

BACTERIAL EARLY SEEDLING DECLINE DISEASE OF PEANUTS

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INTRODUCTION

Peanuts (*Arachis hypogaea* L.) are legumes that are grown in tropical and subtropical regions of the world and serve as an important source of oil and protein. In Texas, peanuts are produced in nine of the 12 agricultural districts of the state, accounting for approximately 4.5 percent of the state’s annual revenue from agriculture (Texas A&M AgriLife Extension Annual Increment Report, 2020) and approximately 12.4 percent of total U.S. peanut production (USDA-NASS, 2019). As a legume, peanut plants can produce their own nutrient nitrates from atmospheric nitrogen as a product of the activities of nitrogen-fixing bacteria that they harbor in nodules. Nodules are small, roundish structures that are visible on the root systems. Consequently, when included in a cropping system, peanuts can serve as a vital partner to other crops by returning nitrogen to the soil for use by subsequent crops. Peanuts have been shown to be excellent cropping partners with cotton, corn, wheat, grain sorghum, and vegetables.

BACTERIAL EARLY SEEDLING DECLINE DISEASE (BEDD): A NEW PEANUT DISEASE

Peanuts, like other crops, are affected by different disease-causing agents, including fungi, bacteria, viruses, and nematodes. Additionally, they also have different insect pests, some of which carry viruses

that also affect peanut plants. However, until recently, bacterial wilt caused by *Ralstonia solanacearum* was the only known bacterial disease of peanuts. In 2020, widespread incidences of poor stand establishment were observed in multiple production fields planted to the Spanish-type peanut varieties in the Texas Panhandle. This observation led to the identification of this new bacterial disease in peanuts. Symptoms of the disease, now known as bacterial early seedling decline disease (BEDD), include: (1) seed rot resulting in skips along planted rows (Figs. 1a and 1b); (2) pre- and post-emergence damping-off that also results in skips along planted rows, poor stand establishment with poor seedling vigor, and sometimes death of young seedling plants (Fig. 1b); and (3) poorly developed root systems, as infected seedlings often have poorly developed lateral roots and overall root mass with little to no nodule formation (Figs. 1c and 1d). Losses of up to 50 percent have been reported from this new disease in Texas.

Indicators of possible BEDD infection

Signs of a possible BEDD infection can include unusually extensive skips along rows planted to treated or non-treated peanut seeds, poor seedling vigor, and possibly death that is not reversed by adequate irrigation or available soil moisture, nutrient application, or pesticide treatment. In addition, the recurrence of similar widespread observations following replant are



Figure 1. Field-grown peanuts in Donley County in the Texas Panhandle in 2020 with symptoms of BEDD, including (a) seed rot, (b) poor seedling vigor/senescence, (c) normal root development, and (d) poorly developed roots lacking nodules.

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indicators of a potentially seed-borne or soil-borne disease. The ineffectiveness of fungicide seed treatment, however, points to a possible seed-borne or soil-borne bacterial infection, assuming otherwise good seed viability. If further investigations reveal the rotting of planted seeds, this strongly suggests a seed-borne disease rather than a disease of soil-borne origin. In this scenario, submit seeds from the same batch as those planted to a plant disease diagnostic laboratory for analysis to investigate the possible presence of the BEDD-associated bacterial pathogens in the affected seed batch.

BEDD has been determined to be caused by two bacteria pathogens belonging to the genera *Ralstonia* and *Pantoea*, respectively. Infection by either is sufficient to cause the disease in affected peanuts. Unlike bacterial wilt disease of peanuts, which is a soil-borne disease, the two bacteria that cause BEDD are known to be seed-borne. Although not demonstrated yet, it is also possible that the bacteria could become established in soil previously planted to infected peanut seeds, thereby posing a threat of infection to future peanut crops.

MANAGEMENT

Given its recent discovery, specific genetic resistance(s) against BEDD has yet to be identified for use in the development of resistant peanut varieties. So far, however, the Spanish-type peanut variety—in which the disease was first identified—as well as a Valencia variety have been determined to be susceptible to BEDD. Pending the availability of genetic resistance and because the disease can be seed-borne, it is recommended to test seeds prior to planting to determine if they are infected with the disease's causative bacterial pathogens. Seed testing can help to exclude infected seed batches from planting and thereby mitigate against the introduction of bacterial pathogens into field soils as well as the associated yield losses and economic impacts from the disease.