PLANT NUTRITION AND FERT

ISSN 1008-505X
CN 11-3996/S

植物营养与肥料学报 » 2010, Vol. 16 » Issue (2) :257-265 DOI:

密植条件下玉米冠根生长抑制的因果关系

严云，廖成松，张福锁，李春俭

农业部植物营养学重点开放实验室，中国农业大学资源与环境学院，北京100193

The causal relationship of the decreased shoot and root growth of maize plants under higher plant density

YAN Yun, LIAO Cheng-song, ZHANG Fu-suo, LI Chun-jian*

Key Laboratory of Plant Nutrition, Ministry of Agriculture/College of Resources and Environmental Sciences, China Agricultural University, Beijing 100193, China

摘要 密植条件下玉米地上部及根系生长均受到抑制。以澄海3719（DH3719）为材料，通过种植密度×施氮量2因素4处理田间试验，研究了密植条件下玉米地上部及根系生长受抑制的因果关系。结果表明，高密度群体具有较高的叶面积指数（LAI），但拔节期后单株叶面积、冠根干物重、茎粗、总根长及含氮量均小于低密度种植的植株，生长受到抑制。叶面积与根长的消长变化趋势相同，各生育期不同处理植株的冠根比没有明显差异。吐丝期剪去穗位叶以上连续两个叶片或切去地上部最上层节根均减少了植株体内的氮素累积。尽管剪叶使根系生物量的减少远远低于切根的影响，但剪叶造成植株含氮量的减少多于切根的影响。综合结果表明，密植引起地上部生长空间竞争加剧，使地上部生长受到抑制，从而影响根系生长。

关键词： 种植密度 含氮量；根系生长；竞争生长空间；玉米

Abstract： Increased plant density decreased both shoot and root growth of maize plant. The causal relationship of the decreased shoot and root growth was studied through a field experiment with 2 factors (i.e. plant density and nitrogen application rate) and 4 replications using DH3719, high-yield maize（Zea mays L.）genotype. The results showed that the plants with higher plant density had higher LAI. On the other hand, the total leaf area, shoot and root dry weight, stem diameter, total root length and nitrogen content of the individual plant with higher density were lower than those of the plant with low plant density, especially after six-leaf stage, when plants began to show competition on above growth space. The changes in total leaf area and root length of single plant during the growth period showed the similar pattern. Also, shoot/root dry weight ratios of the different treated plants at each growth stage were not different. Total N accumulation in single plant was decreased when two leaves above ear leaf were cut off or the up whorl of the shoot-borne roots was removed at the tasselling stage. In comparison, less N was taken up in the former treated plants than that in the later treated ones, in spite of the less influence of cutting off leaves than removing the up whorl of the shoot-borne roots on root dry weight. In conclusion, higher plant density caused increased competition on above ground space between plants, resulted in decreased shoot growth and therefore decreased root growth.

Keywords： plant density N content root growth growth space competition maize

Received 2009-04-10;

Fund:

国家科技支撑计划项目（2006BAD25B02）； 国家重点基础研究发展计划（2007CB109302）； 农业公益性行业科研专项（200803030）资助。

引用本文:

严云, 廖成松, 张福锁, 李春俭.密植条件下玉米冠根生长抑制的因果关系[J] 植物营养与肥料学报, 2010,V16(2): 257-265

YAN Yun, LIAO Cheng-Song, ZHANG Fu-Suo, LI Chun-Jian.The causal relationship of the decreased shoot and root growth of maize plants under higher plant density[J] Acta Metallurgica Sinica, 2010,V16(2): 257-265