# KORESPONDENSI DENGAN UIIM, MALAYSIA

Artikel: Colony Compotion and Biomass of Macrotermes gilvus Hagen (Blattodea: Termitidae) in Indonesia

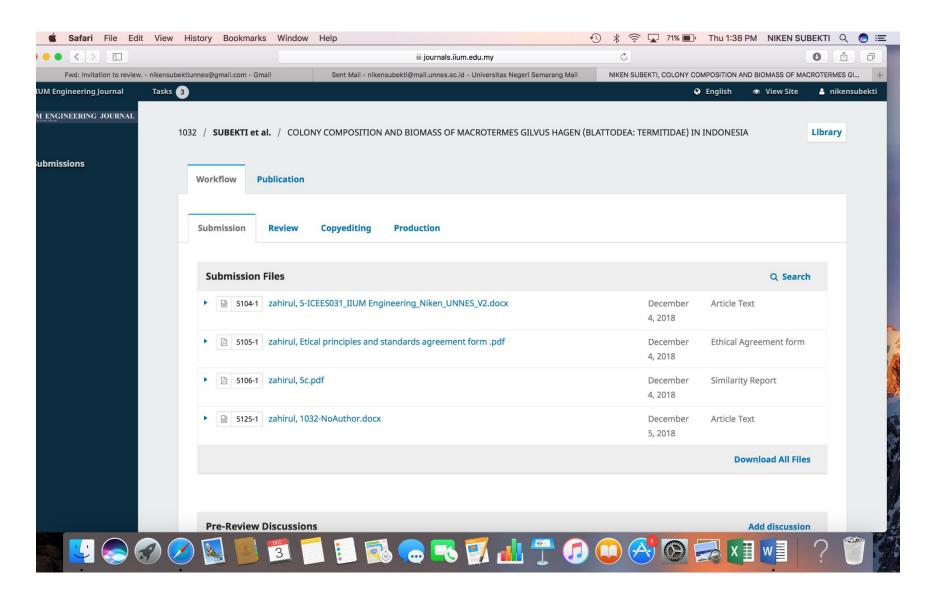
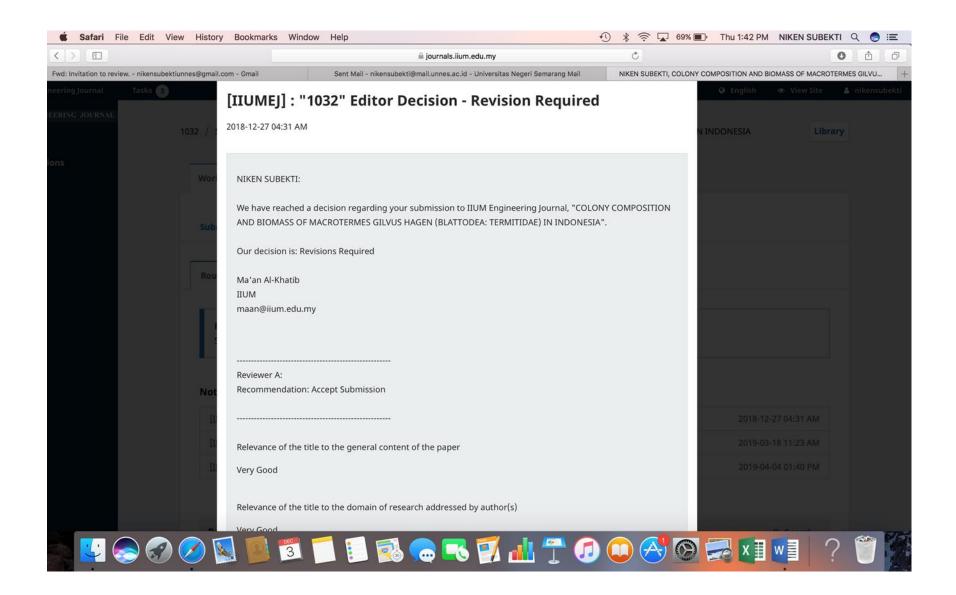


Image: Submission service       Image: Submission review       Image: Submiss	
IUM Engineering Journal       Tasks 3       English       View S         M ENGINEERING JOURNAL       1032 / SUBEKTI et al. / COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN INDONESIA       Submissions         Workflow       Publication	ite 💄 nikensubek
M ENGINEERING JOURNAL         1032       / SUBEKTI et al. / COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN INDONESIA         ubmissions       Workflow         Publication	
1032 / SUBEKTI et al. / COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN INDONESIA         ubmissions         Workflow         Publication	Library
Workflow Publication	
Submission Review Copyediting Production	
Round 1	
Round 1 Status Submission accepted.	
Notifications	
[IIUMEJ] : "1032" Editor Decision - Revision Required 2018-12-27 04	1:31 AM
[IIUMEJ] : "1032" Editor Decision - Revision Required 2019-03-18 11	:23 AM
[IIUMEJ] : "1032" Editor Decision - Accept 2019-04-04 01	:40 PM



	🚔 journals.iium.edu.my	Ċ		0 0 0
Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION A	ND BIOMASS OF MA	CROTERMES GILVU
OO @ IUM Engineering Journal Ta	Note	From	Ø View Si	
	Dear Author,	zahirul		
e://Users/nikensubekti/ wnloads/F4%20DAN%		2019-04-04 06:51		
willodds/F4%20DAN%		PM	TERMITIDAE	Library
	Please upload your final manuscript within 1 weeks of this email based o	on Journal		
Submissions	template and guidelines and specially Journal reference style mention in	Journal		
	website at http://journals.iium.edu.my/ejournal to consider your publica	ation in June		
IKI   E-Status	2019 issue in discussion section.			
iki-indonesia.dgip.go.id	Ref. example :			
cebook	Sarma <b>HKD</b> , Bhuyan <b>B</b> , Dutta <b>N</b> . (2013) An energy balanced routing prot	ocol for		
acebook.com	cognitive wireless sensor networks. In World Congress on Engineering 8	Computer		
cebook	Science: October 2013; San Francisco, USA.		dd discuss	
opus preview - Scopus -	Chouikhi S, El Korbi I, Ghamri-Doudane Y, Saidane LA. (2015) A survey o	n fault	1 111 12	
arch for an author profile opus.com	tolerance in small and large-scale wireless sensor networks. Computer		Replies	
ST 02 - Elsevier's	Communications., 69:22-37.		2	
opus, the largest abstrac				
kti   Silemkerma emkerma.kemdikbud.go.id				
STEM INFORMASI	You can also find the Journal template and other related information in t	he		
REKTORAT PENGEMBAN	Submission Library under View Document Libray at the right top corn	er when click		
PT to PDF - Convert werPoint to PDF Online	your paper title after login to the journal site.			
allpdf.com file size restrictions, no	You are also requested to update contributor author(s) if all authors nar	ne are not in		
watermarks- just a free	the database by following the guidelines as mention in Update Author L		1	
nallpdf.com	Document Library.	ist in the		
allpdf.com	bocument Library.			
ols Compress Convert erge Edit Sign Smallpdf f	You can upload your final manuscript within this discussion.		0	
vox -	Thanking you.			
kensubekti@mail.unnes ail.google.com				
	3 📁 📔 🕵 🥽 🌄 🚺 🕂 🝸 🕖	( ) ( <del>-</del> A-1 (0)) - X	I WE	

	🗎 journals.iium.edu.my 🔿	·	0	Ô Ô
wd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail NIKEN	SUBEKTI, COLONY COMPOSITION AND	BIOMASS OF MACROTERN	IES GILVU
IUM Engineering Journal     T       IUM Engineering Journal     T       e:///Users/nikensubekti/ wmloads/F4%20DAN%     IUM ENGINEERING JOURNAL	final version	×		nikensubekt
	Participants			
Submissions	Prof. Dr AHM Zahirul Alam (zahirul)			
	NIKEN SUBEKTI (nikensubekti)			
IKI   E-Status ki-indonesia.dgip.go.id				
	Messages			
cebook facebook.com	Note	From		
cebook	final version but name and affilation not follwoing journal template.	zahirul	udd discussion	
opus preview - Scopus - arch for an author profile	Editor	2019-04-11 07:01	Replies Closed	
opus.com ST 02 - Elsevier's opus, the largest abstrac	C zahirul, A-1032-Article Text-5140-1-4-20181205.docx	PM	2. (1)	
kti   Silemkerma emkerma.kemdikbud.go.id	<ul> <li>Dear Editor,</li> </ul>	nikensubekti		
STEM INFORMASI REKTORAT PENGEMBAN		2019-04-12 09:49 AM	1 1	
T to PDF - Convert werPoint to PDF Online	I send Final revised after write affiliation			
allpdf.com file size restrictions, no	And This my Orchid number		1	
watermarks- just a free allpdf.com	Niken Subekti ORCID iD https://orcid.org/0000-0003-1548-9219			
all <b>pdf.com</b> ols Compress Convert erge Edit Sign Smallpdf f	🗋 nikensubekti, A-1032-Article Text-5140-1-4-20181205.docx			
box - kensubekti@mail.unnes	Add Message		<u>0</u>	
il.google.com				
	🛐 🚺 🚺 🔜 🥽 🏹 📶 😷 🔕		w ] ?	1

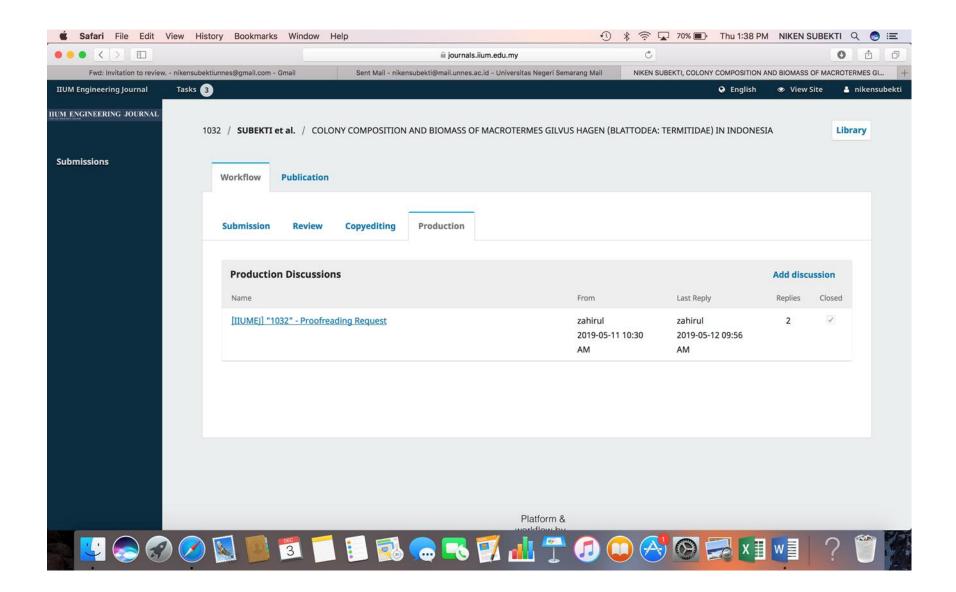
		🚔 journals.iium.edu.my	C			0 0 0
Fwd: Invitation to review. – nikensul UM Engineering Journal Tasks		Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Nege	ri Semarang Mail NIKEN S	JBEKTI, COLONY COMPOSITION	AND BIOMASS (	
	Workflow Publication Submission Review	Copyediting Production				
	Copyediting Discussio	ns			Add discu	ission
	Name		From	Last Reply	Replies	Closed
	[IIUMEJ] "1032" Final versi	on based on template and updating author list	zahirul 2019-04-04 06:51 PM	zahirul 2019-04-11 08:42 AM	2	
	final version		zahirul 2019-04-11 07:01 PM	nikensubekti 2019-04-12 09:49 AM	1	
	[IIUMEJ] "1032" Final versi	on based on template and updating author list	zahirul 2019-04-12 10:05 AM	nikensubekti 2019-04-12 10:57 AM	1	
	[IIUMEJ] "1032" Final versi	on based on template and updating author list	zahirul 2019-05-03 09:02 AM		0	
	need correction in final ve	rsion	zahirul 2019-05-08 10:34 AM		0	

	🚔 journals.iium.edu.my	Ċ		0 0
Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION AN	D BIOMASS OF MAG	CROTERMES GILVU
OO     @     IUM Engineering Journal.     Tas       e:///Users/nikensubekti/ ownloads/F4%20DAN%     IUM ENGINEERING JOURNAL	Dear Author, Your manuscript is not compliance with the journal template. Author name based on journal template. download template form following link http://journals.iium.edu.my/ejournal/index.php/iiumej/libraryFiles/downl	AM	View Sit TERMITIDAE	e å nikensube
Submissions				
	Author anme should follow similar to attached file and references also foll	lowed		
JKI   E-Status	similar to attached file.			
lki-indonesia.dgip.go.id	Please upload your final manuscript by 15th April 2019 of this email based	l on Journal		
	template and guidelines and specially Journal reference style mention in Jo			
cebook facebook.com	website at http://journals.iium.edu.my/ejournal to consider your publicati	ion in June		
cebook	2019 issue in discussion section.		dd discussi	
opus preview - Scopus -	Ref. example :			
earch for an author profile	Sarma HKD, Bhuyan B, Dutta N. (2013) An energy balanced routing protoc	col for	Replies C	
ST 02 - Elsevier's	cognitive wireless sensor networks. In World Congress on Engineering & C	Computer	2	
opus, the largest abstrac kti   Silemkerma	Science: October 2013; San Francisco, USA.			
emkerma.kemdikbud.go.id	Chouikhi S, El Korbi I, Ghamri-Doudane Y, Saidane LA. (2015) A survey on	fault		
STEM INFORMASI REKTORAT PENGEMBAN	tolerance in small and large-scale wireless sensor networks. Computer		1	
PT to PDF - Convert wwerPoint to PDF Online nallpdf.com	Communications., 69:22-37.			
file size restrictions, no watermarks- just a free	You can also find the Journal template and other related information in the		Ť.	
nallpdf.com	Submission Library under View Document Library at the right top corner			
hallpdf.com Jols Compress Convert	your paper title after login to the journal site.	I WICH CHCK		
erge Edit Sign Smallpdf f	You are also requested to update contributor author(s) if all authors name	e are not in	Ö	
box - kensubekti@mail.unnes	the database by following the guidelines as mention in Update Author List	t in the		
ail.google.com	Document Library.			

	🚔 journals.iium.edu.my	Ċ		0 0
Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION AN	D BIOMASS OF MAG	CROTERMES GILVU
OO     @     IUM Engineering Journal.     Tas       e:///Users/nikensubekti/ ownloads/F4%20DAN%     IUM ENGINEERING JOURNAL	Dear Author, Your manuscript is not compliance with the journal template. Author name based on journal template. download template form following link http://journals.iium.edu.my/ejournal/index.php/iiumej/libraryFiles/downl	AM	View Sit TERMITIDAE	e å nikensube
Submissions				
	Author anme should follow similar to attached file and references also foll	lowed		
JKI   E-Status	similar to attached file.			
lki-indonesia.dgip.go.id	Please upload your final manuscript by 15th April 2019 of this email based	l on Journal		
	template and guidelines and specially Journal reference style mention in Jo			
cebook facebook.com	website at http://journals.iium.edu.my/ejournal to consider your publicati	ion in June		
cebook	2019 issue in discussion section.		dd discussi	
opus preview - Scopus -	Ref. example :			
earch for an author profile	Sarma HKD, Bhuyan B, Dutta N. (2013) An energy balanced routing protoc	col for	Replies C	
ST 02 - Elsevier's	cognitive wireless sensor networks. In World Congress on Engineering & C	Computer	2	
opus, the largest abstrac kti   Silemkerma	Science: October 2013; San Francisco, USA.			
emkerma.kemdikbud.go.id	Chouikhi S, El Korbi I, Ghamri-Doudane Y, Saidane LA. (2015) A survey on	fault		
STEM INFORMASI REKTORAT PENGEMBAN	tolerance in small and large-scale wireless sensor networks. Computer		1	
PT to PDF - Convert wwerPoint to PDF Online nallpdf.com	Communications., 69:22-37.			
file size restrictions, no watermarks- just a free	You can also find the Journal template and other related information in the		Ť.	
nallpdf.com	Submission Library under View Document Library at the right top corner			
hallpdf.com Jols Compress Convert	your paper title after login to the journal site.	I WICH CHCK		
erge Edit Sign Smallpdf f	You are also requested to update contributor author(s) if all authors name	e are not in	Ö	
box - kensubekti@mail.unnes	the database by following the guidelines as mention in Update Author List	t in the		
ail.google.com	Document Library.			

	🚔 journals.iium.edu.my	C		0	Ô Ó
wd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION AN	D BIOMASS OF MAG	CROTERMES C	SILVU
OO @ IUM Engineering Journal Ta	Note	From	<ul> <li>View Sit</li> </ul>	e 🔺 n	ikensubekt
:://Users/nikensubekti/ wnloads/F4%20DAN%	Dear Author, You are also requested to update contributor author(s) if all authors nam the database by following the guidelines as mention in Update Author Li	AM	TERMITIDAE	Library	
Submissions	Document Library.				
	You can find the related information in the Submission Library under V	iew			
	Document Libray at the right top corner when click your paper title afte	r login to the			
KI   E-Status ki-indonesia.dgip.go.id	journal site.				
	Thanking you.				
acebook acebook.com sebook			dd discussi		
opus preview - Scopus -					
arch for an author profile	Dr AHM Zahirul Alam, CEng, FIEB, FBCS, SMIEEE, MIET, MIEICE		Repties C		
opus.com ST 02 - Elsevier's	Professor & Editor,		2		
opus, the largest abstrac	IIUM Engineering Journal				
tti   Silemkerma	Dept. of Electrical and Computer Engineering				
mkerma.kemdikbud.go.id TEM INFORMASI	Faculty of Engineering				
EKTORAT PENGEMBAN	International Islamic University Malaysia		1		
T to PDF - Convert verPoint to PDF Online	Jalang Gombak, 53100 Kuala Lumpur				
allpdf.com	Malaysia				
file size restrictions, no	Tel: + 6 03 6196 4529 Fax: + 6 03 6196 4488		1		
watermarks- just a free	Web: http://staff.iium.edu.my/zahirulalam				
allpdf.com allpdf.com Js Compress Convert rge Edit Sign Smallpdf f	Email : zahirulalam@iium.edu.my, alam_z@ieee.org				
inge Lan orgin ornanjoar na	IIUM Engineering Jour	rnal	0		
ensubekti@mail.unnes il.google.com					
ingeogratediti					
	3 📁 📔 🕵 😞 🄜 🛒 👍 🗇				10

	🗎 journals.iium.edu.my	C			0	Û
d: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEK	TI, COLONY COMPOSITION AN	D BIOMASS O	F MACROTERME	ES GILVU
00 @ IIUM Engineering Journal, Tas	Note		From	👁 Vie		
	Please correct and upload in this discussion group within 5 days	s of this	zahirul	dd disc		
///Users/nikensubekti/ vnloads/F4%20DAN%	mail. Find the copy edited version.		2019-05-08 10:34			
			AM	Replies		
				2		
I I E-Status	10					
-indonesia.dgip.go.id	1032					
book	COLONY COMPOSITION AND BIOMASS OF Macrotermes gilvus H	lagen				
zebook.com book	(BLATTODEA: TERMITIDAE) IN INDONESIA			3		
ue preview. Seenue	Niken Subekti, Dodi Nandika,					
bus preview - Scopus - ch for an author profile	Dedy Duryadi Solikhin					
us.com r 02 - Elsevier's				<u>0</u>		
bus, the largest abstrac						
i   Silemkerma	MATERIALS AND METHODS (something is not right).					
ikerma.kemdikbud.go.id EM INFORMASI KTORAT PENGEMBAN				Ö		
to PDF - Convert	Colony composition calculation. The colony composition in the	mound was				
erPoint to PDF Online	obtained by digging and dismantling the mound vertically and	horizontally				
le size restrictions, no	at as much 3 of each nest type. Termite specimens of each sam	ple mound				
atermarks- just a free	were then collected using vacuum cleaner (3.5 kVA). After dism					
llpdf.com lpdf.com	mound were then closed using dark plastic for 3 hours to give t					
s Compress Convert	remaining time for termite foragers back to the nest. of 300 ter	mite				
e Edit Sign Smallpdf f	specimens of each colony by using microbalance.					
x - nsubekti@mail.unnes	Zahirul, 1032 production.docx					
google.com						



🗯 Safari File Edit View History Bookmarks Window Help

🕚 🕴 🛜 🔽 69% 🗊 Thu 1:44 PM 🛛 NIKEN SUBEKTI 🔍 🌏 🖃

<>		⊜ journals.iium.edu.my	C	0 1
Fwd: Invitation to review niken	nsubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION AND	BIOMASS OF MACROTERMES GILVU +
©@ file:///Users/nikensubekti/ Downloads/F4%20DAN%		The submission "COLONY COMPOSITION AND BIOMASS OF MACROTERM (BLATTODEA: TERMITIDAE) IN INDONESIA" to IIUM Engineering Journal of proofread by following these steps. 1. Click on the Submission URL below.		View Site     Inikensubekti      IERMITIDAE     Library
		2. Log into the journal		
		3. Click on VIEW PROOF in Layout and proof the galley in the one or more	e formats used.	
		4. Enter corrections (typographical and format) in Proofreading Correction	ons.	
		5. Email corrected version of PDF.		
DJKI   E-Status odki-indonesia.dgip.go.id		6. Send the COMPLETE email to the editor within 3 days of this email.		
		Manuscript URL:		
Facebook		https://journals.iium.edu.my/ejournal/index.php/iiumej/authorDashboa	rd/submission/1032	
m.facebook.com Facebook		Username: {\$proofreaderUsername}		dd discussion
Scopus preview - Scopus -		If you are unable to undertake this work at this time or have any question	ns, please contact	Replies Closed
Search for an author profile scopus.com TEST 02 - Elsevier's		me. Thank you for your contribution to this journal.		2
Scopus, the largest abstrac		Prof. Dr AHM Zahirul Alam		
Dikti   Silemkerma silemkerma.kemdikbud.go.id		International Islamic University Malaysia		
SISTEM INFORMASI		Phone +60361964529		
DIREKTORAT PENGEMBAN		zahirulalam@iium.edu.my		
PPT to PDF - Convert PowerPoint to PDF Online		Dr AHM Zahirul Alam, CEng, FIEB, FBCS, SMIEEE, MIET, MIEICE		
smallpdf.com		Professor & Editor,		
No file size restrictions, no ad watermarks- just a free		IIUM Engineering Journal		
Smallpdf.com		Dept. of Electrical and Computer Engineering		
smallpdf.com		Faculty of Engineering		
Tools Compress Convert Verge Edit Sign Smallpdf f		International Islamic University Malaysia		
nbox -		Jalang Gombak, 53100 Kuala Lumpur		
nikensubekti@mail.unnes nail.google.com		Malaysia		
		Tel: + 6 03 6196 4529 Fax: + 6 03 6196 4488		
	2 🖉 🚺	🛐 📁 🗾 🕵 😞 🌄 🛒 🏦 😷 🧭	🔍 🥂 🚱 🛃 🚺	2 7

	l journals.iium.edu.my Ĉ	O 🗅 Ć
Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail         OO       @         IUM Engineering Journal       Tas         e:///Users/nikensubekti/       IUM Engineering Journal       Tas         ownloads/F4%20DAN%       IUM Engineering Journal       Tas	We have received the reports from our reviewers on your manuscript which you submitted to IIUM Eng J, "COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN	View Site 🛔 nikensubek
Submissions IKI   E-Status Iki-indonesia.dgip.go.id	INDONESIA". Based on the advice received, your manuscript could be reconsidered for publication should you be prepared to incorporate the revisions. When preparing your revised manuscript, you are asked to carefully consider the reviewer comments which can be found below, and submit a list of responses to the comments. We would appreciate receiving the revised manuscript by two weeks. Thank you and regards,	MITIDAE Library
cebook facebook.com cebook	Md Zahangir Alam IIUM Phone 60361964571	
opus preview - Scopus - arch for an author profile oppus.com 57 02 - Elsevier's opus, the largest abstrac	zahangir@iium.edu.my	
<b>sti   Silemkerma</b> emkerma.kemdikbud.go.id ITEM INFORMASI REKTORAT PENGEMBAN	Reviewer A: Recommendation: Accept Submission	
r to PDF - Convert verPoint to PDF Online allpdf.com file size restrictions, no watermarks- just a free	Relevance of the title to the general content of the paper	
allpdf.com allpdf.com Jis Compress Convert ge Edit Sign Smallpdf f	Very Good	
oox - xensubekti@mail.unnes ii.google.com	Relevance of the title to the domain of research addressed by author(s) Very Good	
	3 📁 🗊 🔜 🥽 😴 📶 🕆 🗊 🖉 🔜 🕅 🛛	2 1

Bed: builden to review - observed/whiteweel/genalt con - Grant       See to that - elevenue/whitegenalt cone - Sec to the review - Sec to the revi		🗎 journals.ilum.edu.my	Č	O 🖞 🗗
CO       CO <td< th=""><th>Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail</th><th>Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail</th><th>NIKEN SUBEKTI, COLONY COMPOSITION AND</th><th>BIOMASS OF MACROTERMES GILVU</th></td<>	Fwd: Invitation to review nikensubektiunnes@gmail.com - Gmail	Sent Mail - nikensubekti@mail.unnes.ac.id - Universitas Negeri Semarang Mail	NIKEN SUBEKTI, COLONY COMPOSITION AND	BIOMASS OF MACROTERMES GILVU
Submissions       Congratulation!!! According to our record, your manuscript. D #*1032*, entitled "COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN INDONESIA* has been accepted for publication in the IUM Engineering journal (IUME).         NUKI JE-Status ddd-indonesia.dgip.go.id       We are requesting you to upload your camera ready manuscript based of the IUM Engineering journal by two weeks of this email in the discussion section by Add discussion. For details for preparation of manuscript, please visit journal website at http://journals.ilum.edu.my/ejournal/index.php/iume/about/submissions       Image: Details in the index is the right top corner when click your paper title after login to the journal site.         You can also find the journal template and other related information in the Submission Library under View Document Libray at the right top corner when click your paper title after login to the journal site.       You are also requested to update contributor author(s) if all authors name are not in the database by following the guidelines as mention in Update Author List in the Document Library.         You are also advised to pay publication processing fee of RM 500.00 (or whatever journal decide) by two weeks of this email and send us the proof of payment by uploading in discussion section.       Image: Proof of payment can be made at following mode to bank account:         We atter enstremation in payment can be made at following mode to bank account: malipot.com       Image: UAM Operating Account       Image: Proof of Canader (TT) *         Mater Libre of Controls Convert.       Name: UIAM Operating Account       Image: Canader (TT) *       Image: Canader (TT) *	ile:///Users/nikensubekti/	Dear DR NIKEN SUBEKTI:		View Site  inikensubekt
UVI I E-Status       weeks of this email in the discussion section by Add discussion. For details for preparation of manuscript, please visit journal website at <a href="http://journals.lium.edu.my/ejournal/Index.php/liumej/about/submissions">http://journals.lium.edu.my/ejournal/Index.php/liumej/about/submissions</a> acebook       You can also find the journal template and other related information in the Submission Library under View       Image: Submission Library under View         bock       You are also requested to update contributor author(s) if all authors name are not in the database by following the guidelines as mention in Update Author List in the Document Library.       Image: Submission Library under View         you are also advised to pay publication processing fee of RM 500.00 (or whatever journal decide) by two weeks of this email and send us the proof of payment by uploading in discussion section.       Image: Submission Library Libr		BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN		TERMITIDAE Library
Lacebook       Document Libray at the right top corner when click your paper title after login to the journal site.       You are also requested to update contributor author(s) if all authors name are not in the database by following the guidelines as mention in Update Author List in the Document Library.         You are also advised to pay publication processing fee of RM 500.00 (or whatever Journal decide) by two weeks of this email and send us the proof of payment by uploading in discussion section.       Image: Comparise the payeet to bank account:         Intervententententententententententententente		weeks of this email in the discussion section by Add discussion. For details	s for preparation of manuscript,	
icopus preview - Scopus - icarch for an author profile copus.com       the guidelines as mention in Update Author List in the Document Library.         icopus.com       You are also advised to pay publication processing fee of RM 500.00 (or whatever Journal decide) by two weeks of this email and send us the proof of payment by uploading in discussion section.         iRikt I Silemkerma ilemkerma.kemdikbud.go.id ISTEM INFORMASI INFECTORAT PENGEMBAN       The payment can be made at following mode to bank account:         PT to PDF - Convert oweerPoint to PDF Online mallpdf.com d watermarks- just a free       "By Cash Counter at BMMB, or Electronic Transfer or Telegraphic Transfer (TT) "         Mame: UIAM Operating Account       Hold-04 01:40 PM	n.facebook.com			
Weeks of this email and send us the proof of payment by uploading in discussion section.         ISTEM INFORMASI IRREKTORAT PENGEMBAN         PT to PDF - Convert owerPoint to PDF Online mallpdf.com of lie size restrictions, no d watermarks- just a free         mallpdf.com oble Compress Convert         Name: UIAM Operating Account         Name: UIAM Operating Account	earch for an author profile copus.com EST 02 - Elsevier's		are not in the database by following	
owerPoint to PDF Online mallpdf.com to file size restrictions, no d watermarks- just a free     "By Cash Counter at BMMB, or Electronic Transfer or Telegraphic Transfer (TT) "     E12-27 04:31 AM       mallpdf.com mallpdf.com pools Compress Convert     Hoas-18 11:23 AM     Hoas-18 11:23 AM	ikti   Silemkerma lemkerma.kemdikbud.go.id ISTEM INFORMASI			
o file size restrictions, no d watermarks- just a free mallpdf.com mallpdf.com bols Compress Convert over the file of the f	owerPoint to PDF Online	The payment can be made at following mode to bank account:		
malipar.com malipar.com pols Compress Convert 9-04-04 01:40 PM	o file size restrictions, no	"By Cash Counter at BMMB, or Electronic Transfer or Telegraphic Transfer	(TT) "	
	nallpdf.com pols Compress Convert			
nbox -       Account No: 1407000004716         iikensubekti@mail.unnes       Swift Code: BMMBMYKL         nail.google.com       Branch: International Islamic University Malaysia (IIUM), Gombak, Selangor	ikensubekti@mail.unnes	Swift Code: BMMBMYKL	ngor	

# COLONY COMPOSITION AND BIOMASS OF MACROTERMES GILVUS HAGEN (BLATTODEA: TERMITIDAE) IN INDONESIA

<u>NIKEN SUBEKTI<sup>1</sup>, DODI NANDIKA<sup>2\*</sup>,</u> Dedi Duryadi Solihin<sup>3</sup>, Ro'iyatul Mar'ah<sup>1</sup>

<sup>1</sup>Biology Department, Semarang State University, Semarang, Indonesia <sup>2</sup>Forestry Department, Bogor Agricultural University, Bogor, Indonesia <sup>3</sup>Biology Department, Bogor Agricultural University. Bogor, Indonesia

\*Corresponding author: <u>\*nikensubekti@mail.unnes.ac.id</u>

(Received: Day Month Year; Accepted: Day Month Year; Published on-line: Day Month Year) https://doi.org/10.31436/iiumej.vxxix.x

**ABSTRACT:** There is no study conducted to investigate the composition and biomass of *Macrotermes gilvus Hagen* in natural forest ecosystem. This study aimed to analyze the colony composition and biomass of *M. gilvus Hagen* colony in natural forest and to evaluate the need of food of the species as well as factors affecting it. Research was conducted in Yanlappa Sanctuary, Bogor, West Java. Termites were surveyed by collecting individual *M. gilvus* Hagen from different colony at different size of mound<sup>‡</sup>, small (0 – 0.99 m), medium (1- 1.99 m), large ( $\geq 2$  m) and then were measured the number of individuals, wet and dry body mass, ratio of dry or wet body mass, and the average of biomass. Results indicated that the small mount was dominated by workers, whereas the medium and the large nest was dominated by nymph. Mean of the termite biomass was 936 kg/ha<sup>km2</sup>. Average of termite biomass collected from large mount was 949.8 kg/km2, medium mount was 605.2 kg/ha<sup>km2</sup> and small mount was about 537.5 kg/ha<sup>km2</sup>. Factor affecting the biomass of subterranean termite *M. gilvus Hagen* are food source, energy efficiency, predators, and environment. The presence of termite mounds influences natural ecosystem, but that the type of mound plays a crucial role in determining the nature of the effects.

**ABSTRAK:** Kajian tentang komposisi koloni dan biomas anai-anai tanah *M. gilvus Hagen* di hutan alam belum pernah dilakukan. Kajian ini bertujuan untuk menganalisis komposisi koloni dan biomas koloni anai-anai tanah *M. gilvus Hagen* di hutan alam dan menganalisa faktor-faktor yang mempengaruhi pemakanannya. Kajian ini dilakukan di Cagar Alam Yanlappa, Bogor, Jawa Barat. Hasil kaji selidik ditunjukkan terdapat perbedaan koloni didasarkan pada ukuran tinggi sarang. Sarang kecil (0 – 0.99 m), sarang sedang (1- 1.99 m), dan sarang besar ( $\geq 2$  m) dan ukuran berat basah, berat kering serta kadar berat basah atau berat kering, dan rata-rata biomas. Hasil kajian menunjukkan bahwa sarang kecil didominasi oleh koloni pekerja, sementara itu sarang serdahana

1	Formatted: Font: 11 pt, Superscript
-{	Formatted: Font: 11 pt, Superscript
-{	Formatted: Font: 11 pt, Superscript
-[	Formatted: Font: (Default) Times New Roman, 11 pt, Font color: Text 1
	Formatted: Font: (Default) Times New Roman, 11 pt, Font color: Text 1
Υ	Formatted: Font: (Default) Times New Roman, 11 pt, Font

Author1Surname et al.

dan sarang besar didominasi oleh koloni nympha. Rata-rata biomas yang ditemukan untuk sarang besar 949.8 kg/ha2, sarang serdahana 605.2 kg/ha2, dan sarang kecil 537.5 kg/ha2. Faktor-faktor yang mempengaruhi biomas anai-anai tanah *M. gilvus Hagen* adalah makanan, tenaga, pemangsa dan lingkungan. Kehadiran koloni anai-anai mempengaruhi ekosistem semulajadi, tetapi jenis koloni memainkan peranan penting dalam menentukan sifat kesannya.

KEY WORDS: biomass, colony, colony, Macrotermes gilvus Hagen

### **1.0 INTRODUCTION**

Macrotermes gilvus Hagen has an important role in natural ecosystem, particularly in nutrient cycling as an active decomposer. Moreover, this species of Termitidae is a crucial component of biogeochemical cycles [1], especially carbon and nitrogen cycle [2]. M. gilvus Hagen widely spread in Southeast Asia, especially in Indonesia. This is one of subterranean termites consuming much litter and other cellulosic material within the forest. However, there are no more information concerning to its biological study in Indonesian natural forest. One parameter associated to those biological roles in certain ecosystem is biomass, a quantitative measurement of total mass of termite from a part or all member of a population in a certain place and time. As we know, biomass of this species can change over time, and this certainly depends on colony composition within the colony. Biomass is possible to be used as an appropriate indicator to measure the number of food consumed by this species, hence it can be predicted the effects of the species in an ecosystem [3]. No studies have ever been conducted to investigate the biomass of M. gilvus Hagen in Indonesian natural forest ecosystem. Therefore, advanced research on biomass and colony composition is crucial and absolutely needed to know the biology of *M. gilvus* Hagen in the current natural ecosystem. The objective of this research was to study the *M. gilvus* Hagen biomass in natural forest and to evaluate the need of food of the species as well as factors affecting it. This present study focused to observe various variables including wet and dry body mass, ratio of dry body mass/wet body mass, and average of biomass based on the nest size of *M. gilvus* Hagen. Biomass is the amount of living matter present at any given time, expressed as mass per unit area or volume of habitat, (Is it any literature concerning wer and dry body mass. More clear what do you mean with biomass.) Given the ubiquitous and wide spread distribution of termites throughout savannahs and biomasses estimated to equal that of large herbivores, this nutrient enrichment through mound erosion may contribute significantly to vegetation heterogeneity in savannahs [4]. This present study focused to observe various variables including wet and dry body mass, ratio of dry body mass/wet body mass, and average of biomass based on the mound size of M. gilvus Hagen

## 2.0 MATERIALS AND METHODS

Research was performed in Yanlappa Sanctuary, Bogor, West Java (located between 6°40' S and 106°45' E. The selection of the area was based on the high density of termite *M. gilvus* Hagen mound after a census...-(is it any reference for this matter).-Subterranean termites *M. gilvus* Hagen samplings were conducted by using colony classification [3] at different size of mound: small mound height (0 – 0.99 m), medium mound height (1 – 2.99 m) and large mound\_height ( $\geq 3$  m).[2]. Height mound means size mound from land surface to on top of mound..-(What do you mean with size in height, diameter, or anything

	r <b>matted:</b> Font: Times New Roman, 12 pt, Not Bold, Font pr: Text 1
For 1	rmatted: Font: Times New Roman, 12 pt, Font color: Text
For	r <b>matted:</b> Font color: Text 1
	rmatted: Font: (Default) Times New Roman, 12 pt, Font or: Text 1
For	r <b>matted:</b> Font color: Text 1
	r <b>matted:</b> Font: (Default) Times New Roman, 12 pt, Font or: Text 1

Formatted: Font color: Text 1

Author1Surname et al.

else.) Colony composition calculation. The colony composition in the mound was obtained by digging and dismantling the mound vertically and horizontally at as much 3 of each nest type. Termite specimens of each sample mound were then collected using vacuum cleaner (3.5 kVA). After dismantled, the mound were then closed using dark plastic for 3 hours to give the remaining time for termite foragers back to the nest. Specimen sampling was continued using vacuum cleaner until no more termites in the mound, and the termite colony was subsequently separated based on their caste. In final, each termite caste in each sample mound was calculated to know its composition.

Biomass quantification. Termites were surveyed by collecting 300 individuals of eachdifferent caste (worker, major and minor soldier, nymph, queen, and king) at each different size of mound (small, medium, and large). Then, the wet body mass value was measured by weighing of each of 300 termite specimens of each colony by using microbalance. All specimens were subsequently dried in oven under 100° C for 24 hours. Dried specimens were then measured for each colony to obtain the dry body mass value. All materials were cooled and stored in desiccator and balanced. All measurements were replicated for 10 times.

# 3.0 RESULTS AND DISCUSSION

Results showed that large mound had ten times higher colony size than small mound, whereas medium mound had four times higher than small mound. The comparison between colonys in small and large mound was consistent, while in the medium mound, the number of major soldier was strongly high. The small mound was dominated by workers, whereas the medium and the large mound was dominated by nymph (Table 1). AVONA and correlation test presented that there was a significant correlation between the number of individuals and the <u>moundnest</u> size.

Table 1. The number of individuals in termite colony at three different types of <u>moundsnest</u>, Yanlappa sanctuary, Bogor

Colony Nest type	Major Soldier	Minor Soldier	Worker	Nymph	Total
	1 <u>,</u> 297 ± 179	$261\pm91$	10,196 ± 1,455	8 <u></u> 468 ± 210	20,223 ± 1,919
Small					
Medium	$4_{\underline{\star}}021\pm289$	$906\pm573$	$3_{\pm}167\pm706$	$38_{\underline{\star}}173\pm 645$	$46_{2}267 \pm 2_{0}073$
Large	$2_{\star}964 \pm 158$	$360\pm423$	$29_{\tt a}277 \pm 183$	$151_{\tt a}233\pm8{,}24$	$183\_825\pm7\_742$

Table 2. Wet and dry body mass of *Macrotermes gilvus* Hagen in natural forest, Yanlappa Sanctuary, Bogor (n=300)

Colony /Sub Colony	Wet body mass (g)	Dry body mass(g)	Ratio Dry body mass/ Wet Body mass (%)
Worker	$6.08 \pm 18.06$	$3.63 \pm 7.17$	<u>59,70</u> 6.15 ± 10.27
Major Soldier	$33.30 \pm 39.31$	$14.37 \pm 16.89$	$43,1521.14 \pm 31.20$
Minor Soldier	$8.43 \pm 20.69$	$6.60 \pm 13.76$	<u>78,29</u> 9.63 ± 14.24
Nymph	$8.67 \pm 14.84$	$6.23 \pm 7.16$	7 <u>1,85</u> . <del>50</del> ± 9.52
Queen	$1.082.30 \pm 66.70.60$	$444.10 \pm -14.01.10$	$41.03 \pm 17.78$
King	$1.038.80 \pm 10.75.40$	$654.20 \pm 67.5.40$	<u>62.98</u> <u>63.00 ± 61.99 ??</u>

Formatted: Font: 10 pt
Formatted: Normal, Indent: Left: 0,5 cm, No bullets or
numbering
Formatted: Font: 10 pt
Formatted: Font: 10 pt

Formatted: Normal, Indent: Left: 0 cm, First line: 0,75 cm

Author1Surname et al.

In the study area, there were 43 points of termite colonies found consisted of 15 spots of large mound, 23 spots of medium mound, and 5 spots of small mound. Termite biomass *M. gilvus* Hagen found in the study area was approximately 936 kg/<u>hakm<sup>2</sup></u> with biomass average for small mound was 537.5 kg/<u>hakm<sup>2</sup></u>, medium mound was 605.2 kg/<u>hakm<sup>2</sup></u>, and large mound was 949.8 kg/<u>hakm<sup>2</sup></u> (Table 3). This variation is due to the size and age of the individuals of mound. The traps which were installed near the colony were found to have adult workers, soldiers as well as nymphs and therefore a large number of individuals were recorded in 1 mound sample [5].

<u>Please re-check for the calculation.</u> Table 3. Mean of biomass for each colony based on the size mound of *Macrotermes gilvus* Hagen in natural forest

Colony/Sub	Biom	y/ha)	
colony	Small	Medium	Large
Worker	$2.458 \pm 2.788$	$2.524 \pm 3.104$	$5.517 \pm 8.666$
Major soldier	$9.058 \pm 10.375$	$10.135 \pm 11.261$	$11.414 \pm 13.164$
Minor soldier	$2.575 \pm 3.153$	$3.175 \pm 3.431$	$3.681 \pm 4.033$
Nymph	$0.764 \pm 1.361$	$1.192 \pm 1.614$	$5.517 \pm 8.666$
Total	5.375	6.052	9.498
Total	537.5 kg/ <u>hakm<sup>2</sup></u>	605.2 kg/ <u>ha</u> km <sup>2</sup>	949.8 kg/ <u>hakm<sup>2</sup></u>

The highest biomass of *M. gilvus* Hagen was recorded in major soldiers, and then followed by minor soldier, worker, and nymph. The highest number of biomass of major soldier may be related to its contribution to the colony, that is smaller compared with minor soldier and worker colony. In the present study, number of worker was found to be higher compared with other colonys with its portion was about  $\pm$  80% of the total colony. The colony, composition in social insects can be influenced by environmental factors such as temperature. Furthermore, colony composition in termite colony or foraging groups of termites are known to vary with time of day, season, species, and colony size or age [6]. Meanwhile, individual shifting was faster in worker colony compared with soldier. Soldier was mostly longer lifespan [33]. In a colony, worker is responsible for various kind of tasks including food foraging and feeding another colony, repairing the nest, and also building a new nest. It also helps to control air circulation especially for CH<sub>4</sub> and CO<sub>2</sub>, maintaining fungus plantation, as well as controlling mound humidity [4]. Smallest biomass was recorded for nymph, this may be related to phenology of termite since nymph is immature phase that still growing become mature termite with certain function for the colony. Foods consumed by termites are not only used for growth and energy but they are also stored inside termite's gut. Feces and water secreted from the body are also converted into energy, tissue, organ, and another use [5]. 10 % of total chicken dry mass and they have many potential industrial applications. protein fibers from boimass termites named as keratin, which is an insoluble protein [6]. The worker's of gut fungus-growing subterranean termites (Macrotermes) secreted enzymes used for final oligosaccharides digestion  $[\underline{77}]$ . Gut of subterranean termites *M. gilvus* Hagen worker was in alkaline condition (pH  $8.83 \pm 0.31$ ) and strongly supported the lignocellulose digestion [88]. These workers also transported enzymes from mature fungi to the inoculated plant substrate [99]. Environmental factor has a strong relationship with termite biomass. Higher number of *M. gilvus* Hagen biomass might be related to their habitats in the tropic with abundant food around it and high level of decomposition, which result in low level of energy utilization. Less predator around the colony will result in more efficient of energy utilization compared with lots of predator living around it [1010].

Formatted: Font: Times New Roman, 12 pt
Formatted: Font: Times New Roman, 12 pt

Formatted: Font: Times New Roman, 12 pt

Formatted: para, Justified, Space Before: 12 pt, After: 14,4 pt

Formatted: Font: Times New Roman Formatted: Font: Times New Roman Formatted: Font: Times New Roman Formatted: Font: Times New Roman

Formatted: Font: 13 pt, Font color: Dark Gray, Expanded by 0.1 pt

Author1Surname et al.

### 4.0 CONCLUSION

This study concludes that the small mound was dominated by workers, whereas the medium and the large mound was dominated by nymph. The mean of *M. gilvus* Hagen biomass reached 936 kg/<u>hakm<sup>2</sup></u>. Mean of termite biomass *M. gilvus* Hagen for large mound was 949.8 kg/<u>hakm<sup>2</sup></u>, medium mound was 605.2 kg/<u>hakm<sup>2</sup></u> and small mound was 537.5 kg/<u>hakm<sup>2</sup></u>.

<u>The variation in percent workers colony suggests that environmental factors such</u> temperature; relative humidity and rainfall affect the ratio of the workers to soldiers.

Factors affecting soil termite biomass *M. gilvus* Hagen are source of food, energy efficiency, predators, and environment. <u>This research did not do the last sentence, it was eiting to reference.</u>

### ACKNOWLEDGEMENT

This work was financially supported by the Ministry of Research, Technology and Higher Education of the Republic of Indonesia through Universitas Negeri Semarang, Semarang, Indonesia.

REFERENCES

- [1] Brune, A. (2014). Symbiotic digestion of lignocellulose in termite guts. Nature Reviews Microbiology 12(3): 168-180.
- [2] \_Meyer, V. W., Crewe, R. M., Braack, L. E. O., Groeneveld, H. T., & Linde, M. J. (2001). Biomass of *Macrotermes natalensis* in the Northern Kruger National Park, South Africa-The Effects of Land Characteristics. J. Sociobiology 38(3): 431-448.
- [3] Turner, J. S. ((2006)). Termites as Mediators of the Water Economy of Arid Savanna Ecosystems Department of Environmental & Forest Biology, Suny College of Environmental Science & Forestry, Syracuse, New York. *Dryland Ecohydrology*, 303-313pp.
- [4] Cleo M. Gosling, Joris P. G. M. Cromsigt, Nokukhanya Mpanza, & Han Olff. (2012). Effects of Erosion from Mounds of Different Termite Genera on Distinct Functional Grassland Types in an African Savannah. *Ecosystems*. 15: 128–139
- [5] Strassmann, J.-E., & Queller, D.-C. ((2007)). Insect Societies as Divided Organisms: The Complexities of Purpose and Cross-Purpose. Department of Ecology and Evolutionary Biology, Rice University, Houston USA
- [5] Sharma S, Gupta, A., Saufi, S.M., Kee, C.Y.G., Podder, P.K., Subramaniam, M., Thuraisingam, J. 2017. Study of Different Treatment Methodson Chicken feather Biomass. (2017) IIUM Engeenering Journal, 18 (2), pp. 47-55
- [66] Sattar A, Naeem M, & Ul Haq E. 2013. Impact of environmental factors on the population dynamics, density and foraging activities of Odontotermes lokanandi and Microtermes obesi in Islamabad. SpringerPlus, 2: 349
- [7] Poulsen, M., Hu, H., Li, C., Chen, Z., Xu, L., Otani, S., Nygaard, S., Nobre, T., Klaubauf, S., M. Schindler, P., Hauser, F., Pan, H., Yang, Z., Sonnenberg, A. S. M., Wilhelm De Beer, Z., Zhang, Y., Wingfield, M. J., Grimmelikhuijzen, C. J. P., De Vries, R. P., Korb, J., Aanen, D. K., & Wang, J. (2014). Complementary Symbiont Contributions to Plant Decomposition in a Fungus-farming

Formatted: Justified, Indent: First line: 0,75 cm

Formatted: Font: Times New Roman, 12 pt Formatted: Font: Times New Roman, 12 pt Formatted: Font: Times New Roman, 12 pt Formatted: Justified

	Formatted: Font: Italic
	Formatted: Indent: Left: -0,75 cm
1	Formatted: Font: 11 nt

Formatted: Normal, Indent: Hanging: 0,75 cm

Formatted: Normal, Indent: Hanging: 0,75 cm

Termite. Proceedings of the National Academy of Sciences of the United States of America 111(40): 14500-14505.

- [87] Subekti, N., Fibriana, F., Widyaningrum, P., & Adfa, M. (2017). Determination of the Major Compounds in the Extract of the Subterranean Termite *Macrotermes gilvus* hagen Digestive Tract by GC-MS Method. Ukrainian Biochemical Journal 89(4): 77-82.
- [98] Da Costa, R. R., Hu, H., Pilgaard, B., E. Vreeburg, S. M., Schückel, J., Pedersen, K. S. K., Kračun, S. K., Busk, P. K., Harholt, J., Sapountzis, P., Lange, L., Aanen, D. K., & Poulsen, M. (2018).

Enzyme Activities at Different Stages of Plant Biomass Decomposition in Three Species of Fungus\_growing Termites. Applied and Environmental Microbiology 84(5): e01815-17.

[109] Meyer, V. W., Braack, L. E. O., Biggs, H. C., & Eberson, C. (1999). Distribution and Density of Termite Mounds in The Northern Kruger National Park, with Specific Reference to Those Constructed by *Macrotermes* Holmgren (Isopteran: Termitidae). African Entomology 7: 123-130. Formatted: Indent: First line: 0 cm