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研究论文

亚高山暗针叶林不同林冠环境下华西箭竹的克隆可塑性

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摘要 以亚高山暗针叶林3种林冠环境中以及暗针叶林林缘的华西箭竹(*Fargesia nitida*)为对象,对其无性系数量特征、无性系根茎特征、分株生物量以及分株形态特征进行了对比研究。结果表明:(1) 林冠环境的差异导致了不同种群的基株密度和每基株分株数的显著差异，但林冠环境差异不影响分株密度。林冠郁闭度愈大，每基株分株数愈少，分株分布愈均匀。(2)不同林冠环境间，分株生物量、分株构件生物量和分株构件的生物量分配百分率均有显著差异。开敞的林冠环境有利于华西箭竹的生长和生物量积累。(3) 随着林冠郁闭度的增加，华西箭竹通过增大分枝角度、叶生物量分配百分率、比叶面积和叶面积率以提高光能利用效率，有效适应弱光环境。(4)隔离者长度、隔离者直径和分枝强度在林缘和林窗环境中要显著大于林内环境；同级隔离者分枝角度随林冠郁闭度的增加而最大，其值在林下显著大于林窗和林缘，而异级隔离者分枝角度的变化则正好相反。研究表明，华西箭竹种群在不同的林冠环境中发生了明显的可塑性变化，这些可塑性变化是种群对林冠郁闭度差异的适应性反应的结果，有利于增强种群对环境中有限光资源的利用。

关键词 华西箭竹 _ _ 克隆植物; 可塑性; 亚高山暗针叶林 _ _ 卧龙自然护区

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Response of clonal plasticity of *Fargesia nitida* to different canopy conditions of subalpine coniferous forest

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Abstract Dwarf bamboos are acknowledged as being key to the structure and dynamics of subalpine forests, since they are widely distributed and often form exclusively dense undergrowth in such environments. In South-West Sichuan in China, several species of dwarf bamboo dominate forest understories, where they have been shown to impede the regeneration of many canopy tree species. However, although the inhibitory effects of dwarf bamboos on tree regeneration have been widely documented, there are comparatively few studies documenting the clonal plastic responses of dwarf bamboo to differing canopy conditions. The aim of this study is to determine the effects of canopy conditions on clump and culm numbers, and to describe the morphological plasticity and biomass distribution patterns of the dwarf bamboo species Fargesia nitida. The specific objectives of the study are:（1）to describe the effects of canopy conditions on the growth and morphological characteristics of F. nitida, and （2）to describe the adaptive responses of F. nitida to the different canopy conditions and its ecological senses. F. nitida, one of the Giant Panda's main dietary sources of bamboo, is mainly distributed within the coniferous belt in Western Sichuan and Southern Gansu in China, at an altitude of between 2450 and 3200 metres. The investigations for this study were conducted in an Abies faxoniana forest situated in the Wolong Nature Reserve in Western Sichuan. The clonal plant F. nitida was surveyed under four different canopy conditions to interpret its clonal plasticity under a range of forest canopies. Data on clump and culm numbers, biomass and morphological characteristics were obtained from three types of canopy gap and one forest edge wilderness; the gap types were: forest understory (FU), intermediate gap (MG) and large gap (LG). While these plots differed in canopy conditions, the canopy tree compositions, topographical traits and soil traits were all homogeneous. The results of the study indicate that forest canopy has a significant effect on the genet density and culm number per clum

p, but that it does not affect the ramet density. Clumps tend to be few and large in gaps and fores t edge plots, and small under forest understory plots. The ramets show even distribution under th e closed canopy, and cluster distribution under gaps and forest edge plots. The forest canopy ha s a significant effect on both the ramets' biomass and biomass allocation. Favourable light conditio ns promote the ramet growth and biomass accumulation. The greater biomass amounts in gaps an d forest edge plots is shown by the higher number of culms per clump and the diameter of these c ulms. Under closed canopy, the bamboos increase their branching angle, leaf biomass allocatio n, specific leaf area and leaf area ratio to exploit the more favourable light conditions in these locat ions. The spacer length, specific spacer length and spacer branching angles all show significant diff erences between gaps and closed canopy conditions. The larger specific spacer length and space r branching angle are beneficial for bamboo growth, scattering the ramets and exploiting the mor e favourable light conditions. In summary, this study shows that to varying degrees, F. nitida exh ibits both a wide ecological amplitude and a high degree of morphological plasticity in response t o differing forest canopy conditions. Moreover, the plasticity changes enable the plants to optimiz e their light usage efficiency to promote growth and increase access to resources available in heter ogeneous light environments.

Key words Fargesia nitida _ clonal plant _ plasticity _ subalpine coniferous forest _ Wolong Nature Reserve

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