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研究报告

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大气CO_2浓度升高对红三叶和高丹草Cs、K竞争吸收与转运的影响

Effects of elevated CO_2 on competitive uptake and transport of Cs and K in *Trifolium Pratene* L. and *Sorhum Vulgare x* S. *Vulgare* var. *sudanense hybrids*

关键词：铯 钾 CO_2浓度升高 红三叶 高丹草

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摘要：水培条件下，研究了大气CO_2浓度升高对红三叶（*Trifolium Pratene* L.）和高丹草（*Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids*）在不同铯（Cs）浓度（0、200、500、1000 μmol·L^{-1}）下生物量、铯和钾的竞争吸收及转运的影响.结果表明，大气CO_2浓度升高显著提高了2种植物叶、茎和根各部位的生物量，其中，红三叶各部生物量分别提高了42.6%、66.2%和45.0%，高丹草分别提高了17.4%、18.9%和22.3%.大气CO_2浓度升高提高了红三叶和高丹草叶片及茎中的Cs含量，提升比例最大的为红三叶的茎（达9.7%），同时显著提高了2种植物对Cs的转运系数及红三叶的茎和根中Cs/K的区别系数.对于红三叶，大气CO_2浓度升高引起叶片K含量略微增加，而茎和根系中K含量显著降低；对于高丹草，大气CO_2浓度升高引起叶片和茎中K含量增加，而根系中K含量降低.2种植物对Cs的吸收都与介质中Cs浓度呈显著的线性相关，溶液中Cs浓度的增加提高了红三叶和高丹草的Cs/K区别系数，并且Cs的添加不仅对红三叶和高丹草的生物量都起到了一定的抑制作用，同时还降低了2种植物对钾的吸收.在正常的CO_2浓度下，1000 μmol·L^{-1} Cs处理可使2种植物叶、茎和根中的K含量分别降低10.4%、13.3%、32.5%（红三叶）和18.3%、42.1%和38.9%（高丹草）；在大气CO_2浓度升高的条件下，分别降低12.2%、22.0%、35.0%（红三叶）和17.9%、38.7%、34.6%（高丹草）.

Abstract：An aqueous culture experiment was conducted to investigate the effect of elevated CO_2 on the competitive uptake and transport of Cs and K in *Trifolium Pratene* L. and *Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids* at different Cs levels (0, 200, 500, 1000 μmol·L^{-1}). The results indicated that under the elevated CO_2, biomass of leaves, stems and roots of both plants increased apparently compared with the control under ambient CO_2. Biomass of leaves, stems, and roots of *Trifolium Pratene* L. increased by 42.6%, 66.2%, 45.0%, respectively, and those of *Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids* increased by 17.4%, 18.9%, 22.3%, respectively. Elevated CO_2 increased Cs content in the stems and leaves of both plants, and Cs content in the stem of *Trifolium Pratene* L. increased by 9.7%, the highest among all the treatments. At the same time, the transfer index (Ti) of Cs in both plants obviously increased, and the Cs/K DF in the stems and roots of *Trifolium Pratene* L. was expanded as well. As for *Trifolium Pratene* L., the rising level of CO_2 density would slightly increase K content in leaves while it would significantly reduce K content in stems and roots. In contrast, the reverse would happen for *Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids*. In summary, the absorption of Cs in both plants was proportional to the Cs concentration in solution. Increased Cs content in solutions elevated the Cs/K DF, inhibited the biomass in some degree, and reduced K absorption in both plants. Under ambient CO_2, 1000 μmol·L^{-1} Cs would reduce K absorption in the leaves, stems and roots by 10.4%, 13.3%, 32.5% in *Trifolium Pratene* L. and 18.3%, 42.1%, 38.9% in *Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids*, respectively. However, under elevated CO_2, the K absorption in the leaves, stems and roots in *Trifolium Pratene* L. would be reduced by 12.2%, 22.0%, 35.0% and 17.9%, 38.7%, 34.6% in *Sorhum vulgare x Sorghum. vulgare* var. *sudanense hybrids*, respectively.

Key words：cesium potassium elevated CO_2 *Trifolium Pratene* L. *Sorhum vulgare x Sorghum. vulgare* var.*sudanense hybrids*