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A Pilot Study on the Assessment of Physicochemical Properties of Multi-Source Edible Oils (Mseo)

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ABSTRACT:
The study focuses on the physicochemical properties of the Multi-Sourced Edible Oils (MSEO), the oils selected for this study are cold-pressed groundnut oil and gingelly oil in different proportions. The fatty acid profile and the sensory evaluation of the blended oils were also carried out. The physicochemical property assessment reveled that both the MSEO samples 1 and 2 were desirable and was well-suited for cooking purposes. The fatty acid profile of the MSEO 2 was found to be more superior than that of MSEO 1 with high level of PUFA content. Hence the MSEO sample 2 with 60% cold-pressed gingelly oil and 40% cold-pressed groundnut is proven to be the superior blend of the two.

INTRODUCTION

Fats and oils are triglycerides, the major component of lipids (Vaclavik & Christian, 2003). Fats and oils serve mainly as sources of energy and provide up to 9 kilocalories of energy. Most vegetable oils are a good source of vitamin E. Fats provide essential fatty acids such as linoleic, linolenic, and arachidonic acids. Furtherfats are essential for the absorption of fat-soluble vitamins like vitamin A, and provitamin A (carotene). At the same time, excess intake of saturated fats and cholesterol consumption has been associated with hypercholesterolemia and atherosclerosis (Swaminathan, 2011). Edible vegetable oils are triglycerides of plant origin that include olive, palm, soybean, canola, groundnuts, gingelly, and sunflower oil. Fats and oils are important nutritional components with a variety of functions in our body as an energy source, membrane structures, regulating body temperature, andinsulating organs (Negash et al., 2019).

The nomenclature for "Blended oil" has been officially changed to Multi- Source Edible Oil (MSEO) by the Food Safety And Standards Authority of India on June 8, 2021 (USDA, 2021). The blending of oil combines the potency of two edible oils and offers a balance of fatty acids (Upadya et al., 2015). Edible blend oil is a mixture of vegetable oils. Edible blend oil can meet the daily need for the two essentialfatty acids for humans to achieve balanced nutrition. Each vegetable oil has its different composition, so vegetable oil contents in edible blend oil determine nutritional components in blend oil (Xu et al., 2015). Mixing different vegetable oils can change the fatty acid composition and give higher levels of natural antioxidants and bioactive lipids in the blends and, therefore, can improve the nutritional value andthe stability of oils (Aladedunye and Przybylski, 2013).

MATERIALS AND METHODS

The study followed an experimental study design which involved the assessment of the physicochemical

properties of MSEO samples. Experimental design is the process of carrying out research in an objective and controlled fashion sothat precision is maximized, and specific conclusions can be drawn regarding a hypothesis statement.

Table – 1 Sample description

Sample	Groundnut oil : Gingelly oil
MSEO Sample 1	3:2 (300ml : 200ml)
MSEO Sample 2	2:3 (200ml : 300ml)

The **MSEO sample 1** contained 300ml of cold-pressed groundnut oil and 200ml of cold-pressed gingelly oil. The **MSEO sample 2** contained 200ml of cold-pressed gingelly oil and 300ml of cold-pressed groundnut oil. According to the FSSAI guidelines, the mixture of the oil that is selected for the blending purpose must be greater than 20 per cent. The proportions of the oils have been curated based on this guideline. The nutritional benefit of MSEO sample 1 is attributed to cold-pressed groundnut oil as it makes 60 per cent of the admixture. The nutritional benefit of MSEO sample 2 is attributed to cold-pressed gingelly oil as it makes about 60 per centof the admixture.

RESULTS AND DISCUSSION

The present study was undertaken to assess the physicochemical properties of (MSEO). The study focuses on the cold-pressed oil blend's physicochemical properties and the oil samples' fatty acid profile. The oils selected forthis study are cold-pressed groundnut oil and cold-pressed gingelly oil. The MSEO samples were made by blending these two oils in different proportions adhering to theFSSAI standards.

Density - There were no statistically significant differences encountered in the density values ofthe MSEO samples 1 and 2. Several factors, including fatty acid groups, antioxidants,fatty acid chain length, and temperature, affect the density of the oil and fats (Senrayanand Venkatachalam, 2020).

Moisture content - A statistically significant difference in the moisture content ($p<0.01$) of MSEO 1 was observed between the cold-pressed oil and the oil heated to its smoking point. Asimilar observation was made when the sample was reheated MSEO 2 exhibited a statistically significant difference in moisture content reheated aswell.

Smoking point - Comparisons in the smoking point of MSEO samples 1 and 2 MSEO 1 does not show any statistically significant difference when the sample isheated to its smoking point and when reheated. MSEO 2 showed no statisticalsignificance when the sample is heated to its smoking point(167° C). There was adecreased significance noted when MSEO 2 was reheated at 143° C, the significancewas seen at $p<0.05$ level.

Acid value : The comparisons in the acid value of MSEO samples 1 and 2. The acidvalue of the MSEO samples 1 and 2 do not show any statistically significant differencewhen the cold-pressed MSEO 1 and 2 were heated to their smoking point and reheated. The acid values are used to indicate the level of rancidity and edibility of oils (Amos et al., 2012). The acid value indicates whether the oil is in a good non-degradable state or not.

Peroxide value: A statistically significant increase ($p<0.05$) was seen in MSEO 1 when the sample is reheated (172°C). MSEO 2 showed a statistically significant decrease ($p<0.01$) when the sample is heated to its smoking point (167° C). The sample does not show any statistical significance when the sample is reheated. similarly, a statistically significant decrease($p<0.05$) was noted when the cold-pressed MSEO 2

was compared with the reheated MSEO 2.

Saponification value:

Comparisons in saponification value of MSEO samples 1 and 2. MSEO 1 showed a statistically significant decrease ($p<0.01$) when the MSEO 1 wasreheated (172°C). When the reheated sample was compared with the cold-pressedMSEO 2 there was a statistically significant increase noted at $p<0.05$ level. MSEO 2 does not show any statistically significant difference in its saponificationvalue throughout the table. The saponification value is a measure of the average molecular weight or chain lengthof all the fatty acids present.

Iodine value: The comparisons in iodine value of MSEO samples 1 and 2. MSEO 1 showed a statistically significant decrease ($p<0.01$) when heated to its smoking point (197°C), There was no statistically significant decrease noted when the sample is reheated. MSEO 2 showed a statistically significant decrease ($p<0.01$) when the sample is heated to its smoking point. There was a statistical difference noted when the sample is reheated, this is seen when the cold-pressed sample was compared with reheated MSEO 2.

Fatty acid profile of MSEO samples:

It is seen that MSEO 1 has 69 per cent of polyunsaturated fatty acids (PUFA), 26 per cent of monounsaturated fatty acids (MUFA), and 52 per cent of saturated fatty acids. The PUFA content is high in this MSEO 1 which denotes that itis essential for human nutrition. It is also seen that groundnut oil is naturally trans-fatfree. K R Polley et al. (2015) in their study, titled "Metabolic responses to high-fat diets rich in MUFA vs PUFA" concluded that, a MUFA-rich meal results in a lower respiratory exchange ratio(RER) and greater diet-induced thermogenesis(DIT). It is seen that MSEO 2 has 82 per cent of polyunsaturated fatty acids (PUFA), 15 per cent of monounsaturated fatty acids (MUFA), and 3 per cent ofsaturated fatty acids. The PUFA content of this blend is comparatively higher than theMSEO 1. The fatty acid profile of MSEO samples 1 and 2 are given in Table – 2

Sample	SFA (%)	MUFA (%)	PUFA (%)
MSEO 1	5%	26%	69%
MSEO 2	3%	15%	82%

Sensory quality:

MSEO sample 1 was preferred by 57 per cent and MSEO 2 was preferred by 43 per cent of the participants. This shows that MSEO 1 which wasthe 300ml cold-pressed groundnut oil and 200ml cold-pressed gingelly oil waspreferred by half of the participants.

CONCLUSION:

From the results, it is concluded that MSEO 2 had high polyunsaturated fatty acids content when compared to MSEO 1. The oil blend with cold-pressed gingelly oil is superior to the oil blend with cold-pressed groundnut oil.The Multi-Source Edible Oil (MSEO), with 300 ml of cold-pressed gingelly oil with200 ml of cold-pressed groundnut oil showed desirable qualities in its physicochemical parameters by adhering to the food standards. The fatty acid profile of the MSEO 2 was reported to be highly healthy for humans as it had docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), with monounsaturated fatty acids that claim to have a positive effect on the cardiac health of the individuals. Overall MSEO 2 was accepted on basis of its physicochemical properties, and fatty acid profile.

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