

喷灌施肥均匀性对冬小麦产量影响的田间试验评估

Field Evaluation of Yield Response of Winter Wheat to Uniformity of Sprinkler Applied Fertilizer

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英文关键词: sprinkler irrigation; fertigation; uniformity coefficient; winter wheat; yield

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中文摘要:

喷灌均匀系数是喷灌系统设计的重要参数,而喷灌洒水与施肥的均匀性对作物产量的影响是确定均匀系数设计值的重要依据。在喷灌施肥的试验中测定了冠层以上承雨筒内肥料溶液浓度和水量的分布,在冬小麦收获时测定了植株的全氮量。结果指出,肥料溶液浓度的均匀系数一般高于水量和肥料施入量的均匀系数。通过分析化肥施入量与灌水量的统计分布规律发现,它们都可以用正态分布来表示。田间试验结果还表明,对华北平原种植的冬小麦而言,在试验的喷灌均匀系数变化范围内(62%~82%),喷灌洒水及施肥的均匀性对产量的影响不明显,现行规范规定的喷灌均匀系数设计值($CU \geq 75\%$)是偏于安全的。

英文摘要:

The influence of uniformity of sprinkler water and fertigation on crop yield is fundamentally important for determining the target uniformity. Field experiments were therefore conducted to evaluate the influence on winter wheat yield of the uniformity of sprinkler applied water and fertilizer. Christiansen uniformity coefficient (CU) was used in this article. Three experimental plots, designed as low uniformity, medium uniformity and high uniformity, were used in the field experiments. Catch cans were placed above and below canopy in a 3 m×3 m grid for each plot. The amounts of water and the concentrations of fertilizer solution caught in the cans were measured after fertilizer was applied. Total nitrogen of plant stem for each grid was also tested when winter wheat was harvested. The experimental results showed that the uniformity of fertigation increased with sprinkler water uniformity. Christiansen uniformity coefficients for fertilizer concentration caught in the cans is usually higher than CUs of water application. The distributions of both fertilizer and water applied through sprinkler system can be represented by an approximate similar normal distribution function. Field experiments also demonstrated that the uniformity of sprinkler-applied water and fertilizer has insignificant effect on the yield of winter wheat grown in north China plains for the studied CU range of 62%~82%.

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