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# Partial Control of Bacterial Wilt of Tomato with Chinese Chives

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Bacterial wilt is a disease that affects many different crops, including tomato, potato, tobacco, pepper, the cucurbits (cucumber, cantaloupes, squash, and pumpkins) and some forage crops. The disease is caused by a number of different bacterial organisms. In tomato, the disease is caused by *Pseudomonas solanacearum*. This article describes some aspects of bacterial wilt in tomato.

The disease is more prevalent in hot, humid conditions. Under these conditions, *P. solanacearum* and other disease organisms thrive, making it more difficult to grow certain vegetables in the tropics than in areas where the growing season is somewhat cooler and less humid.

As its name implies, wilting is the main symptom of bacterial wilt. At first symptoms are localized, but they eventually spread throughout the whole plant before finally killing it. Prior to wilting, plants may be stunted and leaflets and leaf stalks may curl downwards. The wilting appears to be caused by clogging of the water conducting tissues in plant stems. If the stems are cut horizontally at ground level, the water conducting tissues located within the stem have a brown discoloration. The disease can be diagnosed by cutting infected stems and suspending them in clean water. If the disease is present, a white milky stream of bacterial cells and slime will flow from the plant's conducting tissues into the water.

Control of bacterial wilt is difficult. As with many plant diseases, prevention is important. Use disease-free transplants and clean equipment. Rotate tomato crops with non-solanaceous species (something other than pepper, potato, eggplant, etc.). Remove diseased plants from the field and burn the plant material if possible. In some studies, it was observed that organic amendments provided some protection against bacterial wilt. The best protection was observed when soils were amended with bagasse (sugarcane fibrous waste), sorghum green manure (i.e. young plants), soybean oilcake or semidried sewage sludge. Tomato cultivars differ in their susceptibility to bacterial wilt.

We recently learned of a simple technique that may reduce bacterial wilt in tomatoes. Interplanting (or pre-planting) Chinese chive with tomato results in allelopathic suppression of the organism responsible for bacterial wilt. Allelopathy occurs when a chemical produced by one type of organism has a negative impact on another organism. In this case, a chemical (or chemicals) secreted from living Chinese chive roots protect tomato by inhibiting *P. solanacearum* in some way. In experiments done by Jing Quan Yu at Zhejiang University in China (reported in *J.*

*Chem. Ecol.* 25(11): 2409-2417), six tomato plants were grown in a 40 cm by 60 cm by 10 cm box, with or without 16 Chinese chive plants. When Chinese chive plants were included, seedlings were transplanted in three rows (about 10 cm by 10 cm spacing) three months before tomato plants were transplanted. The tomato seedlings were placed between rows of Chinese chive. In the absence of *P. solanacearum*, the presence of Chinese chive did not affect vegetative growth of tomato; fruit yield was not measured. In the second experiment, when *P. solanacearum* was added to soil containing only tomato plants, 100% of the tomato plants wilted after 10 days. In a separate treatment, *P. solanacearum* was added to soil containing tomato plants with Chinese chive. In this case, fewer than 40% of the tomato plants had wilted after 14 days.

In a third experiment, two boxes of soil, one with no plants and a second with Chinese chives, were inoculated with *P. solanacearum* and left for a year. After a year, tomato seedlings were transplanted into each box. All the tomatoes growing in the box without Chinese chive were dead after 20 days, while only 22% of the plants transplanted into the box with Chinese chive were dead. Researchers attributed the latter beneficial effect to a drop in the population of *P. solanacearum*. Clearly, if bacterial wilt is a problem, there is a benefit from planting Chinese chive as much in advance of tomato planting as possible.

Chinese chive (*Allium tuberosum*) is also known as Chinese leek, garlic chive, oriental chive, oriental garlic, or flowering leek. It is closely related to onion and garlic. It can grow in a wide range of climatic conditions (hardiness range 3A-10A) and is thought to have originated in Southeast Asia. Chinese chive is a perennial that grows 30 to 45 cm (12 to 18 in) in height [it seems to stay shorter, around 15 to 20 cm (6 to 8 in) at ECHO]. It grows in clumps of four to ten bulbs, and is spread by rhizomes. Leaves are flat (rather than round) and can be eaten green or blanched. Bulbs may be used like garlic. Martin Price, ECHO's executive director, adds that the leaves of this plant add a garlic flavor when added to other food. Above ground leaves can be harvested and will regrow within days, while harvesting the root bulb will of course kill the clump. At ECHO, Chinese chive thrives year-round.