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Cabbage Black Rot: Understanding Pathogenesis and Prevention

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Description

Cabbage black rot, caused by the bacterium *Xanthomonas campestris* pv. *campestris*, is a significant disease affecting brassica crops worldwide, especially cabbage. This disease can lead to substantial economic losses due to reduced yield and quality of cabbage heads, making it essential for growers to understand its pathogenesis and develop effective prevention strategies. Cabbage black rot primarily affects the vascular system of the plant. The pathogen enters through natural openings, such as stomata and wounds and quickly colonizes the plant tissue. The following steps outline the process of infection and disease development.

The bacterium can be introduced into crops through infected seeds, contaminated soil, or agricultural equipment. Environmental factors such as moisture, temperature and humidity play a vital role in the disease's incidence [1]. The optimum temperature for *Xanthomonas campestris* growth ranges from 25°C-30°C, with higher humidity levels favoring infection [2]. Once inside the plant, the bacteria multiply rapidly within the xylem vessels. The pathogen produces extracellular polysaccharides that help it adhere to plant surfaces and provide biofilms, protecting it from plant defense mechanisms. Symptoms of Cabbage black rot typically begin with yellowing of the leaves, often starting at the edges and moving inward [3]. As the disease progresses, the affected leaves develop dark, water-soaked lesions that eventually turn black. These lesions can merge, leading to extensive tissue death [4]. The vascular tissues become discolored, often turning black or brown, which is characteristic of the disease. Cabbage black rot can spread rapidly, especially in wet conditions. Water splashing, wind and human activity can facilitate the movement of the bacteria from infected to healthy plants [5]. Contaminated tools and equipment can also act as vectors for transmission. The prevalence of Cabbage black rot is influenced by environmental conditions.

Prolonged wetness, high humidity and warm temperatures provide ideal conditions for the pathogen's survival and proliferation. Additionally, the use of susceptible cabbage varieties can exacerbate disease severity. Maintaining proper sanitation in the field is vital for disease prevention [6]. This includes cleaning and disinfecting tools, equipment and containers used in the production process. Removing and destroying infected plant debris from the field can also help reduce the pathogen load and limit disease spread. To prevent the introduction of *Xanthomonas campestris* through seeds, seed treatments can be employed. Soaking seeds in a solution of sodium hypochlorite or using hot water treatments can effectively eliminate bacterial contamination. Additionally, obtaining seeds from reputable suppliers who adhere to strict quality control measures can further minimize the risk of introducing the pathogen [7]. Implementing optimal cultural practices can enhance plant health and reduce disease susceptibility.

This includes proper spacing between plants to improve air circulation, minimizing leaf wetness through appropriate irrigation methods (e.g., drip irrigation) and ensuring that soil drainage is adequate to prevent waterlogging [8]. Regular monitoring of crops for symptoms of Cabbage black rot is essential for early detection and intervention. Growers should be vigilant for early signs of the disease, such as yellowing leaves or dark lesions [9]. Timely identification of infected plants allows for quick removal and destruction to prevent further spread. While chemical control options for bacterial diseases are limited, some bactericides may help manage cabbage black rot. Copper-based products are commonly used as a preventive measure. It is vital to follow label instructions and integrate these applications with other management strategies for optimal results [10]. Educating farmers and agricultural workers about the symptoms, transmission and management of Cabbage black rot is vital. Training programs and workshops can enhance awareness and encourage the adoption of integrated disease management practices.

Conclusion

Cabbage black rot is a formidable threat to cabbage production, causing significant economic losses and impacting food security. Understanding its pathogenesis is vital for effective management. By implementing a combination of resistant varieties, cultural practices, sanitation measures and chemical controls, growers can significantly reduce the incidence of this disease. Continued research into the biology of *Xanthomonas campestris* and the development of resistant cultivars will be essential for sustainable cabbage production in the face of this persistent challenge. Through proactive measures and collaboration among growers, researchers and extension services, the impact of Cabbage black rot can be minimized, ensuring healthy crops and a stable food supply.

References

1. Prietto L, Mirapalhete TC, Pinto VZ, Hoffmann JF, Vanier NL, et al. (2017) pH-sensitive films containing anthocyanins extracted from black bean seed coat and red cabbage. Lwt 80:492-500.
2. Staub T, Williams PH (1972) Factors influencing black rot lesion development in resistant and susceptible cabbage. Phytopathol 62(7):722-728.
3. Alvarez AM, Cho JJ (1978) Black rot of cabbage in Hawaii: Inoculum source and disease incidence. Phytopathol 68(10): 1456-1459.
4. Silva ALBRD, Candian JS, Rego ERD, Coolong T, Dutta B. (2020) Screening cabbage cultivars for resistance to black rot under field conditions. HortTechnol 30(3):448-455.
5. Liu K, Garrett C, Fadamiro H, Kloepper JW (2016) Induction of systemic resistance in Chinese cabbage against black rot by plant

growth-promoting rhizobacteria. Biological Control Aug 99:8-13.

6. Lee J, Izzah NK, Jayakodi M, Perumal S, Joh HJ, et al. (2015) Genome-wide SNP identification and QTL mapping for black rot resistance in cabbage. BMC plant biol 15(32):1-11.
7. Kong C, Chen G, Yang L, Zhuang M, Zhang Y, et al. (2021) Germplasm screening and inheritance analysis of resistance to cabbage black rot in a worldwide collection of cabbage (*Brassica oleracea var. capitata*) resources. Sci Hortic 288:110234.
8. Sutton JC, Williams PH. (1970) Relation of xylem plugging to black rot lesion development in cabbage. Canadian J Bot 48(2): 391-401.
9. Afrin KS, Rahim MA, Park JI, Natarajan S, Kim HT, et al. (2018) Identification of NBS-encoding genes linked to black rot resistance in cabbage (*Brassica oleracea var. capitata*). Mol Biol Rep 45:773-785.
10. Amaral LS, Debona D, Costa LC, Silva RAL, Oliveira JR, et al. (2019) Biochemical insights into basal and induced resistance in cabbage to black rot. J Phytopathol 167(7-8):390-403.