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# *Dipcadi erythraeum* Webb.& Berth. : A threatened medicinal plant of Thar Desert

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**Abstract**

*Dipcadi*, an important genus of family Hyacinthaceae is distributed in tropical regions of the world. Most species of *Dipcadi* are used in folk medicine. *Dipcadi erythraeum* is one such species of Indian Thar desert, which is traditionally used as food during famine and also as a therapeutic herb. Its over exploitation has reduced its populations and it now it stands as threatened. In this paper, the ecology, potential and need for its *in situ* conservation in its native sites are highlighted.

**Key words:** *Dipcadi erythraeum*, conservation, endemic, threatened species, Thar desert.

## Introduction

The genus *Dipacdi* Medic. of family Asparagaceae (formerly Liliaceae and Hyacinthaceae) is distributed in tropical regions. Most of the species of *Dipcadi* are in wild state and await discovery. Jehan *et al*., (2014) reported highest polyphorphism in genus *Dipcadi* with two other genera *Drimia* and *Ledebouria* in family Hyacinthaceae. The genus shows great diversity in India by representing 11 species, of which 9 are endemic and distributed from Himalaya to Peninsular India (VijyaJyothi, 2018). The species viz., *Dipcadi concanense* (Dalz.) Baker, *D. erythraeum* Webb.&Berth.,*D. goaense* Prabhug., D. *krishnadevarya* B.R.P.Rao, *D.maharashtrensis* Deb & Dasgupta, *D. minor* Hook.f, *D. montanum* (Dalz.) Baker, *D. reidii* Deb & S. Dasgupta, *D. saxorum* Blatter, *D. serotinum* (L.) Medic and *D. ursulae* Blatter occur in different parts of India. Most of the species of *Dipcadi* are from Western Ghats and used in folk medicine. Due to increasing biotic interferences, the species of *Dipacdi* are threatened in their natural distribution. *D. erythraeum* is reported as endemic and threatened plant in India (Bhandari and Shringi,1987) and its distribution is restricted to rocky and gravelly soils of north-west Rajasthan (Bhandari, 1990). It is locally known as Bhakar Kanda, Janglipyaz, Kanda, Piaziin, etc. in western Rajasthan. This paper presents the state of research information on *Dipcadi erythraeum* from western Rajasthan and highlights its ecology, potential and need of its *in situ* conservation.

## Origin and Distribution

Rawat *et al*., (2011) reported probable amphidiploids origin of *D. erythraeum.* Jehn*et al*., (2014) mentioned that *Dipcadi erythreum* [syn. *Dipcadi unicolor* (Stocks) Baker, *Uropetalum unicolor* Hooker, *Ornithogalaumerythraeum* (Webb. &Berthel.) J.C. Manning &Goldblan, *Uropetalon erythraeum* (Wevbb. &Berthel.)Boiss.] is genetically distinct species and is restricted to hilly desert tracts of Rajasthan indicating that it might be an introduction from Pakistan and Baluchistan. *D. erythraeum* is distributed in tropical countries such as Canary Islands, Egypt and Saudi Arabia, Iran, Iraq, Afghanistan, Pakistan and India. In India it mostlyoccurs in gravelly plains in western Rajasthanin the districts of Barmer, Jaisalmer,Jodhpur and Jalore. It also shows highly restricted and patchy distribution in Kachchh, Gujarat (Joshi *et al*., 2012).

## Botanical and Ecological Characteristics

*D. erythraeum*is a scapigerous, bulbous herb, attains about 30 cm height (Fig.1). Bulbs are 15-30mm in diameter and tunicated. Leaves are 5-6, narrowly linear, terete, erect15-20 X 4-6 mm. Scapes are up to 25 cm long, 4-12 flowered. Flowers are greenish in lax raceme (Fig.2). Fruit is a capsule, short stalked, 12-15 mm long and broad (Fig. 1), slightly narrowed at base. Each fruit has three locules; number of seeds per locule varies from 10-17. Seeds are 6-7 mm, orbicular, flat black narrowly winged. Flowering and fruiting occurs during August to September. It produces flowers and fruits in short period of time following monsoon rains.

*D. erythraeum* occurs in crevices usually along runnels on shallow sandy gravelly soils and in depressions of rocky and gravelly areas of arid range lands in Thar Desert. It occurs more frequently over rocky and gravelly regions where rainwater gets conserved for some period. In its natural habitat, it forms association with grasses, leguminous and non-leguminous perennial herbs. It is associated frequently with perennial grasses like *Dactyloctenium sindicum* Boiss., *Ochthochloa compressa* (Forsk.) Hilu, herbaceous leguminous species like *Indigofera cordifolia* Heyne ex Roth, *Tephrosia uniflora* Pers., and non-leguminous perennial herbaceous species like *Boerhavia diffusa* L., *Tribulus pentandrus* Forsk., *Tribulus terrestris* L.etc. *Glossonema*

*varians*(Stocks) Hooks. f.is also noticed as associate of *Dipcadi erythraeum*in rocky-gravelly rangelands in Jaisalmer district.

**Economic Importance**

The bulbs of *D. erythraeum* are used as one of the common food during the famine period in the Thar Desert, and capsules are also eaten (Bhandari, 1990, Jongbloed *et al*., 2003). Although, bulbs are edible in Arab region, it is bitter in taste (Mandaville, 1990). Its bulb are used by inhabitants as herbals. They are used as a substitute and adulterant to Indian squill (*Urginea indica* Kunth), which resemble digitalis in action and used as an expectorant (Ambasta*et al.* 1986). In Bahrain, the leaves are used as alaxative and as an ointment for wounds (Rizk and El-Ghazaly, 1995).

**Propagation and Regeneration**

It is propagated through seeds, however, also has ability to grow from bulbs. The collection of seed could be made during August-September when fruiting occurs for a short period. Due to very thin nature, the seeds disperse fast through wind. The plant could be established from seeds in the first year. After 3-4 years it becomes bulbiferous and starts flowering and fruit setting to yield seeds.Seeds of *D. erythraeum* sown in the nursery at ICAR-CAZRI, RRS, Jaisalmer showed, 50% germination after five days of sowing. After four month of seed sowing in nursery, seedlings height was ranged from 14.5 to 28.5 cm (average 21.6 cm) with average length of root 3.3 cm. Regeneration growth data recorded in previous year planting from the bulb of *D. erythraeum* in the field showed high regeneration (>90 %) and good flowering/fruiting. Recently, Sagar and Kasera (2019) reported that seeds of *D. erythraeum* pre-treated with growth regulators improved germination and other parameters as compared to control. Among all growth regulators, $GA_3$ showed best results for seed germination and seedling growth, but higher concentrations of $GA_3$ retards the germination.

**Prospects**

Bulbs of *D. erythraeum*are are most important economic part and utility of the bulbs made this species as one of the valuable plant in the arid region. The bulbs are used as food during the famine period which is a common phenomenon in most of the deserts of the world during severe drought, crop failure etc. So, it as an integral part in the diet of people, especially during drought. Due to the similarity in the mode of action of Indian squill (*Urginea indica* Kunth), it could be a good alternative in the near future. Presence of tannins, alkaloids, flavonoids and saponins reported by various workers in different species of *Dipcadi* viz., Adly*et al*., (2015) in *Dipadiserotinum*, Abdulkareem *et al*., (2014) in *D. filamentosa*and Vijya Jyothi *et al*., (2018) in *D. krishnadevarayae*. EL-Shabrawy *et al*., (2016) reported isolation of two flavanolaglycones (kaempferol and quercetin), one flavonol glycoside (quercetin 3-O-rutinoside-7- O-á-rhamnopyranoside), and four C-glycosyl flavones (vitexin, isovitexin, orientin, and isoorientin) from the whole plant of *D. erythraeum*. Recently, Marzouk *et al*., (2019) reported 22 compounds including 14 C-glycocylflavanoids, 6 phenolic acid derivatives (coumaric acid and caffeic acid derivatives) one organic acid and one anthocynanin (delphinine derivatives) from the bulbs of *D. erythraeum* and one of them identified as C-glycocylflavanoids. Further, they mentioned that the presence of C-glycocylflavonid supported that *D. erythraeum* has a closer relationship with the species of Asperagaceae family than Liliaceae.Sagar and Kasera (2016) reported that leaf pigments in *D. erythraeum* were maximum during flowering stage, while remaining parameters in vegetative stage.

**Conservation**

Genus *Dipcadi* received attention from number of workers in India from conservation point of view. Dasgupta and Deb (1988) emphasized conservation of six species of

Fig. 1: Habit of *D. erythraeum*

Fig. 2: Close up of flower of *D. erythraeum*

*Dipcadi* as mentioned in Red Data Book. Following this, Rawat (2009) highlighted the genus *Dipcadi* as a disappearing genus. Efforts have been made and *D. concanense* was rediscovered and assessed as Critically Endangered (Mishra and Singh, 2001). Another presumably extinct species i.e. *Dipcadi reidii* was recollected after 127 years from Uttrakhand, India (Rawat and Chandra, 2014). *Dipcadi erythraeum*is reported as a rare, endemic and threatened plant in India and its distribution is restricted to rocky and gravellysoils of north-west Rajasthan. In Gujarat, the species is threatened by habitat degradation and soil erosion (Joshi *et al*., 2012). Even during scanty rains, its perennating bulbs sprout and complete life cycle in gravelly- rocky areasin arid region like Jaisalmer district.

Most of the *Dipcadi* species are habitat specific and need special attention for *in situ* conservation in protected areas. Field studies during the course of study of *D.erythraeum* showed that soil and water conservation measures in its native habitats in gravelly rocky rangeland are one of the important measures for regeneration. The half moon terraces can be constructed in the areas which will facilitate in conservation of rain water and will help in regeneration of the bulbs and also in emergence of new seedlings. These structures will also assist the growth of its associated species i.e. low perennial grasses like *Ochthochloa compressa* (Forsk.) Hilu, *Dactyloctenium sindium* Boiss. and important arid range legumes *Indigofera cordifolia* Heyne ex Roth and *Tephrosia uniflora* Pers.

Further, regulation of grazing of the animals is also much needed during its growth and reproductive stage to avoid the damage of emerged seedlings and also developing the bulbs in natural state in the soil. For this, people participation is very much required and for that people awareness campaigns for such species is the need of the hour.

**Conclusion**

*In situ* conservation of *Dipcadi erythraeum* in its natural distribution (western Rajasthan) is the need of the hour for its survival in the climate change scenario. Further, its seedlings or bulbs can be planted in the suitable protected habitats for their multiplication in the natural state. People participation in its conservation is vital to regulate grazing during growth and reproductive period. Mass scale planting in the protected gravelly-rocky areas in the region will not only increase its population but also boosts the herbal sector by incurring the availability of the raw material required as a substitute for *Urginea indica* Kunth.

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