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Optimisation of Blanching Time for Cassava – Pre-Treatment for Processing

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Abstract:
Blanching is conducted as a pretreatment for various processing methods. The blanching time of cassava was optimsed based on the quality parameters and the residual cyanide content. The quality parameters like colour, texture, carbohydrate content, crude fibre content and cyanide content was analysed for cassava blanched at 5, 10, 15minutes at 100˚C. The best treatment was found out as blanching for five minutes at 100˚C.

Keywords: Blanching, cassava, cyanide, quality parameters

I. INTRODUCTION

Cassava is one of the important food crop providing livelihoods and food security for hundreds of millions of people in the tropical regions. Cassava is a stress resistant crop cultivated mostly in Africa and tropical countries. In South-Asian subcontinent and Latin-American countries too it is being used as a major source of carbohydrate. The poorer section of the world resort to cassava as their staple source of carbohydrate since the production requires lower inputs. Annual production statistics of tapioca, sweet potato and potato are very high in developing countries such that these tuber crops come under the first few positions when production volume is considered[1]. A unique phenomena known as Physiological Post harvest Deterioration (PPD) or Primary Post harvest Deterioration sets in immediately after harvesting the crop. This is linked to oxidative burst and enzymatic stress response to wounding[2]. The crop is not marketable after 48 to 72 hours as the process of deterioration starts minutes after harvesting the crop which adversely affect the farmers, consumers and processors[3]. High moisture content of cassava, leads to early deterioration due to microbial attack and also makes it susceptible to desiccation and mechanical injury. Therefore effort has to be put in so that cassava is made available to all the people year-round either in raw, preserved or processed manner. The blanching time was optimised so that cassava can be processed after the pretreatment.

II. MATERIALS AND METHODS

I. RAW MATERIALS

Cassava (*Manihot esculenta Crantz*), M-4 variety was procured from progressive farmers at Kuttipuram. The cassava was diced into cubes of 15 x 15 mm size.

II. PHYSICO-CHEMICAL ANALYSIS

Physicochemical analysis of raw cassava was conducted. The colour, texture, pH, carbohydrate content, crude fibre content, cyanide content were analysed.

III. BLANCHING

Cassava was blanched at 100˚C at various time combinations of 5, 10, 15 minutes. The colour, pH, texture, carbohydrate and crude fibre content, cyanide content of blanched cassava was analysed

B1 – Cassava blanched at 100˚C for 5 min
B2 – Cassava blanched at 100˚C for 10 min
B3 – Cassava blanched at 100˚C for 15 min

III. RESULTS AND DISCUSSION

I. PHYSICO-CHEMICAL ANALYSIS

The pH of cassava was found to be 6.80. The carbohydrate content was found as 18.57%. The cyanide content was estimated to be 76.01 ppm. The moisture content was found to be 74% wet basis. The firmness and toughness of raw cassava were found to be 4.52 kg and 15.17 kg.s respectively. The L*, a*, b* values were found as 73, 1.44, 17.89, respectively.

II. OPTIMISATION OF BLANCHING TIME

Cassava was blanched at 100˚C in combination with three different time treatments. Since cassava did not contain catalase and peroxidase enzymes, the optimisation of blanching time was done based on the cyanide test quality of the blanched cassava instead of enzyme test. Bourdoux et al. (1982)[4] conducted experiments and stated that the safe limit of cyanide content in cassava was 50 ppm, 50–100 ppm was found to be moderately poisonous and above 100 ppm was dangerously poisonous to human beings.

The L*, a*, b* values of 5min blanched samples, B1 was observed as 63.48, 0.45 and 19.8, respectively. Similarly, the colour values for treatments B2 and B3 were 57.12, -1.13, 20 and 54.48, -1.32, 20.6, respectively. The L* and a* values of the blanched samples decreased significantly with increase in blanching time. Control sample had the maximum L* and a* values and minimum b* value. Sample blanched for 5 min was more brighter than samples blanched for 10 and 15 min. The b* value of the blanched samples increased significantly with increase in blanching time. The percentage increase in b* value of blanched samples (5, 10 and 15 min) compared to control sample were 8.85, 9.95 and 13.25%, respectively which indicates an increase in yellowness of the sample.

During blanching, due to increase in temperature, gelatinisation process might have on set and lead to the breakdown of starch into sugars which then acts as a substrate

for non-enzymatic reaction. Millaird reaction might have lead to the decrease in L*, a* values and increase in b* values of processed cassava[5,6]. Similar result was found by Chhe et al. (2018)[7] while hot water blanching of sweet potato at 60˚C for 40 min.

The firmness and toughness of the raw cassava was 4.52kg and 15.17 kg.s, respectively. The firmness values of samples blanched with B1, B2 and B3 treatments were 1.67, 0.49 and 0.47 kg, respectively. Similarly, the toughness values for the corresponding samples were 2.99, 1.62 and 1.57 kg.s, respectively (Fig. 4.3). The maximum percentage reduction of 89.5% firmness was observed in B3 treatment whereas minimum value of 63.06% was found in B1. The percentage reduction of toughness for B3 and B1 treatments were 89.65 and 80.25%, respectively.

Lee et al. (1979)[8] observed similar result on blanching experiments of carrots; with increased process time the loss in texture increased. The loss of texture might be both due to changes in pectin substances, cell wall polymers and turgor loss due to cell wall disruption (Greve et al., 1994a[9]; 1994b[10]). The effect of blanching time on pH was statistically analysed and the variables were not found to be significant. Equilibrium between splitting and formulation of hydrogen bonds might be the reason for the lack of change in pH (Drotz, 2012[11]).

The maximum value of carbohydrate was found in control sample and the minimum value in B3 treatment. The raw cassava having 18% carbohydrate content was reduced to 15.5% when blanched for 5 min (B1). The reduction in carbohydrate content during B2 and B3 treatments was 17.2 and 14.9%, respectively.

The crude fibre content of the raw cassava was found to be 2.42%. During blanching at 5, 10 and 15 min, the fibre content was reduced to 2.35, 2.28 and 2.0%, respectively.

The cyanide content of the blanched samples had a direct effect on blanching time. The cyanide content reduced significantly with time of blanching. The cyanide content of the samples reduced to 34.6 ppm at a blanching time of five min, which is far less than the permissible limit of 50 ppm.

Cooke and Maduagwu[12] (1985) found that boiling for 15 min removes approximately 90% of free cyanide and boiling for 25 min removes the bound moisture.

IV SUMMARY AND CONCLUSION

The blanching time was optimised based on the time required for the removal of cyanide content below permissible limit. It required 5 min of blanching at 100˚C for the reduction of cyanide content below permissible limit. Also, the quality parameters of blanched cassava at 5 min were found to be excellent among the other pretreatments. Hence, the blanching time for M-4 variety was optimised as 5 min and the further studies were conducted at this blanching time.

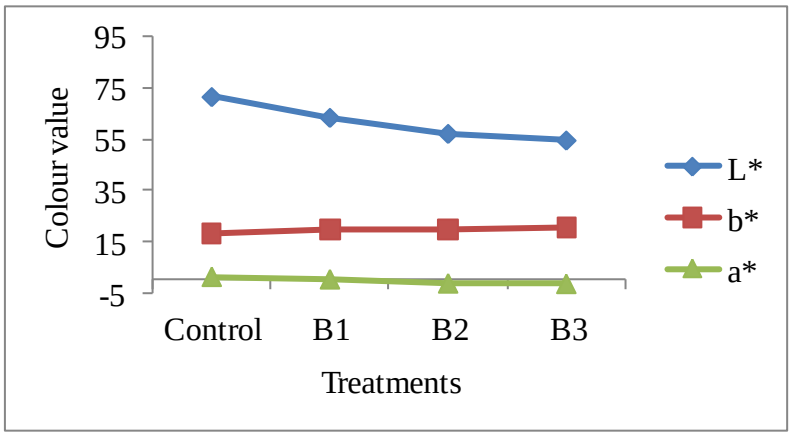

Figure 1 Colour values of blanched cassava tubers

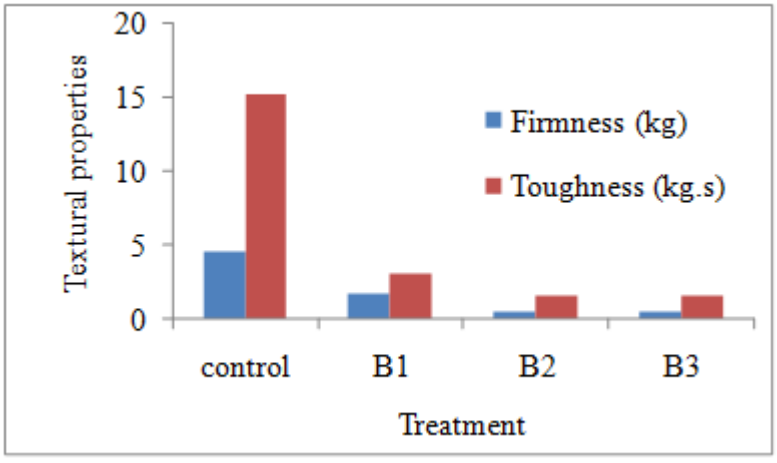

Figure 2 Effect of blanching on texture of cassava tubers

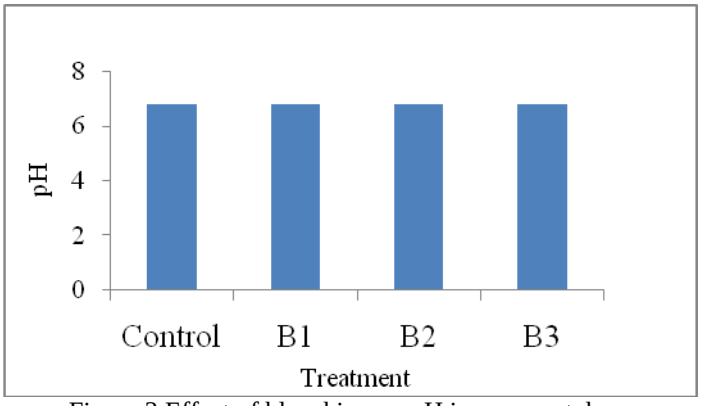

Figure 3 Effect of blanching on pH in cassava tubers

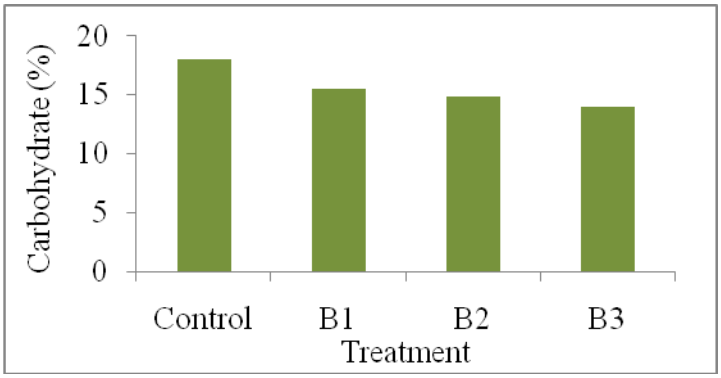

Figure 4 Effect of blanching on carbohydrate content in cassava tubers

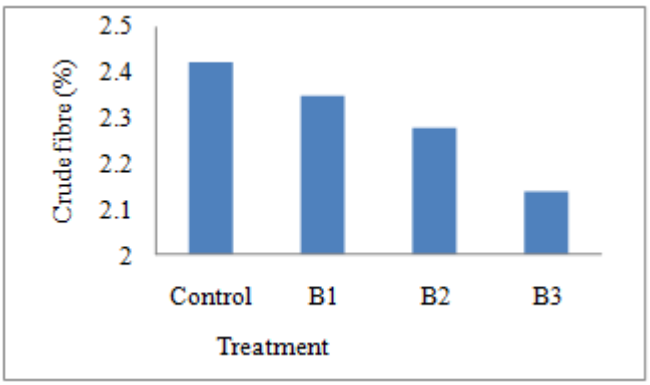

Figure 5 Effect of blanching on crude fibre content of cassava tubers

IV REFERENCES

[1]Mesta, D.P., Bharati, P., and Itagi, S.K. 2017. Physico-Chemical Analysis , Cooking Quality and Acceptability of Minor Tubers. Int. J. Curr. Microbiol. Appl. Sci. 6(11): 3294–3299. Available: https://doi.org/10.20546/ijcmas.2017.611.386 [08 Jan. 2018].

[2]Beeching, J.R., Reilly, K., Gomez, R., Li, H., Han, Y., Rodriguez, M.X., Buschmann, H., Taylor, N., and Fauquet, C. 2002. Post harvest physiological deterioration of cassava. In: Nakatani, M. (ed.), Potential of root crops for food and industrial resources. Proceedings of Twelfth Symposium of the International Society for Tropical Root Crops, Trinidad. International Society for Tropical Root Crop, Trinidad, pp. 60–66.

[3]Reilly, K., Bernal, D., Cortés, D.F., Gómez-Vásquez, R., Tohme, J., and Beeching, J.R. 2007. Towards identifying the full set of genes expressed during cassava post-harvest physiological deterioration. Pl. Mol. Biol. 64(1): 187–203. Available: https://doi.org/10.1007/s11103-007-9144-0 [20 Jan. 2018].

[4]Bourdoux, P., Seghers, P., Mafuta, M., Vanderpas, J., Vanderpas-Rivera, M., Delange, F., and Ermans, A.M. 1982. Cassava products: HCN content and detoxification processes. In: Delange, F., Iteke, F.B., Ermans, A.M. (eds.), Nutritional Factors Involved in the Goitrogenic Action of Cassava. IDRC, Ottawa, Canada, pp. 51–58.

[5]Basu, S. and Shivhare, U.S. 2013. Rheological, textural, microstructural, and sensory properties of sorbitol-substituted mango jam. Fd Bioprocess Technol. 6: 1401–1413. Available: http://dx.doi.org/10.1007/s11947-012-0795-8 [23 Oct. 2017].

[6]Imaizumi, T., Szymańska-Chargot, M., Pieczywek, M.P., Chylińska, M., Kozioł, A., Ganczarenko, D., Tanaka, F., Uchino, T., and Zdunek, A. 2017. Evaluation of pectin nanostructure by atomic force microscopy in blanched carrot. Fd Sci. Technol. 84: 658–667. Available: http://dx.doi.org/10.1016/j.lwt.2017.06.038 [25 Oct. 2017].

[7]Chhe, C., Imaizumi, T., Tanaka, F., and Uchino, T. 2018. Effects of hot-water blanching on the biological and physicochemical properties of sweet potato slices. Engng.

Agric. Environ. Fd 11(1): 19–24. Available: https://doi.org/10.1016/j.eaef.2017.10.002 [25 Nov. 2017].

[8] Lee, C.Y., Bourne, M.C., and Van Buren, J.P. 1979. Effect of blanching treatments on the firmness of carrots. J. Fd Sci. 44(2): 615–616. Available: https://doi.org/10.1111/j.1365-2621.1979.tb03848.x [11 Jan. 2018].

[9] Greve, L.C., McArdle, R.N., Gohlke, J.R., and Labavitch, J.M. 1994. Impact of heating on carrot firmness: changes in cell wall components. J. Agric. Fd Chem. 42: 2896-2899.

[10] Greve, L.C., Shackel, K.A., Ahmadi, H., McArdle, R.N., Gohlke, J.R., and Labavitch, J.M. 1994. Impact of heating on carrot firmness: contribution of cellular turgor. J. Agric. Fd Chem. 42: 2896-2899.

[11] Drotz, H. 2012. Development of thermal process for Gaeng Phed Gai in Retort Pouches. M.Sc. (Food Science) thesis, Swedish University of Agriculture Sciences, Uppsala, 57p. Availabe: http://stud.epsilon.slu.se/4896/ [22 June 2018].

[12] Cooke, R.D. and Maduagwut, E.N. 1978. The effects of simple processing on the cyanide content of cassava chips. J. Fd Technol. 13: 299–306.