5. PHYTOCONSTITUENTS AND HERBAL EXTRACT PROFILES

5.1. Herbal Extract Profile

Information of the selected extracts and phytoconstituents is as follows.

I. Curcuma longa Linn

**Taxonomy**

Kingdom : Plantae  
Phylum : Magnoliophyta  
Class : Liliopsida  
Order : Zingiberales  
Family : Zingiberaceae  
Genus : Curcuma  
Species : longa  
Parts used : Rhizome

**Vernacular names**

Sanskrit : Haridra  
Hindi : Haldi  
Tamil : Manjal  
English : Turmeric  
Bengali : Halod  
Marathi : Haldi  
Telugu : Pasupu

**Information**

*Curcuma longa* (Zingiberaceae) contains an active principle curcumin, chemically known as 1, 7 bis (4-hydroxy-3-methoxy phenyl)-1, 6-heptadiene-3, 5 dione [83]. Turmeric is commonly used colouring agent in foods due to presence of curcumin. It has been used for treatment of several ailments since centuries due to its therapeutic benefits on autoimmune, cancer, cardiovascular, neurodegenerative and pulmonary diseases, where inflammation is involved as major mechanism in these diseases [84]. Even though curcumin possess a wide range of physiological and pharmacological properties, several studies revealed the presence of low bioavailability in the intestine [85-87].
II. *Piper longum* Linn

**Taxonomy**

Kingdom : Plantae  
Phylum : Magnoliophyta  
Class : Magnoliopsida  
Order : Piperales  
Family : Piperaceae  
Genus : *Piper*  
Species : *longum*  
Parts used : Fruits

**Vernacular names**

Sanskrit : Pippali, Magadhi  
Hindi : Pipal  
Tamil : Tippili  
English : Long pepper  
Bengali : Piplamor  
Marathi : Pimpli  
Telugu : Pippuloo

**Information**

Piperine chemical name is 1-(5-(1, 3-benzodioxol-5-yl)-1-oxo-2, 4-pentadienyl, a potent alkaloid available from *Piper longum* (Piperaceae). Piperine has been reported to possess CNS depressant, antipyretic, anti-inflammatory activities. It also improves digestion, appetite, active against cold, cough, dyspnoea, colic, dysentery, worms and piles [88-90]. The bioavailability of several other drugs has been improved with piperine in preclinical as well as clinical studies through inhibition of drug metabolism [91-93].
III. *Piper nigrum* Linn

**Taxonomy**

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<tr>
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**Vernacular names**

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<td>Miriyalatige</td>
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<tr>
<td>English</td>
<td>Black pepper</td>
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</table>

**Information**

Piperine chemical name is 1-(5-(1, 3-benzodioxol-5-yl)-1-oxo-2, 4-pentadienyl, a potent alkaloid available from *Piper nigrum* (Piperaceae). Piperine has been reported to possess CNS depressant, antipyretic, anti-inflammatory activities. It also improves digestion, appetite, active against cold, cough, dyspnoea, colic, dysentery, worms and piles [88-90]. The bioavailability of several other drugs has been improved with piperine in preclinical as well as clinical studies through inhibition of drug metabolism [91-93].
IV. *Citrus aurantium* Linn.

**Taxonomy**

Kingdom : Plantae  
Phylum : Magnoliophyta  
Class : Dicotyledonae  
Order : Sapindales  
Family : Rutaceae  
Genus : *Citrus*  
Species : *aurantium*  
Parts used : Rind

**Vernacular names**

Sanskrit : Brhatjambirah  
Tamil : Narattai  
English : Bitter Orange  
Hindi : Khatta  
Telugu : Bijapuram

**Plant Information**

*Citrus aurantium* Linn belongs to family rutaceae. It contains rutin and quercetin, members of bioflavanoids family. Rutin, chemically 5, 7, 3\(^1\), 4\(^1\)-tetra hydroxy flavanol-3-rhamnoglucoside possess a lot of pharmacological actions including anti-inflammatory, anti-carcinogenic, anti-thrombic, cytoprotective and vasoprotective activities [94, 95]. Quercetin, a flavonoid member chemically known as 5, 7, 3\(^1\), 4\(^1\)-tetra hydroxy flavanol possess a lot of therapeutic benefits. It plays an important role in cardiovascular health improvement, cancer reduction, neurodegenerative diseases, aging, osteoporosis, inflammation, hepato protection, allergies, ulcers and viral diseases [96 99].
V. *Camellia sinensis* Linn

**Taxonomy**

- **Kingdom**: Plantae
- **Phylum**: Tracheophyta
- **Class**: Magnoliopsida
- **Order**: Ericales
- **Family**: Theaceae
- **Genus**: Camellia
- **Species**: sinensis
- **Parts used**: leaves

**Vernacular names**

- **Sanskrit**: Syamaparni, Caha
- **Bengali**: Chai
- **Hindi**: Chha
- **Marathi**: Chaha
- **Tamil**: Karupputeyilai
- **Telugu**: Teyaku
- **English**: Tea

**Information**

*Camellia sinensis* Linn. belongs to family theaceae. It contains rutin and quercetin, members of bioflavanoids family. Rutin, chemically 5, 7, 3\(^1\), 4\(^1\)- tetra hydroxy flavanol-3-rhamnoglucoside possess a lot of pharmacological actions including anti-inflammatory, anti-carcinogenic, anti-thrombic, cytoprotective and vasoprotective activities [94, 95]. Quercetin, a flavanoid member chemically known as 5, 7, 3\(^1\), 4\(^1\)-tetra hydroxy flavanol possess a lot of therapeutic benefits. It plays an important role in cardiovascular health improvement, cancer reduction, neurodegenerative diseases, aging, osteoporosis, inflammation, hepato protection, allergies, ulcers and viral diseases [96-99].
VI. Glycyrrhiza glabra Linn

Taxonomy

Kingdom : Plantae
Phylum : Tracheophyta
Class : Equisetopsida
Order : Fabales
Family : Fabaceae
Genus : Glycyrrhiza
Species : glabra
Parts used : Roots

Vernacular names

Sanskrit : Madhuka, Yashhti-madhhu
Bengali : Jashtimadhhu
Hindi : Mulhatti
Marathi : Jeshta
Tamil : Atimadhuram
Telugu : Ashti-madhukam
English : Liquorice

Plant Information

Glycyrrhiza glabra Linn belongs to the family of fabaceae. It contains rutin and quercetin, members of bioflavonoids family. Rutin, chemically 5, 7, 3, 4'-tetra hydroxy flavanol-3-rhamnoglucoside possess a lot of pharmacological actions including anti-inflammatory, anti-carcinogenic, anti-thrombic, cytoprotective and vasoprotective activities [94, 95]. Quercetin, a flavanoid member chemically known as 5, 7, 3', 4'- tetra hydroxy flavanol possess a lot of therapeutic benefits. It plays an important role in cardiovascular health improvement, cancer reduction, neurodegenerative diseases, aging, osteoporosis, inflammation, hepato protection, allergies, ulcers and viral diseases [96-99].
VII. *Thymus vulgaris* L

**Taxonomy**

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**Vernacular names**

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</table>

**Plant Information**

*Thymus vulgaris* Linn belongs to the family of lamiaceae. It contains rutin and quercetin, members of bioflavonoids family. Rutin, chemically 5, 7, 3¹, 4¹- tetra hydroxy flavanol-3-rhamnoglucoside possess a lot of pharmacological actions including anti-inflammatory, anti-carcinogenic, anti-thrombic, cytoprotective, and vasoprotective activities [94, 95]. Quercetin, a flavonoid member chemically known as 5, 7, 3¹, 4¹- tetra hydroxy flavanol possess a lot of therapeutic benefits. It plays an important role in cardiovascular health improvement, cancer reduction, neurodegenerative diseases, aging, osteoporosis, inflammation, hepato protection, allergies, ulcers and viral diseases [96-99].
5.2. Phytoconstituents Profiles

I. Rutin

Rutin, a bioflavonoid is freely available from buckweed seeds, citrus fruits, widely distributed in higher plants and possess a lot of pharmacological actions including anti-oxidant, anti-inflammatory, anti-tumor, anti-thrombic, cytoprotective, vasoprotective activities and anti-microbial activities [94, 95].

![Rutin Chemical Structure](image)

Source : Buckweed seeds, citrus fruits
Chemical name : 2-(3,4-dihydroxyphenyl)-5,7-dihydroxy-3-[α-L-hammopyranosyl -
(1→6)-β-D-glucopyranosyloxy]-4H-chromen-4-one
Molecular formula : C_{27}H_{30}O_{16}
Molecular weight : 610.52 gm/mol
Solubility : Pyridine, DMSO and aqueous base
II. Quercetin

Quercetin abundantly present in apples, berries, onions and tea and present in plants ethnopharmacologically important for their neuroprotective and cancer potentials. It possesses anti-cancer, anti-inflammatory, anti-oxidant, vasodilating effects, cardiovascular health improvement, anti-microbial, neuroprotective and hepatoprotective effects [96-99].

![Chemical structure of Quercetin]

Source : Citrus fruits, green tea and onion
Chemical name : 2-(3,4-dihydroxyphenyl)-3,5,7-trihydroxy-4H-chromen-4-one
Molecular formula : C_{15}H_{10}O_{7} \cdot 2H_{2}O
Molecular weight : 302.236 gm/mol
Colour : Yellow powder
Solubility : Ethanol, DMSO, methanol
III. Curcumin

Curcumin is an active principle compound found in the curcuma longa belong to the group of Zingiberaceae. The other two principle compounds in curcuma longa are desmethoxycurcumin and bis-desmethoxycurcumin. *Curcuma longa* is mainly present in the turmeric roots. Curcumin have been used for treatment of several ailments since centuries due to its therapeutic potential against neurodegenerative, cardiovascular, pulmonary, autoimmune and neoplastic diseases, where inflammation is involved as major mechanism in the disease [85-87]. Curcumin is brightly yellow colored and may be used as a food colouring.

![Curcumin molecule](image)

Source : Curcuma longa (Zingiberaceae)
Chemical name : \((1E, 6E)-1,7\text{-Bis}(4\text{-hydroxy-3-methoxyphenyl})-1,6\text{-heptadiene-3,5-dione}
Molecular formula : \(C_{21}H_{20}O_6\)
Molecular weight : 368.38 gm/mol
Solubility : Ethanol (1 mg/ml), DMSO (>11 mg/ml)
IV. Piperine

Piperine a major alkaloid present in black and long pepper. In addition it as enhance the bioavailability of several drugs. Piperine \([1-(5-\{1, 3\text{-}\text{benzodioxol}\text{-}5\text{-}yli}\}1\text{-}\text{oxo}\text{-}\text{2,4\text{-}pentadienyl piperidine}\)], a potent alkaloid available from \textit{Piper longum} and \textit{Piper nigrum} belonging to the family Piperaceae. In tropical and subtropical parts of India \textit{Piper nigrum} was available \([88\text{-}90]\). Piperine possesses analgesic, anti-pyretic, insecticidal, anti-inflammatory, immunomodulatory, anti-tumor, anti-depressant, anti-apoptotic. It had effects on mood and cognition disorders \([91\text{-}93]\).

![Chemical structure of Piperine]

**Source**
- Black pepper (Piperaceae)

**Chemical name**
- \(1-[5-(1, 3\text{-}\text{benzodioxol}\text{-}5\text{-}yli}\}1\text{-}\text{oxo}\text{-}\text{2,4\text{-}pentadienyl piperidine}\)

**Molecular formula**
- \(\text{C}_{17}\text{H}_{19}\text{NO}_{3}\)

**Molecular weight**
- 285.34 gm/mol

**Solubility**
- Ethanol, acetone, methanol