Development of pathosystems to test the efficiency of news alternatives methods of treatments

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Introduction, context and objectives

To achieve one of the objectives of the Ecophyto plan, which is to reduce the use of phytosanitary products, many professionals in the seed sector are currently developing new alternative methods of treatment. To be able to evaluate the efficiency of these treatments, tools have been developed in the phytopathology laboratory of GEVES in order to meet the needs of the solutions providers. To reach this goal, the capacity of transmission of the pathogen from seed to plant (pathosystem) is being evaluated and the effectiveness of these alternative treatment methods is being assessed.

Materiels & Methods

Protocols have been set up to obtain soil or seeds infested by different pests, evaluate the percentage of infection and germination of these seeds. Depending on the pest and treatment used, viability and damage potential of the pathogens can be evaluated using the existing detection methods (grow out, culture on media…).

In vitro screening

Example of *Fusarium* sp. / Sunflower development.
Aggressiveness of strains evaluated on *in vitro* confrontation test.
Observation of prospection/growth of mycelium and necrosis area on seedling

Tab. 1 Criteria of notation to differentiate profil

Strains		Germinated seeds (inhibition / development)	Infected seedling (Necrosis area)
Fusarium	*acuminatum*	25 (10/15)	15/15 (20%)
Fusarium	*sporotrichioides*	24 (3/19)	19/19 (40%)
Fusarium	*tricinctum*	23 (0/23)	23/23 (100%)
Fusarium	*equiseti*	25 (0/25)	25/25 (10%)
Fusarium	*avenaceum*	25 (0/25)	25/25 (100%)
Fusarium	*moniliforme*	24 (2/22)	22/22 (60%)

Selected strains :
F. tricinctum / F. avenaceum / F. moniliforme

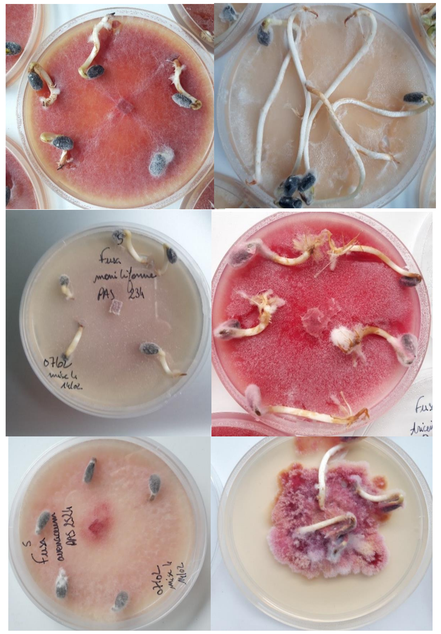

Fig. 1 Strains screened by confrontation test

In vivo Screening

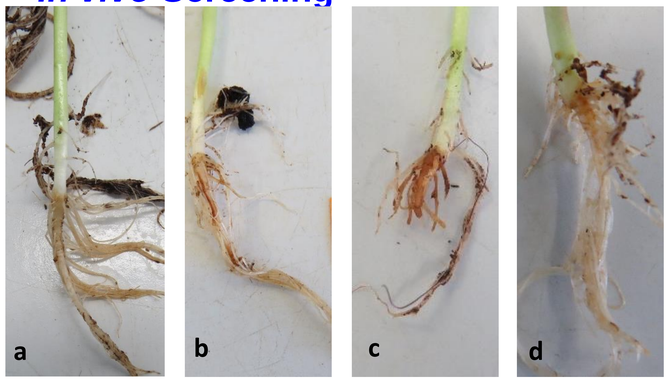

Fig. 1 Aspect of sunflower roots with different *Fusarium* sp.
a : heathy plant / b : *F. avenaceum* / c : *F. moniliforme* / d: *F. tricinctum*

As an official resistance test, a notation scale is developed in order to compare the different profile and impact of pathogen on plants development. This scale is based on necrosis observation.

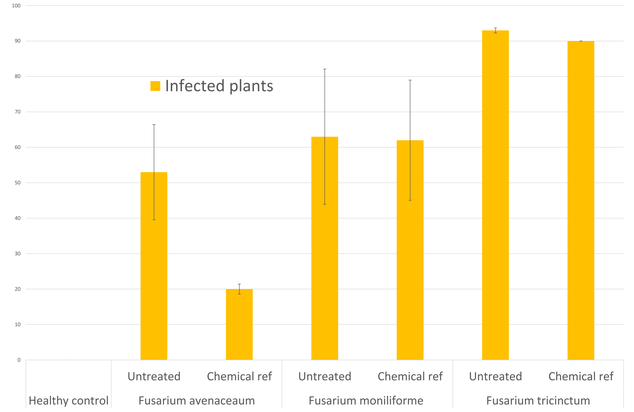

Fig. 2 Infected plants observed with different *Fusarium* strains.

First results are characterized by different types of necrosis and impact on roots development depending on strains (Fig 1). When *F. avenaceum* involved longitudinal necrosis, *F. monoliforme* involved necrosis and inhibition of roots germination and *F. tricinctum* is characterizd by root branching with necrosis at the root tip. The strains tested *in vivo* showed their different profil : pourcentage of infected plants is higher on *F. tricintum* compared to *F. moniliforme* and *F. avenaceum*. Nevertheless, an important standard deviation is observed on two strains (*F. avenaceum* and *F. moniliforme*) due to difference of infected plants between repetitions The chemical reference had an impact on *F. avenaceum* but none on *F monoliforme* and *F. tricinctum*. Important to note that the intensity of symptom is higher on *F monoliforme*. A last test on disease pression needs to be perfomed to standardize the pathosytems.

Conclusions and perspectives

Lot of pathosystems are managed or can be managed due to our expertise on crops or vegetables. This methodological approach can be adapted on new biotests or new complementary methods (vital staining, biotest ...) depending on the biological cycle of the pathogen and the way of application of the solutions. With the development of the alternative way of treatment, more than ever before, the presence of pathogens on seeds needs to be detected and their damage potential needs to be assessed..

IHC 2022
ANGERS – FRANCE