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Disease incidence and severity of rice plants in conventional chemical fertilizer input compared with organic farming systems

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To study the impacts of different fertilizer applications on rice growth and disease infection, a 3-year field experiment of rice cultivation was carried out in the suburb of Shanghai from 2012-2014. No any pesticides and herbicides were applied during the entire experiment to prevent their disturbance to rice disease. Compared with green (GM) and cake manures (CM), the application of chemical fertilizer (CF) stimulated the photosysthesis and vegetative growth of rice plants more effectively. Chlorophyll content, height and tiller number of the rice plants treated with the CF were generally higher than those treated with the GM and CM and the control; the contents of nitrate (NO_3–N), ammonium (NH4+-N), Kjeldahl nitrogen (KN) and soluble protein treated with the CF were also higher than those with the others during the 3-year experiment. The 3-year experiment also indicated that the incidences of stem borers, shreath blight, leaf rollers and planthoppers of the rice treated with the CF were signficantly higher than those treated with the GM and CM and the control. Especially in 2012 and 2014, the incidences of rice pests and diseases treated with the CF were far more severe than those with the others. As a result, the grain yield treated with the CF was not only lower than that treated with the GM and CM, but also lower than that of the no-fertilizer control. This might be attributed to two reasons: Pests favor the rice seedlings with sufficient N-related nutrients caused by CF application; the excessive accumulation of nutrients in the seedlings might have toxic effects and weaken their immune systems, thus making them more vulnerable to pests and diseases. In comparison, the plants treated with a suitable amount of organic manure showed a better capability of disease resistance and grew more healthy. In addition, the incidences of rice pests and diseases might also be related to climatic conditions. Shanghai was hit by strong subtropical storms in the summer of both 2012 and 2014, which might explain a high incidence of rice planthoppers in the two years. While a a continous high-temperature and no-storm climate in the summer of 2013 might lead to the low incidences of planthoppers and other pests and diseases in the year.