Proximate, functional, and biochemical analysis of *Ziziphus nummularia* seeds: A valuable ingredient for the food industry

Running title: Analysis of *Ziziphus nummularia* Seeds

Nidhi Nain[1], Ovais Shafiq Qadri[1], Owais Yousuf[2], Kaiser Younis[2*]

(1. Department of Biotechnology, Thapar Institute of Engineering and Technology, Patiala, India-147004;
2. Department of Food Technology, Islamic University of Science and Technology, Awantipora, India-192122)

Abstract: This study aimed to evaluate the properties of *Ziziphus nummularia* seeds. The seeds of *Ziziphus nummularia* were analyzed for proximate, functional, and biochemical analysis to estimate crude fat, protein, ash, oil, water holding capacity, total polyphenols, and fatty acids. The seed has a high protein content of 38.7% and a relatively high lipid content of 23.1%. It also has a good mineral content of 3.5% ash. The seed has high water-holding capacity and good oil absorption capacity, making it suitable for use in the food industry. The seed exhibits strong antioxidant activity and contains a diverse range of compounds such as fatty acids, esters, and alkanes. The nutritional and functional properties of Ziziphus nummularia seeds make them a valuable ingredient for various food products.

Keywords: *Ziziphus nummularia* seeds; nutritional value; functional properties; protein content; lipid content.

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1 Introduction

Ziziphus nummularia, also known as wild jujube or jhahrberi, is a fruit tree that is native to India. It has been continuously grown for centuries in North Indian plantations, making it one of the oldest fruit trees in the region. The plant is highly versatile and has been used for erosion control, windbreaks, and as a microhabitat for other plants to grow (Mesmar et al., 2022). *Ziziphus nummularia* is a species that is dispersed from Iran to India, but it is extensively present in India, ranging from Punjab, Rajasthan, Gujarat, and Uttar Pradesh. The plant is commonly found in arid areas, hills, plains, and agricultural fields. *Z. nummularia* is a shrub that can grow up to 6 meters or more, branching to form a thicket. The leaves are rounded like those of *Ziziphus jujuba* but differ from those in having a pubescence on the adaxial surface (Pandey et al., 2010). The plant serves various purposes, prized for its delicious fruits, leaves for foraging, wood for fire, buildings, furniture, and traditional medicine. The leaves of the plant are utilized as feed for livestock, and the fruit is consumed as food, especially during times of food shortage in several parts of the world (Singh and Meghwal, 2020).

The plant has great commercial value, and its fruit is consumed as food around the world and used for its medicinal values such as anti-inflammatory, antioxidant, and hepatoprotective activities (Khan et al., 2020). The plant produces small, woody, black-red drupes that are about 0.8 cm in diameter when

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***Corresponding author: Kiser Younis**, Ph.D., Assistant Professor. Department of Food Technology, Awantipora. Email: kaitech.doft@gmail.com.

fully ripe. The fruit is commonly eaten in India, either unripe or fully ripe, and is often dried, ground, and mixed with other ingredients. The powder formed is eaten either alone uncooked or mixed with Gur (a sugar condiment) or Bajra (millet) flour. The fruit is highly nutritious and contains a good number of mineral components, high levels of vitamin C and sugar, and is more abundant in protein, calcium, phosphorus, carotene, and vitamin C than apples (Pandey et al., 2010).

The wild ber plant is known to contain various bioactive compounds that offer numerous health benefits. Recently, there has been a surge in interest in studying the proximate, functional, antioxidant, and phenolic properties of the seeds of this plant (Pandey et al., 2010). It has been acknowledged that *Z. nummularia* is an underused plant that merits more study. Especially there has been very little work done on the seed part due to its rigidity. This research paper aims to explore the potential of wild ber seeds and provide a comprehensive review of their medicinal characteristics. The study will contribute to the growing body of knowledge on the health benefits of wild ber and its potential applications in the food and pharmaceutical industries.

2 Materials and methods

2.1 Materials

2.1.1 Procurement of *Ziziphus nummularia* fruits

Ziziphus nummularia fruit (Figure 1) was taken from the farm located in the village Khanpur, district Fazilka, Punjab. Fruits are treated with preliminary steps (Figure 1) for further processing. The fruits were washed and blanched for 10 to 15 minutes, to loosen the skin and core of the fruit, allowing for simple peeling. The pulping was carried out by meshing the fruit with the hands and then the seeds with debris by immersing them in the water. Seeds being denser than the debris settled on the bottom of the container whereas debris remained on the surface. After this 2% solution of Sodium Hydroxide treatment for 12- 15 minutes was given to remove the unseparated pulp from the seeds. For further processing, seeds were dried in the hot air oven overnight at the temperature of 50ºC. The seeds are small and have a hard outer covering that is difficult to break. The kernels were obtained with the help of mortar and pestle.

2.2 Proximate tests

Protein, fat, moisture content, ash, and carbohydrate content of *Ziziphus nummularia* kernel were estimated by following the AOAC methods (Thangaraj, 2016).

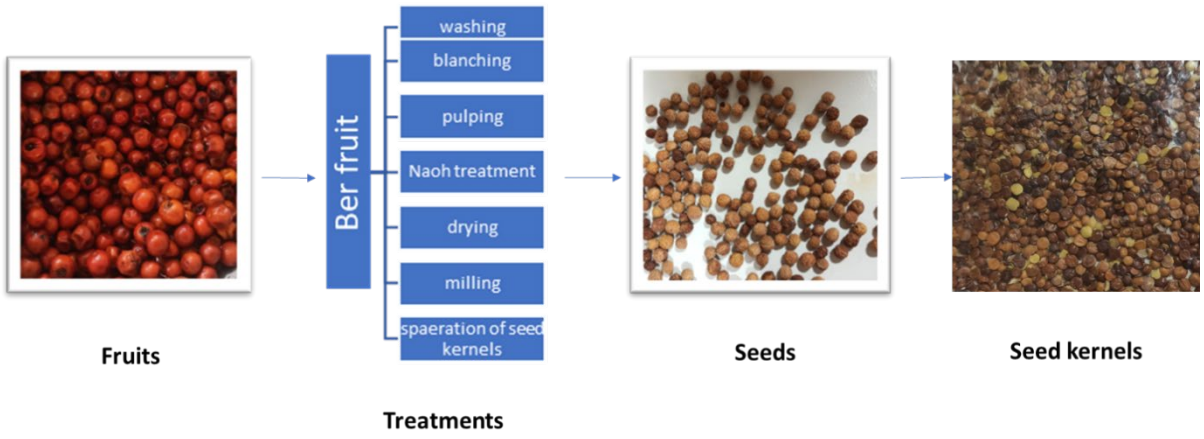

Figure 1 Extraction of seed kernels

2.3 Functional properties

2.3.1 Water holding capacity

The water-holding capacity of the kernels was determined using the Beuchat method (1977) with modifications. The kernels were crushed into flour using a mortar and pestle, and a 1 g sample was weighed into conical centrifuge tubes with a graded volume of 25 mL. Then, 10 mL of water was added to

the tubes, and the mixture was kept at room temperature (37ºC) for a complete 1 hour. After an hour of mixing, the mixture was subjected to centrifugation at 2000 rpm for 30 minutes to separate the suspended solids and quantify the amount of water present. The percentage of water absorbed was then calculated based on the weight of the initial sample.

$$Water\ holding\ capacity = \frac{Weight\ of\ wet\ sediment(g)}{Weight\ of\ dry\ sample(g)} \quad (1)$$

2.3.2 Swelling capacity (SC) and swelling index (SI)

Okaka and Potter's (1977) method with modifications was used to determine the Swelling Capacity and Index. The sample was poured into a 100 mL graduated cylinder up to the 10 mL mark, and then the cylinder was filled with distilled water up to the 50 mL mark. The cylinder was inverted to mix the contents and rested for 2 minutes. After that, it was inverted again and rested for 8 minutes, and the volume was recorded after the 8th minute (Chandra et al., 2015). Replicates were carried out, and the mean of the two replicates was recorded.

$$SI = \frac{Volume\ of\ the\ sample\ after\ soaking(ml) - Volume\ of\ the\ sample\ before\ soaking(ml)}{Weight\ of\ sample(g)} \quad (2)$$

$$SC = \frac{Weight\ of\ wet\ sediment(g)}{Weight\ of\ sample(g)} \times 100 \quad (3)$$

2.3.3 Oil absorption capacity

The methodology described by Beuchat (1977) with some modifications was used to verify this. Specifically, 10 mL of mustard oil (density-0.96 g mL^{-1}) and 1 g of the sample were combined in a 25 mL graduated conical centrifuge tube. The mixture was centrifuged at 2000 rpm for 30 minutes, after which the volume of oil on the sediment was recorded. The amount of absorbed oil was then calculated as a percentage of the original weight of the sample, according to the procedure outlined by Ocloo et al. (2010). Replicates were performed and the mean of two replicates was calculated.

$$Oil\ absorption\ capacity(OAC) = \frac{Weight\ of\ oil\ absorbed(g)}{Weight\ of\ sample(g)} \quad (4)$$

2.4 Analysis of extracted free fatty acid composition:

2.4.1 Gas chromatography (GC-MS with library search)

The oil was extracted from the seed kernel powder using the Soxhlet method. The extracted oil was then subjected to GC-MS analysis, where it was separated and analyzed for its composition and quantity. The results were compared with the library spectra to ensure accuracy and reliability (Goldschmidt and Byrdwell, 2021).

2.4.2 Peroxide test for free fatty acids

To determine peroxide levels, a sample is first treated with acetic acid and an organic solvent mixture, followed by a potassium iodide solution. The released iodine is titrated using a sodium thiosulfate solution. The peroxide levels are expressed in milliequivalents of peroxide/kg or millimoles of peroxide/L. To perform the test, 3 g of the sample is transferred into a 250 mL flask and mixed with 50 mL of solvent and 1 mL of potassium iodide solution. After 60 seconds of reaction time, 100 mL of water is added, and the mixture is stirred. The sodium thiosulfate solution is titrated with a starch solution indicator until the mixture turns from purple to faint yellow or colorless (Christie and Han, 2012).

$$Peroxide\ value(mEqKg^{-1}) = \frac{Titer\ value(ml) \times N \times 10000}{Weight\ of\ oil\ sample\ in\ grams} \quad (5)$$

Where N stands for normality of sodium thiosulphate solution.

2.5 Biochemical analysis

2.5.1 Preparation of extract

For the Biochemical analysis of ber seeds, methanolic extract was prepared (Santos et al., 2012). 2 g of seed kernels were ground and converted into fine powder. Add methanol (1:10 w/v) into the sample and mix with the magnetic stirrer for 2 hours at 25ºC temperature. After the samples were subjected to centrifugation at 4000 rpm for 10 minutes, the resulting supernatant was collected and utilized for subsequent experiments.

2.6 Antioxidant properties

2.6.1 Dpph assay (1, 1-diphenyl-2-(2, 4, 6-trinitrophenyl) hydrazine)

The DPPH assay is a popular method used to evaluate the radical scavenging potency of plant extracts. The method is founded on the principle of decreasing of the violet DPPH radical by the antioxidant compounds present in the sample. To perform the assay, a stock solution of DPPH is prepared in methanol. The 40 μL of methanolic extract sample is then mixed with the 600 μL of DPPH + 160 μL methanol solution and incubated in the dark for 30 minutes. The mixture's ability to absorb light is evaluated using a spectrophotometer at a wavelength of 517 nm (Pereira et al., 2011). The formula used to calculate the percentage of DPPH scavenging activity is as follows:

$$scavenging\ activity(\%) = \frac{Control - sample}{Control} \times 100 \quad (6)$$

2.6.2 Total phenolic content analysis

The Folin-Ciocalteu reagent was used to estimate the total polyphenol content of the ber seed extract. The spectrophotometric measurement value was obtained by monitoring the absorbance at 765 nm and then interpolated on the gallic acid calibration curve. The total polyphenol content was expressed as grams of gallic acid per kilogram of the sample (Younis et al., 2015).

3 Result and discussion

3.1 Proximate analysis

3.1.1 Protein analysis

The protein content of *Ziziphus nummularia* seed was found to be 38.7%, which is comparable to *Z. mauritiana* (36.4%) but much higher than Amaranthus sp. seeds (10.8% to 18.3%), melon seed (33.8%), Digitaria exilis (1.3%), and jackfruit seed (20%). The protein content of orange seed is comparable to that of *Z. nummularia*, at 33%. This study shows fruit seed flours have far more protein than industrial flours such as maize, wheat, or potato starch flour. Wheat flour has the highest protein content among commercial flours, at around 10%, while the other flours examined had levels between 0.5% and 1.5% (Lima et al., 2014).

3.1.2 Fat analysis

Ziziphus nummularia has a lipid content of 23.1%, which is relatively high compared to other sources such as jackfruit (1.7%) (Ocloo et al., 2010), pigeon pea flour (1.80%), and wheat flour (3.10%) (Okpala and Mamah, 2001). Depending on the features of the soil, environment, and germination/propagation, the energy stored in seeds may take the form of lipids or glycids. As a result, seeds with high fat concentrations during the latency stage typically have low starch contents. To give energy for germination, the lipids are then converted by exothermic processes into glycids, although in other species, there is little to no conversion of lipids to carbohydrates (Kozlowski and Pallardy, 1997).

3.1.3 Moisture content

Moisture content is a crucial factor in determining the quality and storage stability of seed. The moisture content of *Ziziphus nummularia* seeds was found as 5%, and the proximate analysis was carried out on this moisture content. The analyses are related to the moisture content, and higher moisture content leads to lower other constituents. Therefore, the lower moisture content of seed generally indicates higher quantity and better shelf stability. Moisture content is the total water component of the food sample and is used to measure the quality of the food sample. The drying process duration is a key factor in determining the moisture content of the seed.

3.1.4 Ash content

The percent ash content found in *Ziziphus nummularia* was 3.5%, which indicates the inorganic mineral content in the seed. Ash content is an important parameter that reflects the amount of minerals present in the sample, and it is commonly used to evaluate the nutritional value and quality of food products. In general, higher ash content is associated with higher mineral content, and the ash content of a food product can vary depending on factors such as the variety, processing methods, and environmental conditions (Harris and Marshall, 2017). In the case of *Ziziphus nummularia*, the 3.5% ash

content suggests that the seeds are a good source of minerals. The percent ash content found in *Ziziphus nummularia* was 3.5% which is slightly higher than jackfruit (2.70%) (Ocloo et al., 2010).

3.1.5 Carbohydrates

The *Ziziphus nummularia* seed flour was found to have a carbohydrate value of 29.1%. The main ingredient in the seed flour was carbohydrates, and the quantities of carbohydrates determined by difference were as expected, given the number of glycines in the seeds.

3.2 Functional properties

3.2.1 Water holding capacity

Our results showed that the water-holding capacity of *Ziziphus* seeds was 28% (2.8 g g^{-1}), which is relatively high compared to other plant materials (Lazos, 1992; Ocloo et al., 2010). This suggests that *Ziziphus* seeds can be used as a natural thickening and stabilizing agent in various food products (Saha and Bhattacharya, 2010). In baked goods, the addition of Ziziphus seed flour can improve the texture and moisture retention of the final product. Similarly, in dairy products such as yogurt and cheese, the addition of *Ziziphus* seed extract can improve the texture and increase the water-holding capacity, resulting in a creamier and smoother product. Furthermore, *Ziziphus* seeds can also be used in meat products as a natural binding agent, reducing the need for chemical binders such as sodium alginate or methylcellulose. The high water holding capacity of materials improve the texture, moisture retention, and sensory attributes of various food products (Kyriakopoulou et al., 2021).

3.2.2 Oil absorption capacity

The results showed that the oil absorption capacity of *Ziziphus* seeds was 23.8%, indicating that it could absorb a significant amount of oil during food processing. Because fats enhance food flavor and mouthfeel, fat absorption is a crucial component of food compositions. Fat enhances flavor retention in processed foods (Drewnowski and Almiron-Roig, 2010). Materials with good oil absorption capacity can be used in the emulsion type foods like meat sausages and patties to prevent the cooking losses (Younis et al., 2021; Younis and Ahmad, 2018).

3.2.3 Swelling capacity (SC) and Swelling index(SI)

The swelling capacity and swelling index of seed flour are important parameters that determine its suitability for various food processing applications. In this research, the swelling capacity and swelling index of the seed flour were found to be 4.067% and 0.88%, respectively. The swelling capacity of a flour is an indication of its ability to absorb water and form a gel-like substance. The higher the swelling capacity, the more water the flour can absorb, resulting in a more viscous product. While as, the swelling index of a flour is a measure of the rate at which it absorbs water. In food processing, this property is useful for applications such as modification and texture and prevention of shrinkage (Younis and Ahmad, 2015).

3.3 GC-MS analysis

The crude fat's fatty acid content was determined by saponification, which was followed by the creation of their methyl esters. Later these fatty acid methyl esters were analysed by the GC-MS with a library search. Individual fatty acids were identified with the help of mass spectral deviation as shown in Figure 2 and the compounds are listed below with given different parameters.

As shown in Figure 2 different fatty acid compounds were identified in the FAME molecules of *Ziziphus nummularia.* There are different peaks shown in Figure 2, each peak indicates the presence of different free fatty acid compounds with different concentrations.

Table 1 presents the different compounds found at different retention times (RT) with varying concentrations. At a retention time of 25.985 min, Hexadecanoic acid, methyl ester; Pentadecanoic acid, 14-methyl-, methyl ester; and Pentadecanoic acid, methyl ester was found. At 30.154 min, 9,12-Octadecadienoic acid (Z, Z)-, methyl ester; Methyl 9-cis,11-trans octadecadienoate; and 9,11-Octadecadienoic acid, methyl ester, (E, E)- were identified. At 30.329 min, 9-Octadecenoic acid (Z)-, methyl ester; cis-13-Octadecenoic acid, methyl ester; and 9-Octadecenoic acid, methyl ester, (E)- were

detected. At 30.848 min, Methyl stearate; Heptadecanoic acid, 16-methyl-, methyl ester; and Heptadecanoic acid, 15- methyl-, methyl ester was identified. Eicosane; Docosane; and Heneicosane were found at a retention time of 32.324 min. At 34.255 min, Tricosane; Eicosane; and Tetracosane were detected. At 34.780 min, Eicosanoic acid, methyl ester; Methyl 18-methylnonadecanoate; and Nonadecaonoic acid, 10-methyl-, methyl ester were identified. At 36.043 min, Pentacosane; Eicosane; and Tetracosane were detected. At a retention time of 37.724 min, pentacosane; nonacosane; and triacontane were found. At 38.206 min, docosenoic acid, methyl ester; methyl 20-methyl-, heneiosanoate; and octadecanoic acid, 17-methyl-, methyl ester were identified. At 38.706 min, tetrapentacontane, 1,54-dibromo-; 2-methylpentacosane; and octadecane, 3-ethyl-5-(2-ethylbutyl)- were detected. At 39.319 min, triacontane; tetratriacontane; and nonacosane were identified. At 40.831 min, triacontane; heptacosane; and tetratriacontane were found. Finally, at 41.719 min, only tetrapentacontane, 1,54-dibromo- was detected.

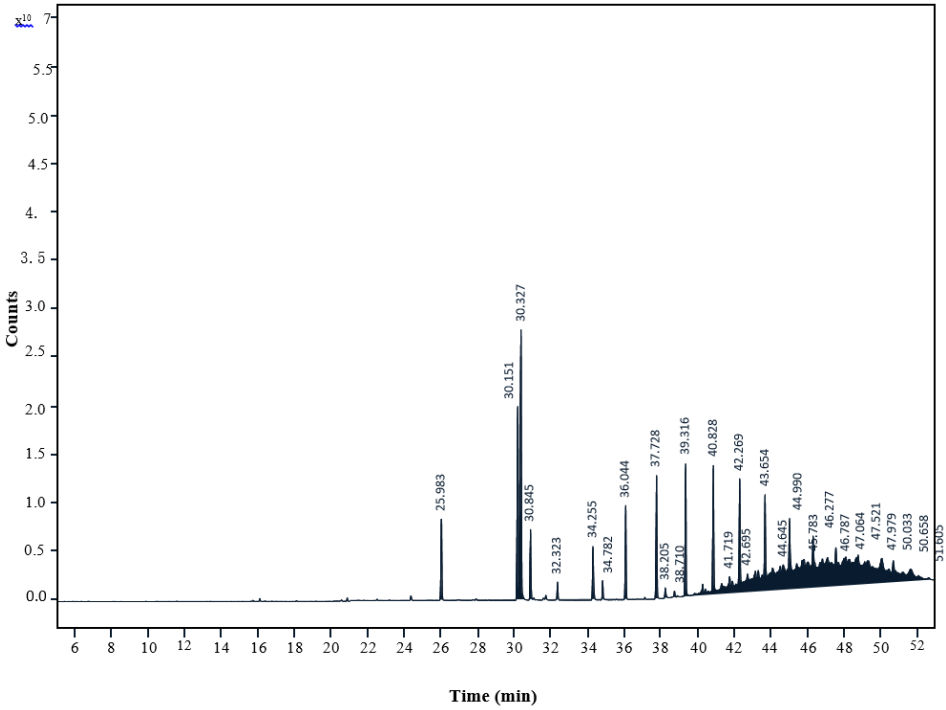

Figure 2 Mass spectral deviation curve

Table 1 Compounds detected and their concentrations

Retention time minutes	Compound name	Concentration %
	Hexadecanoic acid, methyl ester	88.7
25.985	Pentadecanoic acid, 14methyl-, methyl ester	5.53
	Pentadecanoic acid, methyl ester	1.16
	9,12-Octadecadienoic acid (Z, Z)-, methyl ester	42.42
30.154	Methyl 9-cis,11-transoctadecadienoate	9.35
	9,11-Octadecadienoic acid, methyl ester, (E, E)-	7.9
	9-Octadecenoic acid (Z)-, methyl ester	26.84
30.329	cis-13-Octadecenoic acid, methyl ester	12.22
	9-Octadecenoic acid, methyl ester, (E)-	11.28
	Methyl stearate	85.05
30.848	Heptadecanoic acid, 16-methyl-, methyl ester	7.04
	Heptadecanoic acid, 15- methyl-, methyl ester	4.4
	Eicosane	18.87
32.324	Docosane	14.46
	Heneicosane	7.89
	Tricosane	23.68
34.255	Eicosane	17.19
	Tetracosane	8.35

Retention time minutes	Compound name	Concentration %
	Eicosanoic acid	75.34
34.78	Methyl 18-methylnonadecanoate	20.94
	Nonadecaonoic acid, 10-methyl-, methyl ester	1.96
	Tetracosane	34.68
36.043	Eicosane	8.7
	Pentacosane	7.35
	Pentacosane	16.82
37.724	Triacontane	13.22
	Nonacosane	9.33
	Docosenoic acid, methyl ester	65.96
38.206	Methyl 20-methyl-, heneiosanoat	26.07
	Octadecanoic acid, 17-methyl-, methyl ester	1.11
	Tetrapentacontane, 1, 54-dibromo-	11.07
38.706	2-Methylpentacosane	7.59
	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	5.66
	Triacontane	15.35
39.319	Tetratriacontane	10.53
	Nonacosane	9.3
	Triacontane	16.76
40.831	Hetacosane	12.17
	Tetratriacontane	10.75
	Tetrapentacontane, 1, 54-dibromo-	38.07
41.719	17-Pentariactoene	13.9
	tetracosane, 1-bromo-	3.27
	Tetratriacotane	16.87
42.269	Octacosane	16.87
	Triacontane	16.22
	Tetrapentacontane, 1, 54-dibromo-	20.84
42.694	17-Pentatriacontane	16.8
	1-Hexaconsane	11.19
	Tertratriacontane	12.35
43.657	Nonaconsane	8.97
	Triacontane	7.05
	Tetrapentacontane, 1, 54-dibromo-	38.38
44.654	17-Pentatriacontane	17.48
	1-Hexacosane	4.48
	Tetrapentacontane, 1, 54-dibromo-	11.91
44.995	17-Pentatriacontane	10.52
	1-Hexacosane	6.37
	Tetrapentacontane, 1, 54-dibromo-	50.5
45.788	17-Pentatriacontane	13.76
	1-Hexacosane	3.6
	Tetrapentacontane, 1, 54-dibromo-	46.54
46.288	17-Pentatriacontene	11.15
	1-Hexacosane	3.1
	7,8,-Epoxylanostan-11-ol	30.43
46.789	Tetrapentacontane, 1,54-dibromo-	9.28
	17-Pentatriacontene	5.99
	Tetrapentacontane, 1, 54-dibromo-	48.95
47.064	17-Pentatriacontene	16.4
	1-Hexacosane	3.4
	Tetrapentacontane, 1, 54-dibromo-	53.39
47.52	17-Pentatriacontene	14.84
	1-Hexacosane	4.04
	Tetrapentacontane, 1, 54-dibromo-	44.8
47.976	17-Pentatriacontene	19.06
	1-Hexacosane	4.49
	Tetrapentacontane, 1, 54-dibromo-	51.3
50.033	17-Pentatriacontene	14.81
	1-Hexacosane	298
	2',5'-Bis(tert-butyldimethylsilyl)oxy-4-methoxychalcone	16.27
50.658	Cardamonin, bis(tert-butyldimethylsilyl) ether	11.16
	9,12-Octadecadienoic acid, (2-phenyl-1,3-dioxolan-4-yl)meth	7.88

Retention time minutes	Compound name	Concentration %
	Tetrapentacontane, 1, 54-dibromo-	31.98
51.602	17-Pentatriacontene	21.3
	Oleic acid, 3-(octadecyloxy)propyl ester	4.17

The results show that the sample contains a diverse range of compounds, including fatty acids, esters, and alkanes, which are commonly found in plant oils. The presence of these compounds indicates that the sample has been derived from a plant source. The differences in the concentrations of the compounds at different retention times could be due to variations in the composition of the plant source, as well as the extraction and analysis techniques used.

3.4 Peroxide value of extracted fatty acid:

The result of the peroxide value of 58 $mEqKg^{-1}$ obtained from the extracted fat of *Ziziphus nummularia* indicates the degree of oxidation that has occurred in the oil sample. The peroxide value is a measure of the amount of peroxides formed in the oil due to oxidation. A high peroxide value indicates that the oil has undergone significant oxidation, which can lead to the development of off-flavors and odors (Shahidi and Hossain, 2022). In the case of Ziziphus nummularia, the peroxide value of 58 $mEqKg^{-1}$ is relatively high, suggesting that the oil has undergone some degree of oxidation. Hence, the obtained fatty acids appear to be rancid and may be useful in producing biodiesel.

3.5 Antioxidant properties

3.5.1 DPPH ((1,1-diphenyl-2-(2,4,6-trinitrophenyl) hydrazine) assay

Ziziphus nummularia seed has been discovered to possess a remarkable antioxidant capacity of 76%. Antioxidants refer to substances that aid in counteracting the negative effects of free radicals. These free radicals are harmful byproducts that result from cellular metabolism and can cause oxidative stress. Oxidative stress can lead to cellular damage and chronic illnesses like diabetes, cancer, and cardiovascular disease (Lobo et al., 2010). Therefore, the high antioxidant capacity of *Ziziphus nummularia* seed indicates its potential to mitigate oxidative stress and protect cells from damage. The antioxidant properties of *Ziziphus nummularia* seed make it a valuable resource for developing natural health products and supplements. Several studies have reported the presence of various phytochemicals in *Ziziphus nummularia*, which are responsible for its antioxidant activity. For instance, phenolic compounds, flavonoids, and terpenoids have been identified in *Ziziphus nummularia*, which are known for their potent antioxidant properties (Mesmar et al., 2022).

3.5.2 Total phenolic content

The total phenolic content of Ziziphus nummularia seed was determined to be 32.45 mg gallic acid equivalents (GAE). Phenolic compounds are known for their antioxidant properties, and their presence in plant-based foods has been associated with various health benefits (Kumar and Goel, 2019). Therefore, the total phenolic content of *Z. nummularia* seed suggests that this plant species may have potential applications in the food and pharmaceutical industries. Over the past few years, there has been an increasing fascination towards using natural antioxidants as a substitute for the artificial antioxidants that are widely used in various industries (Lourenço et al., 2019). The total phenolic content of *Z. nummularia* seed suggests that it could be a valuable source of natural antioxidants for use in food and pharmaceutical applications. For example, it could be used as a natural preservative to extend the shelf-life of food products by inhibiting lipid oxidation. Lipid oxidation is a major cause of food spoilage, which can lead to rancidity and off-flavors in foods. Therefore, the use of natural antioxidants like *Z. nummularia* seed extract may provide an alternative to synthetic antioxidants that are commonly used in the industry.

This study concludes that *Ziziphus nummularia* seeds are a possible source of natural antioxidant value for their nutritional, sensory, and health properties since they have a comparatively greater ratio of oil content that seems to be rich in free

unsaturated fatty acids. As it has a high oil absorption capacity it can be a rich flavor retainer and could be used in the food industry. It also has a high-water holding capacity which indicates that *Ziziphus* seed flour may be suitable for usage in bread. The swelling capacity of the *Ziziphus* seed is also good swelling power which is a measure of hydration capacity. Due to this quality of food consumed can be checked. Due to the high amount of protein concentration present in *Ziziphus* seed protein from plants could be investigated as a superior nutritional supplement, particularly in developing nations. The crude fat content was also in a very good amount and there were also a lot of free fatty acids identified. So, as a result, ber seed oil demonstrated massive promise as a substitute source of phytochemicals with therapeutic and dietary value. There were also antioxidants and phenolic contents. It can be used in the pharma industry in the development of new drugs for several diseases.

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