



DISCRIMINATING SOYBEAN VARIETIES VIA MINERAL COMPOSITION, PHYTOCHEMICAL PROFILING AND DNA QUALITY ANALYSIS

¹Adewusi, O. F., ²Ologun, O. M. and ³Adeniran, C. O.

¹Department of Biotechnology, Federal University of Technology, Akure.

²Department of Microbiology, Federal University of Technology, Akure.

³Department of Animal Production and Health, Federal University of Technology, Akure.

*Corresponding authors' email: ofadewusi@gmail.com Phone: +2348101109482

ABSTRACT

Soybean (*Glycine max* (L.) Merrill) is a globally important legume valued for its nutritional and industrial applications. This study evaluated twenty soybean varieties for mineral composition, phytochemical profiling, and DNA quality to provide an integrated assessment of their nutritional, biochemical, and molecular attributes. The germplasm was sourced from the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. Genomic DNA was extracted using NIMR Kit I and sodium dodecyl sulfate (SDS) protocols, and quality was assessed via spectrophotometry and agarose gel electrophoresis. The mineral composition of the soybean varieties revealed varying levels of the mineral constituents such as calcium (47.40 - 66.00ppm), magnesium (53.50 - 72.10ppm), manganese (0.89 - 2.14ppm), copper (0.57 - 1.34ppm), zinc (2.34 - 4.24ppm), sodium (120.00 - 589.00ppm), potassium (130.00 - 781.00ppm) and phosphorous (0.47 - 6.16ppm). The phytochemical composition of the soybean varieties revealed varying levels of Phytate (25.54 to 33.78 mg/g), Saponin (2.05 to 3.60mg/g), Tannin (0.05 to 0.23mg/g) and Oxalate (0.90 to 2.79mg/g). DNA quality for NIMR Kit I ranged from 1.709–2.261 (A260/A280) and 1.173–2.304 (A260/A230), while SDS extracted DNA ranged from 1.694–2.097 (A260/A280) and 1.734–2.598 (A260/A230), indicating the presence of contaminants in some samples. Overall, DNA quality based on A260/A280 ratios was higher for the SDS protocol compared to NIMR Kit I, suggesting it as the preferable method for downstream molecular applications, although further purification may be required for some of the samples. In conclusion, this integrated analysis of mineral, phytochemical, and DNA quality attributes can provide a solid framework for discriminating soybean varieties and supports their selection for breeding, nutritional evaluation and molecular studies.

Keywords: Discriminating, Mineral, Phytochemical, Profiling, Dna Quality, Soybean

INTRODUCTION

Soybean (*Glycine max* L.) is an important leguminous crop of the Fabaceae family, widely cultivated for its high protein content, edible oil, and diverse applications in human nutrition, animal feed, and industry (Das et al., 2020). Believed to have originated in East Asia, soybean was first domesticated by Chinese farmers around 1100 BC (Chang et al., 2015). The crop is valued not only for its nutritional content but also for its agronomic benefits, particularly its ability to fix atmospheric nitrogen, improving soil fertility and enhancing the yield of subsequent crops (Tarar et al., 2022). Globally, soybean serves as a major source of dietary protein for humans and livestock, contributing significantly to food security, economic sustainability, and the agricultural economy (Semba et al., 2021). Understanding the biochemical and genetic variability among soybean varieties is critical for varietal discrimination, breeding, and crop improvement. Mineral composition is a key parameter in such characterization because essential macro- and microelements—including calcium, magnesium, iron, zinc, and potassium—affect both seed quality and nutritional value (Ncube et al., 2022). In addition to minerals, phytochemical profiling provides valuable insights into varietal differences.

Phytochemical profiling involves identifying and quantifying bioactive compounds in plants (Rocchetti et al., 2020). Understanding soybean's phytochemical composition aids in developing strategies to enhance its nutritional and functional properties (Kim et al., 2021). Profiling the phytochemical composition of different soybean varieties is essential for identifying genotypes with desirable bioactive compounds, which can contribute to the development of functional foods

and nutraceuticals (Sangiovo et al., 2023). High-quality genomic DNA is a prerequisite for molecular analyses such as PCR, genotyping, and marker-assisted selection (Amiteye, 2021). DNA serves as the foundation for understanding an organism's traits and maintaining high-quality DNA is essential for accurate genetic analyses (Marsal and Gaur, 2020). Accurate quantification and assessment of DNA quality are essential prerequisites for molecular analysis (Bruce et al., 2021). Ensuring the extraction of high-quality DNA is critical because degraded or contaminated samples can compromise the reliability of downstream analyses and lead to erroneous conclusions regarding genetic relationships among varieties (Modi et al., 2021). Despite the importance of mineral, phytochemical, and genetic attributes in soybean characterization, limited studies have integrated these three parameters to discriminate varieties systematically. Combining mineral profiling, phytochemical profiling, and DNA quality assessment can provide a suitable potential comprehensive approach to varietal differentiation, facilitating the identification of genotypes with desirable mineral and genetic traits. Such integrated characterization can serve as a potential bedrock for an informed breeding program strategies and the development of soybean-based functional foods. This research was undertaken to: (i) determine the mineral composition of the soybean varieties (ii) determine the phytochemical composition of the soybean varieties (iii) determine the quality of genomic DNA samples of the soybean varieties using different DNA extraction methods.

MATERIALS AND METHODS

The experimental materials utilized in this research project comprised twenty (20) varieties of Soybean, *Glycine max* (L.) Merrill. These Soybean varieties were sourced from the germplasm bank of the International Institute of Tropical Agriculture (IITA). The twenty soybean varieties are: V1 = TGm4075; V2 = TGm4132; V3 = TGm4164; V4 = TGm4336; V5 = TGm4339; V6 = TGm4373; V7 = TGm4385; V8 = TGm4419; V9 = TGm4445; V10 = TGm4470; V12 = 4501; V13 = TGm4518; V15 = TGm4686; V17 = TGm8508; V18 = TGm8528; V19 = TGm8748; V20 = TGm8874; V22 = TGm9303; V24 = TGm9917; V25 = TGm9991.

Mineral Composition Analysis

The samples were digested using the triple acid digestion method of Sahrawat *et al.*, (2002). 2g of the samples were weighed into a micro-kjeldhal digestion flask to which 24ml of a mixture of concentrated HNO₃, H₂SO₄ and 60% HClO₄ (9:2:1v/v) were added. The flask was put on a heat in block and digested to a clear solution, cooled and the content transferred into 50ml volumetric flask and made up to the volume mark with distilled water. The solution was used to determine Ca, Mg, Zn, Mn and Cu, flame photometer model 210VG & FP902 was used for determination of K and Na which are present in the samples while Vanado-Molybdate method was used for the determination of phosphorus.

Phytochemical Analysis

Determination of Tannin

2g of finely ground sample was extracted with 100ml of 70% acetone and allowed to stand for 24hours at room temperature. The mixture is filtered using whatman filter paper. 1ml of the filtrate is added to 5ml of Folin-Ciocalteu reagent. After 5mins, 4ml of 7.5% sodium carbonate solution is added to the mixture and incubated for 90mins at room temperature. The absorbance is measured at 725 nm using a spectrophotometer. The tannin content is calculated following the procedure of Pereira *et al.*, (2014).

Determination of Phytate

2g of ground sample was extracted with 50 mL of 2.4% HCl in water (v/v) for 30 minutes under reflux. The mixture is filtered using whatman filter paper. 5ml of the filtrate is added to 1 mL of ammonium thiocyanate. 5 mL of 0.1% ferric chloride solution is then added to the mixture and heat at 90°C for 30 minutes. The absorbance is measured at 480 nm using a spectrophotometer. The phytate content is calculated following the procedure of Tian *et al.*, (2018).

Determination of Oxalate

1g of the ground sample is extracted with 50 ml of 0.5 N HCl for 1 hour at 70°C. the mixture is filtered and the filtrate is allowed to evaporate to near dryness. Calcium chloride solution is then added to the extract to precipitate calcium oxalate. The precipitate is then washed with water to remove impurities. The precipitate is allowed to dry at 80°C and then weighed. The oxalate content is calculated following the procedure of Khan *et al.*, 2011.

Determination of Saponin

2g of the ground sample is extracted with 50 ml of ethanol by maceration for 24 hours. Filter the mixture using whatman filter paper. 1ml of the filtrate is diluted with 10ml of water and shaken vigorously. 1ml of the mixture is added to 1ml of 0.5% vanillin in ethanol and 1 ml of sulphuric acid. The mixture is then heated at 60°C for 30 minutes. The absorbance

is measured at 450 nm using a spectrophotometer. The saponin content is calculated following the procedure of Sultana *et al.*, (2007).

Determination of Total Phenol

2g of the ground sample was extracted with 50ml of ethanol and shaking for 30 minutes. The mixture is then filtered and 1ml of the filtrate is added to 5ml of Folin-Ciocalteu reagent, and after 5 minutes, 4 ml of 7.5% sodium carbonate solution is added to the mixture. The mixture is incubated for 90 minutes at room temperature. The absorbance is measured at 765 nm using a spectrophotometer. The total phenolic content is calculated following the procedure of Singleton *et al.*, (1999).

Determination of Flavonoids

2g of the ground sample is extracted with 50 ml of ethanol for 30 minutes by shaking. The mixture is then filtered and 1ml of the filtrate is added to 1 ml of aluminum chloride solution (2% in methanol) and 1 ml of 5% sodium acetate. The mixture is incubated for 30 minutes at room temperature. The absorbance is measured at 430 nm. The flavonoid content is quantified following the method of Chang *et al.*, (2002).

Molecular Analysis

Fresh leaf tissues were used for DNA extraction following NIMR KIT 1 and SDS protocols. The DNA concentration and purity were measured using a Nanodrop spectrophotometer at 230, 260 and 280 nm respectively. The integrity of the DNA samples was confirmed via 1% agarose gels (Aboul - Maaty and Oraby, 2019).

RESULTS AND DISCUSSION

The estimates of the mineral composition of the soybean varieties are presented in Table 1. The calcium level in the soybean varieties varied from 47.40ppm to 66.00ppm. The highest level of calcium was recorded in V9 (66.00ppm) followed by V12 (65.30ppm) and V17 (63.10ppm) whereas the lowest level was recorded in V3 (47.40ppm). The level of magnesium varied between 53.50ppm and 72.10ppm. The level of magnesium was maximum in V10 (72.10ppm) followed by V6 (70.50ppm) and V4 (70.10ppm). The concentration of manganese was maximum in V18 (2.14ppm) and minimum in V20 (0.89ppm). The highest level of copper was recorded in V6 (1.34ppm) followed by V2 (1.12ppm) and V20 (1.10ppm) whereas the lowest level of copper was recorded in V3 (0.57ppm). The concentration of zinc varied between 2.34ppm and 4.24ppm. The highest level of zinc was recorded in V6 (4.24ppm) followed by V20 (4.12ppm) followed by V12 (4.03ppm). The lowest concentration of zinc was recorded in V24 (2.34ppm). The highest level of sodium was recorded in V10 (589.00ppm) whereas the lowest level was recorded in V19 (120.00ppm). The maximum value of potassium was recorded in V10 (781.00ppm) whereas it was minimum in V19 (130.00ppm). The concentration of phosphorus in the soybean varieties varied from 0.47ppm to 6.16ppm. The highest level of phosphorus was recorded in V3 (6.16ppm) followed by V17 (5.63ppm) followed by V6 (4.79ppm) whereas the lowest level of phosphorus was recorded in V5 (0.47ppm).

The phytochemical composition of the soybean varieties is presented in Table 2. The phytate level ranged from 25.44mg/g to 34.60mg/g. The highest level of phytate was recorded in V9 (34.60mg/g) followed by V5 and V15 (33.78mg/g) followed by V2 (32.96mg/g) whereas the lowest level was recorded in V20 and V24 (25.54mg/g). The highest level of tannin was recorded in V6 (0.23mg/g) whereas the

lowest level was recorded in V7(0.05mg/g). The saponin concentration ranged between 2.05mg/g and 3.60mg/g. The highest level of saponin was recorded in V13 (3.60mg/g) followed by V24 (3.05mg/g) followed by V3 (2.90mg/g). The oxalate content ranged from 0.90mg/g to 2.79mg/g. The highest level of oxalate was recorded in V7 (2.79mg/g) followed by V8 (2.61mg/g) followed by V6 (2.52mg/g) whereas the lowest level was recorded in V3 (0.90mg/g). The highest level of phenol was recorded in V20 (0.25mg/g) followed by V13 (0.20mg/g) followed by V8 (0.16mg/g) whereas the lowest level was recorded in V18 (0.03mg/g). The level of flavonoids in the soybean varieties ranged from 4.65mg/g to 5.90mg/g. The highest level of flavonoids was recorded in V1 and V3 (5.90mg/g) followed by V10 (5.43mg/g) followed by V7 (5.30mg/g) whereas the lowest value was recorded in V5 (4.65mg/g).

The estimates of the DNA quality extracted from the 20 soybean varieties using NIMR kit I protocol are presented in Table 3. The DNA quality at A260:A230, most of the soybean varieties recorded DNA quality estimates less than the acceptable range of 2.0 to 2.2. 30% of the soybean varieties

recorded the acceptable DNA quality; V5 (2.193), V10 (2.016), V18 (2.000), V19 (2.105), V20 (2.164) and V24 (2.167). As regards the DNA quality at A260:A280, 60% of the varieties recorded DNA quality within the acceptable range of 1.8 to 2.0. 20% of the soybean varieties recorded DNA quality below the acceptable range of 1.8. V1, V5, V12 and V24 recorded DNA quality above 2.0 (2.125, 2.016 and 2.261).

The results of the DNA quality extracted from the 20 soybean varieties using SDS protocol are presented in Table 4. the DNA quality at A260:A230 ranged between 1.734 and 2.598. 35% of the soybean varieties recorded DNA quality within the acceptable DNA quality range of 2.0 to 2.2. 50% of the soybean varieties recorded DNA quality above 2.2 indicating that the DNA samples were highly contaminated. As regards the DNA quality at A260:A280, 80% of the soybean varieties recorded DNA quality within the acceptable range of 1.8 to 2.0. V1, V5, V9 and V12 recorded DNA quality below and above the acceptable range indicating that they were contaminated.

Table 1: Mineral Composition of the Soybean Varieties

VAR NO	Ca (ppm)	Mg (ppm)	Mn (ppm)	Cu (ppm)	Zn (ppm)	Na (ppm)	K (ppm)	P (ppm)
1	53.00b	68.50a	2.11a	0.59b	3.94a	361.00b	442.00bc	0.58d
2	49.80bc	55.30b	1.59ab	1.12a	2.74b	459.00ab	575.00b	4.26ab
3	47.40bc	56.10b	1.67ab	0.57b	3.00ab	322.00b	407.00bc	6.16a
4	62.10a	70.10a	2.12a	1.04a	2.59b	436.00ab	495.00b	0.55d
5	49.70bc	57.50b	1.67ab	0.92ab	3.54ab	510.00a	609.00b	0.47d
6	60.30a	70.50a	1.67ab	1.34a	4.24a	438.00ab	515.00b	4.79ab
7	58.40ab	53.50b	1.94a	0.85ab	3.04ab	506.00a	657.00ab	3.32ab
8	51.20b	68.20a	1.84ab	0.58b	4.24a	467.00ab	635.00ab	2.97ab
9	66.00a	53.90b	2.04a	0.75ab	4.01a	466.00ab	578.00b	0.68d
10	47.50bc	72.10a	0.96c	1.01a	2.46b	589.00a	781.00a	3.84ab
12	65.30a	55.70b	1.12bc	0.64b	4.03a	518.00a	620.00ab	1.50b
13	55.30ab	55.20b	1.24bc	0.64b	2.41b	484.00a	581.00b	1.29bc
15	50.70b	62.70ab	1.59b	1.02a	2.95ab	442.00ab	535.00b	0.58d
17	63.10a	65.20ab	2.01a	0.93ab	2.67b	321.00b	373.00b	5.63a
18	57.50ab	60.40ab	2.14a	0.64b	3.02ab	185.00c	200.00cd	2.26ab
19	57.00ab	60.30ab	0.94c	0.78b	2.99ab	120.00d	130.00d	4.61ab
20	59.00ab	57.60b	0.89c	1.10a	4.12a	422.00ab	552.00b	1.45b
22	58.10ab	55.80b	0.97c	0.78b	4.01a	298.00bc	350.00bc	0.55d
24	50.30b	58.60b	1.67ab	0.95ab	2.34b	261.00bc	280.00c	1.11bc
25	52.60b	61.00ab	1.53ab	0.83ab	2.64b	466.00ab	597.00b	1.63b

Footnote: V1 = TGm4075; V2 = TGm4132; V3 = TGm4164; V4 = TGm4336; V5 = TGm4339; V6 = TGm4373; V7 = TGm4385; V8 = TGm4419; V9 = TGm4445; V10 = TGm4470; V12 = 4501; V13 = TGm4518; V15 = TGm4686; V17 = TGm8508; V18 = TGm8528; V19 = TGm8748; V20 = TGm8874; V22 = TGm9303; V24 = TGm9917; V25 = TGm9991; Calcium (Ca), Magnesium (Mg), Manganese (Mn), Copper (Cu), Zinc (Zn), Sodium (Na), Potassium (K) and Phosphorus (P)

Table 2: Phytochemical Composition of the Soybean Varieties

Var. No	Phytate (mg/g)	Tannin (mg/g)	Saponin (mg/g)	Oxalate (mg/g)	Phenols (mg/g)	Flavonoids (mg/g)
V1	26.77ab	0.19a	2.75a	1.94ab	0.06ab	5.90a
V2	32.96a	0.17ab	2.40ab	2.52a	0.06ab	4.95ab
V3	28.42ab	0.19a	2.90a	0.90c	0.08ab	5.90a
V4	28.84ab	0.16ab	2.80a	2.03ab	0.04ab	5.10a
V5	33.78a	0.16ab	2.25b	1.58b	0.14a	4.65ab
V6	25.95ab	0.23a	2.40ab	2.52a	0.04ab	5.40a
V7	30.89a	0.05b	2.55ab	2.79a	0.10ab	5.30a
V8	28.42ab	0.09b	2.80a	2.61a	0.16a	4.92ab
V9	34.60a	0.19a	2.90a	1.94ab	0.05ab	4.90ab
V10	28.01ab	0.22a	2.50ab	2.03ab	0.04ab	5.43a
V12	28.42ab	0.21a	2.05bc	1.94ab	0.04ab	4.98ab
V13	32.96a	0.18a	3.60a	2.29a	0.07ab	4.95ab
V15	33.78a	0.19a	2.35b	2.07ab	0.20a	4.90ab
V17	28.01ab	0.22a	2.40ab	1.53b	0.06ab	4.82ab

Var. No	Phytate (mg/g)	Tannin (mg/g)	Saponin (mg/g)	Oxalate (mg/g)	Phenols (mg/g)	Flavonoids (mg/g)
V18	29.26ab	0.14ab	2.60ab	1.35bc	0.03b	4.70ab
V19	28.84ab	0.22a	2.60ab	2.70a	0.09ab	5.25a
V20	25.54ab	0.18a	2.85a	1.85b	0.25a	4.95ab
V22	32.96a	0.18a	2.20b	1.89b	0.07ab	5.05a
V24	25.54ab	0.19a	3.05a	2.39a	0.11ab	5.10a
V25	33.78a	0.16ab	2.90a	1.98ab	0.08ab	4.90ab

Footnote: V1 = TGm4075; V2 = TGm4132; V3 = TGm4164; V4 = TGm4336; V5 = TGm4339; V6 = TGm4373; V7 = TGm4385; V8 = TGm4419; V9 = TGm4445; V10 = TGm4470; V12 = 4501; V13 = TGm4518; V15 = TGm4686; V17 = TGm8508; V18 = TGm8528; V19 = TGm8748; V20 = TGm8874; V22 = TGm9303; V24 = TGm9917; V25 = TGm999

Table 3: Dna Quality Profiling in Soybean Varieties Using Nimr Kit I

VAR. NO	A230nm	A260nm	A280nm	A260/A230	A260/A280
V1	0.045	0.085	0.04	1.889ab	2.125a
V2	0.061	0.1	0.055	1.639b	1.818ab
V3	0.071	0.12	0.065	1.690b	1.846ab
V4	0.081	0.095	0.055	1.173c	1.727b
V5	0.057	0.125	0.062	2.193a	2.016a
V6	0.075	0.115	0.0575	1.533b	2.000a
V7	0.069	0.159	0.085	2.304a	1.871ab
V8	0.071	0.135	0.075	1.901ab	1.800ab
V9	0.041	0.081	0.045	1.976ab	1.800ab
V10	0.062	0.125	0.069	2.016a	1.812ab
V12	0.071	0.125	0.062	1.761ab	2.016a
V13	0.052	0.079	0.0395	1.519b	2.000a
V15	0.054	0.094	0.055	1.741ab	1.709b
V17	0.058	0.115	0.065	1.983ab	1.769b
V18	0.071	0.142	0.075	2.000a	1.893ab
V19	0.038	0.08	0.042	2.105a	1.905a
V20	0.061	0.132	0.068	2.164a	1.941a
V22	0.057	0.128	0.072	2.246a	1.778b
V24	0.096	0.208	0.092	2.167a	2.261a
V25	0.051	0.114	0.062	2.235a	1.839ab

Footnote: V1 = TGm4075; V2 = TGm4132; V3 = TGm4164; V4 = TGm4336; V5 = TGm4339; V6 = TGm4373; V7 = TGm4385; V8 = TGm4419; V9 = TGm4445; V10 = TGm4470; V12 = 4501; V13 = TGm4518; V15 = TGm4686; V17 = TGm8508; V18 = TGm8528; V19 = TGm8748; V20 = TGm8874; V22 = TGm9303; V24 = TGm9917; V25 = TGm9991

Table 4: Dna Quality Profiling in Soybean Varieties Using Sds

VAR. NO	A230nm	A260nm	A280nm	A260/A230	A260/A280
V1	0.051	0.105	0.062	2.059a	1.694b
V2	0.091	0.183	0.0915	2.011a	2.000a
V3	0.027	0.06	0.033	2.222a	1.818ab
V4	0.092	0.239	0.123	2.598a	1.943a
V5	0.156	0.325	0.155	2.083a	2.097a
V6	0.045	0.089	0.0471	1.978a	1.890
V7	0.136	0.307	0.164	2.251a	1.872ab
V8	0.125	0.282	0.144	2.252a	1.958a
V9	0.085	0.19	0.1102	2.235a	1.724b
V10	0.065	0.143	0.073	2.200a	1.959a
V12	0.098	0.244	0.117	2.490a	2.085a
V13	0.091	0.158	0.0833	1.734ab	1.897ab
V15	0.065	0.161	0.088	2.473a	1.830ab
V17	0.143	0.335	0.1708	2.343a	1.961a
V18	0.038	0.078	0.0414	2.080a	1.884ab
V19	0.092	0.193	0.102	2.098a	1.892ab
V20	0.129	0.311	0.1719	2.411a	1.809ab
V22	0.062	0.119	0.06	1.916a	1.983a
V24	0.110	0.285	0.145	2.596a	1.966a
V25	0.044	0.092	0.051	2.091a	1.804ab

Footnote: V1 = TGm4075; V2 = TGm4132; V3 = TGm4164; V4 = TGm4336; V5 = TGm4339; V6 = TGm4373; V7 = TGm4385; V8 = TGm4419; V9 = TGm4445; V10 = TGm4470; V12 = 4501; V13 = TGm4518; V15 = TGm4686; V17 = TGm8508; V18 = TGm8528; V19 = TGm8748; V20 = TGm8874; V22 = TGm9303; V24 = TGm9917; V25 = TGm9991

Discussion

The levels of calcium and magnesium recorded in this study are similar to the findings of Aremu *et al.*, (2019). They also reported varying levels of calcium and magnesium content across various soybean varieties. They also highlighted the nutritional importance of calcium and magnesium in soybean for bone health and metabolic functions. Likewise, the study carried out by Wilson *et al.*, (2015) is similar to the findings of this research. They reported that manganese, copper, and zinc levels in soybeans, exhibited different levels of variability based on the different varieties. The levels of sodium and potassium concentrations reported in this research corroborates the findings of Yusof *et al.*, (2020). They also observed that sodium and potassium levels in soybean varieties differ significantly. The level of phosphorus recorded in this research corroborates the findings of Kumar *et al.*, (2021). The result on the phytate level reported in this research is similar to the findings Shunmugam *et al.*, (2018). They also reported variations in the concentration of phytate in different soybean varieties. The result on tannins concentration in this study also corroborate the findings of Ugwu *et al.*, (2019). They also found similar variations in tannin levels across different varieties of soybean. The high level of saponin and flavonoid concentrations recorded in this study is synonymous to that of (Shahrajabian *et al.*, 2021). They also confirmed soybean as a potential source of functional bioactive compounds with anti-inflammatory, hypocholesterolemic, antioxidant, and anticancer properties that can serve as an excellent potential alternative for nutraceutical product development. The result of oxalate content recorded in this study is also similar to the findings of Getaneh-Zewudie, K. and Gemedie (2024). They reported that oxalate levels in soybeans and other legumes varied significantly in different varieties. The report of Nwachukwu *et al.*, (2021), on varying levels of phenolic concentrations in different soybean varieties is synonymous to the findings of this study. Similarly, the high flavonoid levels recorded in this research corroborates the findings of Ramalingam and Jegadeesh (2022). They also reported a varying high level of flavonoids in different soybean varieties. The finding of this study on the use of SDS DNA extraction protocol corroborates the findings of Zhao *et al.*, (2020). They also compared DNA extraction techniques, including SDS-based methods, and assessed DNA quality using A260/A280 and A260/A230 ratios. The results of DNA extraction using kit method in this study, corroborates the findings of Xia *et al.*, (2019). They investigated the efficiency of various extraction methods on DNA quality which include commercial kits and SDS, with a focus on the A260/A280 and A260/A230 ratios for downstream genetic analysis. The result of this research also corroborates the findings of Abdullah *et al.*, (2021). They also reported variations in the DNA quality in selected legumes using SDS at A260/A230 and A260/A280 ratios. The findings of this research also corroborate the findings of Mahajan *et al.*, (2022). They also compared the quality of DNA from different soybean cultivars using SDS and commercial extraction kits on DNA integrity and purity, focusing on A260/A280 and A260/A230 ratios. Overall, SDS showed superior DNA quality for molecular downstream applications, corroborating previous molecular studies that emphasize SDS as a robust extraction method for mature leaf tissues rich in secondary metabolites.

CONCLUSION

It can be concluded from this that, TGm4075, TGm4339, TGm8508, TGm4419, TGm8528, TGm4501, TGm4385, TGm4470, TGm445 and TGm8874 were found outstanding in terms of nutritional values and micronutrient mineral composition. It can also be concluded from this study that the phytochemical composition of the soybean varieties (TGm4445, TGm4373, TGm4518, TGm4385, TGm8874, TGm4075 and TGm4164) could be used as a cheaper substitute for conventional drugs since they are easily obtainable and utilized in the treatment of cardiac problems and other terminal health challenges as a result of their anti-inflammatory, anti-allergic and anticancer properties. This study also revealed that the extraction method significantly influenced DNA quality, with variations observed in A260/A230 and A260/A280 ratios respectively. Hence, it can be concluded that the quality of DNA obtained using SDS is in preferable range to that of NIMR KIT 1 which can be used for further downstream applications.

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