International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

# Phytochemical and Biological efficacy insights of Morina longifolia Wall

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**ABSTRACT**

*Morina longifolia is one of the important medicinal plants owing to its aromatic properties. In the present study efforts are made to compile its phytochemical and bioactivity scientific reports. Its leaves are found rich source of secondary metabolites particularly of essential oils germacrene D, pinene, bicyclogermacrene, cadinol, (E)-citronellyl tiglate and phellandrene which have a commercial medicinal importance. Moreover it has a potent antimicrobial activity. It is reported to be vastly effective against bacterial species like Escherichia coli, Staphylococcus aureus, Proteus vulgaris, Klebsiella pneumonia, Bacillus subtilis, Pseudomonas aeruginosa and fungal species like Alternaria alternata, Aspergillus flavus, A. fumigates, Fusarium solani, Candida albicans, Candida glabrata .*

***Key Words: Antimicrobial activity, anti-oxidative activity, Morina longifolia, phytochemistry***

## I.INTRODUCTION

Medicinal plants play important role for the treatment of different ailments in the current era because it's an economical way to cure different diseases in the developing nations. As frequent use of modern medicine leads to disease resistant issues hence the alternative and effective way is to isolate natural bioactive compounds from different parts of medicinal plants [1]. Till now various bioactive compounds known as phytoconstituents has been isolated from various medicinal plants and scientifically proven that these compounds can be used to treat life threatening diseases as more than 500,000 plant species has been reported on earth [2;3]. Among the treasure of medicinal plant wealth *Morina longifolia* commonly known as "Whorlflower" belongs to family Dipsacaceae is one of the important medicinal plant. It is widely distributed in temperate and alpine regions of North Western Himalayas at an altitude of 2,400 m - 4,200 m [4, 5]. This plant is a perennial herb possessing spiny margined leaves, erect stem and long interrupted spike of flowers having slender corolla tube upto 2.5 cm in length [6]. The flowers are bracketed and are white to pinkish in color. Leaves of the *M. longifolia* are strap shaped with shallow 3-spined lobes and long pointed spiny apex [7]. The phytochemical studies of this plant has reported that its leaf oil is a rich source of germacrene D, pinene, bicyclogermacrene, cadinol, (*E*)-citronellyl tiglate and phellandrene [8;9;10]. Furthermore its roots are assessed to be rich sources of Phenyl propylalcohol,

Phenyl propyl cinnamate, Phenyl acetaldehyde and Lauraldehyde (11). This plant has strong aromatic properties as a result it is used in the preparation of dhup and agarbatties [5;12]. Furthermore root extracts of this plant is reported to have antiseptic properties and hence are used in treatment of burns and maggot wounds [13; 14; 15].

## II.PHYTOCHEMISTRY

Phytochemical investigations of *M. longifolia* have shown the presence of various compounds particularly morinoursolic acids A and B, *n*-triacont-3-one, 8-methylditriacont-7-ol, and β-sitosterol, 2, 6-dihydroxy-5-methoxy-(3-C-glucopyranosyl) benzoic acid, β-sitosterol, p-hydroxybenzoic acid, caffeic acid and oleanolic acid. [16;17] . Some of the major compounds which have been isolated are given in table 1.

From the aerial parts of *M. longifolia* new aromatic glycoside characterized as 2,6-dihydroxy-5-methoxy-(3-C glucopyranosyl) benzoic acid was also isolated along with four known compounds[18; 19]. Some the commercial important secondary metabolites are elaborated below:

### 2.1 β-Sitosterol

β-Sitosterol (beta-sitosterol) is the plant sterol having chemical structure similar to that of cholesterol. It is a white, waxy powder having a characteristic odor. It is widely distributed in the plant kingdom [20] The synthesis of β-Sitosterol involves specific hydrogenation of the side-chain of stigmasterol **1** which leads to the formation of stigmasterol tosylate **2** [21]. The stigmasterol tosylate then in turn undergoes solvolysis in presence of pyridine and anhydrous methanol (MeOH) and results in the production of i-stigmasterol methyl ether **3** and stigmasterol methyl ether **4** [22]. These compounds undergo isomerisation reaction however in presence of ethanol they undergo chain of reactions and hence form a intermediate compound having β-ring **5** [23]. Furthermore, deprotection of the β-ring double bond of this compound in presence of p-toluenesulfonic acid (p-TsOH) and aqueous dioxane ultimately yields β-sitosterol **6** [24;25;26] (Fig 1).

### 2.2 Caffeic acid

Caffeic acid is 3, 4-Dihydroxybenzeneacrylicacid {3-(3, 4-Dihydroxyphenyl)-2-propenoic acid} having chemical formula $C_9H_8O_4$ [27, 28]. It is an organic compound that is classified as a hydroxycinnamic acid and has both phenolic and acrylicfunctional groups [29; 30]. The biosynthesis of caffeic acid is initiated from tyrosine **7** which gets converted to Trans-*p*-coumaric acid **8**. The hydroxylation of coumaroyl ester of quinic acid (esterified through a side chain alcohol) then leads to the production of caffeic acid ester **9** of shikimic acid [31]. This in turn gets converted to chlorogenic acid. The chlorogenic acid acts as a precursor for number of alcohol molecules (ferulic acid **10**, feruloyl CoA **11**, vanillin **12**) which play a significant role in the formation of lignin [32;33;34]. The details of the pathway are elaborated in Fig 2.

## III.BIOLOGICAL EFFICACY

### 3.1 Anti-microbial activity:

Several studies have revealed that *M. longifolia* has a potent antimicrobial activity. Yousuf et al. [35] put forth that extracts of *M. longifolia* showed prominent antibacterial activity against *Escherichia coli* and *Klebsiella pneumoniae*. Kumar et al. [36] has reported that essential oil from the leaves of *M. longifolia* is effective against four fungi species (*Alternaria alternata, Aspergillus flavus, A. fumigatus* and *Fusarium solani*) and six bacteria species (*Escherichia coli, Staphylococcus aureus, Proteus vulgaris, Klebsiella pneumonia, Bacillus subtilis* and *Pseudomonas aeruginosa*). Furthermore Joshi [37] reported volatile oil of *M. longifolia* has antibacterial activity against *Staphylcoccus aures* and *Bacillus subtilis* and antifungal activity against *Candida albicans* and *Candida glabrata*.

### 3.2 Anti-oxidative activity:

*In-vitro* anti-oxidative activities were determined by DPPH radical scavenging assay and superoxide anion radical scavenging assay [38]. It has been revealed that ethanolic, acetone and choloroform extracts of whole plant of *Morina longifolia* exhibited potent anti-oxidative activities [39, 40].

## IV. FIGURES AND TABLES

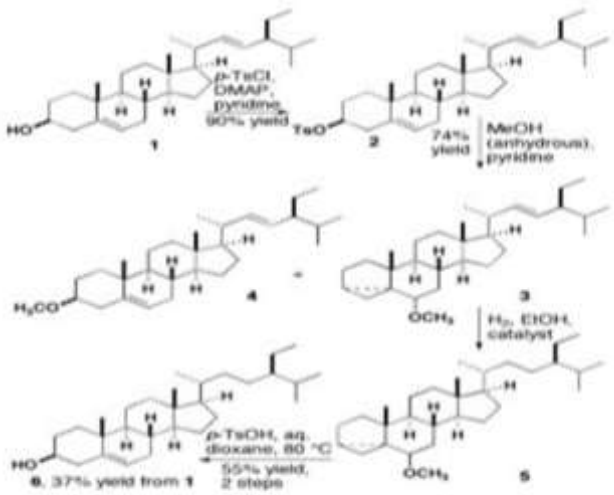


**Fig 1**: Biosynthetic Pathway of β-Sitosterol [23]

International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

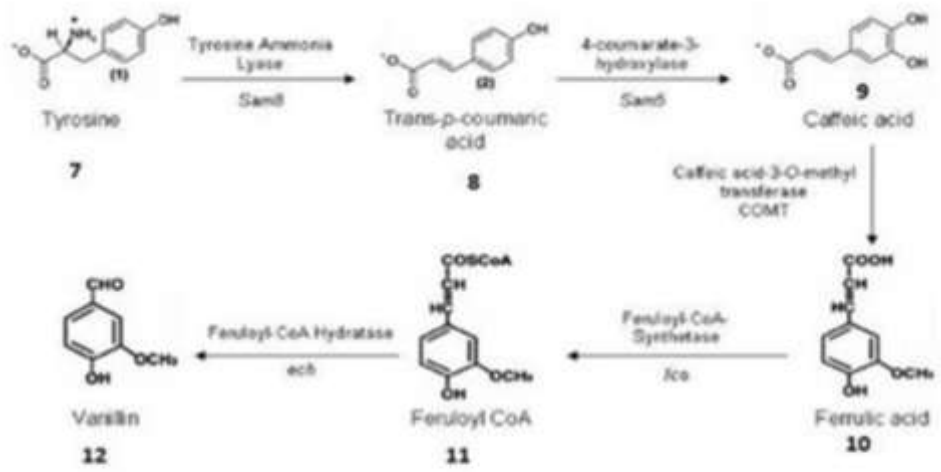


**Fig 2**: Biosynthetic Pathway of Caffeic acid [31]

**Table1.** List of compounds isolated from leaves and root

| S.No. | Name of compound | Root (%) | Leaf (%) |
|---|---|---|---|
| 1. | Lauraldehyde | 3.1 | - |
| 2. | Phenyl acetaldehyde | 12.6 | - |
| 3. | Methyl salicylate | 2.7 | - |
| 4. | Phenyl propyl cinnamate | 7.9 | - |
| 5. | Phenyl propylalcohol | 29.9 | - |
| 6. | Unidentified ester | 11.5 | - |
| 7. | Sesquiterpenes | - | 53.02 |
| 8. | Germacrene D -4-ol | - | 20.74 |
| 9. | α-Cadinol | - | 3.73 |
| 10. | Germacrene D | - | 10.47 |
| 11. | α-Pinene | - | 4.84 |
| 12. | Bicyclogermacrene | - | 4.26 |
| 14. | (*E*)-Citronellyl tiglate | - | 4.20 |
| 15. | β- Phellandrene | - | 3.24 |

**Source:** Kumar et al. [19]

## V.CONCLUSIONS

The chemical investigation of *M. longifolia* has revealed that it is rich source of active principles particularly essential oils. These active principles are found to be potent antimicrobial agents as they adhere to bacterial and fungal cell surfaces there by disturb the receptor signaling within them. Furthermore its ethanolic, acetone and choloroform extracts showed significant antioxidative activities. However hyphenated chromatographic techniques like LC-MS/MS, UPLC-MS needs to be utilized for piercing in depth minutiae of mass fragmentation in active principles.

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