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A Review on an Endemic and Threatened Plant Species of Gujarat- *Helichrysum cutchicum*.

Aumshree Kalpesh Sorathia, Kalpesh Sorathia*, Dhruv Pandya, Archana Mankad, Himanshu Pandya.

Department of Botany, Bio-informatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad-380009, Gujarat, India.

*Associate professor, Botany dept., Tolani College of Arts and Science, Adipur-370205, Kachchh, Gujarat, India.

ABSTRACT:

Helichrysum cutchicum, Asteraceae is endemic and threatened species in Gujarat, in Indian plains and found in semi-arid to arid regions of Gujarat. In an arid ecosystem of Kachchh, Gujarat state and the north-western part of India, this species was surveyed. This paper gives information on Abundance, Habitat, Distribution, Threats and Strategies for Conservation of the plant. *Helichrysum cutchicum* showed a wider distribution in Kachchh in semi-arid and arid regions. The species were reported in 42 locations which are spread across seven talukas. Only four locations out of 42 were represented by more than 200 plants per hectare density, and only three represented the density of 65 to 75 plants per hectare density. *Helichrysum cutchicum* preferred grassland ecosystem interspersed dense grass patches, sandy or clayey soil, substratum of deep soil, these results were shown by habitat specific density. Conversion of grassland into agricultural drylands and overgrazing are the major threats. Ecological studies on seed viability, dispersion methods, intensive survey of the grassland and regeneration potential is prerequisite. Declaring a part of land as a Sanctuary, potential grasslands can be restored with high amount of *Helichrysum cutchicum* fand maintaining a good amount of plants in botanical gardens are the immediate solutions.

KEYWORDS: *Helichrysum cutchicum*, Endemic, Kachchh, Taxonomy, Distribution, Ecology.

INTRODUCTION:

Taxonomy:

C.B. Clarke (comp. Ind. III 1876) while working on the Asteraceae family, described ***Anaphalis cutchica,*** based on single specimen collected by Dr. Stoloozka (1862, 1868/flora Malesiana, 1950). Hooker expressed his doubts on the genus *Anaphalis* in Flora of British India 1881, as he noticed the difference of involucre of this taxon and other specimens of *Anaphalis* taxon. As there was a lack of materials, no final opinion could be given by him on this issue. Further analysis of the characters of *Anaphalis cutchica* like disposition, form, color, and texture of involucral bracts and others, indicated that the taxon is closely allied to some species of *Helichrysum*. So Rao and Deshpande renamed it *Helichrysum cutchicum.* It is endemic to Kachchh and the northern coast of Saurashtra. The plant is found in semi-arid region.

Helichrysum cutchicum is an endemic and endangered species that belongs to the Class-Dicotyledons, Subclass-Gamopetalae, and Family -Asteraceae (Compositae). The synonym is *Anaphalis cutchica* (Shah 1978, Bhole & Pathak 1988), the plant is often confused with *Anaphalis* sp. and *Gnaphalium* sp. as per Rao and Deshpande 1968. It is an erect or procumbent diffuse annual herb of about 40 cm in height. The stem is thinly clothed with grey-white cottony hairs. The roots are prominent and are about 10 -15cm long. The leaves are slender, sessile, oblanceolate or linear with white cottony tomentose beneath. Size can be variable, mostly influenced by habitat but with loose cottony hairs on the upper surface, spathulate or linear, bases narrow, adhering to stem, apex acute, mucronate, 1- nerved, 2-5cm long, and 1-10 cm broad. Involucre, multi-seriate bracts are covered with filamentous hairy structures on the surface, outer one is smaller, ovate, irregularly toothed at the tip, inner one is ovate-oblong, slightly longer than outer one, both inner and outer bracts are transparent glabrous inside, and with small, oval, white, cottony, hairy patch at the bottom on outer side. The peduncle is 2-15 cm long, rarely up to 25 cm, flower heads are white glistering heterogamous. Inflorescence here is terminal and rarely axillary, has multiple heads, very shortly branched at the tip, in cymose pattern with heads group in clusters. Rao and Deshpande found 2 types of flowers- Female/Ray florets and Bisexual/Disc florets flowers. Female flowers are found only on periphery, are papillate, fertile, few- usually

6-7, corolla is smaller, fragile, filiform, and minutely toothed. Style is uniform with 2 arms of stigma at the top. The ovary is finely hairy. Bisexual flowers are at the center only, are papillate, fertile, slightly more in number usually 8-10. Corolla is large, 5-toothed, and trumpet-shaped. There are 5 Stamens, syngenesious, anthers sagittate, lower part of lobe is slightly caudate. Style is slender, with 2 arms stigma at the top and slightly swollen at base. Ovary is finely hairy. The calyx as described by Jayesh is tubular, strongly 5-ribbed, winged between ribs and does not have glands on it (Bhole and Pathak 1988). Fruits are Achenes. Achenes or seeds are oblong, varicose, pappus is hairy, uniseriate and barbellate and connate at the base. Saponins are plenty in all the plant parts.

Phenology:

A remarkable variation was observed in the phonological pattern of the plant. *Helichrysum cutchicum* showed its vegetative phase in three different months- June, August, and November. Maybe mainly due to a one-time survey in each site where the plant was found. The species seems to have leaves throughout the year ideally. Rao (1981) mentioned that flowering occurs during August and November and fruiting occurs between September to December, but according to Bhole and Pathak (1988) flowering occurs from October onwards, also Shah (1978) have stated that flowering and fruiting occurs during August and September. During the present study, fruiting of species was from May till February while the flowering was observed after first shower in May till November (Joshi et al., 2013)

Habitat and Ecology:

The species is mostly confined to the semi-arid region of Gujarat state, particularly from Kachchh and northern coast of Saurashtra adjoining Kachchh, it is evident as per the appearances of the plants. It would be of considerable interest if the species is recorded further north and south of the present range of distribution along the arid zone of India and Pakistan (Kumari, 1876). The species is present in several major ecosystem types including forests (plain and hilly tracts), grassland, agricultural hedges and wastelands (Rana et al., 2020). *Helichrysum cutchicum* was earlier reported on the slopes of rocky hillocks (Nagar and Sastry 1988). The plant grows among the grasses on slopes of dry riverbeds and rocky hillocks (Kothari 1987). It also grows

in Saurashtra on sandy coast. The species was predominantly found at the sites with dense grasses usually with clayey or sandy soil and in grassland on flat areas with a gentle slope or no slope (Joshi et al., 2013); (Rana et al., 2020)

Distribution:

Rao and Deshpande in 1968 were first to describe *Helichrysum cutchicum* in the Kachchh district. The plant is confined only to the drier parts of Kachchh (Kumari, 1876), but according to Jain & Sastry 1980 and Kothari & Hajra 1983, the plant is also found on the northern coast of Saurashtra. Rao in 1981 stated *Helichrysum cutchicum* as "rare and endemic to Khachchh and Saurashtra". According to Nagar & Sastry 1987, this species is endemic to Gujarat and considered to be threatened. It is reported in Kachchh and Saurashtra (Kothari 1987), on the bank of river Khatrod, near Jandaria hill, Bhuj (J. Indraji-1918), in Mundra- Mandvi (Jain 1957, Joshi *et al* 2013), Dhinodhar hill (Jain 1958, Shah 1978, Bhatt 1993), Kala dungar (Jain 1960, Joshi *et al* 2013), near lake Bhorasar, Bhuj (Rao 1964), rocky hillocks at Bhuj and Dahisara village (Rao 1981), Kotda, Lakhpat, Mosuna, Nani Khakhar (Rao 2002), Nakhartana (Rao 2002, Bhatt 1993), Hamankundi and Narayan sarovar (Pande *et al* 2002), Tapkeshwari hills (Joshi *et al* 2012), Banni, Bharasar (Joshi *et al* 2013), Naliya and Nandibaugh Rakhal (Raole 1993), Beyt Dwarka & Beyt islands of northern cost of Saurashtra near Okha (Rao 1964, Bhole & Pathak 1988), Abhapar, Okhamandal, Laloi, Kota near Khambhaliya, Jamnagar, on slopes of Girnar hills in Junagadh district(Bhole & Pathak 1988), Ravapar(Rao 2002), slopes of Barda mountains (Shah 1987).

The plant was recorded at 40 different locations in Kachchh and 2 localities in Jamnagar and 1 location in Junagadh and Porbandar each. This species was recorded from one protected area (PA), three Reserved Forests (RF), and 36 natural habitats without any protection in Kachchh. In Jamnagar, all three sites where the species was documented were without any protection, while in Junagadh it was located at a site, which was outside the Protected Area (PA) or RF, and in one PA in Porbandar. Sabnis and Rao 1983 claimed the species as rare and endemic(P.N.Joshi *et al*, sahjeevan(Barik et al., 2018);(Rana et al., 2020)

Associated Species:

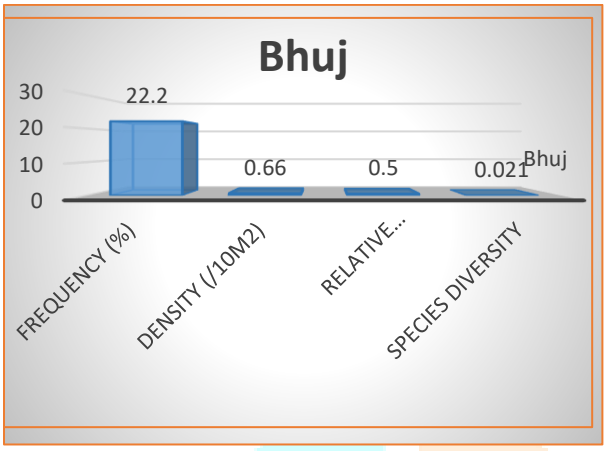
Total of thirty-six (more or less) species were found in association with *Helichrysum cutchicum*. The species mainly associated are *Cymbopogan jwarancusa* (38.46%), *Lepidagathis cristata* (19.98%), *Elucine compressa* (7.42%) and *Zizyphus nummularia* (6.43%), which together forms 72.29% of the total associated species. This can be considered as key to find the plant in the study area (Joshi et al., 2013).

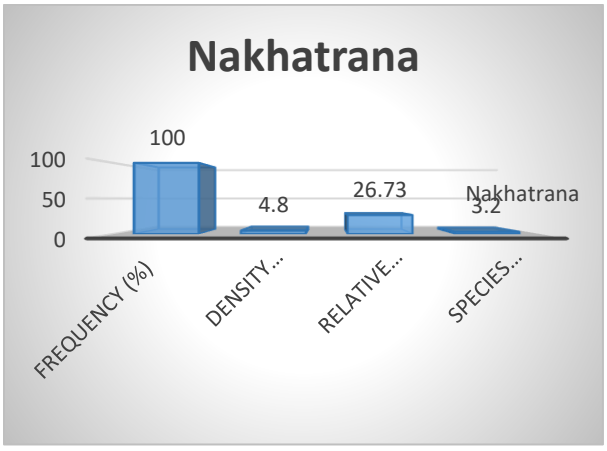
(Joshi et al., 2013), describes a survey of *Helichrysum cutchicum* from 2001 to 2002 which was done in various ecosystems including grassland, agro-ecosystem, forests, wastelands and plantations by using species center quadrate and belt transect methods. . Number of individuals of the study species, associated species and regeneration potential, along with habitat and environmental parameters were recorded in these plots (Hill *et al*., 2005).

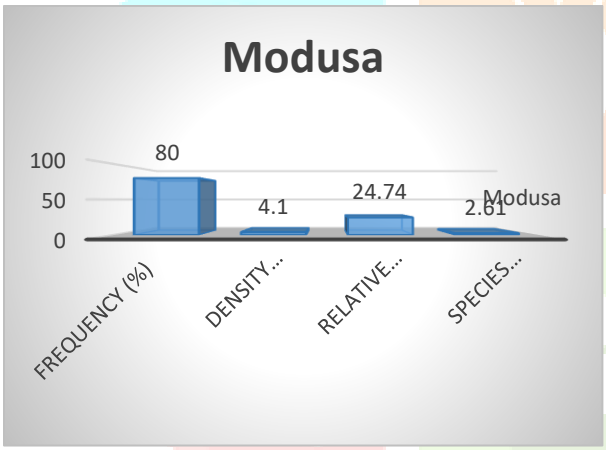
There were total of 6809 individual plants of *Helichrysum cutchicum* from four districts, from which Kachchh has the maximum population of 6587 plants, Jamnagar with 119 plants, Porbandar with 79 and lowest in Junagadh with 24 plants. Out of these 258 plants were found inside the protected areas. In all four districts the overall density recorded was 26.98/ha. Kachchh has the density of 31.94/ha, Jamnagar has 6.64/ha, Porbandar 4.18/ha, and Junagadh has 2.56/ha. Out of which only 10.15/ha area is in the protected areas. Therefore the Kachchh has the most suitable environmental conditions for the plant to flourish. (Barik *et al*., 2018)(Joshi et al., 2013)

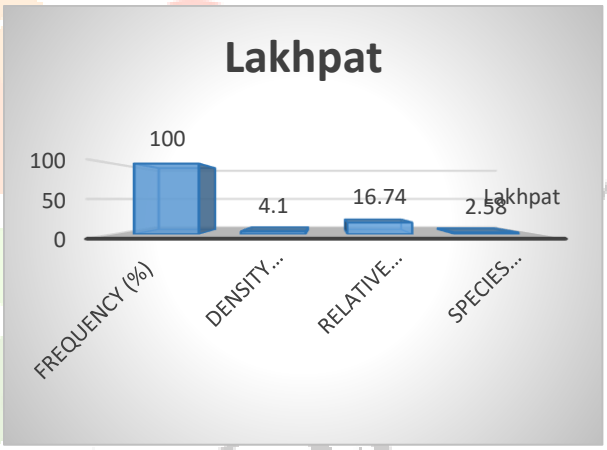
Rao in 2002 (List *et al*., n.d.) studied phytosociological characters like Frequency, Density, Relative abundance and Species diversity values of *Helichrysum cutchicum* at six localities of Kachchh district. The species diversity values are calculated using the Shannon Weaver density index (1949). (List *et al*., n.d.)

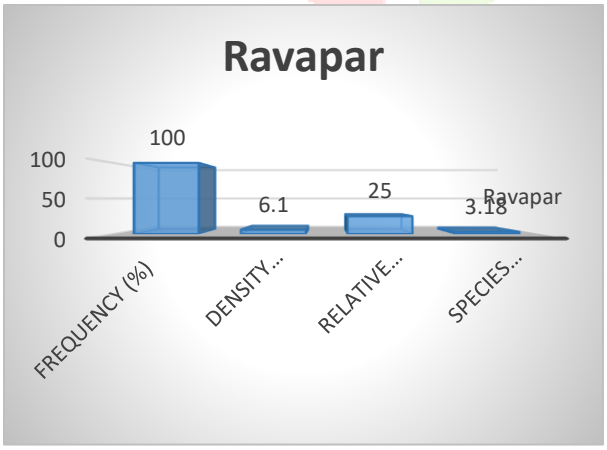
Graph 1: Rao in 2002, studied the phytosociological analysis which includes Frequency (%), Density (/10m^2), Relative Abundance and Species Diversity value of 6 Talukas of Kachchh district.(Rana et al., 2020)

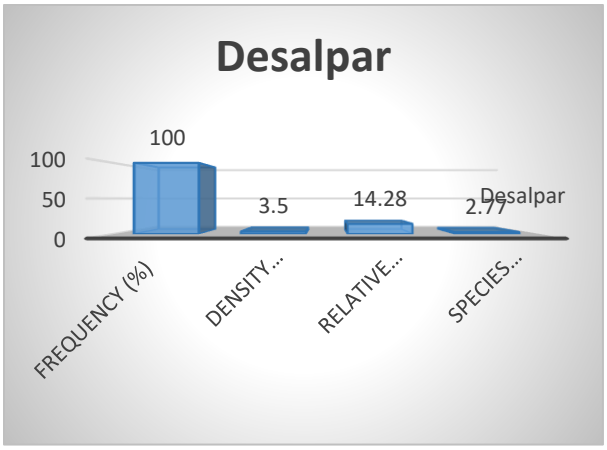








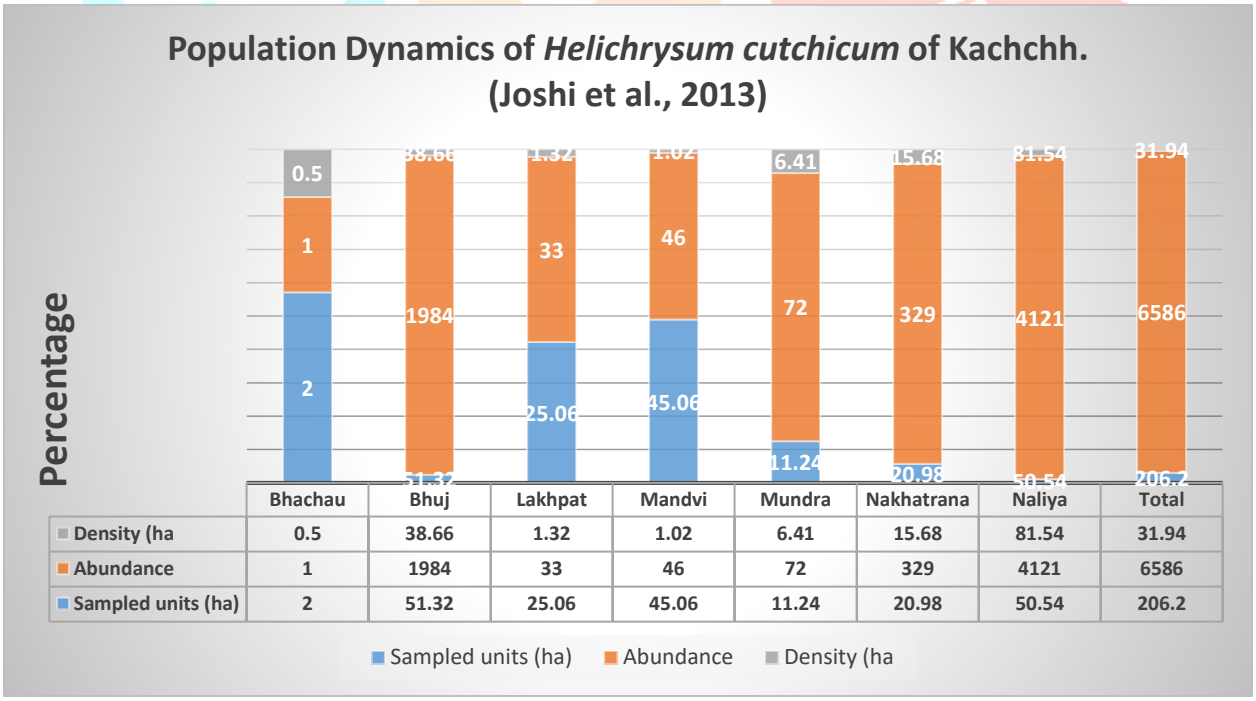




Abundance:

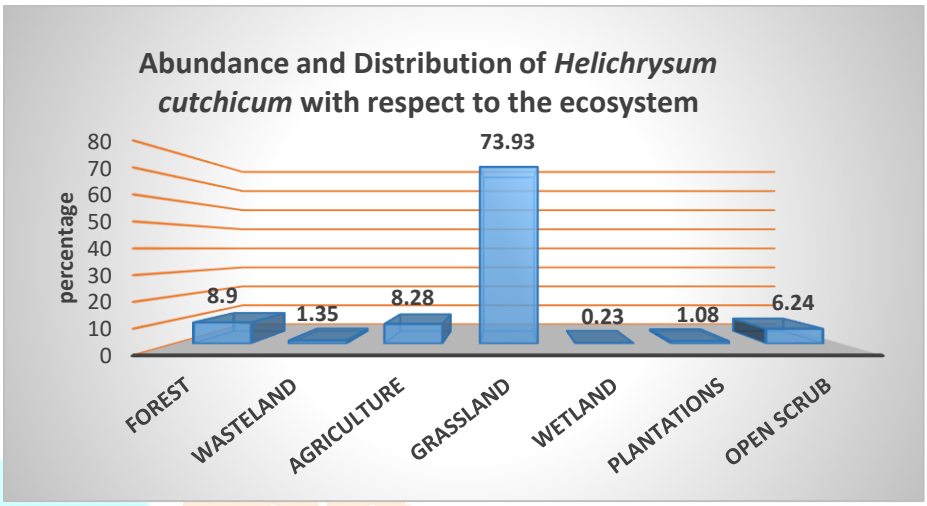
There were total 6809 individual plants of *Helichrysum cutchicum* from four districts, from which Kachchh has the maximum population of 6587 plants, Jamnagar with 119 plants, Porbandar with 79 and lowest in Junagadh with 24 plants. Out of these 258 plants were found inside the protected areas. In all four districts the overall density recorded was 26.98/ha. Kachchh has the density of 31.94/ha, Jamnagar has 6.64/ha, Porbandar 4.18/ha, and Junagadh has 2.56/ha. Out of which only 10.15/ha area is in the protected areas. Therefore the Kachchh has the most suitable environmental conditions for the plant to flourish. (Barik *et al*., 2018)(Joshi et al., 2013)

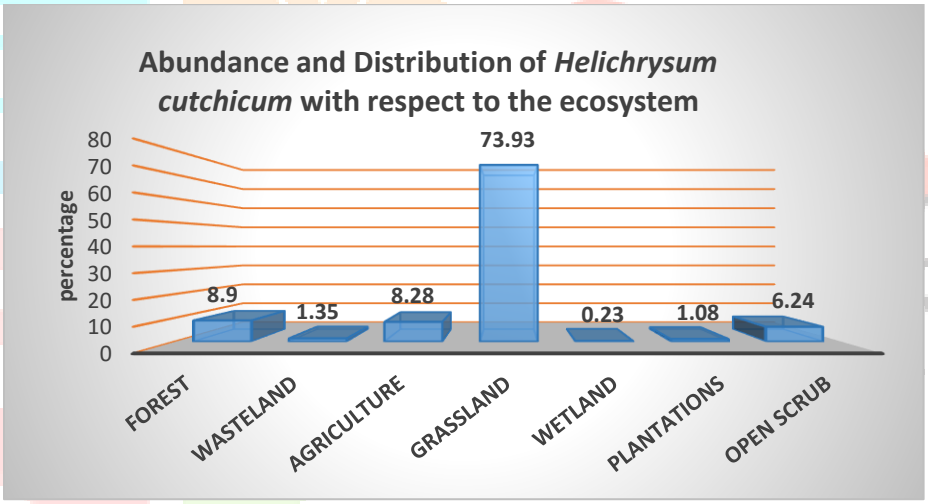
Graph 2- Population Dynamics of *Helichrysum cutchicum* of Kachchh. (Joshi et al., 2013)

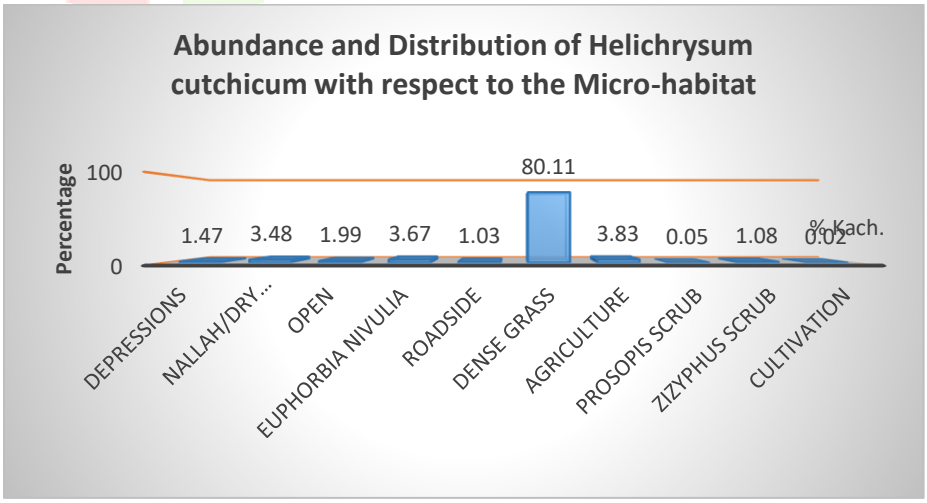


	Bhachau	Bhuj	Lakhpat	Mandvi	Mundra	Nakhatrana	Naliya	Total
Density (ha	0.5	38.66	1.32	1.02	6.41	15.68	81.54	31.94
Abundance	1	1984	33	46	72	329	4121	6586
Sampled units (ha)	2	51.32	25.06	45.06	11.24	20.98	50.54	206.2

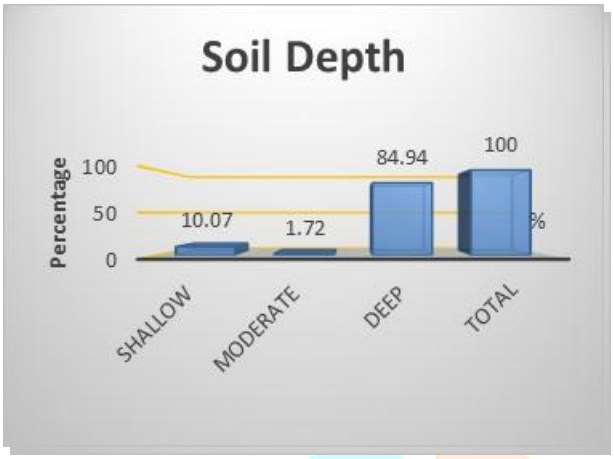
Graph 3- Abundance and Distribution of *Helichrysum cutchicum* in different Ecosystems and Habitats of Kachchh (Joshi et al., 2013).

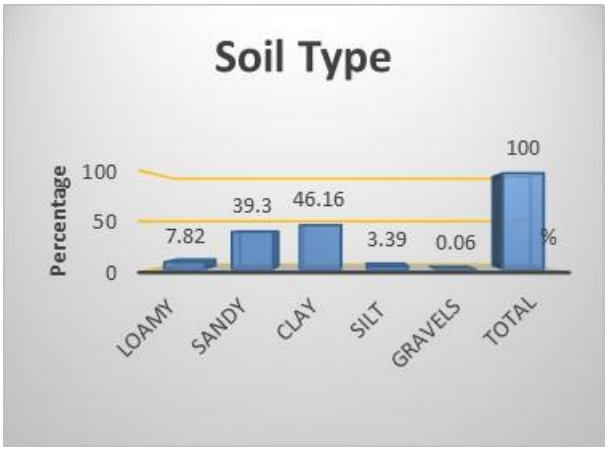


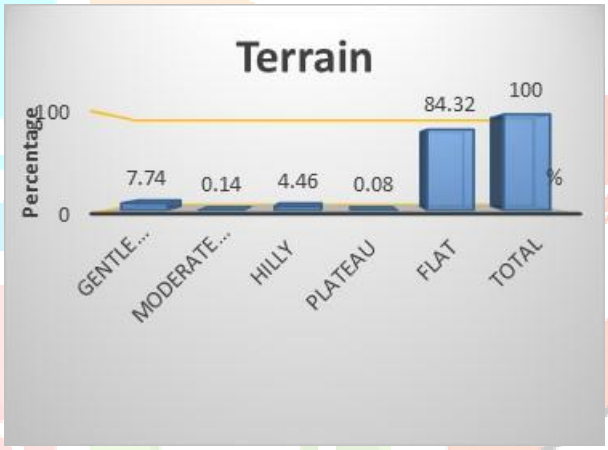




Graph 4 - Abundance and Distribution of *Helichrysum cutchicum* in Physical Environments in Kachchh (Joshi et al., 2013).







CURRENT SCENARIO:

As per the study, *Helichrysum cutchicum* can be categorized as Lower Risk (LR) and is conservation dependent (IUCN, 2002). The taxa which are not close to be qualified as vulnerable and do not have any counting taxon-specific or habitat-specific conservation program are classified as Least Concern (lc) taxa. Therefore the conservation status of *Helichrysum cutchicum* according to this can be denoted as LRcdlc (LR- lower risk, cd- conservation department, lc- least concern). No intense conservation measures were taken till date because no medicinal use of the species is reported.

CONCLUSION:

During the field work livestock was observed grazing on the plants, the gradient of threat is moderate by nomadic grazing, but considering the pressure on the pastures. Therefore, for the conservation of this threatened and endemic plant, rapid actions should be taken. Due to habitat disturbance, human interference and soil erosion the population of the plant is decreasing gradually (Rana et al., 2020)(Joshi et al., 2013). Below are some conservation techniques that can be considered or implemented by government.

1. Techniques that can be established for mass scale propagation and introduction of germplasm into botanical gardens are suggested measures for *ex-situ* conservation.
2. To ensure the safety from livestock grazing, Naliya grassland should be declared as a sanctuary, also it will be a natural seed and gene bank.
3. Grazing should be banned in particular areas during the fruiting and flowering seasons so that the natural regeneration process can be done.
4. Nagar and Sastri (1988) have suggested the *ex-situ* protection of the species in botanical experimental gardens.

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