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Research Article

Medico – Religious Plants of Odisha

Ethno-Medical Informations from Coastal Odisha, a Review

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Abstract: Traditional knowledge that is developed through the combined experience of many generations is still practiced in many tribal and rural societies. The aim of this review is to collect informations on the medico-religious plants used in the various ailments by the rural and Tribal population of Odisha with a focus on the pharmacological uses of *some plants*, in order to create room for future research. The novelty of our review is best understood from the fact that the religious basis of the plants of Odisha and their application has not yet been addressed and this is the first instance that such study is undertaken in a sequential manner. Worldwide accepted databases were searched for plants of Odisha, through electronic search, literature from Indian Classical texts and from different traditional books. Semi-structured interviews were conducted with 50 informants (Age 50yrs, with male 80% & female 20%) at 20 locations around different coastal districts of Odisha to find folkloric use of plants and photographs captured during different rituals observed throughout Year. A total of 46 numbers of plants were found widely used in the coastal district of Odisha for different diseases. The details like scientific name, family, local name and its utilization with the method of preparation were provided. Six plants were found to have religious background and were utilized frequently. Detailed investigations on reviewed plants relating to phytochemistry, pharmacology could be the future research interest in the area of phytomedicine.

Keywords: Phytomedicine, religious, Folkloric, Coastal-districts, *Corchorus depressus, Ocimum sanctum* L, *Azadirachta indica, Aegle marmelos, Emblica officinalis, Mimusops elengi*

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1. INTRODUCTION

In every generation, with the development of humankind and advanced civilizations, some plants having medicinal value are identified and passed on to next generations as they prove their healing properties. The benefits were passed on to another society that upgraded the old properties with new ones discovered. Thus ancient tests of medicine from countries all around the globe, such as Greece, India, Rome, China and others reveal useful information about the usage of the and are recognized a valuable assert for ethno pharmacological research and discovery.[1]Indian state of Odisha is located along the eastern coast on 26^0.00'N latitude and 94^0.20' E longitude. There is an undisturbed coastline (about 480 km long) starting from the seacoast of Suvernarekha in the north to Icchapuram in the south. The state has 30 districts, out of which 12 are tribal districts. The districts of Kendrapada, Balasore, Bhadrak Cuttack, Jagatsinghpur, Puri, and Jajpur that are located in the coastal belt of Odisha have a sticky and humid climate. The temperature typically ranges from 35- 40^0 C and low temperature ranges from 12-14^0 C. Average rainfall is 150 cm, experienced during July-September. In the months of October and November, the retreating monsoon also brings rain, but January and February are the dry seasons.[2]The recorded forest area of the state is 51,345 sq. Km, which constitutes 32.98% of the State's Geographical area. 6,967 sq. km is under very dense forest, 21370 square km is moderately dense and 23008 square km is open forest. Odisha has nearly 3.47 percent of India's population the rural population constitutes 83.32%, Urban 16.68% and tribal population constitutes 22.85%. The population density is 270 per sq.km. The forest rich area is dominated by the Tribal People who have their unique forest dependant life style. The people live in forests and hills, surrounded by variety of geoecological environments and far away from modern conveniences. About 62 modified schedule tribes comprising of total 6 million Tribals are present in the state. Because the rural villagers do not have access to the modern healthcare systems, they are highly reliant on traditional medicines. Due to its rich floral diversity and collection of ancient literature which could serve as a source of information for all systems of medicine, Odisha is rich in folk medicine and home remedies. A review of the ethno botanical records, depict that a number of excellent botanists led several ethno botanical studies in different regions of Odisha, but still the rich flora has remained ethno botanically unexplored. [3-9] This review is novel as the religious basis of plants of Odisha and their application has not yet been addressed and this is the first instance that such study is undertaken in a sequential and scientific manner. This article gives enormous scope for selection of plants around different coastal districts of Odisha, for future research in the field of Phytomedicine.

2. MATERIALS AND METHODS

Worldwide accepted databases in the relevant area were searched for medico-religious plants, plants of Odisha, *C. depressus*, through electronic search such as Pubmed, Science direct along with other literatures from Indian Classical texts, different traditional books, reports on Ethno-pharmacology and traditional medicines including 'Ayurveda'. Semi-structured interview were also conducted with 50 informants (mean age 50, with male 80% & female 20%) at 20 locations in and around different coastal districts of Odisha to find out the uses of variety of religious plants including *Corchorus depressus*

2.1 Medico-religious Plants of Odisha

Some of the Plants utilized by the tribal and rural population of Odisha are treated as sacred and worshiped by the local people. They are therefore termed as medico-religious. It has been found that these plants possess medicinal value and have been authenticated by various scientific researches which explain numerous remedies to treat different ailments. The details of the voucher specimen of the medico-religious plants are stored in the Herbarium, Pharmacognosy Department, SJCPS (Sri Jayadev College of Pharmaceutical Sciences), Bhubaneswar, India for future reference. Medicinal plants of Odisha, having religious background have been explained below;

Plant Name: *Ocimum sanctum* L.
Family : Lamiaceae
Common Name : Tulasi

2.2 Religious base

The plant is treated as sacred. The women in the state of Odisha worship the plant everyday in the morning after taking bath. The Plant is worshiped as "Brundabati", the common deity found in the house of every Hindu family. The leaves are treated as mostly holy leaves and utilised in the rituals related to Lord Vishnu (Lord Krishna). Each day after worshipping the plant maximum people of Odisha consume one or two leaves with small water and believed that by doing so they will be free from attack of any disease (Figure 1 & 2).


Figure 1

Fig 1.The Plant Ocimum sanctum


Figure 2

Fig 2. O. sanctum worshipped as 'BRUNDAVATI'

2.3 Medicinal value and Recorded Researches

2.3.1 Antiepileptic activity

Sarangi *et al* evaluated *Ocimum sanctum* on seizure model and its interaction with levetiracetam (LEV), an antiepileptic drug. The adjuvant role of *O. sanctum* hydro alcoholic extracts at 1000 mg/kg with levetiracetam 300mg/kg was evaluated in wistar rats using pentylenetetrazole (30mg/kg i.p.) kindling injection on alternative days. The neurobehavioral, seizure score, brain tissue oxidative stress and histopathology were evaluated. The seizure protection was more (85.72%) in combined drug group than others. Test groups of Ocimum had better memory retention potential which was evident from passive avoidance test and Morris water maze. Hence combination of levetiracetam along with *Ocimum Sanctum* showed better preservation of neuronal structure than control group.[10]

2.3.2 Anti-inflammatory activity

Singh *et al*., evaluated anti-inflammatory activity of the fixed oil of *Ocimum sanctum* against carrageenan and other mediator's induced paw edema in rats. The inhibitory effect was observed in castor oil induced diarrhoea and also inhibited arachidonic acid and leukotriene induced paw edema in wistar rat. On the basis of evaluation it was concluded that the Plant may be useful an anti-inflammatory agent which blocks cyclooxygenase and lipoxygenase of arachidonic acid metabolism.[11]

2.3.3 Antiulcer activity

The antiulcer activity of *Ocimum sanctum* was evaluated by cold restraint (CRU), aspirin (ASP), alcohol (AL), pyloric ligation (PL) induced ulcer models in rats and histamine induced duodenal (HST) ulcer model. The plant at dose of 100mg/kg was found to be effective in CRU(65.07%), ASP(63.49%), AL (53.87%), PL(62.06%) and HST(61.76%) induced ulcer models and significantly reduced free, total acidity and peptic activity by 72.58, 58.63, 57.6% respectively, and increased mucin secretion by 34.61%. Hence the plant may act as a potent agent for the disease of peptic ulcer. [12]

2.3.4 Immunomodulatory potential

Mediratta *et al.*, evaluated the seed oil of *Ocimum sanctum* on immunological parameters in stressed and non-stressed animals. Seed oil of the plant (3ml/kg i.p.) resulted in a significant increase in anti-sheep red blood cells antibody titre and decrease in actual percentage histamine release from peritoneal mast cells (humoral immune responses), as well as a decrease in footpad thickness and percentage leukocyte migration inhibition (Cell mediated immune responses) in sensitized rats. [13]

Plant Name: *Azadirachta indica* A. Juss
Family : Meliaceae
Common Name : Limba

2.4 Religious base

The plant is so sacred that people of Odisha worship this plant especially by the Hindus and they do not burn these woods for cooking. The Lord 'Jagannath', the Lord of every Oriya People, his brother Lord 'Balabhadra' and his Sister Goddess 'Subhadra' deities are built by the wood of Limba plant during Nabakalebara and worshipped in Sri Mandir (Temple) (Figure 3 & 4).


Figure 3


Figure 4

Fig 3. The Plant Azadirachta indica *Fig 4. Plant Worshipped as Lord 'JAGANNATH'*

2.5 Medicinal value and Recorded Researches

2.5.1 Antibacterial, anti-hemorrhagic and antisecretory activity

Thakurta et *al*., evaluated the antisecretory and antibacterial activity of *Azadirachta indica* (Neem) extract for *Vibrio cholera*, an agent of watery diarrhoea (cholera). The findings provide scientific backing for the usage of Neem by India's indigenous people to treat diarrhoea and deadly disease cholera.[14]

2.5.2 Chemo preventive potential

Dasgupta *et al.,* studied the 80% ethanolic leaves extract of *Azadirachta indica* at two different doses (250 and 500mg/kg) on Phase–I and Phase-II drug metabolising enzymes, glutathione content, antioxidant enzymes, lactate dehydrogenase and lipid peroxidation in the liver of 7-week old Swiss albino mice, as well as its anticarcinogenic potential were investigated using the benzo (a) pyrene- induced fore-stomach and 7, 12- dimethyl benz (a) anthracene (DMBA)-induced skin papillomagenesis protocols. The average number of Papillomas per mouse and the percentage of tumor-bearing animals were used to assess chemopreventive response. In terms of antioxidant enzymes the tested doses considerably increased the activities of hepatic glutathione reductase (GR), glutathione peroxidise (GPX), catalase (CAT) and superoxide dismutase (SOD) activities.[15]

2.5.3 Hepatoprotective activity

Chattopadhyay R.R. studied the hepatoprotective activity of

Azadirachta indica on blood and liver glutathione, Na+K+-ATPAase activity and thiobarbituric acid reactive substances against hepatic damage in rats by paracetamol. It was observed that the leaf extract has reversal effects on the levels of different parameters in paracetamol induced hepatotoxicity. The possible mechanisms of action behind the results were discussed in the article.[16]

2.5.4 Antidiabetic activity

Chattopadhyay studied invitro effect of *Azadirachta indica* leaf extract on serotonin inhibition in glucose driven insulin release in rat pancreas to determine the likely mechanism of antihyperglycemic effect. On insulin secretion mediated by glucose, the leaf extract of the plant significantly checks the inhibitory effect of serotonin. [17]

Figure 5

Fig 5.The PlantAegle marmelos

Plant Name: *Aegle marmelos* L.
Family : Rutaceae
Common (Odiya) Name : Bela plant

2.6 Religious base

The leaves of the plant *Aegle marmelos* L. are worshiped on the Lord Shivalingas (Lord Shiva) by the local people of Odisha and even throughout India. It is an essential component of many rituals related to Lord Shiva. The Purohit (Pandit) takes the holy leaves from the Bela Plant and offers the rituals by putting holy leaves on the head of Shivlinga (Figure 5 & 6).

Figure 6

Fig 6. The Leaves of Plant Aegle marmelos worshipped on "Lord Shiva Linga"

2.7 Medicinal value and Recorded Researches

2.7.1 Antiviral activity

Somu C. *et al* investigated the antiviral activity of *Aegle marmelos* against *Bombyx mori* nucleopolyhedrovirus (*Bm*NPV). Hexane extracts of Plant leaves with promising anti- BmNPV activity were submitted to bioactivity guided fractionation based on column chromatography among the numerous extracts examined. A compound with anti- Bm NPV activity was purified using a fraction with potential activity. This chemical was identified as 'seselin' following structural and functional investigations.[18]

2.7.2 Diabetic cataract Protective role

Sankeshi P. *et al.,* studied the anti-cataractous activity of *Aegle marmelos* in streptozotocin induced diabetic cataract rats. Three different solvents (pet ether, ethyl acetate and menthol) of the leaf extract were prepared and tested for inhibition against rat lens aldose reductase (AR), which is a key enzyme of polyol pathway. Furthermore, the extract's pharmacological capacity was studied in exvivo organ culture against osmotic stress induced lens opacification and STZ induced diabetic cataract in rats. According to the findings, the ethyl acetate extract of *A. marmelos* contains pharmacologically active components that have the capacity to inhibit rat lens AR and reduce osmotic stress.[19]

2.7.3 Anti-inflammatory activity

Kumari *et al.,* evaluated the anti-inflammatory activity of the water extract of dried flowers of *Aegle marmelos* by inhibition of the carrageenan induced rat paw edema. The mechanism of the action was evaluated by nitric oxide production inhibition of rat peritoneal cells, antihistaminic effect, membrane stabilising activity and inhibition of lipid peroxidation. In a dose dependent manner, the extract protected the erythrocyte membrane from heat-induced lysis and showed a significant antioxidant effect and lipid peroxidation inhibition activity.[20]

2.7.4 Effect on Thyroid hormone concentration

Kar *et al*., investigated the importance of *Aegle marmelos* (1.0 g/kg) leaf extract in the regulation of thyroid hormone concentration in male mice. In comparison to the control value, the decrease in T3 concentration by the plant was about 62% that shows its possible use in the regulation of hyperthyroidism.[21]

Plant Name: *Emblica officinalis*
Family : Euphorbiaceae
Common Name : Amla

2.8 Religious base

The plant is worshiped in the festival called "Ala Navami". The plant is known to the Oriya People and throughout India. During the above ritual, the people prepare Prasad and offer it to the plant and then distribute among the family members and relatives (Figure 7 & 8).


Figure 7

Fig 7. The Plant Emblica officinalis


Figure 8

Fig 8. The Plant Worshiped in "ALA NAVAMI"

2.9 Medicinal value and Recorded Researches

2.9.1 Antidiabetic activity

Nain *et al* studied that the oral administration of the hydro-methanolic (20:80) extract of leaves of *Emblica officinalis* Gaertn. (HMELEO) at 100, 200, 300,and 400 mg/kg body weight, daily for 45 days revealed a substantial ($P<0.05$) drop in fasting glucose and rise in insulin level when compared to diabetic rats. In the liver and kidney of diabetic rats, the treatment resulted in a significant ($P<0.05$) rise in reduced glutathione, glutathione peroxidase, catalase, superoxide dismutase and a drop in LPO level. The study revealed that the extract produced fast protective benefits against lipid peroxidation by free radicals scavenging and lowering the risk of diabetes complications.[22]

2.9.2 Antipyretic and Analgesic activity

James *et al* designed a study to investigate the antipyretic and analgesic activity of ethanol (EEO) and aqueous (AEO) extracts of *Emblica officinalis* fruits in experimental models. The findings exerted that *Emblica officinalis* fruits extracts possessed potent antipyretic and analgesic activity. Preliminary phytochemical analysis of extracts revealed the presence of tannins, alkaloids, carbohydrates, phenolic compounds and amino acids, all of which could be responsible for antipyretic and analgesic effects. [23]

2.9.3 Anti snake venom activity

Alam and Gomes studied the methanolic extract of *Emblica officinalis* Gaertn. and *Vitex negundo* Linn. for anti snake venom activity. The plant extracts significantly antagonised the *Vipera russellii* and *Naja kaouthia* venom induced lethal activity both *invivo* and *invitro*. *V.russellii* venom induced haemorrhage, debrinogenating, coagulant and inflammatory activity was significantly neutralised by both plant extracts. Precipitating bands were absent between the plant extract and the snake venom confirming that the plant extracts possess significant snake venom neutralising capacity.[24]

2.9.4 Hepatoprotective Activity

Jose and Kuttan used carbon tetrachloride (CCl_4) induced liver injury model in rats to investigate the hepatoprotective efficacy of *Emblica officinalis* (EO) and Chyavanprash (CHY) extracts. The hepatotoxicity caused by acute and chronic CCl_4 treatment was found to be inhibited by EO and CHY extracts. [25]

2.9.5 Antitumor activity

The *Emblica officinalis* (E.O) aqueous extracts was found to be cytotoxic to L 929 cells in culture in a dose dependant manner. Concentration required for 50% inhibition was 16.5µg/ml. Both E.O and Chyavanprash significantly reduced the solid tumours. In a dose dependent manner E.O extract inhibited cell cycle regulating enzymes CDC 25 phophatase.[26]
Plant Name: *Mimusops elengi* L.
Family : Sapotaceae
Common Name : Baula

2.10 Religious base

The above plant Baula is utilized in the Car-festival of Lord Jagannath where the wood of the plant is utilized in the "Senapata", the method of preparing and protecting the deities with the wood of the plant in order to prevent the deities of Lord Jagannath, Balabhadra and Goddess Subhadra from any damage due to the Car-festival (Figure 9 & 10).


Figure 9


Figure 10

Fig 9.The Plant Mimusops elengi *Fig 10. Plant utilized in the Car-Festival of Lord 'JAGANNATH'*

2.11 Medicinal value and Recorded Researches

2.11.1 Anti ulcer activity

Shah *et al* investigated the effect of *Mimusops elengi* (Saptotaceae) against experimental gastric ulcers. The 50% alcoholic extract of *Mimusops elengi* as well as its various fractions such as ethyl acetate, n- butanol, methanol and water were tested (p.o) for their ability to protect against ethanol-induced gastric damage. The ethyl acetate extract was also studied in ethanol-induced, pylorus ligated and water-immersion plus stress-induced gastric ulcer models. Significant decrease observed in volume of gastric acid secretion, total acidity, total acid output and pepsin activity in comparison to the control group. The mechanism of anti-ulcer activity may be due to decrease gastric acid secretory activity along with strengthening of mucosal defensive mechanisms.[27]

2.11.2 Neuroprotective activity

Nagakannan *et al*., examined the neuroprotective efficacy of *Mimusops elengi* hydro alcoholic extract against brain ischemic reperfusion injury in rats. Pre-treatment with the plant at doses of 100 and 200mg/kg significantly enhanced the neurobehavioral changes and lowered infarct volume, edema and the amount of ischemia perfusion injury-induced disruption of the Blood Brain Barrier. The alteration in the antioxidant status is also prevented and reduced nitric levels when compared to ischemic animals. The HPLC studies showed the presence of five bioactive polyphenolic compounds. [28]

2.11.3 Antibacterial activity

Panda S.K., examined the variety and extent of medicinal plants used in the health care system of tribal inhabitants of Similipal Biosphere Reserve. Plant extracts in methanolic and aqueous form were also tested for antibacterial properties against eight common pathogenic bacteria. A total of 187 plant species from 74 families were identified as having common therapeutic applications. Out of 187 plant species, *Mimusops elengi* was among 120 plants which recorded antibacterial activity against different bacterial strains. [29]

2.11.4 For shining of Body

Ayyanar M and Ignacimuthu S. Found that 90 species of plants distributed in 83 genera belonging to 52 families were regularly utilised Ethno medicinal plants by the Kani traditional healers in Tirunelveli hills and quantitatively reported their indigenous knowledge on the usage of medicinal plants. They have also documented that *Mimusops elengi* juice is utilised in Tirunelveli hills of Western Ghats, India to get a shining body. [30]

2.11.5 Wound healing Activity

Agyare C. *et al* reviewed 61 plants including *Mimusops elengi* from 36 families whose wound healing properties were scientifically demonstrated or reported and found that various plant parts such as leaves, stem bark, fruits and root extracts of African medicinal plants are utilised for wound healing activities. [31]

Review on the Plant *Corchorus depressus*

Botanical Name: *Corchorus depressus*
Family: Tiliaceae

Vernacular names

INDIA:
Hindi: Baphuli
Odisha (Odiya): Bojoromuli
Marathi : Bahuphali
Delhi : Bhauphali
Punjab : Babuna, Bophalli
Guajarati: Bethibahuphali, chhikni
Sanskrit : Bhedani, Chanchu, Katuka
Rajasthan: Baphuli
Thiruvananthapuram: Cham Kas
BALUCHISTAN : Mandira, Mundheri
ENGLISH : Shrubby Jute
SIND : Mudhiri
PAKISTAN : Bophali

Taxonomical classification

Kingdom : Plantae
Phylum : Magnoliophyta
Class : Magnoliatae
Order : Malvales
Family : Tiliaceae
Subfamily : Grewioideae
Genus : Corchorus
Species : *Corchorus depressus* (L.)

2.12 Botanical Characteristics

Habit: A perennial herb, 15 to 23cm, branched from the base (Figure 11a & 11b).
Stem: Stem and branches twisted, imbricate and woody.
Leaves: Leaves 6-20 by 6-12mm, roundish, usually wrinkled, irregularly crenate-serrate, glabrous, the serratures not appendaged, base rounded or cuneate; petioles 1.2-2.5cm, slender; stipules subulate.
Flower: Yellow, Flowers numerous, on leaf –opposed cymes; obovoid buds, apiculate; bracts lanceolate- subulate; pedicels and peduncles very short. Oblong-obovate petals longer than the sepals.
Fruit: Capsules, 1-1.5cm long, cylindrical, beaked, glabrous, often curved upwards, 4-valved, valves scarcely, if at all, separate between the seeds.
Seed: Trigonous, black, smooth.

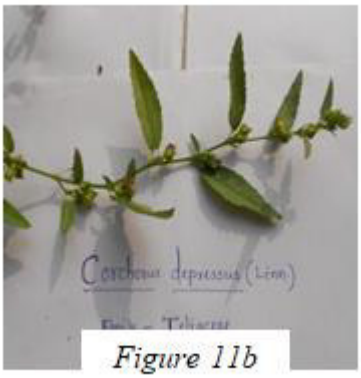

Fig 11a. Plant C. depressus Linn.

Figure 11b. Fruits of C. depressus Linn.

2.13 Distribution

It is widespread in different countries like India (Delhi, Punjab, Odisha, Rajasthan and Gujarat), Afghanistan, North Africa, Arabia, Sind, Baluchistan, Pakistan, Tropical Africa, and Cape Verde Islands.

2.14 Religious Base of the Plant:

The plant is treated as religious and worshipped by the married women of Odisha, India, in the rituals called as "Jama Jutia (Jama Dutia)". This festival is the traditional ancient method of worshiping the Lord "Yamaraj" (The Lord of Death). The women make a daylong fasting, prepare different sweets, cakes and worship the plant in the evening. An old man of the society will sit at a distance area in the same location and act as "Yamaraj". The women sweep the road with the plants up to the old man and donate the cakes and sweets. The worshipped plants were taken up by the women and softly swept over on the body of their family members and it is believed that by doing so the family members will be free from attack of any disease and have a long life(Figure 12a & 12b).

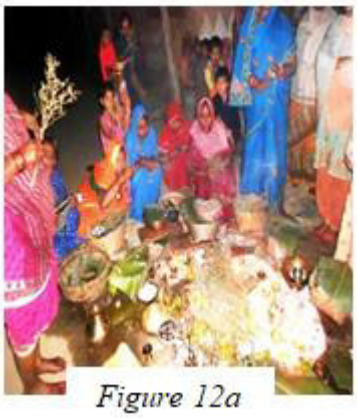

Fig 12a & 12b. Plant C. depressus worshipped in the rituals called as "Jama Jutia"

2.15 Phytochemical Studies of *Corchorus depressus*

Ahmed *et al* isolated two new Cycloartane triterpene glucosides; Depressoside A and Depressoside B from *Corchorus depressus*. The structures of depressoside A and B were elucidated as 9,19-Cyclolanosta-(22R), 25-epoxy-3β,16β, 24(S)-triol-3-O- β-D-glucopyranoside and 9,19-Cyclolanosta-22(R), 25-epoxy-24(S)-acetoxy-3β, 16β-diol-3-O- β-D-glucopyranoside respectively on the basis of 1D and 2D spectroscopic studies and chemical analysis (Figure 13) . [32]

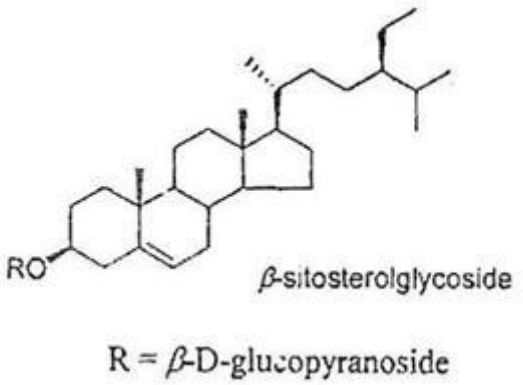

Fig 13.β-D-glucopyranoside

Ahmad *et al* isolated two novel bidesmosidic Cycloartane- type glycosides, depressosides C and D from *Corchorus depressus* L. Their structures were elucidated as (22R)-16β, 22-epoxy-3β, 26-dihydoxy-9, 19-cyclolanosta-24E-ene 3, 26-di-O- β-D-glucopyranoside and (22R, 24S)-22, 25-epoxy-3 β, 16 β, 24-trihydroxy - 9, 19 - cyclolanostane 3, 24 -di -O- β- D - glucopyranoside respectively on the basis of chemical evidence and detailed spectroscopic studies. [33]Zahid *et al* studied new cycloartane and flavonol glycosides from the butanol soluble part of the ethyl alcohol extract of *C. depressus* and found Depressosides E [(22R, 24S)- 22, 25-epoxy-cyclolanostane-3 β, 16 β, 24-triol-3 (α- L-rhamnopyranosyl - (1→4) –β– D - (22R, 24S)- 22, 25- epoxy- 9, 19-cyclolanostane-3β, 16β, 24 -triol-3 (α- D- glucopyranosyl- β-D-glucopyranoside)]. Flavonol glycosides like depressonol A [kaempferol-3-[β-D-glucopyranosyl- (1→4)- D-galactopyranoside] 7-[α-L- arabinofuranoside] and depressonol B[Kaempferol-3-[β-D-glucopyranosyl-(1→6)- β- D- galactopyranoside] 7-[α-L-arabinofuranoside].[34]Khan *et al* studied α-amyrin derivatives from the whole plant extract of *C.depressus* and Cordepressic acid (2α, 3β, 20 β- trihydroxy-urs-12-ene-24, 28-dioic acid) (Figure 14), Cordepressin (2α, 3 β, 20 β-trihydroxy-urs-12-ene-24, 28-dioic acid 24 β-D-galactoside) (Figure 15), Cordepressenic acid (2α, 3 β-dihydroxy-urs-12-20-diene-24-28-dioic acid), phenolics like apigenin and luteolin were isolated (Figure 16 & 17). The sterols like β-sitosterol- D-glucoside was also isolated from the whole plant. [35] Harsh M.L. and Nag T.N. found quercetin and kaempferol (Figure 18 & 19) from *C. depressus* leaves and flowers. [36]

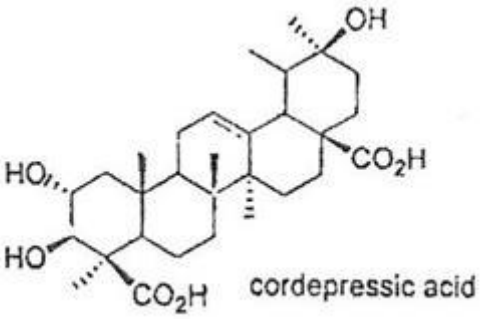

Fig14. Cordepressic acid

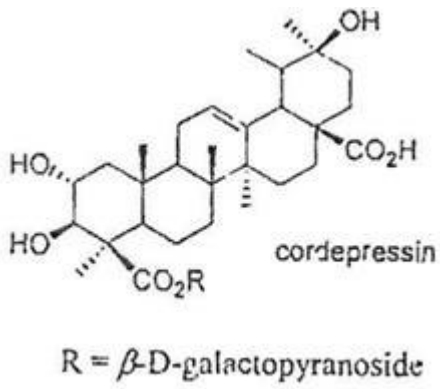

Fig 15. β-D-galactopyranoside

Fig 16. Apigenin

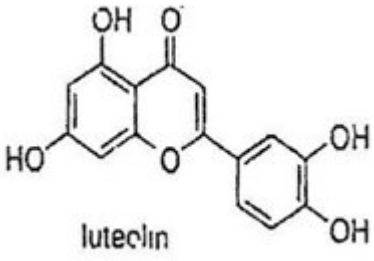

Fig 17. Luteolin

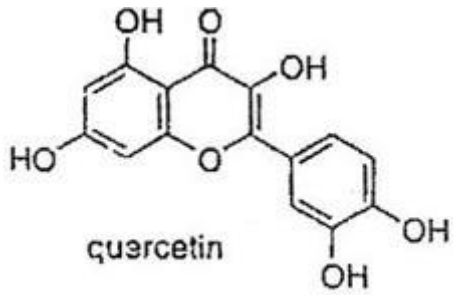

Figure 18. Quercetin

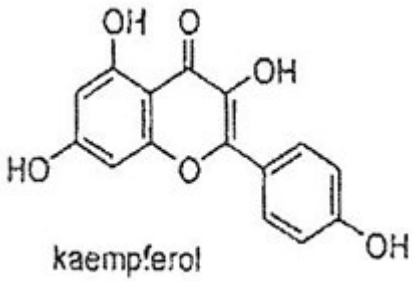

Figure 19. Kaempferol

2.16 Pharmacological activities of *Corc/horus depressus*

In "Ayurveda", the plant C*orchorus depressus* L., is described as hot sharp, acrid, sweetish; cures piles, removes pain and tumours. It is administered as a medicine in fever.[37]In the Indigenous system of medicine the above plant used as a cooling medicine in fevers, as tonic; plants' mucilage is prescribed in gonorrhoea. On stone, the roots are rubbed and smeared over forehead to get relief in migraine; to cure leucorrhoea dried fruits are powered and taken orally with milk for 2 to 3 days. The plant is crushed with tender twigs of *Prosopis cineraria*, mixed with whey and sugar and taken as a drink to treat body ache, protrusion of uterus, urinal inflammation and to avoid abortion. Leaves are made into paste and mixed with curd or whey and given orally to cure diarrhoea in children for 2-3 days.[38]It has application to increase the viscosity of seminal fluid, to set-up menstrual disorder.[39]An extract of plant is used for its anti-diabetic activity and applied as a paste in healing of wounds (The wealth of India). [40]The plant been used as a folk medicine for the treatment as antibacterial, antifungal, anthelmintic [41], review shows that plant is used as antimalarial [42], for its cardiotonic activity [43], as a tonic [44], in the treatment disease called gonorrhoea [45], as a veterinary medicine [46] and the plant possesses diuretic activity. [47] Ikram *et al* studied the hexane and chloroform soluble whole plant extract of *C. depressus* which resulted prominent antipyretic activity in rabbits receiving subcutaneous yeast injections and it has not revealed any adverse effect up to a dose of 1.6g/kg.[48]Vohora *et al* studied that Cordepressic acid possesses antipyretic activity on yeast induced pyrexia at 100mg/kg in albino rats. When administered intraperitoneally, the effect was particularly observed. Significant analgesic activity on acetic acid induced writhing in mice was exhibited at a dose of 100mg/kg orally and on response to electrical stimulus of mice in Pododolorimeter at a dose of 500mg/kg. However it lacked analgesic activity when exposed to heat or mechanical stimulation. Toxicity tests in mice revealed it to be tolerable up to 500mg/ kg, i.p. [49] C*orchorus depressus* L. was tested invitro for hepatoprotective efficacy against CCl_4 induced toxicity in $HepG_2$ cell line. The ethanolic extract was found to relieve the alteration granted by CCl_4 in a concentration dependent manner, which might be attributable to a reduction in CCl_4 induced reactive oxygen species amounts and oxidative stress.[50]Kataria *et al* studied the *invitro* and *invivo Corchorus depressus* Linn. aphrodisiac activity on sexual behaviour of normal male rats and rabbit corpus cavernosum smooth muscle relaxation. The petroleum ether, chloroform, ethyl acetate, n-butanol and aqueous fractions of 95% methanol extract of *Corchorus depressus* were initially evaluated for their *invitro* aphrodisiac effect on rabbit *Corpus cavernosum* smooth muscle. The most active chloroform fraction (CDC) was further investigated on general mating behaviour, potency of normal wistar albino rats in comparison with sildenafil citrate. The study by Kataria *et al*. revealed that the chloroform fraction of methanolic extract of *Corchorus depressus* significantly reduced mounting Latency, Post–ejaculatory interval (PEI), Intromission latency (IL) and Inter-Intromission interval (III). There was significant increase in the MF (Mounting frequency), IF (Intromission frequency), EL (Ejaculatory Latency) and serum testosterone levels throughout the study period. The combined results fraction of *C. depressus* produces significant increase in sexual activity as exhibited by 25 mg/ml *invitro* and 400 mg/kg *invivo*.[51]The ethno botanical studies in the coastal districts of Odisha were presented in Table-I. [52-57]

Table I: The Ethno-botanical studies in the Coastal districts of Odisha.

Sl. No	Plant Name	Family	Local Name	Ethno botanical claims
1	*Acacia nilotica* (L.)	Mimosaceae	Babool	5 gm powder of flower well mixed with 10 g sugar candy is administered for curing Jaundice.
2	*Adhatoda vasica* Nees	Acanthaceae	Basanga	Leaf juice 10 ml with 10ml honey is orally taken 3 times per a day to cure chronic cough
3	*Aegle marmelos*(L.) Corr.	Rutaceae	Bel	5-7 leaf taken with water in the morning once a day to relax from acidity and gastric.
4	*Aloe vera*(L.)Burm f.	Lamiaceae	Ghikuanri	Message the fresh leaf 2-3 times per a day to control high B.P.
5	*Andrographis paniculata* (Burm. f.) wall. Ex Nees.	Acanthaceae	Chireita	Juice of leaves used for curing diabetes and worm in stool
6	*Azadirachta indica* A. Juss	Meliaceae	Limba	Paste of 20-25 fresh leaves mixed with 50 gm turmeric powder is app against skin diseases

7	*Boerhavia diffusa* L.	Nyctaginaceae	Puruni	whole plant except root taken as vegetables
8	*Bombax ceiba* L.	Bombaceae	Simili	Root juice is administered in empty stomach to break the sterility of female
9	*Calotropis gigantea* R. Br.	Asclepiadaceae	Arakha	Fresh leaf fried with castor oil is applied against knee joint pain
10	*Centella asiatica* (L.) Urban	Apiaceae	Thalkuri	7-8 leaves with one piece of sugar candy is taken in empty stomach twice a day to relief from gastric.
11	*Clitoria ternatea* L.	Fabaceae	Aparajita	1-2g root power mixed with warm water/milk is administered against nephritis.
12	*Curcuma longa* L.	Zingiberaceae	Haldi	6g rhizome is taken orally twice a day for 4-5 days to cure from jaundice
13	*Cuscuta reflexa* Roxb.	Cuscutaceae	Nirmuli	Whole plant paste is used against piles
14	*Cynodon dactylon* (L.) Pers.	Poaceae	Duba	Leaf paste is used for curing epitaxis
15	*Cyperus rotundus* L.	Cyperaceae	Mutha	Whole plant decoction is administered against dysentery
16	*Embilica officinalis* Gaertn	Euphorbiaceae	Amla	Dried fruit and jiggery is boiled in water and filtered, which is taken twice a day for joint pain.
17	*Erythrina variegate* L.	Fabaceae	Paldhua	Fresh leaves juice used for curing worm in stool
18	*Euphorbia tirucalli* L.	Euphorbiaceae	Kantasiju	Milky stem juice is applied to relief from ear pain
19	*Ficus benghalensis* L.	Moraceae	Bara	20g bark decoction taken twice a day for treating diabetes. 25g fresh leaves grinded with 200 ml water and is taken twice a day against piles.
20	*Jatropha gossypifolia* L.	Euphorbiaceae	Nakajada	Stem is used to cure from teeth pain
21	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae	Amarpoi	40-50ml decoction of leaves is given 2-3 times a day to treat stone and urinary bladder problems.
22	*Lawsonia inermis* L.	Lythraceae	Manjuati	Stem is boiled in water and kept overnight in a clay pot, in the morning it is filtered and taken as drink for curing stone and jaundice.
23	*Leucas aspera* (wild.) Link	Lamiaceae	Gainchha	Fresh leaves used as vegetable for curng worm in stool
24	*Mimosa pudica* L.	Mimosaceae	Lajakuli	Leaf is used for curing piles
25	*Mimusops elengi* L.	Sapotaceae	Baula	Seed and bark decoction is taken twice a day after food against mouth disease.
26	*Momordica charantia* L.	Cucurbitaceae	Kalara	7-8 fresh leaf juice mixed with 1 spoon honey is applied against diabetes and blood pressure.
27	*Moringa oleifera* Lam.	Moringaceae	Sajana	Juice of fresh leaves (2spoons) is directly taken to treat high blood pressure. Paste of newly arising leaves with black pepper powder is very effective to treat dysentery.
28	*Nyctanthes arbortristis* L.	Oleaceae	Gangasiuli	Juice of 7-8 leaves mixed with 5 drops of honey taken before food twice daily for curing malaria.
29	*Ocimum sanctum* L.	Lamiaceae	Tulasi	Juice of 8-10 leaves mixed with 5 drops of honey taken twice on a day before food for curing from cough
30	*Paederia foetida* L.	Rubiaceae	Pasaruni	Leaf paste 10g is taken with warm water twice a day to cure from mucostool.
31	*Phoenix sylvestris (*L.) Roxb.	Arecaceae	Khajuri	Milk of stem is administered to cure from gastric
32	*Piper longum* L.	Piperaceae	Pippali	A glass of water taken twice a day after food against abdomen pain.
33	*Pongamia pinnata (*L.) Pierre	Fabaceae	Karanja	Stem is used as tooth brush for pain and bleeding of teeth.
34	*Punica granatum* L.	Puniaceae	Dalimba	15-16 fresh leaf juice (1 spoon) is taken twice a day for curing diarrhoea.
35	*Ricinus communis* L.	Euphorbiaceae	Gaba	6g juice of roots is mixed with 25 g milk is administered against jaundice.
36	*Saraca asoka* (Roxb) de wilde	Caesalpiniaceae	Asoka	40-50 ml decoction of its bark is useful for piles. Paste of 1-2g of seeds mixed with water (2spoons) is regularly taken for stone disease.

37	*Streblus asper* Lour.	Moraceae	Sahada	Stem is used as tooth brush for pain and bleeding of teeth
38	*Syzygium cumini* (L.) skeels	Myrtaceae	Jamukoli	Seeds powder 1 spoon mixed with water is taken twice a day in empty stomach to cure from diabetes.
39	*Tarenna asiatica* (L.) kuntze ex Schum.	Rubiaceae	Jajhanga	32-40g leaves pest mixed with 25 g turmeric powder is applied externally on the head of the children for curing wounds.
40	*Terminalia arjuna* (Roxb.ex DC.) Wight and Arn.	Combretaceae	Arjuna	1 spoon bark powder mixed with 1 glass of tomato juice is used for treating tachycardia.
41	*Terminalia bellirica (Gaertn) Roxb.*	Combretaceae	Bahada	Thin bark decoction is used for cough; 2-5g bark powder is mixed with 2-3 cloves and taken with honey for dysentery.
42	*Terminalia chebula Retz.*	*Combretaceae*	Harida	1g powder mixed with jaggery and honey is administered against jaundice
43	*Trewia nudiflora* (L.)	Euphorbiaceae	Garuda gobinda	8-10 leaf juice mixed with 25g mosses is used against dysentery.
44	*Tribulus terrestris* L.	Zygophyllaceae	Gokhura	Whole plant decoction is taken twice a day for urine burning
45	*Vitex negundo* L.	Verbenaceae	Begonia	Fried leaf wraped with thin cloth to relief from ear pain
46	*Zingiber officinale* Rosc.	Zingiberaceae	Sunthi	2-3g stem powder mixed with warm water is taken thrice a day for abdomen pain.

3. RESULT & DISCUSSION

The data obtained from different sources were compiled in Table No-1. A total of 46 numbers of plants were found in widely used in the coastal district of Odisha for different diseases. For each plant, the details like scientific name, family, local name and its utilization with the method of preparation were provided. Six numbers of plants were found to have religious background & were utilized frequently for cosmetic preparation, for antiulcer, antitumor, antioxidant, antiepileptic, Hepatoprotective, anti-snake venom, analgesic, antipyretic, decrease of thyroid hormone T3 activity. The major focused plant *C.depressus* was found to be utilized for wound healing [40] and for the treatment of diseases due to bacterial, fungal, helminthes infections [41], for its antimalarial [42], cardiotonic [43], hepatoprotective [50], and aphrodisiac [51] activities. The *Corchorus depressus* have also been found to be present in other states of India like Thiruvananthapuram, Rajasthan, Maharastra, Punjab, Delhi and in the other countries like Baluchistan, Sind, Pakistan. With the Semi-structured interview conducted with 50 informants at 20 locations in and around different coastal districts of Odisha resulted that 2-3g stem powder of 'Sunthi' (*Zingiber officinale* of family Zingiberaceae) is taken thrice in a day for abdomen pain. Fried leaf of 'Begonia' *(Vitex negundo* L., of family Verbenaceae) covered with cloth utilized to get rid from ear pain and for abortion.[58] 1g powder of 'Harida' (*Terminalia chebula,* belonging to family *Combretaceae*) added with honey and jaggery were utilized against jaundice and throat infection. [58] 32-40g leaves paste of 'Jajhanga' (*Tarenna asiatica*(L.) kuntze ex Schum, of family Rubiaceae) mixed with 25 g turmeric powder then applied externally on children head for healing wounds by local people and against dengue. [59] The common berry 'Jamukoli' (*Syzygium cumini* L. skeels of family Myrtaceae) found in the rainy season, the seeds' powder 1 spoon mixed with water is taken twice a day in empty stomach to cure from diabetes by the Tribals. [60] 15-16 fresh leaf juice 'Dalimba' (*Punica granatum* L., of family Puniaceae) 1 spoon, is taken twice per day for curing diarrhoea. [61] Leaf paste 'Pasaruni' (*Paederia foetida* L., family Rubiaceae) 10g is taken twice daily with warm water to cure from mucostool.[62] The juice of 'Gangasiuli' leaves (7 to 8 nos) mixed with 5 drops of honey taken before food two times per day for curing malaria and possesses analgesic and anti-inflammatory action (*Nyctanthes arbortristis* L., belonging to family Oleaceae).[63] Juice of fresh leaves (2 spoons) of 'Sajana' (*Moringa oleifera* Lam., family Moringaceae) is taken directly as raw for the treatment of high blood pressure. For the effective treatment of dysentery the paste of newly arising leaves with black pepper powder is administered. [64] The leaf juice of *Momordica charantia* L., belonging to family Cucurbitaceae (local name Kalara) which is commonly taken along with honey against diabetes and blood pressure. [65] For 'Basanga'(*Adhatoda vasica* Nees, family Acanthaceae), it was found that Leaf juice 10 ml with honey 10ml is orally taken thrice per a day to cure chronic cough in local population.[66] The 'Nakajada' stem (*Jatropha gossypifolia* L., family Euphorbiaceae) utilized to get treatment from tooth pain. [67] The 'Chireita' (*Andrographis paniculata*, family Acanthaceae) juice of leaves was used for controlling the diabetes and stool worm. [68] 'Simili' (*Bombax ceiba* L. of family Bombaceae), the root juice is administered to break the sterility of female, taken in empty stomach. 8-10 leaf juice of 'Garuda gobinda' (*Trewia nudiflora* of family Euphorbiaceae), mixed with 25g mosses is used against dysentery. [69] Fresh leaf of 'Arakha' (*Calotropis gigantea*, family Asclepiadaceae) fried with castor oil is applied to get heal from knee joint pain. [70] Thalkuri (*Centella asiatica* L., family Apiaceae) leaves with sugar candy one piece are taken in empty stomach twice daily to get relief from gastric problem [71] and possess wound healing property. [72]Many herbs have medicinal properties which are helpful in maintaining human health.[73, 74] It will be a rewarding while choosing the best from the large number of plants, and carryout detailed phytochemical and pharmacological investigation which can lead to the development of plant drugs for many diseases that lacking satisfactory cure in modern medicine, so as to have overall welfare of the mankind.

4. CONCLUSION

We have reported maximum gathered information from the coastal districts of Odisha, for the ethno pharmacological uses of medicinal plants and study of these types would help to develop a comprehensive database of medico-religious plants and the plants used in the state of Odisha for various

traditional medical systems. These studies will further help in conserving the traditional knowledge and practices for posterity.

5. AUTHOR CONTRIBUTIONS STATEMENT

Draft preparation: T.K.K, A.K.S and U.N; Field Survey: T.K.K, A.K.S; Paper writing: T.K.K, A.K.S and U.N; Editing T.K.K, A.K.S. All authors read and approved the final manuscript before submission.

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7. CONFLICT OF INTEREST

In the content of this work, the authors have no conflicts of interest to declare.

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