生态学报 2006 26 (2006(06)): 1809～1817 ISSN: 1004-616x CN: 44-1063/R

研究论文

人工群落中苗期紫茎泽兰的化感作用和对光环境的适应

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收稿日期 2005-2-6 修回日期 2005-9-25 网络版发布日期: 2006-6-25

摘要 在有、无活性炭的条件下分别构建紫茎泽兰（*Ageratina adenophora*）与4种受体植物——飞机草（*Chromolaena odorata*）、鬼针草（*Bidens pilosa*）、胜红蓟（*Ageratum conyzoides*）和兰花菊三七（*Gynura* sp.）混种的人工群落，研究了群落中紫茎泽兰的化感作用和对群落光环境的适应，探讨了化感作用和光适应特性与其入侵性的关系。结果表明，活性炭处理对4种受体植物的生长、生理特性影响不显著，说明苗期紫茎泽兰化感作用不明显，推测入侵初期化感作用不是紫茎泽兰排挤本地种的主要原因。4种受体植物可以通过化感作用对紫茎泽兰产生某些影响，但群落的光环境对其影响更大。紫茎泽兰能很好地适应群落中不同的光环境。苗期紫茎泽兰处于群落下层，叶片受光指数低，此时它能长期忍耐并缓慢生长；随着叶片受光指数的升高，其最大净光合速率、超氧化物歧化酶活性、叶绿素a/b比、总生物量、总叶面积、地茎、叶片数和分支数升高，比叶面积和比茎长降低，这有利于它维持叶片能量平衡并导致对邻近植物的严重遮荫。紫茎泽兰强的光适应能力、强光下对其它物种的遮荫效应与其入侵性密切相关

关键词 紫茎泽兰；化感作用；光适应；入侵性；人工群落

分类号 Q948

Allelopathy and light acclimation characteristic for Ageratina adenophora seedlings grown in man-made communities

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Abstract As one of the most noxious plant invaders in China, Ageratina adenophora (Sprengel) R. M. King & H. Robinson not only severely threatens the biodiversity security and but also leads to huge economic costs to the country. To simulate the natural environments, *A. adenophora* was grown together with 4 receiver plants, *Chromolaena odorata*（L.）R. M. King & H. Robinson, *Bidens pilosa L. Ageratum conyzoides* L. and *Gynura* sp. respectively, to set-up four types of man-made communities. In half of the communities activated carbon was used to absorb allelochemicals, and in turn to eliminate allelopathy between plants. In this way allelopathy and irradiance acclimation characteristics of *A. adenophora* were studied separately, and their relationships with invasiveness were discussed.

After growing with *A. adenophora* for more than three months, *C. odorata, A. conyzoides, B. pilosa* and *Gynura* sp. in communities with activated carbon did not show any significant difference with the plants of the same species in communities without activated carbon in all of the morphological and physiological parameters measured in this study. These results indicated that in the early phase of invasion *A. adenophora* did not affect its neighbors by allelopathy. In contrast, *A. adenophora* were affected in few traits by the receiver's allelochemicals. *C. odorata* reduced its basal diameter; *B. pilosa* reduced its leaf numbers but increased its height; *Gynura* sp. reduced its ascorbate peroxidase activity. At early invasion stage, *A. adenophora* seedlings were located in the lower layer in all of the four types of microcosms constructed in this study, so irradiance around them was weak. *A. adenophora* could adequately acclimate to the light environments in the co

mmunities. Twelve parameters measured in this study were significantly associated ($p<0.05$) wit h the light intensities that *A. adenophora* encountered in the communities. *A. adenophora* could t olerate weak light environments. With the increase of light intensity *A. adenophora's* maximum ne t photosynthetic rate, activity of superoxide dismutase, the ratio of chlorophyll a to b, total plant bi omass, total leaf area, basal diameter, numbers of leaves and branches increased, while its specifi c leaf area and specific stem length decreased. These morphological and physiological changes m ade it possible for A. adenophora to keep leaves energy balance and to shade-out its neighbors i n high light environment. We attributed *A. adenophora's* invasiveness to its remarkable light accli mation ability, especially to its shading-out effect on native plant species in high light environment.

Key words Ageratina adenophora _ allelopathy _ light acclimation _ invasiveness _ man-made community

DOI

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