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Effects of integrated crop management on the soil fertility, physiological mechanisms and yield of winter oilseed rape in the paddy field

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Rapeseed is one of the most important edible oil crops in the world and the seed yield has lagged behind the increasing demand driven by population growth. Winter oilseed rape (Brassica napus L.) is widely cultivated with relatively low yield in China, and rice –rapeseed rotation pattern is popular in the Yangtze River basin. After the mechanical harvest of rice, the straw was returned to the field. Herein, it is necessary to explore the yield ceiling by optimize and integrating the crop management strategies.The plant growth, physiological characters of the leaves and the physiocochemical properties of soil are closely related to the yield, whereas it is still poorly understood in the rapeseed especially under the new rice-rapeseed rotation pattern. Two-sites field experiments were conducted in Jingzhou and Wuxue experimental stations respectively in the Yangtze River basin with Zhongshuang 11(ZS 11), an elite conventional variety. There were six cultivation modes, which combined different tillage and fertilization management, including super high-yielding cultivation (SH), high-yielding and high efficiency cultivation (HH), local farmer's practice (FP), cost effective cultivation (CH), without input of N fertilizer (N0) and K fertilizer (K0), respectively.The results showed that the biomass of single plant is the highest at FP treatment, and the popular biomass is the highest at SH treatment. After flowering, the total non-structural carbohydrate (TNC) in stems and leaves decreased significantly at HH treatment. The FR/R ratio is highest at HH. SH and HH treatments decreased soil bulk density and increased soil porosity and field capacity in 0-20 cm and 20-40 cm soil layer. Without applying K fertilizer, the content of soil available K in arable layer increased with the straw returning. SH and HH had no significant in the seed yield, but the HH increased the input. Straw returning could make up for the shortage of K fertilizer.