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Alien Species in the Flora of Sikkim Himalaya

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ALIEN SPECIES IN THE FLORA OF SIKKIM HIMALAYA, INDIA

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Abstract

The alien flora of Sikkim Himalaya is presented based on field visit, literature survey and herbarium consultation. As many as 334 alien plant species were recorded under 224 genera and 62 families. The families with maximum number of alien species were Fabaceae (57 spp.) followed by Asteraceae (49 spp.), Solanaceae (30 spp.), Poaceae (21 spp.), Amaranthaceae (15 spp.) and Malvaceae (13 spp.). As per the growth forms, herbaceous species are predominant (54.19%). The available information suggests that the majority of the species (208 spp.) have been introduced into the region intentionally for various reasons, chiefly from the region of American continent. Of the alien species, 34.43% are invasive and others are either casual or naturalized. These invasive aliens are chiefly from Asteraceae (e.g. *Ageratina adenophora*, *Ageratum conyzoides*, *Bidens pilosa*, *Chromolaena odorata*, *Mikania micrantha* and *Tridax procumbens*). These species are largely concentrated near human habitations, roadsides, disturbed areas, forest clearings, riparian and scrub habitats. The study provides the scientific names under their families, growth form, habitat, mode of introduction, invasion status and native range of the alien plant species recorded.

Keywords: Himalaya Ecosystem; Exotics; Invasives; Naturalization; Threat.

Introduction

Alien or non-native or exotic or non-indigenous plants are those species which are introduced intentionally or unintentionally in an area outside their native range, either due to human involvement or through any other agency (Richardson *et al.*, 2000; Pyšek *et al.*, 2004). At times, habitat changes, global warming, atmospheric nitrogen and acid rain accelerate the propagation of alien plant species in some non-native areas where they may become invasive causing threat to the native flora. Distribution patterns and abundance of

alien species depend on a number of drivers including introduction history and pathways, life threats, availability of potential ecosystems, residence period and interference (Carranza *et al.*, 2011; Comin *et al.*, 2011; Richardson & Rejmánek, 2011; Dainese & Poldini, 2012; Jucker *et al.*, 2013). It was also established that the anthropogenic forces play a crucial role in the establishment and spread of alien species throughout the world (Richardson & Pyšek, 2006; Pyšek *et al.*, 2010a,b; Bolpagni & Piotti, 2016; Lazzaro *et al.*, 2018; Stinca & Motti, 2017). The threats caused by these alien plant species have already been reported in different geographical zones of the world including India (Mandal, 2011; Adhikari *et al.*, 2015). It is considered that the shift in global environmental conditions due to changes in climatic attributes such as gradual increase in temperature, rapid economic development and invasion by alien species adversely affect the native flora by reducing their abundance (Kelly & Goulden, 2008; Walther *et al.*, 2009; Adhikari *et al.*, 2015). At the UN-Norway Conference on Alien Species (Schei, 1996), the invasive aliens were recognized as the second largest threat to biological diversity after habitat destruction on continents and the greatest cause of biodiversity loss on islands. These species have ability to spread into novel regions and habitats where they often displace local biota, hence threatening the native biodiversity (Bhowmik, 2005). The success of the growth of these species in the alien and new environment may be attributed to several reasons such as anthropogenic activities, overgrazing, high tourism and construction (Keane & Crawley, 2002; Poudel *et al.*, 2019). In the recent years, the spread of the alien species and their management have become a global challenge throughout the world (Dogra, 2010). The invasion of alien plant species actually started when economic liberalization has