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湖北省早、中、晚稻施钾增产效应及钾肥利用率研究

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Effects of potassium fertilizer and potassium use efficiency on early-, mid- and late-season rice in Hubei province, China

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摘要 2006～2009年，在湖北省18个县（市、区）布置多点田间肥效试验，研究在当前生产条件下推荐施用钾肥对早、中、晚稻产量及其构成因素的影响，分析当前水稻生产中的钾肥吸收和利用状况。结果表明，在氮、磷肥的基础上，早、中、晚稻施用钾肥的增产量平均分别为716、679和691 kg/hm2，增产率平均分别为12.6%、9.6%和12.0%，钾肥对产量的贡献率平均分别为10.8%、8.2%和10.3%。说明当前生产条件下，高产水稻生产必须施用钾肥。施钾之所以增产，早稻主要由于单位面积有效穗数增加，中稻主要由于单位面积有效穗数和每穗粒数增加，而晚稻主要由于每穗粒数增加和结实率提高所致。施用钾肥促进了水稻总吸钾量及百千克子粒吸钾量的提高和钾素收获指数的下降。在当前生产条件和推荐施钾量水平下，早、中、晚稻百千克子粒吸钾（K2O）量平均分别为2.96、3.45和2.72 kg，钾肥（K2O）农学利用率分别为9.6、8.2和7.2 kg/kg，偏生产力分别为92.3、101.5和75.4 kg/kg，吸收利用率分别为47.1%、53.8%和46.3%，生理利用率分别为21.1、24.1和23.7 kg/kg，土壤钾素依存率分别为78.0%、83.0%和70.4%。3种类型水稻对钾素的吸收和利用虽有不同，但其吸收的钾都主要来自于土壤，因此改善土壤供钾能力是提高水稻产量和节约钾肥资源的有效措施。

关键词： 早稻 中稻 晚稻 钾肥 产量 钾肥利用率

Abstract: Multipoint field experiments with early-, mid- and late-season rice cultivars were conducted in 18 counties of Hubei province during 2006－2009. The objective of the research was to study the effect of potassium fertilizer on rice yield and yield component factors, and to investigate potassium (K) uptake and K use efficiency under present production conditions. The average yields of early-, mid- and late-season cultivars of NPK (with K) treatment were 6589, 8329 and 6789 kg/ha, respectively, which were 716, 679 and 691 kg/ha higher than those of NP (without K) treatment. The yield increase rate of early-, mid- and late-season cultivars was 12.6%, 9.6% and 12.0%, respectively, corresponding to 10.8%, 8.2% and 10.3% of the K contribution rate, respectively. It was concluded that the application of K significantly increased grain yield, which resulted from an increased number of panicles per unit area in early-season rice, increased numbers of panicles per unit area and grains per panicle in mid-season rice, and increased number of grains per panicle and seed-setting rate in late-season rice. Application of K also increased total K2O accumulation and K2O absorption of 100-kg seeds, and decreased K2O harvest index. Under present production conditions, K2O absorption of 100-kg seeds of early-, mid- and late-season cultivars was 2.96, 3.45 and 2.72 kg, respectively. K use efficiency of early-, mid- and late-season rice were respectively as follows: K2O agronomic efficiency of 9.6, 8.2 and 7.2 kg/kg, partial factor productivity of applied K2O of 92.3, 101.5 and 75.4 kg/kg, K2O recovery efficiency of 47.1%, 53.8% and 46.3%, and K2O physiological efficiency of 21.1, 24.1 and 23.7 kg/kg. The soil K dependent rate of early-, mid- and late-season rice was 78.0%, 83.0% and 70.4%, respectively. As a whole, the K uptake and K use efficiency of early-, mid- and late-season rice differed, but K absorbed by the three kinds of rice primarily came from the soil and not from K fertilizer. As a result, sustaining and increasing soil K fertility is an effective measure to increase rice yield and conserve chemical K fertilizer resources.

Keywords: early-season rice mid-season rice late-season rice potassium fertilizer grain yield potassium use efficiency

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