

## Distribution and ecology of the genus *Murdannia* Royle (Commelinaceae) in South India

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### Abstract

The genus *Murdannia* Royle (Commelinaceae) represents 21 authorised species in South India. The distribution and ecology of the genus in South India has been analysed. The analysis showed that the habitat preference as laterite substrate (43%), grassland (29%), marshes (14%) and rocky substratum (9% each) and streamsides (5%). The altitudinal preference indicates that 38% of *Murdannia* species found in 700 – 1000 m MSL, 28% in 1-70 m MSL, 19% in 40 – 700 m MSL and 5% each in 1000 – 1200 m MSL, 1 – 1000 m MSL and 70 – 1000 m MSL. The population density of the species indicates that 62% *Murdannia* species belongs to rare category, 24% belongs to common category and 14% belongs to vulnerable category. Among this, 81% of species prefers exposed conditions and 19% prefers shade. It is concluded that the speciation and diversification of the genus *Murdannia* in South India strongly correlates with altitude and climatic conditions.

**KEYWORDS:** *Murdannia*, South India, Distribution, Ecology, Habitat, Elevation, Conservation

### Introduction

The genus *Murdannia* Royle (Commelinaceae) is distributed in pantropical and warm temperate regions of the world and diversified in tropical Asia (Faden, 2000). The genus has 59 species in total (Govaerts & Faden, 2004) and 25 taxa (including 2 subspecies) in India (Karthikeyan *et al.*, 1989). Recent taxonomic investigations in the South India lead to three more additions viz. *Murdannia satheeshiana* Joby, Nisha & Unni (Joby *et al.*, 2011), *M. brownii* Nandikar & Gurav (Nandikar & Gurav, 2011) and *M. saddlepeakensis* M.V. Ramana & Nandikar (Ramana *et al.*, 2013). Excluding the cryptic species *M. sahyadrica* A. Ancy & Nampy (Nampy *et al.*, 2012), which is a 'text-type'; the genus represented 21 species in South India. The distribution of this genus has wide habitat ranges starting from sea level to high elevation montane grasslands. We analyzed the ecology of *Murdannia* in South India and found that elevation variation is the most significant environmental correlate for species distribution.

### Materials and methods

#### Study area

The study area includes the South Indian states viz. Andhra Pradesh, Karnataka, Kerala, Goa, Maharashtra, Tamil Nadu and union territories of Mahe and Pondicherry. The area includes the major geographic formations such as Deccan plateau, Eastern Ghats and Western Ghats. A wide range of habitats from sea shore to high elevation montane grasslands including wetlands, marshes, mangrove forests, sacred groves,

laterite plateau, different forest types such as deciduous, semi evergreen, evergreen, scrub, shola and grasslands are found in the study area.

### Methods

Field explorations in different parts of the South India have been carried out during 2011-2013. *Murdannia* species were collected, identified with standard floras (Hooker 1872–1897, Gamble & Fischer 1915–1936) and voucher specimens were prepared and submitted to SES and CMS herbariums. Besides fresh specimens, herbariums of MH, CALI were consulted for the study. The habitats and population of each species were analyzed by phytosociological methods.

## Result and discussion

### Distribution

The distribution of *Murdannia* has primary restricted by the topographical peculiarities. The genus requires high moisture content in the soil and frequent availability of water for survival. 43% of the species prefers laterite mounds/plateau as their natural habitat where the precipitation is high during monsoon. In this habitat, annual *Murdannia* species colonizes after the first shower and flowering fruiting during the post monsoon season. The most important species that prefers laterite plateau as its habitat is *M. semiteres*. 29% of species prefers high altitude grasslands due to high precipitation and atmospheric humidity. 40% of species prefers marshes as their natural habitat due to water availability. Only 9% *Murdannia* species prefer rocks and rocky crevices as their habitat. In the rocky environment, the water holding capacity of these species has been enabled with various adaptations like bulbous base and tuberous roots. Rest 5% of the *Murdannia* species prefers streamside or riverside as its habitat where water availability is high (Table -1 & Fig.1).

Table -1. Distribution, habitat and population of *Murdannia* species in South India

Botanical Name	Habitat	Altitude mts MSL	Population	Ecology
<i>M. crocea</i> sub sp <i>ochracea</i>	Marsh	1 to 70	Rare	Exposed
<i>M. dimorpha</i>	Laterite	1 to 70	Rare	Exposed
<i>M. esculenta</i>	Grassland	700 to 1000	Rare	Exposed
<i>M. fadeniana</i>	Streamside	70 to 1000	Vulnerable	Shade
<i>M. gigantea</i>	Grassland	40 to 700	Rare	Exposed
<i>M. japonioca</i>	Laterite	40 to 700	Vulnerable	Shade
<i>M. juncoides</i>	Rocks	700 to 1000	Rare	Exposed
<i>M. lanceolata</i>	Grassland	700 to 1000	Rare	Exposed
<i>M. lanuginosa</i>	Grassland	700 to 1000	Rare	Exposed
<i>M. loriformis</i>	Laterite	40 to 700	Common	Exposed
<i>M. nudiflora</i>	Laterite	1 to 70	Common	Shade
<i>M. pauciflora</i>	Laterite	1 to 1000	Common	Exposed
<i>M. satheeshiana</i>	Grassland	1000 to 1200	Rare	Exposed
<i>M. semiteres</i>	Rocks	40 to 700	Vulnerable	Exposed
<i>M. simplex</i>	Grassland	700 to 1000	Rare	Exposed

<i>M. spirata</i>	Laterite	1 to 70	Common	Exposed
<i>M. vaginata</i>	Marsh	1 to 70	Rare	Exposed
<i>M. zeylanica</i> var. <i>Longicapsa</i>	Laterite	700 to 1000	Rare	Shade
<i>M. brownie</i>	Laterite	700 to 1000	Rare	Exposed
<i>M. versicolor</i>	Laterite	700 to 1000	Common	Exposed
<i>M. striatipetala</i>	Marsh	1 to 70	Rare	Exposed

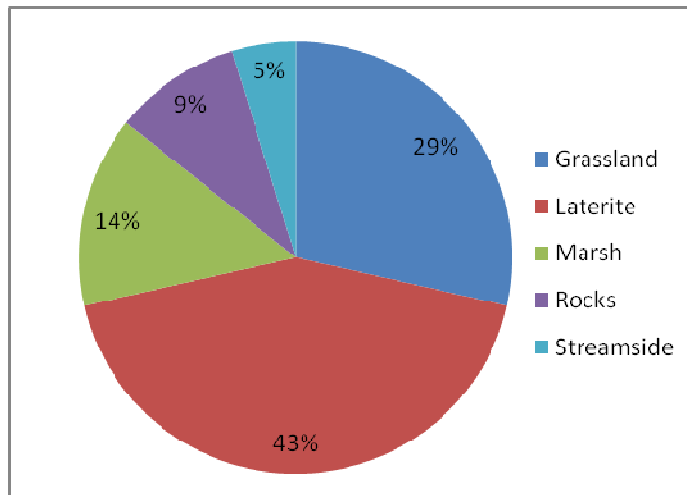


Fig. - 1. Habitat type preference of the genus *Murdannia* in South India

### Preference of elevation

The elevation preference of *Murdannia* in South India ranges from sea level to 1200 mts MSL (Table -1 & Fig. -2). 38% of *Murdannia* species prefers 700 – 1000 mts MSL for their habitat, where most of the laterite plateaus and mounds found in the South Indian states. 28% of species prefers, 1 - 70 mts MSL, where most of the marshes, ditches and wetlands found in the South India. 19% of the species prefers 40 – 700 mts MSL elevation for their habitat. Other elevation ranges preference by 5% of species each in three categories. From the elevation preference of the species studied, high altitude (700 – 1000 mts MSL) is the most suitable place for *Murdannia* distribution in South India.

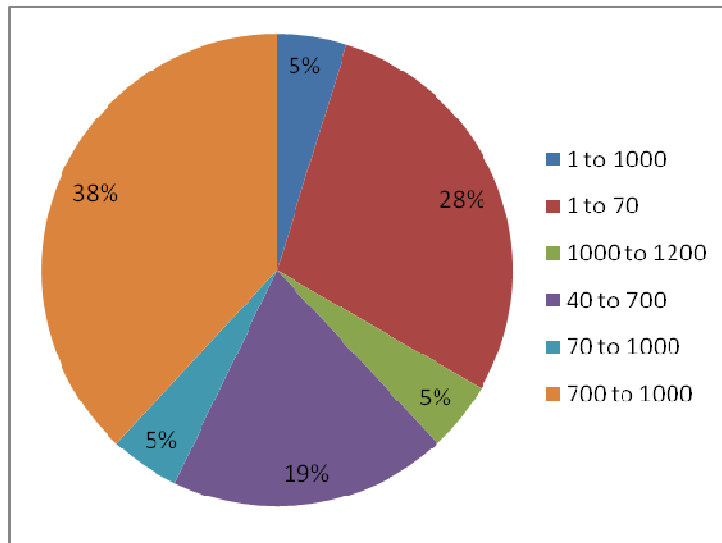


Fig 2. Elevation preference of the genus *Murdannia* in South India

### Preference of sunlight

The genus *Murdannia* prefers exposed habitats (81%), followed by shade or partial shade (19%) due to high light demand for growth and flowering (Table -1 & Fig. -3). The light is an essential factor for blooming, where most of the species flowers forenoon. Flowers are also ephemeral and last for few hours of a day. Only few species has extended their flowering time to afternoon where sufficient light and humidity available. It was also observed that the major preferred habitats are directly exposed to sunlight.

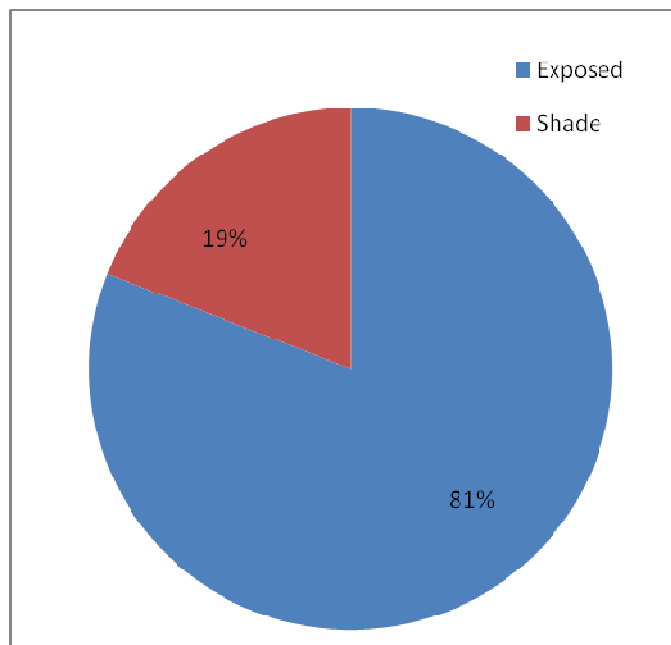


Fig. -3. Preference of sunlight in the habitats of the genus *Murdannia* in South India

### Population status

The population assessment of each species in South India which is not based on IUCN criteria indicated that, 62% are rare in their habitats (Table -1 & Fig. -4). Most of the species represents limited population in their natural habitats due to climatic and anthropogenic interference. 24% of the *Murdannia* species are common in their habitats and 14% vulnerable.

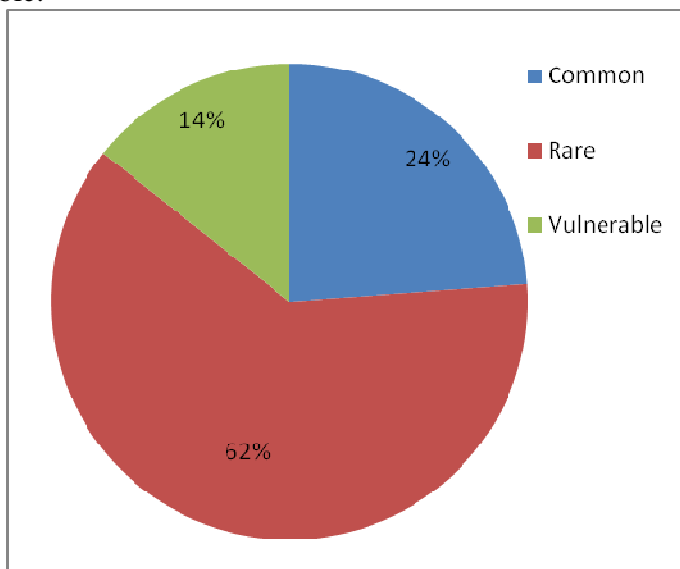


Fig. -4. Population status of different species of *Murdannia* in South India

### Summary and conclusion

The genus *Murdannia* prefers high altitude habitats (700 – 1000 mts MSL) with high moisture content in both soil and atmosphere. The laterite substratum and grassland habitat are the most suitable medium for species survival and distribution. However *M. juncooides*, *M. esculents* and *M. japonica* have made adaptations to survive in the rocky crevices where water and moisture availability is low. *Murdannia* prefers exposed habitats for their survival, because most of the species prefer anemophily and seed dispersal by wind. It requires open, exposed high elevation grasslands or laterite mounds. The population assessment also indicated that most of the species are under threat due to anthropogenic activities. So the conservation of *Murdannia* in their natural laterite and grassland habitat is an urgent need.

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