DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA7580

# Bacterial Panicle Blight of Rice in Arkansas

Yeshi Wamishe
Assistant Professor - Plant Pathology

Christy Kelsey
Program Technician II

Scott Belmar
Program Technician II

Tibebu Gebremariam
Program Associate I

Danny McCarty
Program Technician I

## About the Disease

Bacterial panicle blight (BPB) is an important disease in Arkansas rice that has caused huge losses over the years, including 1995, 2010 and 2011. The cause was identified about 1996 by scientists at LSU, but the problem has likely been around a long time in the United States and is often called something else. It came to the forefront in the early to mid-1990s with the introduction of Bengal (highly susceptible), Cypress and Cocodrie varieties.

BPB is caused mainly by *Burkholderia glumae*, but there are probably a couple of other related species of bacteria involved as well. The disease is known as bacterial grain rot in Asia.

While bacterial panicle blight is primarily seedborne, major symptoms occur at heading and favorable weather has to be present during the growing season, making prediction of the disease very difficult. BPB can cause seedling death, but little is known about this phase of the disease in the U.S.

## Disease Symptoms

Infected panicles mostly have blighted kernels that first appear white to light gray with a dark-brown margin on the bottom third of the developing grains (Figure 1, see inside). The rachis or panicle branches stay green during early infection (Figure 2). Later, the kernels turn straw-colored and may further darken toward the end of the season with growth of secondary fungi (Figure 3). Heavily infected panicles remain upright due to blanking (Figure 4). Heavily infected kernels also show aborted seeds with a dark basal rot (Figure 5). Certain tillers may develop a dark brown lesion on the flag leaf sheath (Figure 6). Such tillers may have severe panicle damage (Figure 7). BPB can be confused with wind damage (Figure 8), water stress (Figure 9) or other environmental factors and insect damage, for instance stem borer.

## Favorable Conditions

Bacterial panicle blight seems to be favored by extended periods of hot summer nights. Thus there was more damage in years with hotter than normal July and August temperatures. Preliminary data also show that long dew periods play an important role in enhancing the disease. The disease was devastating in 2010 and 2011, years with extended periods of high temperatures. Less disease was observed in 2012 when temperatures were milder during July and August. Likewise, BPB was low in 2013 and 2014, when temperatures were cooler in the summer. In the last three years, BPB was only observed in areas of fields close to tree lines and near canals or streams where dew period was extended.

*Arkansas Is Our Campus*

Visit our web site at:
https://www.uaex.uada.edu

**Figure 1. Early symptoms of bacterial panicle blight of rice panicles.**

**Figure 2. Rachis/panicle branches stay green during early infection.**

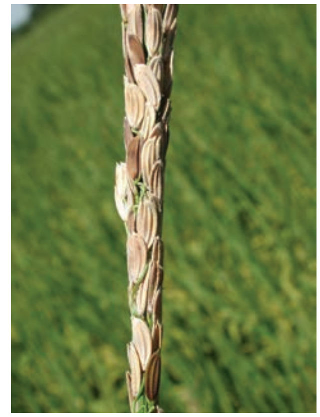


**Figure 3. BPB infected panicle darkens toward the end of the season with growth of secondary fungi.**

**Figure 4. BPB infected blank panicle remains upright during grain fill.**

**Figure 5. Heavily infected kernels also show aborted seeds with a dark basal rot.**

**Figure 6. Flag leaf sheath lesion caused by bacterial panicle blight disease.**

**Figure 7. Severe panicle blight on tillers (left) with flag leaf sheath lesion.**

**Figure 8. Early symptoms of wind damage that may appear as bacterial panicle blight disease.**

**Figure 9. Partial blanking symptoms of rice stressed for water in the intermittent flooding treatment.**

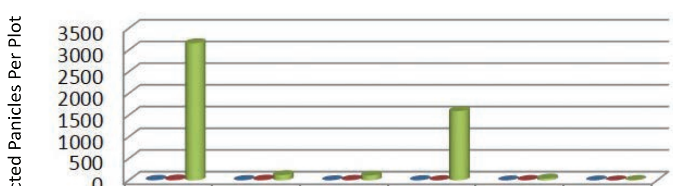
## Management

**Chemical Control:** There are no chemical options for either seed treatment or spray application registered in the U.S. to protect rice. Tested seed treatments have been inconsistent or have greatly reduced seed germination. While certain foliar antibiotics are effective and sold in other countries, they are not permitted for use in the U.S. due to environmental concerns. Other foliar products, like copper-based fungicides, that were tested have not been effective in the field. However, we continue to research other products.

**Resistant Varieties:** Most conventional rice varieties grown in the South are susceptible to the disease. The medium grain variety Jupiter and hybrid rice cultivars have moderate resistance to BPB. Some experimental rice lines that appear to have useful resistance have been identified, and we will continue to work with breeders to move these genes into future rice varieties.

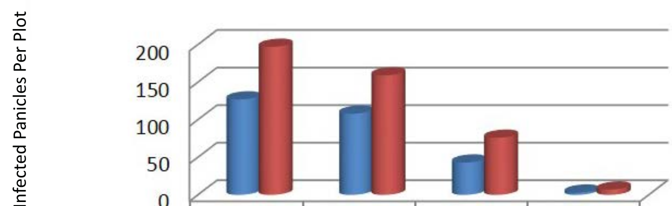
**Cultural Practices:** While resistant varieties will be the best long-term solution, effective cultural practices can minimize the potential of this disease. In field trials supported by rice check-off funds at the Rice Research and Extension Center, we have found the following practices to be potentially useful.

- Plant early to avoid the disease in most years. Susceptible rice varieties planted from late March to the third week of April largely escaped damage from BPB in all years tested, while rice planted in May had much higher BPB (Figure 10).
- High rates of nitrogen fertilizer increase BPB (Figure 11). Use the N-STAR system and Extension recommendations for nitrogen use to minimize this risk.
- Planting too much seed can increase BPB (Figure 12). We noticed that tillering capability of a variety may also influence BPB incidence and severity.
- Water management appeared to influence BPB in our studies (Figure 13). While continuous-flooded (normal) irrigation had somewhat higher levels of BPB than



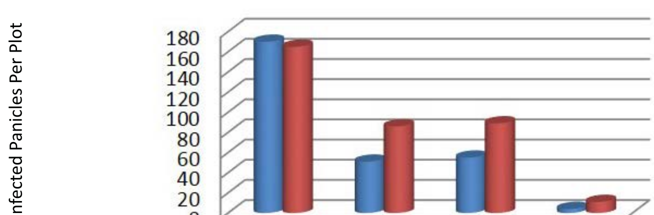

| | Bengal | | | Jupiter | | |
|---|---|---|---|---|---|---|
| | Year 2012 | Year 2013 | Year 2014 | Year 2012 | Year 2013 | Year 2014 |
| March | 14 | 10 | 4 | 7 | 2 | 0 |
| April | 22 | 19 | 14 | 7 | 11 | 1 |
| May | 3161 | 124 | 112 | 1596 | 44 | 9 |

**Figure 10. Effect of planting date on bacterial panicle blight in years 2012 to 2014.**



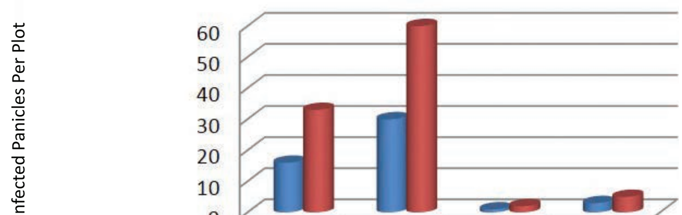

| | Bengal | | Jupiter | |
|---|---|---|---|---|
| | Year 2013 | Year 2014 | Year 2013 | Year 2014 |
| 150 units of N | 127 | 108 | 43 | 3 |
| 220 units of N | 197 | 159 | 76 | 7 |

**Figure 11. Effect of N fertilizer on bacterial panicle blight in years 2013 and 2014.**




| | Bengal | | Jupiter | |
|---|---|---|---|---|
| | Year 2013 | Year 2014 | Year 2013 | Year 2014 |
| Recommended | 170 | 51 | 55 | 4 |
| 2 X Recommended | 165 | 86 | 89 | 11 |

**Figure 12. Effect of seeding rate on bacterial panicle blight in years 2013 and 2014.**




| | Bengal | | Jupiter | |
|---|---|---|---|---|
| | Year 2013 | Year 2014 | Year 2013 | Year 2014 |
| Intermittent Flooding | 16 | 30 | 1 | 3 |
| Continuous Flood | 33 | 60 | 2 | 5 |

**Figure 13. Effect of water stress on bacterial panicle blight in years 2013 and 2014.**

intermittent flooding, the effect was not enough to recommend changes in irrigation practices. Remember there are many other risks associated with intermittent flooding of rice that likely outweigh the benefit of reducing BPB. We also observed other blanking symptoms of rice in our plots stressed for water in the intermittent flooding treatments (Figure 9). This suggested some of the yield loss in exceptionally hot summers may be the result of drought-stressed blanking rather than BPB. More research on this is needed.

## Summary

Low levels of BPB in Arkansas recently were due to cooler summers rather than changes in variety, seed quality or management practices.

Effective seed or foliar control products are not currently available in the U.S., but we will continue to research this option.

The medium grain variety Jupiter is more resistant under field conditions than other medium grains currently available. We have identified other breeding lines, both long grain and medium grain, that show promise for resistance and are working to get the genes crossed into developing rice varieties.

Cultural practices to reduce BPB have been researched for three years. Early planting date clearly had the biggest effect, followed by using the correct amount of nitrogen fertilizer then correct seeding rate. Water management has an effect but needs to be clarified by further research.

## Acknowledgement

We greatly appreciate the financial support from the rice farmers of Arkansas through the rice check-off administered by the Arkansas Rice Research and Promotion Board. We also wish to thank the entire staff and administration of the Rice Research and Extension Center, University of Arkansas System Division of Agriculture.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

**DR. YESHI WAMISHE** is assistant professor - plant pathology, **CHRISTY KELSEY** and **SCOTT BELMAR** are program technicians II, **TIBEBU GEBREMARIAM** is program associate I and **DANNY McCARTY** is program technician at the Rice Research and Extension Center, University of Arkansas Division of Agriculture, Stuttgart.

FSA7580-PD-4-2015N