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Adulteration in Mustard Oil and its Health Effects: An Overview

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Abstract

Mustard oil (Brassica nigra) an extensively cultivated plant, offers numerous uses, with its seeds being of special significance. Mustard oil is highly nutritious, serving both dietary and medicinal purposes. Mustard oil is rich in antioxidants, vitamins, and minerals, blood pressure regulation, and digestion. Mustard oil has applications in biotechnology and the health industry, including traditional medicine and microbial growth mediums. Analytical studies reveal its composition varies with maturity, influencing its nutritional and therapeutic properties. This review explores Mustard oil's diverse applications, emphasizing its medical and biotechnological potential while identifying research gaps for further investigation.

Keywords:- Mustard oil, Nutrition, Medicinal Properties, Physico-Chemical Properties

Introduction

Mustard oil, derived from the seeds of the mustard plant[1] (genus Brassica), has been used for centuries in various cultures around the world. Historically, mustard oil has played an important role in many regions' culinary traditions, medicinal practices, and even religious rituals, particularly in South Asia, especially in India. Its use can be traced back to ancient civilizations where it was prized for its cooking properties and health benefits. Brassicaceae vegetables, consumed worldwide, represent an important part of the human diet, due to their remarkable supply of health-promoting substances that can potentially reduce the risk of diseases[2].Mustard oil is a staple in Indian, Bangladeshi, Pakistani, and Nepalese cuisines. It is known for its strong flavor and pungent aroma, which adds a distinct taste to dishes—common culinary used for sautéing, frying, and as a base for curries. Mustard oil is used as a preservative in pickles due to its antimicrobial properties. In some cultures, it is used as a dressing for salads and other raw preparations.

Mustard oil is produced by pressing or grinding mustard seeds to extract the oil. There are three main varieties of mustard seeds used to produce mustard oil: black mustard[3] (Brassica nigra), brown mustard (Brassica juncea), and white mustard (Brassica hirta)[4].

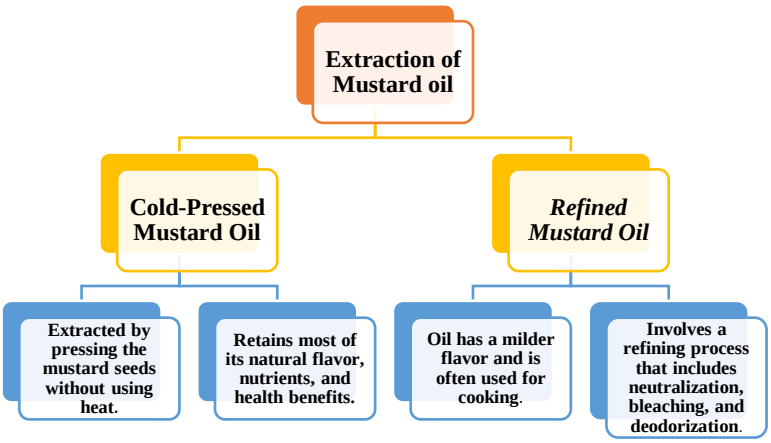

Fig no 1: Extraction method of Mustard Oil

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Nutritional Profile of Mustard oil is rich in monounsaturated and polyunsaturated fatty acids, including omega-3 and omega-6 fatty acids. It also contains important micronutrients like vitamin E, which is an antioxidant. Monounsaturated Fats (MUFA) are beneficial for heart health and Polyunsaturated Fats (PUFA) are essential for brain function and cell growth[5].

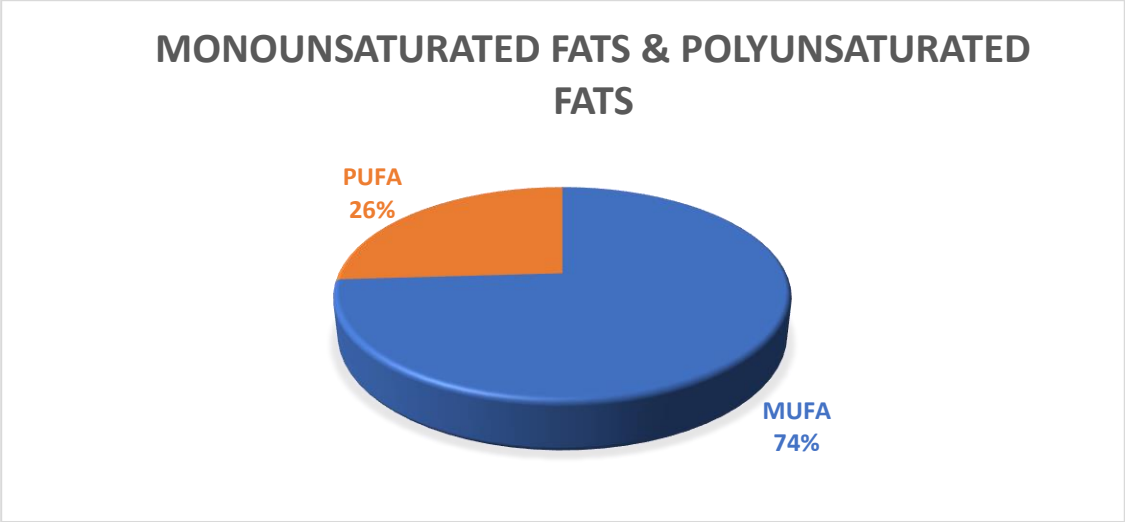

Fig no 2: Percentage of MUFA & PUFA in Mustard oil

Mustard oil has a relatively low saturated fat content (about 12%), making it a healthier choice than other oils high in saturated fats. Mustard oil contains less amounts of vitamins E, K, and trace minerals[6].

Mustard oil is renowned for its medicinal properties and is used in traditional medicine for various treatments. Mustard oil is an important agricultural product in regions where mustard seeds are cultivated extensively.

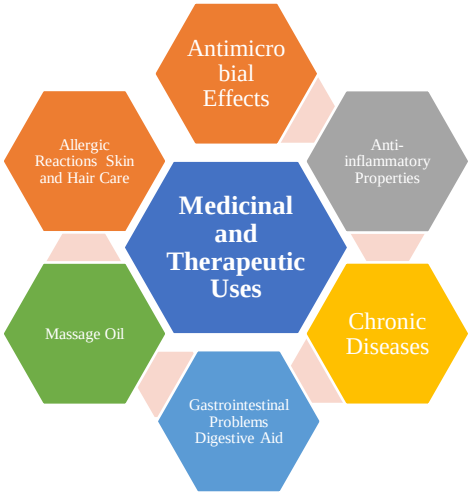

Fig no 3: Medicinal and Therapeutic Uses of Mustard Oil

It provides livelihoods for farmers and plays a significant role in local economies. The oil is also exported to different parts of the world, contributing to international trade. Mustard oil is a versatile and nutritionally rich oil with a long history of culinary, medicinal, and economic significance. Its unique properties and applications make it a valuable addition to both traditional and modern practices. Fats are also an important constituent of the diet because of their high energy value and because of the fat-soluble micronutrients and essential fatty acids. Therefore, both the quality and the quantity of fats in the human diet affect health and an imbalanced intake may often lead to diseases including chronic debilitating diseases such as cardiovascular disease and

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rheumatoid arthritis[7]. The fatty acid composition of Mustard Oil Measured on GLC is shown in Fig no 4 by Altaf Khan et.al.

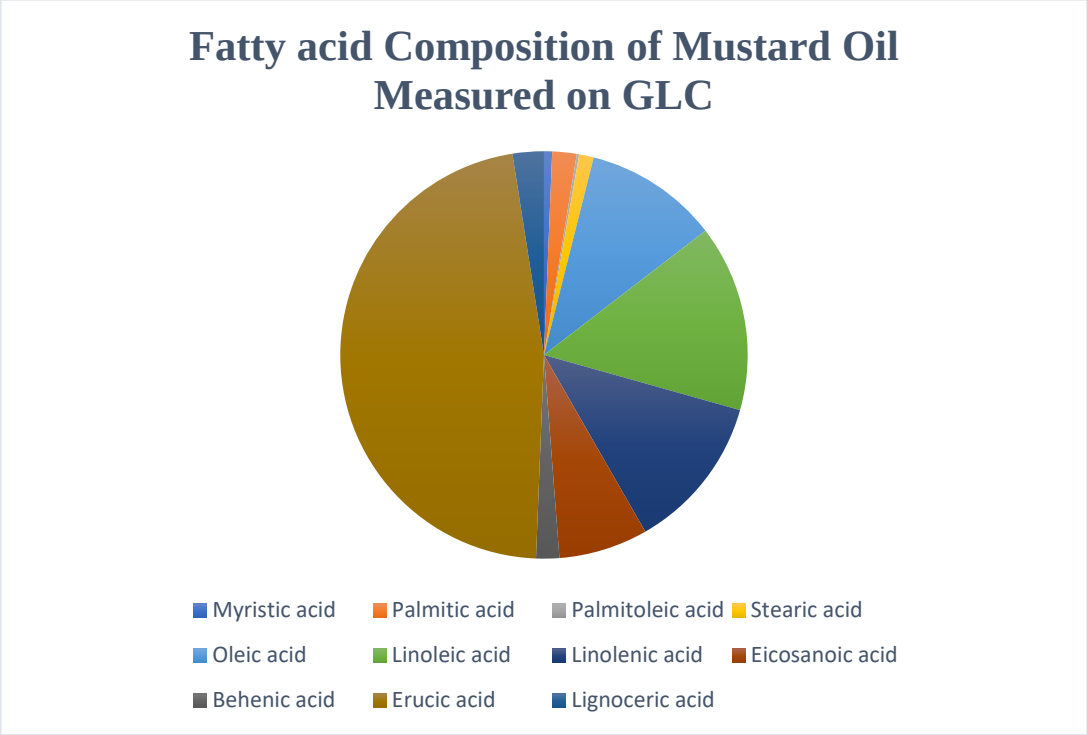

Fig no 4: Fatty acid Composition of Mustard oil Measured on GLC [Altaf Khan et al]

Adulteration in mustard oil can occur in various forms, each posing different health risks. An overview of common types of adulteration in mustard oil and their associated health effects:

Types of Adulteration	**Source**	**Detection**	**Health Effects**
Argemone Oil	Extracted from the seeds of Argemone mexicana	Argemone oil adulteration can be identified by specific chemical tests, such as the nitric acid test or thin-layer chromatography.	Consumption can lead to epidemic dropsy, characterized by swelling, glaucoma, gastrointestinal problems, and in severe cases, heart failure and death.
Mineral Oil	Derived from petroleum.	Detected through physical tests like viscosity measurement or chemical tests	Prolonged intake can cause digestive issues, impaired absorption of fat-soluble vitamins, and potential toxicity affecting internal organs.

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Palm Oil	Derived from the fruit of oil palms	Chemical analysis like fatty acid composition tests can identify palm oil	While not immediately toxic, palm oil has a high saturated fat content, which can contribute to cardiovascular diseases when consumed in large amounts over time.
Cottonseed Oil	Extracted from cotton seeds	Detected using chromatographic techniques	Contains gossypol, which can be toxic if not removed during processing, potentially leading to infertility and liver damage
Synthetic Colors and Flavors	Artificial additives to enhance color and flavor	Identified through spectrophotometry or chromatography	Can cause allergic reactions, gastrointestinal issues, and potential long-term carcinogenic effects

Table No. 1: Adulteration in mustard oil with identification methods and different health risks

Understanding these types of adulteration and their health effects is crucial for both consumers and regulatory bodies to ensure food safety and public health.Ensuring purity is important as adulterated mustard oil with substances like argemone oil can pose serious health risks. Detection of adulteration often involves chemical analysis to identify specific markers of adulterants like argemone oil[8]. Preventing adulteration requires stringent regulations, regular testing, and consumer awareness campaigns to educate people on how to identify pure mustard oil by its color, aroma, and taste. Prolonged consumption of adulterated mustard oil can lead to chronic health issues, particularly affecting the liver and cardiovascular system due to the cumulative effects of toxic substances and altered nutrient profiles. Governments and food safety agencies conduct regular testing to detect adulteration and enforce quality standards[9].

Adulteration in mustard oil can have serious health implications. Mustard oil, derived from mustard seeds, is valued for its high content of beneficial fatty acids, antioxidants, and micronutrients[10]. However, adulteration, often with cheaper oils such as palm oil or argemone oil (derived from the argemone plant), compromises its quality and safety. Mustard oil is a flavorful and nutritious cooking oil with a distinctive taste and numerous potential health benefits[11], particularly when consumed in moderation and its pure form.

Conclusion:-

Adulteration in mustard oil poses significant health risks due to the introduction of toxic substances and the dilution of beneficial nutrients. Consumers should be vigilant when purchasing mustard oil and ensure they buy from reputable sources that adhere to regulatory standards. Regulatory bodies need to continue monitoring and enforcing these standards to safeguard public health effectively.

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