monthly and based on sampling of one plant per Ha. The same sample plants are used for each census.

The manpower required for the biological control of rats were counted.

The observation was carried out monthly to count the number of eggs and young birds as well as the biology of *T. alba*.

**RESULTS**

The initial population of *T. alba* was six pairs in 1996, and substantially increased every year until March 2002. The highest rate of increase was in the period of 1998 – 1999. After 1999, *T. alba* population was still increasing but tend to be level (Figure 1).

The intensity of rat damage was reduced from 33 % to 30 % by May 1998 and gradually reduced every month until reached to 3 % in November 1999 (Figure 1).

Comparison between the number of manpower required for biological control using *T. alba* and baiting control of rats is shown in figure 2.

![Figure 2. The manpower required for the biological control of rats compared with that bait control](image)

The number manpower required for rat control using *T. alba* is significantly lower compared to the normal baiting.

**DISCUSSION**

The trial carried out at P.T. TPP have proven that *T. alba* population could be substantially built up with the use of the nest box as a breeding site and its adequate management (Figure 1). Once, *T. alba* has selected its nest site becomes very attached to it and return to it each breeding season (Duckett and Karuppiah, 1990). Lenton 1980 found that the increase in population of *T. alba* was related to the increase in rat population since *T. alba* is a predator with a specific diet preference for rats, *R. tiomanicus*, in oil palm areas.

Rat damage reduced from 33% to 30% by May 1998. Then the intensity of rat damage reduce every month until a new low point (3 %).
was reached in November 1999. The drop in rat damage is directly related to the increasing population of *T. alba*, as no baiting rounds had been carried out since 1997.

At the population of adult *T. alba* 279 pairs and 96 young birds, the intensity of rat damage reduced below the economic threshold eq. 3%. Following a reduced of rat damage, that population of *T. alba* was maintained by transferring young owls from their parent nests to new nest boxes. Therefore, the population of *T. alba* is the area tends to be level after year 2000. The young birds were ready to leave their parents nest boxes at the age of 45 days, which were indicated by looting of the fluffy feathers on their head and chest. The area of oil palms where they had to release should have enough population of rats. The result showed that one pair of *T. alba* could control rats in the area of oil palms 30 – 50 Ha.

The manpower required for the biological control of rats using *T. alba* were significantly lower compared to that baiting control (Figure 2). To utilize *T. alba* as a predators of rats provided an easy management of rat control in term of:

1. The organization of the biological control of rats were small.
2. *T. alba* as a predator of rats gave more advantages than baiting control team eq:
   - *T. alba* had superiority on the selective target of rat species
   - *T. alba* regularly active to hunt rats as their food
   - *T. alba* could give total biological control of rats continuously as the natural breeding of them are easily encourage over a large area of oil palms.

**CONCLUSION**

Trials on the biological control of rats carried out at Tunggal Perkasa Oil Palm Plantation, Air Molek, Pekanbaru, Riau have proven that:

1. *T. alba* is able to reduce rat damage from 33% to 0.14%.
2. The population growth of *T. alba* is easily encouraged over a large area by the provision of relatively cheap nest boxes (US$ 10-US$21 per box).
3. The cost of biological control is 60.2% cheaper than bait control.
4. The management of biological control of rats is easier since the manpower required is significantly lower compare with that baiting control.
5. Biological control of rats maintains biodiversity, ecological balance and is environment friendly.

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**REFERENCES**


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DISCUSSIONS

Question:
I want to know how effective is *Tyto alba* as a predator of *Rat in oil palm plantation*.

Answer:
*Tyto alba* is an effective predator of Rats in oil palm plantation as:
1. *Tyto alba* has superiority on the selective of Rat species, *Rattus tiananicus* Miller.
2. *Tyto alba* rats large quantity of rats (700 – 800 rats per annum) and breed rapidly in response to a plentiful of food supply.
3. A pair of *Tyto alba* can control rats in 30 Ha of oil palms.
4. *Tyto alba* could give total biological control of rats continuously as the natural breeding of them are easily encourage over a large area of oil palms.

Question:
In your paper it is mentioned that *Tyto alba* is able to reduce the level of rat damage from 33 % to 0.14 %. As I know that the population growth of rats is increase rapidly and the level of rat damage 33 % is high. On the other hand *Tyto alba* eats only 3 – 4 rats per day. I wonder if one pair of *Tyto alba* could really control the population of rats under the economic threshold in 30 Ha of oil palms or not.

Answer:
Yes, one pair of *Tyto alba* could control the population of rats under the economic threshold in 30 Ha of oil palms. There are several reasons:
1. *Tyto alba* has superiority on the selective of rats species, *R. tiananicus*.
2. *Tyto alba* eats large quantity of rats (700 – 800 rats per annum) and also kills rats if the population of rats is high, even they do not eat them.
3. *Tyto alba* breeds rapidly in response to a plentiful food supply.
The Construction of Nest-Box for Tyto alba
(After Smal, Revised 1989 with some modification)