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A Review on Phytochemical and Pharmacological Study on Origanum Vulgare.

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ABSTRACT:-*Origanum vulgare* has been used traditionally for treatment of various ailments. Almost every part of O.vulgare are used in the systems of medicines for the treatment of various diseases. The cultivation,propogation and biophysical limit of the plant is discussed.In modern scientific literature's, the plant has been reported to have potential efficacy against diabetes, antibacterial, anti fungal, and anthelminthic activities etc. O.vulgare is reported to contain various biologically active phytochemicals such as carvacrol, thymol, limonene, piene, ocimenes, caryophyllene, p-Cymene, terpenes etc. The present review highlights the uses of O.vulgare and its therapeutic activity and the evidence based studies on various pharmacological effects of the plant.

KEYWORDS:-*Origanum vulgare*, Propogation, Climatic conditions, Uses, Phytochemical, Pharmacological properties

I. INTRODUCTION:-

Origanum Vulgare (Lamiaceace), known by the common name oregano, is an herbaceous perennial indigenous to Europe, North Africa, and temperate regions of Asia [1, 2]. Origanum species grow copiously on mountainous areas and hilly areas with extensive ranges of altitudes [3].Oregano is a flowering plant in the mint family (Lamiaceace). It is native to temperate Western and Southwestern Eurasia and Mediterranean region. Oregano is a perennial herb, growing from 20–80 cm in height with alternate leaves 1–4 cm. The flowers are purple, long, produced in erect spikes [4]. Indeed, the tribal people of western Himalayan belt use O. vulgare against flatulence, diaphoresis, and cough, to promote menstrual discharge, energize the body, increase appetite, and as a tonic [5–8].Oregano has been assessed for its antioxidant and antimicrobial characteristics with particular relevance to food preservation [4, 5].The major components identified in this plant have been thymol, carvacrol, g-terpinene, p-cymene, linalool, terpinen-4-ol, and sesquiterpenoids. The essential oils of Origanum species containing mainly carvacrol and/or thymol, together with considerable amounts of g-terpinene and p-cymene, have been used in medicine and the food industry [9-10].

Fig1:- Leaves of Origanum Vulgare

Fig2 :- flower of Origanum Vulgare

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Taxonomic Hierarchy:- [11]

Kingdom	Plantae – plantes, Planta, Vegetal, plants
Subkingdom	Viridiplantae – green plants
Infrakingdom	Streptophyta – land plants
Super division	Embryophyta
Division	Tracheophyta – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants, phanérogames
Class	Magnoliopsida
Super-order	Asteranae
Order	Lamiales
Family	Lamiaceae – mints, menthes
Genus	Origanum L.
Species	*Origanum vulgare L.* – oregano

Synonym:-[12]

English	oregano**,** wildmarjoram
Hindi	बनतुलसी ban tulsi, सथ्रा sathra, मिरज़ानजोश mirzanjosh
Sanskrit	Maruvaka
Marathi	Ova,Maruaa
Gujarati	Jungli marvo
Konkani	Ovey
Kannada	Maruga
Malayalam	Kattumaruva
Odia	Saptala
Telugu	Mridumaruvamu

Other common names:-[13-15]

English	Wild marjoram
Danish	Almindelig merian, merianurt
Dutch	Oregano, wilde marjolein
French	Origan, origan commun
German	Dostenkraut, gemeiner Dost, Oregano, wilder Majoran
Greek	Ρίγανη (rigani)
Italian	Maggiorana selvática, origano, origano comune,
Norwegian	Bergmynte, oregano
Portuguese	Orégano, orégão
Spanish	Orégano

Propagation:-

For cultivation, marjoram is both seeded directly and transplanted into fields. Oregano has a spreading root system and is usually propagated by seed or cuttings, the latter being removed in late spring once the leaves are firm enough to prevent wilting when placed in sand (average shoot length: 30 cm). Well-rooted cuttings are placed in the ground about 30 cm apart or planted outside in pots. If seeds are used, they should be sown in a seed box in spring and planted outside when seedlings are 7.5 cm tall. Old wood that becomes leggyshould be cut out at the end of winter and plants should be replaced every four years or so to prevent legginess. Pungency declines in rich soils, and after flowering.Ploughing of the soil and fertilization with ammonium phosphate during November to December is sufficient for oregano cultivation; under normal conditions, pest control can be reduced to a simple weeding out (manually or by using pesticides)[16] although. In addition, O. majorana can be severely affected by Alternaria and

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Fusarium. There is scarce documentation on biological pest control in oregano, which needs frequent (e.g. at least four times a year) mechanical weed control[17]. The lifespan of oregano is about five or six years and usually one harvest is done in the first year and two in the following years. On average, the yield ranges from 2.5 to 3.5 t/ha and the essential oil yield ranges from 0.5 to 1.5% of dry weight[18].

Biophysical limits:-

According to the studies, air temperature for optimum oregano growth and development range from 18 °C to 22 °C, whereas the root system of well-developed plants (older than one year) may withstand air temperatures from -25 °C to 42 °C

[19]. However, temperatures below 4 °C or above 33 °C may limit plant growth. The plant grows in a wide variety of soils and climates from seaside to mountainous areas on the islands and mainland of Greece (1500 m), in rich as well as on poor calcareous soils. An excellent soil pH value is around 6.8, but oregano may be found on calcareous soils with much higher pH values. Generally, a long light period is needed (more than 12 hours) for a high content of essential oil and carvacrol.

Description:-

Origanum vulgare is an aromatic, woody-based perennial, which grows to 20-30 cm in height, and flowering season is between May to October [20]. The leaves are ovate (egg-shaped, with wider end at the base), 10-44 mm long and 5-25 mm wide, and are opposite to each other on the stem [21]. The edges of the leaves are smooth and tips vary shapes from acute (pointed) to obtuse (rounded) [22]. The bunch is many-flowered gropued together, with flowers grouped into terminal spike. The corolla is whitish purple in colour and 5-8 mm long. The calyx has five sepals in it. Each flower has four stamens (male parts).Fruits has four small nutlets (single-seeded units) [23].

Geographical distribution of origanum vulgare[In India]:-

Jammu and Kashmir, Himanchal Pradesh, Uttar Pradesh, and Sikkim.

In northern Himalayan region: O.Vulgare found in seven districts of Uttarakhand situated at different geographical locations:

1. Nainital (1480–2240 m);
2. Uttarakashi (2500–2800 m);
3. Rudrapryag (3555 m);
4. Chamoli (3260 m);
5. Bageshwar (2260 m);
6. Champawat (1840 m); and
7. Almora (2220 m) [24].

Chemical composition:-

The major constituents of O. vulgare leaves essential oil are carvacrol, p-cymene, c-terpinene, limonene, terpinene, ocimene, caryophyllene, b-bisabolene, linalool, and 4-terpineol.The bioactive constituents of O. vulgare leaves extract are rosmarinic acid, linalool, thymol, carvacrol, tannins, flavonoids, triterpenes, phenol carvacrol, and thymol. Oregano also contains iron, vitamins, calcium, copper, niacin, magnesium, and thiamine[25].

MACROSCOPICAL STUDIES OF LEAF:-[26]

Parameters	Observations
Color	Dorsal surface -Grayish green Ventral surface-pale green
Odour	Aromatic and pleasant
Taste	Bland followed by sweet
Form	Simple
Shape	Ovate
Size	1-2 cm X 1 cm
Apex	Obtuse
Margin	Entire
Texture	Smooth
Venation	Reticulate
Base	Symmetrical and tapering
Arrangement of leaves	Opposite

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Leaves are smooth, simple, petiolated, ovate to oblong-ovate, (0.5-1.5 cm) long, (0.2-0.8 cm) wide, with obtuse apex, entire margin, symmetrical but tapering base and reticulate venation. The texture is extremely smooth due to presence of numerous hairs.

NUTRITION VALUE:-[27]
The table below shows some of the nutrients in one teaspoon (tsp), or 1 gram of dried oregano leaves.

Nutrient	Amount	Daily adult requirement
Energy (calories)	2.7	1,800–3,000
Carbohydrate (g)	0.7	130
Fiber (g)	0.4	25.2–33.6
Calcium (millgrams [mg])	16.0	1,000–1,200
Phosphorus (mg)	1.5	700
Potassium (mg)	12.6	4,700
Folate (mcg, DFE)	2.4	400

Pharmacological activity:-

1.Anti-obesity Activity

Pancreatic lipase is the most important enzyme in digestion of triglycerides. One of the strategies in prevention or treatment of obesity is altering metabolism of lipids by inhibition of dietary fat absorption. Anti-lipase activity was determined by turbidimetric assay. The methanolic extract of O. vulgare showed pancreatic lipase inhibitory activity.[28]

2.Anti-hyperlipidemic Actions

Volatile oil, methanolic and aqueous extract of O. majorana syn. O. vulgare leaves showed antihyperlipidemic effects in lowering the elevated triglycerides and cholesterol levels in streptozotocin induced diabetic rats [29,30].

3.Anti-hyperglycaemic

Potentials The essential oil, methanolic and aqueous extract of O. vulgare leaves showed anti-hyperglycaemic activity by significantly decreasing blood glucose levels in STZ diabetic rats.In addition, no changes were observed in basal plasma insulin concentrations after treatment in either normal or STZ diabetic rats indicating that the aqueous extract acted without changing insulin secretion[31,32]. The extracts of clonal oregano lines were reported to possess strong inhibitory activity against porcine pancreatic amylase (PPA) activity in vitro. PPA inhibition varied by extract and ranged from 9% to 57%. The authors also suggested that amylase inhibition by oregano extract was associated with extract total phenolic content and rosmarinic acid, protochatechuic acid, quercetin, and p-coumaric acid contents, as well as extract antioxidant activity and protein content[33].

4.Antioxidant Activity

Different extracts and essential oil of O. vulgare were reported to possess antioxidant activity. They showed strong DPPHscavenging activity, protective effects on lipid peroxidation in liposomes, NO and H2O2 neutralization activities[29,34,35].

5.Hepatoprotective Activity

Aqueous extract of O. vulgare leaves showed hepatoprotective activity on CCl4-induced hepatotoxicity in normal and hepatotoxic rats by decreasing serum alanine amino transferase (ALT), alkaline phosphatase (ALP), and aspartate amino transferase (AST), lipid peroxide (LPO); and increasing GST, CAT, SOD, GPx, GR, and GSH in liver tissues[36]. The O. vulgare extract was reported to possess hepatoprotective activity against halothane induced hepatotoxicity by decreasing the serum levels of AST, ALT, ALP, total bilirubin (T-BIL), direct bilirubin (DBIL) and indirect bilirubin (I-BIL) compared with group of Halothane[37].

6.Antifungal Effects

The essential oil of O. vulgare showed antifungal effects against Aspergillus flavus, A. parasiticus, A. fumigatus, A. terreus and A. Ochraceus[38], Candida albicans, Penicillium species, P.

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aurantiogriseum, P. glabrum and P. brevicompactum, P. chrysogenum; Fusarium proliferatum, F. oxysporum, F. verticillioides, F. subglutinans7 and against the human pathogens Malassezia furfur, Trichophyton rubrum, and Trichosporon beigelii[39]. Antifungal activities were also reported by many other scientists[40,41].

7.Antibacterial Effects

Essential oil from O. vulgare showed antibacterial effects against Bacillus subtilis, Enterobacter cloacae, Escherichia coli[42], Micrococcus flavus, Proteus mirabilis, Pseudomonas aeruginosa, Salmonella enteritidis, S. epidermidis, S. typhimurium, and Staphylococcus aureus[43] and against ulcerassociated Helicobacter pylori[44].

8.Antiurolithic Activity

The crude aqueous-methanolic extract of O. vulgare was reported to exhibited antiurolithic activity by inhibiting the slope of nucleation and aggregation; and also decreased the number of calcium oxalate monohydrate crystals produced in calcium oxalate metastable solutions and prevented as well as reversed toxic changes including loss of body weight, polyurea, crystalluria, oxaluria, raised serum urea and creatinine levels and crystal deposition in kidneys compared to their respective controls[45].

9.Anticancer Activity

Volatile oils and the crude ethanol and water extracts showed antiproliferative activity to the adenocarcinoma of breast cell line (MCF7)[46]. Acetone extracts inhibited in vitro cytotoxicity against a noncancerous African green monkey kidney (Vero) cell line and an adenocarcinoma cervical cancer (HeLa) cell line[47]. The methanolic extract showed cytotoxic effect of on HCT-116 and MDA-MB-231 cell line in vitro by using an MTT viability assay by inhibiting the cell growth[48].

10.Antinociceptive Potential

The aqueous extract of O. vulgare showed antinociceptive activity. The response latency of rats to thermal stimulation was recorded using Tail-Flick test. Co-administration of O. vulgare extract and baclofen showed significant decrease in the response latency compared to control group[49].

11.Antiplatelet Activity

Essential oil from O. vulgare showed antiplatelet activity by inhibition of clot retraction in guinea pig and rat plasma. A significant correlation between antiplatelet potency and phenylpropanoids content was evidenced thus suggesting a key role for this moiety in the prevention of clot formation[50].

12.Antimelanogenic Properties

Rosmarinic acid methyl ester was isolated form O. vulgare showed ability to reduce tyrosinase, DOPA oxidase and melanin contents in B16 cells. The results suggested that the isolated compound possess antioxidant and depigmentation effect that may be useful in food additives and in the control of skin pigmentation[51]

Uses:-

1.Food preservation:

One application of oregano in food preservation is Cypriot pastrami, a type of sun-dried meat product, also known as samarella[52]. The more modern way of making samarella is to take the meat of a goat or sheep and dry the meat using the sun. Once dry, the meat is washed and sprinkled with oregano. A second application of OEO as a food preservative includes that use of additivefree meats that have been dried and cured. This approach has been recognized in the European Union where essential oils are considered safe food additives at concentrations<2 mg/kg body weight by/day[53]

Another strategy of food preservation is to incorporate a combination of extracts to enhance preservation capabilities. Oregano tested in combination with other natural extracts has been reported to enhance its preservative qualities. Chitosan (1%) was found to be effective with OEO (2–4%) in pork meat at inhibiting bacterial growth, protecting from lipid oxidation, and extending shelf-life with minimal effect on sensory qualities[54]

2.Culinary Uses.

The naturally existing traits like essential oil, fixed oils, flavonoids etc. are responsible for aromatic, culinary and pharmacological attributes making this plant high-value. Oregano has an ancient history of being used in cuisine for flavouring meat, fish, vegetables wine[55] and was an important constituent in beers and ales. Customarily O.vulgare and O.marjoram have also been used in making tea[56].

3.Traditional uses

The oregano herb is used as a remedy of for narcotic poisons, convulsions and dropsy[57].

Oregano essential oil and leaf extract are both strong natural antibacterial agents due to the high concentration of thymol in it [58].
The air dried leaves are used in painful swellings and rhumetoid.
Oregano tea is used to treating cold, fevers and menstrual pain because of antiseptic ability [59].
Bile flow is stimulated by the oregano and the herb also aid in alleviating the discomfort of flatulence and excess abdominal gas [60]
Diluted oregano essential oil is used in toothaches and different kind of joint pain in patient.
The oregano was also used as an antidote for venomous bites of snakes and insects [61].

II. CONCLUSION

O.vulgare L. is an exemplary incomparable high class medicinal plant having eminent culinary and pharmacological applications with epic historical background. Probably, each part of the herb has been utilized for innumerable ailments from decades. Modern techniques assessed the plant to have high biological activity credited to the ingredients of the essential oil. Further phytochemical and pharmacological investigations on the OV will establish it as an authentic multi-disease control plant beyond the doubt. Furthermore, there is a need to enhance the accumulation of secondary metabolites using in vitro techniques for pro-conservation of the species.

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