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1. Accession 0220874	Agency Identification No. 2. NIFA 3. LA.B	5. Work Unit/Project No. LAB94013	6. Status Annual Report
7. Title BIOTECHNOLOGY AND MOLECULAR IDENTIFICATION OF POPULATION AND COLONY STRUCTURES FOR IMPROVED TERMITE CONTROL			
12. Investigator Name(s) (Last Name and Initials) Husseneder, C.			
20. Termination Date 11/30/2014		40. Period Covered (mo/da/year): 01/01/2011 TO 12/31/2011	
Outputs: Four invited presentations, five oral submitted presentations, four posters, and one provisional patent application were outcomes of this project.			
Outcomes/Impacts: Termites are known to have an extraordinary reproductive plasticity and capacity, but the underlying genetic patterns of termite reproductive biology are relatively understudied. The goal of this study was to identify genes for which expression levels differ between dealated precopulatory females (virgins) and egg-laying queens of the Formosan subterranean termite, <i>Coptotermes formosanus</i> Shiraki. A normalized polyphenic expressed sequence tag (EST) library was constructed that represents genomic material from most of the castes and life stages of the Formosan subterranean termite. Microarrays were designed using probes from this EST library and public genomic resources. Virgin females and queens were competitively hybridized to these microarrays and differentially expressed candidate genes were identified. Differential expression of eight genes was subsequently confirmed via reverse transcriptase quantitative PCR (RT-QPCR). When compared to virgins, queens had higher expression of genes coding for proteins related to immunity (gram negative binding protein), nutrition (e.g., termite-derived endo-beta-1,4-glucanase), protein storage, regulation of caste differentiation and reproduction (hexamerin, juvenile hormone binding protein). Queens also had higher transcript levels for genes involved in metabolism of xenobiotics, fat, and juvenile hormone (glutathione-S-transferase-like proteins, and cytochrome P450), among others. In particular, hexamerin, the juvenile hormone binding protein, and a cytochrome P450 from the 4C subfamily are likely to be involved in initiating the inactive period during the reproductive cycle of the queen. Virgins had higher expression of genes related to respiration, probably due to recent flight activity than queens, and also several genes of unknown function. Termite reproductive genomics uncover novel avenues for more effective and environmentally friendly pest management by using the discovery of vital genes and pathways to develop novel products and biotechnologies.			
Publications: Husseneder, C., McGregor, C., Lang, P., Collier, R., and Delatte, J. 2011. Transcriptome profiling of female alates and egg-laying queens of the Formosan subterranean termite. <i>Comp. Biochem. Physiol. D</i> : DOI:10.1016/j.cbd.2011.10.002. Husseneder, C., Simms, D. M., Delatte, J. R., Wang, C. Grace, J. K., and Vargo, E. L. 2011. Genetic diversity and colony breeding structure in native and introduced ranges of the Formosan subterranean termite, <i>Coptotermes formosanus</i> . <i>Biol. Invasions</i> . DOI 10.1007/s10530-011-0087-7. Sethi, A., Xue, Q.-G., La Peyre, J., Delatte, J., and Husseneder, C. 2011. Dual origin of gut proteases in Formosan subterranean termites (<i>Coptotermes formosanus</i> Shiraki) (Isoptera: Rhinotermitidae). <i>Comp. Biochem. Physiol. A</i> : 159; 261-267. Yang, Y., Zhu, Y. C., Ottea, J., Husseneder, C., Leonard, B. R., Abel, C., Luttrell, R., and Huang, F. 2011. Downregulation of a cadherin gene, but not of alkaline phosphatase genes, is associated with Cry1Ab resistance in <i>Diatrea saccharalis</i> . <i>PLoS ONE</i> : 6 (10), e25783: 1-12. Vargo, E. L. and Husseneder, C. 2011. Genetic structure of termite colonies and populations. In: <i>Biology of termites: A modern synthesis</i> . Bignell, D., Roisin, Y., and Lo, N. (eds.). Springer, Dordrecht, Heidelberg, London, New York. p. 321-347.			

Participants:		
C. Husseneder (PI), LSU AgCenter.		
Target Audiences:		
Scientific community, Biotech Industry		
Project Modifications:		
Nothing significant to report during this reporting period.		
Approved (Signature)	Title	Date
		