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Research Paper

Physico-chemical and pasting properties of starches from cassava, sweet potato and three leaf yam and their application in salad cream production

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Abstract. Salad cream was prepared from starches of cassava, sweet potato and three leaf yam. The starches were evaluated for functional, chemical and pasting properties and also used for the production of salad cream. Proximate composition and sensory analysis were determined on the salad cream. Functional properties of the starches gave values of 1.0 to 2.0 g/ml for water absorption capacity. A swelling power of 13.00 to 15.25% and solubility of 6.20 to 10.81% was observed, with three leaf yam starch having the highest value. Dispersibility result were 80 to 86% while colour index were 87.77 to 90.72%. The least gelation concentration for all the starches was 10%. Pasting properties of the starches showed that peak, breakdown, final and set back viscosities were 7051.5 to 13408 RVU, 3558 to 16123 RVU, 3977 to 4933 RVU and 668 to 1649 RVU respectively, with cassava starch as least and sweet potato starch as the highest in all cases. While trough viscosity values were 2852 to 3395 RVU, with the three leaf yam starch as the highest and cassava starch as lowest. Pasting time ranged from 4.37 to 5.47min, with sweet potato starch having the least and three leaf yam starch having the highest pasting time. Pasting temperature ranged from 70.20 to 77.03°C. Proximate composition showed cassava starch based salad cream to have the highest moisture of (58.96%), while protein and carbohydrate had 0.17 to 0.46% and from 16.04 to 37.18% with cassava starch having the least and control as highest respectively. Three leaf yam starch based salad cream had the highest ash content of 2.30% and lowest fat content of 21.08% protein and fat contents showed no significant difference ($p > 0.05$), while total available carbohydrate (TCA) was highest in the control as it was significantly different ($p < 0.05$) from all others samples. Sensory analysis result showed no significant difference ($p > 0.05$) in color, taste, texture and spreadability.

Keywords: Physico-chemical, pasting, starches, proximate, sensory, salad cream.

INTRODUCTION

Starch is one of the most abundant substances in nature and a polymer of alpha glucose. It is a carbohydrate consisting of a large number of glucose unit and the major reserve polysaccharide of higher plants (Brown and Poon 2005). It is the most common carbohydrate in the human diet and is contained in large amounts in such staple food as potato, wheat, maize (corn), rice, three leaf yam and cassava. Starch is heterogeneous in relation to both polymer structure and polymer molecular weight. Pure starch is a white, tasteless and odorless powder that is insoluble in cold water or alcohol. Depending on the plant, starch generally contains 20 to 25% amylose and 75 to 80% amylopectin by weight (Brown and Poon, 2005). As an additive for food processing, food starches are typically used as thickeners and stabilizers in foods such as puddings, custards, soups, sauces, gravies, pie fillings, and salad dressings, and to make noodles and pastas. It serves as an energy giving foods but also can readily be converted chemically, physically and applied in diverse industries such as papers, textiles, adhesives, beverage, confectionery, building materials and pharmaceuticals (Starch Wikipedia the free encyclopedia).

Cassava (*Manihot esculenta crantz*) is an important staple food for people in Nigeria who depend on it as a major source of carbohydrate, most of which is derived from starch. It is an important source of food in the tropics. Cassava plant gives the highest yield of carbohydrates. The crop is principally used as human food either fresh, boiled, baked, fried, pounded or in numerous processed forms (Lancaster et al., 1982). Cassava is of growing importance, as human food products which include garri, fufu, tapioca, flour and animal feed as well as raw material for producing starch, starch-based products and starch derivatives which also finds industrial application.

Sweet Potato (*Solanum tuberosum* L.) a food and livestock feed all over the world is known for its carbohydrate content with its predominant form as starch. It has since spread around the world and has become a staple crop in many countries (FAO, 1989). Potato starch is used in many recipes, for example in noodles, wine, gums, cocktail nuts, potato chips, hot dog sausages, bakery cream and instant soups and sauces. These typical properties are used in food and technical applications (James and Roy, 2009), but the agronomic and nutritional potentials identified with the sweet potato crop are still under-exploited in Africa and Nigeria (Akoroda and Egeonu, 2009).

In the tropics, the fresh roots are commonly boiled, fried or roasted and eaten as a carbohydrate constituent of the diet. The tubers are sometimes sliced and sun-dried to produce chips, which are later ground into flour and also used as starch.

Three leaf yam *(Dioscorea dumentorum*) one of the 600 species of the family of yam (Onuegbu et al., 2011) is a plant that grows in Africa and known as “ona” among the Igbo speaking people of southern Nigeria even though it is has been underutilized. It has a fleshy, potato-like root (tuber) and is a source of carbohydrates. The roots are used for food in times of famine; the dried tubers are used for flour, starch in pharmaceuticals and other food purposes (Starch Wikipedia the free encyclopedia).

Salad cream is a creamy, yellow condiment based on an emulsion of about 25 to 50% of oil in water emulsified by egg yolk and coloring. Salad cream contains 30 to 40% vegetable oil accounting for 35% of the production of all dressings, mayonnaise and sandwich spreads. Mixture of vegetable is prepared with various ingredients of which modified flour serves as the base raw material (Turgeon et al., 1996). For people not too familiar with salad cream, the condiment is probably similar to mayonnaise in terms of composition and texture. The major ingredients of salad cream include: egg yolk, mustard, vinegar, vegetable oil and sugar. Many salad creams are also lightly seasoned, coming in a variety of flavor to cater for various palates depending on the brand and style (Turgeon et al., 1996).

Corn starch has been the starch of choice for the preparation of salad cream sold in the market here in Nigeria and beyond. Other types of starches like sweet potato, cassava and three leaf yam can also be used as alternatives in the preparation of salad cream. The objectives of this work are to:

i) Extract and evaluate the functional, chemical and pasting properties of cassava, sweet potato and three leaf yam starches
ii) Prepare salad cream from cassava, sweet potato and three leaf yam starches.
iii) Evaluate the proximate and sensory properties of salad cream produced from these starches.

MATERIALS AND METHODS

Cassava root were obtained from the Rivers State Agricultural Development Programme (ADP) 24 h after harvest. Sweet Potato tubers were obtained from mile 3 market in Port Harcourt and three leaf yam tubers were obtained from Elimgbu Town in Obio Akpor Local Government Area of Rivers State, Nigeria and processed within 24 h after harvest.

Chemicals

Chemical used for the analysis were obtained from the Biochemistry Laboratory, Department of Food Science and Technology, Rivers State University of Science and Technology. All chemicals used for this study were of analytical grade.

Extraction of starch

The method described by Osunsami et al. (1984) with slight modification was used for the extraction of various starches as shown in Figure 1. The cassava, sweet potato and three leaf yam tubers were harvested and washed to remove soil and dirt from the skin, then peeled using a kitchen knife. The peeled roots were washed, blanched (sweet potato and three leaf yam only), grated and sieved by washing off in a basin of water. The

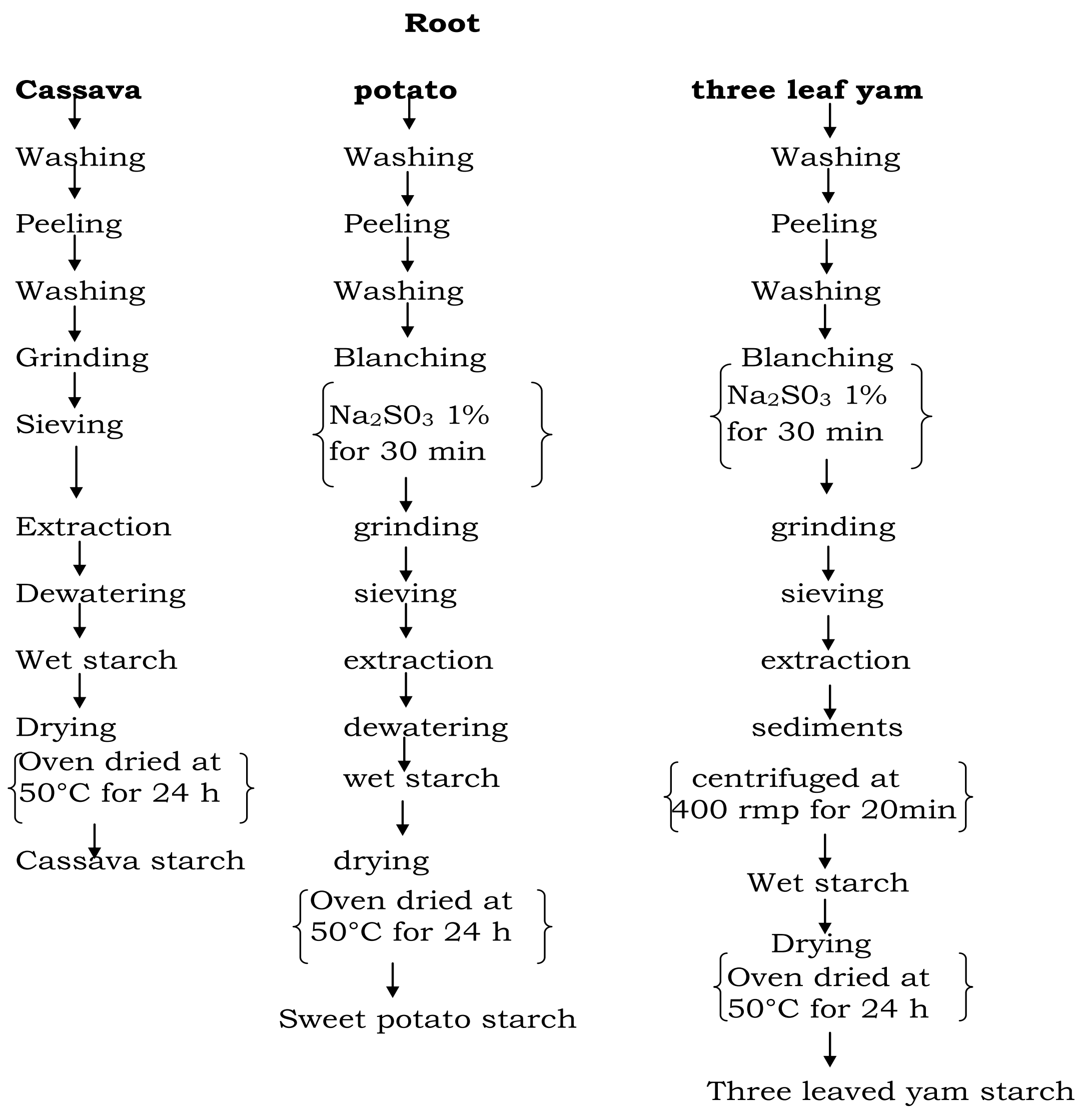

Figure 1. Flow chart for the production of cassava, sweet potato and three leaf yam starches. Source: Osunsami et al. (1998) (modified).

mixture was filtered through a fine mesh sieve (Muslin cloth). The filtrate was allowed to settle and the supernatant was decanted and sediment obtained (cassava and potato) while three-leaf yam was difficult to sediment and so centrifuged at 4000 rmp for 20 min in order to obtain the wet starch. The cassava, potato and three-leaf yam wet starches were thinly spread on tray and oven dried in a hot air oven for 24 h at 50°C. The starch obtained was a white odorless and tasteless starch.

Recipe for salad cream production

Starch 154 g, mutard paste 20 g, salt 90 g, sugar 36 g vinegar 375 ml, water 90 ml, vegetable oil 625 ml and 2 egg yolk.

Preparation of salad cream

Dry cassava, sweet potato and three-leaf yam starches were reconstituted in water respectively. Vinegar, salt, sugar and mustard were added according to the recipe and then cooked until gelatinization occurred. The translucent gel was cooled and blended in a warring blender for one minute after which egg yolk and vegetable oil were added and blended for another five minutes. The resultant salad cream was poured into a covered container respectively and stored for analysis.

Functional properties of starches

Dispersibility of starches was determined using the method described by Kulkani et al. (1991). Swelling power and solubility were determined by the method of Takashi and Sieb (1988) while water/oil absorption capacities were determined by the method of Sosulski (1962) with slight modification. Least gelation concentration was determined by the method of Coffman and Garcia (1977). Starch and sugar were determined by the method described by Dubois et al. (1955). Colour was determined by the method of Francis (1998).

Determination of amylose content was done using the method of Williams et al. (1970), while amylopectin was determined by difference. Pasting properties were determined with a rapid visco analyzer (RVA, model 3C, Newport Scientific PTY Ltd, Syndney) as described by Sanni et al. (2004).

Chemical analysis of salad cream

The moisture and ash content of the salad cream samples were determined using the air oven method as described by the AOAC (1990) method, while total available carbohydrate (TCA) was determined by method of Clagg Anthrone (1956). Crude protein was determined by difference. Crude fat was determined by the method of AOAC (1990). Starch and sugar were determined by the method of Dubois et al. (1956). Viscosity in pascal second (pa.s) of salad cream samples were determined with the aid of a rotary digital viscometer (model NDj-85) using spindle number 4 at 0.6, 1.5 and 3.0 rpm, respectively.

Sensory evaluation

Sensory analysis was done on the salad cream using a 5 point rating. The salad cream samples made from cassava, three leaf yam, and sweet potato based starches were presented using commercial salad cream as a control for sensory evaluation. Twenty (20) untrained panelist who were familiar with salad cream and were neither sick nor allegic to dressings were involved in the assessment. The samples were rated for colour/appearance, odour, taste, texture, spreadability and general acceptability.

Statistical analysis

All data obtained from various analysis were subjected to analysis of variance (ANOVA) using the Statistical Package for Social Science (SPSS) version 15.0. Means were separated using new Duncan's multiple range tests (Duncan, 1955) at 95% confidence level ($p < 0.05$). Determinations were carried out in triplicates.

RESULTS AND DISCUSSION

Functional properties of starches

The functional properties of cassava, sweet potato and three leaf yam starches are presented in Table 1. Water absorption capacity of the starches were 1.0 to 2.0 g/ml with cassava starch having the lowest and potato the highest. This is in agreement with the findings of Omodamiro et al. (2007) who reported 0.5 to 2.0 g/ml. Niba et al. (2001) described water absorption capacity as an important processing parameter that has implications for viscosity. Furthermore, water absorption capacity is important in bulking and consistency of products. Increase in water absorption capacity in food systems enables end users to manipulate the functional properties of the dough in the bakery products.

Oil absorption capacity of starches was 1.0 g/ml for all the samples. Oil absorption capacity of 1.0 g/ml for the entire sample falls within the range reported by Omodamro et al. (2007) which reported 1.0 to 2.5 g/ml. Oil absorption is an important property in food product development because it imparts flavour and mouthfeel to foods.

Swelling power were 6.20 to 10.81% with Sweet Potato starch recording the lowest and three leaf yam starch the highest. The result falls within the findings of Eke-Ejiofor and Owuno (2012) who reported 7.06 to 10.90%. Safo-Kantanka et al. (1996) stated that the swelling power of a starch based food is an indication of the strength of the hydrogen bonding between the granules. Swelling is a measure of swollen starch granule and food eating quality is connected with retention of swollen starch granules (Richard et al. 1991). Furthermore, the report described swelling power as a factor of the ratio of amylose to amylopectin, while Solubility values ranged from 13.00 to 15.25% with sweet potato being the lowest and three leaf yam starch the highest. This is in agreement with the findings of Eke-Ejiofor and Owuno (2012) who recorded a solubility of 12.64 to 13.73% and Eke-Ejiofor and Owuno (2014) 13.00 to 14.00% for cassava and potato starches. Solubility reflects the extent of intermolecular cross bonding within the granule (Hari et al., 1989).

Dispersibility values ranged from 80 to 85% with sweet potato Starch having the lowest and cassava starch the highest. This is in agreements with the finding of Eke-Ejiofor and Owuno (2014) who reported a value of 84 to 86% for cassava and sweet potatoe starches. Dispersibility determines the tendency for flour to move apart from water molecules and reveals its hydrophobic action. Kulkani et al. (1991) reported that the higher the

Table 1. Functional properties of cassava, sweet potato and three leaf yam starches (%).

Sample	Water absorption	Oil absorption	Swelling power	Solubility	Disperbility	Colour	Least gelation conc
Cassva	1.00 ± 0.00[a]	1.00 ± 0.00[a]	9.95 ± 0.01[b]	13.73 ± 0.01[b]	86.00 ± 0.00[a]	90.72 ± 0.21 [a]	10.00 ± 0.00[a]
Sweet potato	2.00 ± 0.00[a]	1.00 ± 0.00[a]	6.20 ± 0.01[c]	13.00 ± 0.00[a]	80.00 ± 0.00[a]	87.77 ± 0.64[b]	10.00 ± 0.00[a]
Three leaf yam	1.20 ± 0.00[a]	1.50 ± 0.71[a]	10.81 ± 0.01[a]	15.25 ± 0.01[a]	81.00 ± 0.00[a]	88.13 ± 1.37[b]	10.00 ± 0.00[a]

Means in the same column bearing same superscripts are not significantly different ($p > 0.05$).

Table 2. Chemical properties of cassava, sweet potato and three leaf yam starches (%).

Sample	Moisture content	Ash content	Protein content	Fat content	Carbohydrate	Fiber	Sugar	Amylose	Amylopection	Starch
Cassava	8.75 ± 0.01[a]	0.26 ± 0.11[b]	0.10 ± 0.00[a]	0.79 ± 0.35[b]	89.38 ± 1.22[a]	1.50 ± 0.09[a]	0.96 ± 0.64[b]	26.73 ± 0.13[b]	73.28 ± 0.13[b]	66.16 ± 0.82[a]
Sweet Potato	8.69 ± 0.01[b]	0.44 ± 0.42[a]	0.10 ± 0.00[a]	0.37 ± 0.01[c]	88.13 ± 2.11[a]	2.66 ±1.56[a]	0.57 ± 0.64[c]	29.53 ± 0.45[a]	70.47 ± 0.45[c]	56.98 ± 1.12[b]
Three leaf yam	8.31 ± 0.28[c]	0.15 ± 0.01[c]	0.13 ± 0.00[a]	3.85 ± 0.01[a]	74.65 ± 8.19[a]	12.93 ± 8.20[a]	1.56 ± 0.42[a]	16.09 ± 0.18[c]	84.04 ± 0.23[a]	57.08 ± 1.20[b]

Means in the same column bearing same superscripts are not siificantly different ($p > 0.05$).

dispersibility, the better the starch reconstitutes in water to give a fine and consistent paste.

Color analysis of samples ranged from 87.71 to 90.92% with sweet potato starch having the lowest and cassava starch the highest. The value for color of the cassava is higher than potato and three leaf yam starch. This could be as a result of difference in origin of the crops. Starch extracted under perfect condition is pure white in colour and is an important criteria for starch quality. Moorthy (1985) reported that the color of starch will determine its clarity when cooked and that clarity depends on the associative bonds between the starch molecules in the granules.

Result of least gelation concentration for cassava, sweet potato and three leaf yam starches was 10% for all. The least gelation concentration can be described as a measure of the minimum amount of starch or blends of starch that is needed to form gel in a given volume of water. The higher the least gelation concentration, the higher the amount of the starch needed to form a gel (Adebowale, 2002).

Chemical properties of cassava, sweet potato and three leaf yam starches

The chemical properties of cassava, sweet potato and three leaf yam starches are presented in Table 2. Moisture content. ranged from 8.32 to 8.75% with three leaf yam starch as the lowest and cassava starch the highest. This is in agreement with the findings of (Eke-Ejiofor and Owuno, 2012) who reported moisture content of 7.36 to 11.42%, and falls within the range recommended for a good shelf life of starch. The lower the moisture content of the starches the better the keeping quality.

Ash content ranged from 0.15 to 0.44% with three leaf yam starch being lowest and sweet potato starch the highest. The amount of inorganic constituent present as measured by the ash content, conveys an impression of the quality of metal ions bound to the raw material (FAO, 1977).

Protein and fibre contents ranged from 0.10 to 0.13% and 1.50 to 12.93% with cassava starch as three leaf yam starch as highest respectively.

Fat content ranged from 0.38 to 3.85% with sweet potato starch as lowest and three leaf yam starch as the highest. This is close to the value of 1.72 to 3.37% reported by Eke-Ejiofor and Owuno (2012).

Total available carbohydrate (TAC) ranged from 74.65 to 89.38% with three leaf yam starch as the lowest and cassava starch as the highest. This is in agreement with the findings of Richard et al. (1991) who reported 86.2 to 89.71% for carbohydrate. Carbohydrate is the major nutrient component of cassava, sweet potato and the

Table 3. Pasting properties (RVU) of cassava, sweet potato and three leaf yam starches.

Sample	Peak viscosity (RVU)	Trough viscosity (RVU)	Breakdown viscosity (RVU)	Final viscosity (RVU)	Set back viscosity (RVU)	Pasting time (MIN)	Pasting temp (°C)
Cassava	7015.5 ± 4.50[c]	2852.00 ± 7.07[a]	3558.00 ± 38.18[b]	3977.00 ± 28.28[b]	668.00 ± 28.28[a]	5.41 ± 0.00[a]	70.20 ± 0.21[c]
Sweet potato	13408.00 ± 74.95[a]	3284.00 ± 648.42[a]	16123.50 ± 30.89[a]	4933.50 ± 68.59[a]	1649.00 ± 579.83[a]	4.37 ± 0.05[b]	77.03 ± 0.53[a]
Three leaf yam	7625.00 ± 4.24[b]	3395.50 ± 58.69[a]	4229.50 ± 54.45[b]	4378.00 ± 248.90[b]	982.50 ± 190.21[a]	5.47 ± 0.00[a]	73.05 ± 0.43[b]

Means in the same column bearing same superscripts are not significantly different ($p > 0.05$).

lowest and three leaf yam roots of which 80% is starch. However, there were significant differences in chemical composition of cassava, sweet potato and three leaf yam starches ($p < 0.05$).

Sugar content ranged from 0.57 to 1.56% with sweet potato starch being the lowest and three leaf yam starch the highest.

Amylose content ranged from 16.09 to 29.53% with three leaf yam starch as the lowest and sweet potato starch as the highest. Amylopectin ranged from 70.47 to 84.04% with sweet potato the lowest and three leaf yam starch the highest. Amylose content in the present study falls within the range reported by Richard et al. (1991) which is 13.6 to 35.8% in cassava starch. Amlyose is the linear components of starch. It imparts definite characteristics to starch and therefore, its content is an important criteria in starch quality (Kurup, 1994).

Amylopectin ranged from 70.47 to 84.04 with Sweet Potato starch the lowest and three leaf yam the highest. The result of the present study is slightly higher than the findings of Eke-Ejiofor and Owuno (2012) which is 66.27 to 76.79%.

Starch content ranged from 56.98 to 66.10% with sweet potato starch having the lowest and cassava starch the highest. This result falls within the range (58.72 to 68.85%) reported by Eke-Ejiofor and Owuno (2012).

Pasting properties of cassava, sweet potato and three leaf yam starches

Table 3 shows the pasting properties of the various starches, such as peak, trough, breakdown, final viscosity, set back viscosity, pasting time and pasting temperature.

Peak viscosity ranged from 7015 to 13408 RVU and trough viscosity ranged from 2852 to 3395 RVU with cassava starch having the lowest and three leaf yam starch the highest value. Peak viscosity is indicative of the strength of the pastes which are formed from gelatinization during processing in food application and higher peak viscosity corresponds to a higher thickening power of the starch (Swinkles, 1985). Peak viscosity is the maximum viscosity developed during or soon after heating .

Breakdown viscosity ranged from 3558 to 16123 RVU and final viscosity ranged from 3977 to 4933RVU with cassava starch having the lowest and sweet potato starch the highest value. Breakdown viscosities reflects the stability of the peak viscosity during processing (Moothy, 1985). Final viscosity ranged from 3977 to 4933 RVU and setback viscosity ranged from 668 to 1649 RVU with cassava starch having the lowest and sweet potato the highest. This is in agreement with the above statement which states that final viscosities are important in determining processing, while setback viscosity indicates gel stability and potential for retrogradtion (Niba et al., 2001). This determines the ability to form gel during processing (Eke-Ejiofor and Kin-Kabari, 2010).

Pasting time ranged from 4.37 to 5.46 min with sweet potato starch recording the lowest and three leaf yam starch the highest.

Pasting temperature ranged from 70.20 to 77.03°C with cassava starch recording the lowest and sweet potato starch the highest. The attainment of the pasting temperature is essential in ensuring swelling, gelatinization and subsequent gel formation during processing. The pasting temperature is the temperature at which the viscosity starts to rise (Swinkels, 1985; Liang and King 2003). There were significant difference ($p < 0.05$) in the pasting temperature value of all the samples.

Proximate analysis of salad cream samples

Table 4 shows the proximate analysis results of salad cream stabilized with cassava, sweet potato and three leaf yam starches. Moisture content ranged from 39.98 to 56.96% with control (commercial salad cream) as the lowest and cassava salad cream the highest. The result of this analysis was higher than that reported by

Table 4. Proximate composition of cassava, sweet potato and three leaf yam starch based salad cream (%).

Sample	Moisture	Protein	Fat	Ash	Carbohydrate
Cassava	56.96 ± 0.02[a]	0.17 ± 0.57[b]	19.00 ± 12.64[a]	1.67 ± 0.13[b]	16.04 ± 0.06[c]
Sweet Potato	52.79 ± 0.78[b]	0.31 ± 0.23[a]	20.58 ± 1.41[a]	1.80 ± 0.28[b]	13.99 ± 0.72[c]
Three leaf yam	50.65 ± 1.56[b]	0.19 ± 0.21[b]	17.39 ± 3.97[a]	2.30 ± 0.11[a]	29.39 ± 3.97[b]
Control	39.98 ±1.65[c]	0.46 ± 0.06[a]	21.08 ± 3.71[a]	1.79 ± 0.63[b]	37.18 ± 0.69[a]

Means in the same column bearing same superscripts are not significantly different (P>0.05)

Table 5. Sensory evaluation scores for cassava, sweet potato and three leaf yam starch based salad cream.

Sample	Color appearance	Odour	Taste	Texture	Spread ability	General acceptance
Cassava	3.95[a]	3.35[a]	3.20[b]	3.95[a]	3.60[a]	3.80[a]
Sweet potato	3.35[a]	3.35[a]	3.20[b]	3.20[a]	3.45[a]	3.45[a]
Three leaf yam	3.35[a]	2.95[b]	3.35[a]	3.65[a]	3.50[a]	3.30[a]
Control	3.75[a]	3.75[a]	3.85[a]	4.00[a]	3.00[a]	4.00[a]
LSD	0.64	0.55	0.69	0.65	0.60	0.60

Means in the same column bearing same superscripts are not significantly different (p > 0.05). Key: LSD: Least significant difference

Babajide and Olatunde (2010), who reported moisture content of 48.80 to 49.79%. Eke-Ejiofor and Owuno (2014) also reported a moisture content of 57.84 to 64.88% for cassava and potato starch based salad cream.The lower moisture content of the control (commercial salad cream), may be attributed to the differences in starch origin and also an indication that the tuber starches could absorb more water than corn starches. Moisture provides a measure of the water content of the seed flour sample and its total solid content. Reduced moisture content implies better shelf life, storability and stability of product

Protein content ranged from 0.19 to 0.31% with three leaf yam as the lowest and control the highest. This findings falls within the range (0.23 to 0.35%) reported by Eke-Ejiofor and Owuno (2014) but lower than that reported by Babajide and Olatunde (2010) which was 2.63 to 3.28%. Fat content ranged from 17.39 to 21.08% with three leaf yam based salad cream as the lowest and control the highest. Babajide and Olatunde (2010) reported a fat content of 27.04 to 29.68% in corn-cocoyam starch salad cream. The higher fat content of the control sample (commercial salad cream) showed that more oil/fat based vegetable oil may have been used during preparation. Ash content ranged from 1.67 to 2.30% with cassava salad cream recording the lowest and three leaf yam based salad cream having the highest. Moisture, protein, fat and ash fell within the range reported by Ashaye et al. (2010) and Eke-Ejiofor and Owuno (2014). Carbohydrate content ranged from 13.99 to 37.18% with sweet potato as the lowest and control as the highest. Sweet potato has a low glycemic index, indicating low digestibility of the starch despite its high carbohydrate content.

Sensory evaluation of salad cream samples

Table 5 shows the sensory evaluation result of cassava, three leaf yam and sweet potato starch based salad cream and control (commercial salad cream). Color/appearance by physical examination ranged from 3.35 to 3.95 with the three leaf yam cream as the lowest and sweet potato cream the highest. Odour ranged from 2.95 to 3.7 with control (commercial salad cream) having the highest and three leaf yam cream the lowest taste ranged from 3.20 to 3.8 with cassava and sweet potato as the lowest (3.20) and control the highest. In terms of odour and taste, panelists rated salad cream from cassava, sweet potato and three leaf yam and control equally. Statistical analysis also revealed no significant difference (p > 0.05) almongst these samples. Texture ranged from 3.20 to 4.00 with control having the highest, while spreadability ranged from 3.00 to 3.60 with sweet potato having the highest and controls the lowest. Results showed no significant difference (p > 0.05) in color, texture and spreadability.

General acceptability ranged from 3.30 to 4.00 with control having the highest and three leaf yam having the lowest. Statistical examination showed no significant difference (p > 0.05) between the control and the salad cream from the other starches.

CONCLUSION

The results of this study have shown that three leaf yam starch had a comparative advantage over cassava and potato starches in terms of higher swelling capacity, solubility, protein, fat, fibre, sugar, peak viscosity and pasting time. These properties are expected to have positive impact on product when used for value addition. In addition, cassava, sweet potato and three leaf yam starch based salad cream compared favourably with the control, (commercial salad cream) interms of chemical and sensory properties especially salad cream produced from three leaf yam starch, which had a comparative low moisture, high ash and carbohydrate with protein and fat showing no significant difference amongst the samples. Apart from the control, the three leaf yam based salad cream was most preferred in terms of taste.

Cassava, sweet potato or three leaf yam starch can therefore be an alternative starches in the production of salad cream considering their starch whiteness, high viscocity and dry matter contents.

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