

蒙古沙冬青花序内性分配的变化、传粉者运动与繁殖成功

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Variation in floral sex allocation, pollinator movement and reproductive success in *Ammopiptanthus mongolicus* inflorescences

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摘要

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摘要 性分配理论主要研究繁殖资源在雌雄功能间的最优分配, 从雌雄功能的角度考虑其个体适合度。对花序内不同部位花的雌性与雄性资源分配变化的研究, 对于我们理解植物采取哪种繁殖对策保障繁殖成功具有重要意义。本文对生长在中国科学院吐鲁番沙漠植物园内的蒙古沙冬青(*Ammopiptanthus mongolicus*)连续开花花序内不同部位花的性分配变化、传粉者运动与繁殖成功进行了研究。主要结果如下: (1)从花序的中部早开花到下部花再到上部晚开花, 花寿命明显缩短, 雄蕊群质量/(雄蕊群质量+雌蕊质量)、花粉量及花粉量/胚珠数增大, 花冠大小、花冠质量、花蜜量减小, 胚珠数无明显变化, 表现出上部花偏雄的性分配; (2)在一个花序内, 西方蜜蜂(*Apis mellifera*)和淡脉隧蜂属1种(*Lasiglossum* sp.1)首先停落在中部花上, 在花序的不同部位间移动, 最后从上部花飞离花序, 因此中部花的首次受访率较高, 最后受访率较低, 而上部花的最后受访率较高, 首次受访率较低; (3)两年间, 给上部花补授异株花粉后, 结籽率、种子质量均明显提高, 给上部花补授异株花粉的同时去除中下部花后, 座果率、结籽率和种子质量也明显增加; 而这两种处理间的座果率、结籽率和种子质量无明显变化。这表明, 蒙古沙冬青自然情况下上部花座果率、结籽率和种子质量较低的主要原因是, 花序内传粉者定向运动而非资源限制是造成上部花缺乏异花花粉。这种情况下, 增加对上部花雄性功能的投入是蒙古沙冬青维持传粉成功的适应策略。

关键词: *Ammopiptanthus mongolicus* 性分配 传粉者 定向运动 异花花粉 繁殖成功

Abstract: The theory of sex allocation can be used to predict the optimal allocation of reproductive resources and considered as individual fitness between male and female function. Variations in resource allocation between sexes and among different positions in the flower inflorescence have great significance for understanding how choice of reproductive strategy affects reproductive success. Changes in floral sex allocation among different positions, pollinator movement and reproductive success within sequentially flowering inflorescences of *Ammopiptanthus mongolicus* were studied at the Turpan Eremophytes Botanical Garden of the Chinese Academy of Sciences. Our major results are as follows: (1) Floral longevity shortened significantly, stamen mass/(stamen mass + pistil mass), pollen number and pollen/ovule ratio all increased among positions along with the turn of intermediate earlier developing flowers→lower flowers→upper later developing flowers. Corolla diameter, corolla mass and nectar production, on the other hand, all diminished and ovule number showed no differences. Upper flowers showed male-biased sex allocation; (2) Within an inflorescence, *Apis mellifera* and *Lasiglossum* sp.1 landed first on the intermediate flowers, moved among different positions in the inflorescence, and finally flew away from the upper flower. Intermediate flowers had the highest first visiting rate but lowest last visiting rate while upper flowers had the lowest last visiting rate but highest first visiting rate; (3) During the two years of our study, the seed set rate and seed weight increased after supplying outcross pollen to the upper flowers; the fruit set rate, seed set rate and seed weight all increased significantly after simultaneously supplying outcross pollen to the upper flowers and removing the intermediate and lower flowers, and these measures did not differ between the two treatments. These results suggested that lower fruit set, seed set and seed weight of upper flowers under natural conditions can be attributed to the pollinators' directionality within inflorescence and a lack of outcrossing pollen in upper flowers rather than resource limitation in *A. mongolicus*. Increasing investment in male functions on the upper flowers may be an adaptive strategy to sustain pollination success for the species.

Keywords: *Ammopiptanthus mongolicus* sex allocation pollinator directionality of movement across pollen reproductive success

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