



## ***European Network for the durable exploitation of crop protection strategies***

### **IA3 Activity: Human resource exchange**

#### **ENDURE - Internal Mobility**

##### ***Final activity report***

*(The form has to be filled in and sent to the activity leader – message should be sent to his p.a. [denise.barreiro@ibaf.cnr.it](mailto:denise.barreiro@ibaf.cnr.it) – within 15 days after the end of the visit)*

##### **Topic of the visit**

Exploitation of resistance of wheat to Fusarium head blight for control and reduction of pesticides use

#### **1. Information about researcher and sending partner**

**Name and surname:** Tomasz Goral

**Professional status:** senior scientist

**Sending partner:** Plant Breeding and Acclimatization Institute

**Institute/Department/Research Unit:** Department of Plant Pathology

**Address:** Radzikow, 05-870 Blonie, Poland

**E-mail and phone number of the researcher:** [t.goral@ihar.edu.pl](mailto:t.goral@ihar.edu.pl); +48 227252611

**Supervisor name\*:**

**Supervisor e-mail\*:**

**Supervisor phone number\*:**

\*Supervisor information only for PhD student, post-doc and junior researchers

#### **2. Information about hosting partner**

**Hosting partner:** University of Aarhus, Faculty of Agricultural Sciences

**Institute/Department/Research Unit:** Research Centre Flakkebjerg, Department of Integrated Pest Management

**Address:** Flakkebjerg, Forsøgsvej 1, DK-4200 Slagelse, Denmark

**Supervisor name\*:** Lise Nistrup Jørgensen

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**Supervisor phone number\*:** +45 89993652

\* For senior scientist indicate the name of the collaborating colleague

### **3. Information about the visit**

**Duration:** 11 weeks (split into 6, 3 and 2 week stays)

**Starting date:** 20<sup>th</sup> April 2009

**Ending date:** 7<sup>th</sup> November 2009

### **4. Description of the activities and outcomes**

#### **Background and context:**

Reduction of the application of pesticides in wheat production requires deeper knowledge of all variables affecting disease incidence, severity and control possibilities. This includes investigations of chemical, biological control methods, the possibilities of combining them into IPM-strategies, the possibilities for applying reduced and appropriate dosages of pesticides in conventional agriculture and methods for plant protection in organic farming and the application of molecular biology for diagnostic methods and determination of resistance/host plant traits and pesticide resistance. Main wheat diseases in Europe are yellow rust, septoria leaf blotch, *Fusarium* head blight (FHB), powdery mildew etc. Among them *Fusarium* head blight is distinctive because of difficult chemical control, contamination of grain with harmful mycotoxins and complex host resistance mechanisms.

#### **Objective:**

1. Training of application of molecular biology tools for qualitative and quantitative diagnosis of *Fusarium* species causing *Fusarium* head blight of wheat and *Fusarium* ear rot of maize.
2. Collecting and processing data regarding *Fusarium* head blight resistance mechanisms and known genes (QTLs) of resistance of wheat to main fungal diseases. Data will be entered on EURO-Wheat web page <http://www.eurowheat.org> (research activity IA 2.1).

#### **Activities carried out:**

During April-May stay 62 samples of wheat grain from heads inoculated with *F. culmorum* were analysed for *F. culmorum* DNA amount and 18 samples of maize grain naturally infected were analysed for amount of DNA of 11 *Fusarium* species. During September-November stay 13 samples of wheat and 40 samples of maize naturally infected were analysed for DNA amount of 8 and 7 *Fusarium* species, respectively. For quantification of *Fusarium* DNA quantitative real-time PCR assay for the 11 *Fusarium* species *F. graminearum*, *F. culmorum*, *F. poae*, *F. langsethiae*, *F. sporotrichioides*, *F. equiseti*, *F. tricinctum*, *F. avenaceum*, *F. verticillioides*, *F. subglutinans* and *F. proliferatum* was applied. All rtPCR assays were completed successfully. DNA amounts for *F. culmorum* inoculated wheat samples (62) were correlated with mycotoxin (DON, NIV) concentrations and head and kernel infection. For maize samples (58) GMO lines were compared with non-GMO analogue lines and conventional cultivars in respect of DNA concentration of different *Fusarium* species DNA and mycotoxin contamination of grain. Results of rtPCR assay of naturally infected wheat samples (13) showed composition of *Fusarium* species infecting wheat heads in Poland in 2009.

Table describing different types (components) of resistance of wheat to *Fusarium* head blight and methods for measuring them was prepared and published on EURO-Wheat page. Drafts of list and description of main FHB resistance genes (QTLs) and table describing resistance genes known to different diseases were also prepared.

## **5. Links between visit activity and ENDURE**

RA 1. Optimising and reducing pesticide use; RA 4. Improving the basic understanding of the biology of crop-pest systems; RA 4.2 Exploitation of plant genetic resistance; IA 2.1 Virtual Lab, EURO-Wheat project.

rtPCR technique is useful for studying host-pathogen relationships (*Fusarium* – wheat), mechanisms of resistance to fungal diseases (FHB), surveys of changes in frequency of wheat pathogens (*Fusarium* species in wheat). All above information is required to develop modern strategies to crop diseases control (*Fusarium* head blight in wheat).

## **6. Impact**

**Added value for the researcher:** Learning modern molecular techniques for DNA concentration assessment. I came through all steps of rtPCR procedure from DNA extraction to processing of rtPCR results. This knowledge will be very useful in my work in IHAR concentrated of FHB resistance in wheat and surveys of *Fusarium* species frequency causing FHB of wheat in Poland. Stay at the Flakkebjerg research centre was also opportunity to know other modern laboratory equipment and organisation schemes of laboratories and laboratory work. Some of them could be implemented in IHAR laboratories. Last but not least it was opportunity to know new people and start to build scientific collaboration between AU and IHAR in new fields.

**Added value for sending partner and hosting partner:** Possibility to collaboration between the scientists from two institutions in the field of *Fusarium* head blight research. Obtained results can be jointly published in scientific journals. Discussions concerning results of *Fusarium* DNA analysis resulted in finding new scientific questions which need to be answered (quantification of DNA of *Fusarium* chemotypes).

**Date of submission**  
**22/11/2009**



Dr. Maurizio Sattin  
IA3 activity leader

Approved