

## Bacterial Ring Rot: Review of Biology and Management

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At the time of this writing, the Pacific Northwest is experiencing a flare up the bacterial ring rot (BRR) disease of potato. This disease is characterized by the deterioration of the vascular ring of the tuber often accompanied by surface cracking of the tubers and the presence of bacterial "ooze" (see figures). In the field, the disease affects the foliage by causing a wilt but can also cause shortened internodes and other upper plant abnormalities in some varieties.

**Important note: Bacterial ring rot can also be 'latent' which means the bacteria are present but do not cause any visible symptoms in foliage or tubers.** This latter factor is likely one of the main reasons why the disease persists in the North American potato production system. BRR can be very difficult to detect in seed potatoes because the disease is usually present at extremely low percentages and much of North America's seed production is located in areas where the disease may not express symptoms very well.



Figure 1. Cross section of potato tubers with typical symptoms of BRR.

BRR is spread by a variety of methods but the cutting of contaminated seed is by far the most common type of spread and is also responsible for the greatest impact on the harvested crop. The disease may be introduced onto a farm in a variety of ways with contaminated seed

being the most common and most important method, but other avenues, such as the purchase of used equipment that is contaminated or contaminated trucks that have not been sanitized, are also frequent pathways. Once the disease has been introduced to a farm, it can persist for long periods of time on harvesting and handling equipment, seed cutters, the aforementioned trucks, and on storage surfaces.



Figure 2. Bacterial "ooze" associated with tuber or stem infection with BRR.

The infection of a healthy seed lot by contaminated equipment usually results in a relatively low level of disease and often won't result in serious problems for the commercial grower. Any level of BRR on a seed farm, however, is an entirely different matter. From a seed certification standpoint, BRR is a "zero tolerance" disease, meaning that even a single positive plant will result in the seed grower having to remove all seed potatoes from his farm and obtain all new, clean seed stock for the next production season.

Detection of the disease during the process of seed certification is usually accomplished by visual inspection of foliage during the growing season and by shipping-point inspection of tubers. There are several laboratory methods that can be employed to confirm suspected infections and these include the Gram stain, latex agglutination, ELISA, IFAS, and PCR. Confirmation of suspects is very important as there are other diseases that can look a lot like BRR. If you have a suspected BRR sample I strongly urge you to have it confirmed with a laboratory test.

All seed produced in North America must originate from totally disease-free propagation material. This means that somewhere during the process of increasing these clean materials from one generation to the next, the BRR organism is getting introduced to previously uninfected seed lots. There is a reason why this is happening. Poor or nonexistent sanitation practices are the main reason that BRR has persisted in North America and why we see these periodic flare ups. **Seed producers in particular must be rigorous and thorough with their sanitation programs. Sterilizing the seed cutter and other handling equipment between seed lots is an absolute requirement.** After an outbreak like the one we're currently experiencing, everyone gets with the program and steps up the level of sanitation for a year or two following the flare up and we beat the disease back down to an undetectable level again. Unfortunately, as the flare up becomes more and more of a dim memory from the past, sanitation practices lapse, people get complacent or may, in fact, even cease to perform any sanitation practices at all. Another flare up down the road is the inevitable result.

The issue of contaminated trucks comes up a lot more often than it should, in my opinion. **Many seed producers complain that trucks are being sent to their operations without being cleaned up in any way at all, let alone sanitized.** It only takes a single incident of this type to introduce this disease to a seed farm. Because of the nature of the disease, a few years might be required after the introduction for the disease to be detected but, before too long, the disease shows up in someone's commercial field. This is a cycle that our industry needs to take steps to break.

Disinfection of storages and equipment is a three-stage process. First you must clean up all the old potato debris and other leftover trash. After using a broom and a shovel, a steam or a hot water wash is recommended for this step. The next step is to use hot water and a detergent on all surfaces. **Do not skip this important step!** The detergent actually starts the disinfection process by breaking down the dried plant sap and bacterial slime that the disease organism survives in. The final step is to soak all surfaces being disinfected with the disinfectant solution and **keep the surfaces wet with the disinfectant for at least 10 full minutes.** Failure to follow any of these guidelines can result in inadequate sanitation and a recurrence of the disease sometime in the future.

Perhaps the time has come for our industry to get serious about eliminating this insidious pest. We now have the ability to detect this bacterium at very low levels, at concentrations lower than we have ever been able to detect before. With modern PCR testing methods performed on relatively large tuber samples it is possible to test seed lots and thus provide seed that is, for all intents and purposes, free of BRR. Combining seed lot testing with a program of thorough clean up and effective sanitation practices, at all levels throughout the industry, could provide us all with a BRR-free future.