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Impact of Different Processing Methods on Physico-chemical Characteristics and Antioxidant Activity of Peanut Milk

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ABSTRACT

Background: Peanut milk was prepared by different processing methods like fresh, blanching, soaking, roasting and germination methods and analyzed its physico chemical properties like pH, TSS, acidity, viscosity and colour value and also analyzed its antioxidant activity in both the selected local and CO 6 peanut varieties and studied the effect of processing methods on physico chemical properties, organoleptic characteristics and antioxidant activity.

Methods: Local and CO 6 peanut variety were selected for preparation of peanut milk by five different processing methods like fresh, blanching (121°C 15 psi for 2 mins), soaking for 3 hrs, roasting (roasting for 5 mins followed by soaking 3 hrs) and germination (8 hrs) pretreatments were done. Then grinded (1:3 ratio of kernel to water), filtered by using muslin cloth, slurry was separated. Then the peanut milk was homogenized for 5 mins and double pasteurized (85°C for 15 mins).

Result: The present study results reported that physico chemical properties of peanut milk (local and CO 6 variety) pH value varied between 6.3-6.9, TSS 11-13°Bx, viscosity 4.80-5.00 (Cp/100 ml), acidity 0.04-0.08 (g%), colour value L*a*b was higher (91.02, 0.97, 12.47) in control peanut milk from both the local and CO 6 variety respectively. Antioxidant activity was significantly higher in peanut milk developed from roasting method (roasting for 5 mins followed by soaking 3 hrs) in both the peanut varieties. Antioxidant activity of the peanut milk is also important for maintaining the shelf life of the product and prevent oxidative damage in human being.

Key words: Antioxidant property, Blanching, Fresh peanut milk, Germination, Physico chemical properties, Roasting, Soaking.

INTRODUCTION

Peanut (*Arachis hypogaea* L.) is a leguminous crop which belongs to fabaceae family and it was considered as the most important oil seed crop among the world. (Campos-Mondragon *et al*. 2009). Peanut does not contain any lactose, so it can be more suitable for lactose intolerance people and cow's milk allergy people. It also contains high protein, vitamins,minerals, essential fatty acids like oleic and linoleic acid, phenolic compounds, phytosterols, because of their high nutritional value it can be suitable for all age groups (Kouane *et al*. 2005).

The price of the peanut based products are comparatively low and can be afforadable for low income people also. Protein content of the peanut helps to treat the protein malnutritious children (Kouane*et al*. 2005). Peanut based milk beverages has been renowned as a most important substitutes in culture where the cow's milk is too expensive and indigestible (Isanga and Zhang, 2009). Production of peanut in India was nearly 45% of oil seed area and 55% of oilseed production in the country and India was the third largest producer of peanut production of over 5-6 million tons (USDA Foreign Agricultural Service, 2008-2009) among the world peanut production. (www. commodityonline.com).

Antioxidant is a substance it can ability to trap free radicals. Phenolic acids, polyphenols and flavonoids are some of the antioxidant compounds and facilitate the scavenging of peroxide, hydroperoxide or lipid peroxyl and other free radicals it will inhibit the oxidative mechanisms and helps to prevent degenerative diseases (Wu *et al*. 2011).

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In this study peanut milk was prepared from fresh, blanching, roasting, soaking and germination method from local and CO 6 peanut variety. Effects of processing methods on physico chemical properties and antioxidant activity were studied to determine the best method for retention of higher antioxidant activity with good physico chemical properties in local and CO 6 variety peanut milk.

MATERIALS AND METHODS

The experiments were conducted in the Department of Food science and nutrition, Community science college and research institute, Madurai during (2018-2021).

Local and TNAU CO 6 variety peanuts were selected for preparation of peanut milk and selected based on complete maturity, raw, free from dust, infectant and mould. Local variety peanut was purchased from a simmakal (local market) and TNAU CO 6 peanut variety was purchased from Department of Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore.

Peanut milk processing techniques

Peanut milk sample was prepared by five different processing methods like fresh (control), blanching, soaking, roasting and germination methods.

In each method local variety (100 g) and CO 6 variety (100 g) was weighed and washed. In blanching (121°C 15 psi for 2 mins), soaking for 3 hrs, roasting(roasting for 5 mins followed by soaking 3 hrs) and germination (8 hrs) pretreatments were done. Then grinded (1:3 ratio of kernel to water), filtered by using muslin cloth, slurry was separated. Then the peanut milk was homogenized for 5 mins and double pasteurized (85°C for 15 mins) (Fig 1).

Analytical methods

a) Physico chemical and antioxidant activity

The pH of the peanut milk sample was determined by the method described by Buck *et al.* (2002) by using pH meter. Peanut milk samples total soluable solids were determined by using a hand refractometer (0 to 32°Brix). The viscosity of the peanut milk sample was analyzed at 25±0.1°C using spindle No. 61, 1-1 coaxial cylinder Brooke field viscometer. Brook field viscometer instrument was calibrated and set the torque was zero and the viscosity (centipose) was measured at a minimum of 100 rpm and the viscosity range was noted down.Peanut milk samples acidity content was determined by the method described by AOAC. (1990).

Peanut milk samples from (local and CO 6 variety) containing radical scavenging activity was determined by (DPPH) 2, 2-diphenyl-1-picrylhydrazyl- radical scavenging assay method described by Lim *et al.* (2007). The data obtained from various characters under study were analyzed by the method of analysis of variance as described by (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Physico chemical analysis

Physico chemical analysis of the local and CO 6 variety prepared peanut milk from fresh, roasting, blanching, soaking and germination methods were carried out and like pH, TSS, acidity, viscosity and colour values were analyzed.

Peanut milk was prepared from selected (local and CO 6 peanut) varieties showed significant differences ($p<0.05$) in different processing methods like fresh, blanching, soaking, roasting and germination methods (Table 1). The pH of peanut milk from local peanut variety was higher in soaking method (6.9) and lower in blanching method (6.3). Yuan *et al*. (2008) reported that the pH of the

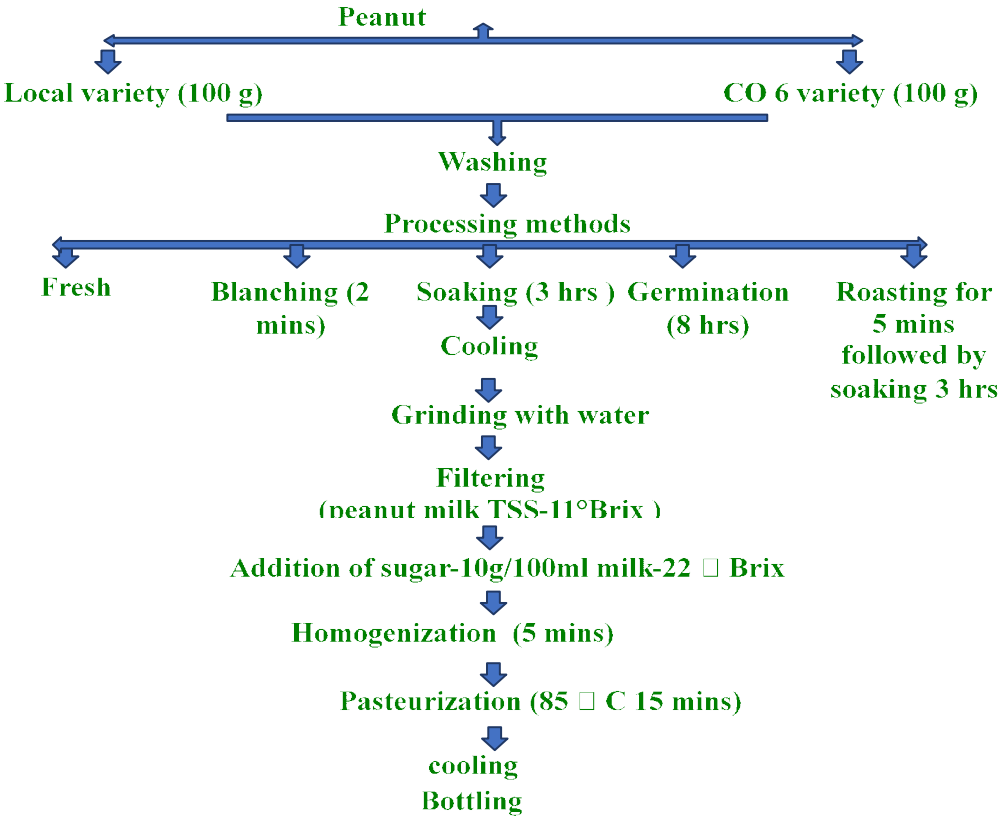

Fig 1: Standardization of peanut from different processing methods.

Table 1: Physico-chemical characteristics of peanut milk from local and CO 6 peanut variety (per 100 ml).

Physico-chemical		Fresh		Blanching		Soaking		Roasting		Germination	
paramete		**L**	**C**	**L**	**C**	**L**	**C**	**L**	**C**	**L**	**C**
PH		$6.5^{a}\pm0.2$	$6.4^{a}\pm0.4$	$6.3^{d}\pm0.1$	$5.8^{a}\pm0.1$	$6.9^{b}\pm0.2$	$6.9^{b}\pm0.8$	$6.8^{c}\pm0.7$	$6.6^{c}\pm0.5$	$6.7^{b}\pm0.4$	$6.7^{b}\pm0.3$
TSS° Brix)		$13^{a}\pm0.1$	$13^{a}\pm0.5$	$11^{c}\pm0.6$	$11^{c}\pm0.7$	$11^{c}\pm0.5$	$11^{c}\pm0.1$	$12^{b}\pm0.4$	$12^{b}\pm0.9$	$12^{b}\pm0.2$	$12^{b}\pm0.7$
Viscosity(cp/100ml)		$4.98^{a}\pm0.8$	$5.00^{a}\pm0.4$	$4.88^{c}\pm0.7$	$4.87^{c}\pm0.8$	$4.82^{d}\pm0.9$	$4.90^{d}\pm0.2$	$4.92^{b}\pm0.7$	$4.98^{b}\pm0.1$	$4.80^{e}\pm0.2$	$4.89^{e}\pm0.8$
Acidity(%)		$0.06^{b}\pm0.5$	$0.05^{b}\pm0.8$	$0.04^{e}\pm0.7$	$0.04^{e}\pm0.2$	$0.07^{a}\pm0.3$	$0.06^{a}\pm0.5$	$0.08^{c}\pm0.8$	$0.06^{c}\pm0.9$	$0.06^{d}\pm0.1$	$0.04^{d}\pm0.9$
Color	L*	$91.02^{a}\pm0.2$	$91.02^{a}\pm0.7$	$85.24^{b}\pm0.6$	$85.24^{b}\pm0.9$	$82.27^{d}\pm0.1$	$81.36^{d}\pm0.3$	$77.36^{c}\pm0.4$	$82.09^{c}\pm0.9$	$80.68^{e}\pm0.4$	$78.68^{e}\pm0.7$
	a*	$0.97^{a}\pm0.6$	$0.97^{a}\pm0.4$	$0.84^{c}\pm0.1$	$0.84^{c}\pm0.2$	$0.82^{d}\pm0.3$	$0.76\ ^{d}\pm0.4$	$0.93^{b}\pm0.6$	$0.96\ ^{b}\pm0.7$	$0.74^{e}\pm0.1$	$0.70^{e}\pm0.3$
	b*	$12.47^{b}\pm0.6$	$12.47^{b}\pm0.3$	$14.66^{c}\pm0.9$	$14.66\ ^{c}\pm0.2$	$15.64^{a}\pm0.1$	$15.02^{a}\pm0.2$	$13.62^{e}\pm0.8$	$13.43^{e}\pm0.4$	$13.72^{d}\pm0.24$	$12.37^{d}\pm0.9$

Values are means of 4 replicates. Means in the same column followed by different superscripts are significantly different at P<0.05

L- Local peanut variety ; C- TNAU CO-6 peanut variety.

L-lightness, a*- redness to greenness b*- yellowness to blueness.

* Siginificant at P≥0.05; NS – Non siginificant at P> 0.05.

soy milk was ranged from 6-6.6 and the pH values of the present study also in close agreement with the report. pH of the peanut milk substitute was 6.82 as per the report of Aydar *et al*. (2020). The pH value of soymilk was 7.39 and acidity was 0.09 was determined by Kundu *et al*. (2018).

TSS content of fresh peanut milk was higher (13°Brix) and lower (11°Brix) in blanching and soaking method. During blanching and soaking method the solid content in the peanut was leached out during processing. TSS content of the peanut milk can increased by addition of sweetner (palm sugar). Viscosity of the peanut milk was higher (4.98 cp/ 100 ml) in fresh peanut milk (control) and lower in germination (4.89cp/100 ml) and soaking method (4.92 cp /100 ml).

Viscosity content of the peanut milk from both the varieties was reduced during soaking and germination process because of absorption of water and indirectly decreased the viscosity content of the peanut milk. Total soluble solid content and fat content of the peanut milk directly influences the viscosity of the peanut milk. Adesola *et al.,* (2013) reported that groundnut milk prepared from fresh, roasted (170°C, 25 min) and steeped (water, 20 min) groundnuts and reported the quality characteristics such as pH 6.82 to 6.85, acidity 0.10 to 0.14%, viscosity 7.33 and 7.56 cp in peanut milk from different processing.

Acidity content of the peanut milk from both the varieties was higher in roasting method (0.08%) and lower in blanching method (0.04%). The pH of the peanut milk from blanching method was high when compared to other treatments. Acidity of the peanut milk is indirectly influenced by the pH value of the peanut milk. pH value of the peanut milk can be influenced by nutritional composition and biochemical changes and also pH value influences the flavor perception of the peanut milk. Hassan *et al*. (2010) determined that peanut milk total acidity yoghurt content was 0.852g/100 ml was significantly lower than cows milk yoghurt 1.173g/100 ml. Specific gravity of soy milk was ranged from 0.95 - 2.35 as per the report of Krishna *et al*. (2003).

Colour value of fresh peanut milk (control) was higher (L*- 91.02, a*- 0.97, b- 12.47) when compared to other processing methods like blanching, roasting, germination. Roasting method had influences and reduce the colour value. Walkowiak-Tomczak *et al*. (2016) reported that L*a*b* values were mostly depends on pH values of the product. Colour value of the peanut milk had higher lightness value because of the white colour of the peanut milk.

Peanut milk from Co-6 variety had a pH value of 6.9 in soaking method and lower (5.8) in blanching method. TSS content was higher (13°Brix) in control (fresh peanut) and lower (11°Brix) in blanching and soaking method. Viscosity of the peanut milk was higher 5.00 (cp/100 ml) in fresh peanut milk (control) and lower (4.87 and 4.92 cp/100 ml) in blanching and soaking method. Roasting process reduces the acidity content, total soluable solids of the peanut milk, offlavour and bitterness taste of the peanut milk, antinutritional factors and also improves the nutritional value, stability of the milk.

Table 2: Antioxidant activity of peanut milk from local and CO 6 peanut variety (per 100 ml).

	Fresh		Blanching		Soaking		Roasting		Germination	
	L	C	L	C	L	C	L	C	L	C
Antioxidant activity(% RSA)	57±0.5^{a}	61±0.4^{a}	58±0.6^{b}	62±0.7^{b}	58±0.2^{b}	62±0.7^{b}	60±0.1^{d}	64±0.5^{d}	59±0.3^{c}	63±0.6^{c}

Values are means of 4 replicates. Means in the same column followed by different superscripts are significantly different at P<0.05

* Siginificant at P d" 0.05; NS – Non siginificant at P > 0.05.

L- Local variety C- CO 6 variety.

Acidity content of the peanut milk from both the varieties was higher (0.06%) in roasting method and lower in blanching and germination (0.04%) method. Acidity content of the peanut milk will influences the pH value of the peanut milk. Colour value of fresh peanut milk (control) was higher L* -91.02, a* -0.97, b -12.47) when compared with other processing methods like blanching, roasting, soaking and germination. Yadachi *et al.* (2012) quoted the physico chemical properties of peanut milk like pH, TSS, acidity, viscosity and its value was 6.4, 8.6°B×, 0.24(g%), 5.62cp/ 100 ml respectively. Albuquerque *et al. (*2015) reported the physico chemical properties of peanut milk such as pH (6.70), Acidity (0.30%), moisture (90%) respectively.

Antioxidant activity

Table 2 shows the results of antioxidant activity of peanut milk from fresh, blanching, soaking, roasting and germination method in both the peanut varieties.

Table 2 shows the results of antioxidant activity in peanut milk prepared from different processing methods in local and CO 6 variety.Antioxidant activity of peanut milk of CO 6 variety from fresh, blanching, soaking, roasting and germination method was 61, 62, 62, 64 and 63 (% RSA) respectively. Antioxidant activity was significantly higher in roasting method (60% RSA) and followed by germination method (59% RSA), soaking and blanching method (58% RSA) in peanut milk from local variety.

The antioxidant activity of Local and CO 6 variety peanut milk antioxidant activity was siginificantly higher in Roasting method (60 and 64% RSA respectively) and followed by germination method (59 and 63% RSA respectively), soaking (58 and 63% RSA respectively) when compared to control peanut milk (57 and 61% RSA respectively). During processing the antioxidant activity of the peanut milk was increased due to enzyme activity and among these five different processing methods roasting method had highest antioxidant activity, CO 6 variety peanut milk had highest antioxidant activity when compared to local variety. Duarte *et al*. (2005) reported that during roasting process the antioxidant activity was increased because of maillard reaction formed roasting process and it produces antioxidant compounds and polyphenolic compounds were reduced. Karunasiri *et al*. (2020) reported that radical scavenging activity by DPPH method in liquid coconut milk, powder coconut milk, Domestic coconut milk and found that antioxidant activity was siginificantly higher in Domestic coconut milk compared to liquid and powder coconut milk and also determined that reduction of total phenolic compounds in the milk during processing can increases the antioxidant activity of the milk.

Acar *et al*. (2009) found that total phenolic content in the peanut was reduced during roasting process (150°C for 60 mins) and it can directly increases the antioxidant activity content. Abou-Dobara *et al*. (2018) reported that peanut milk rayeb possessed higher antioxidant activity than those detected in Rayeb (50% cow's milk and 50% peanut milk) prepared from cow milk. Nuts and oilseed based milk had higher amount of antioxidants it can reduces CVD, cancer and diabetes. Aydar *et al*. (2020).

CONCLUSION

Different processing methods such as blanching, soaking, roasting and germination methods have varying impact on the physico chemical, nutritional properties and antioxidant property. Peanut milk from roasting method (roasting 5 mins followed by 3 hrs soaking) had retained higher antioxidant activity from local and CO 6 peanut variety. From the findings of the research work, peanut milk from roasting treatment (roasting 5 mins followed by soaking 3 hrs) had more therapeutic value when compared to soaking,blanching, fresh and germination methods in both local and CO 6 variety peanut milk because it significantly does not affect the physico chemical properties and antioxidant activity and helps for scavenging of free radicals and prevent oxidization. Among the five processing methods peanut milk from both the varieties roasting method had secured higher sensory score (overall acceptability : 9). Hence, roasting process is a suitable for increasing the taste, colour value and in the reduction of offlavour, beany taste and it indirectly increases the antioxidant activity of the peanut milk.

REFERENCES

Abou-Dobara, M.I., Ismail, M.M. and Refat, N.M. (2018). Influence of mixing peanut milk and honey with cow milk on the nutritional and health properties of Bio-Rayeb milk. Journal of Food Chemistry and Nanotechnology. 4: 18-26.

Açar, Ö.Ç., Gökmen, V., Pellegrini, N. and Fogliano, V. (2009). Direct evaluation of the total antioxidant capacity of raw and roasted pulses, nuts and seeds. European Food Research and Technology. 229 (6): 961-969.

Adesola, A.O., Olasunkanmi, G.S. and Kehinde, T.A. (2013). Effects of some processing factors on the characteristics of stored groundnut milk extract. African Journal of Food Science. 7(6)134-142. Agric. Food Chem. 56(17): 7957-7963.

AOAC. (1990). Official methods of analysis of AOAC.

Aydar, E.F., Tutuncu, S. and Ozcelik, B. (2020). Plant-based milk substitutes: Bioactive compounds, conventional and novel processes, bioavailability studies and health effects. Journal of Functional Foods. 70, 103975.

Buck, R.P., Rondinini, S., Covington, A.K., Baucke, F.G.K., Christopher, M.A., Brett, M.F., Camoes, Milton, MJT., Mussini, T., Renate Naumann., Pratt, K.W. (2002). Measurement of pH. Definition, standards and procedures (IUPAC Recommendations 2002). Pure and Applied chemistry. 74 (11): 2169-2200.

Campos-Mondragon, M.G., Calderon De La Barca, A.M., Duran-Prado, A., Campos-Reyes, L.C., Oliart-Ros, R.M., Ortega-Garcia, J., Medina-Jua´rez, L.A., Angulo, O. (2009).Nutritional composition of new peanut (Arachis hypogaea L.) cultivars. Grasas Y Aceites. 60: 161-167.

de Albuquerque., Barros, E.M. (2015). Production of “peanut milk” based beverages enriched with umbu and guava pulps. Journal of the Saudi Society of Agricultural Sciences. 14.1: 61-67.

Duarte, S.M., Abreu, D.S., Menezes, C.M.P.D., Santos, H.D.C., Gouvêa, C.M.C.P. (2005). Effect of processing and roasting on the antioxidant activity of coffee brews. Food Science and Technology. 25(2): 387-393.

Gomez, K.A., Gomez, A.A. (1984). Statistical procedures for agricultural research: John Wiley and Sons.

Hassan, A., Amjad, I. (2010). Nutritional evaluation of yoghurt prepared by diûerent starter cultures and their physiochemical analysis during storage. African Journal of Biotechnology. 9(20): 2913-2917.

Isanga, J. and Zhang, G. (2009). Production and evaluation of some physicochemical parameters of peanut milk yoghurt. Food Science and Technology. 42(6): 1132-2238.

Karunasiri, A.N., Gunawardane, M., Senanayake, C.M., Jayathilaka, N., Seneviratne, K.N. (2020). Antioxidant and Nutritional Properties of Domestic and Commercial Coconut Milk Preparations. International Journal of Food Science. 2020. https://doi.org/10.1155/2020/3489605.

Kouane, D., Zhang, G., Chen, J. (2005). Peanut milk and peanut milk based products production. A review. Critical Reviews in Food Science and Nutrition. 45: 405-423.

Krishna, A., Singh, G., Kumar, D., Agrawal, K. (2003). Physico-chemical characteristics of some new varieties of soybean. Journal of Food Science and Technology (Mysore). 40(5): 490-492.

Kundu, P., Dhankhar, J. and Sharma, A. (2018). Development of non dairy milk alternative using soymilk and almond milk. Current Research in Nutrition and Food Science Journal. 6(1): 203-210.

Lim, Y.Y., Lim, T.T., Tee, J.J. (2007). Antioxidant properties of several tropical fruits: A comparative study. Food Chemistry. 103(3): 1003-1008.

Walkowiak-Tomczak, D., Czapski, J., M³ynarczyk, K. (2016). Assessment of colour changes during storage of elderberry juice concentrate solutions using the optimization method. Acta Scientiarum Polonorum Technologia Alimentaria. 15(3): 299-309.

Wu, Y.Y, Li, W., Xu, Y., Jin, E.H., Tu,Y.Y. (2011). Evaluation of the antioxidant effects of four main theaflavin derivatives through chemiluminescence and DNA damage analyses. J Zhejiang Univ Sci. 12: 744-751.U Groundnut Milk and Its Qualitative Analysis. Environment and Ecology. 30. 3C: 1209-1211.

Yuan, S., Chang, S.K., Liu, Z., Xu, B. (2008). Elimination of trypsin inhibitor activity and beany flavor in soy milk by consecutive blanching and Ultra-High Temperature (UHT) processing. J. 56(17):7957-63. doi: 10.1021/jf801039h.