

# The Journal of Phytopharmacology

(Pharmacognosy and phytomedicine Research)

## Research Article

ISSN 2320-480X

JPHYTO 2021; 10(6): 484-489

November- December

Received: 04-10-2021

Accepted: 24-10-2021

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doi: 10.31254/phyto.2021.10609

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## Floristic study of perennial flora and ethnomedicinal uses in annual ground fire affected part of dry deciduous forest, Godapiyasal Paschim Medinipur, West Bengal, India

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### ABSTRACT

The lateritic belt of south West Bengal is characterized by dry deciduous forest mainly dominated by Sal. The Godapiyasal forest range, near to Midnapore sadar town and beside NH14 is Sal dominated mixed forest with five to six subdominants of similar life form. The forest area scattered in a vast area with intermittent villages and a major portion of it is affected by ground fire annually. This study was conducted to record the present vegetation status of perennial plants of this forest with their actual habit observed along some soil physico-chemical conditions. Survey and sampling were done randomly up to fourteen km along the road through the forest in second and third week of February, 2019. Along the road, from 10 different roadside points up to one km within the forest both sides were surveyed throughout accessible zones by walking without hampering the vegetation. Photographs were taken also. Plants were identified following local, regional and continental Flora and with the help of expert persons. Soil samples were collected from those zones from up to 20 cm depth and mixed well to form composite soil sample and studied in triplicate. Soil pH, moisture content, organic carbon contents were studied. The survey revealed forest was with 32% trees, 15% small trees, 22% shrubs and climbers or lianas, 8%, herbs and 1% fern. Soil analysis revealed pH 5.5-5.6, moisture content 0.86%, and organic carbon-0.004%.

**Keywords:** Controlled burning, Deciduous Forest, Laterite soil, Plant community.

### INTRODUCTION

Plant vegetation of a particular area is characterized by different factors, i.e. phytogeography of the region, altitude, climate; soil physico-chemical conditions as, pH, moisture, nutrient level and cycling, etc. In forest community, interactions among plants themselves are also an important factor for community composition; as plants interact various way of positive, negative or neutral ways [1]. Community Flora is also depended on Fauna, as animals mostly take part in pollination and seed dispersal [2]. Anthropogenic interference and interactions are also directing forces of vegetation type; directly and indirectly by extraction of forest products, poaching animals, introducing exotic plants. Exotic plants also exert a strong pressure on natural forest structure and plant biodiversity [3]. Moreover, grazing in village adjacent forest area also causes loss of natural vegetation.

Forest of Godapiyasal range is a natural deciduous forest dominated by sal, *Shorea robusta*, along with sub dominated species like, piyasal, *Pterocarpus marsupium*, Mohua, *Modhuca latifolia*, kend, *Diospyros melongena* etc. Though the forest area is discontinuous and scattered with intermittent villages, the whole area covers a land of 1700 km<sup>2</sup> that is 14.3% of total forest area of this state. This forest play a role in livelihood of the adjacent village peoples by providing fuelwood, and non-timber forest products (NTFPs); as sal leaves, for making biodegradable plates; kendu leaves and fruits, Mohul fruit for beverage preparation, various mushrooms, fruits. The forest is also a good source for ethno medicine and other ethno-botanical uses of these plants by local people [4, 5]. The forest is inhabited by some small animals too but with poor population structure. In winter sometimes elephant hards from Dalma forest range visit or passes through.

The forest is frequently found on ground fire in post winter to early spring in order to clear forest floor by villagers to collect NIFPs at ease [6]. The soil is red lateritic, throughout nutrient poor, dry and acidic in nature. Regular burning may lead the soil infertile and more nutrient poor [7] besides the direct effect on vegetation. Forest is not only some gathering of trees, it is one of the most productive and sustainable ecosystems on earth, management of forest must embrace the management of ecosystem too. The exhaustive analyses of effect of fire on forest animals, soil structure, microbial community, nutrient cycle, global increment of greenhouse gases, pathogen attack chances of fire injured plants, deformed timber; actually, a study on ecosystem is needed to judge [8].

Forest studies conducted so far in the entire lateritic zone in West Bengal concentrated on floristic and ethno botanical aspects [9, 10]. Gupta Joshi [11] had done a preliminary quantitative analysis of vegetation structure covering a few sites in lateritic zone. Documentation about sacred groves of West Medinipur district [12, 13] species diversity and community structure of Sal forests under different rainfall regimes compared [14, 15]. No reports are available on vegetation of Godapiyasal forest. The objective of the study was to analyze the vegetation structure according to plant habit or life forms; enlist the forest flora, to know the forest plant composition in present state and impact of anthropogenic interactions and burning of forest ground annually on the vegetation in this lateritic zone. The data may help to control the forest structure by better management to conserve the forest flora.

## MATERIALS AND METHODS

### Study area

Godapiyasal forest is situated in Godapiyasal forest range, Paschim Medinipore, West Bengal (Figure 1), within 22°31'48.9" - 22°56'42"N and 87°19'45"- 87°27'92"E. The temperature ranges from 28°C to 45°C in the summer and 10°C to 21°C in the winter months. This area shows four distinct seasons - winter, spring, summer and monsoon throughout the year. Average rainfall is 1649.0 mm occurring mainly in monsoon of mid-June to August. Soil is red lateritic rich in iron and aluminium content and poor in available nutrients. Godapiyasal forest is a very old natural forest covering 1700 km<sup>2</sup> area that is 14.31% of total forest cover of West Bengal. The forest is dominated by sal, *Shorea robusta* with six to seven subdominants of same life form. Forest was not burned till then study done but not onset on flowering too.

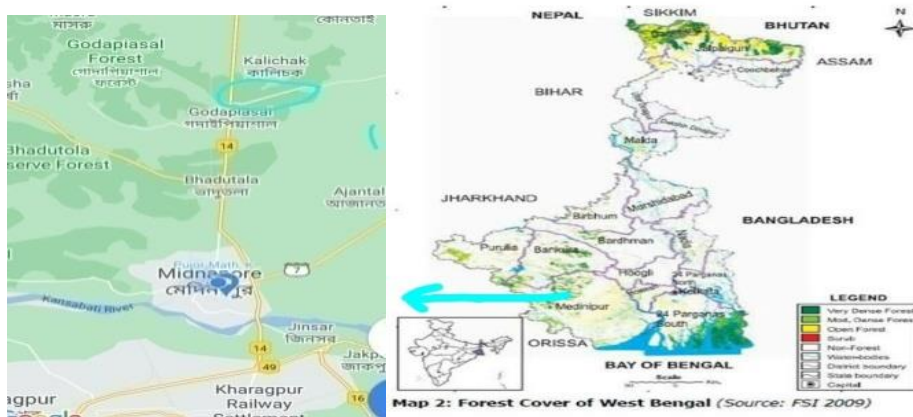


Figure 1: The study area (circled in blue)

**Vegetation sampling and soil study:** Survey and sampling was done randomly up to fourteen km along the road through the forest in second week of February, 2019. From 10 different roadside points up to one km each within the forest was surveyed throughout accessible zones by walking without hampering the vegetation. Some of the plant specimens were collected for herbarium sheet preparation and preserved in college Herbarium. Photographs were taken also. Plants were identified following local, regional and continental Flora [5, 15, 16, 17] and with the help of expert persons.

Soil samples were collected from these five zones from up to 20 cm depth and mixed well to form composite soil sample and studied in triplicate. Soil pH, moisture content [18], organic carbon content [19] were studied.

## RESULTS AND DISCUSSION

In this study, total 60 perennial plant species belong to 20 families were noticed. According to the habits observed 19 species belongs to trees, nine to small trees, 13 to shrubs, 13 to climbers and lianas, three perennials two herbs and one fern species (Table 1). Some small trees of natural habits were observed in shrub conditions only (not sapling) and mentioned as observed. The % of life forms is shown in Figure 2. Maximum number of species belongs to Fabaceae (*sensu lato*) family; followed by Rubiaceae, Apocynaceae and Combretaceae. Climber mainly belonging to Dioscoreaceae, Menispermaceae and Papilionaceae.

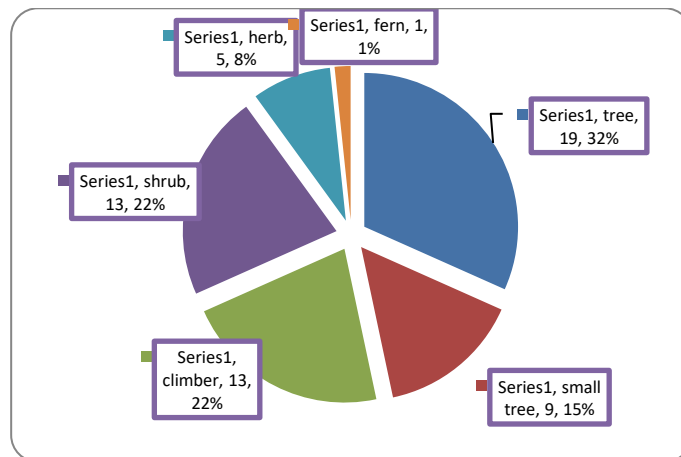


Figure 2: Percentages of life form present in forest.

Soil analysis revealed pH 5.5-5.6, moisture content 0.86%, and organic carbon-0.004%. Near the periphery, forest floor in almost clear from leaf litter or ground herbaceous flora. Actually, herbaceous vegetation is very rare and confined to some pockets or very sparse. Shrubs or small trees and mostly the branches arise from the remnant of near ground stem only, some are forming bushes of sparingly extended branches. New seedling or saplings of small trees and shrubs are very rare in this portion. New plants are only confined to mainly near the termite hills of base of sal trees. As the soil is dry and hard by

repeated burning, they failed to establish or rejuvenate elsewhere after burning. Towards inner zone of the forest density and abundance of species gradually increased and the number of climbers and lianas. These zones possibly formed some microclimate with increased soil moisture. In dense forest, saplings of large trees, and frequency of shrubs and small trees were better, with some ground vegetation including ferns and annuals.

Clearing of forest floor for NTPPs collection and cutting of small trees and bushes for fire-woods hampered the forest community and ecosystem visibly pathetic. Moreover, ground fire for cleaning forest floor early to monsoon not helped the seedling establishment or nutrient cycling by microbial activity as depicted by organic carbon content. The loss of surface soil moisture and organic matter possibly challenged the seed germination and establishment. Though burning adds potash to soil, high temperature hampers the soil microbial flora which takes active part in solubilizing soil nutrients to make those available for plants [7]. Continuous hardening of soil due to annual burning disrupted this ecosystem function affecting plant establishment and biodiversity. Seedling of one year may never be hardy enough to withstand burning and hence number of seedlings and saplings is so scanty.

The survey revealed forest was with 32% trees, 15% small trees, 22% shrubs and climbers or lianas, 8%, herbs and 1% fern (Figure 2). Though showing heterogeneous composition, poor presence of herbaceous vegetation in floor and absence of geophytes,

hemicryptophytes and saprophytic or ectomycorrhizal Basidiomycota fruit bodies indicate a damaged community and ecosystem. The uncontrolled and intense ground fire may affect soil structure, biotic community [7], nutrient cycle, global increment of greenhousegases, and pathogen attack chances of fire injured plants [8]. Tree species are differently affected according to their physiology and genetics. Some species are fire resistant others sensitive and the degree vary. It not affects much on established trees of *Shorea robusta* and *Pterocarpus marsupium* and they recover onset of favourable climatic condition but the juveniles are adversely affected. *Terminalia chebula*, *T. bellirica* having commercial and medicinal values; *Hiptage benghalensis*, *Gardenia spp.* with aesthetic and medicinal values; *Modhuca latifolia*, *Diospyros spp* etc. for NTPFare fire sensitive and gives poor yield and due to frequent fire incidence. Burning favours invasion of obnoxious and exotic weeds as *Lantana camara*, *Eupatorium odoratum*, *Parthenium hysterophorus*, *Cassia tora*, *C. occidentalis* etc. [3], which are already noticed in plenty in the borders of the forest? Lopping of small trees for fire wood and other purposes hampering the growth and both impacts turned those to small shrub structure. All plants are not good coppicers and age also the factor [21], so small trees or large shrubs are remarkably low and the condition is threatening enough, particularly in peripheral forest Zone. This poor ecosystem functioning and plant diversity and richness may affect the fauna with their decreasing resources; that in turn will affect the plant community also. In order to maintain the plant and animal diversity and the forest itself for future anthropogenic disturbances need to address.

**Table 1:** List of Plants found in Survey.

Sl. No	Name of Plants	Family	Habit	Local/common Name	Parts used	Medicinal uses
1	<i>Aglaiia odoratissima</i> Bulme	Meliaceae	Tree	Priyangu.	Flowers Leaves	Have insecticidal properties, antifungal & antibacterial. Diarrhea.
2	<i>Alangium salvifolium</i> L.	Sapindanceae	Small Tree	Ankar.	Roots Fruits	Antidote against snake/scorpion, rabbit, rat, and dog bites. Used to treat rheumatism and hemorrhoid externally.
3	<i>Antidesma acidum</i> Retz	Euphorbiaceae	Small tree	Matha.	Leaves Roots	Cholesterol Bile complaints.
4	<i>Atlantia missionaries</i> Oliv.	Rutaceae	Small tree	Kankla.	Fruits	Used to treat chronic rheumatism.
5	<i>Allophyllus cobbe</i> L. (Blume)	Sapindaceae	Shrub	Rakhalful.	Leaves Roots Bark	Stomach aches and fevers.
6	<i>Stylosanthes guanensis</i> Datz	Papilionaceae	Woody climber	Banbihuiti.	Seeds	Kidney pain, colds & reducing fever.
7	<i>Uraia picta</i> (Jack) Desv. ex, Dc	Papilionaceae	Herb	Sankar Jata.	Whole plant	Gonorrhea, diarrhea.
8	<i>Milletia pinnata</i> (L.)Pannigrahi	Papilionaceae	Tree	Karanjo.	Roots	Tumors, piles, skin disease.
9	<i>Pterocarpus marsupium</i> Roxb.	Papilionaceae	Tree	Piyashaal.	Leaves	Fractures, constipation, hemorrhage.
10	<i>Bauhinia vahlii</i> (Wt & Am) Benth.	Papilionaceae	Woody Climber	Lata Kanchan.	Seeds Leaves	Tonic and aphrodisiac. Demulcent and mucilaginous.
11	<i>B.racemosa</i> Lamk.	-do-	Small tree	Banraj.	Bark Leaves	Headache, fever, skin disease.
12	<i>Butea monosperma</i> L.	-do-	Tree	Palash.	Flowers	Leprosy, strangury and gout.
13	<i>B. superba</i> Roxb.	-do-	Woody Climber	Latapalash.	Roots	Used to treat diarrhea, painful or difficult urination.
14	<i>Caesalpinia bonduc</i> (L) Roxb.	Caesalpinaceae	Tree	Natakaranj.	Bark	Have anthelmintic activity, antioxidant activity.
15	<i>Cassia mimosoides</i> L.	Caesalpinaceae	Herb.	Patwaghas	Stem	Weight loss, kidney swelling.
16	<i>Tamarindus indica</i> L.	Caesalpinaceae	Tree	Teatul.	Fruits	Wound healing, abdominal pain and diarrhea.
17	<i>Pithecellobium dulce</i> (Roxb). Wild.	Mimosaceae	Small tree	Jilibi	Bark	Used as gum ailments, toothache and bleeding.
18	<i>Mimosa pudica</i> L	Mimosaceae	Herb	Lajjabati.	Roots Leaves	Dysentery, smallpox. Hemorrhages, fistula.
19	<i>Carisa spinarum</i> L.	Apocyanaceae.	Shrub	Bankaramcha	Root	Inflammation, arthritis and cancer disease.

20	<i>Cryptoletis buchany</i> R.Br. Ex. Roem & Shult	Apocyanaceae	Climber.	Kakra Shringi.	Stem	Inflammation, muscle and joint pain.
21	<i>Ichnocarpus frutescens</i> L. Br.	Apocyanaceae	Climber	Shymalata	Leaves Roots	Liver disease, jaundice & fatty liver. Used to treat antimicrobial activity, wound healing activity.
22	<i>Hollarhena antidysenterica</i> Wall. Ex G. Don.	Apocyanaceae	Tree	Kurchi.	Bark	Used as constipation, colic & diarrhea.
23	<i>Cerisoides turgida</i> Roxb.	Rubiaceae.	Shrub	Gurman.	Leaves	Scorpionstring, epilepsy & stomach achache.
24	<i>Meyana laxiflora</i> Robyns	Rubiaceae	Shrub	Moynakanta.	Whole plant	Used to treat inflammation, gastrointestinal disorder.
25	<i>Gardenia gummifera</i> Linff.	Rubiaceae	Shrub	Banangir/bhuro	Leaves Fruits	Have antifungal properties & Antibacterial properties.
26	<i>G. latifolia</i> Ait.	Do	Shrub	Dombhuro.	Fruits	Stomach pain, fevers & skin disease.
27	<i>Morinda angustifolia</i> Roxb.	Rubiaceae	Small tree	Daruharidra.	Roots	Small pox, skin disease.
28	<i>Haldenia cordifolia</i> (Roxb.) Ridsdale	Rubiaceae	Tree	Karam	Bark	Antiseptic & febrifuge.
29	<i>Randia spinosa</i> Poir.	Do	Shrub	Maniphala.	Fruits	Have antispasmodic activity & anti-inflammatory.
30	<i>Cleistanthus collinus</i> (Roxb) Benth & Hook.f.	Euphorbiaceae	Tree	Kalajari.	Leaves	Used against the pathogens.
31	<i>Cheliantes tenuifolia</i> (Burm.fil) Sw.	Polypodiaceae	Fern.	Rock fern	Rhizome Roots	General tonic. Cure wound.
32	<i>Dioscorea bulbifera</i> L.	Disoscaraceae	Climber	Banal.	Tuber	Used against jaundice, nervous disorders & treatment of stomach ache.
33	<i>D. esclenta</i> (Roxb.) Pin & Burkill	-do-	-do-	Kantal.	Tuber	Chest pain, nervous disorders & swellings.
34	<i>D. pentalphyala</i> L.	Do	-do-	Suoralu.	Tuber	Have antimicrobial activity, antibacterial & antifungal.
35	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Tree	Kend.	Leaves	Used to treat scabies & old wounds.
36	<i>Ehretia laevis</i> Roxb.	Boragianeae	Shrub	Tamati.	Stem	Skin disease.
37	<i>Flacourtia indica</i> ( Burunt)	Flacourtiaceae	Shrub	Bainchi.	Fruits Leaves	Appetizing and digestive. Used for treatment of snake bite.
38	<i>F. jangams</i> Raeusch.	-do-	Tree	Barabainchi	Leaves Roots	Bronchitis. Used for suppress toothache.
39	<i>Combretm decandrm</i> Roxb.	Combrtaceae	Lianes	Atong.	Seeds Leaves	Eczema. Relieve diarrhea & gastric trouble.
40	<i>Terminalia belerica</i> (Gaertn) Roxb.	Combretaceae	Tree	Bahera.	Fruits	Protect the liver& respiratory conciliations.
41	<i>Terminalia elliptica</i> L.	Combretaceae.	Tree	Asan	Bark	Have antifungal, antioxidant & antileucorrheal properties.
42	<i>T. arjuna</i> L.	Do	Do	Arjun.	Bark	Cardio tonic in heart failure ischemic & myocardium necrosis.
43	<i>Anogeisus latifolia</i> (Roxb.ex.DC) Wallex Bedome	Combretaceae	Small tree	Dhaw.	Leaves	Used to treat UTI infection, skin disease & fever.
44	<i>Litesa gultinosa</i> (Lour) C. B. Rofis.	Lauraceae	Tree	Kukurchita.	Roots	Reduce fever & reduce swelling
45	<i>Sclichera oleosa</i> (Lour) O'kan	Sapindaceae	Tree	Kusum.	Bark	Used against leptotic ruptures, skin inflammations.
46	<i>Syizizium operculatum</i> Gamble	Myrtaceae	Small tree	Chukijam.	Bark	Sore throat, bronchitis & asthma.
47	<i>Zizyphus oenophila</i> Mill	Rhamnaceae	Shrub	Shiakul	Leaves	Dressing for wounds.
48	<i>Cissus adnanta</i> Roxb.	Vitaceae	Woody climber	Panialata.	Whole plant	Used to treat conditions such as hemorrhoids, bone loss & diabetes.
49	<i>Streblus asper</i> Laur.	Moraceae	Small tree	Shaora.	Twigs	Tooth cavities, leprosy & diarrhea.
50	<i>Lannea comondelica</i> (Houtt) Merril.	Anacardiaceae	Tree	Piyal.	Gum	Assortment of diseases.
51	<i>Buchannia lanzan</i> Sprang	Anacardiaceae	Tree	Piyal.	Gum Roots	Used against leprosy. Used in acrid, cooling & constipating.
52	<i>Mimsops hexandra</i> Roxb.	Sapotaceae	Shub	Khira Khejur.	Seeds	Jaundice, ulitis, odontopathy & colic dyspepsia.
53	<i>Oroxylum indicm</i> Vent.	Bignoniaceae	Tree	Shona.	Bark	Jaundice, arthritic and rheumatic problem.
54	<i>Tinospora cordifolia</i> Wild (Miers ex Hook f. ex Thoms	Menispermaceae	Climber	Gulanacha.	Roots	Diabetes, high cholesterol & allergic rhinitis.
55	<i>Tiliacara acuminata</i> (Lam) Hook. f. & Thoms.	Menispermaceae	Climber	Telilata.	Leaves	Applied to cuts in folks.
56	<i>Capparis sepiaria</i> L.	Capparaceae	Bush	Kaliakara.	Fruits	Blood purifier, stomachic, tonic & appetizer.
57	<i>Shorea robusta</i> Roxb.	Dipterocarpaceae	Tree	Sal.	Fruits	Piles, leucorrhoea, gonorrhoea & diarrhea.
58	<i>Limmonia acidum</i> L.	Rutaceae	Shrub	Belishan.	Fruits	Have anti hyperglycemic and anti hyperlipidaemic properties.

59	<i>Hiptage benghalensis</i> Kurtz.	Malpigiaceae	Liana	madhabilata	Leaves	Biliousness, cough & burning sensation.
60	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Ulmaceae	Tree	Natakaranj	Bark	Applied externally on the white patches of leucoderma.



**Figure 3:** Upper row: - *Madhuca latifolia*, *Hiptage benghalensis*, *Oroxylon indicum* and *Pterocarpus marsupium*, *Hollarhena antidysenterica*, Middle row: - *Gardenia latifolia*, *Cerisoidrs turgid*, *Meyna laxiflora*, *Allophyllis cobbe*, *Flacourtia indica* Lower row: - *Chelianthus tenquifolius*, *Gardenia gummifera*, *Shorea robusta*, *Diospyros melanoxylon*. Plants mostly with near ground stunted growth in affected portion.

## CONCLUSION

The study revealed though the part of the forest is rich in flora but the vegetative growth and life form of small trees, climbers' shrubs and are highly hampered by different anthropogenic activities, mainly ground burning, lopping grazing etc. The forest needs more attention in management as the forest that is rich in biodiversity and a source of ethno medicines and livelihood for adjacent village people. As the forest is a good source of NTPF other than timber only, needs to care. The forest is also a source to observe hunting ceremony of tribal's; if vegetation density and diversity decreases other wildlife population will be in danger.

## Acknowledgement

The first author is grateful to Dr. G.C. Bera, Principal, Midnapore College, for his support in this work The First author is thankful to RUSA for funding in the Project. Contribution of authors: All authors

participated actively in survey, sampling and assessment. Compilation of data and manuscript preparation by first author.

## Conflict of Interest

None declared.

## Financial Support

None declared.

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#### HOW TO CITE THIS ARTICLE

Ghosh S, Jana M, Duary J, Das BR, Bhaumik S. Floristic study of perennial flora and ethnomedicinal uses in annual ground fire affected part of dry deciduous forest, Godapiyasal Paschim Medinipur, West Bengal, India. *J Phytopharmacol* 2021; 10(6):286-489. doi: 10.31254/phyto.2021.10609

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