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REVIEW ON SOME TRADITIONAL ETHNOMEDICINAL PLANTS HAVING ANTIOXIDANT ACTIVITY IN RAYAGADA, ODISHA

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ABSTRACT

Several well-known plants have been used in ethnomedicines, focusing to cure diseases, and aiming to maintain health since the beginning era of human civilization. In present global scenario, the major causes of health hazards are more found due to oxidative stress. The ethnomedicinal plants have been investigated for the presence of natural antioxidants, which have magnificent effects in the prevention of various oxidative stress diseases. Pathophysiology and pathogenesis of several diseases in humans has an appeared due to oxidative stress. Ethnomedicinal plants produce various antioxidants. Now-a-days, globally more survey and identify an antioxidant compound which is pharmacologically active but no side effects. In the present research paper ten traditional ethnomedicinal plants (Aloe vera, Clitoria ternatea, Carica papaya, Murraya koenigii, Ocimum sanctum, Citrus limon, Moringa oleifera, Musa acuminate, Mangifera indica, and Ficus benghalensis) are views for their phytochemical, historical, morphological, and pharmacological aspects have identified.

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Keywords- Antioxidant activity, Oxidative stress, Ethnomedicine, Pathophysiology.

INTRODUCTION

The capacity to utilize oxygen has given human with more benefit of metabolizing carbohydrates, fats, and proteins for energy. The highly reactive oxygen atom that is capable of damaging molecules called “free radical”. These free radicals are attacking body cells and causing them to lose the function and structure. The capable of deactivating or stabilizing, free radicals before they attack cells is commonly called “Antioxidant”. The reactive chemical species have single unpaired electron and present in their outer orbit

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[1] Emotional or psychological stress unhealthy eating habits; smoking and prolonged exposures to sunlight are generators of free radicals. This free radical cause to lose their structure and function of healthy cell by disrupting [2] and cause damage to the Nucleic Acids, proteins, and lipids to result in their oxidation [3]. Inove M et. al. reported that several factors are producing mitochondria's free radicals are the centre house ATP production which increases with age[4-5]. Reactive oxygen species (ROS) are highly reactive oxygen molecule which can be divided into super oxide, hypochlorite radicals and hydroxyl. The non-radical under ROS is hydrogen peroxide, lipid peroxides and single oxygen etc. There are two ways produced by ROS such as exogenously and endogenously. The sources of exogenous are environmental agents like xenobiotics, metals, ions, radiation, chlorinated compounds [6]. The sources of endogenous are mitochondria, microsomes, proxisomes, inflammation caused by cell activation and metabolism of cytochrome P450, Eosinophils and neutrophils. Cadenas E. represented that the other endogenous sources of species are catalyzed by X-Rays, UV light, metals, mitochondrial catalyzed electron transport reactions, macrophages, and neutrophil during inflammation, pollutants in atmosphere[7]. Waris and Ashan, 2006 reported by experimental evidence that ROS and free radicals can be related in various disorders such as cancer, diabetes, disorders of neurodegenerative, disorders of liver, disorders of connective tissue, arthritis[8]. The imbalance between ROS and antioxidant defence mechanism of a tissue due to causes of oxidative stress. These causes are conducting to the cell death and inactivation of various enzymes, irreversible oxidation of protein, DNA, and lipids etc. Wang et.al. 2004 represented that cellular ROS contains various mediate the mitochondria-initiated apoptosis[9]. Antioxidant rich ethnomedicinal plants protects to the human beings from the damage caused by lack of controlled production of Reactive Oxygen Species. The scientific study of the relationship between human culture and their use of medicinal plants. Rayagada is a tribal district of Odisha which has practised to their cultural and religious traditional process for nature's conservation. The tribal people in Rayagada district depends upon antioxidant containing ethnomedicinal plants for curing many diseases. The present research gives clear identification from tribal forest locality 10 antioxidant rich in ethnomedicinal plants species belonging ten families are identified and are viewed in detailed for their phytochemical, historical, morphological, and pharmacological aspects. The tribal district of Rayagada, Odisha was covered with forests with various antioxidant rich medicinal plants. The most of tribal people depend on for their food, shelter clothes and ethnomedicines[10-13]. In the tribal culture, the environmental knowledge is shared from one generation to another generation from old people. They have a good knowledge on natural treatment of different diseases by herbal medicine called "Traditional medicine (TM)" or "Ethnomedicine" [14-16]. 63% population in India is living in remote areas, rural areas, forest environment, depend on traditional medicine (TM) because T.M is cost-effective, safe, and affordable [17].About 85% of T.M used for health care is obtained from plant species [18].The present study has been designed to report the antioxidant rich ethnomedicinal plant uses to treat many diseases on the based on taxonomical identification and field survey. The prime focus of this study is to motivate tribal people, farmers, village people of Rayagada district, Odisha to step forward for preservation, cultivation, and utilization of antioxidant rich ethnomedicinal plants.

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MATERIALS AND METHODS

(1) Study area: The tribal district of Rayagada, Odisha is lying between the north latitudes 82°54' and 82°02'E. Rayagada was the status of district in Odisha, 1992. About 94% population of Rayagada district lives in tribal area and completely depends on Agriculture. The climate region of Rayagada is tropical to subtropical with rain, winter, and summer. The average temperature of Rayagada district is 20°C and average rainfall varies from 1030.21 mm to 1569.50 mm. The rainfall in this area is mostly from southwest monsoon from June to October.

(2) Data collection method: From a total population of tribal district in Rayagada, (Odisha) information from 1135 people in the age group 25-85 and was collected by many methods like simple survey, interview, observation, census survey and case study. All informations of antioxidant rich collected from local Baidyas, disari (medicine men), priest, chief of village, ayurvedic medicine practioners etc. By simple survey and interview technique during the year 2021-2022.

RESULTS AND DISCUSSION

a) Socio-demographic data:

Rayagada is the main tribal district hub of Odisha. The population of this district has about 832019 and out of which 473379 are tribal people. The own identity of Rayagada district is ethno-cultural activities of tribal people. This district has been the mother land of various tribal communities such as Souras, Kandhas, Dungaria, Mulikondh, Gadaba, Kondadora, Sabar, Lodha etc. The tribal and village people possesses a mixed economy such as settled agriculture, shift cultivation, food gathering etc. The gift of tribal people, Rayagada is fertile land, which is an economy commodity, and focuses ideological and extra-economic values.

b) Antioxidant activity with ethnomedicinal plants used:

All information on antioxidant rich ethnomedicinal plants were gathered through survey and oral interview of tribal people, ayurvedic medicine practioners, baidya, disari (medicine man) etc. Through survey, oral interview, the ten-antioxidant rich ethnomedicinal plants are viewed for their phytochemical, historical, morphological, and pharmacological aspects. Saxena (1996) reported that the antioxidant rich ethnomedicinal plants were identified from flora of Orissa[19].Ethnomedicinal plant with antioxidant activity plant specimens were collected and identified with local flora[20].A survey of literature was conducted on the study area before started of field work[21-29].According to Marini-Bettolo (1980) reported that the importance of this traditional medicine has spreaded globally as some of them proved it to be amazingly effective[30].The present work is collecting from extensive survey of the Rayagada district

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during 2021-22. The ten ethnomedicinal plants with antioxidant activity was detailed for their phytochemical, historical, morphological and pharmacological aspects.

TEN SELECTED PLANTS WITH ANTIOXIDANT ACTIVITY:

Among many ethnomedicinal plants, ten of them have been particularly survey and investigated for their antioxidant activity.

ALOE VERA:

Family- Asphodelaceae

Genus- Aloe

Species- Vera

Vernicular name (Odia)- Gheekunwari

Habit- It can be growing in arid and semiarid habitats. It is grown in all over India. It has been widely grown as medicinal plant as well as ornamental plants.

Parts used- leaves

Morphological Characteristics: Aloe vera leaves are thick and fleshy and green in colour. Leaf margin is serrated and has small white teeth. The shape of leaves are rosette shape. Yellow flower are found and grow up to 2-3 cm. Seeds are called winged roots grow widely and not enter deep soil. Fruits are triangular capsules.

Chemical constituents: Aloe vera contains arealoin, aloe-emodin, barbaloin emodin & Aloesin.

Pharmacological antioxidant Activity: Antioxidant compounds are preventing biomolecules oxidative damage by ROS through enzyme regulation, metal chelation and free radical scavenging[31]. Antioxidant rich Aloe vera possess peroxyl radical scavenging activity and reducing capacity due to presence of Anthra-quinones and related compounds[32].In-vitro assays, 53 healthy volunteers by clinical trial, the intake of Aloe vera extracts (14 days) increased total antioxidant of plasma of subjects[33].

Fig.1: Aloe vera plant

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CLITORIA TERNATEA

Family- Fabaceae

Genus- Clitoria

Species- Ternatea

Verricular Name- (Odia)- Aparajita

Habitat- It is ornamental as well as medicinal plant and widely distributed tropical and sub-tropical regions of the world. Its growth rate is high drought tolerance and adaptation to heavy clay soil and could be used to improve natural grasslands, open woodland, bushland, and distributed forests.

Morphological Characteristics: The roots of clitoria ternatea (C.T) are branched tap root system having nodules. Stems are weak, aerial and a twiner. Its leaves are imparipinnately compound, alternate, stipulate with reticulate venation and pulvinated stipule. Flowers are bracteates, bracteolate, pedicellate, complete, bisexual, pentamerous, zygomorphic, and hypogynous. Its fruit is legume. Seeds are kidney shaped and non-endospermous.

Chemical constituents: Clitoria ternatea (C.T) contained Kempferol, Quercetin, Myriceti, Taxaxerol, Tannic Acid, Anthoxanthin, Glucoside etc.

Pharmacological Antioxidant Activity: Clitoria ternatea (CT) contains antioxidant activity of extracts of flower. Kamkain and Wilkinson found that aqueous extract shown to have more antioxidant activity (as measured by DPPH scavenging assay) than extract of ethanol[34].The methanolic extract of C.T leaf also found antioxidant activity by in vitro assay[35]. C.T flower petal demonstrated antioxidant activity by invitro study and formed the protection against free radical induced oxidation as well as lipid peroxidation in erythrocytes [36-37]. The number of nonenzymatic antioxidant like Ascorbic acid, reduced glutathione and total carotenoids in the flowers and leaves of Clitoria ternatea which may be responsible for antioxidant activity of this plant [38].

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Fig.2: Clitoria ternatea Plant

CARICA PAPAYA:

Family- Caricaceae

Genus- Carica

Species- Papaya

Vernicular name- (Odia)- Amrutabhanda

Habitat- Carica papaya requires a tropical and subtropical environment and is grown in all over the world.

Morphological Characteristics:- It is a quick growing arborescent herb with short life span period. It has branched stem reaching 2-20 m height (Papaya tree). The stem is hollow, grey-brown color, spongy fibrous, loose etc. The stem is toughened by large and protuberant scars caused by fallen flowers and leaf. This plant is a polygamous species such as male, hermaphrodite, and female. The leaves are dark-green, bright, simple, palm shape, spirally arranged with thick middle irradiant veins. The life span of each leaf is 4 to 6 months. Papaya plants are dioecious, the flower are yellowish and 2-4 cm long. Fruit is lobed, ballon-shaped, fleshy, juicy, green, and yellow to yellow. When fruit is hard a green & rich in white latex.

Chemical constituents: Quinine, Naringin, Catechin, Sapogenin, Sparteine, Flavones, Anthocyanidines.

Pharmacological Antioxidant Activity: Wong and Kong (2014) reported that the papaya seed is rich in source of antioxidants food [39]. The papaya seed are rich in phenolic and flavonoids in the n-butanol fractions and ethyl acetate [40-42]. The leaves contain polyphenols which is called its antioxidant properties.

Fig.3: Carica papaya plant

MURRAYA KOENIGII:

Family- Rutaceae

Genus- Murraya

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Species- Koenigii,

Vernicular name (Odia)- Bhrusanga

Habitat- Its native habitat is terrestrial. The climatic zone of murraya koenigii is tropical. It is native distribution India to Indochina. It grows in well drained soil and full sun or partial shade. It is found in moist forest, evergreen forest.

Morphological Characteristics: It is shrup plant to 2.5 m tall. The leaves are compound, dark green, leaf apex emarginate. The leaf lets are attached to rachis. Leaves are aromatic when crushed. Stems are numerous dots with dark green to brown. Flowers are white, funnel shaped, 5-lobed sweet fragrance flower. The fruits are black, glossy, and dark green in colour.

Chemical constituents: Murrayanine, Mahanimbine, Murrayazoline, Isomahanine, Koenoline, Mukolidine, Mukoline, Mukonal, Girinimbine.

Pharmacological Antioxidant Activity: The antioxidant activity was measured to standard antioxidant ascorbic acid (BDH, England). It is depending on a scavenging effect of 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radial. The whole procedure was performed according to procedure followed by Bracae et.al. (2001) [43].

Fig.4: Murraya koenigii Plant

OCIMUM SANCTUM:

Family- Labiatae

Genus- Ocimum

Species- Sanctum

Verticular name- (Odia)- Tulsi

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Habitat: Ocimum sanctum grows naturally in moist soil. It is grown in home garden. The major source of Tulsi is from wild habitat. It is native to India. It is grown as temperate climates.

Morphological Charecteristics: Plants are herbaceous, exstipulate, opposite or whorled leaves, verticillaster inflorescence, flowers are zygomorphic, corolla gemopetalous and bilabiate, corolla gamopetalous and bilabiate, stamens epipetalous, gynoecium bicarpellary, syncarpous, axile placentation, unilocular ovule, Fruit is simple. Seeds are non-endospermic. Roots are tap root, branched. Stems are aerial, herbaceous, rarely woody, erect, or prostrate, hairy, branched, solid or hollow.

Chemical constituents: Eugenol, Ursolic Acid, Carvacrol, Linalool, Methyl Eugenol, Sequiteerpene, Caryophyllene, Estragole.

Pharmacological Antioxidant Activity: Ocimum Sanctum L. leaf extracts contain phenols and flavonoids. The pharmacophores have been found to their antioxidant activities such as cyclooxygenase inhibitory activity. The hydroalocoholic and methanolic extracts of ocimum sanctum L. show character of antioxidant activity both In-vitro and In-vivo [44].

Fig.5: Ocimum sanctum Plant

CITRUS LIMON:

Family- Rutaceae

Genus- Citrus

Species- Limon

Vernicular name- (Odia)- Lembu

Habitat: Lemon plants are sub-tropical plants native is Asia. It is best grown in warm and humid states.

Morphological Characteristics: Roots are fibrous tap root. Stems are woody, spiny, and cylindrical. Leaves are petiolate, alternate, or opposite, simple or compound, exstipulate, reticulate venation. Flowers are pedicilate, Bracteate or

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ebracteate, Actnimorphic, regular, complete, hermaphrodite, hypogynous. Fruits are berry or drupe, seeds are non-endospermic.

Chemical Constituents: Limettin, p-Coumaric acid, Limonin, Hesperidin, Vitexin, Scorparin, Chrysoeriol, Chrysoeriol-7-O-glucoside, Apigenin, Limocitrin, Quercetin, Eriocitrin, Naringin.

Pharmacological Antioxidant Activity: Citrus limon contains antioxidant activity of the hesperetin and Flavonoids-hesperidin. Cellular defences via the ERK/Nrf 2 signalling pathways [45]. Citrus limon has rich in vitamin-C which protects DNA from mutations and prevents the formation of free radical.

Fig.6: Citrus limon Plant

MUSA ACUMINATA:

Family- Musaceae

Genus- Musa

Species- Acuminata

Vernicular name (Odia) - Kadali

Habitat- Musa acuminate is a perennial, evergreen, herbaceous plant. This plant grows in moist areas as well as grown in tropical and subtropical areas. These plants are suitable for sandy, loamy and clay soils.

Morphological Characteristics: Roots are adventitious. Stems are underground, Rhizomatous, perennating sheathing leaf base rolled upon one another forming pseudoaerial stem. Leavess are simple, alternate, exstipulate, large, and elliptical. Inflorescences are racemose spadix. Flowers are ebracteate, sessile, hermaphorodite, zygomorphic, incomplete, and epigynous. Fruits are elongated berry. Seeds are hard, deeply colourd, endospermic or non-endospermic.

Chemical constituents: Anigorufone, Apigenin, β-sitosterol, cycloarternol, Quercetin, stigmasterol, catechin, caffeic acid, ellagic acid, gallic acid, kaemferol.

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Pharmacological Antioxidant Activity: The fruit pulp of Musa acuminata contains catechin, gallocatechin, epicatechin as well as tannins. The cell wall of banana could be a suitable source of natural antioxidants and they could be bioaccessible in the human gut [46].

Fig.7: Musa acuminata Plant

MANGIFERA INDICA:

Family- Anacardiaceae

Genus- Mangifera

Species- Indica

Vernicular name- (Odia)- Amba

Habitat- Mangifera indica is native to South Asia. It is distributed tropical and subtropical warm climates. This plant prefers low rainfall, low relative density and grow in deep, well drain soil that is slightly acidic.

Morphological characteristics: Roots are deep, branched, tap root system. Stems are eract, branched, hard, and woody with resinous bark. Leaves are simple, alternate, exstipulate, smooth, entire, long ovate lanceolate, acute, thick. Inflorescence is Recemose. Flowers are bracteates, hermaphrodite, complete, Actinomorphic, cyclic, hypogynous, yellowish green. Fruits are a fleshy large drupe. Fruits are cotyledon thick or non endospermic.

Chemical constituents: Mangiferin, gallotannins, gallic acid, pyragallol, methyl gallate and quercetin.

Phormacological Antioxidantt Activity: The phenolic compounds mango leaves contain that possess more antioxidant activity [47]. Mangifera indica leaves contain α-tocopherol in the 22-diphenyl-1-picrylhydrazyl radial (DPPH) assay[48].The antioxidant activities of mango peel and pulp extracts demonstrated a high antioxidant activity in both DPPH and Ferric reducing antioxidant power (FRAP) assay[49].

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Fig.8: Mangifera indica Plant

MORINGA OLEIFERA:

Family- Moringaceae

Genus- Moringa

Species- Oleifera

Vernicular Name (Odia)- Sajana or Munika

Habitat- Moringa Oleifera is found in the tropical and sub-tropical and arid areas. It is a perennial tree and native to India. It is the best grown in loamy soil and well-drained soil which is slightly acidic (PH-6.2-7). It is a deciduous tree with fragile wood.

Morphological charecteristics: Roots are tap, branched and deep. Stems are eract, branched, woody, and wood fragile. Leaves are 2 or 3 pinnately compound with opposite pinnae, alternate, pulvinus of petiole distinct; Inflorescence is hairy axillary cymose panicles. Flowers are hermaphrodite, Actinomorphic or zygomorphic, perigynous, complete, pedicellate, bracteates. Fruits are valved, angled long capsule. Seeds are cotyledons oily, endospermic.

Chemical constitutents: Niazimicin, pterygospermin, Benzyl isothiocyanate-4-(4'-o-acetyl-alpha-L-rhamnosyloxy benzyl isothiocyanate)

Pharmacological antioxidant activity: Moringa oleifera occurs naturally antioxidants particularly polyphenols that are to decrease oxidative demage in tissues by free radical scavenging. The leaves of the Moringa oleifera tree have been reported to demonstrate antioxidant activity due to high number of polyphenols [50]. The leaf extract of Moringa oleifera (50% ethanol) was evaluated to study the LPO (Lipid peroxidation), catalase (CAT) and superoxide dismutase (SOD) activites[51].

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Fig.9: Moringa oleifera Plant

FICUS BENGHALENSIS:

Family- Moraceae

Genus- Ficus

Species- Benghalensis

Vernicular name- (Odia)- bata brukhiya

Habitat- It is a wide evergreen tree, looking crown structure and can grow 20-30 m or more tall. It is found in tropics and sub-tropical region. It grows in monsoon and rain forests. A focus grows well-draining, fertile soil.

Morphological Characteristics: Roots are taproot system, atems are woody, gum exudes from stem, leaves are simple, petiolate, alternate, and stipulate, and inflorescence is catkin. Flowers are bracteates and bracteolate, Actnimorphic, incomplete, unisexual, hypogynous. Fruits are an achne, drupe. Seeds are endospermic or non-endospermic.

Chemical constituents: Protodioscin, Leucocyanidin, Pelargonidin, Heneisanyl oleate, Ceryl behenate, Bengalenisteroic acid acetate.

Pharmacological Antioxidant Activity: Antioxidants such as superoxide radicals, hydroxyl radicals, hydrogen peroxide radicals etc. protect the body against-oxidative stress by neutralizing free radicals and ROS (Reactive Oxygen Species). Body has antioxidant defence system such as SOD (Superoxide dismutase) and catalase etc. F. benghalensis contents antioxidant activity and phenolic substances [52]. The aerial roots of F. benghalensis are good antioxidant activity due to presence of flavonoids and phenolics.

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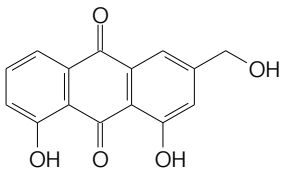
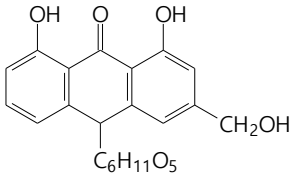
Fig.10: Ficus benghalensis Plant

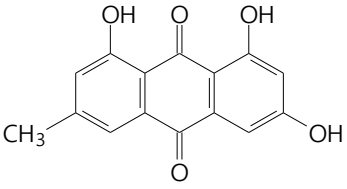
Chemical structure of some important phytoconstituents: The chemical structures of some important phytoconstituents obtained from the above plant are given bellow in scheme-1.



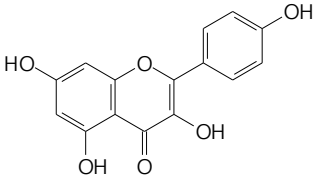
Aloe-emodin



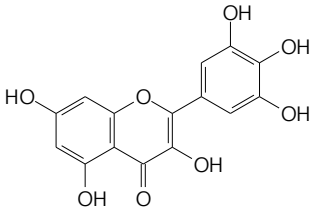
Barbaloin



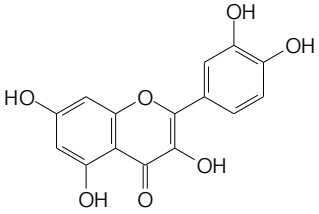
Emodin



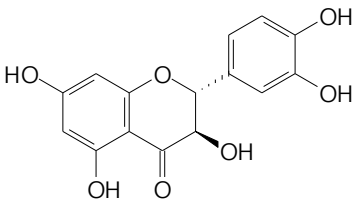
Kempferol

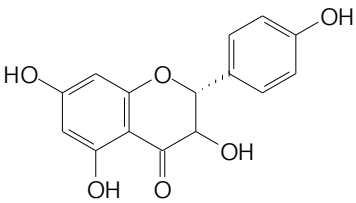


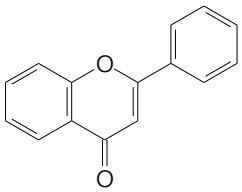
Myricetin



Quercetin







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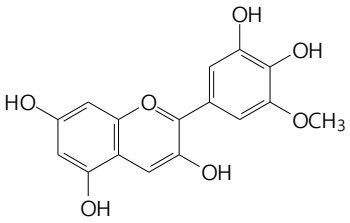
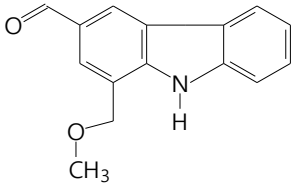
Naringin



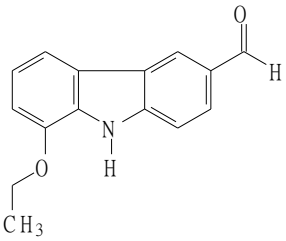
Anthocyanidines

Catechin

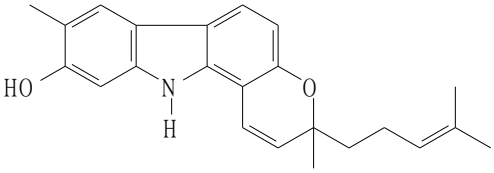


Murrayanine

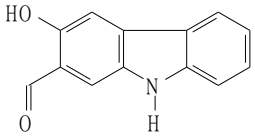
Flavones



Mukolidine



Isomahanine



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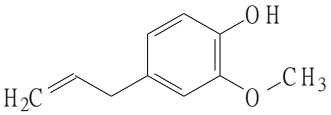

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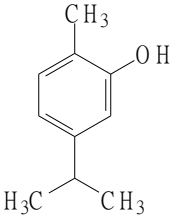
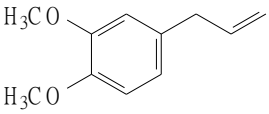
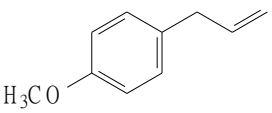


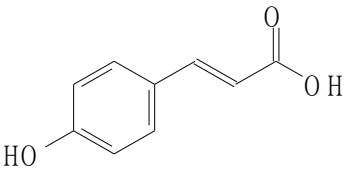
Carvacrol



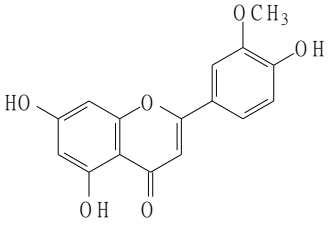
Methyl Eugeno



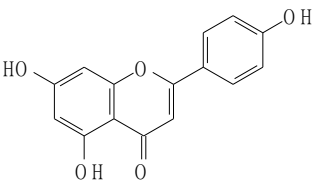
Estragole



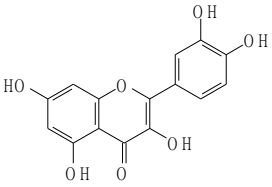
p-Coumaric acid



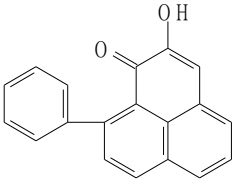
Chrysoeriol



Apigenin



Quercetin



Anigorufone

Scheme-1

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CONCLUSION

ROS (Reactive Oxygen Species) and free radicals has a adverse effect to create diseases like cancer. Various artificial made antioxidants used in processed food which are carcinogenic. In the present work, the antioxident activity of some common plants in Rayagada districts of Odisha are identified. The plants include Aloe Vera, Clitoria ternatea, Carcica papaya, Murraya koenigii, Ocimum sanctum, Citrus limon, Musa acuminate, Mangifera indica, Moringa oleifera, Ficus benghalensis.The chemical constituents of ethnomedicinal plants have divulged various phenolics and flavonoids compounds which shows the activities of antioxidant. These compounds have been more used as Anti-diabetic, Anti-inflammatory, Anti-Carcinogenic, antifungal, Antibacterial, and Antioxidant etc. The present study indicates that it would be highly economical to produce potential supplements of Antioxidant from the ethanomedicinal plants. Furthermore, clinical trials and research works of Antioxidant rich ethnomedicinal plants should need to be done to establish the above-mentioned effect in human

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