

To: The Dean of Graduate Studies

From: PhD student

Name: Raanan Tzarfati\_

I.D. 034559674

Department \_Evolutionary Biology

Stage: (please circle) 1st Stage/ 2nd Stage

## Annual Progress Report

**Submission to the Graduate studies Authority by the departmental secretary only**

### Part A – designated for PhD Student

**Describe the goals as presented on your letter of intentions/ research proposal, and your current research achievements.**

The main objective of this project is to dissect the genetic and genomic differences between cultivated wheat and its wild progenitor *Triticum dicoccoides* with respect to trait complexes related to domestication, evolution under domestication, and productivity. The first part of the research was based on field trials, and phenotypic measurements of domestication traits based on quantitative approach rather than qualitative classification that were characteristic of previous studies. We described in detail the advantages and considerations that were related to the transition to plants with non-brittle rachis and easy threshing. Our results were summarized and published in *Annals of Botany* (Tzarfari *et al.*, 2013). This paper was highlighted in the well known scientific journal *Nature* (see attached file). The second part of the study is genetic mapping of the quantitative traits loci (QTLs) controlling the differences between the domesticated wheat and its wild progenitor. For QTL analysis, we applied quantitative scores of the domestication related traits with a hope that it will be more informative in the deciphering the genetic architecture of the main components of the domestication syndrome. We found novel QTLs that relate to major domestication traits and traits that evolved under domestication. The results were summarized in a new paper that was recently submitted to *Annals of Botany*.

The third part of the study is to assess the differences in genome expression between domesticate wheat and its wild progenitor, with a special focus on tissues related to the “primary” domesticated traits, non-brittle ruchi and free seed threshing. To do that, we employ a novel approach for genome expression analysis, RNA-seq analysis based on

direct sequencing of the transcripts via next generation sequencing technology. It is a powerful tool for genome functional analysis enable to reveal genome-wide differences in gene expression between the compared genotypes. For RNA-seq analysis, we collected plant material from different plant tissues and different time points. Extracted RNA was processed and RNA-sequencing conducted using Illumina platform sequencing. Currently, the obtain data are analysed by using several specially designed bioinformatics pipelines and we have already recognized some candidate genes (from RNA expressed in glumes), with differential expression between the wild and cultivated wheat genotypes. These days, our main focus is to validate the candidate genes, using qRT PCR, and to extract more RNA from the rachis. The new results should highlight the domestication evolution processes, and could be very beneficial for future breeding efforts.

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Estimated date for submitting PhD dissertation to the PhD departmental committee

\_\_\_\_\_ October 2015

Ph.D. student Name:    Raanan    Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### **Part B - designated to the research the Chairperson of PhD Committee)**

Please refer to the student progress and to the estimated date for submission of dissertation

There is a nice progress in this PhD study. One paper summarizing the results of the phenotypic analysis was submitted and already published. A detailed QTL mapping analysis was conducted with new results on the genetic factors affecting the key domestication traits. The obtained evidence strongly supports our concept of genome asymmetry. The second paper summarizing these results was recently submitted for publication. Currently, Raanan is working on the third part of his study devoted to

functional genomics of domestication. I have no doubt that the thesis will be submitted in time, i.e., till October 2015.

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**PhD research evaluation**

(The evaluations relate to all researches previously supervised by you)

Evaluation	Poor	Average	Good	Very good	Ranked in the top 5%
Novelty				v	
Clarity of research and hypothesis			v		
Criticism				v	
Knowledge of Background material				v	
Knowledge of research methods			v		
Comments					

Supervisors Name: Avraham Korol

Signature: \_\_\_\_\_



Date: 24.02.2014

Chairperson of PhD Committee Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_