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Scientific Article

Reaction of signal grass (*Urochloa* spp.) cultivars to *Pyricularia* species associated with blast disease

Reação de cultivares de braquiária (*Urochloa* spp.) à espécies de *Pyricularia* associadas à brusone

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ABSTRACT - Fungi of the genus *Pyricularia* have a wide range of host plants and are capable of infecting more than 50 species of grasses, causing the blast disease, with damage to the ears. Species of the forage signal grass (*Urochloa* spp.) can be hosts of this genus of fungus and can be an important source of inoculum of the pathogen for other agricultural crops affected by blast, especially wheat. The objective of this study was to determine the reaction of nine cultivars of *Urochloa* to the pathogens *Pyricularia oryzae Triticum lineage* (PoTl), *P. pennisetigena*, *P. urashimae*, and *P. grisea*. The virulence of seven races of PoTl to signal grass cultivars was also evaluated. There was variation in the pathogenicity and virulence of *Pyricularia* species and PoTl races in different signal grass cultivars. The cultivars Ipyporã, BRS Tupi, and Xaraés were the most resistant to the different blast pathogen species and PoTl races. Therefore, it is recommended to cultivate these varieties in areas adjacent to wheat or in crop-livestock integration.

Keywords: *Pyricularia grisea*. *Pyricularia pennisetigena*. *Pyricularia oryzae Triticum* lineage. *Pyricularia urashimae*. Varietal resistance.

RESUMO - Os fungos do gênero *Pyricularia* possuem ampla gama de plantas hospedeiras e são capazes de infectar mais de 50 espécies de gramíneas, causando a doença brusone, com danos às espigas. Espécies da forrageira braquiária (*Urochloa* spp.) podem ser hospedeiras deste gênero de fungo e podem ser importante fonte de inóculo do patógeno para outras culturas agrícolas afetadas pela brusone, especialmente o trigo. O objetivo deste estudo foi determinar a reação de nove cultivares de *Urochloa* aos patógenos *Pyricularia oryzae* linhagem *Triticum* (PoTl), *P. pennisetigena*, *P. urashimae* e *P. grisea*. Foi avaliado também a virulência de sete raças de PoTl á cultivares de braquiária. Houve variação na patogenicidade e virulência das espécies de *Pyricularia* e raças de PoTl em diferentes cultivares de braquiária. As cultivares Ipyporã, BRS Tupi e Xaraés foram as mais resistentes às diferentes espécies de patógenos da brusone, e raças de PoTl. Portanto, recomenda-se o cultivo dessas variedades em áreas adjacentes às de trigo ou na integração lavoura-pecuária.

Palavras-chave: *Pyricularia grisea*. *Pyricularia pennisetigena*. *Pyricularia oryzae* linhagem *Triticum*. *Pyricularia urashimae*. Resistência varietal.

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INTRODUCTION

The hemibiotrophic ascomycete fungi of the genus *Pyricularia* are associated with the disease known as blast. The disease is responsible for significant losses in economically important crops such as rice (*Oryza sativa* L.), oats (*Avena sativa* L.), brachiaria grass (*Urochloa* spp.), rye (*Secale cereale* L.), barley (*Hordeum vulgare* L.), maize (*Zea mays* L.), and wheat (*Triticum aestivum* L.) (CERESINI et al., 2019; COUCH et al., 2005; COUCH; KOHN, 2002; DORIGAN et al., 2023; GOULART et al., 2003; MARCHI et al., 2005; MARTINS et al., 2020).

In Brazil, wheat head blast is responsible for economic losses ranging from 40 to 100% (GOULART; PAIVA, 2000). Wheat blast is mainly associated with the species *P. oryzae Triticum* lineage (TOSA; CHUMA, 2014; ISLAM et al., 2016; CERESINI et al., 2018). The species *P. pennisetigena* (CERESINI et al., 2018; DORIGAN et al., 2023; KLAUBAUF et al., 2014; REGES et al., 2016) and *P. urashimae* (CROUS et al., 2016; DORIGAN et al., 2023), pathogens originating from invasive plants in adjacent areas to crops, have also been reported as wheat pathogens. The importance and geographic distribution of these two species in the country's wheat-growing areas are still unknown. On the other hand, the species *Pyricularia oryzae Oryzae* lineage is essentially associated only with rice blast, which is considered globally important due to its widespread distribution in rice cultivation areas (COUCH; KOHN, 2002).

Due to the absence of wheat cultivars with high levels of genetic resistance and the inefficacy of chemical control for managing wheat blast, the pathogen *P.*

oryzae Triticum lineage (PoTl) is widely dispersed in wheat cultivation areas in Brazil (CASTROAGUDÍN et al., 2015; MACIEL et al., 2014). Biological control is seen as a highly important and sustainable strategy to minimize the impact of yield losses associated with wheat blast in areas where fungicides are ineffective (PEREIRA et al., 2022).

Studies on the ecology of PoTl populations are scarce. However, the pathogen is capable of dispersing through airborne spores or associated with contaminated seeds, thus being able to cover long distances (GOULART; PAIVA, 2000; URASHIMA; IGARASHI; KATO, 1993). In the absence of wheat cultivation, the PoTl fungus has the ability to persist in the agroecosystem by infecting various other host grasses (CASTROAGUDÍN et al., 2015). A survey conducted in Mato Grosso do Sul and Paraná in 2012 and 2013 showed the association of PoTl with invasive host grasses in wheat areas, such as oats, sandbur grass (*Cenchrus echinatus* L.), Tifton 85 (*Cynodon* spp.), sourgrass (*Digitaria insularis* L.), barnyardgrass (*Echinochloa crusgalli* L.), goosegrass (*Eleusine indica* (L.) Gaertn), guinea grass (*Panicum maximum* Jacq), Natal grass (*Rhynchelytrum repens Willd*), Sudan grass (*Sorghum sudanense* L.), and brachiaria grass (REGES et al., 2016).

Brachiaria grass (*Urochloa* spp.) is possibly the most important host among grass species in Brazil. In addition to PoTl, *U. brizantha* is also a host for *P. pennisetigena* (Pp), *P. urashimae* (Pu) (CASTROAGUDÍN et al., 2017; DORIGAN et al., 2023; ISLAM et al., 2016; KATO et al., 2000; REGES et al., 2016), and *P. grisea* (MACIEL et al., 2014; REGES et al., 2016; VERZIGNASSI et al., 2012). Although blast incidence does not cause economic losses in the production of Brachiaria pastures, the widespread distribution of this forage crop in the country certainly makes it an important source of pathogen inoculum for various other agriculturally important crops, especially wheat (MARCHI et al., 2005; MACIEL et al., 2023).

In many wheat-producing regions in the country, it is common to cultivate forage crops during the winter for animal grazing, keeping the soil covered to prevent erosion losses, besides serving as an important alternative for crop rotation. These forage crops are typically established in areas close to wheat fields and may also include species considered as weeds in wheat cultivation, thus raising high concerns about their importance in the wheat blast cycle (MACIEL et al., 2023). Besides being highly efficient in restoring soil organic matter, this practice is also effective in breaking the life cycle of phytopathogens. However, this only works for wheat if the forage species is not a host for wheat phytopathogens (DE FACCIO CARVALHO et al., 2010). Conversely, the cultivation of susceptible forage grass species to wheat blast in adjacent or connected areas to wheat cultivation, especially Brachiaria grass, negates the effect of crop rotation as it represents a continuous source of inoculum for phytopathogens like PoTl, Pp, and Pu (CERESINI et al., 2018). Consequently, there may be recurrent annual disease epidemics and a consequent increase in economic losses associated with the high incidence of wheat blast (CASTROAGUDÍN et al., 2016).

Given these facts, the objective of this study was to determine the susceptibility of nine cultivars of the genus *Urochloa* to the pathogens PoTl, Pp, Pu, and *P. grisea* (Pg). Specifically for PoTl, the virulence and aggressiveness of seven races or virulence groups of the pathogen were evaluated on the following Brachiaria cultivars: *Urochloa brizantha* cv. Marandú, *U. brizantha* cv. BRS Paiaguás, *U. brizantha* cv. BRS Piatã, *U. brizantha* cv. Xaraés, *U. decumbens* cv. Basilisk, *U. humidicola* cv. BRS Tupi, *U. humidicola* cv. Comum, *U. ruziziensis*, and *Urochloa* sp. cv. BRS Ipyporã.

MATERIAL AND METHODS

Nineteen isolates of *Pyricularia* spp. originating from blast lesions on wheat spikes or leaf lesions on invasive plants sampled from areas adjacent to wheat fields in the central-southern region of Brazil were used. Of these isolates, 13 belong to the species *P. oryzae Triticum* lineage, comprising nine virulence groups on wheat (DANELLI, 2015), and 6 belong to the species *P. pennisetigena*, *P. urashimae* and *P. grisea*, two of each (Table 1).

Collections from infected plants to obtain isolates were conducted during the years 2012 and 2013 using the transect system. *Pyricularia* isolates were previously identified based on sequencing of two to 10 nuclear genes (CASTROAGUDÍN et al., 2016; REGES et al., 2016). Particularly, isolates of *P. oryzae Triticum* lineage belonging to different races or virulence groups were genotyped with eleven distinct microsatellite loci (CASTROAGUDÍN et al., 2015; PEREIRA et al., 2022) and phenotyped based on the varietal reaction of 10 wheat cultivars (DANELLI, 2015). The isolates are preserved on colonized filter papers, kept in cryo-tubes at -20 °C (CASTROAGUDÍN et al., 2015).

These isolates were reactivated on PDA medium (20.8 g L^{-1} potato dextrose, 15 g L^{-1} agar) with the addition of chloramphenicol and streptomycin (50 µg mL^{-1} each). After five days, mycelium discs from these cultures were transferred to new plates containing PDA medium, which were kept for fifteen days at 24 °C and 12 h photoperiod in an incubation chamber. Spores were collected by superficial scraping of the mycelium, in the presence of sterilized deionized water added with the surfactant Tween 80 (2 drops L^{-1}). The concentration was adjusted to 2 x 105 spores mL^{-1} in a Neubauer chamber. For *Urochloa* plant inoculation, the volume of spore suspension for each isolate was 50 mL.

The *Pyricularia* spp. isolates were individually inoculated on nine cultivars of Brachiaria, from the genus *Urochloa*: *U. brizantha* cv. Marandu, *U. brizantha* cv. BRS Paiaguás, *U. brizantha* cv. BRS Piatã, *U. brizantha* cv. Xaraés, *U. decumbens* cv. Basilisk, *U. humidicola* cv. BRS Tupi, *U. humidicola* cv. Comum, *U. ruziziensis*, and *Urochloa* spp. cv. BRS Ipyporã (Figure 2A).

For the establishment of the experiments, Brachiaria seeding was carried out by placing a sufficient amount of seeds to obtain 35 seedlings of each *Urochloa* cultivar in 400 mL disposable cups containing Tropstrato HT Hortaliças plant substrate (Vida verde, Campinas, SP) and vermiculite, in a 3:1 ratio. After germination, the *Urochloa* seedlings underwent thinning, leaving three seedlings per disposable cup. Inoculation of *Pyricularia* spp. was performed when the plants reached stage 14 on the Zadoks (1974) scale, meaning four true leaves were open, approximately twenty days after emergence.

After inoculation, the plants were incubated for 24 hours in the dark in a Fitotron-type chamber at a temperature of 25 °C under misting. After the 24-hour period, the photoperiod was adjusted to 12 hours of darkness and 12 hours of light, with automatic control of temperature and humidity, maintained at 25 °C and 90% relative humidity, with pots manually irrigated daily (Figure 2B).

Disease assessment was conducted seven days after *Urochloa* inoculation, by photographing three leaves with blast lesions from each treatment. To obtain the photos, a digital camera was attached to a monopod at a height of 20 cm. The leaf area infected with typical blast symptoms was determined using the Assess 2.0 program from APS - American Phytopathological Society (LAMARI, 2002).

To determine the virulence spectrum of PoTl races on *Urochloa* species and cultivars, the blast severity values determined as infected leaf area were converted into ratings according to a diagrammatic scale standardized by the International Network for Genetic Evaluation of Rice (1996), adapted for Brachiaria in this case, where 0 represents absence of symptoms; 1 = 0.1 to 4% of infected leaf area (ILA); 2 = 5 to 10% ILA; 3 = 11 to 25% ILA; 4 = 26 to 50% ILA; 5 = 51 to 100% ILA (CRUZ et al., 2009) (Table 2, Figure 1).

Table 1. Description of *Pyricularia* spp. isolates from wheat areas selected for the study of pathogenicity and virulence to *Urochloa* genus cultivars.

Species, isolate	Host	Virulence group[a] (Race)	State
Pyricularia oryzae Triticum Lineage (PoTl): N = 13			
12.0.007i	Signal grass (*Urochloa brizantha*)	A	PR
12.0.012i	Signal grass	A	PR
12.1.026	Wheat (*Triticum aestivum*)	A	DF/GO
12.1.003	Wheat	A	MG
12.1.037	Wheat	B	DF/GO
12.1.016	Wheat	B	MG
12.1.077	Wheat	C	MG
12.1.195	Wheat	C	RS
12.1.058	Wheat	D	DF/GO
12.1.187	Wheat	D	RS
12.0.535i	Southern sandbur (*Cenchrus echinatus*)	AA	PR
12.0.147	Signal grass	CC	MS
12.0.016	Weeping finger grass (*Chloris distichophylla*)	DD	MS
Pyricularia pennisetigena (Pp): N = 2			
12.0.324	Southern sandbur (*C. echinatus*)	n.d.	MS
12.0.358	Green panic grass (*Panicum maximum*)	n.d.	MS
Pyricularia urashimae (Pu): N = 2			
12.0.212	Green panic grass (*P. maximum*)	n.d.	MS
12.0.595i	Weeping finger grass (*C. distichophylla*)	n.d.	PR
Pyricularia grisea (Pg): N = 2			
12.0.264	Crabgrass (*Digitaria sanguinalis*)	n.d.	MS
13.0.002i	Crabgrass (*D. sanguinalis*)	n.d.	PR

Note: Based on the differential reaction of 10 wheat cultivars: "Anahuac 75", "BR 18 Terena", "BR 24", "BRS 220", "BRS 229", "BRS 234", "BRS Buriti", "CNT 8", "MGS 3 Brilhante", "Renan", and one barley cultivar: "PFC 2010123". The reaction was determined on wheat spikes (CERESINI et al., 2018; DANELLI, 2015). n.d. = Not determined.

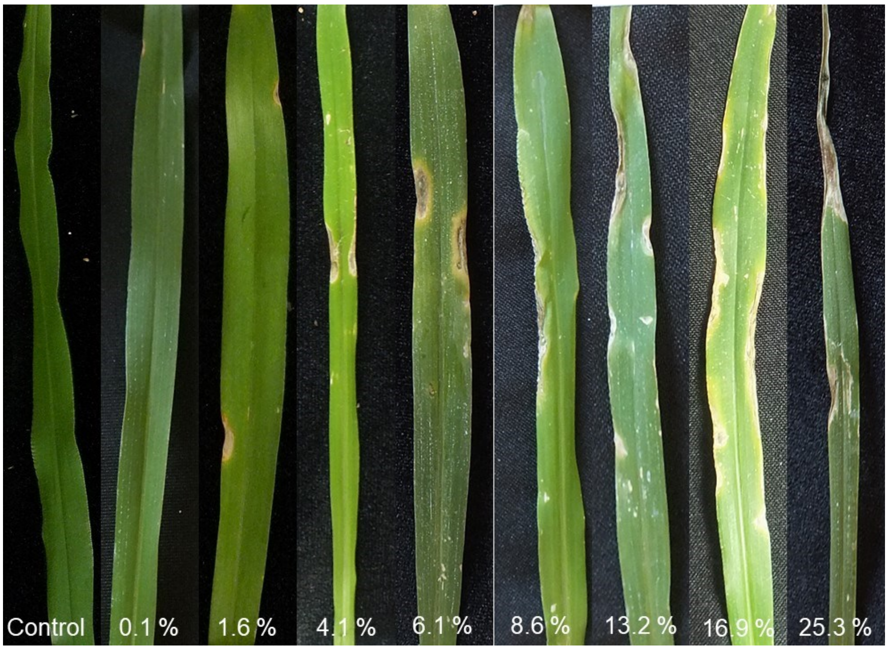
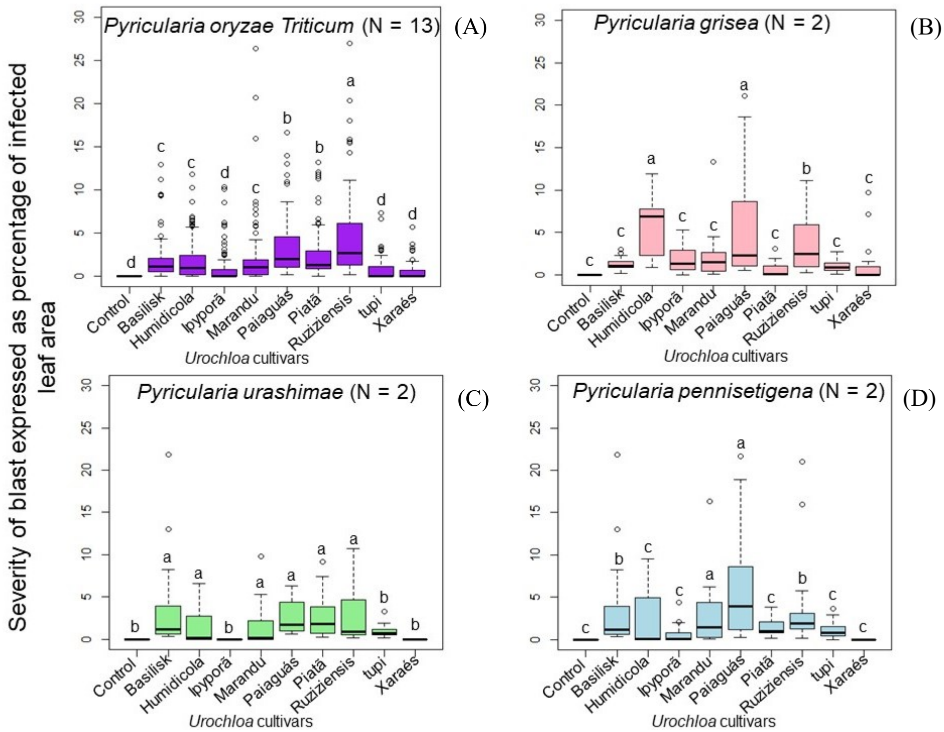


Figure 1. Photographs of leaves. Demonstrative scale of percentage of infected leaf area of Brachiaria grass (*Urochloa ruziziensis*) with the demonstrative scale of percentage of infected leaf area by *Pyricularia oryzae Triticum* lineage. The control was sprayed with sterilized deionized water added with the surfactant Tween 80. Digital photos taken at 7 days after inoculation.



Note: *The dark lines within each boxplot are the medians of ten repetitions representing the percentage of leaf area infected by blast lesions in each cultivar, calculated based on the number N of isolates per species. Means followed by the same letter are not significantly different by the Scott-Knott test at 5% probability level.

Figure 2. Pathogenicity of *Pyricularia* species and variation in leaf blast severity in *Urochloa* spp. cultivars.

Table 2. Reaction of *Urochloa* cultivars according to the percentage of infected leaf area.

Percentage of infected leaf area	Disease severity index*	Reaction of cultivars
0%	0	Resistant
0.1 to 4%	1	Resistant
4.1 to 10%	2	Susceptible
10.1 to 25%	3	Susceptible
25.1 to 50%	4	Susceptible
50.1 to 100%	5	Susceptible

Note: *Disease severity index determined using the diagrammatic scale from the International Network for Genetic Evaluation of Rice (1996), adapted for Brachiaria.

A randomized complete block design was used with a factorial scheme of 20 (19 isolates + negative control) x 9 Brachiaria cultivars, totaling 180 experimental plots, with one replication. The obtained data were subjected to analysis of variance (F test) and means comparison by the Scott-Knott test at 5% probability level. To illustrate the susceptibility reaction of *Urochloa* cultivars to *Pyricularia* species and their reaction to PoTl races, the data were graphically represented using boxplot distribution around the medians of each treatment. R software was used for statistical analyses and construction of the boxplots (R DEVELOPMENT CORE TEAM, 2022).

RESULTS AND DISCUSSION

In the first part of the study, the pathogenicity of *Pyricularia* spp. and the susceptibility and/or resistance levels of *Urochloa* species or cultivars to infection by the pathogens were determined. All four species of *Pyricularia* were pathogenic to Brachiaria. Significant effects of *Pyricularia* species, cultivar, and the species*cultivar interaction were detected, indicating that the reaction of *Urochloa* cultivars varied depending on the four different *Pyricularia* species tested (Table 3, Figure 2).

Table 3. Analysis of variance of leaf blast severity data in *Urochloa* spp. cultivars as a function of inoculation with four different *Pyricularia* species.

Source of variation	Df	MS	F Statistics	*P*
Block	9	16.13	1.87	*0.0525*^{NS}
Pyricularia Species*	3	78.93	9.14	*0.000***
Cultivar*	8	280.60	32.49	*0.000***
Species*Cultivar	24	31.92	3.70	*0.000***
Error	1755	8.64		

Note: NS Non-significant differences; ** significant differences at 1% by the F test.
*As there was no significant effect of the interactions between experiment replicates and the species or cultivar factors, the two experiments with N = 5 repetitions each were combined for joint analysis of the experiments.

Of the nine cultivars tested, three (Xaraés, BRS Tupi, and BRS Ipyporã) were resistant to all four species of *Pyricularia* (Figure 2). In turn, cultivars BRS Paiaguás and BRS Ruziziensis showed the highest mean infected leaf area for all four *Pyricularia* species (Figure 2, Table 4). Xaraés and BRS Ipyporã were the only cultivars with a mean infected leaf area of zero, showing no symptoms when inoculated with *P. urashimae* or *P. pennisetigena* (Figure 2, Table 4).

For the species *P. oryzae Triticum* lineage, the highest variation in blast severity indices was observed in *Urochloa*. While cultivars BRS Ipyporã, BRS Tupi, and Xaraés showed the lowest disease severity levels, not significantly different from zero (or the negative control), cultivar Ruziziensis exhibited the highest severity to the PoTl species, as well as being susceptible to the other tested *Pyricularia* species (Figure 2, Table 4). On average, PoTl caused 1.763 ± 1.115% of infected leaf area.

The severity of blast caused by *P. grisea* in *Urochloa* was 2.605 ± 1.876% of infected leaf area. However, only the Humidicola, Paiaguás, and Ruziziensis cultivars were significantly different from the negative control, showing a blast severity mean exceeding 3.5% (Figure 2, Table 4).

This observation contrasts with that of Reges et al. (2016), who reported an average blast severity of 8.8% in *Urochloa* cv. Marandu inoculated with *P. grisea*. In turn, there are frequent reports of *P. grisea* in *Urochloa*, in pastures of *U. brizantha* cv. Marandu in the Amazon region (VERZIGNASSI et al., 2012). *P. grisea* was also detected in lots of Brachiaria seeds of this cultivar intended for pasture establishment in Rondon do Pará (VERZIGNASSI et al., 2012).

P. urashimae, on the other hand, was the species that resulted in the lowest blast severity in Brachiaria (1.527 ± 0.988%), with severity means not exceeding 2.7% (Figure 2, Table 4).

Table 4. Pathogenicity of *Pyricularia* species and variation in blast severity in *Urochloa* spp. cultivars.

Pyricularia species and disease severity index (% of affected leaf area)									
Varieties of *Urochloa* spp.									
Basilisk	Humidicola	BRS Ipyporã	Marandu	BRS Paiaguás	BRS Piatã	Ruziziensis	BRS Tupi	Xaraés	Mean ** (± standard deviation)
Pyricularia oryzae Triticum lineage (PoTl), N=13									
1.578 cB	1.648 cB	0.686 dA	1.732 cB	2.910 bB	2.314 bA	4.022 aA	0.577 dA	0.404 dA	1.763 ± 1.115
Pyricularia pennisetigena (Pp), N=2									
3.656 bA	2.536 cB	0.627 cA	4.950 aA	5.747 aA	1.455 cA	3.715 bA	1.098 cA	0.000 cA	2.643 ± 1.885
Pyricularia grisea (Pg), N=2									
1.314 cB	5.743 aA	1.792 cA	2.261 cB	5.746 aA	0.565 cA	3.698 bA	1.102 cA	1.225 cA	2.605 ± 1.876
Pyricularia urashimae (Pu), N=2									
2.050 aA	1.589 aB	0.000 bA	1.347 aB	2.601 aB	2.498 aA	2.706 aA	0.954 bA	0.000 bA	1.527 ± 0.988
Average of *Pyricularia* species per cultivar (± standard deviation)									
2.150 ± 0.909	2.879 ± 1.696	0.776 ± 0.645	2.573 ± 1.410	4.251 ± 1.499	1.708 ± 0.768	3.535 ± 0.496	0.933 ± 0.214	0.500 ± 0.407	

Notes: *Average percentage of leaf area infected by blast lesion calculated with ten repetitions. Blast severity was evaluated by assessing digital images of infected leaves, taken seven days after inoculation. The Assess program (APS) was used for image analysis. The letters represented indicate significant differences between means with $p \leq 0.05$, by the Scott-Knott test, where uppercase letters compare means of *Pyricularia* species in the columns, and lowercase letters compare means of *Urochloa* ssp. cultivars for each *Pyricularia* species in the rows. **Mean of *Urochloa* cultivars per *Pyricularia* species (± standard deviation).

In the second part of the experiment, the PoTl species was individually evaluated, as it is the species associated with wheat and is better phenotypically characterized, especially in terms of races and differences in virulence spectra (CERESINI et al., 2018). The reaction of *Urochloa* species and cultivars to PoTl races was further evaluated in more detail (Tables 5 and 6, Figures 3 and 4).

Table 5. Analysis of variance of leaf blast severity data in *Urochloa* spp. cultivars as a function of inoculation with different races of *Pyricularia oryzae Triticum* lineage.

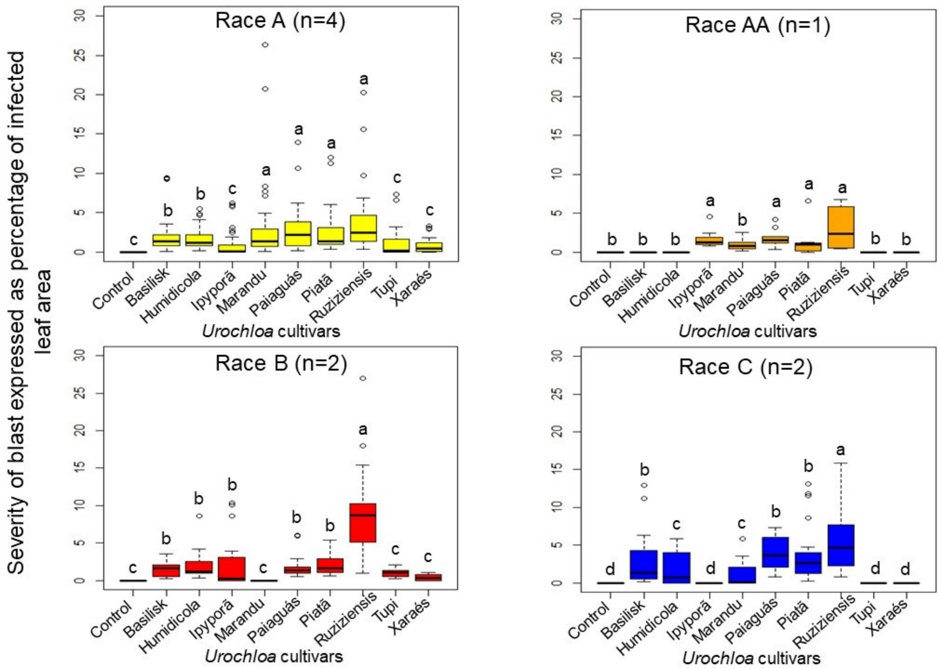
Source of variation	Df	MS	*F* Statistics	*P*
Block	9	8.35	1.47	0.154^{NS}
Pyricularia Species*	7	80.99	14.25	0.000**
Cultivar*	8	195.22	34.35	0.000**
Species*Cultivar	56	24.65	4.37	0.000**
Error	1179	5.68		

Notes: NS Non-significant differences, ** Significant differences at 1% by F test.
* Since there was no significant effect of the interactions between experiment replicates and race or cultivar factors, the two experiments with N = 5 repetitions each were combined for a joint analysis of the experiments.

Table 6. Virulence spectrum of *Pyricularia oryzae Triticum* lineage races to *Urochloa* species or cultivars.

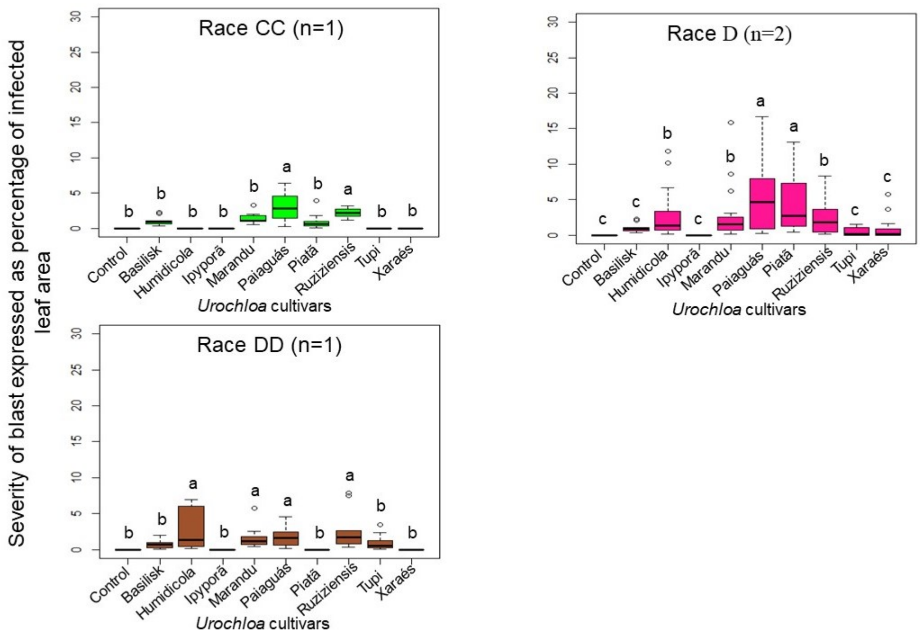
Race	N**	Basilisk	Humidicola	BRS Ipyporã	Marandu	Paiaguás	BRS Piatã	Ruziziensis	BRS Tupi	Xaraés	Total of resistance reactions (R)
A	4	R	R	R	R	R	R	R	R	R	9
B	2	R	R	R	R	R	R	S	R	R	8
C	2	R	R	R	R	S	R	S	R	R	7
D	2	R	R	R	R	S	S	R	R	R	7
AA	1	R	R	R	R	R	R	R	R	R	9
CC	1	R	R	R	R	R	R	R	R	R	9
DD	1	R	R	R	R	R	R	R	R	R	9
Total	1	7	7	7	7	5	6	5	7	7	-

Note: *Blast severity was assessed seven days after pathogen inoculation on different *Urochloa* species/cultivars. Resistance reaction (R) was considered if the severity mean values converted to rating scale ranged from 0 (absence of symptoms) to 1 (0.1 to 4% of infected leaf area); for blast severity values above 2 (i.e., > 4% of infected leaf area), susceptibility reactions (S) were considered (CRUZ et al., 2009). **Number of isolates of each race.



Note: *The dark lines within each box plot represent the medians of ten repetitions of the percentage of leaf area infected by blast lesions in each cultivar and distinct race of PoTl. Means followed by the same letter are not significantly different according to the Skott-Knott test at 5% probability level.

Figure 3. Reaction of *Urochloa* spp. varieties to blast disease on leaves in response to inoculation with isolates of different races or groups of virulence of *Pyricularia oryzae Triticum* lineage.



Note: *The dark lines within each box plot represent the medians of ten repetitions of the percentage of leaf area infected by blast lesions in each cultivar and distinct race of PoTl. Means followed by the same letter are not significantly different by the Scott-Knott test at 5% probability level.

Figure 4. Reaction of *Urochloa* spp. varieties to leaf blast in response to inoculation with isolates of different races or groups of virulence of *Pyricularia oryzae Triticum* lineage.

Variation in virulence was observed among PoTl races, detected by the significance of the race * *Urochloa* cultivars interaction (Table 5), as reported by Danelli (2015) for wheat cultivars. In the same study, it was found that among the PoT1 races, Race A was the most frequent in a survey conducted in Brazil, with an occurrence of 80.5%, followed by Race B, which showed a frequency of 16.6%, making these two the most common races for wheat cultivation.

For Race A, although significant variation in blast severity among *Urochloa* cultivars was detected, the mean severity levels were below 4.0% (Table 6, Figure 3, Race A), indicating a resistant reaction. The same was observed for races AA, CC, and DD (Table 6, Figures 3 and 4). For Race B, the only susceptible cultivar was Ruziziensis, which exhibited the highest infected leaf area, significantly differing from all other cultivars (Table 6, Figures 3 and 4, Race B).

For PoTl Race C, the Paiaguás and Ruziziensis cultivars were the only two susceptible (Table 6, Figures 3 and 4, Race C).

In turn, for Race D, only the BRS Paiaguás and BRS Piatã cultivars were susceptible (Table 6, Figure 4, Race D).

Only three *Urochloa* cultivars showed disease severity levels indicating susceptibility to different races of PoTl. The Paiaguás cultivar was susceptible to races C and D, which resulted in average blast severity of 4.1% and 5.3%, respectively (Figures 3 and 4, Table 6). In turn, the BRS Piatã cultivar was only susceptible to race D, with an average blast severity of 4.3% (Figure 4, Table 6). The Ruziziensis cultivar was susceptible to races B and C, with average blast severity of 9.2% and 5.3%, respectively (Figures 3 and 4, Table 6).

Therefore, considering the resistance of the Basilisk, Humidicola, BRS Ipyporã, Marandu, BRS Tupi, and Xaraés cultivars to all races of PoTl, their cultivation can be recommended in areas adjacent to wheat fields, or even in wheat-pasture integration systems for livestock farming. This recommendation of planting resistant cultivars of brachiaria aims to reduce the inoculum of PoTl that persists during the crop off-season, infecting other hosts (CERESINI et al., 2019; MACIEL et al., 2023).

On the other hand, an important epidemiological aspect to consider is the ability of the seven predominant races of wheat PoTl to infect the species or cultivars of brachiaria considered resistant, albeit at very low severity levels (Table 4, Figures 3 and 4).

PoTl inoculum associated with brachiaria pastures is likely relevant for initiating wheat blast epidemics, even with low potential, when weather conditions are favorable, further complicating control efforts (MACIEL et al., 2023). Indeed, population genetic studies and surveys of PoTl occurrence in brachiaria grass indicated that *Urochloa* species are important inoculum sources for wheat blast epidemics (CERESINI et al., 2019; MACIEL et al., 2023). However, there is an urgent need for field experiments to better understand the epidemiological components of wheat blast, such as the relative and temporal importance of PoTl inoculum associated with infected brachiaria seeds or originating from ascospores and conidia of the pathogen, both from adjacent plantations of this forage grass, as sources of primary and secondary inoculum (CERESINI et al., 2019; MACIEL et al., 2023).

CONCLUSION

There is variation in the pathogenicity and aggressiveness of *Pyricularia* spp. to *Urochloa* cultivars. The BRS Ipyporã, BRS Tupi, and Xaraés cultivars were the least susceptible to wheat blast. The B, C, and D races of *P. oryzae Triticum* lineage were virulent to the Paiaguás, BRS Piatã, and Ruziziensis cultivars of Brachiaria.

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