

## Study of plants used against the skin diseases with special reference to *Cassia fistula* L. among the king (*Dongaria Kandha*) of Niyamgiri: A primitive tribe of Odisha, India

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### Abstract

Fungi causing skin infections are treated by the *Dongaria Kandha* residing at Niyamgiri Hills, Odisha, India, since thousand years back using plant parts of local flora of Niyamgiri as traditional medicine. Keeping this in view it was conceptualized to study the ethnobotany of species used as traditional medicines among them in order to validate their therapeutic claims against eczema and other skin diseases. Through questionnaire it was ascertained that 19 plant species are being used in the treatment of skin diseases, particularly eczema. Among 19 plant species, *Cassia fistula* L. which tops in the priority list was tested against *Aspergillus niger* using disc diffusion method. Antimicrobial and qualitative analysis of bioactive compounds from the leaf of *Cassia fistula* L. showed that the antifungal activity of leaf of *Cassia fistula* L. was excellent against the test fungus as reflected through fungal inhibition. Bioactive compounds present in plant extracts showed the potent medicinal value of *Cassia fistula* L. against skin diseases. The study recommends for using these plants, particularly *Cassia fistula* L. against fungal infections and the study further emphasizes upon detailed analysis of the bioactive compounds in different plant parts and their possible use in preparation of medicines.

### Key words:

Ethnobotany, *Dongaria Kandha*, *Cassia fistula* L., Phytochemistry, Anti-fungal activity

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### Introduction

World health Organization reported that the traditional medical practitioners treat about 85 % of

patients in India<sup>1</sup>, which shows the significant valuable relation between local tribal people with medicinal plants. The medicinal uses of plants are very old. The writings indicate that therapeutic use of plant is being practiced since 5000-4000 B.C. and Chinese used first the natural herbal preparations as medicines. In India, however, earliest references of use of plants as medicine appear in Rig-Veda which is said to be written between 3500-1600 B.C.; Later the properties and therapeutic uses of medicinal plants were studied in detail and recorded empirically by the ancient physician in Ayurveda which is a basic foundation of ancient medical science in India<sup>2</sup>. Odisha claims to have a prominent position among the states and Union Territories of India for having the largest varieties of tribes that is 62 in number including 13 vulnerable tribal groups. It was the third highest tribal populations numbering over 8 millions, which is about 9.7 % of the country's total population constituting 22.13 % of the state's total population as per 2001 census. It means among every five persons one belongs to a scheduled tribe community in the state. Every tribal group represents unique indigenous ethnobotanical systems that include the mode of taking or applying externally or internally plant parts as a cure. Without proper documentation of such knowledge, the cultural and traditional heritage of Odisha is losing its importance and traditional indigenous knowledge is being lost. Tribal communities are forced to change their livelihood which leads to ethnocultural degradation. Therefore an attempt has been made to explore the traditional healthcare system of the Dongaria Kandha (Fig: 8&9) of Niyamgiri Hills, Odisha for the treatment of various types of skin diseases using local medicinal flora. Dongaria Kandha is one of the primitive tribes of the state and enjoys a critical and symbiotic relation with the Niyamgiri forests. Various types of medicinal plants are widely used by the traditional medical practitioners of Dongaria kandha for curing various

diseases in their daily life. They are a significant tribal group which constitutes a primitive section of the Kandha, numerically the largest among the 62 tribes of Odisha. For being the denizens of hills, forests and highlands (Dongar), their neighbors name them Dongria but, they call themselves "Dongran Kuan" or Drili Kuan. The Dongaria Kandha inhabits the lofty Niyamgiri Hill ranges spread across Bissamcuttack, Kalyansinghpur, and Muniguda blocks in Rayagada district. As son of Nature the Dongrias love to live in their natural abode, far away from the madding crowds of civilization. The high altitude of the Dongaria Kandho habitat has made the climate cool and pleasant<sup>3</sup>. The soil and climate are favorable for raising horticultural and ethnobotanical plantations like Pine apple and Patal Garuda or Sarpagandha. Dongaria continue their age old subsistence activity of food gathering and collected medicinal plants from the forest to cure different type of diseases. In this paper authors presented the plants used by Dongaria kandho for skin diseases. There are 19 plants which are used for skin diseases by this community. Authors validate their claims by studying in detail the leaves of *Cassia fistula* L. (Fig: 6 & 7) against fungal infections. *Cassia fistula* L. belongs to family Caesalpiniaceae is a very common usable plant among Dongaria kandha for cure of skin diseases. In the Indian literature, this plant has also been described to be useful against skin diseases<sup>4,5</sup>.

#### The study area

As a part of Eastern Ghats of India, the Niyamgiri Hills range, situated on the borders of Rayagada and Gunupur subdivision of southwest part of Odisha, rise steeply from 1,000 feet to a number of peaks, of which the highest is 4,970 feet above the sea level. Niyamgiri, about 250 sq. Km. in area lying between 19° 26' to 19° 43' N latitude, and 83° 18' to 83° 28' E longitude<sup>6</sup>. Topographically, 75 % of the Niyamgiri hills landmass is covered with dense forests with



evergreen and semi- evergreen in nature where the average forest density is around 0.6, with 1300 to 1400 trees per acre. Eight distinct types of vegetation are seen in Niyamgiri, depending on the local microclimate, plant density, species association and effect of biotic and edaphic factors, among which deciduous forests predominate. *Terminalia tomentosa* and *Shorea robusta* are the most dominant species. Culturally and ecologically the Niyamgiri Hills are extremely rich and significant.

Most important aspect of Niyamgiri hills is that it is rich in Mountain Rivers which give the location are unique Phytogeographical zone. Therefore it was declared as Nature Conservation or Game Sanctuary. It has been proposed as a Wild Life Sanctuary in the working plan of Kalahandi district forest division. The state Wildlife Organization has a proposal to declare this area as South Odisha Elephant Reserve as mentioned in its memo no. 4643/ 3 WL (Cions) 34 / 04 dated 20.08.20047.

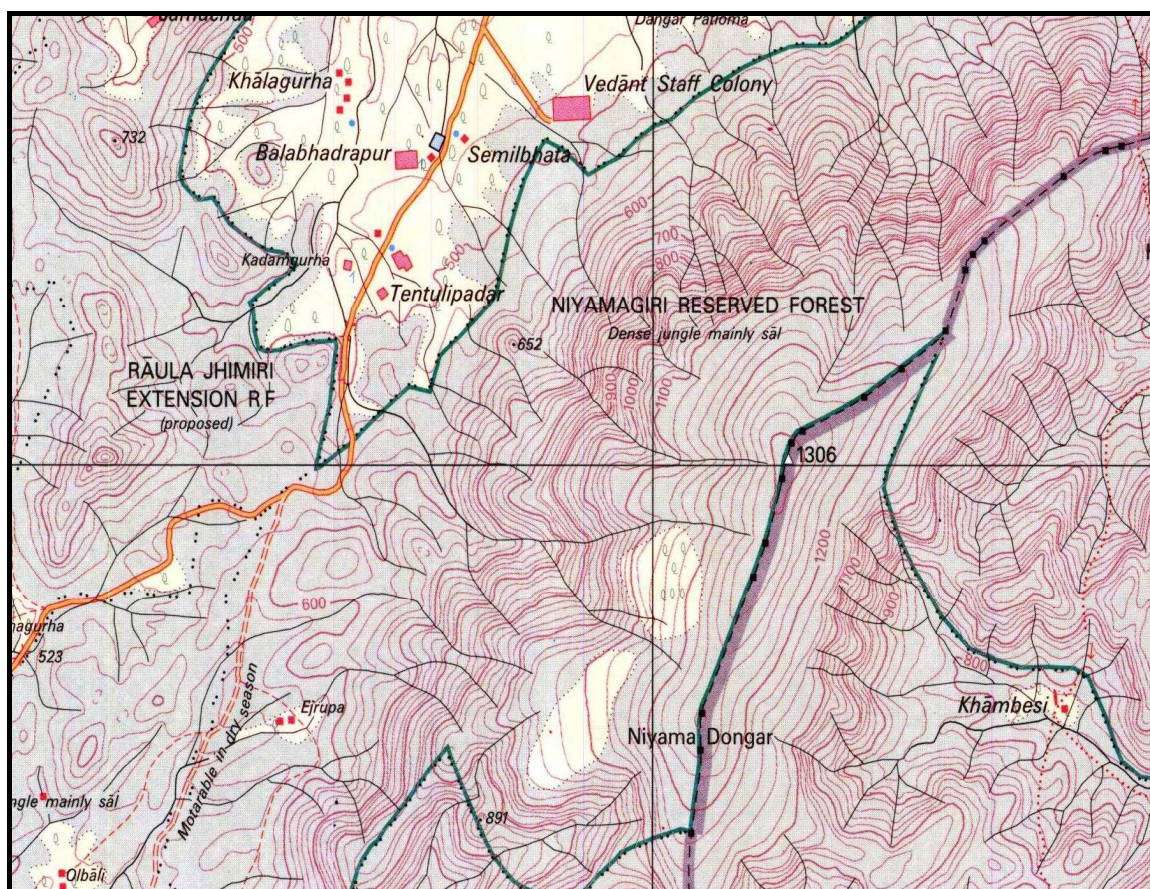


Fig1: Geographical location of Niyamgiri Hills

### Methodology

#### Ethnobotanical surveys

An ethnobotanical survey at Niyamgiri Hills of District Rayagada was carried out from 26-03-2010 to 31-03-2010. The informations on plants used as traditional medicine against eczema or other skin diseases were collected through interactions with Dongaria community and their medical practitioners. The medicinal property of plant under study was

confirmed by at least 4 informants. A total 94 Dongaria peoples were interviewed during the study. Out of 94, 88 (94.62 %) persons were men and only 6 were women (6.38%). Interviews were conducted in the Odia language. Ethnobotanical surveys revealed that the majority of men of this community were familiar with many herbs found in the locality and their uses in health care.

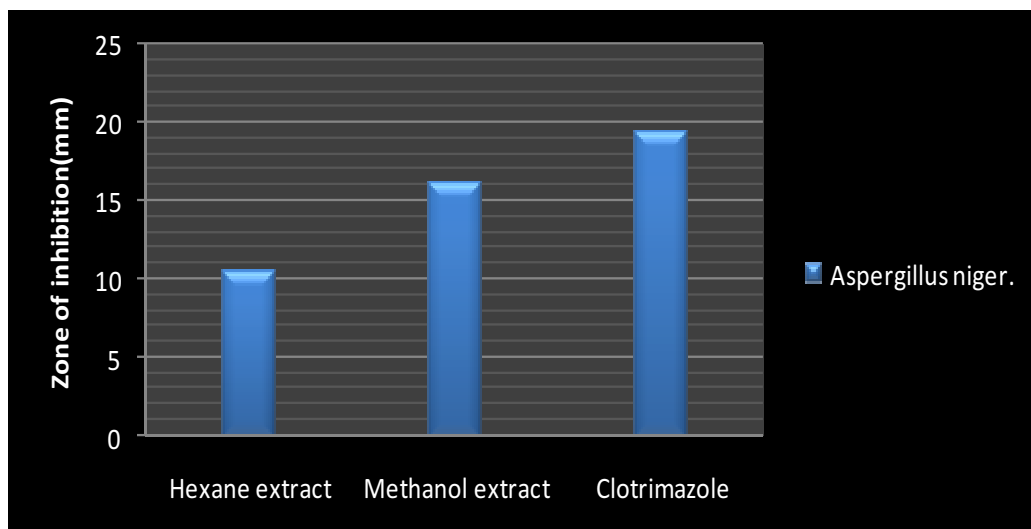
**Qualitative analysis of bioactive compounds and Antifungal activity**

The collected plant materials were washed thoroughly by tap water followed by distilled water twice and were oven dried at 30 degree Celsius. The dried materials were crushed to powder with mechanical devise and were kept it in air tight container for qualitative analysis of bioactive

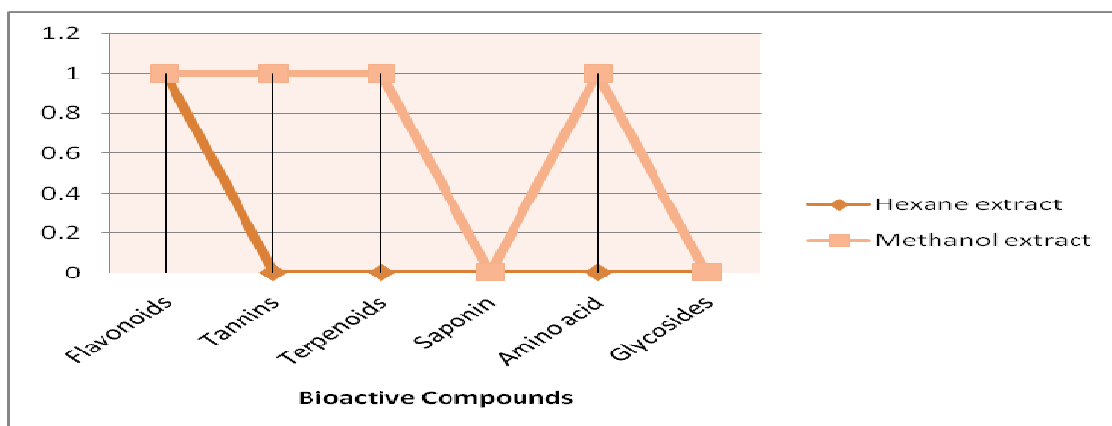
compounds of *Cassia fistula* L. Phytochemical analysis were done using percolation method for crude extract and qualitative analysis for bioactive compound was done followed by Harborne<sup>8</sup> (1973), Trease and Evans<sup>9</sup> (1989). The antifungal activity of *Cassia fistula* L. was done using agar diffusion method followed by Scorzoni<sup>10</sup> et al.

**Table 1:** Enumeration of Plant species against skin disease among *Dongaria Kandha* at Niyamgiri Hills.

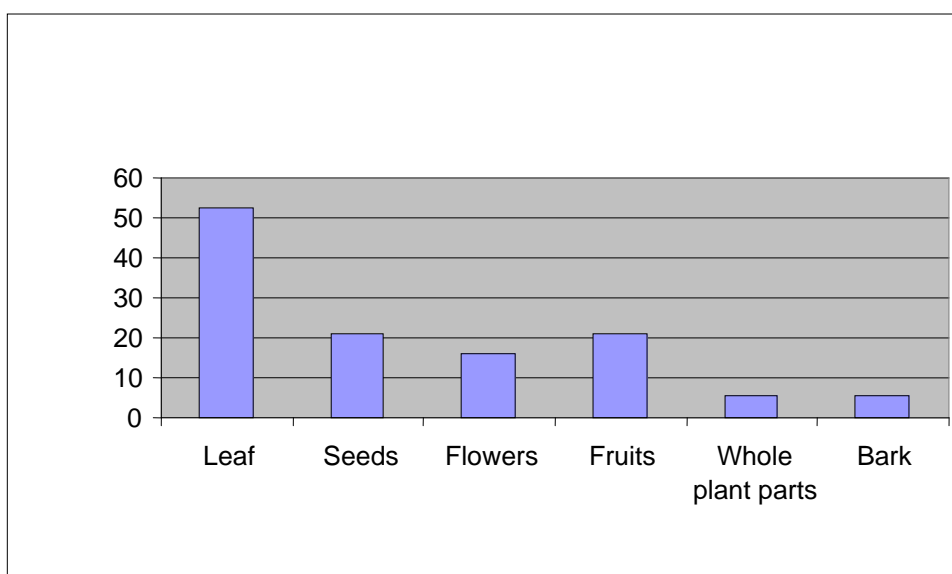
Plant species	Local Name	Family	Number of Informants (M-MALE F-FEMALE)	Uses
1) <i>Andrographis paniculata</i> Nees. (Brum.f.) Wall. Ex Nees	Chiraita, Bhui nimba	Acanthaceae	03 (M-3)	Fresh leaf chewing in empty stomach to cure all type of skin disease
2) <i>Argemone mexicana</i> L.	Udoshomari, Khurokonta	Papaveraceae	04 (M-4)	Seed paste is applied on lesions to cure of eczema
3) <i>Azadiracta indica</i> A. Juss.	Nimba	Meliaceae	10 (M-9, F-1)	Flowers powder with leaf powder mix with seed oil of <i>Pongamia pinnata</i> is used to cure skin infections and eczema
4) <i>Lawsonia inermis</i> Linn.	Mehendi	Lythraceae	06 (M-6)	Leaf paste with mustard oil is applied to cure skin infections
5) <i>Pongamia pinnata</i> L.	Karanja	Fabaceae	20 (M-19, F-1)	Seed oil is used to cure eczema and other skin infections
6) <i>Cassia fistula</i> L.	Sunari, Pujariguda	Caesalpinaceae	09 (M-8, F-1)	Leaf paste is externally applied to cure eczema or other skin disease.
7) <i>Marsilia quadrifolia</i> L.	Sunsunia sago.	Marsileaceae	02 (M-2, F-1)	Leaf powder mix with Karanja (Seed oil of <i>Pongamia pinnata</i> ) oil and applied externally to cure skin disease
8) <i>Christella dentate</i> Forssk.	Kokkodi	Thelypteridaceae	01 (M-1)	Leaves paste with coconut oil is applied externally to cure skin infections
9) <i>Datura mete</i> L.	Durdura	Solanaceae	12 (M-12)	Leaf juice externally applied to the lesions of eczema
10) <i>Cucumis hardwicki</i> (Royle) Alef.	Pita dimbo	Cucurbitaceae	03 (M-3)	Fruits juice externally applied to the lesions of eczema.
11) <i>Calotropic Gigantean</i> (L.) Br.	Arko	Asclepiadaceae	02 (M-2)	Aqueous paste of leaf powder is applied externally on lesions of eczema
12) <i>Cassia tora</i> (L.)	Sano Chakonda	Caesalpinaceae	01 (M-1)	Fresh leaf juice applied on itching
13) <i>Euphorbia hirta</i> L.	Khirmi, Dudhir	Euphorbiaceae	02 (M-2)	Whole plant parts are in cuts as antiseptic
14) <i>Cassia occidentalis</i> L.	Ghoda chakonda	Caesalpinaceae	01 (M-1)	Flowers and leaf paste applied to cure skin infection
15) <i>Semicarpus anacardium</i> L. f.	Valia	Anacardiaceae	02 (M-1, F-1)	Fruit oil applied externally to cure skin disease
16) <i>Abutilon indicum</i> (L.) Sweet.	Pedi-pedika	Malvaceae	04 (M-4)	Some leaves rubbed and the juice applied directly to cure wounds
17) <i>Litsea glutinosa</i> (Lour.) Robins.	Ponjo	Lauraceae	03 (M-3)	Paste of Bark powder with Nimba leaves applied externally
18) <i>Ricinus communis</i> L.	Joda	Euphorbiaceae	03	Seed oil applied on itching portion
19) <i>Butea monosperma</i> (Lam) Taub.	Palaso	Fabaceae	05 (M-5)	Decoction of flowers applied on the affected area of leprosy and other skin diseases



**Fig 2:** Diameter of zone of inhibition (mm) of hexane extract and methanol extract with Clotrimazole as a control

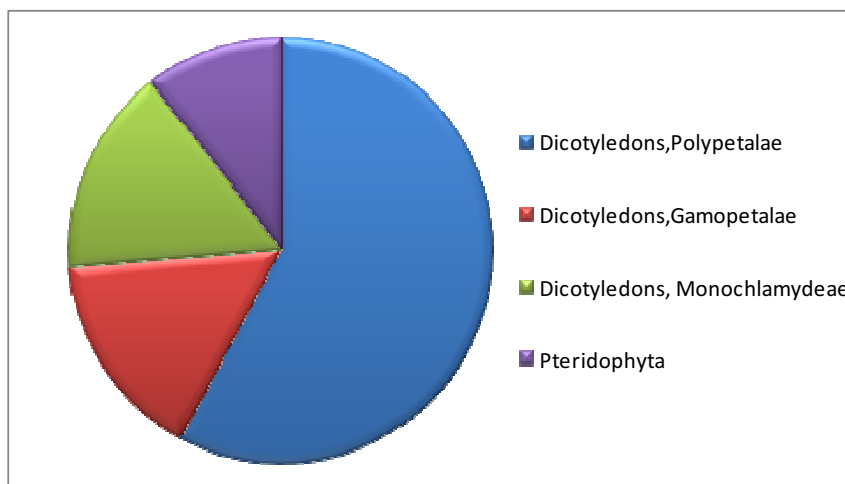


**Fig 3:** Qualitative analysis of leaves of *Cassia fistula* L. with two organic solvents.



**Fig 4:** Parts of plant used against skin diseases by Dongaria Kandha in Niyamgiri Hills, Odisha, India.





**Fig 5:** Diversity of Plant species used against skin diseases by Dongaria Kandha community in Niyamgiri Hills, Odisha, India.

### Results

From the field survey with the tribes of Niyamgiri Hills, it was found that 19 plant species are being used to treat eczema and other skin diseases by the Dongaria Kandha community of this locality. Of the 19 plant species, 6 species were found to be trees, 6 species were shrubs, 1 species was a climber, 4 species were herbs, 1 species was under tree and rest 1 species was growing in marshy areas aquatic habitats. Among 19 Plants 2 plants belong to Pteridophyta, 11 plants belong to Polypetalae (Dicotyledons), 3 plants belong to Gamopetalae (Dicotyledons) and rest 2 plant belongs to Monochlamydeae (Dicotyledons) according to Bentham and Hooker classification (Fig:5). Majority of families (12) were mono-specific. Eight species namely, *Andrographis paniculata*, *Lawsonia inermis*, *Cassia fistula*, *Marsilia quadrifolia*, *Christella dentate*, *Datura metal*, *Cassia tora* and *Abutilon indicum* are being used by these people to cure various type of skin disease using their leaves (Table – 1). Most of plant species belong to family Caesalpiniaceae, Fabaceae and Euphorbiaceae rest are belongs to Acanthaceae, Papaveraceae, Meliaceae, Lytheraceae, Solanaceae, Cucurbitaceae, Asclepiadaceae, Anacardiaceae, Malvaceae, Lauraceae and Marsileaceae (Table -1). *Litsea*

*glutinosa* was a rare medicinal plant and tribal people use powder of bark with leaves of Neem to cure skin diseases (Table-1). Also flowers of *Butea monosperma* (Lam) Taub (Fig: 10) are effective in leprosy and fruits juice of *Cucumis hardwicki* (Royle) Alef. (Fig: 11) is effective in eczema. *Cassia fistula* L. is extensively used for curing eczema by them. The survey indicated that leaves are mostly used (52.63 %) against skin diseases (Fig: 4). Barks (5.26%) of the plant is least used among this community (Fig: 4). Of the 19 plant species, *Cassia fistula* L. is a common plant in Niyamgiri forest and very familiar to Dongaria kandho. 9 informants claimed its use for skin diseases. The phytochemical analysis of leaf of *Cassia fistula* L. showed the presence of flavonoid in both extract and presence of tannin, terpenoid and amino acid only in methanol extract (Fig: 3). The MIC test showed good zone of inhibition against the organisms in methanol and hexane extract compared to standard (Fig: 2). Thus justifies the potent medicinal value of methanol extract<sup>11</sup>. This reporte also supports that tannins have astringent properties, healing of wounds and inflamed mucous membranes. The presence of tannin in methanol extract (Fig: 3) is likely to be responsible for the free radical scavenging effects which provide potent medicinal value of *Cassia fistula* L. as an antioxidant.

### Conclusions

The findings of the survey emphasized that herbal medicines are widely used by the tribal people and these medicine have great potentiality to cure different types of skin diseases including eczema. The indigenous rural community mostly depends on traditional healthcare system. The study of antifungal activity as well as the literature survey justifies the traditional therapeutic claims of *Cassia fistula* L. among Dongaria kandha to treat eczema and other skin diseases. The study further emphasizes upon the collection of detailed information on medicinal plants of Niyamgiri Hill and the presence of bioactive compounds in different plant parts. Anthropogenic activities such as unsustainable harvesting and cultivation practices, over exploitation of bio-resources have lead to serious threat to such

potential genetic resources available in this area. This has further led to the decline of medicinal plants drastically in their natural habitat<sup>12</sup>. Therefore the Ecologist, Ethno-botanist, Pharmacologist, Anthropologist and Plant Taxonomist should pay attention towards the conservation of such resources which in turn will lead to develop strategy for conservation of rich biodiversity.

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Fig 6: - Flowers and leaves of *Cassia fistula* L.

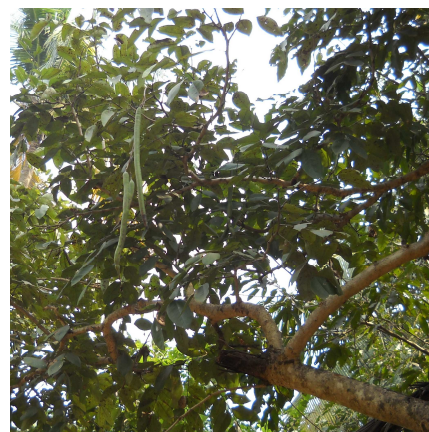


Fig 7: Fruits and leaves of *Cassia fistula* L.



Fig 8: Dongaria women peeling seeds of *Ricinus communis* L.



Fig 9: Dongaria Kandha with Corresponding author during questionnaire



Fig 10: Flowers of *Butea monosperma* (Lam) Taub.



Fig 11: Fruits of *Cucumis hardwickii* (Royle) Alef.

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