ECFG15
ROME • ITALY 2020

The endophytic mycobiome of spring and winter wheat (*Triticum aestivum L.*) forms cultivated in ecological, conventional and control conditions

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This research was supported by the National Science Centre (Poland), project no 2017/27/B/NZ9/01591.

ENDOPHYTES IN WHEAT

- Wheat are crucial for global food production, due to their application as important nourishment for humans and livestock animals.

- Endophytes occurrence in plants may ensure various benefits:
  - → oppose pathogen development,
  - → promote host growth,
  - → enhance host defence against abiotic stresses.

- Exploring the ecological role of endophytes and understanding the complex interaction between them and host wheat, may lead to improve wheat tolerance for biotic and abiotic stresses.

http://agro-technika.pl/wp-content/uploads/2014/06/pszenica-1_fmt.jpeg

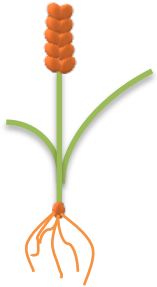
AIM OF THE STUDY

The aim of the study was to isolate and molecular characterize the fungal communities colonizing endosphere of different wheat organs (leaves, stems, kernels, roots) and to compare the obtained mycobiome structures of winter and spring wheat forms cultivated in field (conventional and organic farming) and in control conditions.

MATERIAL

5 WINTER WHEAT FORMS

(Legenda, Bamberka, Ostroga, Arkadia, Euforia)



5 SPRING WHEAT FORMS

(Rusałka, Rospuda, Bombona, Arabella, Kandela)

GROWING CONDITIONS:

1. CONVENTIONAL (FIELD)

2. ORGANIC (FIELD)

3. CONTROL (GREENHOUSE)

METHODS

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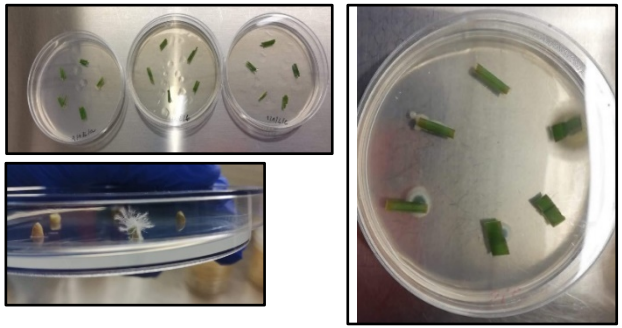
I. SAMPLE COLLECTION AT LATE MILK STAGE

II. SURFACE STERILIZATION

(70% ETHANOL, 0,5% ACTIVE CHLORINE)

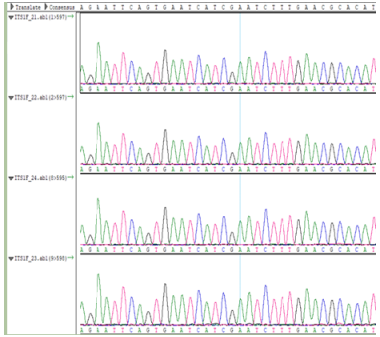
III. ISOLATION OF ENDOGENOUS FUNGI



PARTS OF THE PLANT ORGANS WERE PLACED ON PDA MEDIUM AND INCUBATED

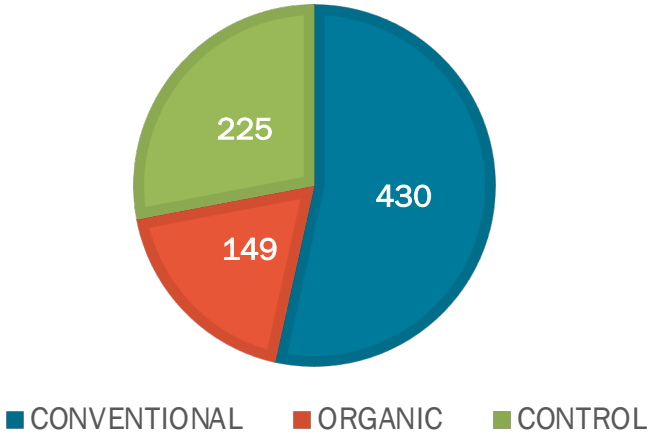
IV. MOLECULAR IDENTIFICATION

- DNA ISOLATION FROM PURE CULTURE
- SANGER SEQUENCING OF : ITS1 - 5.8- ITS2; SSU, LSU REGIONS, *tef1, RBP1*, CaM, *tub2* and *act* genes fragments
- nBLAST ALIGNMENT

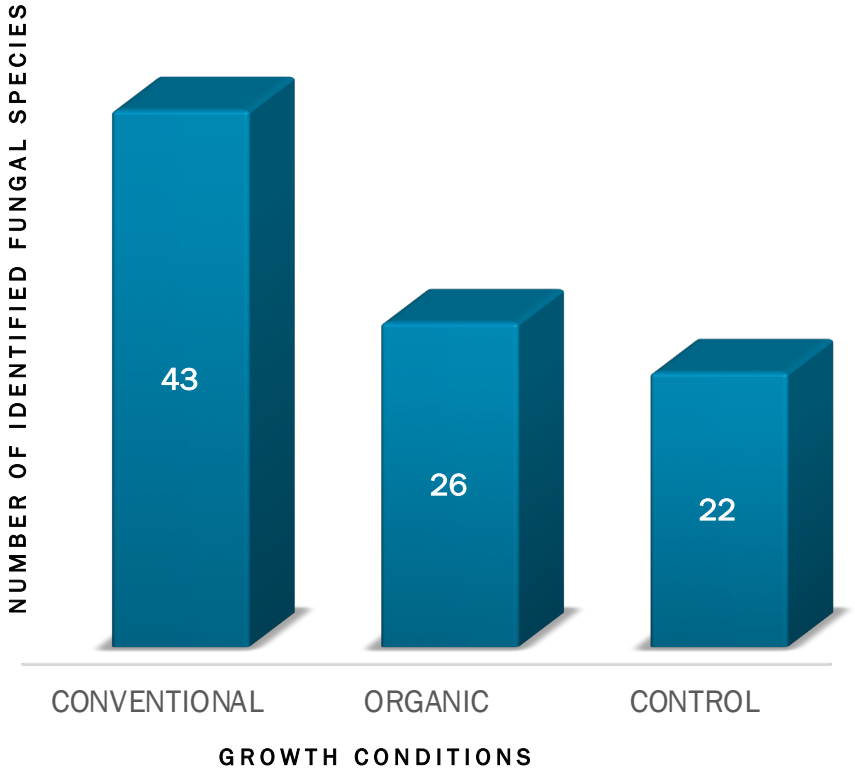


RESULTS

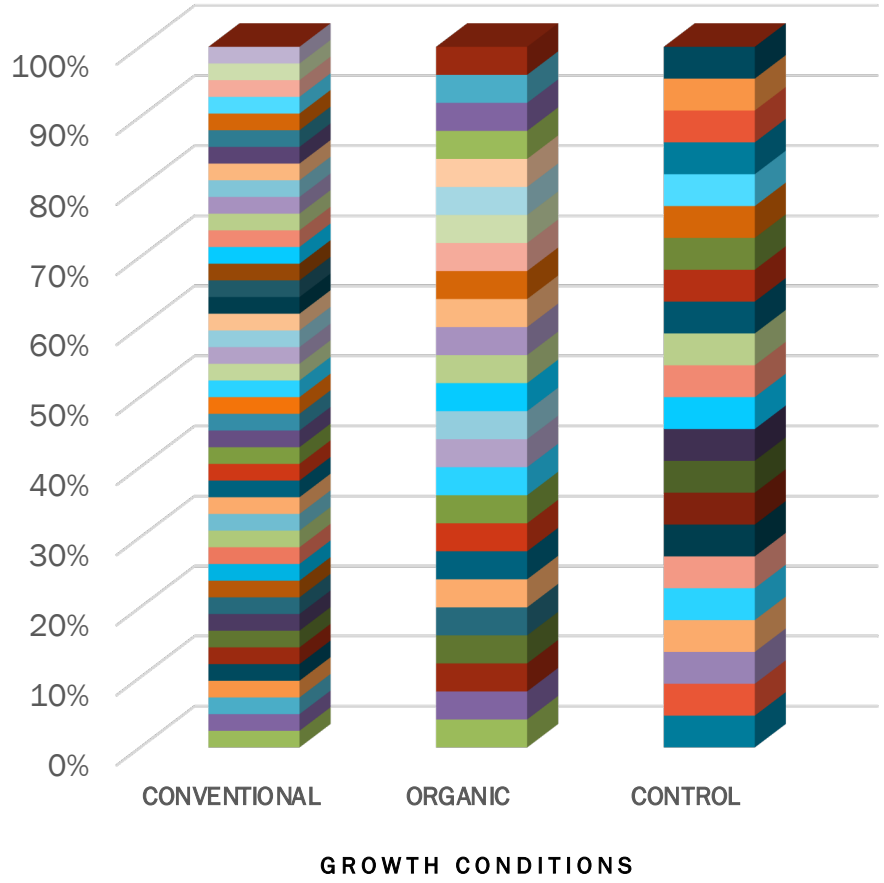
NUMBER OF OBTAINED ISOLATES



DIVERSITY OF FUNGAL ENDOPHYTES IN DISTINCT GROWTH CONDITIONS



COMPOSITION OF ENDOPHYTIC FUNGI IN WHEAT



- *Penicillium olsonii*
- *Aspergillus sp.*
- *Meira sp.*
- *Geomyces pannorum*
- *Gloeotinia sp.*
- *Stemphylium vesicarium*
- *Setophaeria pedicellata*
- *Sarocladium sp.*
- *Phoma sp.*
- *Trichoderma koningii*
- *Phoma pomorum*
- *Periconia macrospinosa*
- *Penicillium crustosum*
- *Penicillium aculeatus*
- *Penicillium digitatum*
- *Phlebia sp.*
- *Neonectria sp.*
- *Microdochium bolleyi*
- *Fusarium proliferatum*
- *Fusarium solani*
- *Fusarium poae*
- *Fusarium avenaceum*
- *Cladosporium sp.*
- *Cladosporium cladosporioides*
- *Cadophora sp.*
- *Backusella sp.*
- *Arthrinium sp.*
- *Anthracocystis flocculosa*
- *Alternaria infectoria*
- *Alternaria alternata*
- *Acremonium sclerotigenum*
- *Clonostachys candelabrum*
- *Meyerozyma sp.*
- *Leptobacillium leptobactrum*
- *Engyodontium album*
- *Gibellulopsis sp.*
- *Setophoma terrestris*
- *Sarocladium strictum*
- *Rhizoctonia solani*
- *Trichoderma viride*
- *Trichoderma hamatum*
- *Phoma eupyrena*
- *Penicillium sp.*
- *Penicillium chrysogenum*
- *Penicillium amphipolaria*
- *Penicillium expansum*
- *Nigrospora gorlenkoana*
- *Moesziomyces sp.*
- *Isaria farinosa*
- *Fusarium sp.*
- *Fusarium redolens*
- *Fusarium oxysporum*
- *Epicoccum sp.*
- *Cladosporium allicinum*
- *Chaetomium sp.*
- *Bipolaris sorokiniana*
- *Aureobasidium pullulans*
- *Anthracocystis sp.*
- *Alternaria sp.*
- *Alternaria conjuncta*
- *Achrobstachys sp.*
- *Chrysosporium pseudomerdarium*

DISTRIBUTION OF THE ENDOGENOUS FUNGI IN DIFFERENT PLANT ORGANS

MOST FREQUENT:

Setophoma terrestris, Setophaeria pedicellata, Fusarium oxysporum, Periconia macrospinosa, Microdochium bolleyi, Fusarium sp.

MOST FREQUENT:

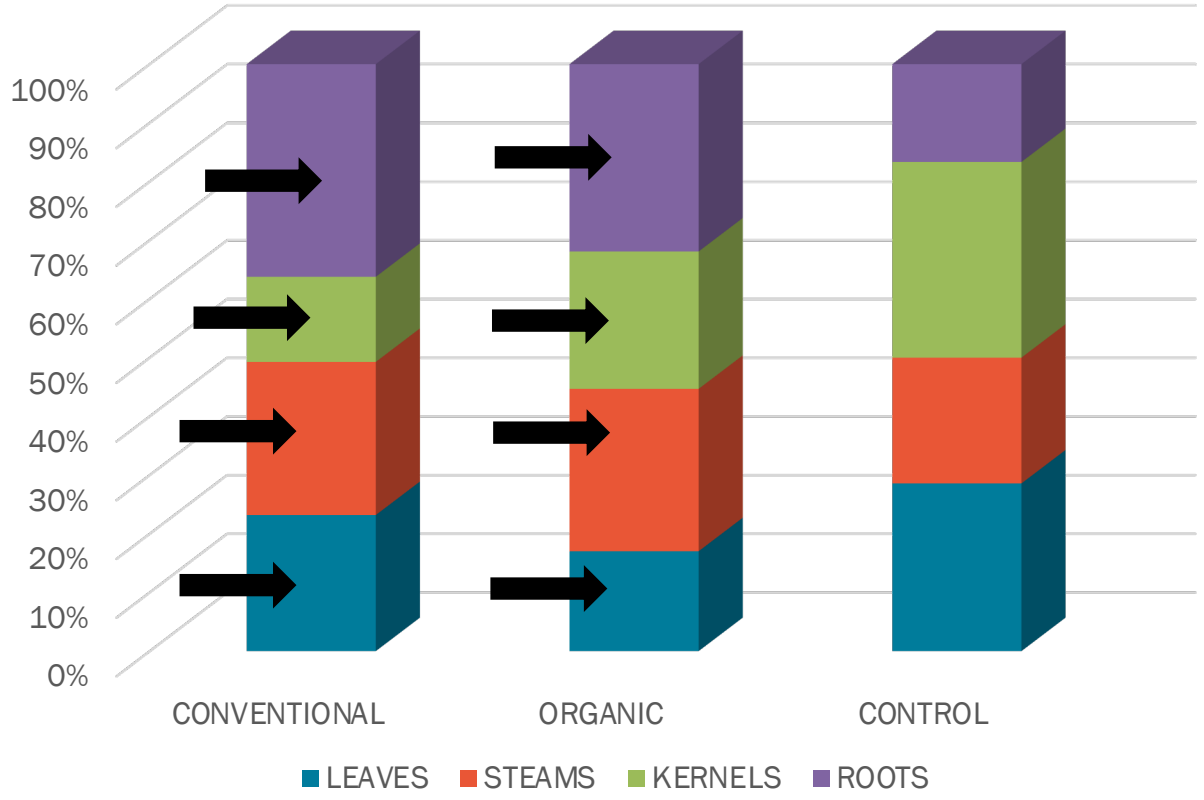
Alternaria sp., Penicillium sp., Sarocladium strictum, Cladosporium sp. Anthracocystis flocculosa

MOST FREQUENT:

Alternaria sp., Sarocladium strictum, Penicillium sp., Anthracocystis sp.

MOST FREQUENT:

Alternaria sp., Sarocladium strictum, Penicillium sp., Anthracocystis sp., Aureobasidium pullulans



FUNGAL DIVERSITY OF WINTER AND SPRING WHEAT ENDOSPHERE IN CONVENTIONAL CONDITIONS

WINTER

OSTROGA

ARKADIA

LEGENDA

EUFORIA

BAMBERKA

SPRING

RUSAŁKA

ROSPUDA

KANDELA

BOMBONA

ARABELLA

FUNGAL DIVERSITY OF WINTER AND SPRING WHEAT ENDOSPHERE IN ORGANIC FARMING

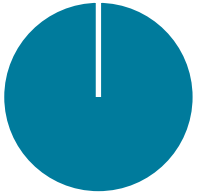
WINTER

OSTROGA

ARKADIA

LEGENDA

EUFORIA



BAMBERKA

SPRING

RUSAŁKA

ROSPUDA

KANDELA

BOMBONA

ARABELLA

FUNGAL DIVERSITY OF WINTER AND SPRING WHEAT ENDOSPHERE IN CONTROL CONDITIONS

WINTER

OSTROGA

ARKADIA

LEGENDA

EUFORIA

BAMBERKA

SPRING

RUSAŁKA

ROSPUDA

KANDELA

BOMBONA

ARABELLA

CONCLUSIONS

- The highest number of endogenous fungi species were observed in wheat cultivated in conventional, field conditions (43), contrary in organic, field and in control conditions the 26 and 22 taxa were identified, respectively.
- The endophytic mycobiome structure of wheat from field conditions have similar species composition, moreover the above and bellow ground parts of this plant present distinct structure of endogenous fungal community.
- In wheat cultivated in field conditions the highest number of fungal endophytes were identified in roots (25 and 15 in conventional and organic farming, respectively), whereas in plants from control conditions the kernels where the most diverse (14).
- *Sarocladium sp.* and *Penicillium sp*. were mostly observed in analysed cultivars and organs from wheat cultivated in control conditions. *Clonostachys candelabrum, Geomyces pannorum, Engyodontium album, Nigrospora gorlenkoana, Chrysosporium pseudomerdarium and Phlebia sp.* were observed only in single cultivars.
- The genotype of the host plant has a lower effect on the mycobiom structure of the wheat endosphere. The main differences were observed between winter and spring wheat forms in organic cultivation.