Commentary Article

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Black Rot Growth in Chinese Cabbage

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Description

Xanthomonas campestris's black rot is the most significant and potentially fatal cabbage disease. The selection of Plant Growth-Promoting Rhizobacteria (PGPR) strains and the creation of strain mixtures with the potential to elicit induced systemic resistance or to increase Chinese cabbage plant growth were the aims of this study. 10 of the 12 individual PGPR strains that were tested reduced the number of foliar lesions, and two PGPR strains-AP7 and AP18-increased all of the parameters of plant growth promotion that were tested, including plant diameter, root fresh weight, root dry weight, and shoot fresh weight. In advanced tests, mixture-1 was created by combining four distinct stains. All of the strains in mixture 1 were present in mixture 2, as were three additional stains. In greenhouse tests, mixture-2 increased shoot dry weight and root dry weight, while the number of black rot lesions was significantly reduced by mixtures and three distinct strains. All of the treatments tested in a field experiment reduced the severity of head disease at harvest and the incidence of disease on whole plants three weeks after transplantation. In addition, the marketable yield of all treatments was higher than that of the unbacterated control. These findings demonstrated that, in both the greenhouse and the field, specific PGPR strains and strain combinations produced systemic resistance to black rot.

Inappropriate Farming Practices

Due to its wide range of adaptability, high nutritional value, and distinctive flavor, cabbage, a cruciferous vegetable, occupies a significant position in agricultural production. One of the most significant diseases that pose a threat to the production of cabbage is Black Rot (BR). Garman (1894) discovered BR on Brassica oleracea in Kentucky, US, and Pammel (1894) discovered it on rutabaga and turnip in Iowa. In 1898, BR became widespread and spread to Wisconsin, seriously harming local turnip and kale production. Since then, BR has spread to nearly every region in the world where cruciferous vegetables are grown and become a major disease. The disease has become more severe in recent years as a result of inappropriate farming practices and an increase in the area under cabbage cultivation. As a result, research into BR resistance is crucial. The bacteria *Xanthomonas campestris* is the cause of BR. It can infect almost all cruciferous vegetables, including cole crops, mustard, and Chinese cabbage, and it has a wide range of hosts. BR is mostly a disease spread by seeds, but it can also be spread by insects and agricultural activities. All growth stages are affected by BR, which mostly affects leaves. The pathogen mostly enters the plant from the hydathodes along the leaf margin, causing necrotic lesions in the shape of Vs and the death of the plant. There have been 11 reported Xcc physiological races, and their differentiation has been extremely complex to date. More than 90% of BR cases worldwide can be attributed to the most virulent and widespread races 1 and 4. The screening and mining of resistant genotypes is a primary step in resistance breeding, and the cultivation and application of resistance cultivars is the most desirable method of disease control because it can reduce overall cost and chemical pollution. The seed infection method was initially used by Bain (1952) to identify the resistances of "Early Fuji" and "Hugenot." The Xcc race was not differentiated in detail until the beginning of the 21st century, and researchers have been screening and finding materials that are resistant to various pathogenic races ever since. Griesbach and others 2003 used an inoculation of a mixture of races 1 and 4 to produce a cabbage that was highly resistant, named "AU4518." According to a study, the cabbage cultivar Balon was resistant to races 1 through 4, while Quintal de Alsacia was resistant to races 1 through 4. Although some resources for resistance have been found, few germplasms clearly exhibit race-specific resistance, and cabbage resources with high resistance are uncommon, limiting the development of BR-resistance breeding.

Cabbage in Current Production

Cabbage is broadly disseminated in many areas of the planet and has been suggested in the eating regimen for malignant growth counteraction because of its elevated degrees of significant cancer prevention agent and anticarcinogenic compounds, including ascorbic corrosive, carotenoids, phenolics, glucosinolates and sulforaphane. However, cabbage is a product that quickly deteriorates, and the way it looks and smells greatly depends on how it is stored. Fresh cabbage, for instance, can be kept at a low temperature for several months; despite the fact that undesirable yellowing of the leaves and other disease effects cause it to have a shelf life of only two to four days at 30 °C. The shelf life and nutritional value of cabbage have been extensively studied in relation to a variety of storage methods, including preservative coating and LED irradiation. However, due to the complicated processes involved and concerns about food safety, these methods have not been widely used in practice. The storage of cabbage in current production systems is advised to be controlled and cooled. However, these facilities are not always available in developing nations, where postharvest storage, handling, transportation, and marketing are frequently subjected to high temperatures. As a result, the product has a shorter shelf life due to rapid senescence, as indicated by yellowing of the leaves. To the benefit of producers, processors, retailers, and consumers, it is necessary to develop efficient methods to prevent postharvest deterioration and extend the shelf life of cabbage. The cabbage leaves' shade of green is an important commercial quality; However, chlorophyll breakdown accelerates the vegetable's degradation after harvest. The plant hormone ethylene has the potential to speed up the degradation process. On the other hand, 1-methylcyclopropene (1-MCP) has the ability to prevent Chl degradation in a wide variety of horticultural crops by blocking the action of ethylene. Take, for instance, Al-Ubeed et al. 2018 found that 1-MCP prevented the leaves from losing their green color, which in turn extended the pak choy's shelf life. The fact that 1-MCP can be used as a postharvest treatment strategy to control the yellowing of leaf vegetables is further demonstrated by the fact that similar outcomes were observed in fresh cut celery and coriander leaves, respectively. However, cultivar, species, treatment duration, concentration, and temperature all had an impact on 1-MCP's effects. Meng et al., for instance demonstrated that the application of 1-MCP preserved the quality of kimchi cabbage and that treatment with 1-MCP inhibited Chinese cabbage leaf abscission. On the other hand, Australian researchers discovered that 1-MCP had no effect on the shelf life of Chinese cabbage after it had been harvested. It is evident that the characteristics of the product determine how vegetables respond to 1-MCP. However, we are aware of no information regarding the effects of 1-MCP on cabbage's storage characteristics.