Preliminary

Estimate of Foraging Populations of Transferred Colonies of *Coptotermes formosanus* Shiraki (Isoptera : Rhinotermitidae)*[1]

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Among newly developed technologies for subterranean termite management in urban area, baiting system is widely accepted in some countries such as USA[1] and Japan[2]. Efficacy of bait application was determined by the survey of monitoring stations, and a triple-mark-recapture program was often applied as a non-destructive method to the estimate of foraging population and territory of subterranean termites such as *Reticulitermes speratus* (Kolbe)[3], *Reticulitermes flavipes* (Kollar)[4], *Coptotermes formosanus* Shiraki[5] and *Coptotermes gestroi Wasmann*[6]. In the current investigation two programs compared estimate of foraging populations of three colonies of *C. formosanus* : a conventional triple mark-recapture and a new triple mark-recapture using fast-marking method.

Transfer of *C. formosanus* colonies and installation of monitoring stations

Two colonies of *C. formosanus* (colony A and colony B) were transferred into the test site in Kagoshima Pref. on April 20, 2000. Two additional colonies (colony C and colony D) were also transferred on September 20, 2000. Monitoring stations consisting of four pine stakes (3×3×35 cm) were concentrically installed around the transferred colonies. Numbers of monitoring stations were 48, 52, 29 and 18 for colonies A, B, C and D, respectively. The stations were surrounded by corrugated board to attract termites and covered with unglazed pot to protect them from weather. Colony D was discarded from the experiment because no termite activity recovered after transfer. The three colonies were therefore used for the estimate of foraging populations prior to the application of baiting program.

Foraging population determined by a conventional triple mark-recapture

The first triple mark-recapture program was conducted with colonies A and B during September–November, 2000. Termites collected from a single station were fed on Nile Blue A-treated filter paper for a week, and released back to their original station. Recapture was conducted from every monitoring station where marked termites were present. This cycle was then repeated twice. Both

Table 1. Foraging population of colony B determined by a conventional triple-mark-recapture program.

Survey period	ith mark-recapture	M_i	n_i	m_i	Foraging population (mean±SE)
Sep. 20, 2000–Nov. 3, 2000	I	849	508	7	73,000±14,600
	II	1,283	400	6	
	III	1,669	615	13	

Table 2. Foraging populations of colonies A, B and C determined by a triple-mark-recapture program using fast-marking technique.

Colony	Survey period	ith mark-recapture	M_i	n_i	m_i	Foraging population (mean±SE)
A	Aug. 27, 2001–Sep. 26, 2001	I	760	112	5	14,200±10,200
		I	410	192	7	
B	Aug. 27, 2001–Oct. 2, 2001	II	588	830	5	60,300±14,700
		III	1,343	431	6	
		I	1,141	308	5	
C	Oct. 2, 2001–Oct. 31, 2001	II	1,393	231	2	84,200±34,500
		III	1,609	0	0	

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numbers of captured (n_i) and marked termites among captured termites (m_i) at each recapture and the total number of marked termite individuals (M_i) were recorded. Foraging populations (N) and standard errors (SE) were calculated from the following equation:

$$N=(\Sigma M_i n_i)/[(\Sigma M_i)+1],\ SE=N\{[1/(\Sigma m_i+1)]+[2/(\Sigma m_i+1)^2]+[6/(\Sigma m_i+1)^3]\}^{1/2}$$

Since it was impossible to collect enough termites from colony A for estimate due to the decreased activity of the colony, no data was obtained with this colony. Results are summarized in Table 1. The figure obtained with colony B was much smaller than earlier records[7,8], although it is uncertain whether such variation depends on colony age, seasonal fluctuation or depression of termite activity after transfer.

Foraging population determined by a triple mark-recapture using fast-marking technique

Following the survey of monitoring stations of colonies A, B and C in April 2001, the second triple-mark-recapture was conducted during August–October 2001 using fast-marking technique[9]. Termites collected from each colony were kept in petri-dishes without water until they lost 10% of their body weight and given filter papers moistened by aqueous solution of Nile Blue A (400 mg/l) for 24 hrs. Table 2 shows the summarized results of the second estimate.

Comparison of the results with colony B (Tables 1 and 2) suggests the feasibility of fast-marking for *C. formosanus*. As colony A was very active just after transfer and its activity suddenly declined since June 2000l, which was supported by the survey of monitoring stations, the result (Table 2) was not surprising. The results of colonies B and C are definitely much smaller contrary to our expectation based on the size of nest, although they are still alive and possibly recover their activity and grow later.

Conclusions

Although only a limited data would not allow us to draw definite conclusions, fast-marking method seems applicable to the estimate of foraging populations and territories of subterranean termites. This enables us to save time with a similar accuracy of a conventional technique by feeding termites on marked materials. Further trials are planned to examine the feasibility of fast-marking for other economically important Japanese subterranean termite, *R. speratus*.

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