



REVIEW

Overview of the Occurrence and Prevention of Bemisia tabaci Invasion in China

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ABSTRACT

Biological invasion refers to the process of invading into another new environment through natural or man-made means from the original place of existence, which includes several stages of introduction, colonization, incubation, diffusion and outbreak. Bemisia tabaci is a worldwide important agricultural pest composed of multiple biotypes. Studies have confirmed that the B biotype Bemisia tabaci that invaded China has been genetically differentiated, and the Q biotype Bemisia tabaci has replaced the B biotype in most areas of China. Bemisia tabaci has become the dominant biotype in the field.

1. Introduction

In China, Bemisia tabaci was recorded in 1949, but it has not been a major agricultural pest. According to the data, these Bemisia tabaci should be indigenous Bemisia tabaci distributed in China. The more invasive and widespread B biotype Bemisia tabaci and Q biotype Bemisia tabaci were designated as Middle East -Asia Minor 1 and Mediterranean cryptic species^[1]. In the middle and late 1990s, Bemisia tabaci type B was introduced to China, causing serious economic losses to agricultural production^[2]. Since 2005, Q biotype Bemisia tabaci can replace the early established B biotype Bemisia tabaci on a variety of field crops year by year and become the dominant biotype^[3,4].

Biodiversity is the integration of ecological complexes formed by organisms and their environment and various ecological processes related to this. The rapid genetic differentiation of invasive alien organisms may help them adapt to different habitats. The inherent superiority hypothesis^[5] believes that certain inherent superiority characteristics (such as morphology, physiology, ecology, genetics, and behavior) determine the spread and spread of alien species. The occurrence of its invasion. This may be because compared with native species, alien species with inherent advantages have obtained more mutations during evolution, and thus have the ability to tolerate wider environmental conditions, use more resource types, and resist the control of a large number

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of potential natural enemies or traits finally gained an advantage in the competition.

2. Results and Discussion

The successful invasion of *Bemisia tabaci* B -biotype is driven by its wide range of hosts, high reproductive capacity, strong resistance to pesticides, and strong adaptability to adversity environments^[6,7]. Human interference also indirectly promotes new invasive species to quickly replace previously invasive relatives, such as *B. tabaci* Q -biotype since it invaded China in 2003^[8], and has replaced B biotype whitefly in many areas in recent years, And become the dominant population^[9,10].

The study also found that B biotype *Bemisia tabaci* obtains its reproduction and survival promotion effect by feeding on susceptible plants, and there was an indirect mutual symbiosis between the two. The massive increase of B biotype *Bemisia tabaci* promotes the epidemic of viral diseases, and the epidemic of the virus is more conducive to the proliferation of B biotype whitefly, so that its population can expand more rapidly^[11]. When the B biotype *Bemisia tabaci* arrived in a new area and coexisted with the indigenous *Bemisia tabaci*, although they could not complete mating between them, a series of courtship behaviors and effects occurred between them, making the B biotype *Bemisia tabaci*. The mating frequency increased rapidly, the egg fertilization rate increased, and the population growth accelerated. Because this courtship interaction between *Bemisia tabaci* and indigenous *Bemisia tabaci* is beneficial to one side but harmful to the other, this phenomenon is called “asymmetric mating interaction”^[12]. This phenomenon reveals that when the intruder arrives in a new area, it interacts with the native relatives to improve its ability to invade and accelerate the process of invasion and replacement.

The successful invasion of *Bemisia tabaci* Q biotype in China involves many factors such as its population genetic basis, ecological factors, and human activities. The importance of these factors may be different at different stages of invasion. *Bemisia tabaci* Q biotype has become a dominant pest on cotton, vegetables and other crops in most provinces in China in recent years, and the tomato yellow leaf curl virus (TYLCV) caused by it has broken out in large areas of China^[4], resulting in widespread damage to crops. Indoor studies have also shown that Q biotype *Bemisia tabaci* has a stronger ability to acquire and transmit viruses than B biotype. Especially Q biotype *Bemisia tabaci* can obtain maximum viral load faster, and Q biotype tobacco Whitefly has a higher horizontal transmission rate than type B^[13].

3. Conclusion

Due to the extremely high transmission efficiency of *Bemisia tabaci* and the strong reproduction ability, early prevention of *Bemisia tabaci* must be carried out to achieve the purpose of “preventing insects and controlling diseases”. At the same time, using modern molecular biology methods to assist breeding, it is hoped to cultivate new varieties resistant to virus disease. With the development of modern science and technology, the in -depth integration of invasion biology and other multi -disciplines will be increased. It is foreseeable that we will achieve more results in the fields of the mechanism, influence and control of biological invasion, thereby further promoting the problem of human invasion of organisms. A deeper understanding of, and finally find scientific forecasting methods, prevention and governance countermeasures and measures.

The Chinese agricultural authorities have always adhered to the sustainable control technology system for the management of *Bemisia tabaci*. Currently, isolation, seedling cleaning, spraying, trapping, natural enemies and control policies have been implemented in the main vegetable production areas of China’s facility agriculture. This measure can reduce 70% Of pesticide usage^[14]; Studies have found that abamectin and nitenpyram are currently ideal agents for controlling *B. tabaci*, and the insecticides such as bifenthrin, thiamethoxam, acetamiprid, and imidacloprid have all developed resistance to different levels^[15]. Researchers have also studied the control effects of abutilon traps, yellow board traps, natural enemy insects and pathogenic microorganisms on whitefly pests, and conducted demonstration and promotion of integrated whitefly pest control technologies in different regions of China^[16].

In biological control, Chinese researchers have discovered a variety of native natural enemies and dominant parasitic wasps^[17], and established a large -scale production technology for the dominant parasitic wasps of *Bemisia tabaci* (*Brassica oleracea*) as a host. However, there are still many technical problems to be tackled in its large -scale field promotion. In recent years, due to the existence of different invasive biotypes (such as B and Q) of *Bemisia tabaci* in China, and the replacement of dominant biotypes, this has put forward new requirements for the comprehensive management of *Bemisia tabaci*, such as Q biotype *Bemisia tabaci*. It is often more resistant to many insecticides (especially neonicotinoid insecticides) than *Bemisia tabaci* type B^[18,19]. Therefore, the management and control of *Bemisia tabaci* should pay attention to the resistance monitoring of different biotypes, and timely

study and adjust the control technology.

Finally, for the port detection and monitoring of quarantine invasive species, we will further study the rapid molecular detection technology, gene chip diagnosis technology and DNA barcode identification technology of malignant alien species, build a remote expert identification and diagnosis platform, strengthen the combination of PDA and other intelligent systems and grid management and monitoring system, and improve the efficiency and accuracy of monitoring^[20].

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