

## **Survey of Ethanomedicinal plants for management of Sickle cell disease in Gadchiroli District of Maharashtra State (India)**

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### **Abstract**

The ethanobotanical survey focus on the medicinal plants used by different tribes for management sickle cell disease of the Gadchiroli district of Maharashtra state. The study was conducted and documented 49 plant species belonging to 29 families used by the tribal herbal healers, called Vaidu. The information of plants was gathered by interviewing the traditional herbal healers and surfing authenticate data base. The survey was conducted for documentation of their various plants and plant parts regular visit and interviews of Vaidu's (traditional herbal healer) were carried out for gathering the information about the plants and documents their knowledge for future actions may be executed for identification of phytochemical constituent (phytochemistry). Sickle cell disease (SCD) or sickle cell anemia is an autosomal recessive genetic blood disorder with over-dominance characterized by red blood cells with abnormal, rigid, sickle shaped Sickle-cell anemia (SCA) is a neglected chronic disorder of increasing global health importance, with India estimated to have the second highest burden of the sickle cell disease.

**Key words :** Medicinal plants, Gadchiroli district, Vaidu, Sickle cell disease.

Sickle cell anemia is an autosomal recessive genetic blood disorder with over-dominance characterized by red blood cells with abnormal, rigid, sickle shaped. This is one disease afflicting the population living in Africa, South America and Asia. It occurs in other ethnic groups including Mediterranean and Middle Eastern descent<sup>55</sup>. Sickling of red blood cells occur because of the polymerization of deoxygenated Hbs. This abnormality of RBC characterized by painful episodes, chronic anemia, enlarged spleen, serious frequent infections and damage to vital organs<sup>9</sup>. Sickle cell disease being a genetically inherited disease, there is no radical method to cure it. But various medicinal plants as important source of medicines are being used for sickle cell disease management since prehistoric times. There is need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resources received more and more recognition<sup>48</sup>.

In India, many indigenous plants are being used in herbal medicine to cure many diseases. Tribal people have been in the practice of preserving a rich heritage of information on medicinal plants and their usage.

Ethnomedicinal plants, since long times immemorial, have been used in virtually all cultures as a source of medicine. The widespread use of herbal remedies and healthcare reparations, as those described in ancient literature obtained from plants has been traced to the occurrence of natural products with medicinal properties. The plants have been the important source of medicines used by man from prehistoric times for relieving

suffering and curing ailments. The need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resources received more and more recognition<sup>48</sup>.

In India, many indigenous plants are used in herbal medicine to cure diseases and heal injuries. Tribal people have worldwide<sup>27</sup>. Treatment of SCD required that one focus on ways of inhibiting sickle cell haemoglobin polymediation and prevention or repair of red cell dehydration. SCD treatment also requires interrupting the interaction of sickle cells with the endothelium<sup>11,13,18,34</sup>. Hydroxyurea is a known inhibitor of sickle cell polymerization and various drugs containing it has an ability to increase fetal hemoglobin concentration<sup>50,54</sup> noted that more than 80% of the world population relies on traditional medicine for their primary health care. The World Health Organisation<sup>55</sup> estimated 90% of the population of developing countries relied ethnomedicinal plants to help meet their primary health care needs. In developing countries, medicinal plants used to treat sickle cell crises associated morbidities among the less privileged classes of the society. Treatment and management of diseases such as HIV/AIDS, malaria, diabetes, sickle-cell anemia and mental disorders involve the use of medicinal plants<sup>22</sup>. Medicinal plant extracts were found to have ability to prevent the erythrocytes from de-forming and losing its integrity<sup>2</sup> reported the in vitro antisickling activities of crude methanol extract and aqueous fractions of roots of *Plumbago zeylanica* and *Uvaria chamae*.

*Study area :*

Gadchiroli District, is situated in the

South-eastern corner of Maharashtra, and is bounded by Chandrapur district in the west, Gondia District in the north, Chhattisgarh state in the east, and Andhra Pradesh state in the south and southwest (Fig. 1). Gadchiroli district lies between  $19^{\circ}31'$  &  $19^{\circ}45'$  N latitude and  $80^{\circ}15'$  &  $80^{\circ}45'$  E longitude<sup>52</sup>. Gadchiroli District, is situated in the South-eastern corner of Maharashtra, and is bounded by Chandrapur district in the west, Gondia District in the north, Chhattisgarh state in the east, and Andhra Pradesh state in the south and southwest (Fig.1). Gadchiroli district lies between  $19^{\circ}31'$  &  $19^{\circ}45'$  N latitude and  $80^{\circ}15'$  &  $80^{\circ}45'$  E longitude<sup>52</sup>.

Gadchiroli district's climate is changing seasonally. In the summer, there is definitely a hot summer in the district, but there is very cold in the winter. The average humidity in the district is 62%. The major rivers flowing through the district are Wainganga, Godavari, Pranhita, Dina. Total land cover of the study area is 14412.0 sq. km. Out of which, nearly 78.4% (*i.e.* 11694.0 sq. km.) is covered by reserve or protected forest. Dhanora, Etapalli, Aheri and Sironcha talukas in the eastern part of the district are covered by forest. The area receives an annual rainfall of nearly 1510 mm (<http://nagpur.nic.in/divisionalcommissioner/Dist.info/GAD.html>)

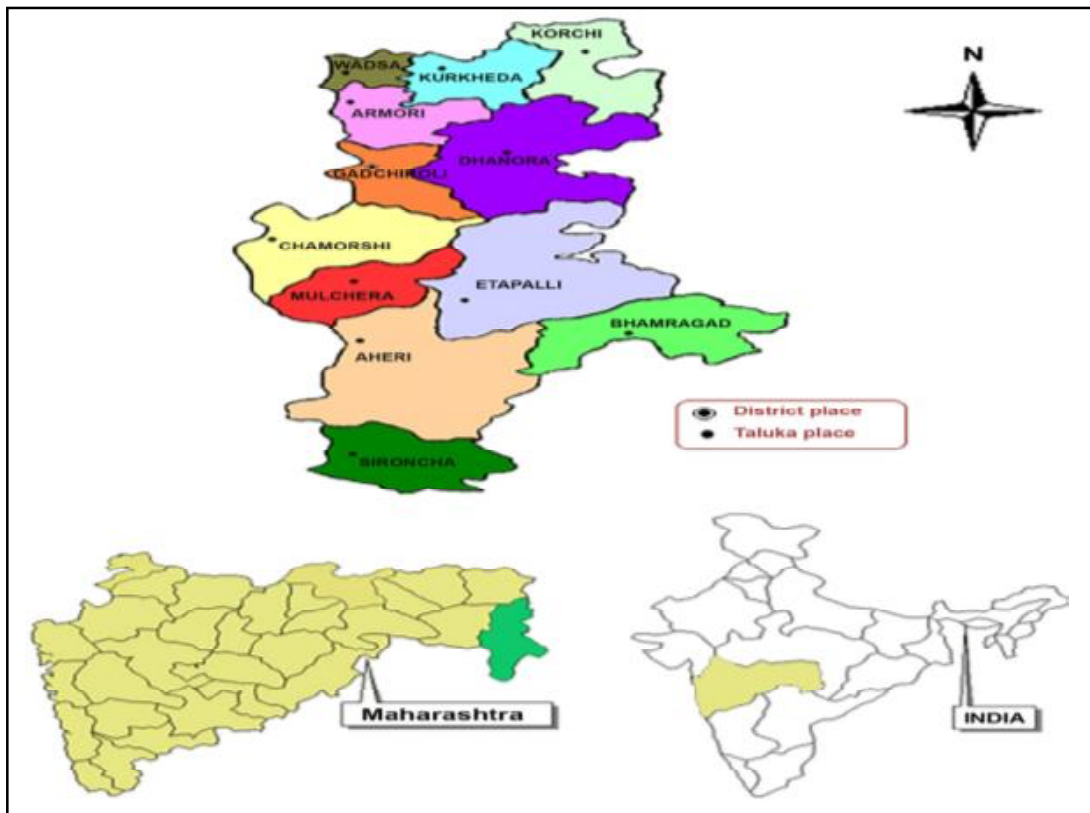


Fig. 1. Location map of study area (Source: <https://www.semanticscholar.org/paper/Plant-diversity-of-Gadchiroli-district-of-India>)

Table-1. Scientific name, family, common name, plant parts used, Mode of cultivation Growth habit and Literature citations

Sr. No	Scientific name	Family	Common name	Plant parts	Mode of cultivation	Growth habit	Literature citations
1	<i>Abrus precatorius</i> L.	Fabaceae	Crab's eye, rosary, love nut	Leaf	Wild	Climber	(Nwodo <i>et. al.</i> , 2008) <sup>46</sup> , (Kadiri <i>et. al.</i> , 2014) <sup>33</sup>
2	<i>Aegle marmelos</i> L.	Rutaceae	Stone apple, bael	Fruit	Wild	Shrub	(Patil S.S & Pawar M. S. 2023) <sup>47</sup>
3	<i>Adansonia digitata</i> L.	Bombacaceae	Gorkhachinch	Leaf, bark	Wild	Tree	(Adesanya <i>et. al.</i> , 1988) <sup>4</sup> .
4	<i>Aloe barbadensis</i> miller	Liliaceae	Aloe	Leaf,	Cultivated	Herb	(Patil S.S & Pawar M. S. 2023) <sup>47</sup>
5	<i>Allium cepa</i> L.	Amarylidaceae	Onion,	Bulb	Cultivated	Herb	(Nwaoguikpe, R.N., 2009) <sup>44</sup>
6	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Kaduneem	Leaf	Cultivated and wild	Tree	(Nwaoguikpe, R.N., 2009) <sup>44</sup>
7	<i>Allium sativum</i> L.	Amarylidaceae	Garlic	Bulb	Cultivated	Herb	(Nwaoguikpe, R.N., 2009) <sup>44</sup>
8	<i>Bambusa vulgaris</i> Schrad.	Poaceae	Bamboo	Leaf	Cultivated	Shrub	(Amujoyegbe <i>et. al.</i> , 2016) <sup>7</sup>
9	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Hog weed	Leaf, root	Wild	Herb	(Devi <i>et. al.</i> , 2012) <sup>19</sup>
10	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Pigeon pea	Leaf	Cultivated	Shrub	(Akinsulie <i>et al.</i> , 2005) <sup>5</sup> ; (Ameh <i>et al.</i> , 2012) <sup>8</sup> , (Imaga, 2013) <sup>28</sup>
11	<i>Cannabis sativa</i> Linn.	Cannabanaceae	Indian hemp	Leaf	Cultivated	Herb	(Ameh <i>et al.</i> , 2012) <sup>8</sup>
12	<i>Capsicum frutescens</i> Linn.	Solanaceae	Chilli	Fruit	Cultivated	Herb	(Egunyomi A. <i>et. al.</i> , 2009) <sup>21</sup>
13	<i>Carica papaya</i> Linn.	Caricaceae	Pawpaw	Leaf, root, fruits	Cultivated	Tree	(Iweala <i>et. al.</i> , 2010) <sup>31</sup>
14	<i>Calotropis procera</i> (Aiton) W. T. Aiton	Asclepiadaceae	Rui,	Root	Wild	Shrub	(Ilagouma A.L. <i>et al.</i> , 2019) <sup>32</sup> .
15	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	Chandan-batawa	leaf	Wild	Herb	(Adejumo <i>o. et al.</i> , 2011) <sup>3</sup>
16	<i>Cassia fistula</i> Linn	Fabaceae	Bahawa, Amalataas Golden tree	leaf, bark	Wild	tree	(Heidari N. <i>et. al.</i> , 2015) <sup>26</sup>
17	<i>Cassia obtusifolia</i> L.	Fabaceae	Sicklepod, tarita	Leaf	Wild	Herb	(Heidari N. <i>et. al.</i> , 2015) <sup>26</sup>



			Mungana		& wild		
35	<i>Momordica charantia</i> L.	Cucurbitaceae	bitter gourd	Leaf	Cultivated	Climber	(Gupta A. <i>et al.</i> , 2015) <sup>25</sup>
36	<i>Ocimum gratissimum</i> Linn.	Lamiaceae	Scent leaf, mint.	Leaf	Cultivate	Shrub	(Ngbolua <i>et al.</i> , 2013) <sup>43</sup>
37	<i>Phyllanthus niruri</i> Linn	Euphorbiaceae	Stone breaker	Whole plant	wild	herb	(Rada. S. K. & Pradhan M 2022) <sup>49</sup>
38	<i>Psidium guajava</i> L.	Myrtaceae	Guava	Leaf	Cultivated	Tree	(Chikezie, <i>et al.</i> 2011) <sup>15</sup>
39	<i>Sorghum bicolor</i> L.	Poaceae	Sorghum	Leaf, seed	Cultivated	Herb	(Mpiana <i>et al.</i> , 2013) <sup>39</sup> ; (Abugri <i>et al.</i> , 2011) <sup>1</sup> ; (Gbadamosi <i>et al.</i> , 2012) <sup>23</sup>
40	<i>Tamarindus indica</i> L.	Caesalpinaceae		Leaf	Wild and cultivated	Tree	(Ilagouma A. T. <i>et al.</i> , 2019) <sup>32</sup>
41	<i>Telfairia occidentalis</i> Hook.f.	Curcubitaceae	Fluted pumpkin	Leaf	Cultivated	Climber	(Nwaoguikpe <i>et al.</i> , 2013) <sup>45</sup>
42	<i>Terminalia catappa</i> L.	Combretaceae	almond tree,	Leaf	Wild and cultivated	Tree	(Moody <i>et al.</i> , 2003) <sup>41</sup> ; (Mgbemene and Ohiri, 1999) <sup>37</sup>
43	<i>Terminalia chebula</i> Retz.	Combretaceae	tropical almond	Fruit	Wild and cultivated	Tree	(Patil S.S & Pawar M. S. 2023) <sup>47</sup>
44	<i>Terminalia superba</i> Engl & Diels	Combretaceae	Shinglewood	bark	Wild and cultivated	Tree	(Patil S.S & Pawar M. S. 2023) <sup>47</sup>
45	<i>Tinospora cordifolia</i> (Willd.) Hook. f. and Thoms.	Menispermaceae	Giloe, Guduchi	leaves	Wild and cultivated	Climber	(Patil S.S & Pawar M. S. 2023) <sup>47</sup>
46	<i>Walteria indica</i> L.	Malvaceae	Bush Buff Coat Leather Coat	root	wild	herb	(Ilagouma A.T. <i>et al.</i> , 2019) <sup>32</sup>
47	<i>Vigna unguiculata</i> (L.) Walp	Fabaceae	black-eyed pea	Leaf seed	Cultivated	Shrub	(Egba <i>et al.</i> , 2012) <sup>20</sup>
48	<i>Zingiber officinale</i> Rosc.	Zingiberaceae	Ginger	rhizome	Cultivated	Herb	(Kshatriya <i>et al.</i> , 2008) <sup>35</sup>
49	<i>Zea mays</i>	Poaceae	Corn	stem, leaf	Cultivated	Herb	(Ilagouma A.T. <i>et al.</i> , 2019) <sup>32</sup>

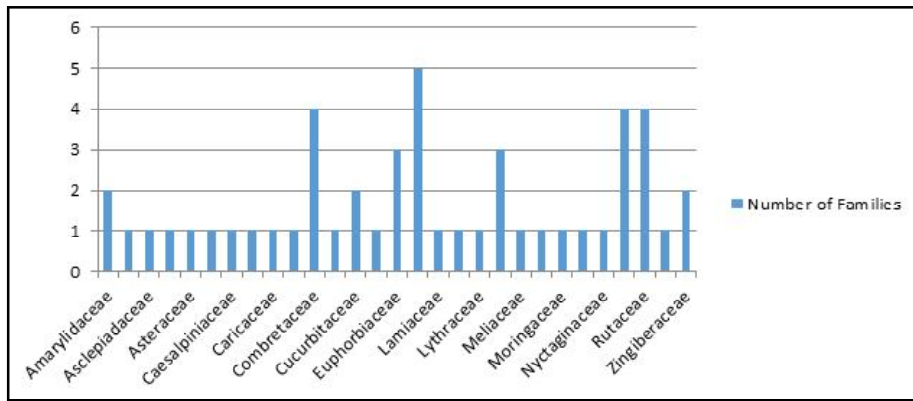


Fig. 2. Number families of medicinal plants in used in management of Sickle cell disease in

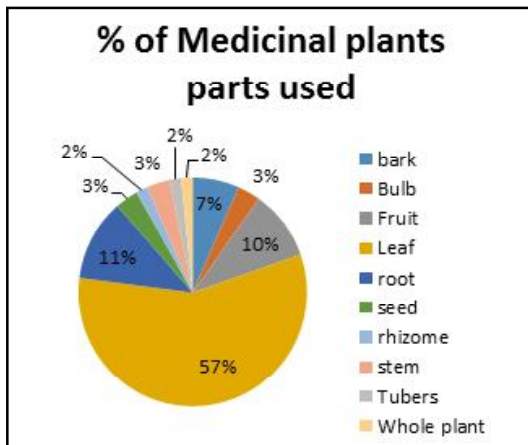


Fig. 3. Percentage of medicinal plants parts used in the management of sickle cell disease in Gadchiroli District.

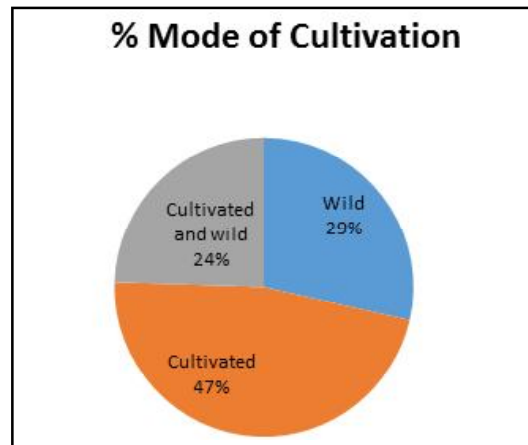


Fig. 4. Percentage & number of growth habit medicinal plants parts used in the management of sickle cell disease

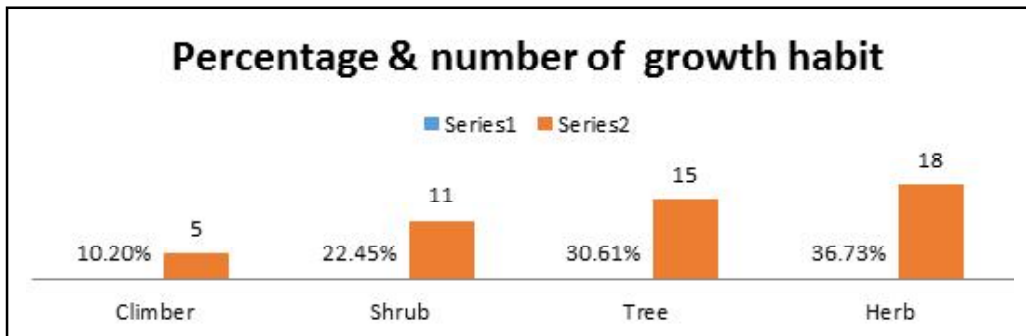


Fig. 5. Percentage & number of growth habit medicinal plants parts used in the management of sickle cell disease in Gadchiroli District

An extensive ethnomedicinal survey was carried out to collect information about the medicinal plants. The interviews were planned with tribal herbal healers for gathering medicinal plant information which are used on sickle shape anemia. These healers include men and women belonging to different tribal communities. The area under study was visited in different seasons. The data were collected through repeated field visits and the careful interaction with the village tribes. The collected specimens were identified taxonomically with the help of available Monographs, taxonomic revisions and floras and by using field keys. The literature search includes databases such as PubMed, Google Scholar, and local repositories of traditional knowledge. Keywords used include "sickle cell disease," "anemia," "ethnomedicine," "traditional knowledge,". Relevant articles, books, and reports published in English and local languages are included in the review

Table-1 provides the Scientific name, family, common name, plant parts used, Mode of cultivation, Growth habit and Literature citations for 49 species (arranged in alphabetical order) used by the tribal communities of the Gadchiroli district of Maharashtra. These plant species belong to 29 families. The dominant family used by the tribal is Fabaceae (5 spp.), followed by Combretaceae, Poaceae, Rutaceae (4 spp.) Euphorbiaceae & Malvaceae (3 spp.)

Poaceae (3 spp.), Amarylidaceae Cucurbitaceae, Zingiberaceae (2 spp.) While other 20 families are with single species each. In the sickle cell disease management leaf is used more than (57%) and root (11%) other part of plant such as stem, stem bark, fruit, tuber, seeds, bulbs, whole plant (fig. 3) Mode

of cultivation in three types in that Cultivated (47%) wild (29%) Cultivated and wild (24%) Percentage & number of growth habit medicinal plants parts used in the management of sickle cell disease shown in fig no. 5 in that herbs with 18 quantity (39%) , tree with 15 number (31%), shrub with 11 number (22%) climber (10%).

It was observed that majority of the information were obtained from traditional healers and acquired by inheritance. Moreover, these traditional healers are of old age and there is no proper documentation about their knowledge. There is thus a possibility of losing this valuable ethnomedicinal knowledge in the nearest future and therefore, this present study provides opportunity to sustain the knowledge by documentation. The integration of traditional medicinal practices with modern healthcare systems presents both opportunities and challenges. While these ethnomedicinal plants offer potential benefits, their efficacy and safety require rigorous scientific validation through pharmacological and clinical studies. Collaboration between traditional healers, healthcare providers, and researchers is essential to bridge gaps in knowledge and enhance healthcare delivery for individuals with sickle cell disease in resource-limited settings like Gadchiroli District.

Ethnomedicinal plants used in Gadchiroli District represent a valuable cultural heritage and resource for managing sickle cell disease-induced anemia. Further research is needed to validate their efficacy, safety, and mechanisms of action, integrating traditional knowledge with modern medical approaches to improve health outcomes for affected individuals.

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