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Amino acid composition (AA) and SDS-PAGE Electrophoresis of Flour & Protein Isolates from Two Varieties (DAS & BS) of Nigeria Cultivated Solojo Cowpea [Vigna unguiculata (L.) WALP]

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ABSTRACT: *The amino acid configuration of the protein determines the nutritional value of the protein. Table 1-9 showed the amino acid composition of germinated DAS and BS flour and isolate. The value of the essential amino acid for the flours and isolate was generally highest for Leucine; this was followed by lysine and then phenylalanine. Sprouting was observed to cause increment in the AA quantity of the samples. The lysine content of germinated DAS flour increased from 6.85 to 7.91 g/100 g after 72 h of germination, while that of BS went from 6.97 to 8.20 g/100 g. The Isolates of the two varieties also increased with germination, the isolate of DAS g/100g obtained a value of 6.8 and 6.7 g/100 g respectively for the flour and protein isolate of their cowpea variety. The sulphur containing amino acids too also increased with germination, methionine of germinated DAS flour increased marginally from 0.65 to 0.86 g/100 g, BS flour from 0.65 to 0.91 g/100 g. The isolate of DAS from 1.15 to 1.37 g/100 g and BS isolate from 1.25 to 1.56 g/100 g. The approximate amount of proline, an EAA, was also observed to be apparently increased in germinated peanut cotyledons and sprouts. This goes to show that germination truly improved the AA content of the legumes. The non- essential amino acid had the glutamic acid having the greatest value, followed by aspartic acid, then arginine, while the rest followed at various levels. The non-essential amino acids were also improved by germination. It was also observed that improvement in the AA content of different fractions of the protein isolate from the two (2) varieties of solojo cowpea increased with germination. All the samples had their amino acid quantity reaching and surpassing the FAO/WHO requirement for both children and adult especially after germination except for methionine which is slightly short of the standard after germination furnishing the value of lysine in the range of 5.98-6.05 and isoleucine value in the range of 4.01-4.18. In germination, protein disintegration takes place because the plant makes use of the stored protein as point of supply of nitrogen and carbon for bio –molecule synthesis. Here, lower molecular weight polypeptides were not evident this may likely be due to the higher molecular weight proteins which might have broken down during germination into short chain peptides and amino acid which were not detected by electrophoresis analysis. SDS-PAGE electrophogram confirmed that high molecular weight bands almost disappear after germination of lupin,*

KEYWORDS: Solojo Cowpea, Under-utilised legumes, Protein isolate, Functional, Nutritional, DAS, BS, Vigna unguiculata

INTRODUCTION

All over the world, there are different varieties of legume playing an important role in local food production **(Eskin and Shahidi, 2012).** The greatest attribute of legumes is their high plant protein content, brought about by the symbiotic relationship with the nitrogen fixation bacteria. Legumes possesses valuable proteins, which not only have superior nutritional and anti-oxidative properties, they have also been successfully used as nutraceutical ingredient **(Sharif et al., 2017).** They are also important for providing balanced diet in human nutrition; they also give other nutrients essential to the body, such as, minerals, vitamins, dietary fibre, low glycemic index carbohydrate and variety of phytochemials **(Ashraf et al., 2012; Kouris-Blazos and Belski, 2016).** Consumers now have greater diversification in their diet because of legumes which has offered a practical avenue for greater balance between animal and plant food sources.

After cereals, legume foods are the next significant aggregation of crops and are vital ingredients of balanced diet for man and animal nourishment identified **(Bhat and karim, 2009; Bhadana et al., 2013)**. Legumes can serve as crops for human, forages for animals, and as green manures. Those which can serve as forage include, peanuts, soybeans, beans, peas, clovers, birdsfoot trefoil and alfalfa; and for man to eat, garbanzo beans (Chick pea), lima-beans, black- beans, kidney- beans, white pea bean, split-peas, Phaseolus vulgaris, black- eyed peas, and red, green or brown lentils, and many more. They are all nutrient-packed legumes. A good number of these legumes are harvested for other uses such as fiber, fuel, oils, fertilizers, medicinal attributes and as chemicals not only as crops for man and animal **(Lewis et al., 2005).** An extensive collection of native (organic) produce is also synthesized such as drugs, flavonoids, poison and dyes (ILDIS, 2006); Compounds that arrest cancer growth or retard its growth have been found in some legumes; for instance, “genistein” an alkaloid which have the unique property to retard cancer growth is derived from kudzu beans (Pueraria montana low) **(Bhat and Karim, 2009)**; “trigonellina” and “canavanine” both of jack bean (Canavalia ensiformis) have been found to possess anti- cancer properties and to be toxic to the cancer cells found in man’s pancreas respectively **(Bence and Crooks, 2003; Sridhar and Bhat 2007)**. as drugs, flavonoids, poison and dyes **(ILDIS, 2006);** Compounds that arrest cancer growth or retard its growth have been found in some legumes; for instance, “genistein” an alkaloid which have the unique property to retard cancer growth is derived from kudzu beans (Pueraria montana low) **(Bhat and Karim, 2009)**; “trigonellina” and “canavanine” both of jack bean (Canavalia ensiformis) have been found to possess anti- cancer properties and to be toxic to the cancer cells found in man’s pancreas respectively **(Bence and Crooks, 2003; Sridhar and Bhat 2007)**. Excellent complex carbohydrates which are beneficial for the control of diabetes and cardiovascular diseases are also found in legumes **(Hu, 2003; Jacobs and Gallaher, 2004; Annor et al., 2014)**. This could be a function of the huge amount of phenolics and aquar-soluble fibers it contains **(Enujiugha, 2010).** The danger of malignant growth in the colon is also minimized by the presence of fiber, resistant starch (RS), raffinose oligosaccharides, resistant low glycaemic index carbohydrates and fibre, which pass non-stop to the small intestine through the stomach undigested till reaching the colon, at which point they operate as “prebiotics” for the helpful bacteria resident there, also known as “probiotic”, that is as “food”. They are then fermented by bacterial bringing about the generation of butyrate, a short-chain fatty acid, promoting

a healthier gut microbiome, leading to improved colon health thereby reducing the risk of colon cancer **(Onimawo et al., 2007; Bird et al., 2010)**. The fiber in beans also aid the metabolism of diabetes, and improve insulin sensitivity by moderating blood sugar levels after meals. They play a potential role in weight management as they create satiating feeling which may help reduce food intake thus enabling dieters gratify their appetite while not overloading on calories **(Papanikolaou and Fulgoni, 2008; Li et al., 2014)**. The fiber in beans has also been shown to fight cholesterol as fiercely as the oat bran diet **(Piepoli et al., 2016; Kouris-Blazos and Belski, 2016).** Legumes used for food can be split to oil producing seeds and the pulse **(Ndife et al., 2011).**

The year 2016 was declared as International year of pulses by the 68th United Nations General Assembly; However, though huge resources have been committed to the growth of grasses, such as rice, wheat, sorghum, corn and bailey, the same cannot be said of legumes; not much has been done with legumes. The statistical report of the Food and Agricultural Organisation (FAO) for 2001, showed that across the world, cereals produced was two trillion cadent tons while, of grain legumes only 274 million cadent tons were produced, of which, 177 million cadent tons was soy beans. In 2008, even after seven years, the typical world production yield of cereal crops was (3.54t/ha) as compared with the general world yields of pulse crop (0.86t/ha), this was found to be barely around one- fourth of cereal production **(Akinbode and Maredia, 2011).** This shows that, more resources are still being channelled to production of grasses as compared with grain legumes.

Tounkara et al. (2013) reported for Roselle seed protein a molecular weight range of protein from 55,000 Da to below 14,300 Da of protein. **Pang et al. (2012)** also reported that protein profile for horse gram decreased in quality and quantity with germination. They also observed that the dominant proteins of Macrotyloma uniflorum disintegrate into two groups of bands 21.5 -34 KDa and 52 – 66 KDa just as observed in our samples. Storage proteins are known to be degraded with germination and seedling growth **(Pang et al., 2012). Gulewicz et al. (2008)**, also observed that germination caused important variations in the protein characterisation of the Osborne fractions in all the lupins they studied. SDS-PAGE electrophogram confirmed that high molecular weight bands almost disappear after germination of lupin, this was also corroborated by **Pang et al. (2012).** They observed that the SDS-PAGE electrophoregrams displayed disintegration of high molecular mass polypeptides from 97.4 KDa until 45 KDa. They also observed that higher molecular weight protein was more readily degraded than the lower molecular weight fractions which indicates that they were more easily hydrolysed than the lower molecular weight fraction. Proteins found in the region of 55 KDa correspond to globulins **(Abugoch et al., 2008)**. Those around the region of 31-33 KDa correspond to chenoprotein while the bands below 20 KDa correspond to albumin **(Elsohaimy et al., 2015)**. **Limoń et al. (2014)** also coroborated that germination process led to gradual hydrolysis of kidney beans protein which was mirrored in the disintegration or reduction in bulk of some protein bands, and the emergence of a smear of lower molecular weight polypeptides. **Portari et al. (2005)** were also able to identify six (6) bands in the elution of germinated chickpea with estimated molecular weight ranging between 55.0 to 23 KDa and another frail protein band above 60 KDa, which may signify undegraded mixtures. They further observed that the major polypeptides (38.5 to 55 KDa) showed little activity with germination until about the sixth day of germination, meanwhile the protein bands between 20 and 30 KDa and above 60 KDa appear to have undergone greater dissociation during

germination. They also observed degradation of the storage protein and increase in proteolytic activity as a result of germination for chickpea just like for solojo cowpea. **Ricci et al. (2018)**, in their work with five legumes, observed notable band in all samples in the region of 70 KDa, linked with convicilline and 32 KDa, these falls within the observed band region of our samples. They also observed that all the samples they worked with, similarly showed very frail bands at lower molecular mass, the better detectable among them is between 15 – 16 KDa and can be assigned to γ – vicilin.

Experimental

MATERIALS AND METHODS

Two varieties of the underutilized cowpea (V. unguculata) found in South west region of Nigeria where it is called 'Solojo' were used. Seeds obtained from Bodija market in Ibadan, Western Nigeria, were screened to get rid of every irrelevant materials and unwholesome seeds. The beans were then portioned into six (6). The Solojo seeds for germination were sterilised by soaking in 0.07 % Sodium hypochlorite (Rumiyati et al., 2012) for 30 min, then, it was rinsed thoroughly. The Solojo seeds were then immersed for 6 h in distilled water at ambient temperature (1:10 w/v) (~25oC), then placed in a colander and germinated under subdued light in an open laboratory (Rusydi, 2011) for, 24, 36, 48 and 72 h.

Preparation of Flours

Raw flour: The grains were segregated to remove the spoilt ones; then dry dehulled with a mechanical dry dehuller (Fabricated in FIIRO), dried at 40^{o}C and later milled dry to powder then sifted using 80 µm mesh. The flour was stored in flexible bags and preserved at 4^{o}C preceding utilization in a refrigerator freezer.

6 h Soaked flour: The seeds were segregated to remove the unwholesome ones, then immersed for 6 h in the ratio (1:10 w/v) (seed/water). The grains were then frozen to prevent germination from setting in, then the hull was removed manually, dried for 48 h at 40oC later milled dry to smooth powder prior to sieving using 80 µm mesh screen. The resulting flour was packaged in plastic pack and preserved in a fridge- freezer at 4oC pending utilization.

Germination of seed: This was implemented by the method of **Mubarak (2005)** with minor adjustment. The seeds for germination were disinfected by soaking in 0.07 % Sodium hypochlorite **(Rumiyati et al., 2012)** for 30 mins, then, it was rinsed painstakingly. The Solojo seeds were then immersed for 6 hours at ambient temperature in water in the ratio (1:10 w/v) (seed/water) (~25oC), then placed in a colander and germinated under subdued light in an open laboratory **(Rusydi, 2011)** for various h, 24, 36, 48 and 72 h. The process of germination was terminated by freezing, the seeds were manually dehulled, dried in a draught oven (Schutzart DIN EN 60529-IP 20. Memmert, Germany) at 40^{o}C for 48 h, cooled, milled and packaged in an air tight plastic bag in the refrigerator pending analysis.

Figure 1: Dark- Ash Solojo Cowpea (Vigna unguiculata)

SDS- PAGE Electrophoresis

Sample Treatment

Flour/protein isolates (20 mg) were mixed in 1.5 mL of borate buffer, vigorously vortexed to make a homogenous solution which was then incubated at 37°C for 2 hours accompanied by centrifugation at 4,000 xg for 15 minutes. The clear supernatant was then transferred to a sterile 1.5 mL micro-centrifuge tube and stored at 4°C overnight. For sample treatment, 30 µL protein isolate extracts were mixed with 70 µL of Laemmli sample buffer while 50 µL defatted flour extracts were mixed with 50 µL of Laemmli sample buffer. The resulting mixture was vortexed, incubated at 95°C for 15 minutes and centrifuged at 13000 rpm for 1 min. The clear supernatant (10 µL) was analyzed using Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis. Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis **(Azevedo and Arruda, 2010).**

Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis (SDS-PAGE) was carried out using the Cleaver Scientific VS10WCBS OmniPAGE unit. The unit which consists of glass plate sandwich, a casting frame, a casting base and an electrophoresis tank was assembled according to manufacturer's instructions. The glass plates were fixed with a spacing of 1 mm, slid into the casting frame and tightly clamped into the casting base with the two clamp levers of the casting base.

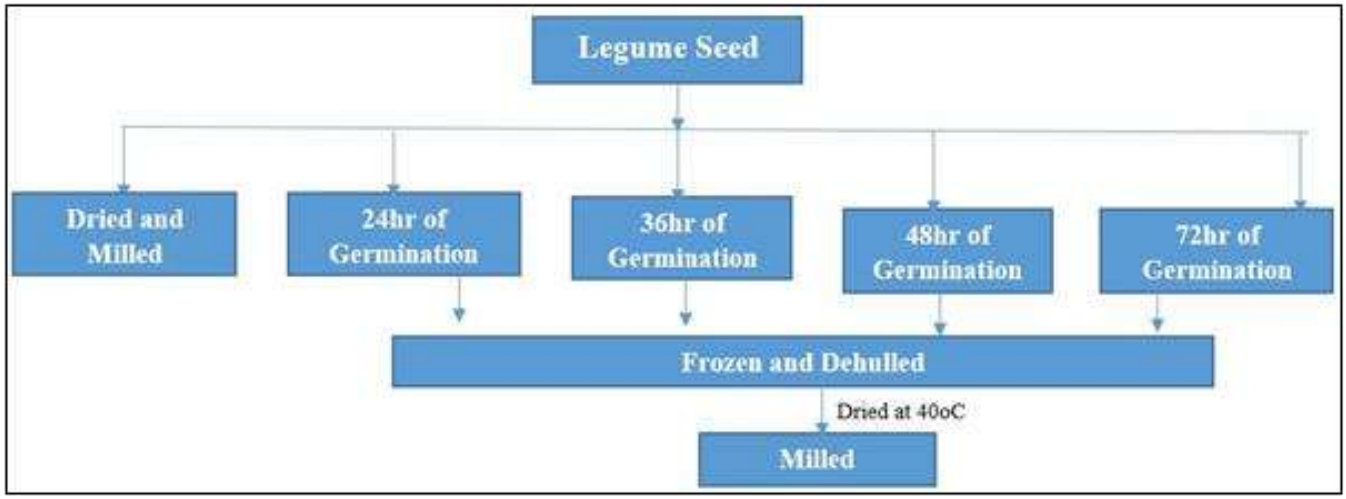


Figure 3: Preparation of Beans Flour/Schematic representation

Resolving gel (10 %) contained distilled water (2 mL), 1.5 M Tris-HCl, pH 8.8 (1.625 mL), 40% Acrylamide/Bisacrylamide Solution (1.25 mL), 20 % SDS (125 µL), 30 % Ammonium Per Sulphate (12.5 µL) and Tetramethylethylanediamine (5 µL). The resolving gel was carefully casted by pipetting into the 1 mm spacing of the glass sandwich. A layer water was added on top of the resolving gel to avoid drying and prevent air (oxygen), an inhibitor of polymerization. The unit stood for 30 -40 minutes for polymerization of gel. The layer of water was drained out and water droplets on the surface of the gel removed with a filter paper.

Stacking gel (4 %) contained distilled water (1.95 mL), 1.0 M Tris-HCl, pH 6.8 (250 µL), 40% Acrylamide/Bisacrylamide Solution (250 µL), 20 % SDS (50 µL), 30 % Ammonium Per Sulphate (8 µL) and Tetramethylethylanediamine (4 µL). The stacking gel mixture was carefully casted by pipetting, the combs inserted and stood for 30 mins to polymerize. Upon polymerization, the casting apparatus was disassembled, and casting frame inserted into the electrophoresis tank. The running buffer was then poured onto the apparatus filling the lower portion of the casting frame and glass cassette and fully immersing the inner chamber to cover the comb, the comb was then gently removed leaving perfectly casted wells. Treated samples (10 µL) were carefully loaded onto each well without spilling into neighboring wells. Pre- stained 200 kDa New England Biolabs protein marker (5 µL) was run as a standard. The electrophoresis was run on the Cleaver Scientific power Pro -300, at a constant current of 100 volts for 20 minutes for stacking and 160 volts for 1 h 15 mins for separation. Afterwards the casting chamber was taken out of the electrophoresis tank, and the gel cassette was gently disassembled. The stacking gel was cut-off using a spatula and the separating gel was immersed in the staining solution. Staining was done using Coomassie brilliant blue G-250 for 2 hours on an orbital shaker, thereafter the stain was decanted off, and the gel was immersed in the de-staining solution of 25% methanol on the shaker. Destaining was done until the bands were visible. The stained gel image was viewed and documented on Cleaver Scientific Omni-Doc system **(Rapala Kozik et al., 2007; Salaam, 2014).**

RESULT AND DISCUSSION

Moisture content	Crude Protein	Crude Fat	Crude Fiber	Ash (%)	Carbohydrates (%	Dry Matter	Bulk Densit	Water Absorptio	Oi l	Swellin g	Foam Capacity
9.05-9.85	26.50-29.00	2.50-4.00	2.90-3.25	4.20-4.85	50.90-54.00	90.20-90.90	0.70-0.82	1.85-2.20	1.90-2.35	260-270	9.00-22.00

Table 1: **Physico-functional Characteristics of Nigeria Cultivated Solojo Cowpeas**

Those physico-chemical properties that dictates the reaction in foods of protein at the time of preparation, storage and consumption are known as functional properties. These properties of proteins are capable of being grouped into three major categories according to the mechanism of their action: (i) hydration relating properties (solubility, water and oil absorption).

(ii) protein make up and rheological attribute associated properties (gelation, viscosity, elasticity), and (iii) protein surface characteristics (foaming, emulsifying). Food quality, processing, applications, and acceptance are influenced by the reaction of protein with other functional components directly or indirectly. The final product quality and usefulness in any food system is affected by solubility, water imbibition, gelation, surface activity, swelling, and viscosity.

Table 2: Essential Amino Acid of Dark ash Solojo flour.

EAA	Raw	6 h	24 h	36 h	48 h	72 h	FAO/WHO (1991)
Lysine	6.85	6.92	7.16	7.30	7.79	7.91	5.8
Histidine	3.10	3.19	3.30	3.50	3.62	3.70	1.9
Cysteine	1.10	1.18	1.2	1.38	1.80	2.0	
Methionin	0.65	0.70	0.7	0.75	0.86	0.8	
Threonine	4.75	5.01	5.2	5.27	5.61	5.8	3.4
Isoleucine	4.60	4.70	4.8	5.25	5.41	5.6	
Leucine	7.95	8.25	8.4	8.64	8.78	8.9	6.6
Tyrosine	2.22	2.98	3.3	3.31	3.64	3.8	
Phenylala	4.85	4.98	5.0	5.18	5.24	5.5	
Valine	5.25	5.71	5.80	6.05	6.62	6.38	3.5

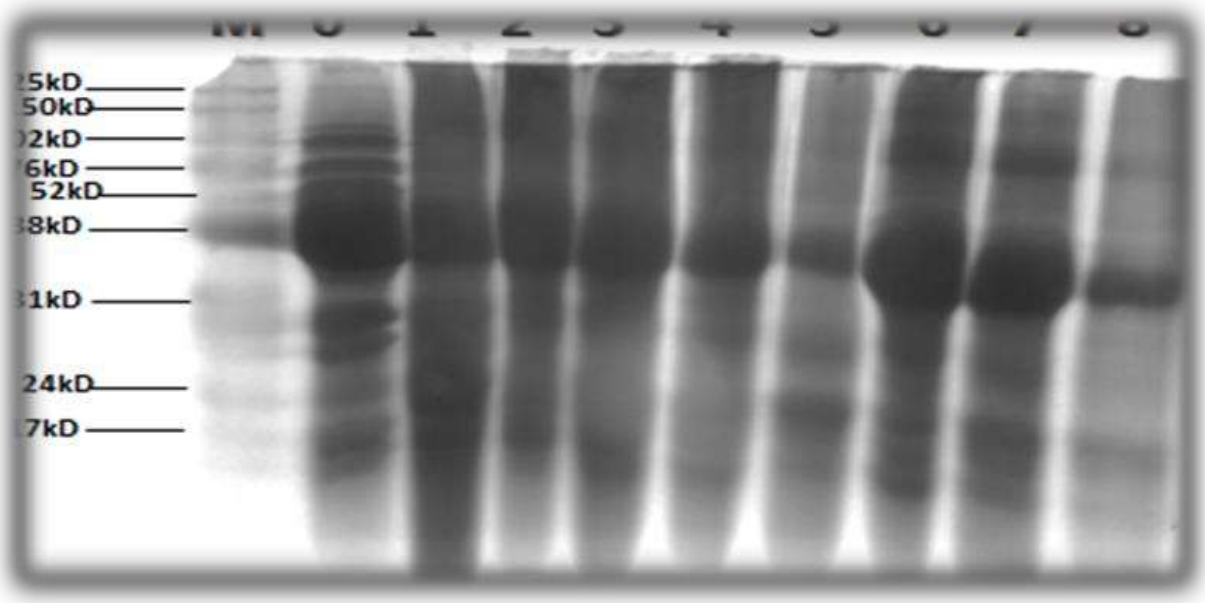
EAA: Essential amino acid

Table 3: Non –essential amino acid for Dark ash Solojo flour

EAA	Raw	6 h	24 h	36 h	48 h	72 h
Arginine	5.80	6.38	6.74	7.05	7.20	7.30
Aspartic	11.40	11.52	11.66	11.85	11.93	12.08
Sarine	6.55	6.85	7.06	7.14	7.20	7.24
Glutamic	14.95	15.20	15.32	15.42	15.60	15.70
Proline	4.65	4.82	4.92	5.05	8.10	8.22
Glysine	7.59	7.69	7.89	8.02	8.21	8.22
Alanine	7.65	7.80	7.89	8.02	8.21	8.42

Non - EAA: Non - Essentail amino acid

Ability to dissolve is the most crucial functional property of any protein in order to be useful in food systems. Apart from this, some other abilities like emulsification, foaming, and gelation are solubility dependent. Solubility of protein is an expression of the thermodynamic demonstration of the balance occurring among protein-solvent as well as protein. It can also be expressed as having balance existing amidst hydrophilic (water loving) and hydrophobic (oil loving) reactions. The distribution of amino acid residue on the covering of proteins influences to a considerable magnitude the solubility of protein in aqueous buffer. The hydrophilic (polar) and hydrophobic (non-polar) composition. Hydrophobic (oil loving) residuals are majorly obtained in the protein globular core, but could also be found in bits on the covering. Proteins with high hydrophobic (oil loving) amino acid composition on the surface possess low dissolving power in water.



4: SDS-PAGE Electrophoresis result for DAS and BS

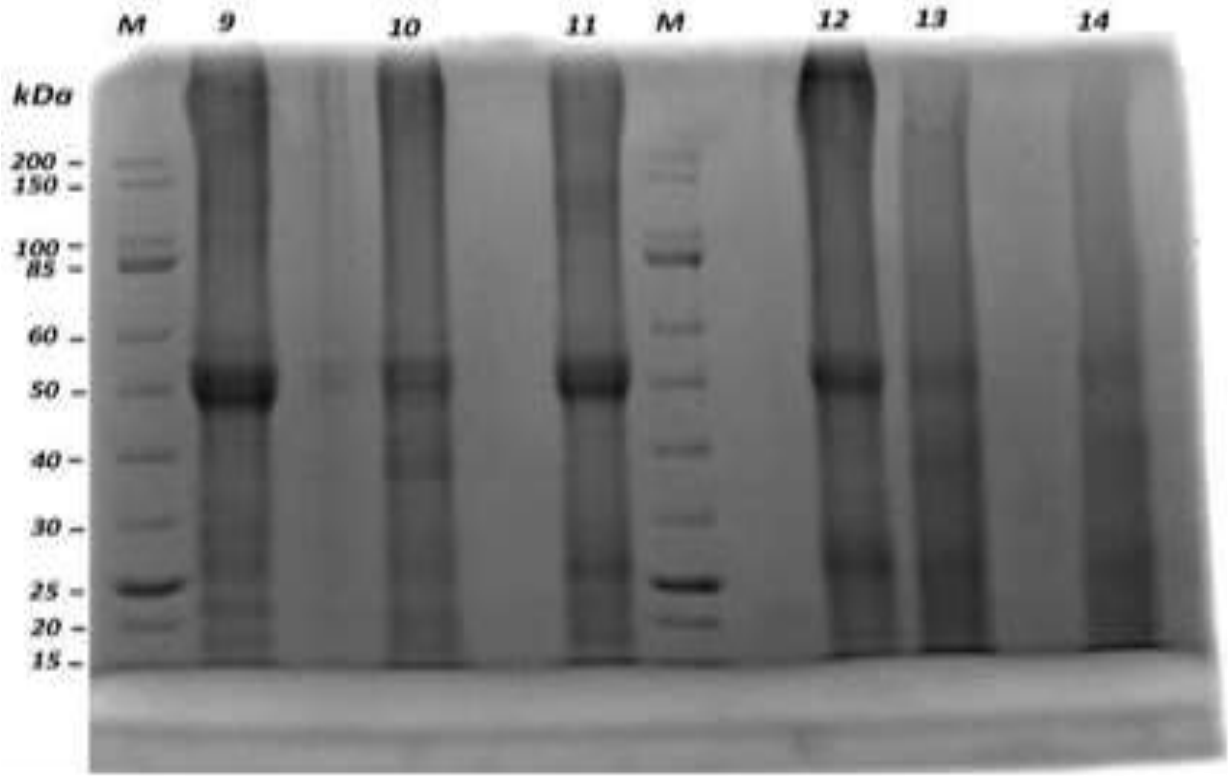


Figure 5: SDS-PAGE Electrophoresis result for DAS and BS continued

Table 4: Amino assay of Brown Solojo Cowpea Flour (E.A.A)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h	FAO/WHO (1991)
Lysine	6.97	7.08	7.20	7.35	7.88	8.20	5.8
Histidine	3.40	3.44	3.76	3.85	3.89	4.05	1.9
Threonine	5.10	5.25	5.44	5.55	5.70	5.90	3.4
Cysteine	1.35	1.38	1.52	1.73	1.91	2.28	
Valine	5.84	5.89	6.00	6.20	6.48	6.69	3.5
Methionine	0.65	0.70	0.75	0.80	0.86	0.91	
Isoleucine	4.65	4.69	4.85	4.98	5.01	5.40	2.8
Leucine	8.79	8.96	9.11	9.20	9.38	9.50	6.6
Tyrosine	3.29	3.31	3.31	3.48	3.48	3.97	
Phenylalanine	4.90	5.01	5.15	5.28	5.45	5.60	

EAA- Essential Amino Acid

Table 5: Amino assay of Brown Solojo Cowpea Flour (NAA)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h
Arginine	6.40	6.52	6.88	7.21	7.40	7.51
Aspartic acid	12.40	12.50	12.66	12.77	12.96	12.60
Serine	7.09	7.11	7.20	7.39	7.55	7.81
Glutamic acid	15.07	15.21	15.49	15.54	15.78	15.95
Proline	4.70	4.98	5.06	5.15	5.25	5.40
Glycine	7.65	7.85	7.98	8.11	8.24	8.34
Alanine	7.77	7.98	8.06	8.28	8.37	8.51

Table 6: Amino assay of Dark ash Solojo Cowpea Isolate (EAA)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h	FAO/WHO (1991)
Lysine	6.90	6.98	7.28	7.40	7.89	8.19	5.8
Histidine	3.38	3.40	3.52	3.59	3.78	3.84	1.9
Threonine	4.40	4.42	4.48	4.53	4.82	4.93	3.4
Cysteine	0.90	0.97	1.11	1.24	1.38	1.52	
Valine	5.55	5.80	5.92	6.20	6.39	6.51	3.5
Methionine	0.75	0.88	0.97	1.05	1.12	1.15	
Isoleucine	4.50	4.56	4.69	4.82	5.17	5.65	2.8
Leucine	9.50	9.69	9.09	10.03	10.27	10.50	6.6
Tyrosine	1.80	1.99	2.07	2.16	2.32	2.40	
Phenylalanine	5.60	5.68	5.70	5.78	5.84	5.95	

Table 7: Amino assay of Dark ash Solojo Cowpea Isolate (NAA)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h
Arginine	7.00	7.25	7.59	7.10	7.36	7.62
Aspartic acid	13.05	13.14	13.224	13.243	13.435	13.65
Serine	6.46	6.58	6.69	6.77	6.88	6.98
Glutamic acid	15.92	16.06	16.221	16.419	16.690	16.80
Proline	4.94	5.09	5.28	5.40	5.60	5.81

Table 8: Amino assay of Brown Solojo Cowpea Isolate (EAA)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h	FAO/WHO (1991)
Lysine	7.04	7.20	7.28	7.42	7.93	8.32	5.8
Histidine	3.58	3.65	3.71	3.78	3.84	3.90	1.9
Threonine	4.90	5.00	5.20	5.30	5.55	5.78	3.4
Cysteine	1.20	1.24	1.24	1.38	1.52	1.66	
Valine	6.00	6.07	6.13	6.29	6.61	6.62	3.5
Methionine	0.78	0.92	1.02	1.10	1.18	1.22	
Isoleucine	4.74	4.80	4.87	5.07	5.39	5.78	2.8
Leucine	9.63	9.78	9.98	10.18	10.29	10.38	6.6
Tyrosine	2.10	2.17	2.32	2.38	2.42	2.51	
Phenylalanine	5.65	5.70	5.80	5.88	6.05	6.23	

Table 9: Amino assay of Brown Solojo Cowpea Isolate (Non –essential amino acid)

g/100 g	Raw	6 h	24 h	36 h	48 h	72 h	Soy
Arginine	7.19	7.35	7.75	7.83	8.04	8.12	8.93
Aspartic acid	13.10	13.28	13.30	13.45	13.62	13.82	13.64
Serine	6.75	6.82	6.98	7.08	7.18	7.29	3.70
Glutamic acid	16.14	16.83	16.51	16.69	16.87	17.02	21.60
Proline	5.05	5.12	5.35	5.55	5.76	5.98	3.02

Increased solubility is often brought about by the interaction of charged and hydrophilic surface residues having other ionic assemblage in the solvent. Protein solubility is also influenced by pH, its lowest at the isoelectric point, which makes surrounding pH a very crucial component when discussing the extent of protein solvation. Other control protein solubility in food are, freezing, heating, ionic-strength, drying

as well as shearing. Proteins are insoluble and not suitable for food utilization, therefore, its of uttermost importance that denaturation is especially that of heating, so that protein solubility is influenced negatively.

CONCLUSION

This research work shows that biochemical modification (Germination/Malting/ Sprouting) had an enormous impact on the nutritional composition, functional properties, mineral bioavailability, anti-nutrient content and amino assay of Solojo bean, thus, it could be used as protein supplement in infant, young children and geriatric foods.Efforts should be increased to promote the cultivation, encourage the consumption and industrial application of this under-utilized legume by the Government, especially in the south-western region where it can survive the rain fall level. Large scale production of this legume which is gradually going into extinction should be encouraged in order to fight the menace of malnutrition in developing countries where animal protein price is exorbitant; This will ensure food security and also creation of jobs, because people can engage in different aspects of the production process and thereby reducing the rate of unemployment.

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