

Article

## A brief manual of technical specification for integrated control of major rice insect pests in China

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### Abstract

Rice is the most important cereal crop in the world. It feeds nearly half of the population worldwide. Diseases and insect pests are important natural factors that threaten rice production in China. Therefore, it is necessary to develop agricultural production standards, which are coherent, scientifically reasonable and easy to perform, especially the standard for prevention and control of rice insect pests. In 2012, China issued the technical regulation for rice disease control. However, so far there is not any systematic technical regulation on control and management of rice insect pests in China. From the perspective of agricultural standardization, we developed the technical specification for the integrated control of major rice insect pests, by collecting and collating extensive literature. This study is just the brief manual of the technical specification.

**Keywords** rice; insect pests; control; manual; technical specification.

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### 1 Introduction

Rice is the most important cereal crop in China. The stable production and high yield of rice is significant for guaranteeing the food security of China. Diseases and insect pests are important natural factors that threaten rice production worldwide, including China (Yarasi et al., 2008; Li, 2010). There are a variety of rice insect pests (Walker, 1962). So far, chemical control is still the main technique in rice pest control and management. However, the unreasonable and excessive utilization of pesticides leads to increase of serious “3R” problems (Zhang, 2005; Zhang, 2007). Surely there are a variety of factors that result in these problems, however the lack of agricultural standardization is one of the important factors. To perform the standardization of insect pest control and management in the process of rice production, fundamental and applied research must be first conducted, in order to develop the control standards which coincide with the practical needs of rice production.

Standardization plays an extremely important role in the process of social development, especially in guiding industrial and agricultural production. Agricultural production, especially the cultivation and management of crops and the prevention and control of plant diseases and insect pests, is a complicate and systematic project. The same technical measurement on the same cultivated variety may result in different results due to the influence of natural conditions, such as the environment and climate, and the other factors. Therefore, it is eager to develop some agricultural standards, which are coherent, scientifically reasonable and easy to perform, especially the standard of prevention and control of rice insect pests (Wei and Zhang, 1996).

In 2012, China issued the technical regulation of rice disease control, NY/T 2156-2012-Technical regulation for the major disease control. So far, there is not any systematic technical regulation on control and management of rice insect pests. Therefore, we developed the technical specification for the integrated control of major rice insect pests, by collecting and collating extensive literature (Li, 2014). This study is just the brief manual of the technical specification. It is expected to be improved and further used in the formal development of the national standard on the integrated control of rice insect pests (Zeng et al., 2013).

## **2 Basic Guidelines of Technical Specification**

2.1 Timely forecast the insect pests so that a good prevention performance will be acquired and the high quality and yield of rice can be ensured.

2.2 Reduce the use of pesticide in the control of rice insect pests. Agricultural or ecological methods are the best choices. Use pesticide according to both pesticide characteristics and growth features and environment of rice, climate, etc. Strictly control its concentration, spraying schedule and frequency as well.

2.3 Popularize comprehensive prevention measures. Positively use anti-pest or pest-enduring rice varieties; take such measures as crop rotation and alternate husbandry, and utilize the biological or physical preventive methods rather than chemicals alone, thereby achieving the goal of comprehensive prevention.

2.4 Avoid using the pesticides resisted by insect pests. Successively use the same pesticide or the pesticide use too much times will lead insect pests to acquire resistance against the pesticide. So such conditions must be avoided.

2.5 Ensure environmental safety, and the safety of humans, fish and beasts. pesticides should be stoped from diffusing, flowing away and polluting environment, and their harm to humans, fish and beasts should be avoided.

2.6 Properly stock pesticide. Avoid unexpected accidents caused by stocking pesticide inappropriately.

## **3 Major Contents of Technical Specification**

### **3.1 Atitude**

Make clear the target of technical specification for integrated control of major rice insect pests.

### **3.2 Principles**

This specification is developed based on the principles of scientificness, utilization, unity and nomalization and also practicability.

### **3.3 Evidences**

This specification is developed following national laws, regulations and relevant rules.

### **3.4 Prevention goals**

The economical, ecological and social goals for applying technical specification of integrated control of major rice insect pests needs to be achieved.

### **3.5 Technological measures for prevention**

This standard points to the major insect pests during the process of rice growing, mainly describes the reasons and characters of pest occurrence, and then puts forward the methods of prevention and control by chemicals and the proper pesticides, in order to take corresponding measures according to occurrence and development of major insect pests with respect to climate and environmental factors, and thereby protect the whole growing process, from cultivate seeds to harvest, against insect pests.

### 3.6 Advice as a compulsory or suggestive standard

It is advised that the standard procedures for protecting rice against insect pests be taken as the agricultural standard. Due to vast rice growing areas in China and huge between-region differences, the major insect pests in each rice growing region have different laws. It is advisable to take this standard as the fundamental and flexibly to adjust this procedure according to the practical situation.

## 4 Basic Items and Features of Establishment of Technical Specification

4.1 Make clear the right schedule for preventing rice insect pests is adopted.

4.2 All pesticides recommended by the preventive standard is confirmed by local or ecologically similar institutions and research fields after research.

4.3 The standard for preventing insect pests are uniformly formulated while the kinds and time of pest damage in each region are different. So it depends when the standard is carried out in each region.

4.4 It is advisable to strictly follow rules for using pesticide safely when the preventive specification is conducted.

## 5 Relevant Standards of Establishment of Technical Specification

### 5.1 Pesticide residue standard

The standard is established to guide the farmers for reasonably using pesticides, and thus to ensure the quality and safety of agricultural products.

### 5.2 The safe use standard of pesticides

The standard explicitly prohibits the use of certain pesticides in crops, it also defined the latest time of using pesticides, the dosage forms and methods of using pesticides, etc. The standard offers security and reliability for agricultural products.

### 5.3 The standard of applicable pesticides and the usage

The standard includes the names and the usage of pesticides standards (usage periods, methods and timing), so that farmers can choose the appropriate pesticides for control (Bai, 2009; Song, 2004).

## 6 Establishment of Technical Specification

It is distinct in three aspects, law-orientation, environmental consideration and content universality, which are briefly stated as follows.

### 6.1 Law-orientation

The specifications are enacted according to Regulations on the Control of AGR, and the <<GB 4285 Standard on the safe use of pesticides>> and <<GB/T 8321 Rules of rational use of pesticides>>.

### 6.2 Environmental consideration

The pest control of rice involves the utilization of toxic pesticides, whose negative influences on the environment must be considered. High-toxic pesticides that are prohibited by national regulations must not be employed, and low-toxic ones should be used rationally. In addition, biological as well as agricultural and physical methods are preferred in the pest control of rice.

### 6.3 Content universality

The specifications are composed of extensive contents including pest control techniques, cultivation techniques, entomological theories, and theories and usage guidance of pesticides. The specifications aim to help farmers using pesticides and other control methods reasonably and efficiently (Lu and Hu, 2009).

## 7 Summary

At present, the development and application of new pesticides and techniques attract much attention in China, while little work has been conducted on the study of integrated pest control standard. In this study, the integrated control specification for thirteen insect pests, including rice planthopper throughout the growing period, is developed by combining plant protection and agriculture standardization, and the technical regulations on the pest control throughout the whole growing process ranging from the preparation for planting to the completion of harvest, which is of great significance to guide rice production.

Nevertheless, the regulations are not perfect due to the diversity of rice varieties, the difference between rice growing regions, etc. Moreover, the specification will change over time, climate and pesticide resistance of insect pests. It should be improved in the future.

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