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研究论文

不同密度红桦幼苗苗冠结构与竞争对CO_2浓度升高的响应

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摘要 研究了两个种植密度下，红桦 (*Betula albosinensis*)苗冠结构特征对CO_2浓度的响应，在此基础上探讨了CO_2浓度升高对植物竞争压力的影响。结果表明，冠幅、冠高、苗冠表面积和苗冠体积均受CO_2浓度升高的影响而增加，但是受密度增加的影响而降低。CO_2浓度升高对苗冠的促进效应在低密度条件下大于高密度处理，高密度条件下苗冠基本特征部分地受到CO_2浓度升高的促进作用；升高种植密度的效应则在高CO_2浓度条件下大于现行CO_2浓度处理。高CO_2浓度和高密度条件下，*LDcpa*（单位苗冠投影面积叶片数）、*LDcv*（单位苗冠体积叶片数） 和苗冠底部枝条的枝角均低于相应的现行CO_2浓度处理和低密度处理，这主要是由于冠幅和冠高的快速生长所造成的。升高CO_2浓度对枝条长度的影响与枝条在主茎上所处位置有关。总之，升高CO_2浓度有利于降低增加种植密度对苗冠所带来的负效应，而增加种植密度降低了升高CO_2浓度的正效应。*LDcpa*和*LDcv*的降低表明，红桦在升高CO_2浓度和种植密度的条件下，会作出积极的响应，从而缓解由于生长的增加所带来的竞争压力的增加。

关键词 苗冠结构 _ 竞争压力 CO_2浓度升高 _ 种植密度 _ 红桦 (*Betula albosinensis*)

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Responses of crown architecture and competition of birch seedlings (*Betula albosinensis*) to enriched CO_2 under different planting densities

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Abstract Crown structure and competition of red birch seedlings were studied after one year exposure to ambient (AC) and elevated (EC) CO_2 concentration under Low (LD) and high (HD) planting density. Crown width, crown depth, branch number, branch angle and length were measured and derivative indices such as crown surface area, crown volume, leaf number and distribution were also examined. Crown width, crown depth, crown surface area and crown volume were all stimulated by elevated CO_2 and reduced by elevated planting density. The results showed that the effect of elevated CO_2 was higher under low planting density than under high density and the effect of elevated planting density was greater under elevated than under ambient CO_2. *LDcpa*(leaf number per unit projected crown area), *LDcv*(leaf number per unit crown volume) and branch angles from the bottom branch group of tree crown were negatively affected by both elevated CO_2 and planting density. Effect of elevated CO_2 on branch length was related to branch position on the main stem. In conclusion, elevated plant density could reduce the positive effect of elevate

d CO_2 and the addition of elevated CO_2 might alleviate the negative effect of elevated plant density on crown features. The smaller *LDcpa* indicated that leaves were less overlapped and self-shaded under elevated CO_2, and the lower *LDcv* suggests that leaves in crown under elevated CO_2 were less crowded than that under ambient CO_2. Thus conclusion could be drawn that competitive pressure in crown was prone to be alleviated but not intensified through the effect of elevated CO_2, due to the fast extending of crown width and crow depth resulted from stimulated growth.

Key words crown architecture _ competition _ elevated CO2 _ plant density _ birch (Betula albosinensis)

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