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Outbreak of Some Rice Insect Pests and Diseases

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Abstract

In the intensified rice-based agricultural production ecosystem, non-crop habitats had been greatly reduced, resulting in the simplified agricultural landscapes and farmland ecosystem. The sharp reduction of biodiversity has weakened the role of natural enemies in pest management.

Keywords: Plant-hoppers; Rice pests; Chemical pesticides; Food safety; Plant protection; Sesame;

Introduction

Our primary strategy was to conserve the native arthropod natural enemies by planting with green manure in fields at winter, leaving grasses on the bund and roadsides at other times of the year, growing sesame on the bunds during the rice cropping season, inter-planting with Z. caduciflora as the overwinter habitat for parasitoid hosts as well as arthropod predators and frogs. Sesame was grown on the bunds of rice fields before rice transplanting and new plantings after one month of rice transplanting so as to ensure flowering plants were present at all rice growth stages [1]. Rice is a very important crop in China with cultivation dating back for thousands of years. The Green Revolution in the 1960s was aimed at meeting the increasing demand for food with the rapid population growth. Rice production increased greatly, with the wide-scale adaptation of high-yielding varieties, extensive use of pesticides and chemical fertilizers [2]. The resulting production system was dependent on high inputs of agrochemicals resulting in a serious threat to the ecological stability in rice, human and environmental health, as well as the rice grain quality. Although rice yields in China continuously increased in recent decades, the outbreak of rice pests has become one of the main obstacles to sustainable production. Large scale outbreaks of rice plant-hoppers and the viral diseases they transmit become common in the first decade of the 21st Century. Chemical control has been considered as a key measure to suppress the population of rice plant-hoppers.

Methodology

The excessive application of chemical pesticides not only led to the development of resistance to insecticides but also negatively affected natural enemies and other beneficial organisms, and resulted in unwelcome contamination to the aquatic environment and rice grain [3]. It consequently became essential to minimize the use of chemical pesticides and to guarantee the food safety by developing ecological pest management. Attempts of rice insect pest management by ecological engineering in Jinhua, China, was initiated in 2008 with the funding of ADB and technical support from the IRRI Rice Plant-hopper Project [4]. To explain and promote ecological engineering concepts, practices were communicated to the professional technicians, policy makers, practitioners and farmers through a national seminar in 2010 and an international field day in 2012, which was covered by the mass media such as local TV, newspaper and a farmers' information system. In 2013, rice insect pest management by ecological engineering has become the national recommended plant protection strategy [5]. Ecological engineering strategies in rice based ecosystems that target this natural enemy are two-fold. First, providing alternative hosts for the parasitoid during periods of rice planthopper unavailability as shown in (Figure 1).

In eastern China a perennial vegetable crop Zizania caduciflora, which is attacked by the green slender plant-hopper Saccharosydne procerus, is often grown in fields to rice. The parasitoid A. optabilis attacks S. procerus during the winter period, then moves to rice crops in spring to parasitise rice plant-hoppers [6]. A second and complementary approach is the use of flowering plants to provide nectar to parasitoids. Laboratory screening experiments were conducted to select plant flowers that best enhance Anagrus spp. parasitoids. Findings indicated that A. optabilis is attracted by volatiles of Sesamum indicum, Impatiens balsamen, Emilia sonchifolia, Hibiscus coccineus, Trida procumbens and Hibiscus esulentus. Of these, S. indicum, E. sonchifolia, and I. balsamena were also attractive to A. nilaparvatae.

Discussion

Sesame was selected for further study that discovered that A. nilaparvatae and A. optabilis female life span was enhanced by sesame flowers. Realised parasitism by A. nilaparvatae was also enhanced by sesame flowers as was that of A. optabilis [7]. This indicated that sesame promotes key aspects of Anagrus spp. Performance and justified its use in field studies. Field experiments also indicated that egg parasitisms by A. nilaparvatae and A. optabilis could be significantly enhanced

Figure 1: Rice Plant-hopper.

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Figure 2: Rice ecosystems.

by sesame flowers in field conditions. Ecological engineering for rice pest management was led by the International Rice Research Institute and initiated in China, Vietnam and Thailand in 2008. Recently in Vietnamese field studies it was demonstrated that growing nectar plants on the bunds beside rice crops significantly increased the number and impact of natural enemies on rice plant-hoppers [8]. We discuss the parallel development and evaluation of ecological engineering in rice ecosystems in China as shown in (Figure 2).

Increasing in the area of agricultural production and improving crop yields was thought to guarantee the adequate provision of food with an increasing world population [9]. These changes have reduced the area of non-crop habitat and simplified farming landscapes. This sharp decline in farmland biodiversity reduces the number of flowering plants, which natural enemies depend on. In this context ecological engineering aims to protect crops from pest damage by maximizing natural mortality by strategic introduction of plant diversity. A key consideration is the identification of plants that selectively favour natural enemies over pests [10]. Ideally these are then included in agro-environmental schemes so as to provide pest suppression at the same time as delivering other ecosystem services such as pollination and biodiversity conservation. In the recent past outbreaks of pests, rice stem borer, rice brown plant hopper, white backed plant hopper and rice leaf folder were prevalent, resulting in huge losses and great financial cost of insecticides in Jinhua. During 2005 and 2007 the population size of brown plant hopper reached the highest level in the history it seriously threatened rice production [11]. Simultaneously, rice leaf folder populations also reached at high levels. Thus, costs of insecticides used in rice field increased to about 360 US$ per hectare for one rice season. Farmers were losing interests in rice production due to the cost of production. Against this backdrop, the Zhejiang Academy of Agricultural Sciences and the Jinhua Plant Protection Station in collaboration with the IRRI initiated a pioneering attempt to manage rice insect pests by ecological engineering in 2008 [12]. A 35-ha experimental site was established to determine and demonstrate the possibility and practicability of sustainable rice pest management by ecological engineering . The ecological engineering site was located at Si Ping village, set in an area with nearby mountains and high quality water resources. Although the original ecosystem had not been greatly disturbed, the areas used for rice production had been impacted by intensive cultivation and overuse of chemical fertilizers and pesticides. Using ecological engineering principles and methods, various interventions were made. These included manipulation of vegetation to promote natural enemies; specifically planting nectar-rich plants, zero insecticide sprays during first 40 days after transplanting, and stopping overuse of nitrogen fertilizer [13]. The goal was to reduce the usage of chemical pesticide to keep yield losses by major pests to less than 3%, and to gradually recover the natural pest control function of the ecosystem [14]. The hectare acre site was divided into two zones. The small block was assigned to ecological engineering and was made up of rice fields, each of which was managed as a separate crop and subject to arthropod monitoring using sweep nets, yellow sticky traps, and yellow water pan traps. Frog numbers were also monitored by counting at night. The larger block, separated from the ecological engineering area by a sealed road, was a control treatment managed under conventional farmer practice including pest management based on repeated insecticide use. It was comprised of separate rice fields in which arthropods and frogs were monitored.l

Conclusion

Data from the multiple fields in each of the two management regimes were compared by appropriate inferential statistical tests. Whilst this design does not constitute a formal, randomized, replicated design, the scale and reality of the testing conditions do provide a valuable test of the practicability of various ecological engineering methods and a broad indication of the effects on key taxa as well as the ultimate need for insecticide use.

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Conflict of Interest

None

References

1. Dogbe W, Marfo K, Bam R, Darte K, Ansere-Bio F (2002) Needs assessment of farmers' rice systems and demands from varieties in Tambalug and Nyorigu Upper East Region, Ghana. CSIR AFR 155:315-327.
2. Dorward P, Craufurd P, Marfo K, Dogbe W, Bam R, et al. (2007) Needs assessment of farmers' rice systems and demands from varieties in Sayerano, Western Region, Ghana. UR AFR 40: 316-327.
3. Kearney M, Porter W (2009) Mechanistic niche modelling: combining physiological and spatial data to predict species' ranges. Ecol Lett UK 12:334–350.
4. Smakhtin V U (2001) Low flow hydrology: a review. J Hydrol EU 240:147–186.
5. Frenken K (2005) Irrigation in Africa in figures – AQUASTAT Survey – 2005:Water Reports. FAO EU 1-649.
6. Beyene AM, Gashu AT, Tegegne MA, Mihertie AA (2022) Is the longstanding local rice cultivar "X-Jigna" being replaced by the improved variety "Shaga" in Fogera plain, Northwest Ethiopia? CEF UK 10:1-21.
7. Senthilkumar K, Bindraban PS, Thiyagarajan TM, Ridder ND, Giller KE (2008) Modified rice cultivation in Tamil Nadu, India: yield gains and farmers'(lack of) acceptance. Agric Syst UK 98:82-94.
8. Kumar V, Ladha JK (2011) Direct Seeding of Rice: Recent Developments and Future Research Needs. Adv Agron US 111:297-413.
9. Kotera A, Sakamoto T, Nguyen DK, Yokozawa M (2008) Regional consequences of seawater intrusion on rice productivity and land use in coastal area of the Mekong River Delta. Agric Environ 42:267-274.
10. Pingali PL, Xuan VT (1992) Vietnam: Decollectivization and rice productivity growth. EDCC US 40:697-718.
11. Rugumamu CP (2014) Empowering smallholder rice farmers in Tanzania to increase productivity for promoting food security in Eastern and Southern Africa. Agric Food Secur NY 1-8.
12. Emmanuel D, Enoch OS, Victor O, Henry J (2016) Impact of row-planting adoption on productivity of rice farming in Northern Ghana. RAAE EU 19 :19-28.
13. Easter KW, Abel ME, Norton G (1977) Regional Differences in Agricultural Productivity in Selected Areas of India. Am J Agric Econ 59:257-265.
14. Wassmann R, Jagadish SVK, Heuer S, Ismail A, Redona E, et al. (2009) Climate Change Affecting Rice Production: The Physiological and Agronomic Basis for Possible Adaptation Strategies. Adv Agron US 101:59-122.