**Sisymbrium irio L.:** A Herb used in the Unani system of medicine for broad spectrum therapeutical applications

Temesgen Hailu, Rajinder K. Gupta, & Archna Rani
Department of Applied Chemistry Delhi Technological University, Shahbad Daulatpur, Main Bawana Road, Delhi 110042, India

E-mail: archnar8@yahoo.co.in; rkg67ap@yahoo.com; temesgenhailu88@gmail.com

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Medicinal herbal plants constitute effective sources of natural products consumed as phytomedicines and the products obtained from medicinal plants have been playing a significant role in drug discovery efforts for treatment of animals and human diseases. *Sisymbrium irio* is one of the class of *Cruciferae* family used in Unani medicine. The plant is known for its value in traditional medicine. The various parts of *Sisymbrium irio* such as, flowers, leaves, stem, seeds and aerial parts contains different types of phytochemicals such as tannin, alkaloids, flavonoids, saponins, glycosides, carbohydrates, phenolics, amino acids, proteins, steroids, fatty acids that are responsible for pharmacological actions such as antimicrobial, antifungal, antancer, antinflammatory, antipressant, rheumatoid, antipyretic, analgesic, detoxify liver and spleen, bronchoprotective role, voice disorders, cytotoxic, phytotoxic, diuretic, expectorant, febrifuge, boils, pimples, cough, hepatoprotective and stomachic treatments. The different solvent extracts of the plant parts such as leaves, stem, seeds and flowers exhibited a higher antioxidants activity which could be attributed to its higher contents of phenolics and flavonoids constituents. This preexisting knowledge necessitates a qualitative screening of the plant with scientific approach to identify natural template for safer drug discovery and designing.

**Keywords:** *Cruciferae*, Phytochemicals, Phytomedicine, *Sisymbrium irio*, Unani medicine

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Drugs derived from plants have great interest due to diverse applications in Unani medicine. The medicinal herbal plant materials are the basis for synthetic drugs, modern medicines, pharmaceuticals, food supplements, and folk medicines. The discovery of new drugs is attained through natural compounds and their products, followed by other synthetic drugs. This situation run in the direction of improved international quest for natural medicine, leading to the phytochemical investigation of plants in diverse ecological environments for their various medicinal properties. These medicinal herbal plant materials are used to treat different types of human and animal diseases because they contain different types of secondary metabolites or pharmacologically bioactive components belonging to different classes of compounds such as tannins, saponin, flavonoids, alkaloids, phenolic substances, glycosides, steroids and terpenoids. These bioactive secondary metabolites play different role, in the human body and also protects the plants from predators. The medicinal herbal plant *Sisymbrium irio* belong to the family *Cruciferae*, called Khubah (Arabic); Asalio, Khubkalan, khubkhala (Hindi); Khakasi, Khakshi (Persian); Khubakalan (Urdu) and London Rocket/Rocket Mustard (common names) and is found in different parts of the world. In the traditional medicine this plant has a significant role for treatment of coughs, upper body mobbing, rheumatism, purification of liver, irritation, decrease inflammation and injuries. In 2003, Guil et al., reported that *Sisymbrium irio* is used to treat inflammation, rheumatism, antipyretic, analgesic, antimicrobial and antioxidant potential and food supplements. The seeds of plant are widely used for treatments of voice disorders, as an expectorant, febrifuge, treating inflammation & rheumatoid, reduces fever, painkilling, antibacterial & antifungal activities. The 70% ethanolic extract of the plant was subjected to qualitative phytochemical analysis and the results showed the existence of various types of pharmacological active components such as nitrogen containing compounds, phenolic compounds, saponins, gums, mucilage, tannins, oils, saturated and unsaturated fatty acids, glycosides, proteins, amino acids, carbohydrates, phytosterols and flavonoids. This report focuses on the details of phytochemistry
and broad-spectrum pharmaceutical applications of various parts of Sisymbrium irio.

Phytochemistry

The plants synthesize secondary metabolites to protect themselves, nevertheless, the study also shows that they have significant roles for protection and prevention of the different kinds of livestock and human diseases. These plant metabolites have anticancer activity, antimicrobial activity, scavenges free radicals, act as hormone, stimulates enzymatic activity & various therapeutic uses. Numerous free radicals, act as hormone, stimulates enzymatic anticancer activity, antimicrobial activity, scavenges prevention of the different kinds of livestock and that they have significant roles for protection and protect themselves, nevertheless, the study also shows

Pharmaceutical applications of Sisymbrium irio

The plant Sisymbrium irio is used for the treatment of different types of diseases such as inflammatory conditions and rheumatism, expectorant, febrifuge and for treatment of voice disorders, chest congestion, rheumatism, detoxify liver and spleen, reduces swelling and clean wounds, antipyretic, analgesic, antimicrobial and antioxidant potential. The seeds of London rocket are used for the treatment of inflammatory conditions, boils, pimples, cough, cholera and non-specific fever. Crude extracts of the seeds were tested for antipyretic, analgesic and antimicrobial effects. The ethanolic extract exhibited significant antipyretic and analgesic effects as well. It also exhibited marked antibacterial action against both gram-positive and gram-negative organisms and was found to be non toxic in acute studies. The polarity-based extract of the Sisymbrium irio was active to inhibit the growth of major disease-causing bacterial strains. The n-hexane extract of plant leaves inhibited the growth of microbial strains such as Klebsiella pneumoniae and Staphylococcus epidermidis. The ethyl acetate extract of the leaves was active against the gram-negative bacteria such as Escherichia coli, Klebsiella pneumonia and Pseudomonas aeruginosa, whereas the plant seed demonstrated greater inhibitory effect against Pseudomonas aeruginosa and Staphylococcus epidermidis. Sisymbrium irio aqueous extract

| Table 1 — Compounds isolated from Sisymbrium irio |
| Phytochemicals | Part of the plant |
| Flavonoids (apigenin, apigenin-7-galactoside, apigenin-7-O-β-D-glucoside, luteolin-7-O-glucoside, apigenin-7-di-glucoside, apigenin-7-O-(6′ acetyl) glucoside, apigenin-7-O-gluco(6′,1″) rhamnoside, apigenin-7-O-gluco(6′,1″) rhamnoside-5- methoxide, Kaempferol, kaempferol-3-O-xyllosoid-7-galactoside | Aerial part |
| Alkaloid (nicotine) | Aerial parts |
| β-sitosterol, stigmasterol and β-sitosterol-glucoside | Aerial parts |
| β-sitosterol, β-sitosterol-D-glucoside, isorhamnetin & quercetin | Aerial & Seeds parts |
| Glucosinolates | Aerial parts |
| Terpenoids, diocetyl adipate, N-(n-propyl) acetamide, isopropyl isothiocyanate, isobutyl isothiocyanate, 3,7,11,15-tetramethyl-2-hexadecen-1-ol, cis-8,11,14-eicosatetraenoic acid, heptacosane, palmitic acid, n-butyl isothiocyanate, dimethoxy acetophenone aliphatic hydrocarbons & aromatic compounds | Aerial parts |
| Sisoteryl-6′-O-undecanoate-β-D-glucoside, (Z)-8, 11, 12-trihydroxyoctadec-9-enoic acid, 1,2-dipalmitoyl-3-O-α-O-6″-sulfooctinovosyl glycerol, crotanoyl cosomin, tetracosanoic acid, β-sitosterol, ursolic acid, indole-3-carboxaldehyde, indole-3-carboxylic acid, -sitosterol-D-glucoside, apigenin, naringenin-4′-O-glucopyranoside, -adensine and apigenin-7-O-glucoside | Aerial parts |
was active against all tested pathogenic microbes such as *Staphylococcus aureus*, *Enterococcus faecium*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Escherichia coli* ATCC 25922, *Enterobacter cloacae*, *Staphylococcus aureus* ATCC 29213, and *Klebsiella pneumoniae*. The plant has numerous therapeutic uses for the treatment of acute diseases, chronic, ribs bottleneck, to decrease pain in the joints and muscles pain, inflammation, treat the liver and the irritation, injuries, painkilling, reduce fever& antibiotic uses. The ethanolic extracts of *Sisymbrium irio* seeds shows phytotoxic, cytotoxic and insecticidal activities. The ethanolic extracts of the seeds of this plant showed antiinflammatory activity, antidepressant, swim stress immobility and altered the signalling pathways that regulate cancer growth & apoptosis. Secondary metabolites such as isothiocyanates and nitriles, which are found in *Sisymbrium irio* have wide applications against different kinds of the microbial diseases. The study shows the uses of *Sisymbrium irio* for the treatment/inhibition of cancers and development of safer and more effective therapeutic agents. The activity may be attributed to the presence of β-sitosterol, as in vivo study showed β-sitosterol had a significant rolein the diets of mice & rats fed with colon carcinogens that reduced the proliferative variations of the cancer growth. β-sitosterol had distracted the structure of cancer cell membranes & altered the signalling pathways that regulate cancer growth & apoptosis. The *Sisymbrium irio* extracts showed hepatoprotective effects against CCl4 induced hepatotoxicity in albino rats. The hepatotoxic properties of the CCl4 was mainly due to the presence of intermediate reactive metabolite, trichloromethyl radical. Trichlor omethyl radical bound covalently to the macromolecules & encouraged peroxidative deprivation of membrane phospholipids of endoplasmic reticulum rich in polyunsaturated fatty acids, that leads to unnecessary build-up of phospholipids in tissues such as liver. Histopathological study revealed that post treatment with *Sisymbrium irio* clearly exhibited the significant protection of liver cells. The effectiveness of antihapatotoxicity of drug mayrely on its capacity in decreasing the harmful effect/mending the usual hepatic functioning impaired by a hepatotoxin. *Sisymbrium irio* extracts have powerful reducing ability of carbon tetrachloride action to raise the levels of the enzyme in testing groups, this shows the defense of structural integrity of hepatocyte membrane or renewal of injured liver cells, this may be due to the existence of bioactive flavonoids. In the Mediterranean region *Sisymbrium irio* leaves are consumed as food and used as folk medicine for infections of the throat and chest. This plant is used in Unani system of medicine for various therapeutic uses and recommended for the prevention of dengue fever due to the presence of bioactive components.

**Conclusion and Recommendation**

From this review, it is certain that various phytochemicals are present in different parts of *Sisymbrium irio* plant, which need further phytochemical and biological investigation to develop into useful therapeutic uses and for the development of novel drug molecules.

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**Conflict of interest statement**

The author(s) declare(s) that here is no conflict of benefits concerning the publication of this paper.

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