



Establishment of a rice-duck integrated farming system and its effects on soil fertility and rice disease control

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Rice-duck integrated farming is an ecological farming system newly established in some areas of southern China. It was reported that the ducks walking around the paddy fields is beneficial to control weed hazards and reduce rice pests and diseases. To study and evaluate the effects of the rice-duck integrated farming on soil fertility and rice disease control, a field experiment of rice cultivation was carried out in the suburb of Shanghai in 2014. It includes a treatment of raising ducks in the fields and a control without ducks. The treatment was implemented by building a duck coop nearby the experimental fields and driving 15 ducks into a plot at daytime since the early stage of rice growth. Each plot is 667 m² in area. The treatment and control were replicated for three times. No any herbicides, pesticides, fungicides and chemical fertilizers were applied during the experiment to prevent any disturbance to duck growing and rice weed hazards and disease incidences from agrochemicals. The results are as follows: (1) The incidences of rice leaf rollers (*Cnaphalocrocis medinalis*) and stem borers treated with ducks, 0.45% and 1.18% on average, respectively, are lower than those of the control, 0.74% and 1.44% on average, respectively. At the late stage of rice growth, the incidence of rice sheath blight treated with ducks, 13.15% on average, is significantly lower than that of the control, 16.9% on average; and the incidence of rice planthoppers treated with ducks, 11.3 per hill on average, is also significantly lower than that of the control, 47.4 per hill on average. (2) The number of weeds in the plots treated with ducks, 8.3 per m² on average, is significantly lower than that of the control, 87.5 m² on average. (3) Raising ducks in the fields could also enhance soil enzyme activity and nutrient status. At the late stage of rice growth, the activities of urease, phosphatase, sucrase and catalase in the soils treated with ducks are 1.39 times, 1.40 times, 1.29 times and 1.13 times those of the control, respectively; and the content of available P and alkali-hydrolyzable N in the soils treated with ducks, 23.35 mg kg⁻¹ and 107.33 mg kg⁻¹, on average, respectively, are significantly higher than those of the control, 15.70 mg kg⁻¹ and 84.00 mg kg⁻¹ on average, respectively. (4) The grain yield of the plots treated with ducks, 6456.25 kg hm⁻² on average, is significantly higher than that of the control, 3403.81 kg hm⁻². In short, raising ducks in the paddy fields not only shows a potential of controlling weed hazards and reducing rice pests and diseases, but also effectively improves soil fertility and rice grain yield. Such rice-duck integrated farming will highly contribute to establishing an organic or low-input farming system in southern China in the future.