Host Range and Survival of *Bipolaris oryzae*, Causal Organism of Fungal Brown Spot on Cultivated Wild Rice

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Introduction

Fungal brown spot (FBS) disease on wild rice (*Zizania palustris*) is caused by *Bipolaris oryzae*. Various aspects of *B. oryzae* infection and survival are known. However, the primary inoculum source for this disease is not well understood. Identifying the primary source of inoculum may be very important for developing improved methods for controlling this damaging disease of cultivated wild rice.

Previous research indicated wild rice residue did not act as a source of inoculum when fields were fall flooded and/or when residue was incorporated into the soil (1). Also, infected seed did not act as a source of inoculum and airborne spores (conidia) of the pathogen were rarely found using spore traps placed in wild rice fields. Because of these results, further research into pathogen ecology is necessary to understand of the origin of the fungus prior to wild rice infection.

It had been suggested that grasses growing on the dikes were a possible source of initial inoculum for FBS (4). Therefore, the objective of this study was to investigate the role these grasses played in the development of FBS. My studies determined the host range for *B. oryzae* on various grasses and sampled plants for the presence of FBS along wild rice paddies.

Results and Conclusions

I. Defining a Host Range for *B. oryzae*

Grasses typically found in Minnesota (Table 1) were grown in the greenhouse and inoculated with *B. oryzae*. Host range was measured by percentage of plants infected. The grasses displaying the highest percentage of infection

were barnyard grass (*Enchinochloa crus-galli*) at 100%, green foxtail (*Setaria viridis*) at 96%, wild oat (*Avena fatua*) at 88%, downy brome (*Bromus tectorum*) at 75%, and yellow foxtail (*Setaria lutescens*) at 70%. However, in all cases the lesions were small and did not spread (Table 1). Lesion size was determined using a scale where 1 is approximately 0.005 cm^2, 5 is 0.12 cm^2, and 9 is 3.5 cm^2 (3). Sparse sporulation was observed on yellow and green foxtail, and downy brome prior to reisolation of the fungus. All of the infected leaves showed less than one percent leaf area covered with lesions except for wild rice which showed 10-15 % leaf area covered (Table 1). Percent leaf area covered was determined by comparing leaves against templates of known percentages (2). These results indicate that these grasses are not good candidates for a potential inoculum source.

II. Sampling Grasses Along Dikes for the Presence of *B. oryzae*

Grass samples from dikes in each of three wild rice paddies were taken from Aitkin, Waskish, and Clearwater, Minnesota during the summer of 1996. Two representative sites at each location were chosen for sampling. The main grasses identified and sampled were reed canary (*Phalaris arundinacea*), timothy (*Phleum pratense*), and quack grass (*Agropyron repens*), though other less abundant grasses were also examined. *B. oryzae* was detected only on reed canary grass (RCG) and therefore only RCG data is reported here. In order to determine percent infection of the grasses, lesions were cut from the leaves, washed, and placed onto moist, sterile filter paper. After ten days, these lesions were examined for sporulation and the number of lesions caused by *B. oryzae* versus the total number of lesions was determined (reported as percent infection). Table 2 indicates the detection of FBS infection on dike grasses was rare and when infection did occur, it was at the same time or after wild rice infection. Although some infection was detected when grasses were inoculated in the greenhouse, the detection of *B. oryzae* in the field was uncommon. To date, these results suggest that dike grasses play a very minimal role, if any, in the development of FBS in cultivated wild rice fields.

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Future Studies

Future work will continue to look at reed canary, timothy, and quack grass to determine if developmental stage or plant stress affects susceptibilty to FBS. Also to be determined is whether *B. oryzae* is more saprophytic than parasitic (i.e. lives better on dead than living tissue) on wild rice and other grasses.

Table 1 : Evaluation of various grasses as possible hosts for *B. oryzae*, causal organism of FBS of cultivated wild rice.

Grass	% plants infected	lesion size	% leaf coverage
Avena fatua	88	1-2	less than 1%
Avena sativa	9	1-2	less than 1%
Agropyron repens	*	*	*
Andropogon gerardii	14	2	less than 1%
Agropyron smithii	5	1	less than 1%
Bouteloua curtipendula	20	1	less than 1%
Bromus tectorum	75	1-2	less than 1%
Bromus inermis	*	*	*
Dactylis glomerata	*	*	*
Digitaria sanguinalis	6	*	*
Enchinochloa crus-galli	100	0-1	less than 1%
Elymus canadensis	55	1-2	less than 1%
Festuca arundinacea	0	none	none
Hordeum vulgare	5	1	less than 1%
Lolium perenne	28	0-1	less than 1%
Panicum virgatum	11	1	less than 1%
Phalaris arundinacea	48	1-2	less than 1%
Poa pratensis	*	*	*
Phleum pratense	0	none	none
Poa trivialis	0	none	none
Panicum dichotomoflorum	*	*	*
Setaria viridis	96	0-1	less than 1%
Setaria lutescens	70	0-1	less than 1%
Sorghum sudanense	62	1-2	1%
Sorghastrum nutans	*	*	*
Schizachyrium scoparium	9	1	less than 1%
Triticum aestivum	0	none	none
Zea mays	*	*	*
Zizania palustris	100	1-5	10-15%

* to be evaluated

Table 2 : Date of initial detection and percent infection of *B. oryzae* on cultivated wild rice and reed canary grass in 1996.

Site	Date: Wild rice	Percent infection	Date: RCG	Percent infection
Aitkin 1	July 25	36.4	July 25	0.8
Aitkin 2	July 25	31.2	August 7	4.9
Waskish 1	August 7	2.9	no infection detected	0
Waskish 2	July 9	12.5	no infection detected	0
Clearwater 1	July 25	6.1	no infection detected	0
Clearwater 2	August 7	6.7	no infection detected	0

References

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