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Review Article

An Overview of *Brassica nigra* as a Supportive Therapy in Pneumonia

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ABSTRACT

Brassica species are extensively utilized in traditional medicine as food for humans and as feed for animals. Recently there has been a heightened focus on brassica seeds due to their potential as a source of health-boosting phytochemicals. The review summarizes the latest findings regarding the Phytochemistry, Bioactivity, dietary significance and toxicity of brassica seeds by examining major scientific databases. Phytochemistry, polyphenols, glucosinolates and their degradation products were identified as the primary secondary metabolites found in seeds. Various Extract and their isolates components from the seeds of brassica species have demonstrated a broad spectrum of biological activities including antioxidant, anticancer, antimicrobial, anti-inflammatory, antidiabetic and neuroprotective effects. Seeds of brassica nigra (black mustard) are frequently eaten in various Asian and African nations. Mustard seeds have shown notable anticancer effects against a range of cancer types. In Asian black mustard plants are extensively utilized for their healing benefits, and these methods are recognized for treating various ailments. Medicinal herbs are employed for numerous severe illness.

INTRODUCTION

The Brassicaceae family known as crucifers is notable for being one of the most widely grown and eaten globally, comprising approximately 338 genera and over 3700 species. In recent years, cruciferous vegetables have gained more interest as they provide a remarkable source of nutrients (carbohydrates, proteins, vitamins and minerals) and beneficial phytochemicals (phenolics, and glucosinolates). That aid in the prevention and

management of various diseases through multiple biological properties such as anti-obesity, antioxidant, anticancer, antimicrobial, anti-inflammatory and antidiabetic effects. The WHO (world health organization) estimates that 80 percent of the global population currently utilizes herbal medicines for various aspects of primary health care. Plants have a significant source of numerous secondary metabolites that have a broad carry of pharmacological effect. Black mustard are

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used in ancient time for treating various diseases .It has a strong flavour due to the metabolites it is also used in food. It was cultivated in small scale areas in the traditional system of medicine Unani and Chinese are utilized the brassica nigra as domestic level in rural areas. In most of the Indian dishes mustard are used, mustard seeds are strong, highly flavoured. black mustard origin place is middle eastern countries. Mustard oil is used to treat arthritis and common cold. It is one of the best medicine to treat respiratory tract infection.¹

Scientific classification² :

Kingdom: Plantae

Subkingdom: Viridaplantae

Division: Tracheophyta

Subdivision: Spermatophytina

Class: Magnoliopsida

Superorder: Rosanae

Order: Brassicales

Family: Brassicaceae

Genus: Brassica

Species: Brassica rapa



FIGURE 1 : *Brassica nigra* (plant)

Botanical Description : In the various temperature region across the globe, black mustard flourishes .Its distribution worldwide includes countries such as Egypt, Libya, Morocco, Tunisia, Syria, turkey, Armenia, Kazakhstan, China, Europe, United kingdom. Black mustard, scientifically known as brassica nigra, is a herbaceous plant that grows as an annual. this plant has multiple branches and can reach a height of up to 2 meters (6 feet).three types of lower leaves consist of dentate (serrated) ,pinnatifid, has a large terminal lobe and smaller lateral lobes .typically the undersides are covered in hairs. the flowering stems possess slender, elongated upper leaves. the bright yellow, cross-shaped blooms consist of four petals and develops into 4-sided siliques that grow in spike like arrangements. once matured the fruit can reach length of up to 2.5 cm (1 in) and will eventually open. It has two to twelve spherical seeds that are reddish-brown to black in colour. A single plant produce thousands of seeds ,they are harvested by hand or with machine before they reach complete ripeness. This is because once the siliques are fully mature, they burst open and scatter the seeds.³

Leaf : The structure of leaves can vary from basic to intricate, alternate arrangement along with stem. lower leaves are large, petioles with large terminal lobe and 2-4 pairs of smaller lateral leaflet, surfaces are softly hairs, upper leaves are smaller, short, narrower, margins are shallowly toothed.

Flowers : They are typical cruciform in shape, it has four bright yellow petals are arranged, four green sepals, six stamens.

Seeds : small, spherical and dark brown, brownish orange, pale brown-black with a pungent, sharp flavor.

Trichomes : Brassicaceae family, the unicellular trichomes are Y-shaped with 3-4 branches, clavate

simple glandular types, hooked forms and stellate shapes, while the multicellular trichomes are glandular in nature.

Root: They are thin, fibrous taproot system typically they penetrates less than 1 meters into the soil.

Stem : Erect, rigid and round, sparsely hairy. The branches are out extensively with thin stems.



FIGURE 2: *Brassica nigra* (seed)

Phytochemical Constituents of Mustard : Mustard seeds primarily consist of oil (28-42%) with protein (25-40%), carbohydrates (15-35%), fibres (10-15%), minerals (5-10%) and plant secondary metabolites (up to 10%) such as glucosinolates, tannins and phenolic compound. Plants gather secondary metabolites are a response to withstand biotic and abiotic stress. Secondary metabolites of mustard are utilized for medical purposes due to their diverse bioactive properties.⁴

Oil And Fatty Acids : Mustard seed oil primarily consists of lipids as triacylglycerides, they include three main types of fatty acids .saturated fatty acids, monosaturated fatty acid and polyunsaturated fatty acids. MUFAs primarily comprise eucic acid and oleic acid. MUFAs mainly consist of linoleic acid. linoleic acid, eicosapentaenoic and docosahexaenoic acid are the long -chain n-3 polyunsaturated fatty acids).various species of mustard and canola oil

such as B.napus, B.rapa and B.junceae they contain lower SFA level. lipid is regarded as one of the finest among vegetables, such as reducing overall blood cholesterol, lowering cardiovascular risk, enhancing insulin sensitive and glucose tolerance, diminishing inflammation and slowing cancer cell proliferation⁵.

Glucosinolates : All mustard plants are characterized by a distinctive sharp flavor attributed to the presence of sulfur containing glucosinolates (beta-thioglucosides-N-hydroxysulfates) derived from amino acids. These compounds are glycosides that result from the decarboxylation of amino acids like tyrosine, phenylalanine and tryptophan. All glucosinolates are produced from amino acids and sugar has common structural backbone they comprises a thioglycoside linked to a sulfonated aldoxime group connected to sugar through a sulfur atom. A side chain originating from amino acids is attached to the aldoxime . The most prevalent glucosinolates include gluconapin, sinigrin, progoitrin and napoleiferin. The amount and types of glucosinolates differ among various brassica species, cultivars and genotypes as well as across different plant tissue .Their concentration is positively linked to the levels of oil, acid and the amount of sulfur in the soil. The activation of myrosinase result in the hydrolysis of glucosinolate compound into organic aglycone forms (isothiocyanate, thiocyanate, or indole) along with glucose and sulphate ions.⁶

Minor Chemical Compound: The carbohydrates content in the seeds of rape and canola is relatively lower compared to other oilseeds and seed grains. The seeds have around 10% soluble sugars,4-5% cellulose ,4-5% pectin ,3% hemicellulose, under 1% starch based on dry seed weight. The concentration of oligosaccharides is about 20g/kg of dry matter.

The seeds are rich in minerals, containing significant amount of iron(0.01-0.002%),calcium(0.3-0.45%),phosphorus(0.6-0.84%) ,potassium(0.5-0.65%)have been detected in the seeds.⁷

Protein : Mustard seeds are rich in protein, containing up to 40% protein content .The primary storage proteins in these seeds are cruciferin, oleosin .The other relatively prevalent proteins in mustard seeds include myrosinase, an enzyme involved in degradation glucosinolates that serves a defensive role in plants and has a molecular weight between 120 and 150 KDa and rich in sulfur containing cysteine that contribute to plant defense .there are heat sensitive trypsin inhibitor protein. The crude protein and lipids transfer protein with weight of 7-9kDa that account for 2-3% of the total protein found in the seeds.⁸

Phenolic And Flavonoid Compound: Aromatic compounds that contains hydroxyl group, are referred to as phenolic or polyphenolic compounds are the most prevalent secondary metabolites found in rapeseeds constituting nearly 50%of these metabolites ,with phenolic choline esters being predominant. They exist primarily as phenolic acids, flavonoids, as well as soluble and insoluble condensed tannins. These compounds can exist in a free state or bound as esters and glycosides. The most prevalent free phenolic acid detected in oilseed mustard is p-hydroxybenzoic acid, while sinapic acid also known as sinapinic acid and are naturally occurring hydroxycinnamic acid is the most common bound phenolic acid.⁹

PHARMACOLOGICAL ACTIVITIES:

Antioxidant And Antibacterial Activity: *Brassica nigra* demonstrates antioxidant and antibacterial characteristic through its ability to combat oxidation and display effective activity against bacteria.¹⁰

Antiinflammatory Activity : Chronic inflammation leads to various health issues. *brassica nigra* may greatly lower the chances of chronic inflammation by blocking lipopolysaccharide, it decreases the production of nitric oxide, tumour necrosis factor and interleukin(IL-6),which subsequently restrict macrophage activity. mustard oil expands peripheral arteries and stimulate sensory nerves ,leading to intense warmth and unease.¹¹

Antiepileptic Activity : The seeds of *brassica nigra* possess anti-epileptic effect.in a mouse study the duration of seizures was reduced.

Antidiabetic Activity : Derivatives of glucosinolates possess antidiabetic properties. benzyl isothiocynates, derived from glucotropaeolin, enhance antioxidant defenses and decrease liver glucose production aiding in the prevention and management of type 2 diabetic .it was suggested that glucoraphanin might enhance insulin sensitivity.¹²

Anticancer Activity : The anticancer effect of *brassica nigra* plants are primarily attributed to the presence of glucosinolates .chemical components derived from glucosinolates primarily play a role in anticancer effects .isothiocynates may help prevent various cancers, such as lungs and esophageal cancer. gastrointestinal cancer is one of the many cancers that isothiocynates can help reduce.¹³

Antiobesity Activity : Mustard shows promise in encouraging a nutritious diet for overweight people a decline in the food efficiency ratio was observed in this group.

Bronchodilator And Vasodilating Properties :Mustard oil can be applied to the chest and back as a poultice to alleviate chest congestion, helps loosen phlegm and aid in its expulsion. Mustard oil



helps alleviate discomfort in kids experiencing colds, cough and chest congestion. Inhaling mustard impress nasal blood flow and can help alleviate chest and sinus colds.¹⁴

Anti -irritation Action: Traditionally, mustard seed paste, ground seeds and oils were used externally to alleviate irritation by blood away from capillaries. A counter -irritant activates sensory nerve ending ,resulting in cutaneous vasodilation and as inflammatory reaction in the skin's capillaries and boundary membrane. This expands blood vessels enhances blood circulation, alleviating discomfort at the application area.

Antiarthritic Action: European scientific advisory group located in Germany has approved mustard as a therapeutic or option for arthritis.

Diuretic Action : Mustard have historically served as a diuretic. Diuretic decrease the volume of sodium and water absorbed into the blood stream, impairing kidney function by transforming surplus body water into urine. Glucosinolates in mustard seeds may irritate the renal mucous membrane, resulting in a diuretic effect.

Anthelminthic Activity : Mustard has reduce the presence of plant parasitic nematodes in soil, making then effective rotation crops in agriculture. Helping to eliminate parasitic worms in humans and animals.

Emetic Action: Emetic induce vomiting to eliminate toxins from food or poisoning. They do by either stimulating the vomiting nerve centre in the brain or irritating the nerves of the stomach mucus membrane.¹⁵

Laxative Action : Consuming mustard activates the stomach mucosa, raises pancreatic secretion, and irritates the gastrointestinal system. This

minimizes food retention and water absorption. This causes a higher than normal release of water in stools, leading to laxation. Consuming mustard seeds as a on a daily basic improves blood circulation to the bowels, speeds up from transit and reduces liquid absorption from meal residue.¹⁶

CONCLUSION

Brassica nigra (L.) is an important nutritional medicinal plants, They have rich source of bioactive phytochemicals presence of glucosinolates and isothiocyanates, phenolic compound, flavonoids, fatty acids, Alkaloids. Some pharmacological activities are antioxidants, antibacterial, anti-inflammatory, antiepileptic, antidiabetic, anticancer, antiobesity, antiarthritic actions. Although numerous experimental studies have demonstrated promising biological activities. *Brassica nigra* remains a versatile and sustainable natural resource with considerable potential for future pharmaceutical and industrial development.

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