Oplismenopsis najada new host of Pyricularia spp.

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Short Report

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Abstract

Pyricularia spp is a fungal complex whose best known representative is *Pyricularia oryzae.* It also affects other weeds that grow alongside the rice culture, posing greater risk of contribute as primary inoculum for development, survival and dissemination of pathogen. During monitoring of species weeds near of rice culture in Corrientes (Argentina), were observed symptoms of blast on leaf blades of *Oplismenopsis najada*, known as “canutillo” (Poaceae). It is a perennial species that inhabits flooded and rice-growing areas of argentinian NE. Koch's postulates were applied to determine the etiology confirming *O. najada* as a new host of *Pyricularia* spp, but incapable of causing disease in rice. This is the first report of *Oplismenopsis najada* as new host of *Pyricularia* spp in Argentina.

Introduction

The genus *Pyricularia* comprises large group of species hose best known representative is *Pyricularia oryzae* (teleomorph *Magnaporthe oryzae* B. Couch) named by Cavara in Italy in 1891 (Ou 1985). Is the causal agent of the rice blast disease (*Oryza sativa*), considered as the most widespread and destructive disease worldwide (Couch and Kohn 2002; Ou 1985; Bastida et al. 2019) and is a threatening global food security (Asibi et al. 2019).

The genus *Pyricularia* It affects more than 50 species of the Poaceae family, among them crops like rice, wheat and accompanying weeds (Ou 1985; Scheuerman et al. 2012; Webster and Gunnell 1992). In rice crops it attacks from seedling to grain filling; though most damage is observed from tillering stage onward (Bastida et al. 2019).

In monitoring of species weeds near of rice culture in Corrientes (Argentina) plants of *Oplismenopsis najada* (Hack, et Arech) Parodi, commonly known as canutillo (Poaceae), were observed, whose leaf blast symptoms were typical as shown in Fig. 1.

INSERT **Fig. 1** Symptoms of blast on *O. najada* in natural infection

The primary inoculum of *Pyricularia* spp survives in crop residue, seeds and secondary hosts as conidia and mycelium. Despite having been identified in different plants, the role of the different hosts of the pathogen on rice is still controversial (Scheuerman et al. 2012).

In this regard several authors cross-inoculated isolated from rice and grass-weeds and were able to show cross-infection. Results from some cross-inoculation studies shown that *Pyricularia* spp from *Bromus catharticus* infect *Oryza sativa* (Bastida et al. 2019). Also Mackill and Bonman (1986) showed pathogenicity cross between of *Pyricularia* spp from *Rottboellia exalta* on *O. sativa*. These researches suggests that each pathosystem should be evaluated in particular, being that most of the pathogenicity tests of *Pyricularia* spp isolated on grass weeds, does not show positive results in cross inoculations with rice (Ou 1985) which is the most important extensive crop in Argentina, confirming that cross pathogenicity is a rare phenomenon (Scheuerman et al. 2012).

Our hypothesis holds that the inoculation of *Pyricularia* spp strains of *O. najada* in rice will be negative. However, it constitutes a new host for *Pyricularia* spp.

In order to update the host range of *Pyricularia* spp and to contribute to the clarification of the pathogenic role of rice weeds as potential sources of primary inoculum, the present work was carried out.

Materials And Methods

The study was carried out in the Laboratory of Plant Pathology, Faculty of Agronomy, National University of North East (FCA-UNNE) (Corrientes Province). Botanical identification was carried out at the Weed Center FCA-UNNE.

Lesions on leaves were measured with a ruler. Micromorphometric characteristics were determined by measuring conidia and conidiophores obtained from lesions, using an ENOSA 40x microscope with micrometer eyepiece.

To obtain *Pyricularia* spp isolates, sowings were made from leaf pieces taken from the border between healthy and diseased tissue of the lesions, which were disinfected in 2.5% NaCl one minute, and transferred to Petri dishes with 1.5% potato glucose agar (PGA) 1.5%, pH 6. Colonies were grown in a 12 h light – 12 h dark illumination hood for 8 days (Philips TL-D 36W/54–765 1SL/25 lamp) at 25 ± 2°C. Cultural characteristics were determined on PGA.

Pathogen inoculations were performed by spraying a suspension of 10^6 conidia mL^{-1} with the addition of Tween 20, on healthy plants of *O. najada* (Fig. 2) and rice (GURI INTA CL variety) with 3–4 leaves, grown in greenhouses. Inoculated plants remained in humid chamber conditions for 7 days (25 ± 2°C) (Verzignassi et al. 2012).

INSERT Fig. 2 *Pyricularia* spp on *O. najada* leaves inoculated in the laboratory

Results

The genus *Pyricularia* was identified on leaf blades of *O. najada* causing fusiform lesions with brown edges surrounded by a chlorotic halo measuring 7.3 x 2.15 cm. Numerous spots tended to coalesce to form blight. In young lesions a green efflorescence was observed, becoming gray in older ones; with sympodially growing conidiophores with 10 to 18 conidia at their extremity, pyriform, biseptate, of 16.8 x 5.4 µ.

Direct pathogenicity was tested in *O. najada* plants reproducing the lesions of the natural infection. The natural and micromorphometric characteristics of the reisolate coincided with the pure isolate, complying with Koch's postulates. Pathogenicity in rice was negative.

According to our studies this is the first report of *Oplismenopsis najada* as a new host of *Pyricularia* spp. in Argentina however, pathogenicity studies should continue to determine if it plays a role as a reservoir

of the disease capable of making other hosts sick.

Discussion

Oplismenopsis najada, commonly known as “canutillo” is found inhabiting canals, drains, flooded sites and rice fields in the province of Corrientes. Although it is a host of *Pyricularia* spp, it does not represent a source of inoculum for rice blast.

Several authors have verified the cross-pathogenicity of *Pyricularia* spp obtained from different hosts on rice plants (Bastida et al. 2019; Gutiérrez and Cúndom 2015; Ou 1985; Mackill and Bonman 1986; Perelló et al. 2017) however, it is still a rare phenomenon as Scheuerman et al. (2012) argue, which is why each pathosystem should continue to be studied individually.

The direct pathogenicity of *Pyricularia* spp from *O. najada* in the same host, but with negative results in rice plants, indicates that it does not represent a direct inoculum source of blast disease confirming our hypothesis, despites be a *Pyricularia* spp hosts.

All this points to the need to continue exploring the pathogenic combinations among the different hosts deepening the studies in botanically related plants and of other families, in order to clarify the role of the weeds as potential sources or rice blast inoculum to contribute to the knowledge of this disease of worldwide distribution.

Declarations

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Human and animal rights. This research did not involve any animal and/ or human participants. Conflict of interest. The authors declare that they have no conflict of interest.

Contributions

Bastida LM has conceived the idea, carried out plant sampling, trials, writing and general supervision. Quiroga JA has contributed with sampling, trials, photographic registration and editing of the text. Gutiérrez SA and Carmona MA have contributed to the revision and final editing of the text.

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Figures

Figure 1

Symptoms of blast on *O. najada* in natural infection

Figure 2

Pyricularia spp on *O. najada* leaves inoculated in the laboratory