ISSN:2782-8484

FEDPOLAD Journal of Science & Agricultural Technology
(FEDPOLADJSAT); Vol. 4, ISSUE 1. OCTOBER, 2024 Edition
Website: https://seemjournals.fedpolyado.edu.ng/index.php/fedpoladjsat

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PHYTOCHEMICAL PROPERTIES AND IMPROVED QUALITIES USING BANANA (*Musa spp.*), LEAF OF LIFE (*Bryophyllum pinnatum*) AND PEAR LEAF (*Pyrus communis*) FLOUR BLENDS

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ABSTRACT
This study attempts to increase the nutritional composition of banana and its utilization through processing into more shelf stable products. Blends of banana flours with and without pear leaf and leaf of life flour were produced and analyzed for the phytochemical, glucans composition and functional properties at different ratios. The result of the phytochemical composition of flour blends ranged from 7.00 $\times 10^{-2}$ to 16.89 $\times 10^{-2}$ mg/g, 1.39 $\times 10^{-2}$ to 3.22 $\times 10^{-2}$ mg/g, 0.60 to 3.15 mg/g and 11.79$\times 10^{-2}$ to 15.58 $\times 10^{-2}$ mg/kg for phytate, oxalate, tannin and cyanide respectively. Sample BLP5 (80% Unripe banana, 10% Leaf of life and 10% Pear leaf) had the highest value for alpha glucan, beta glucan and total glucan content. The high glucans content could help to promote healthy body and regulate cell growth. The composite flour of 90% Banana and 10% pear leaf flour had higher functional properties which will help in further usage of the flour blends, especially in baking. The present research showed that it is possible to achieve a highly nutritious and good qualities gluten free flour by blend banana, leaf of life and pear leaf flour together.

Keywords: *Phytochemicals, Glucans, Unripe banana, Pear leaf, Leaf of life.*

1.0 INTRODUCTION

Banana pulp is rich in phenolic compounds such as carotenoids, flavonoids, and vitamins (B3, B6, B12, C, and E). Phenolic compounds and natural antioxidants in banana contributes to the storage stability and exerting health benefits as well as contributes to the astringency of green banana. Furthermore, bananas are rich in iron and potassium, magnesium, and other nutrient contents (Adeniji *et al*., 2007). Leaf of life (*Bryophyllum pinnatum*) contains bioactive compounds such as alkaloids, flavonoids, triterpenes, glycosides, steroids, lipids and organic acids. These compounds have antimicrobial, anti-inflammatory, anti-cancer, antihistamine, immunosuppressive, antiulcer, antihypertensive, central nervous system anti-depressant activities, among others (Fatima *et al*., 2016). The presence of flavonoids and other antioxidants in *Bryophyllum pinnatum* contributes to its potential antioxidant activity. Antioxidants help protect the body's cells from damage caused by free radicals and oxidative stress, which are associated with various chronic diseases and aging (Belewu and Abodunrin, 2006). Bryophyllum pinnatum has shown potential in managing diabetes. It contains compounds that can help regulate blood sugar levels and improve insulin sensitivity. The plant has immune-modulatory properties, meaning it can help regulate and strengthen the immune system (Jandonadi *et al*.2010). *Bryophyllum pinnatum* is known for its beneficial effects on the digestive system. It helps relieve gastrointestinal issues such as constipation, indigestion, and stomach ulcers. The plant

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is thought to possess gastro protective and antispasmodic properties. (Jandonadi *et al*.2010). Pear/avocado leaves are a good source of vitamins, including Vitamin C which is an important antioxidant that supports immune function, collagen synthesis, and iron absorption. Vitamin E which is a potent antioxidant that helps protect cells from oxidative damage and supports skin health and B Vitamins, including thiamin (B1), riboflavin (B2), niacin (B3), and folate (B9), which play crucial roles in energy metabolism, cell growth, and brain function. Pear leaves provide essential minerals that support various bodily functions such as Potassium which helps maintain fluid balance, supports proper nerve and muscle function, and contributes to heart health, Calcium which is essential for strong bones and teeth, proper muscle function, and blood clotting (Cantrell *et al*., 2019). Avocados are known to be high in antioxidants, but avocado leaves have even higher concentrations than the fruit. Avocado leaves have a compound called quercetin that removes free radicals from your body. Free radicals are the product of naturally-occurring degeneration in our bodies as a result of oxygenation. Antioxidants slow or even prevent this process from occurring, keeping our bodies healthier (García-Solís *et al*., 2009). One part of the avocado plant that has the potential as a natural antioxidant substance is avocado leaf (Fulgoni *et al*., 2013). Previous research has shown that avocado leaf has the potential as a natural antioxidant and positively contains alkaloids, flavonoids, saponins, tannins and steroids using methanol solution to hydrolyze and extract avocado leaf (Vinha *et al*., 2013). Effect of blending banana with pigeon pea flour on the composition and acceptability had been studied by Anuonye *et al.*, 2012. Blending of unripe banana flour with leaf of life and pear leaf will produce flour with improved nutritional composition as well as health benefit. The objectives of this study is to determine the phytochemicals, glucan content and functional properties of flour blends from unripe banana, pear leaf and leaf of life.

2.1 Materials

Unripe banana was purchased from “Bisi” market in Ado Ekiti. Pear life and leaf of life were obtained from a garden near The Federal Polytechnic, Ado Ekiti (Longitude and Latitude coordinate; 7.6053^{o}N, 5.2887^{o}E). All the reagents used were of analytical grade.

2.2 Methods

2.2.1 Production of matured unriped banana flour

The procedure described by Daramola and Osanyinlusi (2006) was adopted for the production of unripe banana flour. The banana fingers were washed, and peeled under water and was treated with 0.05% (w/v) sodium metabisulphite. The peeled bananas were then horizontally sliced to an average thickness of 1 mm and were allowed to remain in water containing 0.05% (w/v) sodium metabisulphite for 5 min to prevent browning. The banana slices were dried in hot air oven at 60^{o}C for 12 h. The dried chips were milled using a hammer mill, sieved through 250 µm sieve, packaged in high density polyethylene bag and was stored at ambient temperature.

2.2.2 Production of Pear leaves flour

The pear leaves flour was prepared according to the method described by Pearson (2001) the leaves were sorted to remove extraneous material and damaged leaves. The leaves were washed with clean water and dried in an hot air oven at 60$°C$ for 24 h. The dried leaves were milled and sieved using 250 µm sieve. The fine flour

ISSN:2782-8484

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produced was packaged in a polyethylene bag and stored.

3.2.3 Production of Leaf of life flour

The leaves were sorted to remove extraneous material and damaged leaves, the leaves were washed and dried in a hot air oven at 60°C for 24 h. The dried leaves were milled and sieved. The fine flour produced was packaged in a polyethylene bag and stored.

2.2.4 Formulation ratio of the flour blends

The flour blends of unripe banana, leaf of life and pear leaf were substituted at different ratio of 100% unripe banana flour as sample BLP1, BLP2: 90% unripe banana and 10% leaf of life, BLP3: 90% unripe banana and 10% pear leaf, BLP4: 90% unripe banana, 5% leaf of life and 5% pear leaf, and BLP5: 80% unripe banana, 10% leaf of life, 10% pear leaf.

2.3 Analysis

2.3.1 Determination of functional properties

Oil and water absorption capacity, bulk density, gelatinization temperature and least gelation concentration were determined according to Adebowale *et al*., (2015), solubility and swelling index power as described by Kaushal *et al*., 2012.

2.3.2 Phytochemicals properties of flour blends produced from Banana, pear leaf and leaf of life

Oxalate, tannin and phytate were determined as described by Alabi *et al* (2005) and cyanide as described by Ikediobi *et al*., 2013.

2.3.3 Glucans determination

The Glucans content were determined according to the method of Won *et al*., 2014.

2.3.4 Statistical analysis

All analysis was determined in triplicates and data were subjected to analysis of variance (ANOVA) using statistical package for social scientist (SPSS version 21) computer package. Mean were separated by New Duncans' Multiple Range Test, significance was taken at $p < 0.05$. Error was reported as standard deviation from the mean.

3.0 RESULTS AND DISCUSSION

3.1 Polysaccharides composition of unripe banana, leaf of life and pear leaf flour blends

The result of the polysaccharides composition of flour blends is shown in Table 1. The alpha glucan content ranged from 67.19 to 82.19% with sample BLP5 (80% Banana flour, 10% Leaf of life and 10% Pear leaves) having the highest value and sample BLP1 (100% Banana) having the lowest value. The samples were significantly different ($p<0.05$). Alpha glucan are mainly present for storage of glucose such as starch, glycogen and dextran. Alpha glucan content help reduce inflammation, improve digestion, and boost the immune system, it also helps to reduce cholesterol levels, blood sugar levels, and reduce the risk of heart diseases (Agama-Acevedo *et al*.,2012). The Beta glucan content varied from 36.71 to 69.67%, sample had the highest value while sample BLP1 had the least value. The samples were significantly different ($p<0.05$). Flour containing Beta-glucan have been used to decrease blood cholesterol levels, the β-glucan increase intestinal viscosity and decrease cholesterol absorption, thereby promoting its excretion. Beta-glucans prevent the body from absorbing cholesterol from food (Abiyot, 2017). They also stimulate the immune system by increasing chemicals that prevent infections (Adeniji *et al*., 2007). The values for total

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glucan revealed that sample BLP5 had the highest value of total glucan (151.86%) and sample BLP1 had the least value (103.90%). The value for total glucan content increased as percentage of the addition of leaf of life and pear leaf to banana flour increased. These results obtained is higher compared to 76.43% and 94.51% obtain by Adeniji *et al*. (2007). Total glucan helps to promote healthy body, control cell differentiation and regulate cell growth.

3.2 Phytochemical composition of unripe banana, leaf of life and pear leaves flour blends

The result of the phytochemical composition of the flour blends is shown in Table 2. The presence of anti-nutrients in foods could hinder the efficient utilization, absorption or digestion of some nutrients and thus, reduce their bioavailability (Adeniji *et al*., 2007). Oxalate content ranged from 1.40 x 10^{-2} to 3.22 x 10^{-2} mg/100 g. Sample BLP5 (80% unripe banana flour, 10% leaf of life and 10% pear leaves) had the highest oxalate while sample BLP1 (100% Banana) had the lowest. The samples were significantly different ($p<0.05$). Study had shown that oxalates in large amounts bind with calcium forming calcium oxalate, which is insoluble and not absorbed by the body (Taiwo *et al*., 2017). Oxalates are considered poisonous at high concentration, but harmless when present in small amounts (Chai and Liebman, 2004). The value of oxalate obtained in this study is low compared to 0.49 to 0.82% for new Musa hybrids by Adeniji *et al* 2007. Sample BLP5 had the highest (16.89 x 10^{-2} mg/100g) phytate while BLP1 had the least (7.00 x 10^{-2} mg/100g). The samples were significantly different ($p<0.05$). The value obtained for the phytate were higher than the value obtained by Adeniji *et al*., (2007) and Adeyeye *et al*., (2000). The tannin content of between 0.60 and 2.80 mg/100g were obtained across the samples, it is higher than the value obtained by Adeniji *et al*., 2007.Tannins are polyhydric phenols majorly founds in all parts of plants and are known to lower the activities of chymotrypsin, trypsin, lipase and amylase (Inyang and Ekop, 2015). The observed presence and quantity of tannins in all the samples can be of great medical importance since tannins serve as good antioxidant. The Cyanide content ranged from 11.79 x 10^{-2} to 16.05 x 10^{-2} mg/kg, sample BLP5 had the least value and sample BLP2 (80% Banana flour, 10% Pear leaves and 10% Leaf of life) had the highest value and the values were high compared to the report of Adeniji *et al.*, 2007. Results obtained in this present study indicated that the cyanogen level found in the samples were below the safety level for cyanide poisoning. The lethal dose range for human is estimated to be 0.5-3.5 mg/kg body weight (Adeniji *et al*., 2007).

3.3 Functional Properties of Banana, leaf of life and pear leaves flour blends

The results of the functional properties of the flour blends produced from unripe banana, leaf of life and pear leaves is shown in Table 3. The Oil absorption capacities (OAC) of the samples range between 1.80 to 3.85 g/mg. It was observed that the highest oil absorption capacity was found in sample BLP5 (80% Unripe Banana flour, 10% Leaf of life and 10% Pear leaves) and the least in sample BLP2 (90% Banana flour and 10% Leaf of life). Oil absorption capacity increased with increase in the proportion of leaf of life and pear leaf in the banana flour blends. The samples were significantly different ($p<0.05$). The major chemical component affecting Oil absorption capacity is protein, which is composed of both hydrophilic and hydrophobic parts. Non-polar amino acid side chains can form hydrophobic

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interaction with hydrocarbon chains of lipids (Jitngarmkusol *et al*., 2008). Therefore, the possible reason for increase in the OAC of composite flours might be due to the variations in the presence of non-polar side chain, which might bind the hydrocarbon side chain of the oil among the flours of blends. Oil absorption capacity is very important from an industrial viewpoint, since it reflects the emulsifying capacity (Kaur and Singh, 2017).

Water absorption capacity (WAC) values ranged from 2.80 to 5.90 g/ml and differed significantly ($p<0.05$), sample BLP3 (90% Banana flour and 10% Pear leaves) having the lowest WAC while sample BLP5 had the highest value. This indicates the increase of the values as the substitution of banana, leaf of life and pear leaves blends increases. Ayo-Omogie and Odekunle (2012) also obtained higher values in the banana and leaf of life sample which may be due to variation in the concentration of protein content, degree of association and conformational characteristics and higher number of hydroxyl groups found in fibre structure, which tends to allow more water interactions through hydrogen bonding has been reported to be responsible for high water absorption capacity of fibre rich flours (Noor Aziah *et al*., 2012). Water absorption obtained in this study was lower compared to 101.93 to 224.94 g/ml reported by Abiyot (2017). Water absorption capacity is used to indicate starch degradation and thus it determines the amount of free polysaccharide released from the granule on the addition of excess water (Oshundahunsi *et al*., 2003).

The bulk density, sample BLP1 (100% Unripe Banana flour) had the highest value of 0.76 g/ml, while sample BLP5 had the lowest value of 0.67 g/ml. The samples were significantly different ($p<0.05$). The result of this study is higher than the report of Abiyot (2017) (0.58 g/ml) for banana based flour supplemented with leaf of life, but similar to the report of Okafor *et al*. (2017) (0.66 to 0.74 g/ml) for flours from unripe banana, cabbage and pear leaves. Low bulk density of flour has been reported to be useful in food formulation because it has less retrogradation. Low bulk density is an indication of the heaviness of the flour sample (Olade and Aina, 2009). The lowest bulk density implies the flour will occupy less space during storage and more economical during transportation because more quantities can be transported (Abiyot, 2017). The higher the bulk density, the more packaging space required (Agunbiade and Ojezele, 2010).

Gelatinization temperature is the temperature at which starch molecules in a food substance lose their structure and leach out from the granules as swollen amylase, and it affects the time required for the cooking of food substances (Eleazu *et al*., 2014). The gelatinization temperature ranged from 78.50 to 80.00 °C, sample BLP4 (90% Unripe Banana flour, 5% Leaf of life and 5% Pear leaves) had the highest value and sample BLP2 and BLP3 had the least value, the samples were significantly different ($p<0.05$), the differences may be due to the difference in their substitution level.

In the swelling capacity, sample BLP5 had the least value (1.00 ml/g) while sample BLP3 had the highest value (1.27 ml/g). The swelling capacity of flours depends on size of particles, types of variety and types of processing methods or unit operations. Swelling capacity of the flour blends increased with increase in the level of incorporation of banana and pear leaves and decreased with the addition of leaf of life. The solubility index of the flour blends ranged from 0.08 to 0.35 ml/g, sample BLP3 had the highest solubility index.

Least gelation capacity measures the minimum amount of flour needed to form a gel in a measured volume of water. It varies from flour to flour depending on the relative ratios of their structural constituents like protein, carbohydrates, and lipids. These samples have low least gelation capacity and the lower the least gelation capacity, the better the gelling ability of the flour. The increasing concentration of protein enhances the interaction among the binding forces which in turn increases the gelling ability of the flour.

4.0 CONCLUSION

The present study showed that high nutritive flour can be produced from unripe banana, leaf of life and pear leaf flour blends. The flour blends produced have low oxalate and cyanide contents and increased tannin which are all desirable for good health and wellbeing. It has also revealed that flour blends of 80% unripe banana, 10% pear leaf and 10% leaf of life contain high amount of glucans properties compared to 100% unripe banana flour. Addition of leaf of life and pear leaf to unripe banana flour did not affect the function properties of the flour. The use of these locally grown crop and plant will go a long way in reducing malnutrition, it will also reduce food insecurity and diversify the use of unripe banana, leaf of life and pear leaf.

REFERENCES

Adeyeye, E.I., Arogundade, L.A., Akintayo, E.T., Aisida, O.A., and Alao, P.A. (2000). Calcium, zinc and phytate interrelationships in some foods of major consumption in Nigeria. *Food Chemistry*, 71: 435-441.

Abiyot, N (2017). Development and Quality Evaluation of Wheat Based Cookies Supplemented with oat and fenugreek flour. Presented in Partial Fulfillment of the Requirements for Degree of Master of Science in Chemical and Bio Engineering (*Food Engineering stream).*

Adebowale, S.O., & Odekunle, M.O. (2015). Effect of Processing on functional properties of Red Kindney Bean (Phaseolus vulgaris.L). *Pakistan Journal of Nutrition*. Vol: 10 Issue: pg.11 1069-1075 DOI; 10.3923/pjn.2011. 1069.1017.

Adeniji, T.A., Sanni, L.O., Barimalaa, I.S. and Hart, A.D. (2007). Anti-nutrients and heavy metals in some new plantain and banana cultivars. *Nigerian Food Journal*, 25(2), 165-170. https:// doi.org/10.4314/nifoj.v25i1.33666.

Agunbiade, G, I., Ojezele, N.P., 2010. Comparative evaluation of phytochemical composition and functional properties of two varieties of cooking banana. *Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 9, 01-04.

Alabi, A.O, (2005). Antinutritional Factors in Nutritional Quality of Plant Foods. Ambik Press Ltd Benin City, Nigeria, pp. 1-40.

Anuonye J.C., Ndaliman M., Elizabeh O.U. and Yakubu M.C. (2012). Effect of blending on the composition and acceptability of blends unripe banana and pigeon pea flours. *Nigerian Food Journal*, 30 (1) : 116-123.

Ayo-Omogie, H. N. and Odekunle, O. Y. (2012). Substituting Wheat Flour with Banana Flour: Effects on the Quality Attributes of Doughnut and Cookies. *Applied Tropical Agriculture*, 1:134-142.

Belewu G.A, and Abodunrin S.O. (2006). Phytochemical screening and antioxidant activities of some selected medicinal plants used for malaria therapy in Southwestern Nigeria. *Tropical Journal of Pharmaceutical Research*, 7: 1019-1024.

Cantrell F, Calderon de la Barca A.M., Islas-Rubio A.R., Marti A., Marengo M., Pagani M.A., (2014). Addition of leaf of life in extrusion processes for the production of amaranth-enriched, gluten-free rice pasta. *LWT Food Science and Technology*.; 47:421-6.

Chai, P.C., Liu, Z., & Chai, Y. (2004). Hedgehog Signaling acts with the temporal cascade to promote neuroblast cell cycle exit.PloS Biol.11(2):e1001494.

Daramola, B. and Osanyinlusi, S.A. (2006). Production, characterization and application of banana (Musa spp) flour in whole maize. *African Journal of Biotechnology*, 5 (10): 992-995.

Eleazu, O. C., Eleazu K. C. and Kolawole, S. (2014). Use of indigenous technology for the production of high quality cassava flour with similar food qualities as wheat flour. *Acta Science Pol Technology Aliment*. 13(2): 249-256. Erleen, Tilton (2011). www.livingahealthylifestyle.com accessed 5th April,2016.

Fatima, K.; Imran, A.; Amin, I.; Khan, Q. M.; Afzal, M., (2016). Plant species affect colonization patterns and metabolic activity of associated endophytes during phytoremediation of crude oil-contaminated soil. Environ. *Sci. Pollut. Res*., 23 (7): 6188-6196

Fulgoni, V.L., M. Dreher and A.J. Davenport, (2013). Avocado consumption is associated with better diet quality and nutrient intake and lower metabolic syndrome risk in US adults: Results from the National Health and Nutrition Examination Survey (NHANES) 2001-2008. *Nutritional Journal*., Vol. 12. 10.1186/1475-2891-12-1.

Garcia Solis, F.S., S.P. Sanchez, M.G.G. Iradi, N.A.M. Azman and M.P. Almajano, (2009). Avocado seeds: Extraction optimization and possible use as antioxidant in food. Antioxidants, 3: 439-454.

Ikediobi, C.O., Onyike, G.O.C., as Eluwah, C.E. (2013). A rapid and inexpensive assay for total cyanide in cassava and cassava

Inyang, U.F. and Ekop, V.O. (2015). Physico-chemical properties and anti-nutrient contents of unripe banana and African yam bean flour blends. *International Journal of Nutrition and Food Sciences*, 4(5), 549-554. https://doi.org/10.11648/j.ijnfs.20150405.16.

Jandonadi S, Sawhney S (2010). Modulation of TDZ-induced morphogenic responses by anti-auxin TIBA in budbearing foliar explants of Kalanchoe pinnata. *Plant Cell Tissue Organ Cult*. 86: 69-76.

Jitngarmkusol, S., Hongsuwankul, J. and Tananuwong,K. (2008). Chemical composition, functional properties and microstructure of defatted macadamia flours. *Food Chemistry*., 110(1):23-30.

Kaushal, P., Kumar, V.& Sharma H. K. (2012): Comparative study of physicochemical, functional, anti-nutritional and pasting properties of Taro, Rice, Pigeon pea flour and their blends. LWT-Food Science and Technology, 48, 59-68.

Noor Aziah, A. A,. Ho, L. H., Noor Shazliana, A. A. and Rajeev, B. (2012). Quality evaluation of steamed wheat bread substituted with green banana flour. *International Food Resource Journal*, 19 (3): 869- 876.

Okafor, J. N. C., Okafor, G. I., Ozumba, A. U., & Elemo, G. N. (2012). Quality characteristics of bread made from wheat and Nigerian oyster mushroom (*Pleurotus plumonarius*) powder. *Pakistan Journal of Nutrition*, 11(1), 5-10.

Oladele, A.O., and Aina S.O. 2007. Recent advances in postharvest technologies of banana and plantain in Africa. *Acta Horticulture*, 540, 517-527, DOI: 10. 17660/ActaHortic.2000.540.57.

Oshundahunsi, O. F., Fagbemi T. N., Kesselman, E. and Shimoni, E. (2003). Comparison of the physic chemical properties and pasting cahracteristics of flour and starch from red and white sweet potato cultivars. *Journal Agriculture Food Chemistry*, 51:2232-2236.

Pearson, M., S., 2001. The nutritional composition and pharmacological profile of Persea americana Mill. Pharm. Rev., 4: 77-84.

Sathe, S. K., and D. K. Salunkhe. 2013. Functional properties of great northern bean (Phaseolus vulgaris L.) proteins: emulsion, foaming and gelation properties. *Journal of Food Science*, 46(1): 71-81.

Taiwo, E.O., Sekinat, A.A., Adegbola, D.O., Arise, A.K. and Sotunde, A.J. (2017). Chemical composition and sensory qualities of wheat-sorghum date cookies. *Croatian Journal of Food Technology*, Biotechnology and Nutrition, 12(1-2), 71-76.

Vinha, A.F., J. Moreira and S.V. Barreira, 2013. Physicochemical parameters, phytochemical composition and antioxidant activity of the algarvian avocado (Persea americana Mill.). *Journal of Agricultural Science*, 5: 100-109.

Won C.B, Ji H P, Young A.P. and Kang H.K. (2014). Determination of glucans content in the fruiting bodies and mycelia of Lentinus Edode cultivals. *Mycobiology*, 42(3), 301-304

Zhang, Y., H. Chen, N. Zhang, and L. Ma. 2005. Antioxidant and functional properties of banana products as affected by the different processing methods. *Journal of Food Science and Technology*, 52(2): 742-752.

Table 1: Glucans composition of flour produced from the blend of unripe banana, leaf of life and pear leaf

Samples	BLP1	BLP2	BLP3	BLP4	BLP5
Alpha glucan (%)	67.19±0.60[e]	76.33±0.60[b]	75.42±0.60[c]	73.73±0.07[d]	82.19±0.43[a]
Beta glucan (%)	36.71±0.08[e]	60.14±0.08[b]	57.09±0.08[c]	49.20±0.80[d]	69.67±0.75[a]
Total glucan (%)	103.90±0.14[e]	136.46±0.14[b]	132.57±0.08[c]	122.93±0.14[d]	151.89±0.50[a]

Mean values ± standard deviation along the same row with different superscript are significantly different from each other ($p<0.05$)

Key
BLP1 = 100% Unripe banana
BLP2 = 90% Unripe banana + 10% Leaf of life
BLP3 = 90% Unripe banana +10% Pear leaf
BLP4 = 90% Unripe banana + 5% Leaf of life + 5% Pear leaf
BLP5 = 80% Unripe banana + 10% Leaf of life + 10% Pear leaf

Table 2: Phytochemical analysis of flour produced from the blend of unripe banana, leaf of life and pear leaf

Samples	BLP1	BLP2	BLP3	BLP4	BLP5
Phytate (mg/g)	7.00 $\times10^{-2}$ ±0.41[a]	11.95 $\times10^{-2}$ ±0.41[a]	15.66 $\times10^{-2}$ ±0.00[a]	9.90 $\times10^{-2}$ ±0.80[a]	16.89 $\times10^{-2}$ ±0.41[a]
Oxalate (mg/g)	1.39 $\times10^{-2}$ ±0.23[d]	2.07 $\times10^{-2}$ ±0.00[bc]	2.21 $\times10^{-2}$ ±0.05[b]	1.89 $\times10^{-2}$ ±0.09[c]	3.22 $\times10^{-2}$ ±0.12[a]
Tannin (mg/g)	0.60±0.00[e]	2.31±0.06[c]	3.15±0.01[a]	1.35±0.06[d]	2.79±0.01[d]
Cyanine (mg/kg)	14.92$\times10^{-2}$ ±0.18[b]	15.58 $\times10^{-2}$ ±0.48[a]	12.78 $\times10^{-2}$ ±0.33[d]	14.26$\times10^{-2}$ ±0.16[c]	11.79$\times10^{-2}$ ±0.33[e]

Mean values ± standard deviation along the same row with different superscript are significantly different from each other ($p<0.05$)

Keys:
BLP1 = 100% Unripe banana
BLP2 = 90% Unripe banana + 10% Leaf of life
BLP3 = 90% Unripe banana +10% Pear leaf
BLP4 = 90% Unripe banana + 5% Leaf of life + 5% Pear leaf
BLP5 = 80% Unripe banana + 10% Leaf of life + 10% Pear leaf

Table 3: Functional properties of flour produced from the blend of unripe Banana, Leaf of life and Pear leaf

Samples	BLP1	BLP2	BLP3	BLP4	BLP5
OAC (ml/g)	2.15±0.55[b]	1.80±0.00[b]	2.35±0.25[ab]	2.50±0.10[ab]	3.85±1.85[a]
WAC (ml/g)	4.90±1.90[a]	5.00±0.40[a]	2.80±0.60[b]	3.10±0.50[b]	5.90±0.10[a]
Bulk density (g/ml)	0.76±0.001[a]	0.75±0.01[ab]	0.75±0.00[ab]	0.74±0.01[b]	0.67±0.01[c]
GT (°C)	79.50±0.50[a]	78.50±1.50[a]	78.50±1.50[a]	80.00±0.00[a]	79.50±0.50[a]
Swelling Capacity (ml/g)	1.15±0.05[bc]	1.10±0.10[bc]	1.27±0.12[a]	1.20±0.00[b]	1.00±0.00[c]
Solubility power (ml/g)	0.08±0.03[e]	0.30±0.20[b]	0.35±0.50[a]	0.27±0.76c	0.18±0.14[d]
Least gelation (%)	0.60±0.00[b]	0.40±0.00[c]	0.80±0.00[a]	0.80±0.00[a]	0.40±0.00[c]

Mean values ± standard deviation along the same row with different superscript are significantly different from each other ($p<0.05$)

Keys:
OAC= Oil absorption capacity, WAC= Water absorption capacity, GT= Gelatinization temperature.
BLP1 = 100% Unripe banana
BLP2 = 90% Unripe banana + 10% Leaf of life
BLP3 = 90% Unripe banana +10% Pear leaf
BLP4 = 90% Unripe banana + 5% Leaf of life + 5% Pear leaf
BLP5 = 80% Unripe banana + 10% Leaf of life + 10% Pear leaf