A REVIEW ON HEMP (CANNABIS SATIVA L) SEED & ITS MILK

Abstract

The family Cannabaceae includes hemp, widely known as Cannabis sativa L. As shelled seed or de-shelled kernel, along with byproducts including oil, protein powder, and flour, it is frequently eaten up in various ways throughout the world. In addition to a high concentration of methionine and cysteine, two amino acids that are rather scarce in plant proteins, hemp seeds are said to contain all nine necessary amino acids (AAs). In contrast to its low quantity of saturated fatty acids (SFAs), hempseed oil contains assemblage of polyunsaturated fatty acids (PUFAs). Additionally, it has been observed that consumption of hemp seed has a helpful impact on insulin sensitivity, hunger, blood total cholesterol, and low-density lipoprotein (LDL) levels. Hempseeds include significant amounts of phosphorus (P), sodium (Na), magnesium (Mg), potassium (K) and calcium (Ca), among other macro-elements. For those who cannot consume milk, hemp seed (Cannabis Sativa L.) is the greatest source and alternative. The superiorities of hemp seed and its milk are the major subject of this review.

Keywords: Polyuunsaturated Fatty Acid, Monounsaturated Fatty Acid, low-density lipoprotein, Anti-carcinogenic, Gut microbiota.

Author

H Kavya Jyothi
Department of Food Science and Nutrition
Dr. N. G. P Arts and Science College
Coimbatore, Tamil Nadu, India
kavyajyothifsn@gmail.com

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I. INTRODUCTION

Cannabaceae is the family name for hemp, often known as Cannabis sativa L (Pollio, 2016). In recent years, hemp and its products have become more and more well-liked. The amount of delta-9- tetrahydrocannabinol (THC), the main ingredient in marijuana, is the main distinction. THC levels in industrial hemp range from 0.3% to 1.5%, compared to marijuana's 5% to 10% or higher levels. Minerals, antioxidants, fiber, and vitamin E are all abundant in hemp seed. The amount of B vitamins is comparable to that of other cereals. The quality and quantity of the fatty acid content and protein of hemp seeds, on the other hand, makes them unique. The protein found in hemp seeds is made up of 35% albumin protein and necessary amino acids, with 65% of the protein being the highest-quality edestin protein, which is also the most stable protein found in any plant source. All of the necessary amino acids (AAs) are abundant in hemp seeds, especially cysteine and methionine , which are typically scarce in vegetable .

In terms of nutritional profiles, hemp seeds and soy protein are comparable (Tang et al., 2006). 3:1 is the ratio of omega-6 to omega-3 fatty acids in hemp. Hemp includes the stearidonic acid (omega-3) and polyunsaturated fatty acids- gamma linolenic acid (GLA; omega-6) , unlike fish, which does not. (Li D et al., 2006).

Figure 1: The Hemp Plant and its Seed

II. HEMP SEED- NUTRITIONAL FEATURES

Due to its excellent nutrient profile, hempseed is also referred to as a complete food source. It is eaten as a whole seed, a dehulled kernel, or as by-products such protein powder, flour, and oil. It has about 25–35% lipids with a distinctive fatty acid (FA) composition, 20–25% digestible proteins with all the required amino acids, and 20–30% carbohydrates that are

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insoluble dietary fiber. In contrast, hempseed is high in bioactive substances such carotenoids, tocopherols and phytosterols as well as antioxidants. (Irakli et al., 2019).

(A) (B)

Figure 2: (A) Hemp seed (B) De- hulled Hemp Seed

1. **Fat Content:** Polyunsaturated fatty acids (PUFAs) are abundant in hempseed oil, but saturated fatty acids (SFAs) are relatively scarce. 90% or so of hempseed oil is made up of unsaturated fatty acids, of which 70% to 80% are polyunsaturated fatty acids. Oleic Acid is the monounsaturated fatty acid (MUFA) that is present. Hempseed oil has more OA than chia seed (7%) does. (Da Silva Marinelli et al., 2014) and low in linseed (15%) (Teh et al., 2013). Linoleic Acid is the PUFA that is most abundant in hempseed oil. Linolenic acid is the second prevalent PUFA. So, according to this assertion, hempseed oil is a great supply of two essential fatty acids.

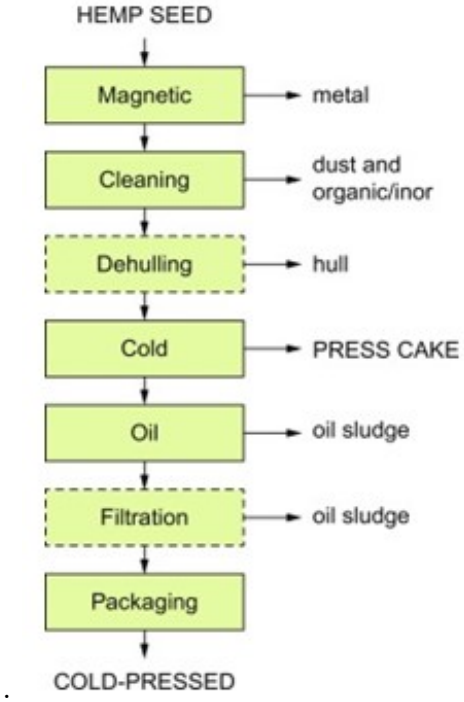

Figure 3: Extraction Process of Hemp Seed Oil. (Source: Industrial hempseed oil and lipids: Processing and properties, https://doi.org/10.1016/B978-0-323-90910-5.00003-8.)

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2. **Protein Content:** Depending on the variety and environmental variables, hempseed contains 20 to 25% protein. In particular hempseed byproducts like dehulled seed, hempseed meal, and flour, the ratio may rise. (Mattila et al., 2018).

   The greater part of the proteins in hempseed are build in the inner layer of the seed (Mattila et al., 2018). As a result, the removal of seed components like the hull causes a an increase by 1.5 in oil and protein, which is why processed products have more protein in them. When both the hull and the oil are removed, more proteins can be obtained. When they are eliminated, goods with high protein and low fat contents result. (House et al., 2010).

   According to studies on hempseed proteins, there are two primary proteins present: edestin, a legumin, and albumin, a spherical protein. (Tang et al., 2006)

   The study "Amino acid composition observed in hempseed proteins" asserts that (1) proteins include all essential amino acids and (2) glutamic acid, the most influential amino acid, next to arginine. Hempseed proteins include a significant quantity of sulfur-containing amino acids as compared to casein and soy proteins. In general, hempseed is regarded as a high-protein source since its protein concentration is higher than that of other high-protein foods like linseeds , quinoa , chia seeds and buckwheat seeds . Since hempseed has a fair ratio of EAAs, its protein component is also easily digested. (Mattila et al., 2018) .

3. **Carbohydrate and Dietary Fibre Content:** Hempseed contains 20–30% carbohydrate by weight. Few literature studies have examined hempseed's total carbohydrate and fiber content. It was discovered that the hempseed had a carbohydrate content of 27.6 g/100 g of seeds (Mattila et al., 2018). The entire carbohydrate content of whole hempseed was indistinguishable to that of flaxseed. Respectively, according to an analysis of the nutritive value of several commercially available protein-abundant seeds, including hempseed. Dietary fibre content- 27.6 g/100 g of seeds was discovered by Callaway (Callaway, 2004). The research by Mattila and colleagues showed that dietary fiber made up the overall carbohydrate percentage, hempseed's TDF was 98% of the total carbohydrate, was measured (Mattila P et al., 2018).

   It has been shown to, among other things decreases appetite , increases insulin sensitivity, lowers blood cholesterol and low-density lipoprotein (LDL), and improving insulin sensitivity. Additionally, because dietary fiber is resistant to digestion , in large intestine it is fermented by the gut microbiota and forms short chain fatty acids with anti-inflammatory and anti-carcinogenic properties.

4. **Mineral Content:** In addition to the in-trace elements zinc (Zn), iron (Fe), manganese (Mn) and copper (Cu), the main macro-nutrients found in hempseeds were calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg) and sodium (Na). (Lan Y et al., 2019).

   The amount of phosphorus obtained was more than that of linseeds and niger seeds , which are similar to hempseeds and are regarded as the best sources of phosphorus . (José Ignacio Alonso-Esteban, 2022).

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According to José Ignacio Alonso-Esteban (2022), hempseeds have a K content that is higher than that of linseeds and equal to that of hazelnut . It's interesting that a high K/Na ratio results from a high K/Na ratio with a relatively low Na content, which is thought to have cardioprotective benefits since it encourages a high K intake linked to blood platelet aggregation and stroke. Hempseeds contain almost the same amount of potassium as walnuts . Fe, one of the in-trace elements that is widely deficient in diets and is thought to be crucial for human health. The Fe content of hempseed is significantly higher than that of cereal grains, according to research by Lan and colleagues (Lan et al., 2019), and it can be utilized to enrich cereal food products to lower iron deficit. The RDI provided by hempseeds was highest for Fe and Mn , leading the authors of the same study to draw the conclusion that every variety represent an outstanding source, especially of P,Fe, Mn, Cu, Zn and Mg. The study was conducted on adult males aged 19 to 30. The removal of the hull increased the concentrations of phosphorus by 1.5 times, zinc by 2 times and iron by 1.25 times in the Hungarian Hlesiia cv. While Cu and Mg were uniformly distributed throughout the seed's kernel and hull, it was found that entire hempseed had 30-65% less macro-minerals and Zn than hemp hulls (Mattila et al., 2018).

III. HEMP SEED MILK

1. Overview of Hemp Seed Milk: Comparing hemp milk to almond, soy, rice, and cow's milk, it is generally found to be a best source of calcium, iron, magnesium and zinc.

Table 1: Comparison of % daily value (DV) of minerals

Milk	Calcium	Magnesium	Zinc	Iron	Phosphorous
Hemp milk	40%	19%	9%	15%	43%
Rice milk	30%	0	0	4%	15%
Whole cow’s milk	29%	6%	7%	1%	22%
Soy milk	35%	15%	0	40%	15%
Almond milk	30%	0	0	2%	15%

Source: Hemp Seed and Hemp Milk The New Super Foods, ICAN: Infant, Child, & Adolescent Nutrition (2009)

2. Nutrient Profile for Hemp Seed Milk: Hemp milk with no flavors or added sugar has 60 calorie lower than cow's milk. Compared to cow's milk, 8 g of protein , hemp milk has 3 g. In comparison to cow's milk, hemp milk contains more monounsaturated and polyunsaturated fats (Curl, S. et al., 2020). While unsweetened hemp milk has less potassium than cow's milk per cup, it has comparable levels of salt and calcium (when fortified).

Table 2: Nutrient Profile Comparison of Hemp Milk Compared to Whole Cow’sMilk

	Unsweetened hempmilk (1 cup)	Whole milk(1 cup)
Energy(kcal)	60	150
CHO (g)	3	8
Protein (g)	4.5	8

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Total Fat (g)	NR	4.5
Saturated fat (g)	0	12
Fibre (g)	0	0
Total sugar (g)	0	12
Vitamin A (mcg)	NR	112
Vitamin B12 (mcg)	NR	1
Vitamin D (mcg)	2	3

Source: Curl, S *et al.,(*2020), Plant-Based Milks: Hemp,Food Science and Human Nutrition Department, UF/IFAS Extension.

IV. CONCLUSION

A fascinating alternative to address societal and environmental concerns in the future is the usage of plant proteins, which are less resource-intensive and have a far smaller environmental impact. The hemp seed, which has several utilization in both food and nutraceutical industries, is the subject of numerous fundamental studies and serves as a source for the nutrient fortification of diverse foods. Therefore, hemp seed is the greatest source for lactose intolerant individuals, athletes, young children, and those with cardiovascular disease.

REFERENCES

[1] A Pollio (2016), The Name of Cannabis: A Short Guide for Nonbotanists, Cannabis and cannabinoid research, https://doi.org/10.1089/can.2016.0027.
[2] CH Tang, Z Ten, XS Wang (2006), Physicochemical and Functional Properties of Hemp (Cannabis sativa L.) Protein Isolate, Journal of Agricultural and Food Chemistry, https://doi.org/10.1021/jf0619176.
[3] Tianpeng Chen, Jianxiong Hao, and Lite Li (2010), Analytical Characterization of Hempseed (Seed of Cannabis sativa L.) Oil from Eight Regions in China,Journal of Dietary Supplements , https://doi.org/10.3109/19390211003781669.
[4] Maria Irakli et al., (2019), Effect of Genotype and Growing Year on the Nutritional, Phytochemical, and Antioxidant Properties of Industrial Hemp (Cannabis sativa L.) Seeds, https://doi.org/10.3390/antiox8100491.
[5] Yang Lan et al., (2019), Genotype x Environmental Effects on Yielding Ability and Seed Chemical Composition of Industrial Hemp (Cannabis sativa L.) Varieties Grown in North Dakota, USA, Journal of the American Oil Chemists' Society, https://doi.org/10.1002/aocs.12291.
[6] Pirjo Mattila, Sari Mäkinen, Merja Eurola, Taina Jalava, Juha-Matti Pihlava, Jarkko Hellström & Anne Pihlanto (2018), Nutritional Value of Commercial Protein-Rich Plant Products, Plant Foods for Human Nutrition, https://doi.org/10.1007/s11130-018-0660-7.
[7] James D. House, Jason Neufeld, and Gero Leson(2010), Evaluating the Quality of Protein from Hemp Seed (Cannabis sativa L.) Products Through the use of the Protein Digestibility-Corrected Amino Acid Score Method, Journal of Agricultural and Food Chemistry, https://doi.org/10.1021/jf102636b.
[8] José Ignacio Alonso-Esteban, María Esperanza Torija-Isasa, María de Cortes Sánchez-Mata (2022), Mineral elements and related antinutrients, in whole and hulled hemp (Cannabis sativa L.) seeds, Journal of Food Composition and Analysis, https://doi.org/10.1016/j.jfca.2022.104516.
[9] Sarah Curl, Daniela Rivero-Mendoza, and Wendy J. Dah (2020), Plant-Based Milks: Hemp, Food Science and Human Nutrition Department, UF/IFAS Extension.
[10] Cary Leizer BA,David Ribnicky PhD,Alexander Poulev PhD,Slavik Dushenkov PhD &Ilya Raskin PhD (2015), The Composition of Hemp Seed Oil and Its Potential as an Important Source of Nutrition, https://doi.org/10.1300/J133v02n04_04.
[11] Umme Salma Vahanvaty, (2009), Hemp Seed and Hemp Milk, The New Super Foods?, ICAN: Infant, Child, & Adolescent Nutrition

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