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施氮时期对超高产夏玉米产量及氮素吸收利用的影响

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Effects of nitrogen application dates on yield and nitrogen use efficiency of summer maize in super-high yield conditions

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摘要 选用登海661（DH661）和郑单958（ZD958）为试材，研究了超高产条件下施氮时期对夏玉米子粒产量、氮素利用率以及转运特性的影响。结果表明，拔节期一次性施氮较不施氮增产不显著；随着施氮次数的增加产量显著提高，灌浆期施氮可以显著提高粒重，从而提高产量。拔节期、大口期、花后10d按2:4:4施氮，DH661产量可达14188.9 kg/hm2；基肥、拔节期、大口期、花后10d按1:2:5:2施氮，ZD958产量可达14529.6 kg/hm2。生长期内分次施氮及灌浆期施氮可显著提高植株和子粒中氮素积累，延长氮素积累活跃期；同时可以显著提高氮素收获指数、氮肥农学利用率、氮素表观回收率和氮肥偏生产力。DH661和ZD958在2:4:4和3:5:2施肥方式下开花前和开花后氮素吸收比例分别为51:49和60:40。开花前分次施氮可显著提高氮素转运量和转运效率，灌浆期施氮可显著提高花后子粒氮素同化。DH661和ZD958在2:4:4和3:5:2施肥方式下花后氮素同化量分别占子粒吸氮量63.0%和50.5%。本试验条件下，DH661采用拔节期、大口期、花后10d按2:4:4施入，ZD958基肥、拔节期、大口期、花后10d按1:2:5:2施入或拔节期、大口期、花后10d按3:5:2施入可提高氮素利用率，实现高产高效。

关键词： 夏玉米 施氮时期 产量 氮素利用

Abstract： The effects of nitrogen application dates on grain yield, nitrogen translocation and use efficiency were studied under the super-high yield conditions. Denghai661 (DH661) and Zhengdan958 (ZD958) were selected experimental materials. The results show that the grain yield was not increased significantly under the single nitrogen application at the jointing stage, while the yields of two cultivars are increased significantly with the increase of nitrogen application times. Nitrogen application at the grain filling stage could increase weight of kernels significantly. The grain yield of DH661 is 14188.9 kg/ha, when the nitrogen fertilizers are applied at the jointing, male tetrad and grain filling stages, and the ratio is 2:4:4. The grain yield of ZD958 is 14529.6 kg/ha, when the nitrogen fertilizers are applied as the base fertilizer, and at the jointing, male tetrad and grain filling stages and the ratio is 1:2:5:2. Nitrogen accumulation amounts in the plant and grain, nitrogen harvest index, nitrogen agronomic efficiency, nitrogen recovery efficiency and nitrogen partial factor productivity are increased significantly with nitrogen application times and nitrogen application at the grain filling stage, and the active nitrogen accumulation period is prolonged. The ratio of nitrogen accumulation amounts before and after anthesis for DH661 is 51:49 by supplying nitrogen at the jointing stage (20%), male tetrad stage (40%) and grain filling stage (40%), while the ration for ZD958 is 60:40 for by supplying nitrogen at the jointing stage (30%), male tetrad stage (50%) and grain filling stage (20%). Nitrogen application several times before the anthesis stage could increase nitrogen translocation amount and nitrogen translocation efficiency, and nitrogen application at the silking stage could increase the assimilated amount of nitrogen in grain after anthesis. Through supplying nitrogen at the jointing stage (20%), male tetrad stage (40%) and grain filling stage (40%), the assimilated amount of nitrogen after anthesis is 63.0% of nitrogen accumulation amount in grain for DH661. Through supplying nitrogen at the jointing stage (30%), male tetrad stage (50%) and grain filling stage (20%), the assimilated amount of nitrogen after anthesis is 50.5% in grain for ZD958. In conclusion, under this field experiment conditions, as far as grain yield and nitrogen use efficiency are concerned, the jointing stage (20%), male tetrad stage (40%) and grain filling stage (40%) for DH661 and base fertilizer(10%), jointing stage (20%), male tetrad stage (50%) and grain filling stage (20%) for ZD958 are the most optimal nitrogen application stages and ratios.

Keywords： summer maize (Zea mays L.) nitrogen application date yield nitrogen use efficiency

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