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**DIVERSITY OF ANTS ACROSS GROWTH STAGES  
AND MONTHS IN RESEARCH FIELD, FASSB P. P.P  
TUN RAZAK, ULU TEKAM, PAHANG**

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**ABSTRACT**

The study on the diversity and abundance of ants in oil palm plantation of different plot ages (1 to 3, 6, 18 and 23 years old) at the Research Field FELDA Agricultural Services Sdn. Bhd, in Ulu Tekam, Jerantut Pahang was conducted. The sample was collected from June to October 2013, using several traps namely malaise trap, pitfall trap and pit-light trap. A total of 57,316 individuals of ants consisting 4 subfamilies, 23 genera and 32 morphospecies were successfully collected. The most abundant and dominant species was *Tetramorium* sp. (30,975 individuals). Plot 6 years recorded the highest number of ants encountered (22,144) followed by plot 3 years (18,198), plot 1 year (7,011), plot 18 years (5188) and the least was plot 23 years (4775). In term of the species diversity, plot 18 years old recorded the highest diversity ( $H'=2.51$ ,  $E'=0.41$ ,  $R=2.9$ ), while plot 3 years ( $H'=1.13$ ,  $E'=0.11$ ,  $R=2.65$ ) was the least diverse. According to

the month of sampling event, September recorded the highest diversity ( $H'=2.011$ ,  $E'=0.275$ ,  $R=3.177$ ) of ant while July recorded the lowest diversity ( $H'=1.58$ ,  $E'=0.16$ ,  $R=2.87$ ). The two-way ANOVA show significant differences in abundance of ants per different plot (ages of plantation) as well according to different month. This study is expected to enhance the information about the diversity of ants in different age of oil palm, especially in Peninsular Malaysia.

**Keywords:** diversity, ants, Ulu Tekam, Pahang.

### ABSTRAK

Kajian mengenai kepelbagaian dan kelimpahan semut mengikut kawasan umur sawit yang berbeza (bermula umur 1 hingga 3, 6, 18 dan 23 tahun) telah dijalankan di Ladang Penyelidikan FASSB P.P.P Tun Razak yang terletak di Ulu Tekam, Jerantut, Pahang. Pensampelan telah dijalankan bermula bulan Jun sehingga Oktober 2013, menggunakan beberapa jenis perangkap iaitu perangkap malaise, perangkap lubang dan perangkap cahaya. Sejumlah 57,316 individu semut yang terdiri daripada 32 morfospesies dan 23 genus daripada 4 subfamili telah berjaya dikumpulkan. Spesies yang paling melimpah dan dominan adalah spesies dari genus *Tetramorium* sp. (30975 individu). Plot berumur 6 tahun merekodkan jumlah bilangan semut tertinggi (22,144), diikuti oleh plot berumur 3 tahun (18,198), plot 1 tahun (7,011), plot 18 tahun (5,188) dan paling minimum adalah plot berumur 23 tahun (4,775). Bagi kepelbagaian spesies pula, plot berumur 18 tahun merekodkan kepelbagaian tertinggi ( $H'=2.51$ ,  $E'=0.41$ ,  $R=2.9$ ), manakala plot berumur 3 tahun ( $H'=1.13$ ,  $E'=0.11$ ,  $R=2.65$ ) mempunyai kepelbagaian terendah. Bagi kepelbagaian dari segi bulan pula, bulan September direkodkan mempunyai kepelbagaian yang paling tinggi ( $H'=2.011$ ,  $E'=0.275$ ,  $R=3.177$ ) manakala bulan Julai merekodkan kepelbagaian yang terendah ( $H'=1.58$ ,  $E'=0.16$ ,  $R=2.87$ ).

Analisis statistik dua hala (ANOVA) juga telah dijalankan dan hasilnya menunjukkan terdapat perbezaan yang bererti dan signifikan dalam kedua-dua faktor yang di uji iaitu faktor umur dan bulan, juga pada interaksi antara dua faktor tersebut. Kajian ini diharapkan dapat menambahkan lagi maklumat tentang kepelbagaian dan kelimpahan semut di kawasan sawit terutamanya yang berbeza umur di kawasan Semenanjung Malaysia.

**Kata kunci:** kepelbagaian, semut, Ulu Tekam, Pahang.

## INTRODUCTION

Ants play an important role in the ecosystem and it can be found in a variety of habitats, from the Arctic to the Equator (Brian 1978). Ants can be considered as monitoring agent and a good indicator of terrestrial habitat as the numbers of ants are many and are always available either in disturbed or undisturbed habitat (Majer 1983). Insects are sensitive and respond quickly if there is a change in the environment. This is one of the reasons why insects are a good indicator for changing in the landscape. The study of ants in Malaysia largely focuses on the distribution and abundance in the forest ecosystem, nor in the landscape of plantation. This study was done to examine the diversity of ants across different ages of oil palm plantation in FELDA Ulu Tekam, Jerantut Pahang. Bruhl & Eltz (2010) stated that the oil palm ages is one of the factors influencing the species richness of ants in monoculture palm trees.

## STUDY AREA

This study was conducted at FELDA Ulu Tekam, Jengka Pahang from June to October 2013. The sampling was carried out at five different plot according to the age of plantation namely plot 1 (replanting), plot 2 (3 years old), plot 3 (6 years old), plot 4 (18 years old) and plot 5 (23 years old). The malaise trap, pitfall trap

and pit-light trap was installed at each plot. The specimens collected from field were sorted, oven-dried, pinned, identified, and labeled in the Entomology laboratory of the Centre for Insect Systematics, Universiti Kebangsaan Malaysia (CIS-UKM). Identification was based on *The Identification Guide to the Ant Genera of Borneo* by Hashimoto. All the identified specimens were kept in the CIS-UKM repository for future references.

## RESULTS AND DISCUSSIONS

A total of 57316 individuals of ants consisting 23 genera and 4 subfamilies were recorded from FELDA Ulu Tekam, Jengka, Pahang. The subfamilies recorded are Myrmicinae, Ponerinae, Formicinae, and Dolichoderinae. Subfamily Myrmicinae recorded the most abundant ant encountered, followed by Formicinae, Dolichoderinae and Ponerinae (Table 1). Plot 3 recorded the highest abundance of ants (22144), followed by plot 2 (18198), plot 1 (7011), plot 4 (5188) and the least one was plot 5 (4775) (Table 2).

The most abundance ant species recorded was *Tetramorium* sp., (30975). This species was a non-native species but among the most abundance and dominant. According to Pfeiffer et al. (2008), plantation landscape was always invaded by the non-native species, and it affected the mosaic structure of the particular area. It is either decrease the abundance and affected the interaction in a negative way or increase the abundance through interaction and competition with a strong native species (Dejean et al. 1997). In our study, few non-native species that were recorded are *Anoplolepis* sp., *Dolichedurus* sp., *Odontoponera* sp, *Technomyrmex* sp., *Oechophylla* sp., *Paratrechina* sp., and *Crematogaster* sp. This is similar to a report by Brühl & Eltz (2010) from his study in oil palm plantation at Sabah Malaysia. The second most abundant ant species encountered in FELDA Tekam is *Anoplolepis* sp. (8414).

These yellowish ants also known as crazy ants are among the common ant in the oil palm plantation in Sabah and Sarawak (Pfeiffer et.al 2008). *Anoplolepis* is invasive ant species and was documented as dominance species in the disturbed area all over the world (Majer 1983). In term of the species diversity, Plot 4 has the highest species diversity, followed by plot 5, plot 1, plot 3 and plot 2.

Table 1 The total number of individual and subfamily recorded at the FELDA Ulu Tekam Jengka Pahang.

<b>Subfamily</b>	<b>Genus</b>	<b>Total</b>
Dolichoderinae	<i>Doleromyrma sp.</i>	111
	<i>Tapinoma sp.</i>	148
	<i>Technomyrma sp.</i>	191
	Unknown genus	1545
Formicinae	<i>Anoplolepis sp.</i>	8414
	<i>Componatus sp.</i>	1950
	<i>Oecophylla sp.</i>	10562
	<i>Paratrechina sp.</i>	1697
	<i>Polyarchis sp.</i>	645
	Unknown genus	64
Myrmicinae	<i>Crematogaster sp.</i>	1351
	<i>Meranoplus sp.</i>	432
	<i>Selenopsis sp.</i>	889
	<i>Pheidole.sp</i>	273
	<i>Tetramorium sp.</i>	30975
Ponerinae	Unknown genus	798
	<i>Anochetus sp.</i>	6
	<i>Diacamma sp.</i>	417
	<i>Hypoponera sp.</i>	31
	<i>Leptogenys sp.</i>	11
	<i>Odontomachus sp.</i>	1364
	<i>Odontoponera sp.</i>	3218
<i>Ponera sp.</i>	638	
<b>Total</b>	<b>23 species</b>	<b>57316</b>

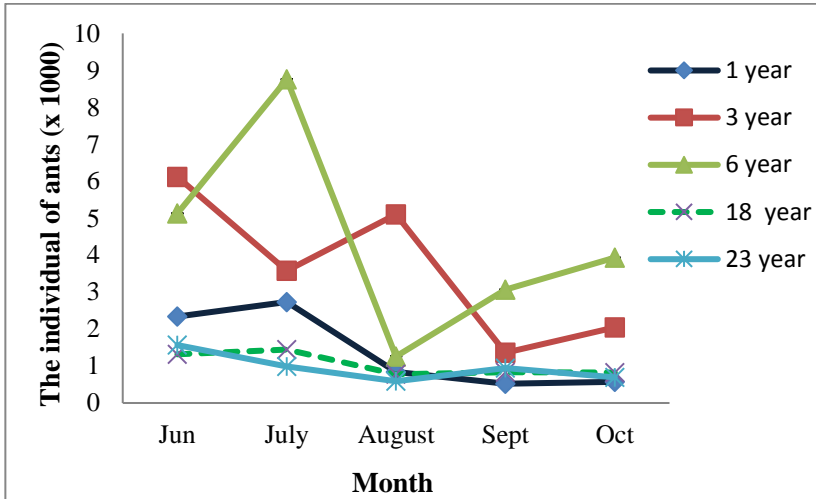


Figure 1 Abundance of ants has been recorded from five different plots for five consecutive months.

Table 1 Number of individuals (N), Shannon-Weiner diversity index ( $H'$ ), Margalef species richness ( $R'$ ), for different plot at Ulu Tekam, Pahang.

Age of Trees	N	$H'$	E	R
1 year old	7011	2.33a	0.41	2.71
3 years' old	18198	1.13b	0.11	2.651
6 years' old	22144	1.33b	0.13	2.78
18 years' old	5188	2.51a	0.47	2.9
23 years' old	4775	2.48a	0.52	2.59

\*a and b show either there is significant different for species diversity between two different plots (T-test).

July has the highest species abundance with 17501 individuals followed by June with 16469 individuals and September has the lowest species abundance with 6721 individuals. August has the highest species richness with 30 species recorded followed by

July and September with 29 species for both months. September has the highest species diversity with 2.011 followed by July with 1.583. There is no significant value for species diversity on June, August and October (Table 2).

Table 2 Number of individuals (S) and Shannon Weiner species diversity index (H'), Margalef species richness (R), Peilou species similarity index (E') for different months.

Month	N	S	H'	E	R
Jun	16469	21	1.81ab	0.25	2.37
July	17501	29	1.58b	0.16	2.87
August	8570	30	1.79ab	0.20	3.20
September	6721	29	2.01a	0.27	3.18
October	8055	25	1.79ab	0.24	2.67

\*a and b show that there is significant different for species diversity between two different months (T-test)

This species is non- native species but they are the most dominant and abundance ant species in this study (Fayle 2010). Plantations area always invaded by non-native species and frequently changed mosaic structure area (Pfeiffer et al. 2008). Non-native species have significantly reduced the species abundance and influenced the interactions between negative species or it will add the species abundance and interactions through strong competition with native species (Dejean et al. 1997). Certain ants that are native to the forests present in the oil palm plantation, and non-native ant species are much more widespread in all these microhabitat (Fayle 2010).

Margalef species richness (R') and Shannon-Weinner species diversity index (H') showed that plot 4 which is 18 years old trees has higher species richness and species diversity compared to other plots for spatial distribution. This is due to well managed environment and there are many dried leaves that

provide suitable habitat for the species. Microclimate that has less sunlight captured present at the area of mature oil palm trees makes the highest species diversity recorded here (Luskin & Potts 2011). This results also influenced by species similarity index because Pielou (1975) stated that species diversity for an area is influenced by species richness ( $R'$ ) and species similarity index ( $E'$ ) for each species. This situation also shows the ecological displacement has stabilized for plot 4 which is 18 years old trees compared to the other plots. Plot 2 and plot 3 has highest species abundance compared to the other plots. Coleoptera and Hymenoptera are more attracted to mature oil palm trees because there are so many fruit bunch at this area and usually this area is not well managed (Mwansat and Turshak 2010).

For temporal distribution, September has highest species diversity index ( $H^2=2.011$ ) while August has the highest species richness ( $R'=3.202$ ). Based on Official Portal Malaysian Meteorological Department (2013), Peninsular Malaysia has the lowest rainfall for June and July compared the other months. Bruhl et al. (2010) stated that the peak abundance of Formicidae is during the lowest rainfall due to wet conditions makes it difficult for ants to go out looking their food. Dry weather facilitates other insects including ants to find their mate for reproduction.

## CONCLUSION

A total of 32 morphospecies with 57316 individuals were recorded from five different plots. Abundance of non-native ant species has been recorded and Myrmicinae are the largest contributor to the highest abundance of ant species in this study area. Plot 4 which is 18 years old trees has highest species diversity and species richness compared to other plots. June and July have highest species abundance and September has highest species diversity index compared to other months for temporal distribution. Hopefully this study will provide the latest



information about diversity of ant species in different ages of oil palm as there are no specific studies and journals published related with this study in Peninsular Malaysia.

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