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EFFICIENCY OF SUBTERRANEAN
BAITS FOR TERMITE SAMPLING IN EUCALYPTUS FORESTS

EFICIÊNCIA DE ISCAS SUBTERRÂNEAS PARA
AMOSTRAGEM DE TÉRMITAS EM FLORESTAS DE EUCALIPTO

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A B S T R A C T

In order to fit sampling methods of soil termites to silvicultural areas, subterranean baits were evaluated and compared along the four seasons, in eucalyptus crops in the South and Southeast regions of Brazil. Thus, Termitrap® baits were buried at 15 and 50cm deep for 30 and 60 days. Results showed that in the South, due to climatic and edaphic existing conditions, such baits are inefficient to sample soil termites. Nevertheless, in the southeast region, regardless of the depth in which the baits had been buried for 60 days, termites were trapped with varying frequencies, from 30% in Winter to 58% in Spring. Thus, in the eucalyptus forests of the Southeast region, Termitrap® baits could be used to monitoring the abundance of subterranean termites.

Key words: Isoptera, silviculture, soil termites.

R E S U M O

Visando adequar métodos de amostragem de térmitas de solo em áreas de silvicultura, foram avaliadas e comparadas iscas subterrâneas nas quatro estações

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do ano, em plantios de eucalipto no Sul e no Sudeste do Brasil. Para tanto, foram testadas iscas Termitrap® enterradas a 15 e 50cm de profundidade, durante 30 e 60 dias. Os resultados indicaram que, no Sul, pelas condições climáticas e edáficas existentes, tais iscas são ineficientes para amostrar térmitas de solo. No entanto, na região Sudeste, independente da profundidade, as iscas que permaneceram enterradas por 60 dias apresentaram térmitas com freqüências variando de 30% no inverno a 58% na primavera. Assim, na região Sudeste, iscas Termitrap® poderiam ser utilizadas para monitoramento da abundância de térmitas subterrâneos em florestas de eucalipto.

Palavras-chave: *Isoptera, silvicultura, térmitas de solo.*

INTRODUCTION

Despite the importance of wood as energy source, it is quite recent the interest in repairing the problems caused to woodlands, due to the increase of demand and probable scarcity of commercial wood. In many countries, including Brazil, there appeared a solution with the introduction of fast-growing exotic species, as the ones belonging to the *Eucalyptus* genus. Nevertheless, the edaphic, climatic and demographic characteristics of particular regions where that forest tree has been introduced, together with the termite attacks against young plants, have imposed severe limits to eucalyptus growth (Harris, 1971; Wardell, 1987; Cowie *et al.*, 1989; Wood & Pearce, 1991). It is worth noticing that, according to Wylie & Peters (1993), some termite species are responsible for great harm even in native eucalyptus forests, such as in Queensland, Australia.

Despite the termites being so abundant and causing significant damage to farming and cattle raising, as well as to silvicultural and urban zones, studies and specific literature are scarce. Due to their gregarious distribution and kinds of habitats, these insects have been inappropriately studied as regards collection methods, thus making observation and experimentation difficult (Martius, 1994). The lack of adequate evaluation methodologies in turn, brings about a mistaken judgement of the range of the damage caused by termites (Santos *et al.*, 1990). The problem caused by soil termites in plant growing and eucalyptus forests is severe, and research on control methods and alternatives must be intensified, to include evaluations of spatial distribution,

samplings and determination of pest species and species with pest-potential (Berti Filho, 1995; Wilcken & Raetano, 1995).

In Brazil, despite the vast silviculture area, mainly of exotic species, very little is known about the occurrence, density, and dispersion of termites and the associated damage.

A preliminary approach to those aspects was presented by Junqueira & Berti Filho (2000). Thus, considering such gap regarding silvicultural knowledge, this work was carried out in order to compare the efficiency of Termitrap® baits, which were buried in two depths, each with distinct time frames for remaining in the soil. Concurrently, the objetive was to determine the most favorable season to sample soil temites in commercial eucalyptus forests, both in the Southeast and the far South of the country.

MATERIAL AND METHODS

The experiments were carried out from August 2000 to July 2001, with soil termite collections always taking place during the intermediate month for each season. Samplings were taken in two *Eucalyptus pilularis* forests, both being 12 years old. One forest, located at the *Estação Experimental de Ciências Florestais* of the University of *São Paulo*, in the *Anhembi* (22°47′S; 48°09′W), *São Paulo* state; the other, was a commercial forest belonging to RIOCELL, in Barra do Ribeiro (30°17′S; 51°17′W), *Rio Grande do Sul* state (Figure 1).
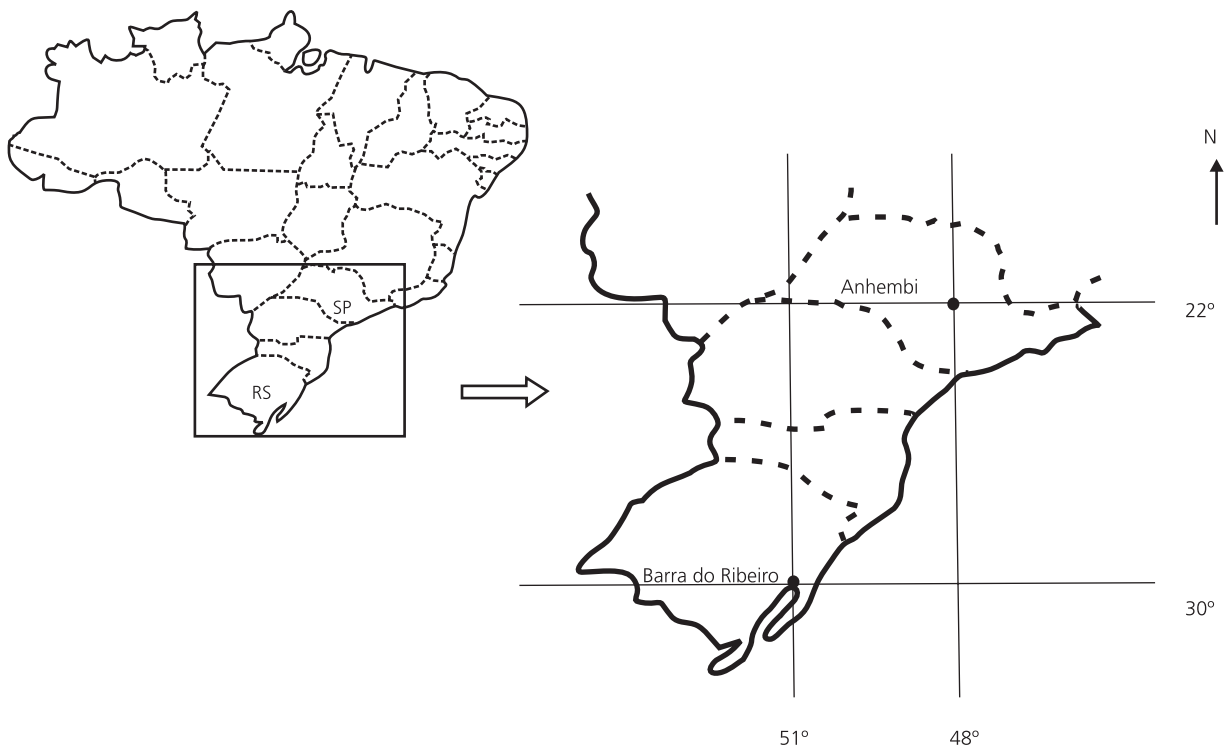
Figura 1. Location of the municipalities of *Anhembi*, SP and *Barra do Ribeiro*, RS, where termite collections were carried out.

The climate at *Anhembi* site, SP, is characterized as subtropical humid (ca), usually presenting dry winters and hot summers. The mean annual rainfall is about 1,240 mm. The soil is sandy and water-permeable, with very deep profile. In *Barra do Ribeiro*, RS, the climate is also ca, subtropical humid, although presenting rainy winters. The mean annual rainfall is about 1,370mm. The soil is low-draining and sandy.

In each forest, ten 100-meter-long transects were run, with a 10-meter space in-between. At every 10 meters along each transect, a Termitrap® bait a 15-cm-high-and-7-cm-wide corrugated cardboard was buried at vertical position, 15cm deep; this first set amounting to 100 baits. At the same transects, a second set of 100 baits were buried 20cm apart from the previous baits, 50cm deep.

Thirty days later, half of the baits were collected from each depth and half remained buried for another 30 days. The collected baits were

individually placed in plastic bags tagged with the collection data. In the laboratory, the baits were open and the termites were transferred into 80% alcohol for subsequent identification. The collected specimens are deposited in the Isoptera Collection of the *Laboratório de Entomologia Florestal* of *Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo (ESALQ-USP).*

RESULTS AND DISCUSSION

The use of Termitrap® baits and this method of collecting soil termites showed different results in both silviculture areas, one in *Rio Grande do Sul*, RS and the other in the state of *São Paulo*, SP. In *Barra do Ribeiro*, RS, regardless of the season of the year and the burial depth of the baits, due to severe rainfalls and low soil drainage at the growing site, it was possible to retrieve only less than 30% of the placed baits. These baits, in turn, were completely

soaked, and did not show either termites or signs of these insects activity. Such data indicate that the use of Termitrap® baits to monitor termite occurrence in *Rio Grande do Sul* forests, at least in the experimental area, is not advisable.

Completely different results were obtained at the forest in *Anhembi*, SP, where the Termitrap® baits were suitable to sampling soil termites. A comparison of the data obtained during the four seasons, with baits that remained at any of both depths, and were retrieved after either 30 or 60-day time period, shows the inexistence of significant differences regarding the frequency of baits containing termites (Table 1). The differences between the results from *Anhembi* and those of *Barra do Ribeiro* were probably due to environmental conditions, mainly to soil drainage (or lack of it); but they also might be due to the actual occurrence (or not) of termites in either site.

Along all seasons and regardless of the depth (Table 2), the greatest frequency of baits retrieved with termites was found among those buried for 60 days, which indicates this is as ideal time period for baits to remain in the soil. But, if a faster monitoring is necessary, the baits could still provide good results in Spring, even at a 15-cm depth, for only 30 days (Table 1), thus making the system less costly.

Taking into account the fact that the baits have advantages as a fast and economical method in sampling large areas and comparing the data, besides minimizing the collector error, it's important to consider that many other types of baits were recently developed (Costa-Leonardo, 1997). Termitrap® baits, used in this study, were developed by Almeida & Alves (1995) and are frequently used in monitoring termite activities, in sugar cane crops. They have also been used, impregnated with biological and/or chemical agents, in the management programs of subterranean termites (Campos *et al.*, 1998).

The results from *Anhembi*, SP, clearly show that Termitrap® baits can be used to monitor the abundance of soil termites in eucalyptus forests. Data obtained by Junqueira & Berti Filho (2000), using that same type of baits at the same *Anhembi* area,

Table 1. Frequencies of baits (%) retrieved with termites, 30 and 60 days after being buried in different depths, each season. *Anhembi*, 2000-2001.

Days*	Depth**	Winter		Spring		Summer		Autumn	
		%	χ^2_{Yates}	%	χ^2_{Yates}	%	χ^2_{Yates}	%	χ^2_{Yates}
30	15	6		40		24		32	
			0.125		0.108		0.552		0.033
	50	10		34		34		28	
60	15	30		58		38		56	
			0		0.073		0.098		0
	50	32		52		44		54	

Notes: *In-soil remaining time frame; **Depth in cm.

Table 2. Seasonal comparison of occurrence of baits (%) retrieved with termites. *Anhembi*, 2000-2001.

Depth**	Days*	Winter	Spring	Summer	Autumn	χ^2	p
15	30	6	40	24	32	12.451	<0.01
	60	30	58	38	56	6.187	ns
50	30	10	34	34	28	7.302	ns
	60	32	52	44	54	3.286	ns

Notes: *Depth in cm; **In-soil remaining time frame.

showed the great potential of them to map subterranean infestation sites, mainly those of *Heterotermes tenuis*. Therefore, one might suggest the use of these baits soaked with control agents to decrease the population density of soil termites in silvicultural areas. Nevertheless, results from *Barra do Ribeiro*, RS, show that such baits would probably be inefficient for monitoring or mapping termite population in areas of high rainfall density and low drainage soil. It is also worth remembering that, according to Costa-Leonardo (1997), baits specifically used in certain environments, do not necessarily work in other ones, making it difficult to generalize the use of a bait material.

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