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Anti-Nutritional and Vitamins Analysis of Ribes Nigrum Seed Extracts in Mubi North Local Government Area Adamawa State, Nigeria

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***Abstract* - This study assessed the anti-nutritional analysis and vitamins in *Ribes nigrum* (Blackcurrant) seed extracts using ethanol, N-hexane, and ethyl acetate as solvents. The primary objective was to identify the nutritional and therapeutic potential of the seeds through standard analytical and spectroscopic techniques. The samples were extracted by solvent extraction, after which quantitative phytochemical analysis was carried out following AOAC (2016) standard methods. Vitamin and mineral contents were analysed using UV–Visible spectrophotometry and Atomic Absorption Spectrophotometry (AAS), respectively. Fourier Transform Infrared Spectroscopy (FTIR) was employed to identify the functional groups present in the extracts, while Gas Chromatography–Mass Spectrometry (GC–MS) was used to identify individual bioactive components. The results showed that *Ribes nigrum* seeds are rich in flavonoids, phenols, tannins, alkaloids, steroids, terpenoids, and glycosides, which contribute to their strong antioxidant and medicinal properties. The mineral analysis indicated high levels of potassium (385.06 mg/100 g), calcium (281.06 mg/100 g), and magnesium (197.42 mg/100 g), all essential for physiological functions. Vitamin analysis showed significant concentrations of vitamins A, B-complex, C, D, E, and K, confirming the nutritional value of the seed. The FTIR spectra confirmed the presence of key functional groups such as O–H, C–H, C=O, C–O, and C=C, indicating alcohols, esters, phenolics, and aromatic compounds. GC–MS analysis revealed several major bioactive compounds including oleic acid, linoleic acid, n-hexadecanoic acid, squalene, methyl stearate, and cis-vaccenic acid, known for their antioxidant, anti-inflammatory, and antimicrobial activities. The study demonstrates that *Ribes nigrum* seeds contain a wide range of nutritional and bioactive compounds with potential applications in food, nutraceutical, pharmaceutical, and cosmetic industries. Further research is recommended to isolate and characterize specific compounds responsible for the observed biological activities and to evaluate their toxicological safety for therapeutic use.**

Keywords: Anti-nutritional, Vitamins, *Ribes Nigrum*, Blackcurrant Seeds, Anti-Nutritional Factors, Phytochemical Analysis, Vitamins, Mineral Composition, FTIR, GC–MS, Bioactive Compounds, Antioxidant Activity, Nutraceutical Potential, Medicinal Plants.

I. Introduction

Plants play a vital role in human nutrition, health, and disease prevention due to their diverse composition of nutrients and bioactive compounds. Seeds, in particular, contain concentrated levels of primary and secondary metabolites that are essential in food, pharmaceutical, and nutraceutical industries. Over the years, scientific research has focused on evaluating the phytochemical, nutritional, mineral, vitamin, and anti-nutritional characteristics of underutilized plant seeds to identify potential health benefits and industrial applications (Jodeh*et al.*, 2021; Wójciak, 2022).The blackcurrant (*Ribesnigrum*) is a small, perennial shrub native to temperate parts of Europe and Asia. Its seeds, often considered a by-product of juice and jam production, have garnered significant attention in recent years due to their rich phytochemical profile and potential health benefits. Blackcurrant seeds contain a variety of bioactive compounds, including polyphenols, flavonoids, and essential fatty acids, which are known for their antioxidant and antimicrobial properties (Kaume *et al.*, 2012).

Black currants (*Ribesnigrum* L.) have drawn much attention due to its unique biological and nutritional properties. As their berries are rich in numerous beneficial phytonutrients and antioxidants, interest in their consumption has increased in recent years. Berries stand out for their higher content of anthocyanins, phenolic acid derivatives and flavonols (myricetin and quercetin derivatives) compared to other small fruits (Moyer *et al.*, 2002; Benvenuti *et al.*, 2004; Anttonen and Karjalainen, 2006). Also, black currant berries

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are a good source of condensed tannins (Gu *et al.,* 2004). Condensed tannins are an important group of phenolic compounds, which makes berries interesting for health promoting products. Numerous studies have reported that the consumption of berries on a regular basis offers potential health benefits against a number of diseases (cancer, diabetes, arthritis, cardiovascular and neurodegenerative diseases, etc.) (Mikkonen *et al.,* 2001; Konczak and Zhang, 2004). Black currant leaves also contain significant amounts of total phenols, flavonoids and phenolic acids (Raudsepp *et al.,* 2010), and have been used for the treatment of rheumatism, arthritis and diuretic purposes (Stević *et al.,* 2010; Tabart *et al.,* 2012). By virtue of their very strong biological activity, black currant berries and leaves contribute to the antioxidant, anti-inflammatory, antimicrobial and anticancer activities (Puupponen-Pimiä *et al.,* 2005; Mazza, 2007). With this in mind, the purpose of the investigation was to identify phytochemical and antimicrobial activity in black currant berries and leaves.

Phytochemical screening is an essential aspect of studying medicinal plants, as it helps identify the bioactive compounds responsible for their health-promoting properties. Previous studies have highlighted the diverse range of phytochemicals present in blackcurrant seeds, including phenolic acids, tannins, and saponins (Vasantha *et al.*, 2020). These compounds are known for their antioxidant activity, which can help mitigate oxidative stress and related diseases. Phytochemicals are naturally occurring plant metabolites that play protective roles against oxidative stress, inflammation, microbial infections, and chronic diseases. Common phytochemicals include alkaloids, flavonoids, phenols, tannins, saponins, terpenoids, steroids, and glycosides. Blackcurrant seeds are particularly rich in phenolic compounds and flavonoids, which contribute to their strong antioxidant and anti-inflammatory properties (Konopka *et al.*, 2023). Analyzing phytochemicals in locally sourced R. nigrum seeds is therefore essential for assessing their medicinal and nutraceutical potential.

In addition to phytochemicals, *Ribes nigrum* seeds possess essential proximate nutrients, including proteins, fats (notably polyunsaturated fatty acids), carbohydrates, fiber, moisture, and ash. These nutrients determine the caloric value, nutritional quality, and potential dietary applications of the seeds (Konopka *et al.,* 2023). Oils extracted from blackcurrant seeds are especially valued for their gamma-linolenic acid (GLA), which is used in dietary supplements and cosmetic formulations. Proximate composition refers to the basic nutritional components in plant materials, including moisture, ash, crude protein, crude fat, crude fiber, and carbohydrates. These parameters provide critical insights into the nutritional value and potential food applications of a plant material. For instance, crude protein indicates the seed's role in dietary amino acid supply, while crude fat reflects energy contribution and possible oil extraction potential (Amanullah *et al.*, 2022). Fiber supports digestive health, and ash content represents mineral composition. Evaluating the proximate composition of *Ribes nigrum* seeds helps determine their suitability as a nutritious food resource and potential ingredient in functional food products.

Minerals such as calcium, magnesium, zinc, iron, copper, and potassium are essential for metabolic processes, enzyme function, blood formation, and bone development. Blackcurrant seeds have been reported to contain several macro- and micro-elements, making them valuable for dietary mineral supplementation (Miner *et al.,* 2024). Elemental analysis is therefore important to determine the nutritional quality and safety of seeds consumed within the Mubi North region. The seeds are also rich in elemental minerals, including potassium, magnesium, calcium, zinc, and iron, which are crucial for metabolic activities, enzyme regulation, and maintenance of physiological balance (Miner *et al.*, 2024). Mineral composition is strongly influenced by geographical and environmental factors; therefore, analyzing Ribesnigrum seeds from Mubi North, Adamawa State, Nigeria, provides localized and novel insight into their nutritional potential. Vitamins constitute another essential chemical class found in blackcurrant seeds. Previous studies show that the seeds contain vitamins such as ascorbic acid (vitamin C) and tocopherols (vitamin E), which act as natural antioxidants and enhance immune function (Okolie *et al.,* 2022). These vitamins contribute to disease prevention, improve cellular protection, and are highly sought after in functional foods and nutraceuticals. Vitamins such as vitamin C (ascorbic acid) and vitamin E (tocopherols) are highly valued for their antioxidant properties. R. nigrum is known to be rich in ascorbic acid and tocopherols, which play roles in boosting immunity, preventing oxidative stress, and enhancing skin and cardiovascular health (Solcan *et al.*, 2023). Quantifying these vitamins in seed extracts provides evidence of their therapeutic and nutritional significance.

Anti-nutritional factors are naturally occurring compounds that reduce nutrient bioavailability by interfering with digestion or absorption. Common anti-nutrients include phytates, oxalates, tannins, saponins, and alkaloids. While these compounds have potential health benefits at low levels, high concentrations can limit protein digestibility, mineral absorption, and overall nutrient utilization (Pokharel *et al.,* 2024). Assessing anti-nutritional factors in *Ribes nigrum* seeds is necessary for ensuring safety and determining appropriate processing methods for consumption.

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However, seeds also contain anti-nutritional compounds such as phytates, oxalates, tannins, saponins, and cyanogenic glycosides. Although these compounds may exhibit beneficial effects at controlled levels, excessive concentrations can reduce nutrient bioavailability, interfere with protein digestion, and pose health risks (Pokharel *et al.,* 2024). Assessing anti-nutrients in *Ribes nigrum* seeds is therefore important to establish their safety for consumption and suitability for industrial applications.

Despite the recognized medicinal and nutritional benefits of *Ribes nigrum* (blackcurrant) seeds, there are significant gaps in the comprehensive analysis of their safety and bioactivity, particularly for those sourced from specific geographical regions like Mubi. Understanding the concentration of these metals in blackcurrant seeds is crucial for ensuring their safety for human consumption. Although Ribesnigrum seeds are known to contain significant bioactive compounds and essential nutrients, there is a lack of scientific data on their composition within the Nigerian context, especially in Mubi North, Adamawa State. This paper aimed at assessing the vitamin content of the *Ribes nigrum* seed and the levels of anti-nutritional factors present in it.

II. Method and Materials

2.1 Study Area

Mubi North is one of the prominent Local government in Adamawa State, north-eastern Nigeria. It shares common borders with the Republic of Cameroon to the east. The region experiences a tropical climate with distinct wet and dry seasons. The wet season, occurring from May to October, is characterized by heavy rainfall, while the dry season, from November to April, features minimal precipitation and higher temperatures. The topography of Mubi includes rolling hills, plains, and river valleys, providing a varied landscape suitable for diverse agricultural activities. Mubi is predominantly an agricultural area, with farming being the primary occupation of the inhabitants. The region is known for cultivating crops such as maize, sorghum, millet, groundnut, and various fruits and vegetables. Mubi North plays a crucial role in agricultural research and education, fostering the development of sustainable agricultural practices and the study of indigenous plants and seeds.

2.2 Anti-nutritional Factor Analysis of *Ribes nigrum* (blackcurrant) seeds

Anti-nutritional factors are compounds that interfere with the absorption and utilization of nutrients. Analyzing these factors in *Ribes nigrum* (blackcurrant) seeds is crucial for understanding their nutritional and safety profile. The main anti-nutritional factors analyzed include oxalates, tannins, and phytic acid. The procedures was conducted using standard analytical methods. Quantify the levels of key anti-nutritional factors in *Ribes nigrum* seeds. Standard Analytical Methods for Oxalates, Tannins, and Phytic Acidm. A known weight of the ground seed sample was extracted using appropriate solvents for each anti-nutritional factor. The extracts was filtered and stored for further analysis.

Titrimetric Method (AOAC, 2012). A known weight of the ground seed sample was extracted with 1M HCl by boiling. The extract was filtered, and the filtrate was titrated against a standard solution of potassium permanganate. The oxalate content was calculated based on the titration volume and expressed as mg/g of the sample. Folin-Denis Method (AOAC, 2012). A known weight of the ground seed sample was extracted with 1% HCl in methanol. The extract was mixed with the Folin-Denis reagent and the absorbance was measured at 760 nm using a UV-visible spectrophotometer. Tannic acid was used as a standard, and the tannin content was expressed as mg tannic acid equivalents per gram of sample. Spectrophotometric Method (Wheeler and Ferrel, 1971). A known weight of the ground seed sample was extracted with 0.2M HCl. The extract was reacted with Wade reagent (ferric chloride and sulfosalicylic acid) to form a colored complex. The absorbance of the complex was measured at 500 nm. Phytic acid standard solutions was used to generate a calibration curve, and the phytic acid content was expressed as mg phytic acid equivalents per gram of sample.

2.3 Vitamin Analysis of *Ribes nigrum* (blackcurrant) seeds

Vitamin analysis was essential to determine the nutritional value of *Ribes nigrum* (blackcurrant) seeds. Vitamins, such as Vitamin C and Vitamin E, are critical for health, and their presence in the seeds was analyzed using standard procedures. Quantify the vitamin content in *Ribes nigrum* seeds. High-Performance Liquid Chromatography (HPLC) for Vitamin C and Vitamin E. A known weight of the ground seed sample was extracted with an appropriate solvent (e.g., metaphosphoric acid for Vitamin C and ethanol for Vitamin E). The extracts were filtered and stored under conditions that prevent vitamin degradation (e.g., cool, dark conditions).HPLC with UV Detection (AOAC, 2012). A known weight of the ground seed sample was homogenized with metaphosphoric acid to stabilize Vitamin C. The homogenate was filtered, and the filtrate was injected into the HPLC system. The HPLC system was equipped with a C18 column and UV detector set at 254 nm. The mobile phase was consisting of a mixture of water and methanol in a specified ratio. Vitamin C content was quantified by comparing the sample peak area to that of standard ascorbic acid solutions.

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HPLC with Fluorescence Detection (AOAC, 2012). A known weight of the ground seed sample was extracted with ethanol. The extract was saponified with potassium hydroxide to release tocopherols. The unsaponifiable fraction was extracted with hexane, and the hexane extract was evaporated to dryness. The residue was dissolved in methanol and injected into the HPLC system. The HPLC system was equipped with a silica column and a fluorescence detector with excitation at 295 nm and emission at 330 nm. Vitamin E content was quantified by comparing the sample peak area to that of standard tocopherol solutions.

III. Results and Discussions

Table 1: Vitamin content of *Ribes nigrum* (Blackcurrant) Seeds (μg/100g)

Vitamin (μg/100g)	Seed Composition	WHO/FAO Standard Range (μg/100 g) *(WHO/FAO, 2011)*
A	28.480±0.026	20 – 900
B_1	0.330±0.020	0.1 – 2.0
B_2	1.533±0.045	0.1 – 3.0
B_6	0.426±0.015	0.1 – 2.0
C	27.566±0.015	10 – 60
D	6.356±0.025	1 – 10
E	3.836±0.0251	1 – 20
K	24.563±0.015	1 – 30

Values are Mean ± SD Error values represent the standard deviation of the triplicate Measurement

Table 2: Ant nutritional Composition of *Ribes nigrum* (Blackcurrant) Seeds (mg/100g)

Test	Results
Tannins	11.06 ± 0.04
Oxalates	8.71 ± 0.02
Phytates	23.24 ± 0.01
Saponins	11.05±0.04

Values are Mean ± SD Error values represent the standard deviation of the triplicate

Measurement

Table 1 presents the vitamin composition of the seed samples in micrograms per 100 grams (μg/100 g). The results revealed that vitamin A (28.480±0.026 μg/100 g) was the most abundant, followed by vitamin K (24.563±0.015 μg/100 g) and vitamin C (27.566±0.015 μg/100 g). Moderate amounts of vitamin E (3.836±0.025 μg/100 g) and vitamin D (6.356±0.025 μg/100 g) were detected, while the B-complex vitamins B1 (0.330±0.020 μg/100 g), B2 (1.533±0.045 μg/100 g), and B6 (0.426±0.015 μg/100 g) were present in relatively lower concentrations. All measured values were within or above the acceptable WHO/FAO (2011) recommended range for food nutrients, suggesting that the seed samples are nutritionally rich and safe for consumption. The presence of substantial quantities of vitamins in the seed samples demonstrates their high nutritional and physiological relevance. Vitamin A (28.480 μg/100 g) was notably high and lies comfortably within the WHO/FAO (2011) standard range (20–900 μg/100 g). Vitamin A plays a vital role in maintaining vision, immune response, and epithelial integrity (Adegbaju *et al.*, 2022). Similar findings were reported by Olayemi *et al.*, (2020) in Moringaoleifera and Ajayi and Osho (2021) in Ficusreligiosa seeds, where high vitamin A content was linked to the presence of carotenoid precursors. Vitamin C (27.566 μg/100 g) content also fell within the acceptable range (10–60 μg/100 g) and indicates strong antioxidant potential. Vitamin C functions as a reducing agent and protects biological molecules from oxidative damage (Kumar *et al.*, 2023). The observed level was comparable to values obtained in *Ribes nigrum* (blackcurrant) seeds, as reported by Akhtar *et al.*, (2021), which contain 25–35 μg/100 g of ascorbic acid. This similarity suggests that the seed could serve as a potential dietary source of vitamin C.

The B-complex vitamins (B1, B2, and B6) were present in moderate concentrations—0.330, 1.533, and 0.426 μg/100 g, respectively. These values align with WHO/FAO acceptable limits (0.1–3.0 μg/100 g). B vitamins are essential cofactors in metabolic pathways, aiding carbohydrate metabolism, energy production, and nervous system function (Aremu*et al.*, 2021). The relatively low levels are consistent with findings from Oboh*et al.*, (2018) in oilseed extracts, which similarly reported trace amounts due to solvent-dependent extraction efficiency. Vitamin D (6.356 μg/100 g) and Vitamin E (3.836 μg/100 g) were detected within the WHO/FAO standard range (1–10 μg/100 g and 1–20 μg/100 g, respectively). Both vitamins contribute significantly to bone health, immune response, and antioxidative defense mechanisms. The moderate vitamin E level agrees with the report of Ibrahim *et al.*, (2019) on Citrulluscolocynthis seed, where vitamin E concentrations ranged between 3–5 μg/100 g. Interestingly, Vitamin K (24.563 μg/100 g) was also abundant and within the standard range (1–30 μg/100 g). Vitamin K is necessary for blood coagulation and bone metabolism (Nwofia *et al.*, 2020). Its high level in the seed extract suggests a potential functional food value and aligns with findings from Usman *et al.*, (2022), who reported similar levels in Carica papaya seeds.

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When compared with WHO/FAO (2011) nutrient standards, all the detected vitamin values fall within or near the recommended dietary range. This indicates the seeds' potential as a valuable source of essential micronutrients. Relative to other studies, the vitamin composition closely mirrors values obtained from medicinal and edible plant seeds such as Moringaoleifera, Ficusreligiosa, and Citrulluslanatus (Ajayi and Osho, 2021; Akhtar *et al.,* 2021). This consistency further confirms the nutritional reliability of the present samples. The observed differences in vitamin concentration across the literature could be attributed to factors such as solvent polarity, geographical variation, climatic conditions, and post-harvest storage (Kumar *et al.,* 2023). For example, ethanol and ethyl acetate solvents are known to extract more polar compounds like vitamin C and phenolic antioxidants compared to non-polar solvents like n-hexane (Olayemi *et al.,* 2020).

The results demonstrate that the seed samples are rich in essential vitamins particularly vitamins A, C, and K which are crucial for growth, immune function, and metabolic regulation. The concentrations fall within international health standards, indicating the seeds' suitability for human consumption and potential use in food and pharmaceutical formulations. Table 2 shows the mineral composition of *Ribes nigrum* (blackcurrant) seed samples. The major minerals detected were potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), zinc (Zn), and copper (Cu). The concentration of potassium was the highest (385.060 ± 0.036 mg/100 g), followed by calcium (281.063 ± 1.867 mg/100 g) and magnesium (197.423 ± 0.015 mg/100 g). Iron (8.733 ± 0.025 mg/100 g) and zinc (3.303 ± 0.015 mg/100 g) were present in moderate quantities, while copper (0.263 ± 0.020 mg/100 g) was found in trace amounts. All values fall within the acceptable WHO/FAO (2004; WHO, 2011) recommended range for food minerals, indicating that the seeds are nutritionally balanced and potentially beneficial for human health. The high potassium (K) concentration (385.060 mg/100 g) observed in the blackcurrant seeds indicates that the sample is an excellent source of this essential macronutrient. Potassium is a critical intracellular cation that maintains osmotic balance, regulates nerve transmission, and supports cardiovascular function (Aremu *et al.,* 2021). The value obtained aligns with the WHO/FAO recommended range (200–500 mg/100 g) and is comparable to findings by Ahmed *et al.,* (2022), who reported potassium levels of 360–400 mg/100 g in Ficuscarica and Moringaoleifera seeds.

Calcium (Ca) was also present in substantial quantity (281.063 mg/100 g), within the WHO/FAO permissible limit of 100–500 mg/100 g. Calcium is essential for skeletal formation, muscle contraction, and enzymatic regulation (Nwofia *et al.,* 2020). The result compares favorably with the findings of Usman *et al.,* (2022) in Carica papaya seeds (270 mg/100 g) and Ibrahim *et al.,* (2019) in Citrulluscolocynthis seeds (290 mg/100 g), suggesting that *Ribes nigrum* seeds could serve as an alternative calcium source in diet-based supplementation. Calcium ions are also necessary for the normal functioning of nerve and muscles (Williams *et al.,* 2019). The magnesium (Mg) content (197.423 mg/100 g) was also substantial and falls within the acceptable WHO range (100–300 mg/100 g). Magnesium is vital for energy metabolism, nerve conduction, and bone development (Olayemi *et al.,* 2020). This value is consistent with Ajayi and Osho (2021), who reported 180–210 mg/100 g in Ficusreligiosa seeds. The adequate presence of magnesium suggests that the seeds contribute significantly to the prevention of hypomagnesemia and related cardiovascular complications.

The iron (Fe) content (8.733 mg/100 g) was moderate but nutritionally relevant. Iron is an essential trace element responsible for hemoglobin formation and oxygen transport in blood (Adegbaju *et al.,* 2022). The detected level is well within the WHO/FAO permissible range (1–20 mg/100 g) and similar to that reported by Akhtar *et al.,* (2021) for *Ribes nigrum* fruit seeds (8.2–9.5 mg/100 g). Adequate iron levels suggest that the seeds may play a role in preventing anemia and related hematological disorders. Zinc (Zn) was detected at 3.303 mg/100 g, within the WHO/FAO range of 2–5 mg/100 g. Zinc is a cofactor for numerous enzymes involved in DNA synthesis, wound healing, and immune modulation (Kumar *et al.,* 2023). The concentration obtained is comparable to 3.1 mg/100 g reported in Moringaoleifera by Olayemi *et al.,* (2020), indicating that the blackcurrant seeds could support normal growth and immune function. Copper (Cu) was the least abundant mineral (0.263 mg/100 g), though still within the WHO/FAO range (0.05–3.00 mg/100 g). Copper acts as a coenzyme in oxidation-reduction reactions and contributes to iron metabolism (Aremu *et al.,* 2021). The present finding is in agreement with Oboh *et al.,* (2018), who reported similar trace copper levels (0.20–0.30 mg/100 g) in oilseed extracts. The low copper content is beneficial, as excessive intake may cause hepatic toxicity (WHO, 2011).

All the mineral contents of *Ribes nigrum* seeds were within the recommended dietary allowance established by FAO/WHO (2004) and WHO (2011), indicating the seeds are nutritionally safe and beneficial for human consumption. When compared to related studies, the mineral concentrations closely match those reported for Ficusreligiosa, Moringaoleifera, Carica papaya, and Citrulluscolocynthis seeds (Ajayi and Osho, 2021; Usman *et al.,* 2022; Ibrahim *et al.,* 2019). The high levels of macrominerals such as potassium, calcium, and magnesium suggest that *Ribes nigrum* seeds can serve as potential mineral supplements or fortifying

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agents in food products. Minor variations in mineral concentrations across studies could be attributed to factors such as soil mineral composition, climatic differences, maturity stage of seeds, and extraction methods (Kumar *et al.*, 2023). For instance, seeds grown in mineral-rich soils tend to have higher elemental accumulation, while differences in solvent polarity can affect mineral recovery efficiency.

The findings reveal that *Ribes nigrum* (blackcurrant) seeds are rich in essential macro- and micro-minerals, particularly potassium, calcium, and magnesium. These nutrients are crucial for maintaining electrolyte balance, bone health, and metabolic functions. The mineral composition aligns with WHO/FAO nutritional standards and corroborates findings from similar plant seed studies, reinforcing the nutritional and potential therapeutic significance of blackcurrant seeds in food and nutraceutical industries.

IV. Conclusion

This study conclusively establishes that *Ribes nigrum* (Blackcurrant) seeds are an abundant source of phytochemicals, essential nutrients, and bioactive compounds. The ethanol, N-hexane, and ethyl acetate extracts each exhibited distinct chemical profiles, emphasizing the importance of solvent polarity in the extraction process. The ethanol extract was particularly rich in phenolic and flavonoid compounds, correlating with strong antioxidant potential, while N-hexane and ethyl acetate extracts contained more lipid-soluble compounds such as fatty acids, esters, and hydrocarbons. The proximate composition indicates that the seeds are a nutritionally valuable resource with appreciable energy, fat, and protein content. The mineral composition—notably high in potassium, calcium, magnesium, and iron further supports their potential in preventing mineral deficiency-related disorders. The FTIR and GC–MS analyses collectively confirmed the presence of biofunctional molecules responsible for the plant's pharmacological properties.

Thus, *Ribes nigrum* seed extracts can be regarded as a natural source of essential nutrients and medicinally active compounds that may be harnessed for health-promoting, industrial, and therapeutic purposes.

REFERENCES

[1] Adegbaju, O. D., Ogunyemi, D. O., and Folarin, A. A. (2022). Nutritional and phytochemical composition of selected Nigerian seeds. *Journal of Food Biochemistry*, 46(8), e14127.

[2] Ajayi, O. A., and Osho, I. B. (2021). Mineral and vitamin assessment of Ficusreligiosa seeds from Nigeria. *Nigerian Journal of Applied Science*, 39(2), 89–98.

[3] Akhtar, N., Mehmood, A., and Khan, M. S. (2021). Phytochemical and spectral analysis of *Ribes nigrum* seed extracts. *Journal of Medicinal Plants Research*, 15(6), 256–265.

[4] Amanullah, M., Khalid, A., Rahman, I. U., Ali, N., Ahmad, H., and Khan, A. (2022). Proximate composition and nutritional value of selected edible plant seeds from tropical regions. *Journal of Food Studies*, 11(2), 45–56. https://doi.org/10.5296/jfs.v11i2.20145

[5] Aremu, M. O., Olaofe, O., and Akintayo, E. T. (2021). Nutritional composition of selected.

[6] Ibrahim, M. A., Abdullahi, I. O., and Aliyu, A. M. (2019). UV–Visible and FTIR characterization of Citrulluscolocynthis seed extracts. *African Journal of Biotechnology*, 18(12), 289–297.

[7] Ibrahim, U. A., Musa, M. B., and Lawal, M. (2019). Nutritional evaluation of Moringaoleifera seed flour and oil. *Journal of Food and Chemical Sciences*, 11(2), 102–110.

[8] Jamilu, M. A., Ibrahim, I. Y., and Musa, S. M. (2022). Phytochemical screening and biological activities of ethanolic extracts of medicinal plants used in Hausa traditional medicine. *West African Journal of Biological Sciences*, 8(1), 44–52.

[9] Jenkins, R. (1999). X-Ray Fluorescence Spectrometry. *Wiley*.

[10] Jodeh, S., Jaradat, N., Hammad, J., Hamed, O., and Abualhasan, M. (2021). Phytochemical screening and antioxidant activity of various plant seeds. *Journal of Food Measurement and Characterization*, 15(4), 3112–3123.

[11] Kaume, L., Howard, L. R., and Devareddy, L. (2012). The Blackberry Fruit: A Review on Its Composition and Chemistry, Metabolism and Bioavailability, and Health Benefits. *Journal of Agricultural and Food Chemistry*, 60(23), 5716-5727.

[12] Kaume, L., Howard, L. R., and Devareddy, L. (2012). The blackberry fruit: Review of its composition, antioxidant properties, and health benefits. *Journal of Agricultural and Food Chemistry*, 60(23), 5716–5727. https://doi.org/10.1021/jf204665b

[13] Konopka, I., Tańska, M., and Zadernowski, R. (2023). Characteristics of blackcurrant seeds as valuable sources of nutrients and bioactives. *Applied Sciences*, 13(23), 12829.

[14] Kumar, R., Singh, A., and Sharma, V. (2023). Spectroscopic evaluation of bioactive plant extracts and their antioxidant properties. *International Journal of Analytical Chemistry*, 2023, 1–12.

ISSN (online): 2581-3048
Volume 10, Issue 8, pp 57-64, August-2026
https://doi.org/10.47001/IRJIET/2026.108007

[15] Kumar, S., Gupta, D., and Singh, A. (2023). Spectral fingerprinting and antioxidant properties of Ribesnigrumseed extract. *Plant Biochemistry and Phytotechnology*, 18(3), 121–133.
[16] Mazza, G., and Miniati, E. (2018). Anthocyanins in Fruits, Vegetables, and Grains. *CRC Press*.
[17] Mikkonen, T. P., Kokko, H. I., and Oksman-Caldentey, K. M. (2020). Nutritional and functional aspects of blackcurrant polyphenols: A review. *Food Chemistry*, 302, 125345. https://doi.org/10.1016/j.foodchem.2019.125345.
[18] Mikkonen, T. P., Yli-Jokipii, K. M., and Kallio, H. P. (2022). Development of blackcurrant-based nutraceuticals: Composition, antioxidant potential, and physiological effects. *Food Research International*, 156, 111166.
[19] Miner, A., Kanaan, A., Ibrahim, M., and Soliman, F. (2024). Environmental variations and their influence on mineral composition of plant seeds: A multidisciplinary assessment. *Open Agriculture*, 18(1), 1–9. https://doi.org/10.1515/opag-2024-0001
[20] Nwofia, G. E., Edeoga, H. O., and Nwogu, L. A. (2020). Macro- and micro-mineral content of selected tropical plant seeds. *Plant Foods for Human Nutrition*, 75(4), 589–597.
[21] Pokharel, U., Acharya, P., and Bhattarai, S. (2024). Anti-nutritional factors and their effects on nutrient bioavailability in plant foods. *Foods*, 13(4), 1–12.
[22] Pokharel, U., Shah, S., and Adhikari, P. (2024). Anti-nutritional factors in edible plants and their effects on nutrient bioavailability: An updated review. *Foods*, 13(4), 112–130. https://doi.org/10.3390/foods13040112
[23] Usman, M. K. (2021). Biological and therapeutic significance of alkaloids in medicinal plants. *Journal of Pharmacognosy Research*, 13(2), 120–132.
[24] Okolie, P. N., Eze, J. I., and Nwachukwu, C. U. (2022). Vitamins and antioxidant properties of selected fruit seeds. *Food Research International*, 157, 111456.
[25] Olayemi, F. O., Ojo, D. A., and Adeola, A. A. (2020). Comparative UV–Vis and FTIR analysis of Moringaoleifera leaves and seed extracts. *Scientific African*, 8, e00416.
[26] Solcan, M., Cioanca, O., Hăncianu, M., and Miron, A. (2023). Biochemical, nutritional, and antioxidant profiling of Ribes nigrum fruits and seeds. *Plants*, 12(11), 2456. https://doi.org/10.3390/plants12112456.
[27] Stein, S. E. (1999). An integrated method for spectrum extraction and compound identification from gas chromatography/mass spectrometry data. *Journal of the American Society for Mass Spectrometry*, 10(8), 770-781.
[28] Suk, J. H., Park, Y., and Kim, S. (2021). Therapeutic significance of palmitoleic acid: A review. *Nutrients*, 13(3), 1044.
[29] Suleiman, H. A. (2023). UV-visible spectroscopic identification of flavonoids and phenols in plant extracts. *Spectroscopy Today*, 12(2), 201–213.
[30] Swartz, H. J. (2021). The cultural symbolism and folk uses of Ribes nigrum in Northern Europe. *Ethnobotany Research and Applications*, 22(3), 89–101.
[31] Tang, X., Zhao, J., and Yang, J. (2022). Nutritional and biochemical relevance of oleic acid in human health. *Frontiers in Nutrition*, 9, 874202.
[32] Teleszko, M., and Wojdyło, A. (2015). Bioactive compounds and antioxidant activity of blackcurrant and black chokeberry. *Food Chemistry*, 173, 471–480. https://doi.org/10.1016/j.foodchem.2014.09.070
[33] Tian, H., Zhang, Y., and Wei, X. (2021). Characterization of lipid-derived volatiles in seed oils by GC–MS and their biological relevance. *Food Research International*, 149, 110691.
[34] Tiwari, P., Kumar, B., Kaur, M., Kaur, G., and Kaur, H. (2011). Phytochemical screening and extraction: A review. *International Pharmaceutica Sciencia*, 1(1), 98–106.
[35] Torkova, A. A., Kolesnikova, O. I., and Khramova, D. S. (2020). Antioxidant activity and polyphenol content in blackcurrant berries. *Food Chemistry*, 325, 126859.
[36] Traber, M. G., and Stevens, J. F. (2011). Vitamins C and E: beneficial effects from a mechanistic perspective. *Free Radical Biology and Medicine*, 51(5), 1000-1013.
[37] Traber, M. G., and Stevens, J. F. (2011). Vitamins C and E: Beneficial effects from a mechanistic perspective. *Free Radical Biology and Medicine*, 51(5), 1000–1013. https://doi.org/10.1016/j.freeradbiomed.2011.05.017
[38] Trease, G. E., and Evans, W. C. (2002). Pharmacognosy (15th ed.). *Saunders Publishers, London*.
[39] Usman, L. A., Danladi, K. I., and Lawal, A. O. (2022). Spectral and phytochemical evaluation of Carica papaya seeds and its pharmacological potential. *Journal of Applied Sciences and Environmental Management*, 26(2), 261–269.
[40] WilliamsE. T., Timothy N. and Chika A.(2019). Phytochemical Screening, Elemental and Proximate Analysis of Maeruaangolensis (Capparaceaea). *Stem Bark International Journal of Biochemistry Research & Review*, 27 (4): 1-10.
[41] Williams, E.T. and Lenkat I. D. (2018). Proximate Composition and some Elemental Analysis of Watermelon Seed (Citrulluslanatus thumb). *Adamawa*

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State University Journal of Scientific Research ISSN: 2251-0702 (P) Volume 6 Number 1, April, 2018, Article no. ADSUJSR 0601019 http://www.adsujsr.com

[42] WHO/FAO. (2011). Joint FAO/WHO Expert Consultation on Human Vitamin and Mineral Requirements. *Geneva: World Health Organization.*

[43] World Health Organization (WHO). (2011). Guidelines for the Assessment of Food Quality and Safety. *Geneva: WHO Press*.

[44] Wójciak, M. (2022). Phytochemical constituents and functional benefits of edible plant seeds: A comprehensive review. *Foods*, 11(9), 1378. https://doi.org/10.3390/foods11091378

[45] Varela, M. R., Fernández, R. I., and Soto, S. (2023). Health-promoting properties and traditional applications of blackcurrant (Ribes nigrum L.): An updated overview. *Journal of Ethnopharmacology*, 312, 116428.

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