



Biological control of cotton pests in China



Shuping Luo^a, Steven E. Naranjo^b, Kongming Wu^{a,*}

^aState Key Laboratory for Biology of Plant Diseases and Insect Pest, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing 100193, PR China

^bUSDA-ARS, Arid-Land Agricultural Research Center, 21881 N. Cardon Ln., Maricopa, AZ 85138, USA

HIGHLIGHTS

- Biological control plays an important role for control of cotton pests in China.
- More than a hundred species of major arthropod predators and parasitoids of cotton insect pests have been described.
- *Trichogramma* spp., *Bacillus thuringiensis* and HaNPV etc. have been mass reared or commercially produced and used.
- Biological control strategies have been developed for control of non-target insect pests in Bt cotton fields.

GRAPHICAL ABSTRACT



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ABSTRACT

Cotton is one of the most economically important crops in China, while insect pest damage is the major restriction factor for cotton production. The strategy of integrated pest management (IPM), in which biological control plays an important role, has been widely applied. Nearly 500 species of natural enemies have been reported in cotton systems in China, but few species have been examined closely. Seventy-six species, belonging to 53 genera, of major arthropod predators and parasitoids of lepidoptera pests, and 46 species, belonging to 29 genera, of natural enemies of sucking pests have been described. In addition, microsporidia, fungi, bacteria and viruses are also important natural enemies of cotton pests. *Trichogramma* spp., *Microplitis mediator*, *Amblyseius cucumeris*, *Bacillus thuringiensis* and *Helicoverpa armigera* nuclear polyhedrosis virus (HaNPV) have been mass reared or commercially produced and used in China. IPM strategies for cotton pests comprising of cultural, biological, physical and chemical controls have been developed and implemented in the Yellow River Region (YRR), Changjiang River Region (CRR) and Northwestern Region (NR) of China over the past several decades. In recent years, Bt cotton has been widely planted for selectively combating cotton bollworm, *H. armigera*, pink bollworm, *Pectinophora gossypiella*, and other lepidopteran pest species. As a result of reduced insecticide sprays, increased abundance of natural enemies in Bt cotton fields efficiently prevents outbreaks of other pests such as cotton aphids. In contrast, populations of mirid plant bugs have increased dramatically due to a reduction in the number of foliar insecticide applications for control of the bollworms in Bt cotton, and now pose a key problem in cotton production. In response to this new pest issue in cotton production, control strategies including biological control measures are being developed in China.

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1. Introduction

Cotton production plays an important role in the economic development of China. Upland cotton (*Gossypium hirsutum*) varieties were introduced to China in the late nineteenth century, then

* Corresponding author. Address: Institute of Plant Protection, Chinese Academy of Agricultural Sciences, West Yuanmingyuan Road, Beijing 100193, PR China. Fax: +86 10 62894786.

E-mail address: kmwu@ippcaas.cn (K. Wu).

they rapidly replaced *Gossypium arboreum* and became the predominant cultivars (Sun and Chen, 1999). By the mid twentieth century, cotton planting had extended to 24 provinces and autonomous regions in China. In 2009, China was ranked as the largest cotton producer in the world with a total planting area of >5 million ha, and lint yields of 6377 million kg (China Agricultural Yearbook, 2010). Since the 1990's, cotton production has been mainly distributed in three major regions: the Yellow River Region (YRR), the Changjiang River Region (CRR), and the Northwestern Region (NR) (Fig. 1). Climatic conditions such as length of the rainy season differ significantly among the three regions.

In the early 1980s, cotton growing area increased rapidly in YRR, and then decreased gradually in the 1990s (Fig. 2), even

though the YRR is at present still the largest cotton production region in China where cotton is often the only crop or is interspersed with wheat in each year. In southern areas of the YRR, cotton is planted following the wheat harvest. Associated with the YRR's vast population and limited farmland, cotton is planted by single families with small lands of less than one hectare (Wu and Guo, 2005).

In the 1970s, 46.0% of the cotton was planted in the CRR (Jia et al., 2004). While during the 1980s cotton production in this region was gradually reduced in association with rapid regional economic development, the planting area of cotton has been maintaining at about 1.2 million ha since 2000 (Fig. 2). In this region, two crops are typically grown per year, and cotton is often

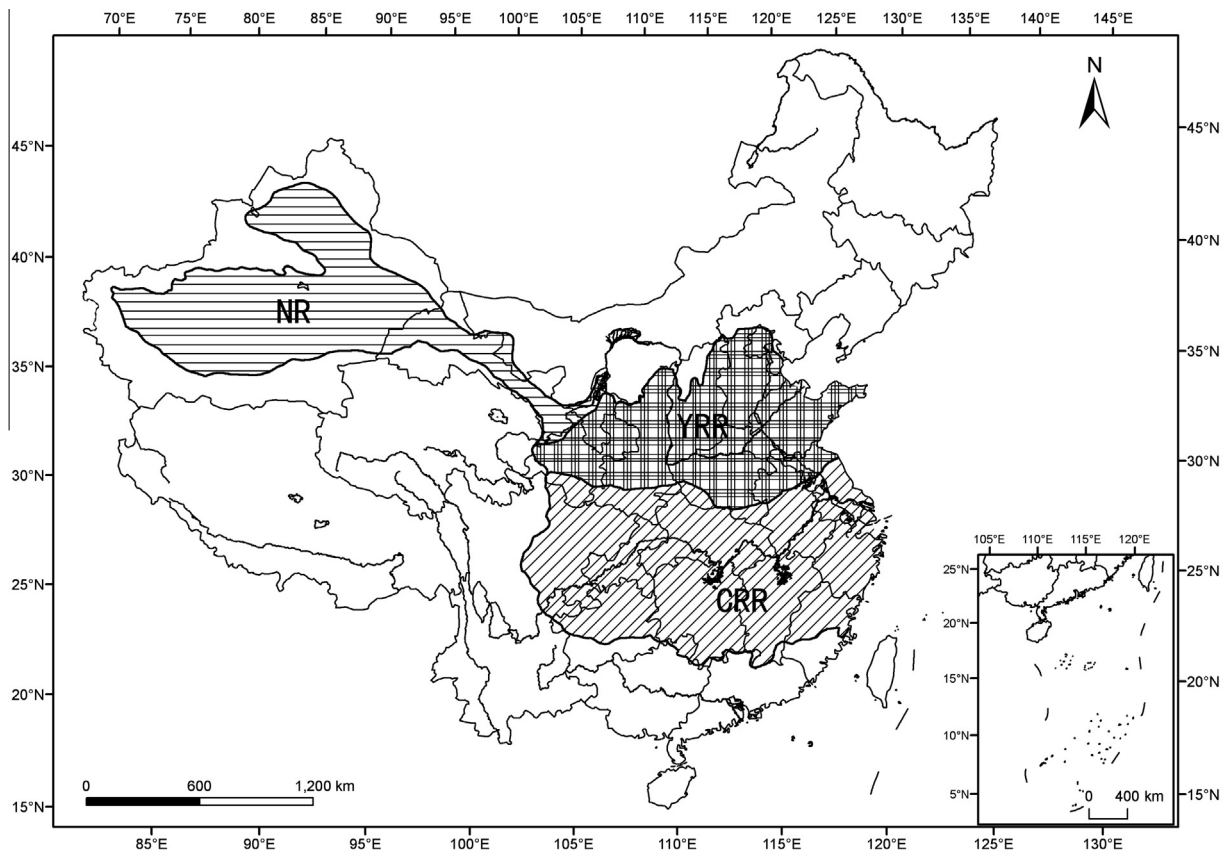


Fig. 1. Geographic regions of cotton production in China, YRR, Yellow River Region; CRR, Changjiang River Region; NR, Northwestern Region (Sun and Chen, 1999).

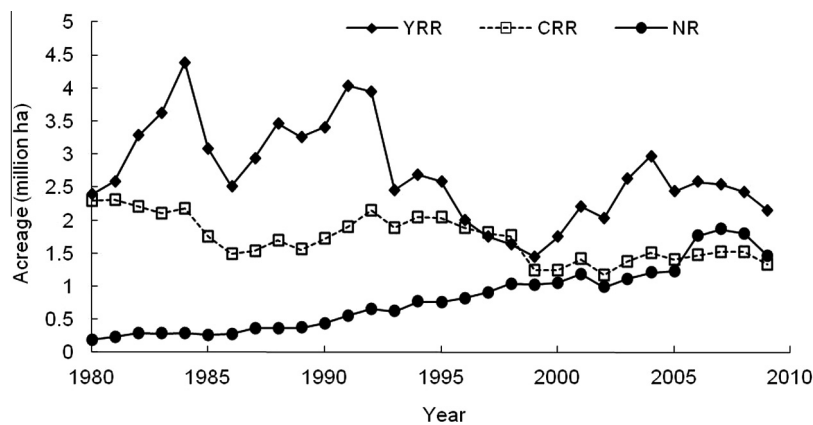


Fig. 2. The trend of the cotton production in China by region (Data source: Planting Information of China).

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