Effects of Tea Leaf Blight on Physical and Chemical Composition of Tea in Yunnan

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Abstract: The activities of peroxidase, polyphenol oxidase, catalase and phenylalanine ammonia lyase in tea were determined by spectrophotometer. The results showed that Xanthomonas oryzae had different degrees of infection before and after infection. There were some differences in the activities of defense enzymes between diseased and susceptible cultivars. After natural inoculation and artificial inoculation, the activities of protective enzymes of resistant and susceptible varieties increased rapidly. The increase of protective enzymes of resistant varieties was significantly greater than that of susceptible varieties, but there was no significant difference in the activities of CAT enzymes. The changes of POD and PPO isozyme bands in tea plants were studied by polyacrylamide gel electrophoresis. The results showed that the two isozyme bands had the same characteristics before and after artificial inoculation. There are some differences in resistance and sensory changes. Before inoculation with Xanthomonas oryzae. The POD isozymes of resistant and susceptible cultivars had 4 to 5 bands, and PPO isozymes had 3 to 4 bands. The susceptible cultivars were darker in color. It was thicker, while resistant varieties had lighter and better color. After artificial inoculation, the number of POD and PPO isozyme bands of resistant and susceptible varieties increased to 5-6 and 4-5, respectively. The new enzyme bands of diseased tea varieties appeared earlier than those of susceptible tea varieties, and the enzyme bands were thicker, darker and more active, which indicated that the isozymes of different resistant tea varieties were different.

1. Introduction

Tea blight is mainly harmful to old leaves, but it is also affected by buds and fruits. When the blade is damaged, diseases begin to appear on the edge or tip of the blade, and gradually spread to the middle tissue of the blade. The first lesion is stained yellow-green water, which slowly expands to a semicircular, almost circular or irregular brown area. In the process of enlargement, the color of the lesion changes from gray to white from inside to outside, forming a concentric circle which is inconspicuous. The outer edge of the lesion is purple or black-brown. In the latter stage, a large number of small spots appeared on the surface of the lesion, which were distributed or arranged in a round shape. Young leaves often get dark brown from the top and are killed[1]. The tender leaves will be killed and the color of the lesions will be as uneven as clouds. The leaves of the buds twisted and scorched. Because the irregular spot of soup destroys the shooting ball, there are many small black spots on the surface. Fruit was damaged by yellow-brown proximal lesions, gradually grey-white, with small black spots on the surface, which made the lesions easy to crack. The black spots in the lesion were mainly conidial discs and ascospores in winter.

2. Symptoms and Harmfulness of Tea Moire Blight

The withered leaves of the tea leaves are very severe for the fragility of the trees and for the tea gardens after flowering. Some microclimates, such as high temperatures and droughts in summer, are very serious. After tea disease, photosynthesis was significantly reduced, respiratory level was increased, yield and quality were decreased. The leaves of the pathogenic bacteria fall off early, the

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leaves appear “withered” and the tea plants begin to weaken[2]. The real tea gardens are brown and brown. If young tea plants are seriously ill, the whole plant will wither, which will have a far-reaching impact on the current production of spring tea and the quality of the next year's spring tea.

With the improvement of living standards, people began to pay attention to the quality of life, promote pollution-free and pollution-free green foods, and produce various kinds of organic food and green tea. The demand for tea is gradually shifting from consumption to quality consumption, and green tea and organic tea are very popular. After China's accession to the WTO, tea export trade has further expanded. However, China's tea export trade has repeatedly encountered the problem of “farmers' residues”[3]. This has seriously restricted the development of tea ceremony economy. In recent years, researchers and production units have made great efforts and achieved results. Tea's “peasant residues” are declining, but they can't keep up with the international market, especially the needs of European community development. Tea market access standards show that China's tea exports are still facing trade barriers.

Now, in the tea production of main tea producing areas in China, the prevention and control of pests and diseases of tea plants are generally based on chemical control. In order to solve this problem completely, it has been proposed in recent years that a large ecosystem-based framework should be established for the prevention and control of tea plant pests[4]. This framework includes plague resistance breeding, agricultural cultivation and biological control. The most basic, effective and economical method of these measures is resistance breeding, and the necessary condition of resistance breeding is to clarify the resistance mechanism. Therefore, the research on resistance mechanism of tea provides a theoretical basis for tea breeding and a new method for integrated management of harmful diseases in tea plantations. The purpose is to explore the physical and chemical elements of resistance of tea culture.

In order to identify the resistance of tea varieties and study the physiological and biochemical mechanism of tea resistance, it is necessary to understand the biological characteristics of the pathogen of tea cloud blight. The biological characteristics of the pathogen of tea cloud blight have also been utilized. The report, however, is not very detailed and long-term. Peroxidase (POD) and polyphenol oxidase (PPO) are common phenolic oxidase in plants[5]. Phenylalanine ammonia lyase (PAL) is a secondary metabolite (such as lignin) in plants. It is one of the key enzymes in the metabolism of enzymes, phenols and plant antitoxins. Invasion of plant pathogens can cause complex physiological and biochemical changes in host plants. Many plant disease scientists have begun to explore the pathogenic mechanism of pathogens and the resistance mechanism of host plants, many of which are related to plant disease resistance. For example, superoxide dismutase (SOD), peroxidase (POD), catalase (CAT), phenylalanine ammonia lyase (PAL), polyphenol oxidase (PPO) are the focus of scholars'research.

2.1. Molecular factors of plant disease resistance

Through the interaction of resistance gene (R) and receptive gene (R), host plants exhibit molecular resistance to disease, i. e. gene resistance. R genetic factors and R genetic factors are essential genetic factors for plant normal metabolism. Those are the original functions, but the two functions are different. Once invaded by pathogenic bacteria, r plants will show resistance, and R plants will show symptoms[6]. Host pathogens, pathogenic gene interactions of disease resistance genes, and how disease resistance genes cause disease resistance are all more complex topics. The number of microeffect genes is uncertain, the natural environment is very vague, and it is difficult to learn. Current research focuses on the identification, isolation, cloning and expression of drug resistance genes. Thus, the gene functions of disease resistance genes, disease resistance institutions and signal transduction pathway related genes were identified.

In order to fundamentally identify the mechanism of plant diseases, it is particularly important to study the pathogen infection mechanism and disease resistance mechanism of plant defense system. In the past 20 years, great progress has been made in the research of plant disease resistance molecular biology, which is mainly reflected by the deep understanding of plant disease resistance mechanism at the molecular level. The ultimate realization of improving plant disease tolerance by genetic engineering.

Table 1 Effect of temperature on spore germination

Temperature	Spore germination rate(%)			Average germination rate(%)
26	83.2	80.9	80.2	82.4
23	72.9	78.5	73.2	74.8
29	68.5	68.5	69.2	68.8
19	46.8	47.2	49.2	48.6
15	18.5	26.8	30.1	25.7
33	18.3	18.9	10.2	15.7
11	44.7	14.5	13.5	14.7
7	3.1	5.7	5.8	5.6
37	2.2	3.6	3.1	3.3
3	1.8	2.4	2.1	2.2

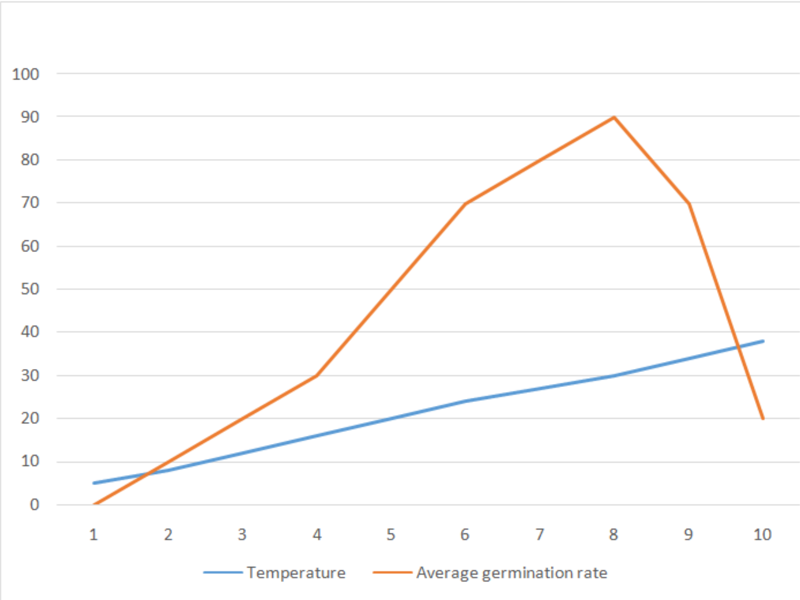

Fig.1 Effect of temperature on spore germination

2.2. Advances in research on disease resistance of tea plants

The disease resistance of tea plants is characterized by avoidance, resistance, resistance, enlargement, alleviation and disappearance of pathogens. This is the result of mutual adaptation and selection between tea plants and pathogens during long-term co-evolution. All kinds of pathogens have different types, sexes and degrees of pathogenicity[7]. Tea plants form different types and degrees of disease resistance. The study of disease resistance of tea plant has important theoretical and practical significance for resistance breeding of tea plant. It is to improve and maintain the disease resistance of existing varieties. Researchers at home and abroad have been studying the disease resistance of tea plants, and began to study the resistance mechanism in depth.

3. Physiological and Biochemical Changes of Tea Plants after Infection

After tea plants are infected with various pathogens, a series of physiological changes with common characteristics will take place in vivo. The changes of cell membrane permeability and electrolyte leakage in tea plant cells are important physiological pathological changes in the early stage of infection, followed by changes in respiration, photosynthesis, protein, phenolic substances, aquatic organisms and other aspects, and finally show signs.

3.1. Respiration

The preliminary investigation report showed that the respiratory function of the sensory cells and tissues of the damaged tea tree was enhanced. When tea is sensitive, the interval between enzymes and matrices in tissue cells is destroyed, and the enzymes are directly contacted with matrices, thus increasing the activity of respiratory enzymes. At the same time, sugars and other soluble substances near the infected site accumulated in the affected area, the respiratory matrix increased, and the respiration increased.

3.2. Photosynthesis

The most significant effect of pathogen infection on tea plant is to destroy green tea, reduce the range of normal photosynthesis and reduce photosynthesis. After tea infection, the chloroplasts of sensory tissues were damaged, chloroplast content and photosynthesis were reduced[8]. Especially, some diseases with larger pathological changes have great influence on tea cake disease and tea photosynthesis. Leaf blight of mosquitoes, spot of tea, round position of tea, coal disease of tea, and serious damage part of tea may completely lose the ability to assimilate CO_2.

3.3. Protein

According to preliminary investigation, the total nitrogen and protein content of the lesion tissue increased in the early stage of pathogenic fungal infection. In the late stage of infection, the activity of proteolytic enzymes increased, protein degradation and total nitrogen decreased, but still free amino acids. Add content. After pathogenic bacterial infection, the host's protein synthesis ability is easily affected by disease resistance. Generally speaking, the content of free amino acids in tea cultivars increased significantly, and the ability of protein synthesis decreased rapidly.

3.4. Changes in biochemical components

The disease affects a series of biochemical changes in tea plants. Studies have shown that when red rust algae are severely infected, the diseased leaf tissues contain more amino acids, amides and soluble sugars, while polyphenols, chlorogenic phenols and dry grains decrease, and the activity of enzymes decreases. On the contrary, it stimulates the growth of pathogens and deteriorates the conditions. As an important secondary metabolite of tea plant, phenolic compounds are affected by phenolic substances and a series of phenoloxidases after being infected by pathogenic bacteria. These changes are closely related to the disease tolerance mechanism of tea plants. Punyasiri et al. found that EC content in tea cake resistance was significantly higher than that in susceptible varieties, while EGCG content was significantly lower than that in susceptible varieties. The identification of resistance to peroxidase and charcoal bacteria showed a positive correlation between the activity of peroxidase and the activity of peroxidase. Within 48 hours, the disease resistance of tea plants was identified. The change of oxidase activity was positively correlated with the sensibility of Camellia after 48 hours of inoculation. Before and after the beginning, the bands of peroxidase isozymes of different resistant varieties changed significantly, and the bands of susceptible varieties increased compared with resistant varieties.

3.5. Water physiology

After perception, the water metabolism balance shows a significant imbalance. When leaves become sensitive, tissue cells are destroyed, membrane permeability increases, and water diffusion tolerance decreases, thus promoting water evaporation loss in the body. After root infection, the root system was destroyed. Then, the water absorption capacity of roots was greatly reduced. In addition, several fungal pathogenic microorganisms, tea tree body, pathogenic bacteria, mycelia, according to the spores of pathogenic fungi to produce sugar, chewing gum is infected by pathogens acne and play, in the catheter, water occlusion or transportation interruption, the possibility of blocking tea leaves.

4. Conclusion

The activities of POD, PPO, CAT and PAL in resistant tea varieties were determined. It was found that the activities of defensive enzymes of resistant tea varieties changed before and after infection with Xanthomonas oryzae. Some differences. After natural inoculation and artificial inoculation, the activities of protective enzymes (POD, PPO, CAT, PAL) in resistant and susceptible varieties increased rapidly. The activities of pod, PPO and pal in leaves of tea plants infected with Xanthomonas oryzae were observed. The increase of enzyme activity in resistant cultivars was significantly higher than that in sensitive cultivars, suggesting that the change of POD, PPO and friend activity were positively correlated with resistance to bacterial leaf blight of tea plants, but the increase of CAT activity. There was no significant difference between susceptible and resistant varieties. The changes of POD and PPO isozyme bands in tea plants were studied by polyacrylamide gel electrophoresis. The results showed that two isozyme bands could be detected before and after Moir inoculation. The characters of resistant and susceptible varieties showed some differences. Before inoculation with Xanthomonas oryzae. The POD isozymes of resistant and susceptible cultivars had 4 to 5 bands, and PPO isozymes had 3 to 4 bands. The susceptible cultivars were darker in color. Thick. After artificial inoculation, the number of POD and PPO isozyme bands of resistant and susceptible varieties increased to 5-6 and 4-5, respectively. The new resistance bands of resistant varieties appeared earlier than susceptible varieties, and their enzyme activity was stronger, their color was thicker and their color was darker. Although the susceptible cultivars had new enzyme bands, the enzyme bands were finer, lighter in color and weaker in activity. The change trend of isozyme bands was basically consistent with that of enzyme activity, which indicated that plant protective enzyme defense system actively participated in disease resistance activity.

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