Impact of imidacloprid and natural enemies on cereal aphids: Integration or ecosystem service disruption?

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With 5 figures and 1 table

Abstract: Wheat is a major crop and plays a significant role in food security in China. Cereal aphids Rhopalosiphum padi L. and Sitobion avenae Fab. are widespread worldwide and considered as serious pests in the winter wheat belt of North China. Natural enemies are well known for their ability to control aphid species in a wide range of cropping systems. Imidacloprid is one of the most widely used insecticides for the management of cereal aphids. Nevertheless, insecticides are harmful to the environment and disrupt the biological services. A full understanding on the effects of insecticides, natural enemies and their interactions on the cereal aphids in the complex agroecosystem is quite crucial. Field studies were conducted in the two consecutive seasons 2014/2015 and 2015/2016 to address this question using exclusion cage techniques. Our data demonstrated strong effects of natural enemies, application of pesticide as well as their interactions on the population densities and growth rates of cereal aphids (R. padi and S. avenae) in the wheat field. The instantaneous rate of population growth of R. padi and S. avenae strongly declined by the application of imidacloprid, nevertheless, the parasitism rate was also significantly affected. We conclude that imidacloprid insecticide is still effective in suppressing cereal aphid populations in winter wheat fields of North China throughout the growing season, however, the negative impact on the biological control services needs to be considered with caution.

Keywords: wheat, cereal aphids, insecticide, side effects, biocontrol service