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AN OVERVIEW ON: *MURRAYA PANICULATA* LINN.

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ABSTRACT

Murraya paniculata Linn. (*Murraya exotica* L.) Belongs to the family Rutaceae, and is commonly known as orange jasmine and Honey bush. It is distributed over the greater part of India and the Andaman Islands to an altitude of 1500 m. Due to strong fragrances of the plant leaves which make them suitable to be used in Indian and Malay dishes. Besides as a flavoring, leaves, branches, stem barks and roots of the plant are used in folk medicine to treat dysentery and morning sickness. Flowers of the plants are used in cosmetics. Many different phytochemicals constituent were extracted from *Murraya paniculata*. The extract revealed the presence of alkaloids, flavonoids, phenolic compounds, carbohydrate, proteins & amino acids and; while fixed oil, saponins and mucilage were absent.

INTRODUCTION

Plants have been used for health and medical purposes for thousands of years. Fossil records date human use of plants as medicines at least to the middle Paleolithic age some 60,000 years ago. From that point the development of traditional medical systems incorporating plants as means of therapy. The number of higher plant species on earth is about 250,000. It is estimated that approximately 35,000 to 70,000 species have been used as medicinal purposes. A majority of the world's population in developing countries still relies on natural medicines to meet health needs. Natural medicines are often used to provide first-line and basic health service, both to people living in remote areas as well as people living in poor. The interest on natural medicines and their utilization have been increasing rapidly in recent years. Medicinal plants are important sources for pharmaceutical manufacturing[1].

Murraya paniculata (L).Jack (orange jasmine) known as" kamini" in India. It can be used as a background plant or an accent plant. It can prune into animals and other shapes (topiary), pruned into trees forms, grown as a potted plant or cultivated as a bonsai[2]. The sapwood is light yellow, heartwood is light brown color, fine textured and good for small turned articles. Branches or stems 2 to 5 cm in diameter. In India Himalayan region were evaluated for fuel wood suitability[3].

Various chemical constituent isolated from different of the parts plant including roots, stem, bark, leaves and fruits were: flavanoids, Indole alkaloids, Spiroquinazoline alkaloid, Coumarins, Isoflavanoids, Essential oils, Polysaccharides and fatty acid.

Murraya paniculata (L). Plant has been evaluated for various its pharmacological activities ie: anti implantation, antinociceptive, antiinflamatory, immunoreactivity, antiinfertility, antioxidant, antimicrobial, antifungal, antifeedant, dysentery and stimulant[4,5,6].

There are fourteen global species belon-ging to genus *Murraya*, only two are available in India, viz. *Murraya paniculata* (Linn) jack and *Murraya koenigii* Spreng. *Murraya koenigii* (L.) commonly known as meethi neem/ curry patta, family Rutaceae, is widely distributed in Himachal Pradesh (North Indian State) but remained under utilized. *Murraya koenigii* is used traditionally as antiemetic, antidiarrhoeal, febrifuge and blood purifier. The whole plant is considered to be a tonic and stomachic. The leaves are used extensively as a flavouring agent in curries and chutneys.

TAXONOMICAL CLASSIFICATION OF *MURRAYA PANICULATA*

Kingdom: Plantae

Division : Tracheophyta

Class : Magnoliopsida

Order : Sapindales

Family : Rutaceae

Genus : Murraya

Species : *Murraya Paniculata* (Linn.) Jack

Murraya Paniculata Linn. (Synonyms: *Chalcas paniculata* L., *Chalcas exotica* L. and *Murraya exotica* L.) belongs to the family Rutaceae, and is commonly known as orange jasmine, mock orange, satin wood, honey bush, China box, café de la India, mirto azahar, naranjo, jasmine, limoneria, bun . The genus Murraya belongs to the orange subfamily (Aurantioideae) in Rutaceae, and comprises two sections: Murraya and Bergera. Section Murraya contains 4 species and 3 varieties, all of which are closely related each other from taxonomical viewpoints. *Murraya paniculata* is geographically the most wide-spread species of Section Murraya occurring in either the tropics or subtropics of Asia and Oceania. It is distributed over the greater part of India and the Andaman Islands to an altitude of 1500 m. Native to tropical Asia from India and Srilanka to

Myanmar (Burma), southern China and Taiwan, Thailand, and east words throughout the Malesian region to northeastern Australia and Caledonia. This species has found wide medicinal value throughout the area of distribution[7].

MORPHOLOGICAL CHARACTERS OF *MURRAYA PANICULATA*[3,8]

It is an evergreen shrub or occasionally a small tree, usually 2 to 3 m in height but reaching 7.5 m and 13 cm in stem diameter.

Leaves: The leaves are alternately arranged along the stems and borne on stalks (i.e. petioles). These leaves (6-11.5 cm long) are once-compound (i.e. pinnate) with 3-9 leaflets. The glossy leaflets (1.5-7 cm long and 1.2-3 cm wide) are narrowly oval (i.e. narrow-elliptic) to somewhat egg-shaped in outline (i.e. ovate or obovate). They have entire margins, wedge-shaped (i.e. cuneate) bases, and pointed tips (i.e. acuminate apices).

Stem: Older orange jasmine normally have multiple stems from the ground level. The stems are supported by taproots with lateral roots and abundant fine roots. Stem bark is gray, becoming fissured and rough. Its younger stems are green and hairless (i.e. glabrous) or covered in tiny hairs (i.e. minutely pubescent). Older stems become woody and brown or grey in colour. They can reach up to 13 cm across and may eventually become fissured and rough.

Flowers: The fragrant flowers are borne in clusters, containing up to eight flowers, at the tips of the branches or in the upper leaf forks (i.e. terminal or upper axillary cymes). Each flower has five green sepals and five white petals (10-18 mm long) that are curved backwards (i.e. recurved). They also have ten stamens and an ovary topped with a style and a globular (i.e. capitate) stigma. Flowering occurs irregularly throughout the year, often in response to rain, but is most common from late winter through to late spring.

Fruit: Shiny, red elliptic fruits about 1 cm long develop. One or two light green seeds are embedded in the bitter, watery pulp.

Seeds: The seeds are tear-drop shaped, rounded or flattened on one side depending on whether there are one or two seeds per fruit.

CHEMICAL CONSTITUENTS OF *MURRAYA PANICULATA* LINN.

Many chemical constituents like flavanoids, alkaloids, coumarins, essential oils etc are obtained from different parts of *Murraya paniculata* parts like leaves, fruit, roots, stem, and flowers

Some of the Coumarins isolated from the different parts of *Murraya paniculata*[9,10,11,12,13,14].

S.No.	Flowers	Leaves	Root	Fruit	Stem
1.	Scopoletine glycoside	Paniculatine	Mexoticin	Scopoletine	7-(3-methyl-2-butenyloxy)-8-(3-butenyl-3-methyl-2-oxo)-coumarin
2.	Scopoline	Coumurrayin	Murrangatin		7-O-β-D-glucopyranosylloxy-8-(3-butenyl-3-methyl-2-oxo)-coumarin
3.	Murralongin	Osthol	Murralongin		8-(butenyl-3'-methyl)-7-O-β-D-galactopyranoside
4.	Merranzin hydrate	8-Isopentenylllimettin	Murrangatine palmitate		7-methoxy-8-(2'-isovaleryloxy-3-butenyl-3-methyl)coumarin
5.	5,7-Dimethyl-8-(3'-methyl-2-Keto Butyl) coumarin	Phebalosin	Sibiricin		Marmesin-4'-O-α-L-arabinopyranoside
6.	Murpanidine	Murralongin	Omphamurin		7-Methoxy-8-(3-butenyl-3-methyl-2-oxo)coumarin
7.	Auraptenol	Imperatorin	Murraol		7-Methoxy-8-(butenyl-3'-methyl)coumarin
8.	7-methoxy-8(1'-ethoxy-2'-hydroxy-3'-methyl-3'-burenyl)coumarin	Murrangtin	Murracarpin		
9.	Yuehgesin A	Isomexoticin	Murralonginol isovalerate		
10.	Yuehgesin B	Mupanidin	Isomurralongial isovalerate		
11.	Yuehgesin C	Murpanicin	Murrangatine isovalerate		
12	Braylin	Hainanmurpanin	Chloculol		
13.	Omphalocarpin	Isomerazin	6-Methoxy-7-geranylloxy coumarin		
14.	(-)Murracarpine	7-Methoxy-8-(2'-methyl-2'-formylpropyl)coumarin	Umbelliferone		
15.	Murrayacarpine A	Murrayanone	8-(2'-oxo-3'-methyl)butoxy-7-methoxy coumarin		
16.	Murrayacarpine B	Murraculatin	Minumicrolin		

SOME OF THE FLAVONOIDS ISOLATED FROM DIFFERENT PARTS OF *MURRAYA PANICULATA*[15-19]

S.No.	Fruits	Leaves	Root	Stem
1.	5,7,3',4',5'-pentamethoxy flavanol	Gardenin A	Methyl-N-methyl anthranylate	3,5,6,7,8,3',4',5'-octamethoxy flavones
2.	5,6,7,3',4',5'- hexamethoxyflavone	Gardenin C		3,5,7,3',4',5'-hexamethoxy favone
3.	3,5,6,7,3',4',5'-heptamethoxyflavone	Gardenin E		
4.	5,7,8,3',4',5'- hexamethoxyflavone	Exoticin		
5.	3,5,7,8,3',4',5'-heptamethoxyflavone	Umhengerin		
6.	3,5,7,8,3',4'-hexamethoxyflavone	5,3',5'-trihydroxy-6,7',4'-trimethoxyflavone		
7.	5-hydroxy-3,7,8,3'4',-pentamethoxyflavone	5-hydroxy-6,7,8,3',4',-pentamethoxyflavone		
8.	5-hydroxy-3,7,8,3',4',5'-hexamethoxyflavone(gardenin A)	5,3'-Dihydroxy-6,7,4',5'-tetramethoxyflavone		
9.	8-hydroxy-3,5,7,3',4',5'-hexamethoxyflavone	5,3',5'-trihydroxy-6,7,4'-trimethoxyflavone		
10.	5,7,3',4',5'-pentamethoxyflavanol			

SOME OF THE ALKALOIDS ISOLATED FROM DIFFERENT PARTS OF THE *MURRAYA PANICULATA*[20,10,19]

S.No.	Roots	Fresh flowers	Leaves
1.	Noracronycine	Caffeine	Tamynine
2.	De-N-methylnoracronycine	Murrayaculatine	
3.	De-N-methylacronycine		
4.	Skimmianine		
5.	Yuehchukene		
6.	Paniculidine A		
7.	Paniculidine B		
8.	Paniculidine C		
9.	Edulitine		
10.	Murrapanine		
11.	Murrayacarine		
12.	3-Formylindole		
13.	Paniculol		
14.	3- prenylindole		

SOME OF THE ESSENTIAL OILS ISOLATED FROM *MURRAYA PANICULATA* PLANT[21-23]

Sabinene, 3-Hexen-1-ol, formate, Limonene, Linalool, Cyclohexene-3,4-diethenyl-3-methyl, Cyclohexene-5,6-diethenyl-3-methyl, Azulene, Ocimene, Cis-3-hexenyl valerate, 2- cyclohexen-1-one,2-methyl-5-(1-methylethenyl), 1H-imidazole-4-methanol-5-methyl, δ- Elemene, α-Cubebene, Germacrene D; 3,9-dodecadiene, β –caryophyllene, Caryophyllene oxide, Cyclooctene-4-methylene-6-(1-propenylidene); Retinal, α- Caryophyllene, β- humulene,

Copaene, γ- Elemene, Cubenol, α- Bulnesene, Calamenene, 3- tetradecynoic acid, Cis- lanceol, β-vatirenine, β- Elemene, Nerolidyl acetate, Alloaromadenderene oxide, Spathulenol, D-Verbenone; Pyrimidine-2(1H) thion-3,4,-dihydro-6-methyl-4-phenyl; 3-Carene; 12-Oxabicyclo-(9,10)-dodeca-3,7-diene-1,5,5,8-tetramethyl; Globulol; Eremophilene; 2(1H) Napthalene-4a,5,6,7,8,8a-hexahydro-4a,8a-dimethyl; Tau-Muurolol, Ledol; Aromadendrene oxide; α- Calaconene; Longifolenealdehyde; 11- Hexadecyn-1-ol; Cycloisolongifolene-8-hydroxy-endo; T-Longipinocarveol; Carveol; 1-Cyclohexene-1-ethanol-2,6,6-trimethyl; 1-Methyl verbenol; Corymbolone; 2-(4a,8-Dimethyl-1,3,3,4,4a,5,6,7-octahydro-naphthalene-2-yl)-prop-2-en-1-ol; Ledene alcohol; Aristolene oxide; 6-Isopropenyl-4,8a-dimethyl-1,2,3,5,6,7,8,8a-octahydro naphthalene-2-ol; Longifolene-(12)-epoxide.

TRADITIONAL USES[24, 25]

In Indonesia especially in the history of Jogjakarta Sultanate located in Java Island, this plant was considered as part of royal plant that represents the symbol of wisdom. The King always stopped for a while near the plant for contemplation on the way to the palace hall before held a meeting. Among the Javanese people the plant is believed to protect from devil, witchcraft, bad luck and to bring joyful life and good luck, for this purpose they grow the plant in their garden or yard. The plant also involves in two important cycles of human life which are marriage and death/funeral. This plant is also used in wedding ceremonies as a symbol of praise for the couple in order to have fruitful and joyful life just like the nice fragrance of the flower and in funeral especially its leaves to be put as a bed for the death body to create pleasant fragrance.

Decoction of dried material (3 - 9 gm) or 0.3 - 0.9 gm of pulverized material by mouth with water: These preparations were used for gas pains. Swelling pain due to sprain and contusions, rheumatic bone pain and poisonous snake bites. . Infusion of plant leaves was used as tonic; for diarrhea and dysentery. Decoction of leaves also used as mouthwash for toothaches. Infusion of leaves and flowers is tonic and stomachic. Leaves and root bark used for rheumatism, cough, and hysteria. Used for abscesses, cellulites, tapeworm disease, rheumatic fever, coughs, giddiness, hysteria, thirst, and burning of the skin. Infusion used for herpes of the stomach, and the sediment applied externally. In Yi medicine in China, used for common colds, fever, cough, sore throat, influenza. In the Gujarat region of India, used to regulate fertility. In Singapore, leaves are ingredient of a tonic given for irregularities in the regenerative organs of young women. Also similarly used in Java. In China, plant is widely used for stomachaches, toothaches, rheumatism, paralysis, and diabetes. Many of the other parts of plant were used in different ways like: Wood: Most useful part of the tree is the yellow wood, in demand for making canes. Also used for

making Kris handles. Crafts: Top branches, with the leaves, used for making wreaths and in giving body to bouquets'. Cosmetic: In Thailand and Burma, powdered bark and root used as cosmetic. Flowers are sometimes put in the hair for their pleasant smell. In Java, flowers are used in making cosmetics.

PHARMACOLOGICAL ACTIVITY

Oestrogenic activity: Yuehchukene ia an alkoloid isolated from roots of *Murraya paniculata* has oestrogenic activity as evidenced by 100% anti-implantation effects on 1-3 day gestation in female mice. When given to immature female mice there was an increase in the weight of uterus[26].

Anticholinesterase activity: Two compounds murranganone and paniculatin, isolated from the leaves of *Murraya paniculata* was found to have anticholinesterase inhibitory activity. Another compound minumicrolin isolated from aerial parts of Murraya paniculata has mild butyryl anticholinesterase inhibitory activity[27, 28].

Antiprotozoal activity: The cholofom exctract form *Murraya paniculata* was found to be moderately active against *Giardia intestinalis* infestation. The extract also shows moderate activity against *Entamoeba histolytica*[29].

Antimicrobial activity: Auraptene, trans-gleinadiene,5,7-dimethoxy-8-(3-methyl-2-oxo-butyl) coumarin and toddalenone were isolated from the chloroform, petroleum ether and methanol extract from leaves of *Murraya paniculata*. Only chloroform extract showed a weak activity against *Bacillus cereus* and *Saccharomyces cerevisiae* with inhibition zone 9 mm and 8 mm respectively. Among the isolated compound, only trans-gleinadiene exhibited a weak antimicrobial activity against *Bacillus cereus* with 8 mm inhibition zone which conclude that trans-gleinadiene, auraptene and 5,7-dimethoxy-8-(3-methyl-2-oxo-butyl) coumarin give synergistic effect towards chloroform extract[30].

Antioxidant: Currently, *Murraya paniculata* with several extraction methods possess antioxidant activity. According to, ethanolic extract of "kemuning" leaves using linoleic-thiocyanate method showed antioxidant strength in the following sequence of 10% "kemuning" > 1% vitamin E > 5% "kemuning" > 1% of "kemuning" extract. Using 2,2-diphenyl-l-picryl hydrazyl (DPPH) method, the IC50 of "kemuning" extract was 126.17 µg/ mL which is 15 times lower than the vitamin E (positive control) 8.27 µg/ mL. In addition, the acetone extraction of M. paniculata showed inhibitory effect toward xanthine oxidase (XO), tyrosinase and lipoxygenase (LOX) where 100 µg/ mL of the acetone extract was able to inhibit 10% of XO activity, 62% of LOX activity and at 500 µg/mL, the acetone extract inhibited 72% of tyrosinase activity[31, 32].

Analgesic activity: It is evident from the study that the bark of *Murraya paniculata* extracted by equal proportions of petroleum ether, ethyl acetate and methanol exhibits significant analgesic effect in albino mice. We believe, further detailed advanced studies may be pursued in future to explore the analgesic activities of the plant as well as its active constituents[33].

Insecticidal Activity: Leaf-derived petroleum ether fraction was found more toxic than ethyl acetate fractions were evaluated against adult male and female *Callosobruchus maculatus.* Males were more susceptible than females. It suggests further study for its potential as an insect-control agent[34].

Antinociceptive / Bioactivity: Study of the ethanol extract of leaves showed a profound nociceptive dose-dependent effect. The extract also showed considerable brine shrimp toxicity[35].

Antidiabetic: Study of the ethanol extract of leaves on STZ-induced diabetic rats showed significant reduction of blood glucose, serum cholesterol, serum triglycerides. Study also showed significant reduction of TBARS, lipid peroxidation and increase in GSH. Results showed significant antidiabetic activity along with potent antioxidant potential in diabetic conditions. Supplementation of MP extracts may be beneficial in correcting hyperglycemia and preventing diabetic complications[36].

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