



## Documentation of some endangered medicinal plants growing in Indravati National Park, Bijapur district, Chhattisgarh, India

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**Abstract:** Indravati National Park, located in the Bijapur district of Chhattisgarh, India, is a biodiversity hotspot and a sanctuary for numerous plant species, including several recognized as endangered and possessing medicinal properties. This study aimed to document and provided valuable information on the endangered medicinal plants found within the Park. The research involved field surveys, interviews with local communities, and a comprehensive review of existing literature to compile data on these plants. The national park region is densely covered with green vegetation consisting of several important medicinal plants and some threatened and endangered plants of ethnomedicinal value. A total of 21 medicinal plants belonging to 16 families were reported during the study, categorized under rare, threatened and endangered categories with efficient ethnomedicinal applications. The maximum reported medicinal plant families were Bignoniaceae and Fabaceae (3 species report), Buseraceae (2 species report) followed by Apocynaceae, Araceae, Boraginaceae, Capparaceae, Lamiaceae, Lauraceae, Longaniaceae, Meliaceae, Piperaceae, Putranjivaceae, Rutaceae, Sterculaceae, Zingiberaceae with one species reported. The plants' parts used for the preparation of herbal medication included leaves, roots, bark, flowers, fruits, seeds, corms, whole plant, gum and resin derived from the plants, which were further used for the preparation of fresh extracts, juice, decoction, infusion, grounded paste, and dried powder. The documentation presented in this study not only contributes to the preservation of traditional knowledge but also serves as a valuable resource for researchers, policymakers, and conservationists working towards the protection of endangered medicinal plants in Indravati National Park, ensuring their availability for future generations and the advancement of herbal medicine and biodiversity conservation.

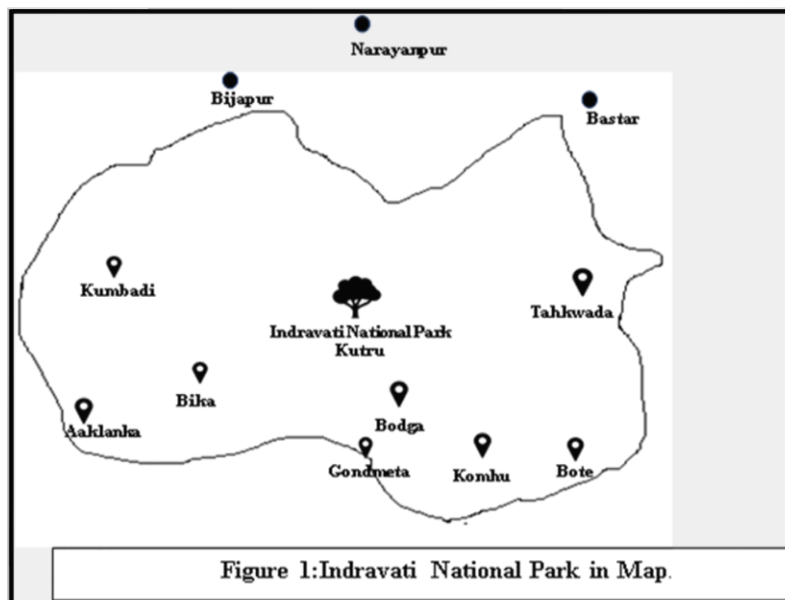
### Introduction

Indravati National Park, located in the Indian state of Chhattisgarh, is known for its rich biodiversity, including various medicinal plants. The Park is rich in medicinal plant diversity due to its unique geographical and climatic conditions. The tribal population of Chhattisgarh greatly relies on the medicinal plant diversity of the area to fulfil their primary healthcare needs. Indravati National Park, located in the Indian state of Chhattisgarh, is known for its rich biodiversity, including various medicinal plants. The Park's unique geographical and climatic conditions contribute to this diversity. The state of Chhattisgarh is

home to several tribes, including Gond, Baiga, Korba, Sahariya, etc. These indigenous populations have vast knowledge of the locally available medicinal plants and their mode of administration. This knowledge is passed through generations in the tribal communities and needs to be documented for the development of novel drugs.

Traditional indigenous knowledge and use of herbal preparations for curing general and severe illnesses has been passed on to the younger generation by the older people and has been continued for centuries with some variations in every generation (Laldingliani et al., 2022; Kumar et al., 2021). As plants are an integral part of our





**Figure 1. Indravati National Park in map**

lives and a vital source of therapeutic drugs, traditional medicinal practices have been performed for ages without any known side effects, with easy availability and low cost (Campos and Albuquerque, 2021; Gogoi and Nath, 2021; Sarkar et al., 2021; Sarkar et al., 2022; Ghosh et al., 2022; Acharya et al., 2022; Sarkar et al., 2023). India has been known throughout the world for its traditional medicinal heritage in the form of Ayurveda, Siddha and Unnani, which are considered the most ancient and traditional medicinal systems practised for centuries (Sharma and Thokchom, 2014; Singh, 2017; Mohanraj et al., 2018).

In India, there are almost 427 tribal communities residing that solely depend on plants for their socio-economic and health requirements (Kar et al., 2022; Laldingliani et al., 2022; Gowthami et al., 2021; Shriwas et al., 2023; Bee et al., 2023; Rami et al., 2023). Several reports have suggested that the indigenous people have highly utilized several important medicinal plant species and are also harvested for commercial use by pharmaceutical companies, which has led to a severe threat to their existence (Campos and Albuquerque, 2021; Erfani, 2021; Choudhary et al., 2023; Sur et al., 2023; Biswas et al., 2023; Roy et al., 2023). Solid steps should be taken to conserve threatened and endangered medicinal flora to protect the rich floral diversity of the country (Tirkey et al., 2014; Kumar et al., 2021).

## Materials and Methods

### Area of Study

The Indravati National Park is situated in the Bijapur district of Chhattisgarh state and covers an approximate area of 2799.08 km<sup>2</sup>. It is also known as Kutru National, with the river Indravati flowing at the northern boundary

of the Park. It is also a wildlife sanctuary and tiger reserve (Figure 1). The Park's forest area is majorly tropical, moist, and dry deciduous forests with sal, teak and bamboo trees dominating the area. The Park is home to several medicinally important plant species that the local inhabitants utilize to fulfil their primary healthcare needs.

### Ethnomedicinal data collection

For data collection regarding the ethno-medicinal plants, frequent field surveys were performed during the study period of June 2020-July 2021. Semi-structured interviews were conducted with the local informants after explaining the study's aim. The informants were selected based on age, knowledge of the local area and the floral diversity, experience of using locally available medicinal plants, local Vaidya and guniya were selected for the study. The selected local informants were asked questions regarding their traditional knowledge of medicinal plants, the local names of plants, diseases cured, plant parts used, and mode of administration. The plant specimens were also collected during the study with the help of informants for herbarium preparation. Pictorial records of the medicinal plants were also collected. The collected plant samples were further categorized into threatened, endangered, rare, vulnerable and least concern categories.

## Results and Discussion

A total of 21 medicinal plant species belonging to 20 genera and 16 families were recorded during the study and catalogued in Table 1. The present study was performed at various sites in the national park area with the help of the local informants and the forest dwellers.

Table 1. List of medicinal plants

Sl. No.	Botanical name	Family	Status	Plant Part used	Mode of administration
1.	<i>Gymnema sylvestre</i>	Apocynaceae	Threatened	Leaves	Extract, decoction, paste
2.	<i>Typhonium venosum</i>	Araceae	Least concern	Corm	Juice, powder
3.	<i>Radermachera xylocarpa</i>	Bignoniaceae	Vulnerable	Seeds	Infusion, paste
4.	<i>Stereospermum chelonoides</i>	Bignoniaceae	Least concern	Flowers	Extract, decoction, grounded paste
5.	<i>Oroxylum indicum</i>	Bignoniaceae	Highly threatened	Fruits	Decoction, paste, direct intake of tender fruits
6.	<i>Cordia macleodi</i> Hook	Boraginaceae	Critically endangered	Leaves	Infusion, decoction, extract
7.	<i>Boswellia serrata</i>	Burseraceae	Not Extinct	Whole plant	Extract
8.	<i>Commiphora wightii</i>	Burseraceae	Endangered	Resin	Boiled
9.	<i>Crateva religiosa</i> G. Forst.	Capparaceae	Least concern	Leaves	Extract, decoction
10.	<i>Entada gigas</i>	Fabaceae	Not Extinct	Leaves	Paste, extract, decoction
11.	<i>Butea monosperma</i> var. <i>Lutea</i>	Fabaceae	Rare	Root	Decoction, juice, extract
12.	<i>Butea monosperma</i>	Fabaceae	Threatened	Roots	Juice, powder, paste
13.	<i>Clerodendron serratum</i>	Lamiaceae	Threatened	Leaves	Extract, infusion
14.	<i>Litsea glutinosa</i>	Lauraceae	Endangered	Bark	Paste, extract, decoction
15.	<i>Plumbago indica</i>	Longaniaceae	Not Extinct	Whole plant	Extract
16.	<i>Soyimida febrifuga</i>	Meliaceae	Rare	Bark	Decoction
17.	<i>Peepar longa</i>	Piperaceae	Not extinct	Fruit	Decoction, infusion and grounded paste
18.	<i>Putranjiva roxburghii</i>	Putranjivaceae	Least concern	Leaves	Decoction, direct intake of nuts
19.	<i>Naringi crenulate</i>	Rutaceae	Not evaluated	Roots	Paste, extract, decoction
20.	<i>Sterculia urens</i> Roxb.	Sterculiaceae	Endangered	Gum	Extract
21.	<i>Curcuma longa</i>	Zingiberaceae	Endangered	Rhizome	Fresh paste, extract

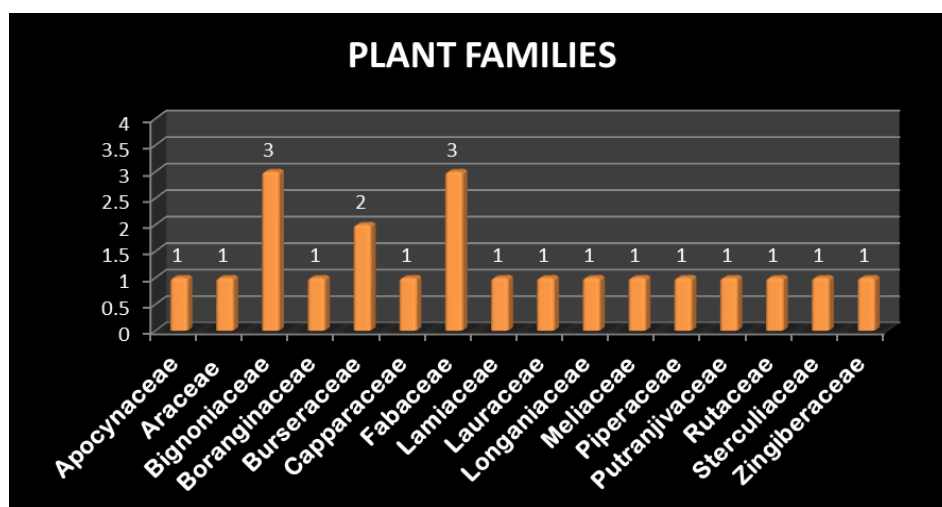


Figure 2. Various Plant families of Ethno-botanical importance

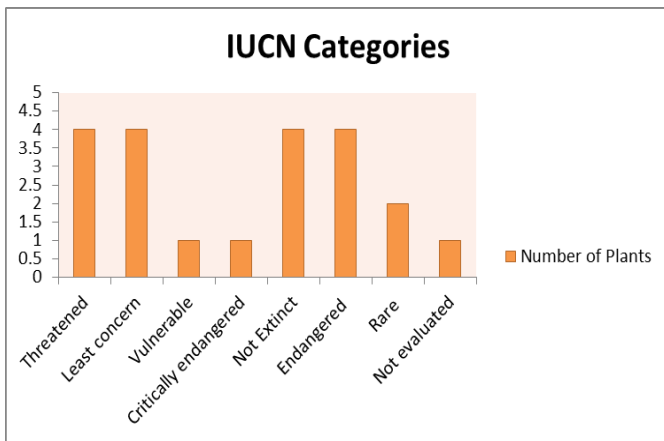


Figure 3. IUCN Categories of various plant species.

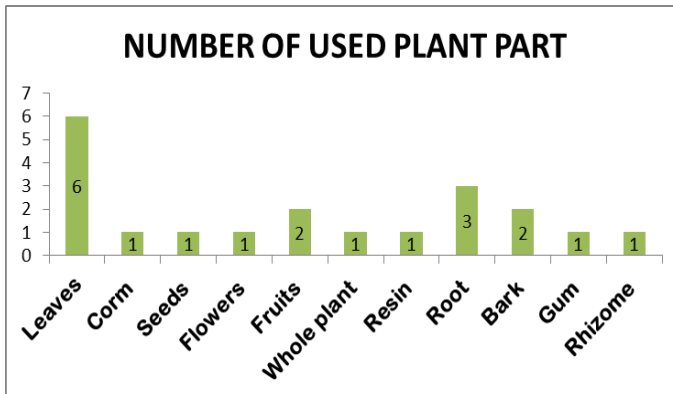


Figure 4. Number of plants and their used parts.

The most encountered plant families observed during the study were Fabaceae (3 species) and Bignoniaceae (3 species), followed by Burseraceae (2 species). In contrast, the rest of the plant families, including Apocynaceae, Araceae, Boraginaceae, Capparaceae, Lamiaceae, Lauraceae, Longaniaceae, Meliaceae, Piperaceae, Putranjivaceae, Rutaceae, Sterculaceae and Zingiberaceae represented single plant species (Figure 2). In the present investigation, there are four plant species named as *Commiphora wightii*, *Litsea glutinosa*, *Sterculia urens* Roxb., *Curcuma longa* is considered as Endangered, whereas *Cordia macleodi* Hook is considered as critically endangered as indicated by IUCN categories (Figure 3). In the present investigation conducted in Indravati National Park, Bijapur district, Chhattisgarh, it has been observed that leaves of certain plant species are used in maximum amounts (6 in number) for medicinal purposes (Figure 4). This finding aligns with a common practice in traditional herbal medicine, where leaves of various plants are often used for their therapeutic properties due to their accessibility and the presence of active compounds. The descriptions and images of the collected plant species (Figure 5) are listed below:

a) Botanical name: *Gymnema sylvestre*

Common name: Gurmar; meshashringi

Family: Apocynaceae

Status: Threatened

Medicinal uses: The extract of the leaves is given for stomach problems and liver diseases; leaves are crushed and rubbed on body parts to cure infections; decoction of leaves is given for diabetes; extract of leaves is also used to cure conjunctivitis and other eye infections.

b) Botanical name: *Typhonium venosum*

Common name: Bhasmakand

Family: Araceae

Status: Least concern

Medicinal uses: Fresh corm juice is applied for scorpion bites; corm powder is mixed with honey and ghee and applied for tuberculosis and bleeding piles.

c) Botanical name: *Stereospermum chelonoides*

Common name: Ashtkapadi

Family: Bignoniaceae

Status: Least Concern

Medicinal uses: Flowers are crushed and mixed with honey and used for cough. Decoction of roots is given in fever; leaves extract is used for curing vomiting, piles, diarrhoea and acidity.

d) Botanical name: *Oroxylum indicum*

Common name: Dashmul; Sonapatha

Family: Bignoniaceae

Status: Highly Threatened

Medicinal uses: Decoction of root bark is used as a tonic and in diarrhoea. Bark of the stem is used in rheumatism; the roots, also known as "dashmul", are used as an anti-inflammatory; anti-anorexic agent and given to women post-childbirth; tender fruits are given for stomach problems.

e) Botanical name: *Radermachera xylocarpa*

Common name: Garudphal

Family: Bignoniaceae

Status: Vulnerable

Medicinal uses: Infusion of the inner bark is used for a snake bite; Paste of seeds is given orally for snake bite.

f) Botanical name: *Cordia macleodi* Hook

Common name: Dahiman

Family: Boraginaceae

Status: critically endangered

Medicinal uses: Infusion of leaf and bark is given for wound healing; decoction of bark is used for jaundice; leaf extract is applied for mouth ulcers.

g) Botanical name: *Commiphora wightii*

Common name: Gugul

Family: Burseraceae

Status: critically endangered



(a) *Gymnema sylvestre*



(b) *Typhonium venosum*



(c) *S. chelonoides*



(d) *Oroxylum indicum*



(e) *Radermachera xylocarpa*



(f) *Cordia macleodi*



(g) *Commiphora wightii*



(h) *Boswellia serrata*



(i) *Crateva religiosa*



(j) *Butea monosperma*



(k) *B. monosperma* var. *Lute*



(l) *Entada gigas*

(m) *Clerodendron serratum*(n) *Litsea glutinosa*(o) *Plumbago indica*(p) *Soyimida febrifuga*(q) *Peepar longa*(r) *Putranjiva roxburghii*(s) *Naringi crenulate*(t) *Sterculi aurens Roxb*(u) *Curcuma longa***Figure 5(a-u). Images of different collected plant species**

Medicinal uses: Resin is mixed with castor oil and given for obesity; guggul is boiled with water for rheumatoid pain and heart problems.

h) Botanical name: *Boswellia serrata*

Common name: Salaiguggul; Kundur

Family: Burseraceae

Status: Not Extinct

Medicinal uses: Plant extract is used as an effective pain killer; gum derived from tree bark is used for rheumatic pain.

i) Botanical Name: *Crateva religiosa* G. Forst.

Common name: Spider tree, Dalur

Family: Capparaceae

Status: Least Concern

Medicinal uses: Paste of crushed leaves is applied for aches and pain; Leaves are pickled and used for digestive problems; similarly, pickled flowers are used for stomach aches; Decoction of roots is used for curing diabetes and kidney stones.

j) Botanical name: *Butea monosperma*

Common name: Chichra, SafeedPalash

Family: Fabaceae

Status: Threatened

Medicinal uses: Juice of flowers is used to cure eye infection; Fine powder of seeds is given to children for intestinal worms; powdered roots are used as an antidote for snakebite; paste of stem bark is applied to cure any injury.

k) Botanical name: *Butea monosperma* var. *Lutea*

Common name: Yellow Flame of forest, pilapalash

Family: Fabaceae

Status: Rare

Medicinal uses: Decoction of bark is given to women during childbirth; juice of root bark is used as a contraceptive; extract of stem bark is taken orally for jaundice.

l) Botanical name: *Entada gigas*

Common name: Monkey ladder

Family: Fabaceae

Status: Not Extinct

Medicinal uses: Grounded paste of seeds is used for snake bites and digestion problems; extract of leaves is used to cure infections; decoction of stem bark is given for diabetes.

m) Botanical name: *Clerodendron serratum*

Common name: Bharangi

Family: Lamiaceae

Status: Threatened

Medicinal uses: Boiled leaves are used for eye infections; extract of leaves is given internally for fever; seeds boiled in buttermilk are used for curing dropsy.

n) Botanical name: *Litsea glutinosa*

Common name: Maida chhal

Family: Lauraceae

Status: Endangered

Medicinal uses: Powdered stem bark is used for wound healing and as a plastering material in fractures; extract of leaves is used in diarrhoea and dysentery; paste of roots is used in sprains and joint pain.

o) Botanical name: *Plumbago indica*

Common name: White chitrak

Family: Longaniaceae

Status: Not Extinct

Medicinal uses: Root extract is given for rheumatoid arthritis and kidney problems; extract of plant promotes wound healing; decoction of roots reduces the blood cholesterol level.

p) Botanical name: *Soyimida febrifuga*

Common name: raktarohan; Indian redwood

Family: Meliaceae

Status: Rare

Medicinal uses: Decoction of bark is used in diarrhoea and dysentery; it is also used in gargles and for vaginal infections; Decoction of the stem is used for bronchitis.

q) Botanical name: *Peepar longa*

Common name: Pippali

Family: Piperaceae

Status: Not Extinct

Medicinal uses: grounded paste of fruit is applied for muscular pain and muscle inflammation; fruit decoction

is used for digestive problems; infusion of roots is used in diabetes.

r) Botanical name: *Putranjiva roxburghii*

Common name: Putranjiva

Family: Putranjivaceae

Status: Least concern

Medicinal uses: Decoction of leaves and fruit is given in fever; decoction of seeds is used for ophthalmic problems, mouth and stomach problems; nuts of the plants are consumed to influence the birth of a male child.

s) Botanical name: *Naringi crenulata*

Common name: Mahavilvam

Family: Rutaceae

Status: Not Evaluated

Medicinal uses: Paste of roots is used in rheumatism; decoction of roots is prepared and applied on boils; Leaves soaked in buttermilk are used as a cure for ulcers; paste prepared from root bark is applied for pain.

t) Botanical name: *Sterculia urens* Roxb.

Common name: Kullu; karaya gum

Family: Sterculiaceae

Status: Endangered

Medicinal uses: gum of the plant is used for blisters and dysentery; extract of gum is used for leukoderma, throat infection and joint pain; a small amount of gum is given internally and applied externally for snakebite.

u) Botanical name: *Curcuma longa*

Common name: Kali haldi

Family: Zingiberaceae

Status: Endangered

Medicinal uses: Fresh paste of rhizome is applied for snakebite; paste of rhizome is applied on wound and rheumatic pain; extract of rhizome is used for stomach ache and typhoid.

The reports obtained during the present study agree with previous studies conducted in different parts of Chhattisgarh (Khanna et al., 2004; Jahan, 2020; Kushwaha, 2020).

The most common plant parts used for the preparation of herbal medicine were leaves, apart from which bark, stem, fruits, flowers, seeds, and gum extracted from the plant were also used for the herbal preparation. The herbal preparations are also categorized into grounded paste, infusion, extract, juice, decoction and powdered form based on the mode of administration. The most common illnesses cured using the observed medicinal plants included fever, cough, muscular pain, inflammation and wound healing. Some other illnesses that are cured using the observed medicinal plants include stomach ache, diarrhoea, dysentery, jaundice, digestive

problems, eye infections, diabetes, bronchitis and heart problems. The remedies suggested by the local healers are based on the signs and symptoms of the disease rather than any lab tests, as the knowledge of the identification of any disease is passed along through generations in their families.

The majority of the plants belonged to the Endangered (04), Least concern (04) and Threatened (03) category, followed by Rare (02), Not Extinct (04), Critically endangered (01), Highly threatened (01), Vulnerable (01), and Not Evaluated (01) medicinal plant species. The threat to the biodiversity of these medicinal plants is basically due to the exploitation of the forest resources by the locals and also due to harvesting for commercial use. Extensive steps must be taken to conserve medicinal plants and protect their rich biodiversity. In the present study, we observed that the traditional knowledge of the medicinal plants is rapidly depleting among the tribal population the prime reason behind it being the migration of the younger population and the death of elderly people. Preserving this knowledge and documenting the ethno-medicinal details are highly important. The tribal population, indigenous knowledge, rich biodiversity and cultural values are all interconnected and interdependent, and one of the essential parts of the traditional medicinal practises (Laldingliani et al., 2022; Kumar et al., 2021). Due to the ever-rising demand for pharmaceutical drugs and over-exploitation of their economic value have led to an existential threat to their herbal resources (Gogoi and Nath, 2021). The government and private sector entities should identify this natural wealth and establish national strategies and legal practises to protect the biocultural resources effectively.

## Conclusion

Traditional knowledge is being depleted day by day due to a lack of appropriate scientific documentation and data investigation. Knowledge was closely guarded by "plant doctors" or "folk healers" and passed from generation to generation. It is tough to absorb knowledge from these people. Therefore, the knowledge that has been recorded in this article is precious and of great significance to researchers, botanists, chemists, druggists and many other pharmaceutical companies for isolation and identification of "active ingredient" or "secondary metabolite" for future discoveries of new and biologically active drugs (Acharya et al., 2023; Shriwas et al., 2023).

Indravati National Park, situated in Bijapur district, Chhattisgarh, India, is a reservoir of rich biodiversity, housing several endangered medicinal plants that are vital for both traditional healthcare practices and ecological

balance. In the present study, among the 21 medicinal plant species, plant families like Bignoniaceae and Fabaceae are the most used plant families by the tribal population of the studied region. The leaves are the most utilized plant part for herbal preparations. However, habitat degradation and over-exploitation of the medicinal flora have threatened the survival of these medicinal plants. Practical steps should be taken to ensure the conservation of these medicinal plants. This documentation provides a comprehensive insight into the endangered medicinal plants within the Park, shedding light on their botanical characteristics, distribution, traditional uses, and the urgency of their conservation. In conclusion, the conservation of endangered medicinal plants in Indravati National Park is not just an environmental imperative but a cultural and medicinal necessity. Protecting these plants is essential for the well-being of the ecosystem, the local communities, and the broader field of herbal medicine.

## Conflict of interest

There is no conflict of interest.

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