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Variable resource allocation pattern, biased sex-ratio, and extent of sexual dimorphism in subdioecious *Hippophae rhamnoides*

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Abstract

Evolutionary maintenance of dioecy is a complex phenomenon and varies by species and underlying pathways. Also, different sexes may exhibit variable resource allocation (RA) patterns among the vegetative and reproductive functions. Such differences are reflected in the extent of sexual dimorphism. Though rarely pursued, investigation on plant species harbouring intermediate sexual phenotypes may reveal useful information on the strategy pertaining to sex-ratios and evolutionary pathways. We studied *H. rhamnoides* ssp. *turkestanica*, a subdioecious species with polygamomonoecious (PGM) plants, in western Himalaya. The species naturally inhabits a wide range of habitats ranging from river deltas to hill slopes. These attributes of the species are conducive to test the influence of abiotic factors on sexual dimorphism, and RA strategy among different sexes. The study demonstrates sexual dimorphism in vegetative and reproductive traits. The sexual dimorphism index, aligned the traits like height, number of branches, flower production, and dry-weight of flowers with males while others including fresh-weight of leaves, number of thorns, fruit production were significantly associated with females. The difference in RA pattern is more pronounced in reproductive traits of the male and female plants, while in the PGM plants the traits overlap. In general, habitat conditions did not influence either the extent of sexual dimorphism or RA pattern. However, it seems to influence secondary sex-ratio as females show their significant association with soil moisture. Our findings on sexual dimorphism and RA pattern supports attributes of wind-pollination in the species. The observed extent of sexual dimorphism in the species reiterates limited genomic differences among the sexes and the ongoing evolution of dioecy via monoecy in the species. The dynamics of RA in the species appears to be independent of resource availability in the habitats as the species grows in a resource-limited and extreme environment.