



## RESEARCH ARTICLE

# Floristic diversity of Koppal District, Karnataka, India

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## Abstract

Koppal district is popularly known as 'rice bowl' of Karnataka and is one of the newly formed districts. Since there are no comprehensive report on floristic diversity of Koppal district till today, hence authors present the first comprehensive report on floristics. This district mostly has rocky terrain on one side and acres of dry land on the other wherein agricultural crops like Jowar, Maize, Chick pea, Redgram, Safflower, Ground-nuts etc. are grown. The survey was carried out during 2016-20 and flora was recorded and plants were collected during all the seasons. The present study reports 430 flowering plant species from this district. Out of 430 plant species, total 57 families were recorded, of which Leguminosae [including Papilionoideae (30), Caesalpinioideae (23) and Mimosoideae (20)] the largest family with total 73 species followed by Apocynaceae (27), Malvaceae (22), Asteraceae (20), Acanthaceae and Euphorbiaceae (16), Poaceae (14), Labiatae (12) and other families like Amaranthaceae, Convolvulaceae, Moraceae, Cucurbitaceae, Combretaceae, Rutaceae, Asparagaceae etc. were found to have less species. *Dalbergia latifolia*, *Ficus religiosa*, *Hardwickia binata*, *Chloroxylon sweitenia*, *Syzygium cumini*, *Bauhinia variegata*, *Bauhinia racemosa*, *Ailanthus excelsa*, *Prosopis juliflora* etc. were dominant species found grown in natural habitat throughout the district. Many important medicinal plant species which most of them were herbs and climbers like *Abrus precatorius*, *Achyranthes aspera*, *Aegle marmelos*, *Andrographis paniculata*, *Bacopa monnieri*, *Gymnema sylvestre*, *Hemidesmus indicus* etc. were found abundant. *Aegle marmelos*, *Ailanthus excelsa*, *Syzygium cumini*, *Dalbergia sissoo*, *Tectona grandis* are cultivated for commercial purposes. Since Koppal district is found to have most of its part a rocky terrain species belonging to Rubiaceae, Apocynaceae, Euphorbiaceae, Rutaceae, Mimosoideae were predominant, of which most of the species are edible like *Carissa spinarum*, *Zizyphus nummularia*, *Canthium coromandelianum*, *Balanites aegyptiaca*, *Annona squamosa* etc. the district also comprises ornamental trees, weedy plants, grasses, hydrophytes including Rare Endangered and Threatened (RET) species like *Saraca asoka*, *Pterocarpus santalinus* etc. District has a huge repository of curious medicinal plants which have sufficient accumulation of secondary metabolites and can prove potential resources after scientific bioprospection methods.

**Keywords:** first report, Koppal, floristic, Karnataka, diversity

## Introduction

The significance of floristic research in general and taxonomic in particular is further greatly enhanced when plant samples are collected for their present and future use and also it is

required for planning conservation, management strategies and rehabilitation project. Since floristic composition is one of the major anatomical characters of the plant community (Dansereau, 1960), it is usually measured or estimated on a plant community basis (van der Maarel, 2005). Hence, it is seen as a fundamental aspect of plant community research. There are several reports on floristic diversity at local, district, state and national level from various parts of the world. This work has a reference from a book Kishkinda Khanda where it has a mention about medicinal plants from Koppal district (Danapur *et al.*, 2020; Kambalimath, 2019).

Koppal is newly carved out of Raichur district and is popularly known as "Rice bowl" of the State. It is spread across 136755 hectares of land. The total extent of recorded forest area in the division is 43,066 hectares which constitute about 7.64 of the division's geographical area of 5,630 km<sup>2</sup> deciduous scrub type. The division has a very unique ecosystem comprising rocks and boulders with sparse dry scrub jungle. It is situated between 15° 09' 00" to 16° 03' 30"

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North Latitude and 75° 47' 30" to 76° 48' 10" East Longitude. It consists of four talukas Koppal, Gangavathi, Kushtagi, Yelburga and Newly formed three talukas Kanakagiri, Karatagi and Kukanoor. Koppal district is surrounded by Raichur district in the east, Gadag district in the West, Bagalkot district in the north, Bellary district in the south. It has rocky terrain on one side and acres of dry land on the other wherein agricultural crops like Rice, Jowar, Maize, Redgram, Safflower, Ground-nuts etc. are grown. Floristic diversity of Koppal district, the present study was undertaken.

## Methodology

Extensive field study was undertaken during years from 2016-2020. The collected plants were identified following various national and district floras like Flora of Karnataka (Saldanha, 1984), Flora Eastern Karnataka (Singh, 1988), Flora of the Presidency of Madras (Gamble, 1915-36 and Flora of Gulbarga district (Seetharam *et al.*, 2000). Voucher specimens were prepared for each species by following standard procedures of Jain and Rao (1977) and deposited at Herbarium, Department of Botany (HGUG), Gulbarga University, Kalaburagi.

## Results and Discussion

The survey was carried out during 2016-20 and plants were collected during all the seasons. The present study reported 430 flowering plant species from this district. These 430 plant species belong to 57 families, of which Leguminosae [including Papilionoideae (30), Caesalpinoideae (23) and Mimosoideae (20)] was the largest family with total 73 species followed by Apocynaceae (27), Malvaceae (22), Asteraceae (20) and Acanthaceae and Euphorbiaceae (16), Poaceae (14), Lamiaceae (12) and other families like Amaranthaceae, Convolvulaceae, Moraceae, Cucurbitaceae, Combretaceae, Rutaceae, Asparagaceae etc. were found to have less than less than 10 species.

Dominant tree species like Beete (*Dalbergia latifolia* Roxb.), atti (*Ficus racemosa* L.), Kammari (*Hardwickia binata* Roxb.), arali mara (*Ficus religiosa* L.), urugali (*Chloroxylon swietenia* DC.), nerale (*Syzygium cumini* (L.) Skeels.), bettada nelli (*Phyllanthus emblica* L.), *Ailanthus excels* Roxb. *Tectona grandis* L.f. (teak) etc. flourish well in this region. Interestingly, all these plants are of commercial value. *Ficus carica* fruits (Fig) being exported to other countries from this district. *Hardwickia binata*, *Tectona grandis* wood is valued for its durability mainly due to its water resistant quality, followed by *Dalbergia sissoo* and *Chloroxylon swietenia*.

Pomegranate (*Punica granatum*), Fig (*Ficus carica*) and Grapes (*Vitis vinifera*) are being exported to other countries, hence farmers are into practice of cultivating these plants. Seethaphala (*Annona squamosa*), Geru (*Anacardium occidentale*), Halasu (*Artocarpus heterophylla*), Bela (*Feronia elephantum*) found to be grown in natural habitat throughout the belts of Koppal district.

Amidst the rocky terrain of this district predominant species are *Annona reticulata* (ramphala), *Annona squamosa* (seethaphala), *Randia* (*Randia rugulosa*), *Canthium coromandelicum* (Kaare kaye), *Carissa spinarum* (kavali hannu), *Euphorbia* spp. The fruits of these plants are consumed and sold at local markets.

Throughout the road belts and in between the crop fields *Aegle marmelos* (bilva), *Feronia elephantum* (belada hannu) are quiet common trees. In the dry rocky major Euphorbiacean members like; *Euphorbia cauducifolia*, *E. thymifolia*, etc. are seen growing in thick populations throughout including Agave and Aloe vera.

Dry land trees belonging to family Rutaceae, Mimosoideae, Annonaceae, Combretaceae, Meliaceae, Burseraceae, Lecithydaceae, Simaroubaceae etc. are wide spread in the district. *Phoenix sylvestris* (Indian date), *Borassus flabilifer* (toddy palm) are found in open dry land. Koppal district is also comprised by ornamental trees/shrubs such as, *Samanea saman*, *Albizia lebbeck*, *Barleria buxifolia*, *Butea monosperma*, *Spathodea campanulata*, *Caesalpinia pulcherrima*, *Canna indica*, *Delonix regia* etc.

In India, during the last 4 decades there is an increase in demand for aromatic/essential oils like citronella oil, Japanese mint, Vetiver oil, thyme oil etc. The modern era people are being exposed more towards benefits of plants and this shift for natural products from synthetic chemistry (Rajeswara Rao, 2013). In Koppal district many aromatic plant species are found to be grown in open dry lands and few of the dominant species are mentioned in Table 1. It is presumed that production of essential oils in dry land plants may be to defend against damaging predators (there are reports on antimicrobial properties of aromatic plants), attract pollinators and particularly to face drought conditions and may be essential oils act as stored energy for most of the aromatic plants. The aromatic plants of this district such as *Cymbopogon nardus*, *Ocimum* spp., *Jasminum* spp., *Magnolia champaca* etc have already proven biological activities and are popularly used in perfumery industries. *Hyptis suaveolens*, *Glossocardia bosvallea*, *Anisomeles* spp., *Lantana camara* are highly aromatic and are available in abundance in this district and essential oils from these plants can prove promising sources of essential oils if explored for bioprospection studies.

Since the district having dry seasons most of the year, many plants which grow in presence of less water and less moisture were found to be grown in open disturbed land, road sides and crop fields. There are plants which have shown their invasiveness in crop fields like *Celosia argentea*, *Hyptis suaveolens*, *Lantana camara*, *Croton bonplandianum*, *Calyptocarpus vialis*, *Syendrella nodiflora*, *Acanthospermum hispidum*, *Acanthospermum australe* etc. Few of them are mentioned in Table 2. Majority of the weeds are common in Ballari as reported by Sagar (2019), Seetharam *et al.*, (1999).

**Table 1:** Few aromatic species in Koppal district

Sl. No.	Name of the plant	Family
1	<i>Aegle marmelos</i>	Rutaceae
2	<i>Aerva lanata</i>	Amaranthaceae
3	<i>Ageratum conyzoides</i>	Asteraceae
4	<i>Anisomeles indica</i>	Labiatae
5	<i>Anisomeles malabarica</i>	Labiatae
6	<i>Blumea lacera</i>	Asteraceae
7	<i>Blumea mollis</i>	Asteraceae
8	<i>Chloroxylon swietenia</i>	Rutaceae
9	<i>Cleome viscosa</i>	Cleomaceae
10	<i>Cymbopogon nardus</i>	Poaceae
11	<i>Glossocardia bosvallea</i>	Asteraceae
12	<i>Hemidesmus indicus</i>	Apocynaceae
13	<i>Hyptis suaveolens</i>	Labiatae
14	<i>Jasminum spp.</i>	Oleaceae
15	<i>Lantana camara</i>	Verbenaceae
16	<i>Leonotis nepetifolia</i>	Labiatae
17	<i>Leucas aspera</i>	Labiatae
18	<i>Magnolia champaca</i>	Magnoliaceae
19	<i>Murraya koenigii</i>	Rutaceae
20	<i>Ocimum americanum</i>	Labiatae
21	<i>Ocimum basilicum</i>	Labiatae
22	<i>Ocimum sanctum</i>	Labiatae
23	<i>Pavonia odorata</i>	Malvaceae
24	<i>Syzygium cumini</i>	Myrtaceae
25	<i>Vitex negundo</i>	Verbenaceae
26	<i>Vitex trifolia</i>	Verbenaceae

**Table 2:** Few Weedy species in Koppal district

Sl. No.	Name of the plant	Family
1	<i>Abutilon indicum</i>	Malvaceae
2	<i>Croton bonplandianum</i>	Eupobiaceae
3	<i>Cajanus scarabaeoides</i>	Leguminosae: Papillioideae
4	<i>Ageratum conyzoides</i>	Asteraceae
5	<i>Alternanthera pungens</i>	Amaranthaceae
6	<i>A. sessilis</i>	Amaranthaceae
7	<i>Amaranthus spinosa</i>	Amaranthaceae
8	<i>Amaranthus viridis</i>	Amaranthaceae
9	<i>Alysicarpus longifolia</i>	Leguminosae: Papillioideae
10	<i>Anisomeles indica</i>	Labiatae
11	<i>Argemone mexicana</i>	Papavaraceae
12	<i>Bidens pilosa</i>	Asteraceae
13	<i>Calotropis gigantea</i>	Apocynaceae
14	<i>Calotropis procera</i>	Apocynaceae
15	<i>Parthenium hysterophorus</i>	Asteraceae

Most of such plants exhibit weedy nature. Population of weeds during drier season was found to be abundant. As the plants established in drier habitats, most of them remain

**Table 3:** Few aquatic and marsh plants

Sl. No.	Name of the plant species	Family
1	<i>Azolla pinnata</i>	Salviniaceae
2	<i>Salvinia molesta</i>	Salviniaceae
3	<i>Typha angustata</i>	Typhaceae
4	<i>Ipomoea carnea</i>	Convolvulaceae
5	<i>Alternanthera philoxeroides</i>	Amaranthaceae
6	<i>Eichhornea crassipes</i>	Pontederiaceae
7	<i>Pistia stratiotes</i>	Areceae
8	<i>Saccharum spontaneum</i>	Poaceae
9	<i>Marselia quadrifolia</i>	Marseliaceae
10	<i>Ipomoea aquatica</i>	Convolvulaceae
11	<i>Nelumbo nucifera</i>	Nelumbonaceae
12	<i>Hygrophila auriculata</i>	Acanthaceae
13	<i>Persicaria glabra</i>	Polygonaceae
14	<i>Oryza sativa</i>	Poaceae
15	<i>Cyperus spp.</i>	Cyperaceae
16	<i>Bacopa monnieri</i>	Scrophulariaceae
17	<i>Juncus inflexus</i>	Juncaceae

dormant unless they do not encounter favourable conditions. Once such conditions are made available the seeds germinate vigorously within very short span of time resulting in invasive nature (Sagar, 2015). Thus they will directly affect the growth and development of commercial crops.

Many small lakes and ponds enhance beauty of the district along with the major river Thungabhadra. Aquatic and plants growing in marshy habitat are mentioned in Table 3.

Few interesting and important plant species from conservation point of view which are mentioned in RET list of Karnataka like *Saraca asoca*, *Pterocarpus santalinus*, *Gloriosa superba*, *Terminalia arjuna*, *Terminalia bellirica* are also found grown either they are cultivated or in wild in natural habitat. *Gloriosa superba* and *Saraca asoca* are endangered species with high medicinal values. *Terminalia arjuna* is near threatened and is one of the three ingredients including *T. bellirica* in 'Triphala churna'. *Pterocarpus santalinus* (red sanders) is endemic to southern eastern ghats in south India, due to its over exploitation as its heart wood is valued at International market.

Many important and high valued medicinal plants like *Abrus precatorius* (Indian liquorice), *Achyranthes aspera*, *Aegle marmelos* (stone apple), *Ailanthus excelsa* (Indian tree of heaven), *Aloe vera*, *Andrographis paniculata*, *Centella asiatica* (indian pennywort), *Cardiospermum halicacabum*, *Cissus quadrangularis* (devil's backbone), *Decalepis hamiltoni* (swallow root), *Gymnema sylvestre* (sugar destroyer), *Bacopa monnieri* (Indian pennywort) etc. are seen grown in wild and most of these plants thrive well in dry conditions also.

## Conclusion

Since there are no comprehensive report on floristic diversity of Koppal district till today, hence the present study was

undertaken. The present survey reports 430 flowering plant species from this district. These 430 plant species belong to 57 families. Many economically valued plants which can be considered for further bioprospection studies like extraction of aromatic oils, secondary metabolites flourish well in this region. Underutilized edible fruits can be made more popular since these are found grown in wild in this district hence exhibiting a huge repository of nutraceuticals. Medicinal plants are available in plenty and since these grow in drier region, production of secondary metabolites will be in larger quantity when compared to the plants grown in other regions. Secondary metabolites are widely used as antibiotics, as aggressive weapons utilized against other microbes, parasites, amoebae, plants, bugs, and large creature. It is further suggested that the above medicinal plants can be considered for further bioprospection investigations.

### Author contributions

All the authors have substantially contributed in collection, photography, identification and preparation of herbarium of plants from Koppal region. Second and Third authors have provided additional information regarding the other aspects of the paper based on their earlier published book "*Kishkinda Khanda*".

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