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Data Article

Data on assessment of flours from advanced genotypes and improved cassava varieties for industrial applications

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ABSTRACT

The data presented in this article are related to the research paper "Physicochemical parameters and functional properties of flours from advanced genotypes and improved cassava varieties for industrial applications" [1]. The genotypes were collected from a multi-location (Uniform yield Trial) trial of the IITA breeding program in Malawi. The data were obtained using multiple analytical techniques and methodology such as oven-drying, sieving, colorimetry, titration, acid hydrolysis method, the Kjeldahl procedure, UV/VIS spectrophotometry, and centrifugation.The data set contains physicochemical parameters described dry matter (on fresh weight basis), moisture content, pH and total titratable acidy, the content of ash, bulk density; chemical properties were described by total cyanogen potential, total starch, amylose, amylopectin, crude protein and total carbohydrates; functional properties were described by swelling power, water solubility, water binding capacity and oil absorption capacity. The presented data are valuable for cassava breeders, food scientists, nutritionists, and other researchers working on breeding and

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processing cassava for innovative product development from cassava flour.

Specifications Table

Subject	Chemistry, Agricultural science, Material science
Specific subject area	Applied chemistry, physicochemical parameter analysis
Type of data	Table and Figure
How data were acquired	Oven-drying, sieving, colorimetry (PCE-CSMS, SN: 60158946), titration, pH meter (Model: 8603, S/N: 1000329), acid hydrolysis method, the Kjeldahl procedure, UV/VIS spectrophotometry, centrifugation
Data format	Raw and Analyzed
Parameters for data collection	Cassava flour samples were obtained from the roots of ten improved cassava genotypes collected from a multi-location (Uniform yield Trial) trial of the IITA breeding program in Malawi, which were dried at 60 °C for 48 h prior investigation. The analyzed chemical parameters (Total cyanogens, Total starch, amylose, amylopectin, Crude protein content, Total carbohydrates) using a UV/VIS Spectrophotometerat 630 nm before boiling in the water bath at 100 °C. Dry matter, moisture content, color, pH and total titratable acidy (TTA), ash, bulk density swelling power, water solubility, water binding capacity and oil absorption capacity were other parameters on which data was collected.
Description of data collection	Physicochemical parameters of samples were described by dry matter, moisture content, color, pH and total titratable acidy (TTA), the content of ash, bulk density; chemical properties were described by total cyanogens, total starch, amylose, amylopectin, crude protein and total carbohydrates; functional properties were described by swelling power, water solubility, water binding capacity and oil absorption capacity
Data source location	Samples were collected from a multi-location (Uniform yield Trial) trial of the IITA breeding program at Chitala (36L -0637226 and UTM 8488485), Chitedze (36L 0568515 and UTM 8453756), Njuli (36L 0727647 and UTM 8265212) and Mkondezi (36L 0568515 and UTM 8453756) Research stations in Malawi; analyses were performed at the University of Malawi, Zomba, Malawi
Data accessibility	Repository name: Mendeley Data DOI: 10.17632/c7kg9m7gv9.1 Direct URL to data: https://data.mendeley.com/datasets/c7kg9m7gv9/1
Related research article	L. Chimphepo, E.O. Alamu, M. Monjerezi, P. Ntawuruhunga, J.D.K. Saka - Physicochemical parameters and functional properties of flours from advanced genotypes and improved cassava varieties for industrial applications, LWT-Food Science and Technology, 2021. In Press. https://doi.org/10.1016/j.lwt.2021.111592

Value of the Data

- The data involve a comprehensive analysis of cassava flour samples from improved cassava genotypes for industrial uses.
- The data are valuable for cassava breeders, food scientists, nutritionists, and other researchers working on breeding and processing cassava for innovative product development from cassava flour.
- The data are useful to processors and industries using cassava in different products development. They will be assured to produce good products when they use varieties having appropriate qualities.
- The data provide valuable information on high-quality Cassava Flour (HQCF) from promising pipeline cassava genotypes suitable for dietary and industrial applications.

1. Data Description

The data involved in this article is based on the evaluation of physicochemical parameters, and functional properties of ten (10) improved cassava genotypes for fast-tracking adaptable and preferred cassava genotypes for industrial use. The data repository contain two XLSL files (excell) and a DOCX file (word doc). The two XLSL files contain physicochemical parameters and functional properties of flours from ten (10) genotypes and improved cassava varieties. The DOCX file contains the descripitve statastics for color parameters. Samples are identified by codes (genotypes) and local names (improved variaties). For every sample, each parameter was measured in four replicates and analysis of variance (ANOVA) was applied to each treatment. The data files in the repository are identified by the following names: (1) Data on physicochemical parameters and functional properties of flours from advanced genotypes and improved cassava varieties for industrial applications.xlsx; (2) Flour color.xlsx; and (3) Table.docx. Table 1 compiles color parameters, whiteness index (WI) and chroma (C) of cassava flour from the ten genotypes analyzed. Physicochemical parameters are described by dry matter on fresh weight basis (DM-FWB), moisture content (MC), pH and total titratable acidy (TTA), the content of ash, bulk density, in Figs. 1 and 2 [1] with DM-FWB ranging between 27.58 g/100 g (Sauti) and 38 g/100 g on average; bulk densinty ranging between 0.68 and 0.75 g/mL; MC in the range of 7.00 to 10.20 g/100 g; ash content in the range of 0.11 g/100 g to 1.83 g/100 g (dry weight); pH with values from 4.24 to 7.72; and TTA values ranging from 0.36 to 0.53 g/100 g). Chemical properties were described by total cyanogen potential (CNP), total starch, amylose, amylopectin, crude protein and total carbohydrates in Figs. 2 and 3 [1] with Total carbohydrates range of 79.82–91.58 g/100 g; CNP ranging 2.19 to 7.66 mg/kg; Starch content on a dry basis in the range of 76.49 g/100 g to 84.17 g/100 g; amylose content mean values ranging from 14.58 to 17.01 g/100 g; and protein content (mean values) in the range of 1.05 to 3.06 g/100 g (dry weight). Functional properties were described by swelling power, water solubility, water binding capacity (WBC) and oil absorption capacity (OAC) in Fig. 4 [1] with swelling power in the range of 8.81 to 10.05 g/100 g; WBC ranging from 143.56 g/100 g to 171.04 g/100 g; and OAC in between 130.01 g/100 g and 158.70 g/100 g. Correlation matrix of functional properties and physicochemical parameters for all genotypes and trials is shown in Fig. 5 [1] and revealed that Starch and amylopectin content are the major determinants of variability in the cassava flours' functional properties, such as water and oil absorption capacities, solubility, and swelling power. The principal component analysis was performed in R with FactoMineR, where (a) PC2, (b) PC3 and (c) PC4 were plotted against PC1 in Fig. 6 [1] which determined genotypes I020452 and I010040, and the released variety Sagonja to have a high starch and amylopectin content, high bulk density, and all the analyzed functional properties.

2. Experimental Design, Materials and Methods

2.1. Sample collection and preparation

Samples of cassava genotypes comprising four varieties of Mbundumali, Sagonja, Sauti, Mpale and six new advanced genotypes (MM06/0045, IITA-TMSL110080, I010085, TMEB419, I010040,

Table 1
Summary of color parameters, whiteness index (WI) and chroma (C) of cassava flour from the ten genotypes under study.

Parameter	Mean	Median	Minimum	Maximum	Standard deviation	Skewness
L*	83.62	84.17	72.89	95.13	2.40	-0.41
a*	4.23	4.43	0.03	10.15	1.77	-0.25
b*	11.88	11.99	7.10	20.17	2.27	-0.04
C	12.66	12.89	7.20	22.58	2.66	-0.01
WI	79.16	79.66	66.49	86.09	2.61	-1.92

and I020452 were collected from the IITA Uniform Yield trial planted on 22/12/2016 at Chitala, Chitedze, Njuli, and Mkondezi research stations in Malawi. The genotypes were planted in a randomized complete block design with four replications, and the harvesting was done 12 months after planting from only two middle rows. The roots of the cassava genotypes were collected in four replicates and were processed within 24 h after harvesting. In addition, samples of high-quality cassava flour (HQCF) were collected from Universal Industries in Blantyre, Malawi, as an example of industrially utilized flour available on the market.

The cassava roots were washed to remove soil, and then woody ends of the roots were chopped off using a sharp stainless-steel knife. The roots were peeled, sliced into small pieces (approximately 20 mm thickness) and then oven-dried at 60 °C for 48 h [2]. The dried chips were ground into flour using a laboratory mortar and pestle to a consistent 0.25 mm particle size and then packaged in polythene bags and stored awaiting analysis.

2.2. Determination of physicochemical properties

Moisture, dry matter and ash contents of flours (cassava and HQCF) were determined using Eriksson's method [3]. The moisture content was determined in four replicates where approximately 3 g of the flour sample was placed in pre-weighed dishes and dried in an oven at 105 °C for 4 h, and then samples were cooled in a desiccator for 30 min and weighed again. Then moisture content was determine as:

$$\text{Moisture content } (\%) = \frac{w_2 - w_3}{w_2 - w_1} \times 100 \quad (1)$$

W_1 is the weight of the dish, W_2 is the weight of the dish + weight of the sample before drying, and W_3 is the weight of the dish + weight of the sample after drying.

However, 10 g of fresh cassava sample was used for dry matter determination of cassava on fresh weight basis (FWB) at 110 °C, overnight and cooled in the following morning in a desiccator for 2 h and then Eq. (1) was applied. Therefore dry matter-FWB was obtained by subtracting moisture content of fresh cassava from 100%.

To determine ash content, flour samples were prepared in four replicates and weighed (2 g) into pre-weighed, porcelain crucibles. The samples were transferred to muffle furnace (S302AU, England. S/N: 12/91/1994) and ashed at 550 °C for 8 h. The U crucibles were allowed to cool in desiccators and then weighed using Mettler Toledo (K.G. Goettingen, Germany, S/N 00365108). Then ash content was calculated as a percentage.

Bulk density was estimated following the method used by Iwe et al. [4]. Flour sample (10 g) was put into a 25 mL volumetric cylinder. The lower surface of the cylinder was tapped several times on the laboratory bench until there was no more diminution of the sample level. The sample weight was then determined, and bulk density was expressed as the weight/volume of the sample (g/mL).

The color of the cassava flour and HQCF was measured using a colorimeter, PCE instrument (PCE-CSMS, SN: 60158946). According to the Comission Internationale de l'Eclairage (CIE) color space, data were expressed on the three color coordinates that characterize color points as L^*, a^*, and b^*. L^* is the "lightness" coordinate (0 = black to 100 = white), a^* is the "redness-greenness" coordinate ($+a^*$ = redness, $-a^*$ = greenness) and b^* is the "yellowness-blueness" coordinate ($+b^*$ = yellowness, $-b^*$= blueness). A standard white background, supplied by the supplier, was used to standardize the instrument (L^* = 97.63, a^* = -0.48, b^*= +2.12). Values of chroma (C) and Whiteness Index (WI) were then calculated as follows [4,5,6]:

$$C = \sqrt{a^{*2} + b^{*2}} \quad (2)$$

$$WI = 100 - \sqrt{(100 - L^*)^2 + a^{*2} + b^{*2}} \quad (3)$$

Chroma indicates color saturation, with higher values showing more color purity. All measurements were performed at least in triplicate. pH and total titratable acidy (TTA) of cassava

flour were determined using a method described by Eriksson [3]. Cassava flour sample (10 g) was weighed into a 250 mL beaker, to which distilled water (90 mL) was added and then mixed well. The mixture was left to stand for 1 h at room temperature, and the pH of the supernatant was measured in four replicates using a pH meter (Model: 8603, S/N: 1000329). TTA was then determined on the same supernatant of the sample mixture used for pH by titration using a 0.1 mol/L NaOH and phenolphthalein indicator (4,5 drops). The volume of NaOH added was multiplied by 0.09 to obtain the g/100 g titratable acidity as lactic acid.

2.3. Determination of chemical properties

Total cyanogens were determined by the acid hydrolysis method as described by Iwe et al. [4]. Extraction of cyanogens from cassava flour was done as follows: A 30 g of cassava flour sample was weighed in triplicate and blended with 160 mL of cold orthophosphoric acid, 0.1 mol/L H_3PO_4 (prepared by diluting 13.6 mL Orthophosphoric acid with 2 L of distilled water) and then homogenised at high speed for 15 s, at low speed for 60 s then at high speed for 60 s followed by 1 min rest. The sample was finally homogenised at highest speed for 60 s. This was done to avoid overheating of the blender and escape of HCN from the flour. The homogenate was transferred into a plastic beaker and covered tightly with para-film and stored in the refrigerator to settle for 30 min, and then the sample was removed from the refrigerator, and the solution decanted into a sample bottle and kept in in deep freezer till analysis.

The Linamarin in cassava extracts were hydrolyzed as follows: 1.0 mL of 4.0 mol/L H_2SO_4 solution (prepared by diluting 108.5 mL, 98% sulphuric acid with 50 mL of distilled water then made up to the mark of a 500 mL volumetric flask with constant shaking and cooling in ice water) was added to 1.0 mL of the sample extract. The acid hydrolyzed samples were then vortex mixed and put in a water bath (in triplicates) at 100 °C for 120 min. The samples were removed from the water bath and cooled in ice for 10 min, and then to each sample, added 2.5 mL of 3.6 mol/L NaOH solution (prepared by dissolving 37.1134 g of Sodium hydroxide in 100 mL of distilled water and quantitatively transferring into a 250 mL volumetric flask containing a small volume of distilled water and cooled in the ice water bath. The solution was diluted to the mark with distilled water) followed by 0.5 mL of distilled water. KCN Calibration Curve was obtained at pH 6 [pH 6 was prepared by mixing 0.13 mol/L Na_2HPO_4 (9.03 g of Potassium dihydrogen Phosphate was dissolved in 100 mL of distilled water and quantitatively transferred into 500 mL volumetric flask and diluted to mark with distilled water and shaken thoroughly) with 0.26 mol/L KH_2PO_4 (34.8491 g of Di-sodium Hydrogen Phosphate was dissolved by 100 mL of distilled water and quantitatively transferred into a 500 mL volumetric flask and diluted to the mark with distilled water) while stirring until the pH 6 was obtained. This was done while the pH meter's probe was dipped into the KH_2PO_4 and stirring the mixture on a magnetic stirrer. The pH meter was calibrated before using it to prepare the buffer].

Thus, KCN Calibration Curve was obtained as follows: To 0.0, 0.2, 0.4, 0.6, 0.8 and 1.0 mL of 2.5μg/mL KCN working solution (1.0 mL of Potassium cyanide stock solution was diluted to the mark of a 100 mL volumetric flask with pH 6 buffer solution to give 2.5 μg/mL KCN), 3.4, 3.2, 3.0, 2.8, 2.6 and 2.4 mL of pH 6 buffer solution were added, respectively, vortex mixed and then while cooling in ice, added 0.6 mL of 0.2 mol/L NaOH solution (8.0064 g sodium hydroxide pellets were dissolved in 50 mL distilled water and quantitatively transferred into a 1000 mL volumetric flask placed in an ice-water bath for cooling and then diluted to the mark with distilled water). The samples were then vortex mixed and 0.2 mL of Chloramine T (prepared by dissolving 0.500 g of Chloramine-T hydrated with 10 mL of distilled water and solution quantitatively transferred into a 100 mL volumetric flask and diluted to the mark with distilled water) was added to each solution and vortex mixed while cooling in ice. The solutions were left to cool in ice before adding 0.8 mL of coloring reagent. After adding the coloring reagent, the solutions were left at room temperature for 15 min before analysis on a spectrophotometer at 600 nm.

Exactly 0.1 mL of hydrolyzed extract was diluted to 4.0 mL with 3.9 mL of pH 6 buffer solution and then vortex mixed. While in ice, 0.2 mL of Chloramine T was added to each sample,

vortex mixed and left to cool in ice for 5 min, and then 0.8 mL of coloring reagent was added to the sample, vortex mixed and left at room temperature for 15 min. The samples were analyzed for cyanogens on UV/VIS Spectrophotometer (S/N:20-1901-0351; Model: T90+; PG instruments Ltd) at 600 nm, the absorbance was recorded, and total cyanogens were calculated as follows [4]:

$$\text{mg HCN} = \frac{10 \times A_s\left(160 + \frac{\text{moist\%} \times \text{wt}}{100}\right)}{A_{ref} \times \text{wt}} \quad (4)$$

Where A_s –sample absorption at 600 nm
10 –dilution factor
Moist% -moisture content of cassava flour
A_{ref} –absorbance for 1.00 µg HCN equivalent
Wt –the weight of cassava flour used for cyanogens extraction
160-extraction volume (160 mL of 0.1 mol/L orthophosphoric acid)

Total starch (anthrone reagent) content and amylose (iodine reagent) content were determined by UV/VIS spectrophotometry [7]. For starch analysis, a 100 mg of the flour samples (cassava and HQCF) was weighed into 50 mL centrifuge tubes and homogenised with 30 mL of hot 80% ethanol to remove sugars and then centrifuged for 10 min (Gallenkamp, England. CAT. No: CF 405. App. No: 8A 8840E) and the residue retained. The residue was washed repeatedly with hot 80% ethanol until the washings did not give the color with anthrone reagent. The residue was dried well over a water bath. To the residue was added 5.0 mL of water and 6.5 mL of 52% perchloric acid and then extracted at 0 °C for 20 min, centrifuged for 5 min and then saved the supernatant. The supernatant was made up to 100 mL by distilled water. Then 0.1 mL of the supernant was pipetted into a boiling tubes using micro pipette and made up to 1.0 mL with distilled water.

Thus, to determine total starch content, calibration curves were derived using D (+) Glucose Anhydrous (SAAR2676020EM, Merch, Wadeville, Gauteng, RSA) where stock solution was prepared by dissolving 100 mg of glucose in 100 mL of distilled water and then working standards of glucose were prepared (by diluting 10 mL of stock solution into 100 mL flask to its mark) as 0.2, 0.4, 0.6, 0.8 and 1 mL of working standard of D (+) Glucose Anhydrous (SAAR2676020EM, Merch, Wadeville, Gauteng, RSA) which were also made to the mark of 1 ml volume and "0" served as a blank. Then 4 mL of anthrone (400 mg dissolved in 200 mL of ice cold 98% sulphuric acid) were added to the samples, aswell as to the standard solutions of glucose and boiled (100 °C) for 8 min on water bath, after cooling, the standards and the samples were read on UV/VIS Spectrophotometer (S/N: 20-1901-0351; Model: T90+; PG instruments Ltd) at 630 nm. Glucose content in the sample was found using calibration curve and the following equation:

$$\text{100 mL of the sample} = \frac{x \times 100\ \text{mg}}{0.1\ \text{mL}} \quad (5)$$

Where x = concentration

Then starch content was found by multiplying value of glucose content found by a factor of 0.9.

To determine amylose content, 100 mg of cassava flour sample was added to 1 ml of 99.9% ethanol, and then 10 mL of 1 N NaOH (4 g of NaOH pellets was dissolved in 100 mL of distilled water) was added, and left overnight. Then the volume was increase to 100 mL using distilled water. A 2.5 mL of the extract was taken, and 20 mL of distilled water was added to it followed by 3 drops of phenolphthalein. Then 0.1 N Hydrochloric acid (prepared by diluting 4.8 mL of 10.4 N HCl in 500 mL of distilled water) was added drop by drop until the pink color just disappeared. Then 1.0 mL of iodine reagent (1.0 g of Iodine and 10 g of KI dissolved in distilled water and made up to the mark of 500 mL volumetric flask) was added and blue black color developed and the volume was increased to 50 mL using distilled water. Calibration curves were derived using pure amylose from potato (A0512; Sigma–Aldrich, St. Louis, MO, USA), prepared (100 mg amylose was dissolved in 10 mL of 1 N NaOH and the volume increased to 100 mL using distilled water) as 0.2, 0.4, 0.6, 0.8 and 1 mL, and the color was developed as in the case of the

sample. For a blank, 1.0 mL of iodine reagent was diluted to 50 mL with distilled water. Hence the color developed for samples and amylose standards was read on UV/VIS Spectrophotometer (S/N: 20-1901-0351; Model: T90+; PG instruments Ltd) at 590 nm. The following equation was used to calculate the amount of amylose in cassava flours:

$$\text{Absorbance that corresponds to 2.5 mL of the solution} = x \text{ mg amylose 10 mL contains} = \frac{x}{2.5} \times 100 \text{ mg} = \%\text{Amylose} \quad (6)$$

The amount of amylopectin was obtained by subtracting the amylose content from the total starch content.

Crude protein content was determined as total nitrogen content per the Kjeldahl procedure following the method used by Bankole et al. [8]. Duplicate 1.0 g of flour samples were dried, powdered, weighed, and digested with H_2SO_4 and K_2SO_4/Se catalyst tablets in a Foss Tecator Auto Digestor (block digestion). The resulting digest was steam distilled into boric acid using a Labconco Rapid Still II, and then the distillate was titrated with 0.2 mol/L HCl. Then nitrogen content and crude protein were determined as follows:

$$\%\text{ Total nitrogen} = \frac{\text{Titre value} \times \text{Normality}}{\text{Weight of flour sample}} \times 0.014 \times 100 \quad (7)$$

$$\%\text{ Crude protein} = \%\text{ Total nitrogen} \times \text{conversion factor} = 6.25 \quad (8)$$

Total carbohydrates were determined as glucose content, using anthrone reagent, according to the method described by Oladayo et al. [7] with modifications. 100 mg of sample was weighed into a boiling tube and hydrolyzed using 5 mL of 2.5 mol/L NaOH in a boiling water bath (100 °C) for 3 h. After cooling to room temperature, it was neutralized with about 3 g sodium carbonate powder until effervescence ceased and then it was made up to 100 mL with distilled water and centrifuged. The supernatant was collected, and 0.5- and 1 mL aliquots were taken for analysis. Standard solutions of D (+) Glucose Anhydrous (SAAR2676020EM, Merch, Wadeville, Gauteng, RSA) were prepared by taking 0, 0.2, 0.4, 0.8 and 1.0 mL of working standard of D (+) Glucose Anhydrous (SAAR2676020EM, Merch, Wadeville, Gauteng, RSA) and "0" served as a blank. Distilled water was added to both the samples and standards to make up to 1.0 mL volume, and then 4 mL of anthrone reagent was added. Then the samples were heated for 8 min in a boiling water bath (100 °C) and cooled rapidly, and then the intensity of a green to dark green color was determined using a UV/VIS Spectrophotometer (S/N: 20-1901-0351; Model: T90+; PG Instruments Ltd) at 630 nm.

2.4. Determination of functional properties

Swelling power and water solubility were determined using methods described by Kusumayanti et al. [9]. For the determination of swelling power, 0.1 g flour sample was mixed with 10 mL distilled water and heated at 90 °C for 1 h, with constant mixing. Then, the suspension was cooled rapidly, equilibrated at 25 °C and centrifuged for 30 min at 1600 rpm (Gallenkamp, England. CAT. No: CF 405. App. No: 8A 8840E), and then the sediments were weighed. For water solubility, a 0.5 g flour sample was heated in 10 mL distilled water at 60 °C (in a water bath) for 30 min, without mixing. The sample was centrifuged at 1600 rpm for 10 min rpm (Gallenkamp, England. CAT. No: CF 405. App. No: 8A 8840E). The supernatant (5 mL) was separated, dried and weighed. The swelling power and water solubility of the flour were calculated using the equations below:

$$\text{Swelling power(g/g)} = \frac{\text{Weight of the sediments}}{\text{Weight of intial flour}} \quad (9)$$

$$\text{Solubility (\%)} = \frac{\text{Dried supernant weight}}{\text{Weight of intial flour}} \times 100 \quad (10)$$

Water binding capacity and oil absorption capacity were determined according to methods described by Agyepong & Barimah [10] and Iwe et al. [4], respectively. For water binding capacity, 2.0 g of the flour sample was dissolved in 40 mL of water in a centrifuge tube. The suspension was agitated for 1 h at room temperature on a shaker and centrifuged for 10 min at 2200 rpm. The free water was decanted from the pellet, drained for 10 min, and the pellet was weighed. For oil absorption capacity, 1 g flour sample was mixed with 10 mL soybean oil (Sp. gravity: 0.9092) and allowed to stand at ambient temperature (30 $\pm$ 2 °C) for 30 min centrifuged for 30 min at 300 rpm. Water and oil absorption capacities were reported as follows:

$$\text{Water (Oil) Absorption Capacity (\%)} = \frac{\text{Weight of absorbed water (oil)}}{\text{Weight of intial flour}} \times 100 \quad (11)$$

2.5. Data analysis

All statistical analyses were performed using R: A language and environment for statistical computing version 3.6.3 [11]. The analysis of variance was performed on all measured characteristics of the genotypes by pooling data from all the trials. The correlation matrix for physicochemical and functional properties was produced using *rcorr* (Hmisc package), incorporating Spearman's correlation as a type. The correlation matrix was displayed using *corrplot* (corrplot package) and ordered by hierarchical clustering [11,12,13], using "Ward.D2" method. In addition, principal component analysis (PCA) was performed using FactoMineR package [14] to link correlations among chemical and functional parameters to the cassava varieties and the genotypes.

Ethics Statement

The authors declare that they have followed the general ethics rules of scientific research performance and publishing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

CRediT Author Statement

Lifa Chimphepo: Data curation, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing; **Emmanuel O. Alamu:** Conceptualization, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing; **Maurice Monjerezi:** Formal analysis, Project administration, Validation, Visualization, Writing – original draft, Writing – review & editing; **Pheneas Ntawuruhunga:** Conceptualization, Methodology, Project administration, Resources, Supervision, Writing – review & editing; **John D.K. Saka:** Conceptualization, Methodology, Project administration, Resources, Supervision, Writing – review & editing.

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Supplementary Materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.dib.2021.107332.

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