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The evolution of a geographic cline in flowering time in bamboos

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Bamboos are clonal plants that undergo mass flowering followed by simultaneous death after a long-term period of rhizomatous vegetative growth. The time to flowering after germination depends on species and shows a geographic cline in which it is short in tropical region and becomes longer as we move northward into temperate region. As another geographic tendency in bamboo, rhizome systems are different between tropical and temperate region. The species in tropical region have short and thick rhizomes, called pachymorph, resulting in clumped spatial arrangement of ramets. On the other hand, species in temperate region have long and slender rhizomes, called leptomorph. As a result, individuals are spatially intermingled each other. How these types of rhizome emerged in the evolutionary history and how the geographic correlation between flowering interval and rhizome system has been formed remains elusive. In this talk, using spatially explicit mathematical model, we explore the evolution of rhizome system in heterogeneous environment. We demonstrate that the longer rhizome is adaptive in relatively homogeneous environment, and short rhizome can evolve only when spatial autocorrelation of the quality of environment is high. We also demonstrate that flowering interval affects the evolution of rhizome length, in which long rhizomes are favoured when flowering interval is long. In addition to this, rhizome system, in turn, affects the evolution of flowering time.

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