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MUSTARD OIL
SATURATED WITH LOVE

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Historically mustards are one of the foremost crops domesticated by man. Even evidence shows its cultivation in the Neolithic age. Mustard seeds have been used as a spice since written history began in Babylonia, and are constantly appertained to in Greek and Roman jottings and the Bible. Seeds of mustard were set up in the Chanhu-daro of the Harappan civilization ca. 4000-1750 BC. Aryans used mustard as a seasoning agent and for oil. Still, the use of oil was more common among non-Aryans than among Aryans. Thus it is evident that in over 3500 years, mustard came to hold an important place in the diets of Indian people as a source of oil and vegetable.

Until now, all that was consumed as mustard oil was extracted by grinding mustard seeds of Indian mustard (Brassica juncea). However, the origin of B. juncea is contradictory. This particular species of mustard is a natural hybrid of two different parent species, black mustard (B. nigra) and field mustard (B. rapa), and the Middle East seems to be the place of origin of this cultivated amphidiploid. From the Middle East, it soon spread to Europe, Africa, Asia, India and the Far East. Central Asia-Himalayas are the primary centre of diversity for this species, with migration to China, Eastern India and the Caucasus. It has arisen further with different forerunners and in the present-day two centres of diversity. Biochemical and molecular studies also support this finding and provide evidence for two geographical races, Chinese and Indian.

At present in India, we are waiting for the genetically modified transgenic mustard oil from ‘Dhara Mustard Hybrid-11’ or 'DMH-11', which is a hybrid form of mustard developed by researchers from the Centre for Genetic Manipulation of Crop Plants, at the University of Delhi. It would be the first genetically modified food crop available to Indian farmers. It was led by former Vice-Chancellor

Figure 1: Golden yellow flowers of Indian mustard (Photo: Goutam Panda).

Figure 2: Siliqua, the two-segmented capsular fruit, contains many seeds (Illustration: Dilnawaz Khatun).

of Delhi University Prof Deepak Pental, who has been involved in efforts to develop hybrid mustard for decades. About two decades ago, Prof Pental was able to develop a hybrid variant called 'DMH-1' without transgenic technology. During 2005–2006, the 'DMH-1' was approved for commercial release in northwest India. But in reality, this technology was not considered profitable enough to produce hybrid mustard consistently at that time, so the matter did not proceed that way.

The biology of Indian mustard

The Indian mustard (B. juncea) belongs to Brassicaceae, which contains about 3500 species under 350 genera and is one of the ten most economically important plant families. Mature B. juncea plants grow to a height of 1 meter. The lower leaves are deeply lobed, while the upper leaves are narrow and not clasping. The inflorescence is an elongated raceme. Flowers (Figure 1) are bisexual, golden yellow, actinomorphic; pedicel 5-8 mm long, increasing up to 15 mm in fruit, glabrous, ascending. Sepals 4, erect, about 4-6 mm long, 1-1.5 mm broad, oblong, subequal, apex rounded or obtuse, yellowish and glabrous. Petals 4, about 6-9 mm long, 2.5-3 mm broad, obovate, clawed, margin entire and apex rounded. Stamens 6, tetradynamous, filaments not dilated at the base, anthers oblong-ovate, nectar glands 4, lateral and median; ovary superior, bicarpellary, syncarpous, linear, ovules 4-48, style distinct, stigma capitate or bilobed. Fruits (Figure 2) are siliquae (two-segmented seed capsules), 2.5 to 5 cm long exclusive of the beak which is 0.5 to 1 cm long, dehiscent, erect or slightly curved, compressed, valves papery, midveins prominent, torulose, glabrous or rarely pubescent. Seeds are many, uniseriate, not winged, round, yellow or brown, minutely reticulate and cotyledons conduplicate

Figure 3: Mustard seeds and oil (Photo: Sutrishna Kar).

(i.e. the cotyledons are longitudinally folded around the radical).

The liquid gold

Mustard oil (Figure 3) is extracted from the seeds of the mustard plant. It has a characteristically pungent flavour and aroma – it tingles one's throat and gives a buzz in the nose. This is the essential characteristic of this vegetable oil. The strong aroma of mustard oil adds warm, spicy, and stinging flavour to the dishes. The pungency is caused by allyl isothiocyanate, a volatile component present in extracted oil.

Mustard oil has about 60 per cent monounsaturated fatty acids (constituting 42 per cent erucic acid and 12 per cent oleic acid), about 21 per cent polyunsaturated fats (15 per cent omega-6 linoleic acid and 6 per cent omega-3 alpha-linolenic acid), and about 12 per cent saturated fats. These healthy fats are crucial in supporting overall well-being, promoting heart health, and reducing inflammation. In addition, mustard oil contains significant amounts of vitamins E, and K, and small quantities of vitamin A, which are

Figure 4: Magnified view of Argemone seeds (Photo: Dipanjan Ghosh).

essential for various bodily functions.

Vegetable oils with high amounts of specific fatty acids are also immensely important for industrial purposes. Mustard oil high in oleic acid is in demand in marketable food-service operations due to its long shelf-life and cholesterol-reducing properties. Both linoleic and linolenic acids are essential fatty acids; however, less than 3 per cent linolenic acid is preferred for oil stability. The high erucic acid content in mustard oil benefits the polymer industry, whereas low erucic acid is recommended for food purposes.

The oil for life

Mustard oil possesses powerful antimicrobial properties which help to block the growth of certain types of harmful bacteria. It promotes health and also checks the growth of certain types of fungi. This way, mustard oil creates a shield against the harmful diseases that may onset owing to the weather changes. On the other hand, mustard oil in its purest form is known to boost skin and hair health, promising great quality. It offers strength to the muscles on the skin and promotes hair growth by keeping the roots healthy. Mustard oil is thus preferred mostly as a great massage oil.

Mustard oil's nutrition facts highlight its role as a heart-healthy oil, rich in beneficial fats yet free from carbohydrates, proteins, and sodium. It helps lower triglycerides, blood pressure, and

blood sugar levels. Thus, keeping the risks of heart attacks and other cardiovascular problems under check. Mustard oil also decreases the levels of bad cholesterol (LDL), helping protect heart health even further. Its high monounsaturated fatty acid composition underlines its nutritional significance, making it a valuable addition to a well-rounded diet.

Muscle pain, sprains and cramps are common problems that cause a lot of unease and discomfort. This can restrict the movement of the muscles and lead to delays in daily tasks and work. That is where mustard oil can help and it is known to alleviate pain with a lot of relief. The oil is especially good for rheumatoid arthritis. Mustard oil contains a high amount of selenium and magnesium, which gives it anti-inflammatory properties. It also helps stimulate sweat glands and helps lowering body temperature. Not only the normal diseases, but mustard oil also helps slow the growth and spread of certain types of cancer cells. It is easier to boost the human immune system with mustard oil and thus, keep the free radicals causing cancer at bay. In traditional medicines, seed paste is applied on wounds whereas paste of leaf is said to heal cattle wounds.

Oil in turmoil

Mustard oil has some negative impacts which are controversial. Research on experimental animals has revealed that in addition to elevating cardiovascular risks, the high percentage of erucic acid in mustard oil can also adversely affect the respiratory system, particularly the upper respiratory tract, leading to difficulties in breathing and similar issues. For this reason, mustard oil is banned in some countries such as Canada, the USA and the European Union. However, mustard is most popularly used as a cooking oil or condiment in the cuisines of East, Southeast and Central Asian countries such as China, Bangladesh and India, and also appeared in some dishes in Russian and other Baltic cuisines for centuries.

Argemone oil extracted from Mexican poppy (Argemone mexicana) seeds is poisonous. Two physiologically active benzophenanthridine alkaloids, such as sanguinarine and dihydrosanguinarine, are responsible for the toxicity of argemone oil. Histopathological studies suggest that the liver, lungs, kidneys, and heart are the target sites for argemone oil intoxication. Occasionally argemone oil is mixed with mustard oil as an adulterant to increase the volume. This adulteration can beget serious health problems, such as epidemic dropsy, a disease characterized by the acute manifestation of bilateral pitting oedema, rashes, erythema or skin redness, eye problems, vomiting, and gastrointestinal disturbance along with congestive heart failure and in severe cases leading to death. Prolonged use of adulterated oil can cause neural degeneration and paralysis. The toxic alkaloids in argemone seeds (Figure 4) may damage capillaries and result in haemorrhage in organs.

End notes

One should always remember that moderation and quality are essential when incorporating cooking oil into the lifestyle. For its high smoking point of almost 249°C, mustard oil is suitable for high-heat cooking methods such as frying and sautéing, commonly used in Indian cuisine. Moreover, its unique spiciness and strong flavour also complement the spices and ingredients typical of this region. Last but not least suggestion is to always opt for cold-pressed, virgin or organic options to earn the most benefits. ◆

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