Introduction

The tribes live in this area from ancient times and they had been accepted as an integral part of the surrounding ecosystem. Main tribes include Gond, Kanwar, Uraon, Baiga, Bharia and Pahadi korwa. These aborigines live mainly in the hilly areas of the Achanakmar, Marwahi and Gaurella region. The main occupation of the tribes of the reserve is farming, collection of non-wood forest products, animal husbandry and labouring in forest department works.

The focus of the present study is to know about diversity of dye yielding plants of Achanakmar-Amarkantak region, plant parts from which the colours are extracted, habit of plants, colour produced by them, ethnic uses and methods of dye extraction. They live in natural forests and learned different properties of local plant and have used them for different purposes including various uses of dye-yielding plants.

Study area

A study was conducted on dye-yielding plants found in the newly formed Achanakmar-Amarkantak Biosphere Reserve (BR). This is situated between the parallels of latitude 21°15’ North and 22°58’ North and the meridians of longitude 81°25’ East and 82°5’ East. Total area of the BR is 3,835.51 sq km, out of which, 1,224.98 sq km falls in Madhya Pradesh State and the remaining area of 2,610.53 sq km falls in Chhattisgarh State. It has a very rich floral diversity and biotic interference in the area have been very less. This area is also rich in ethnic population (6,616,596; 31.8% of state population). Many local tribes live here by deriving all that they need from forest for sustaining life.

The altitude of the region is in between 362 to 721 m above sea level and has typical monsoon climate having short rainy season. The mean
daily maximum temperature ranges from 24 to 39°C and minimum from 10 to 25°C depending upon the season. The rainfall occurs due to South-western monsoon from mid June to September. The forests of the state fall under two major forest types, i.e., Tropical Moist Deciduous forest and the Tropical Dry Deciduous forest7, 8. From the management point of view, there are four types of forests in the state of Chhattisgarh. These are Teak, Sal, Miscellaneous and Bamboo forests.

**Methodology**

The study was conducted in forest villages namely, Achanakmar, Bindawal, Lamni, Tilaidabra, Birarpani, Chhatarwara, Surhi, Ataria, Pataita, Shivatarai, Sihawal, Navagaon and Amadob. These forest villages are tribal dominated areas and come under biosphere reserve.

The study has been conducted following the methodology of Jain and Rao9. Specimens of different dye yielding plants were collected and taken photographs. The information recorded during this study was through direct observation and discussions with tribal villagers. Consultation with tribal religious persons likes “Ojhas and Baigas” of these villages was done to know about the local customs and social life. Each species is arranged alphabetically and is provided with correct botanical name, local name, family, general description, phenology and dye yielding plant part10 (Table 1).

**Results and Discussion**

Total 33 species belonging to 18 angiosperm families have been recorded in the present work (Table 1). Fabaceae is found to be dominant with 5 species followed by Combretaceae having 4 species and Mimosaceae and Zingiberaceae each having 3 species. Moraceae, Euphorbiaceae, Lythraceae and Rhamnaceae have 2 species each and rest of the families having one species each (Fig. 1).

In terms of plant parts utilized for dye extraction it was found that mostly bark has been utilized for dye extraction constituting 21 per cent of total plant recorded followed by leaves 16 per cent, fruits constituting 14 per cent, flowers and seeds 12 per cent each, wood, roots and tubers 9 per cent each and rhizomes 7 per cent (Fig. 2).

The species recorded are mostly trees which constitute 64 per cent of the total species recorded followed by shrubs having 18 per cent, climbers 9 per cent and herbs 9 per cent (Fig. 3).

For extraction of dye local Baigas and other tribes use different methods. For extraction of dyes from Butea monosperma (Lam.) Kunze flowers and Syzygium cuminii (Linn.)
Skeels leaves they perform following procedure: freshly collected flowers along with water are placed in a small copper pot and kept in dark condition for few days for fermentation. After 2-3 days material is taken out from the dark and heated indirectly by placing this small copper pot inside a large pot (Handi) filled with water. Heating is continued for 2-3 hours. Little water is added in between if it tends to get dry. The obtained liquid is filtered and some fresh cow dung is added to it and mixed for rapid drying of colour and to fix the colour. Same method is applied for the leaves but it is not necessary that leaves are fresh.

For extracting dye from fruits of Myrobalans (Terminalia chebula Retz.) and bark of T. arjuna (Roxb.) Wight & Arn. these plant parts are cleaned by water and soaked in water for 5-6 days for softening. Thereafter, they are crushed with stone to split up fibres. Again the split fibre parts are placed in water for few days then placed in an earthen or copper pot. Water is added and the mixture is heated and boiled. After 7-8 hours when colour starts coming out again water is added and heated concentrated.

The obtained dye is crude in nature hence filtered through a cloth before use. Water is added to decrease the concentration. Many times ash, clay, lime stone, cow urine, cow dung are also added for different purposes e.g., ash and clay are added as mordant. Cow urine gives fast drying property to the dye. Cow dung acts as fixing agent. The fresh dung is collected and dried, then put in boiling water, stirred and strained through a simple filter to add it at the time of colouring the objects.

The locally extracted dyes are used for different purposes such as cosmetic purpose by Baiga women to colour feet and hands. The local Rauat families use dyes for colouring the clothes. They also use colour for decorating walls of house and the earthen pots, which is known as Sawnhai art. The colours are also used for colouring the ox, cows and buffalos horns. Dhanwar tribe uses dyes for beautifying of weapons like bow, arrows and axes.

Thus, it is observed from the present study that different dye-yielding plants have important role in the social and cultural life of the local tribes. However, it is matter of concern that the local tribes are fast loosing their such great heritage and knowledge about dye plants, their uses and the methods of extraction. Now-a-days only the old persons of local tribes have knowledge about such plants and their young generations are not keen to know and conserve their knowledge. There is a need of serious attempts to document the traditional knowledge of tribes of this region about dye-yielding plants and the different extraction methods.

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Family</th>
<th>General description</th>
<th>Phenology</th>
<th>Dye yielding plant part</th>
<th>Dye produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia catechu (Linn. f.) Willd.</td>
<td>Khair</td>
<td>Mimosaceae</td>
<td>Small moderate sized, xerophytic tree, 12-15m high, girth 60-90 cm</td>
<td>Leaf shedding February-March, new leaves in April-May, whitish flowers during same period, pods develop up to July-August</td>
<td>Bark</td>
<td>Brown Black</td>
</tr>
<tr>
<td>Acacia leucopephloea (Roxb.) Willd.</td>
<td>Safed kikar</td>
<td>Mimosaceae</td>
<td>Moderate sized deciduous tree, 15 m in height, ordinarily 90 cm in girth</td>
<td>Leafless in February-March, new leaves in April. Yellowish flower appear from July to November. Pod ripens during April to June</td>
<td>Bark and leaves</td>
<td>Red</td>
</tr>
<tr>
<td>Acacia nilotica (Linn.) Willd. ex Delille</td>
<td>Babool</td>
<td>Mimosaceae</td>
<td>Almost evergreen in moist locality, 15-20 m in height, girth up to 3m</td>
<td>Seldom leafless, leaf shed in March-June, flowering irregular from April-June, pod fully developed in May-June</td>
<td>Seeds</td>
<td>Brown Black</td>
</tr>
<tr>
<td>Artocarpus heterophyllus Lam.</td>
<td>Kathal</td>
<td>Moraceae</td>
<td>Large ever green tree, 15m in height, girth 1-3 m</td>
<td>Numerous yellowish flowers in December-March, fruits in March-April which ripens in rainy season</td>
<td>Wood</td>
<td>Yellow</td>
</tr>
<tr>
<td>Species</td>
<td>Local name</td>
<td>Family</td>
<td>General description</td>
<td>Phenology</td>
<td>Dye yielding plant part</td>
<td>Dye produced</td>
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</tr>
<tr>
<td>Artocarpus lakoocha Roxb.</td>
<td>Barhal</td>
<td>Moraceae</td>
<td>Evergreen tree, 10-15m in height</td>
<td>Flowers December-March; fruits March-April</td>
<td>Wood</td>
<td>Yellow</td>
</tr>
<tr>
<td>Berberis aristata DC.</td>
<td>Daruhaldi</td>
<td>Berberidaceae</td>
<td>Stout erect spinous shrub, up to 3m in height, leaves foliated, flower in short corymbose, nectary gland</td>
<td>Flowering and fruiting, March-April</td>
<td>Root and tubers</td>
<td>Yellow</td>
</tr>
<tr>
<td>Bixa orellana Linn.</td>
<td>Sinduri</td>
<td>Bixaceae</td>
<td>6-10 m high tree</td>
<td>Flowering September-April</td>
<td>Seeds</td>
<td>Red and Pink</td>
</tr>
<tr>
<td>Butea monosperma (Lam.) Kuntze</td>
<td>Palash</td>
<td>Fabaceae</td>
<td>Medium sized deciduous tree, 6-12m in height, girth 2m</td>
<td>Leaf shedding in November-December, new leaves in April, flower buds in January-April and flowers gregariously</td>
<td>Flowers</td>
<td>Yellow</td>
</tr>
<tr>
<td>Butea superba Roxb.</td>
<td>Palash lata</td>
<td>Fabaceae</td>
<td>Deciduous liana, 12m in height</td>
<td>Flowering April; fruiting in June</td>
<td>Root tubers</td>
<td>Red</td>
</tr>
<tr>
<td>Curcuma angustifolia Roxb.</td>
<td>Tikjur</td>
<td>Zingiberaceae</td>
<td>Herbaceous rhizomatous plant, 1m in height</td>
<td>Flowering July-November</td>
<td>Tubers</td>
<td>Yellow</td>
</tr>
<tr>
<td>Curcuma aromatica Salisb.</td>
<td>Ban haldi</td>
<td>Zingiberaceae</td>
<td>Herbaceous rhizomatous plant, 1m in height</td>
<td>Flowering July-November</td>
<td>Tubers</td>
<td>Yellow</td>
</tr>
<tr>
<td>Curcuma longa Linn.</td>
<td>Haldi</td>
<td>Zingiberaceae</td>
<td>Perennial herb</td>
<td>Flowering July-November</td>
<td>Tuber</td>
<td>Yellow</td>
</tr>
<tr>
<td>Emblica officinalis Gaertn. syn. Phyllanthus emblica Linn.</td>
<td>Aonla</td>
<td>Euphorbiaceae</td>
<td>Medium sized deciduous tree, 10m high</td>
<td>Flowering March-May; fruiting in July-December</td>
<td>Fruits</td>
<td>Brown</td>
</tr>
<tr>
<td>Indigofera cassioides Rottl. ex DC.</td>
<td>Neel</td>
<td>Fabaceae</td>
<td>Shrub, cultivated, 1m in height</td>
<td>Flowering September; fruiting in February</td>
<td>Leaves and flowers</td>
<td>Blue</td>
</tr>
<tr>
<td>Indigofera tinctoria Linn.</td>
<td>Neel</td>
<td>Fabaceae</td>
<td>Perennial shrub, cultivated, 1m in height</td>
<td>Flowering September; fruiting February</td>
<td>Leaves and flowers</td>
<td>Blue</td>
</tr>
<tr>
<td>Lawsonia inermis Linn.</td>
<td>Mehndi</td>
<td>Lythraceae</td>
<td>Much branched shrubs 2-3 m in height</td>
<td>Flowering April; fruiting December</td>
<td>Leaves</td>
<td>Red and Orange</td>
</tr>
<tr>
<td>Mallotus philippensis (Lam.) Muell. - Arg.</td>
<td>Kamela</td>
<td>Euphorbiaceae</td>
<td>Evergreen tree, 8 m in height</td>
<td>Flowering October-November; fruiting in February-May</td>
<td>Fruit capsules</td>
<td>Orange</td>
</tr>
<tr>
<td>Michelia champaca Linn.</td>
<td>Champa</td>
<td>Magnoliaceae</td>
<td>Evergreen tree 35 m in height, girth 2-3.5m</td>
<td>Flowers April onwards, fruits ripen in August-November</td>
<td>Wood</td>
<td>Yellow</td>
</tr>
<tr>
<td>Species</td>
<td>Local name</td>
<td>Family</td>
<td>General description</td>
<td>Phenology</td>
<td>Dye yielding plant part</td>
<td>Dye produced</td>
</tr>
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</tr>
<tr>
<td>Mimusops elengi Linn.</td>
<td>Maulshri</td>
<td>Sapotaceae</td>
<td>Evergreen tree, 8-12m in height</td>
<td>Flowering March-July; fruiting January-February</td>
<td>Seed</td>
<td>Yellow</td>
</tr>
<tr>
<td>Myrica esculenta Buch.-Ham. ex D. Don</td>
<td>Kay phal</td>
<td>Myricaceae</td>
<td>Deciduous tree, 8m in height</td>
<td>Flowering April; fruiting December</td>
<td>Bark</td>
<td>Yellow</td>
</tr>
<tr>
<td>Pterocarpus marsupium Roxb.</td>
<td>Beejasal</td>
<td>Fabaceae</td>
<td>Tall deciduous tree, 30 m height, girth 5 m</td>
<td>Flowering July-October; pods ripens in December-March</td>
<td>Bark</td>
<td>Red</td>
</tr>
<tr>
<td>Punica granatum Linn.</td>
<td>Anar</td>
<td>Punicaceae</td>
<td>Shrub, 3-4.5 m in height</td>
<td>Flowering in March-June; fruiting in July-October</td>
<td>Rind and flowers</td>
<td>Yellow</td>
</tr>
<tr>
<td>Rubia cordifolia Linn.</td>
<td>Maddar</td>
<td>Rubiaceae</td>
<td>Herbaceous plant, height 1 m</td>
<td>Flowering in February and fruiting in December</td>
<td>Whole plant</td>
<td>Red</td>
</tr>
<tr>
<td>Semecarpus anacardium Linn. f.</td>
<td>Bhilwa</td>
<td>Anacardiaceae</td>
<td>Deciduous tree, 20-25 m in height</td>
<td>Flowering in July-October; pods ripens in December-March</td>
<td>Fruits</td>
<td>Black</td>
</tr>
<tr>
<td>Syzygium cuminii (Linn.) Skeels</td>
<td>Jamun</td>
<td>Myrtaceae</td>
<td>Large evergreen tree, 30m in height, girth 4m</td>
<td>Flower March-April; fruit ripens in June-August</td>
<td>Bark and leaves</td>
<td>Red</td>
</tr>
<tr>
<td>Terminalia alata Heyne ex Roth</td>
<td>Saja</td>
<td>Combretaceae</td>
<td>Deciduous tree, 30 m in height</td>
<td>Leaf fall January-February, new leaves in March-April; flowers in July; fruits ripens in March-July</td>
<td>Bark</td>
<td>Red and Brown</td>
</tr>
<tr>
<td>Terminalia arjuna (Roxb.) Wight &amp; Arn.</td>
<td>Arjuna</td>
<td>Combretaceae</td>
<td>Large evergreen tree 25m in height, girth 3m</td>
<td>White flower in April-May and fruits ripen in Feb-May</td>
<td>Bark</td>
<td>Red</td>
</tr>
<tr>
<td>Terminalia bellirica Roxb.</td>
<td>Bahera</td>
<td>Combretaceae</td>
<td>Deciduous tree, 30 m in height, girth 2.4 m</td>
<td>Leave fall in November-January, new foliage in April; flower in April to June; fruits in November-February</td>
<td>Fruits</td>
<td>Black</td>
</tr>
<tr>
<td>Terminalia chebula Retz.</td>
<td>Harra</td>
<td>Combretaceae</td>
<td>Deciduous tree, 24 m in height, girth 2.4 m</td>
<td>Old leaves fall in February-March, new leaves in March-May, flowering in July-August; fruits ripen in October-March</td>
<td>Fruit</td>
<td>Yellow and Black</td>
</tr>
<tr>
<td>Ventilago denticulata Wild.</td>
<td>Kyoti</td>
<td>Rhamnaceae</td>
<td>Climber 10-15 m</td>
<td>Flowering in December; fruiting in April</td>
<td>Bark and roots</td>
<td>Violet</td>
</tr>
<tr>
<td>Woodfordia fruticosa (Linn.) Kurz</td>
<td>Dhwai</td>
<td>Lythraceae</td>
<td>Shrub, 3-4 m in height</td>
<td>Flowering January; fruiting in May</td>
<td>Flowers</td>
<td>Red-yellow</td>
</tr>
<tr>
<td>Wrightia tinctoria R. Br.</td>
<td>Indrajan</td>
<td>Apocynaceae</td>
<td>Small deciduous tree, 10 m in height</td>
<td>Flowering March-May; fruiting in June-February</td>
<td>Seeds</td>
<td>Blue</td>
</tr>
<tr>
<td>Ziziphus mauritiana Lam.</td>
<td>Ber</td>
<td>Rhamnaceae</td>
<td>Xerophytic tree, 12m in height</td>
<td>Flowering January; fruiting May</td>
<td>Leaves and bark</td>
<td>Pink-red</td>
</tr>
</tbody>
</table>
Conclusion

It is quite clear from the present study that Achanakmar-Amarkantak Biosphere Reserve is a storehouse of floral biodiversity and economically important plants particularly dye yielding plants. Preliminary study has been made about such biodiversity rich region. Comprehensive study about the assessment of biodiversity of dye yielding plants is needed to document knowledge of current status of these plants in this region.

References