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Survey of some rare, endangered and threatened (RET) plant species of district Rampur (U.P.) India

Sompal Singh*, Gulafshan, Farha Rehman, Saba Irshad
Department of Botany, Mohammad Ali Jauhar University, Rampur, Uttar Pradesh, India

Abstract
The present study deal with survey and identification of Rare, Endanger and Threatened (RET) plants species in six tehsil of district Rampur *viz*. Shahabad, Milak, Sadar, Bilaspur, Swar, and Tanda. In our survey we investigated total thirty nine (39) plant species among which 23 are rare, 13 are endangered and 03 species are threatened. All the thirty nine (39) plant species belong to twenty one (21) families were identified and documented in the list. Names of plants and RET category was gathered from IUCN annual reports and standard research articles and website of Botanical Survey of India Regional Centre Allahabad. Enumerated plants were categorized in rare, endangered, endemic and threatened, species such as *Asparagus racemosus Willd., Boerhavia diffusa L., Centella asiatica (L.) Urban, Jasminum sambac (L.) Aiton., Phragmites karka (Retz.) Trin. ex. Steud., Terminalia arjuna (Roxb.) Wight & Arn. and so on.* Finally it has been suggested that proper conservation and management of the RET plant species has to be needed before they will extinct.

Keywords: biodiversity, threatened plants, endangered plants, medicinal plants, conservation, survey, district Rampur

Introduction

Biodiversity or Biological diversity refers to the wide variety of ecosystems and living organisms i.e. plants, animals, their habitats and also their genes. Biodiversity is the foundation of life on the earth. In general biodiversity is a complex and balanced network of various species, which are mutually dependent on each other. Floral and faunal diversities are two major components of biodiversity which covers the variety and variability of different species. Biodiversity hotspots are areas that support natural ecosystems that are largely intact and where native species and communities associated with these ecosystems are well represented. They are also areas with a high diversity of locally endemic species, which species that are not found or are rarely found outside the hotspot. According to International Union for Conservation of nature (IUCN) Rare, Endanger and Threatened (RET) plants that are endemic to India has to be highlighted for their conservation. According to IUCN an endangered species is a population of organisms which is at risk of becoming extinct because it is either few in numbers. "Threatened species" is a related term, referring to a species likely to become endangered within the foreseeable future. (Bryde, 1979; Smith 1980; Nayar and Sastry, 1990) [2, 26, 20].

The Species Survival Commission of the IUCN published information about approximately 41,500 endangered species worldwide as the Red List of Threatened Species. In India the work on threatened plants was first published in 1980 by the Botanical survey of India (BSI). Jain and Sastry, (1980) [13] published a small booklet entitled "Threatened plants of India". Later a comprehensive work on rare, endangered and threatened plants of India was also published by BSI in the form of a book in three volumes entitled "Red Data Book of Indian Plants" (Nayar and Sastry, 1987, 1988, 1990) [18, 19, 20]. And also there are references in the website: http://www.iucnredlist.org or www.iucn.org IUCN's important and detailed overview of the status of the Indian flora, with special studies of a number of key-areas of biodiversity in India and adjacent Countries has been presented by Davis *et al.*, (1994, 1995 and 1995a) [5. 6, 7]; Sudip & Jeetendra (2014) [28] and Muthukumar (2017) [16].

The objective of present study is important to find out the exact number of Rare, Endanger and Threatened (RET) plant species in district Rampur and it is also important to determine the current status of threatened plants species. During the present study it was noted that anthropogenic activities are the main contributor in the unsustainable utilization of the plant natural resources growing in the area. (Sudip & Jeetendra 2014; Muthukumar, 2017) [28, 16]. The conservation and management of Rare, Endanger and Threatened (RET) plant species have become an important issue in the present study area (Rampur). Therefore, in line with studies regarding the conservation status, it is an attempt to study the documentation and conservation assessment of Rare, Endanger and Threatened (RET) plant species of the six tehsil of district Rampur.

The current trend toward increased commercialization of medicinal and aromatic plants containing large amount of secondary metabolites and essential oils of traditional and therapeutic importance has resulted in overharvesting, therefore, many of which have become threatened. (Sanjappa, 2005; Samydurai *et al.* 2012; Subbaiyan *et al.* 2014) [23, 22, 27]. Threatened medicinal plant species have become a hot topic of world attention. They represent vanishing flora which need protection and conservation because of their role as an essential commodity for health care (Gustafsson *et al.* 2002; Kala, 2002) [10, 14]. The present investigation was carried out to explore the distribution of rare, endangered and threatened (RET) category of plant species in Rampur district. These kinds of plants are in need of proper conservation and management for its medicinal importance before they lost forever. (Sudip & Jeetendra, 2014; Subbaiyan *et al.* 2014; Singh *et al.*2022) [28, 27].

Materials and Methods

The study area chosen for the present survey is district Rampur which is situated in division Moradabad of Uttar Pradesh State. It lies between 79°05' E and 28°48' N. The total area of the district is around 2367 Sq. Km., Map of district Rampur shown in Figure – 1. The height from sea level is about 192 m. It is known for its various industries, including sugar and cotton mills. There are all total six tehsils in the district namely *viz*. Rampur Sadar, Shahabad, Milak, Bilaspur, Swar and Tanda. District Udham Singh Nagar of Uttarakhand lies in North, district Bareilly in East, Moradabad in West and Badaun in South. Summer temperature is about 30 °C to 40 °C and Winters temperature from 23 °C to 5 °C. District lies in foothills of Himalaya so most of the flora is reliant on rainfall. Annual normal precipitation fluctuates between 850 to 900 mm (Singh *et al.* 2020) [24].

The survey was carried out during the month of January 2019 to December 2021, on visited various field data sach as distribution, number of individuals, habit and habitat of Rare, Endangered and Threatened (RET) plant species was recorded and documented. The plants are enumerated alphabetically with their total number and percentage (Gamble and Fischer, 1915-26; Matthew, 1983; Nair and Henry, 1983; Chandrabose and Nair, 1988) [9, 15, 17, 4] and threat status referred by C.A.M.P. report (1998); IUCN plant list (2015).

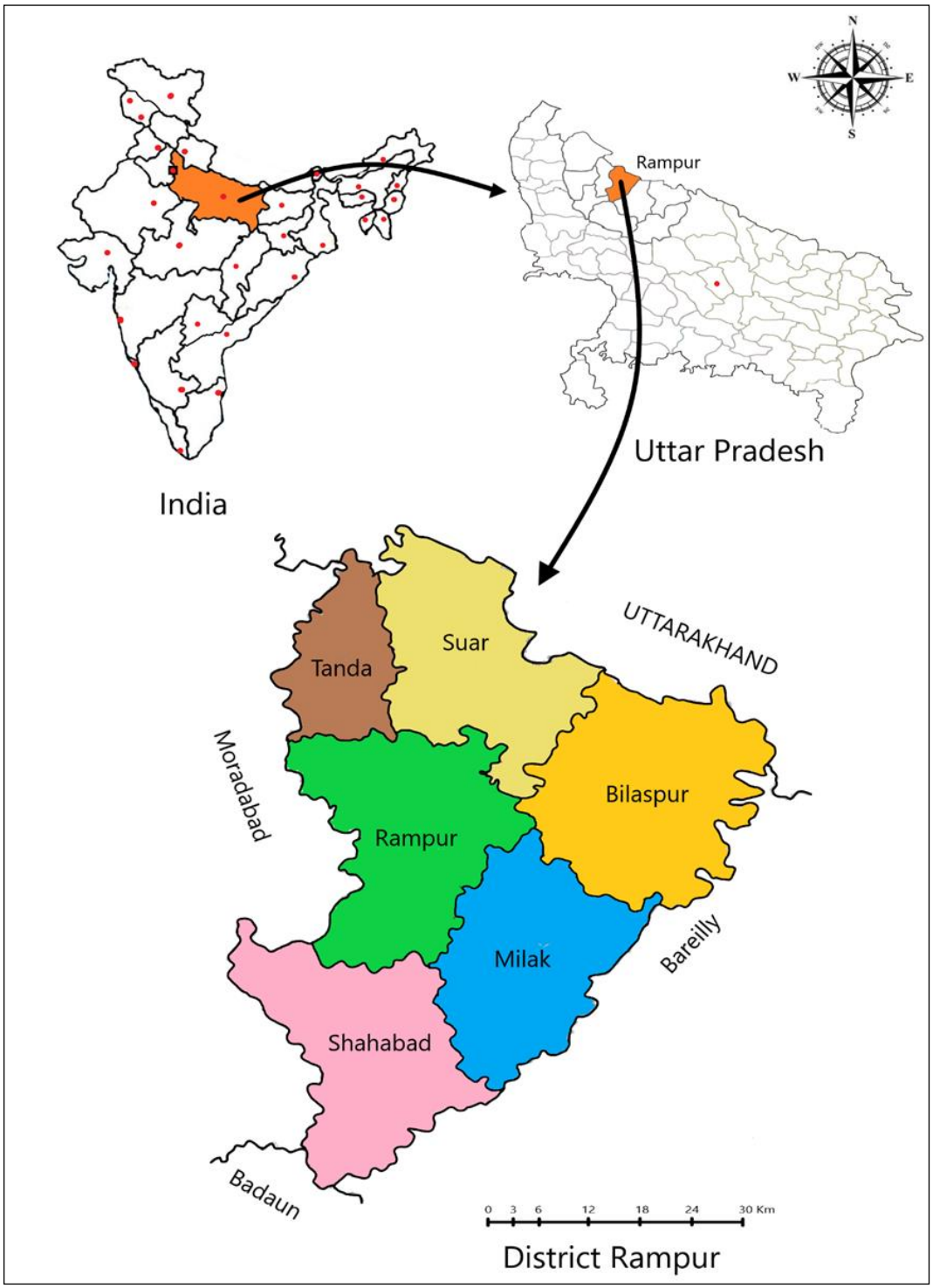

Fig 1: Map of study area (District Rampur)

The medicinal and other uses of rare, endangered and threatened (RET) plant, study area and general information about the field was collected from the local people of different tehsils of district Rampur before starting the survey of plants. Field survey location was chosen on the random basis. It was observed that RET plants are widely distribution in six tehsils of district Rampur (U.P). The collected plants were identified through consultation with the expert, local people, farmers and photographs of plants and sample specimen also with the help of available literatures and floras of concerned region, IUCN plant list. In the present survey the plant specimens were collected and processed by standard herbarium methods which were used by expert in earlier standard research (Bridson *et al*. (1992) [1], Duthie 1960 [8], Jain and Rao 1977 [12], Prajapati *et al*. 2006) [21]. All specimens were dried, preserved and deposited in the herbarium and submitted in department of Botany as a practical record in Mohammad Ali Jauhar University Rampur, Uttar Pradesh, India. Herbarium specimen preservation and process technique was followed by the method of Bridson *et al*. (1992) [1], Duthie (1960) [8], Jain and Rao (1977) [12], Prajapati *et al.* (2006) [21]. The survey also documented that, the Rare, Endangered and Threatened (RET) plant & its medicinal and ethnic uses with their botanical name, family, habit, local name and threat status.

Results and discussion

The present study deal with survey and identification of Rare, Endanger and Threatened (RET) plants species in six tehsil of district Rampur *viz*. Swar, Shahabad, Milak, Sadar, Bilaspur, and Tanda. By this survey it was found that thirty nine (39) Rare, Endangerd and Threatened (RET) species found in selected study area (Table - 1), which are llisted as Rare 23 species (58.97%), Endangered 13 species (33.34%) and Threatened 03 species (7.69%) in different tehsil of district Rampur (Table - 3, Figure - 3). From the results of present study it was recorded that, the thirty nine (39) plant species were identified and belong to Twenty One (21) families and documented in list which are shown in Table - 2. Among 39 plant 17 species (43.58%) were herbaceous (herb), 11 species (28.21%) were shrubs, 9 species (23.08%) were tree, and 2 species (5.13%) were climber recorded in the selected study area (Rampur district) Figure - 2.

From the present data it was also also recorded that, the maximum number of Rare, Endangered and Threatened (RET) plant species belong to the family Fabaceae 8 species (20.51%), followed by the Acanthaceae & Poaceae 4 species each (10.25% each), Malvaceae 3 species (7.70%), Apocynaceae, Asparagaceae, Brassicaceae 2 species each (5.12% each), Apiaceae, Cactaceae, Capparaceae, Colchicaceae, Combretaceae, Dioscoreaceae, Lamiaceae, Nyctaginaceae, Plumbaginaceae, Polygalaceae, Polygonaceae, Ranunculaceae, Rhamnaceae, Solanaceae 1 species each (2.56% each), (Table – 2).

Names of plants and RET category was gathered from IUCN annual reports and standard research articles and website of Botanical Survey of India Regional Centre Allahabad. Enumerated plants were categorized in rare, endangered, endemic and threatened, species such as *Asparagus racemosus* Willd., *Boerhavia diffusa* L., *Centella asiatica* (L.) Urban, *Terminalia arjuna* (Roxb.) Wight & Arn. *and so on.* Finally it has been suggested that the RET medicinal plants are need to be proper conservation and management before it lost forever.

Table 1: List of Rare, Endangered and Threatend (RET) plant species in district Rampur.

S. No.	Botanical Name	Family	Habit	Threat (RET) Status
1.	*Abutilon indicum* (L.) Sweet	Malvaceae	Herb	Rare
2.	*Acacia catechu* (L.f.) Willd.	Fabaceae	Tree	Endangered
3.	*Aeschynomene americana* L.	Fabaceae	Herb	Rare
4.	*Albizia lebbeck* (L.) Benth.	Fabaceae	Tree	Rare
5.	*Andrographis echinoids* (L.) Nees	Acanthaceae	Herb	Rare
6.	*Andrographis paniculata* (Burm.f.) Nees	Acanthaceae	Herb	Endangered
7.	*Asparagus fysonii* J.F. Macbr.	Asparagaceae	Shrub	Rare
8.	*Aspargus racemosus* Willd.	Asparagaceae	Shrub	Threatened
9.	*Atylosia cajanifolius* (Haines) Maesen	Fabaceae	Shrub	Rare
10.	*Bambusa arundinacea* Willd.	Poaceae	Herb	Rare
11.	*Barleria acuminate* L.	Acanthaceae	Herb	Endangered
12.	*Barleria buxifolia* L.	Acanthaceae	Herb	Endangered
13.	*Boerhavia diffusa* (L). nom.cons.	Nyctaginaceae	Shrub	Rare
14.	*Centella asiatica* (L.) Urban	Apiaceae	Herb	Endangered
15.	*Cereus hexagonous* (L.) Mill.	Cactaceae	Shrub	Rare
16.	*Clematis gouriana Roxb.* Ex DC.	Ranunculaceae	Herb	Rare
17.	*Crateva magna* (Lour.) DC.	Capparaceae	Tree	Rare
18.	*Dendrocalamus strictus* (Roxb.) Nees.	Poaceae	Sheub	Rare
19.	*Desmodium triquetrum* (L.) DC.	Fabaceae	Shrub	Rare
20.	*Dioscorea bulbifera* L.	Dioscoreaceae	Climber	Endangered
21.	*Erythrina variegate* L.	Fabaceae	Tree	Endangered
22.	*Gloriosa superba* L.	Colchicaceae	Climber	Endangered
23.	*Grewia elastic* Royle.	Malvaceae	Tree	Rare
24.	*Helicteres isora* L.	Malvaceae	Tree	Rare
25.	*Hemidesmus indicus* (L.) R. Br.	Apocynaceae	Herb	Threatened
26.	*Indigofera uniflora* Buch	Fabaceae	Herb	Endangerd
27.	*Leersia hexandra* Sw.	Poaceae	Herb	Rare
28.	*Ocimum gratissimum* L.	Lamiaceae	Shrub	Rare
29.	*Plumbago zeylanica* L.	Plumbaginaceae	Herb	Endangerd

30.	*Polygala irregularis* Boiss.	Polygalaceae	Herb	Rare
31.	*Rauvolfia serpentina* (L.) Benth. Ex Kurz	Apocynaceae	Shrub	Rare
32.	*Rorippa dubia* (Pers.) H. Hara	Brassicaceae	Herb	Rare
33.	*Rorippa indica* (L.) Hiern.	Brassicaceae	Herb	Rare
34.	*Rumex dentatus* L.	Polygonaceae	Herb	Rare
35.	*Saraca asoca* (Roxb.) Willd.	Fabaceae	Tree	Endangered
36.	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretaceae	Tree	Threatened
37.	*Thysanolaena maxima* (Roxb.) Kuntze	Poaceae	Shrub	Rare
38.	*Withania somnifera* (L.) Dunal	Solanaceae	Shrub	Endangered
39.	*Ziziphus rugosa* Lam.	Rhamnaceae	Tree	Rare

Table 2: Numbers and Percentage of Rare, Endangered and Threatend (RET) plant species according to Family in district Rampur.

S. No.	Family Name	(RET) Plants Number	Percentage (%) of (RET) Plants
1.	Acanthaceae	4	10.25 %
2.	Apiaceae	1	2.56 %
3.	Apocynaceae	2	5.12 %
4.	Asparagaceae	2	5.12 %
5.	Brassicaceae	2	5.12 %
6.	Cactaceae	1	2.56 %
7.	Capparaceae	1	2.56 %
8.	Colchicaceae	1	2.56 %
9.	Combretaceae	1	2.56 %
10.	Dioscoreaceae	1	2.56 %
11.	Fabaceae	8	20.51 %
12.	Lamiaceae	1	2.56 %
13.	Malvaceae	3	7.70 %
14.	Nyctaginaceae	1	2.56 %
15.	Plumbaginaceae	1	2.56 %
16.	Poaceae	4	10.25 %
17.	Polygalaceae	1	2.56 %
18.	Polygonaceae	1	2.56 %
19.	Ranunculaceae	1	2.56 %
20.	Rhamnaceae	1	2.56 %
21.	Solanaceae	1	2.56 %
	Total =	39	100.00 %

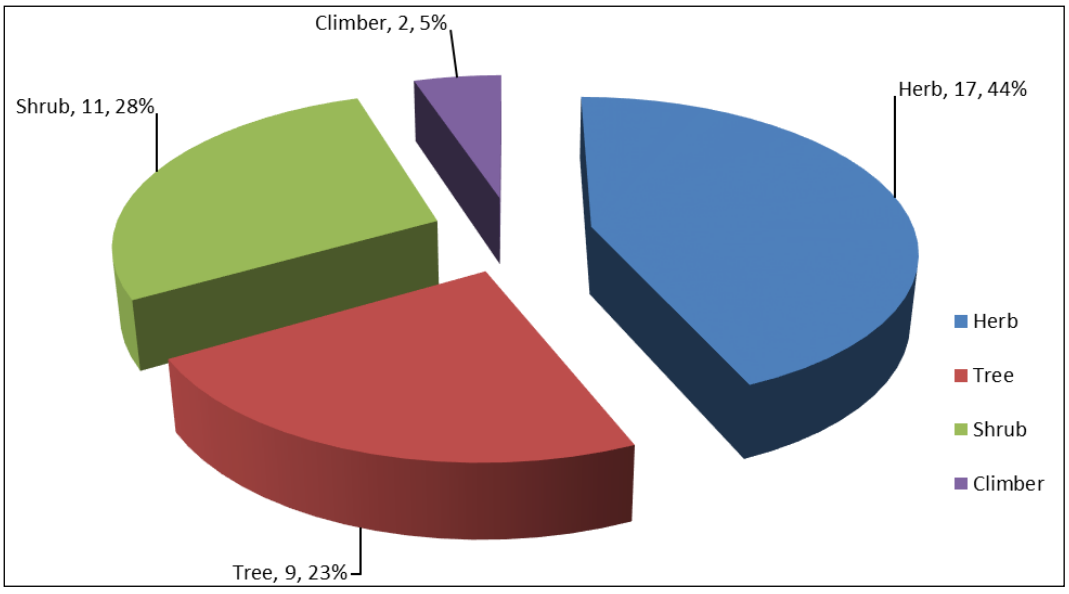

Fig 2: Habit wise analysis of Rare, Endangered and Threatend (RET) plant species of district Rampur (U.P.)

Table 3: Number and Percentage of Rare, Endangered and Threatend (RET) plant Species of district Rampur.

S. No.	Threat Status	Number of Species	Percentage of Species (%)
01.	Rare	23	58.97 %
02.	Endangered	13	33.34 %
03.	Threatened	03	7.69 %
	Total =	39	100.00 %

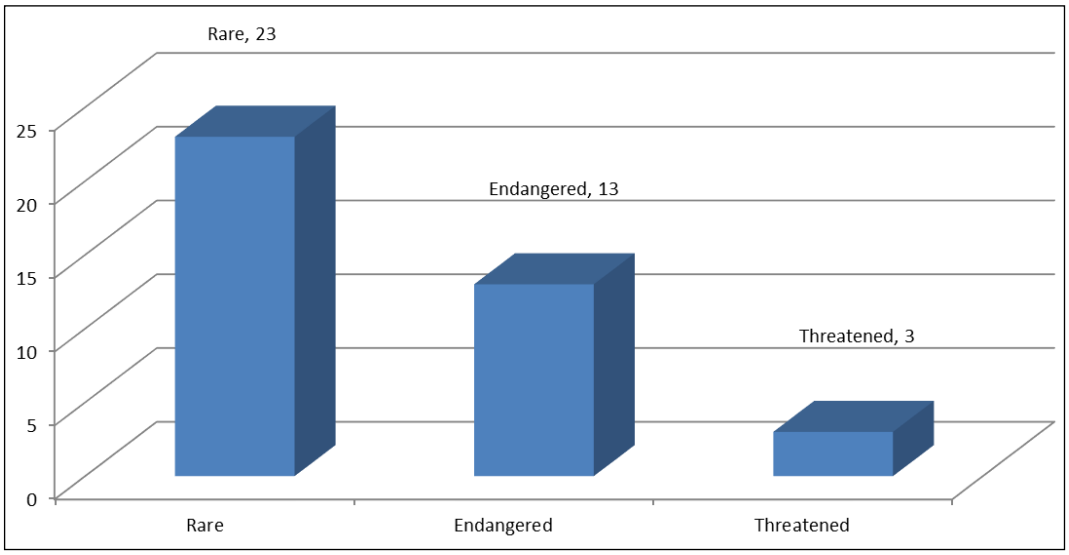

Fig 3: Numbers of Rare, Endangered and Threatend (RET) Plant species in district Rampur. (Representing Threat Status)

Conclusion

The present study documented the RET plant species, which are of highly important to tribal communities and herbal drug industries. Over exploitation of these species may cause the harmful effect to biodiversity as well as economic growth of the country. By conducting the awareness program about these species we can promote the knowledge and importance of biodiversity to conserve the RET plants. Above study will also help to develop the herbal gardens and proper cultivation of important RET plants like, *Decalepis hamiltonii*, *Gymnema sylvestre*, *Gloriosa superba* and *Hemidesmus indicus* to provide livelihood.

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