The research on and development of grain quarantine in China

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Abstract

Chinese grain quarantine has got great improvement especially in its fields of scientific research and development since 1950. This paper briefly gives the following information: PRA on pests of stored grain, researches on pests' biology, ecology and regularity of transmission as well as methods of inspection, researches on pest's invasion surveillance, researches on technology of quarantine treatment and its facilities, and researches on high and up-to-date technology of grain quarantine. General situation about Chinese Grain Quarantine is also introduced in this paper.

Introduction

China is not only a great grain-producing country, but also a great country of international grain trade. Many countries keep relationship of grain trade with China. Because China's grain trade has the following characteristics: large quantity, trading with quite different countries, greater possibility of being infected/infested with grain diseases, pest insects and weeds, it makes the work of grain quarantine complicated and hard to do (Yao Wenguo and Guan Lianghua, 1998). Although situation is complicated, Chinese quarantine authority has been firmly dealing with those problems especially paying more attention to grain cargoes (Gu Jianfei and Qu Nengzhai, 1994; Lu Junmin and Ye Bingyuan, 1994) since 1950.

According to 'The List of the Diseases and Pest Insects as well as Weeds Dangerous to Chinese Plants' issued by the Ministry of Agriculture of the P.R.C in 1992, the emphatic diseases, insects and weeds dangerous to importing grain are Trogoderma granarium Everts, Acanthoscelides obtectus (Say), Callosobruchus analis (Fabricius), Prostephanus truncatus (Horn), Callosobruchus phaseoli (Chevrolate), Zabrotes subfasciatus (Boheman), Graphognathus leucoloma (Boheman), Tilletia controversa Kühn, Tilletia indica Mitra, Peronosclerospora spp., Erwinia stewartii (E. F. Smith) Dye, Lolium temulentum L., Sorghum halepense (L.) Pers., Sorghum alnum Parodi & Orobanche spp. Chinese quarantine research work on importing grain is aimed at those pests, quarantine soft science such as quarantine administration and so on, and research arrangement has been made also.

The Scientific and Technological Work and Research Programs

Since 1981, Chinese quarantine authority has been managing to settle the problems, such as quarantine policy and technical problems, which existed in grain quarantine. Specialists from universities or institutes have carried out researches on these key problems To sum up, mainly there were 5 research projects in implementation with a great quantity of work.

PRA on pests of stored grain

China is one of the earlier countries dealing with the work of Pest Risk Assessment in the world. Since the early time of 1980s, China's research institutes have made arrangement to start PRA work on diseases, insects and weeds, which are dangerous to China's agricultural production. Then viability researches of those pests were made by China's plant quarantine system, a data base of those pests was developed before long. In 1991, a Chinese PRA Working Group was set up formally comprising entomologists, phytopathologists, biologists, botanists, administrators, quarantine officers and computer experts as well. The working group's work in stored grain is to make researches on exotic pests' PRA of Chinese main crops; harmful, exotic weeds' PRA; viability and countermeasures of Trogoderma granarium Everts; and to make comparative research on development of Zabrotes subfasciatus (Boh.) living in Phaseolus vulgaris and P. Angularis. These researches provided scientific basis for decision making of quarantine policy (Ji Lang, 1994; Yao Wenguo, 1995).

The researches on biology, ecology, regularity of spread, and inspection method, identification standards of dangerous grain diseases, insects, and weeds

Grain pests' biology, ecology and regularity of spread are

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the bases of PRA, quarantine inspection and decision making of quarantine policy, so tens of scientific programs concerning important pests of grain have been arranged with the researching contents mentioned above such as Ecology and Morphology of Zabrotes subfasciatus (Boh.), Acanthoscelides obtectus (Say), Callosobruchus phaseoli (Chevrolate), Caryedon serratus (OL.), Callosobruchus analis (Fabricius), (Zhang Shengfang and Lu Yongqun, 1989; Li Nanhu and Song Baoshen et al., 1995; Lu Jie, 1994, Lu Jie and Song Baoshen et al., 1996; Pan Qishan, 1989; Pan Qishan and Jiao Xiaopan et al., 1994; Wei Houde et al., 1995; Huang Shishu and Liang Fenguang, 1996). Other quarantine stored product insects’ researches on morphology and identification standards were included. Furthermore, the carried on grain diseases’ researches are on the inspection methods and identification standards of Tilletia controversa Kuhn; the spread role, inspection method & identification standards of Tilletia indica Mitra; the researches of inspection methods and identification standards of Erwinia stewartii (E. F. Smith) Dye and Peronosclerospora spp.; the inspection methods and identification standards of Lolium temulentum L. and Sorghum halepense (L.) Pers.

The researches on pests’ invasion surveillance

Quarantine surveillance is the prerequisite and important measure to practise quarantine control, which is the reason why Chinese authority of animal and plant quarantine has taken it so seriously. In recent years Sitophilus granarius L., Trogoderma granarium Everts and some other important stored product insects have been placed under surveillance for systematically and deeply researches including study of lures and pheromones as well as traps, also including the study of storage insects’ tendency to lures & pheromones.

Speaking of the utilization of surveillance achievement, a practice for surveillance of Khapra beetle had been carried out by 32 organizations which located at 16 border entrances in Shandong, Guangdong, and Yunnan provinces as well as Tibet Autonomous Regions from August 1993 to July 1994. 228 traps were placed in 6 types of stores, after one-year surveillance, there were 3420 insects trapped belonging to a different classification, 37 families and 53 species in total. However Khapra beetle had not been found yet (Jiang Xiaolong and Wang Wenlong, 1995). Moreover Chinese scholars had made study on some storage insect’s sound and sounding mechanism for the surveillance of the insects hidden in a big grain stack. Evidence shows that they have done it very well.

The researches on technology of quarantine treatment and its facilities

China has been taking the technique of quarantine treatment seriously. Because of the time challenge, quarantine treatment and fumigation techniques are facing very hard situation. In recent years, the studies on alternative substance of traditional fumigant and treatment facilities as well as technical standardization of grain’s quarantine treatment have been arranged including over 20 research programs (Zhu WeiZu, 1994), so that quarantine service is able to adapt to the new speedy developing situation of import & export trade, to satisfy the needs of quickening inspection and passing through at the border entrances, especially to push towards international trade and to serve plant quarantine well in the meantime. A set of efficient technical standardization of grain treatment has been managed to find out. In plant pesticide, Chinese scholars have done some plant oil researches on (Deng Yongzhe and Lan Jianghua et al., 1996) some plant extract’s effect such as oleander’s stems and leaves (Jiang Xiaolong 1995), meanwhile they have done some fumigation researches such as mixed gas fumigation, controlled atmosphere of grain. A kind of gas concentration meter has been researched and developed successfully.

Researches on high and up-to-date technologies of grain quarantine

When doing common researches, some research programs of high and up-to-date technology have been arranged timely to trace the advanced technology of plant quarantine in the world and to develop mainly the fast, accurate and efficient techniques of both inspection and treatment of grain. The programs carried out were: computer expert system for pest insects identification (Li Zhihong et al., 1998); utilization of SEM and TEM to analyze the fine-structure and ultra-structure; RAPD for insect identification; DNA nail vein and PCR for fungi’s identification of plant quarantine disease; legume’s viruses ELISA and PCR diagnose-box’s research and spread.

By means of putting emphasis on grain-quarantine’s scientific program, and in a planned way, facilitate the management of grain quarantine, safeguard the prestige of trade and promote the trade development of grain import and export. Now the services of animal and plant quarantine in China are doing their scientific programs in a centralized way forming a mechanism, which has the characters of taking the application of technology as main point, basic research of the application of technology as the secondary point, giving consideration to personnel training, scientific research and their development, utilization as well as spread.

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