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Research Paper

Pasting Properties and Color Attributes of Potato Flour as Influenced by Pre-Cooking

Food Science

KEYWORDS : Color properties, pasting properties, pre-cooking, potato, potato flour

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ABSTRACT

Pasting properties of raw (uncooked) and pre-cooked potato flours were studied by Rapid Visco Analyzer. Significant difference ($p < 0.05$) in pasting characteristics was noticed in raw and cooked flours. Peak viscosity, breakdown viscosity and setback viscosity was lower in processed potato flour than raw flour. Color attributes indicated higher L value for pre-cooked flour (66.82) than raw flour (62.18). Pre-cooking improved the functional properties of potato flour by inducing lower viscosities which are considered desirable for product development.*

INTRODUCTION

Potato production has significantly increased in recent years in India, making it the second largest potato producing country in the world [1]. Increased potato production with inadequate storage facilities have resulted in frequent gluts in the market leading to wastage of this nutritious crop [2]. Potatoes can be processed into dehydrated flour which has a longer shelf life than fresh tubers. Dehydrated potato flour is a highly versatile and inexpensive raw material that can be added as an ingredient to a variety of products such as bakery products, extruded products and soup mixes.[3] Processing of potato into value added product such as flour would not only reduce post harvest loss but also generate income at village level [4]. Potato flour is generally prepared by cooking the peeled potato slices in hot water followed by drying and milling [5]. Cooking is an important step done to inactivate polyphenol oxidase enzyme, responsible for enzymatic browning of cut potatoes. These steps would definitely bring about a number of changes in the physic-chemical composition of potatoes thus affecting their functional properties. Supplementation of potato flour in various products demands its high quality. so, this study was undertaken to determine the effect of pre-cooking on the pasting and functional properties of potato flour.

MATERIAL AND METHODS

Materials

Fully cured tubers of potato cultivar 'Kufri Pukhraj' were procured from vegetable farm of Punjab Agricultural University, Ludhiana.

Potato flour preparation

Pre-cooked flour

Modified method of Marwaha and Sandhu [6] was used for the preparation of pre-cooked flour. Raw potato tubers were washed, peeled and cut into 10 mm thick slices with a rotary hand slicer. The slices were pre-cooked for 6 minutes in boiling water. After cooking, potato slices were dipped in 0.2% solution of potassium metabisulphite for 15-20 minutes. The sulphited slices were drained, loaded in cabinet tray dryer at 60±5°C for 5 to 6 hours.

Preparation of raw flour

Potato slices prepared as above, were dried in cabinet tray drier at 60±5°C for 5 to 6 hours. The dried potato slices obtained from the above cooking methods, were ground in an electric grinder and then powdered in cyclotec mill to fine powder (0.5 mm mesh size). The potato flour samples were collected and packed in polythene bags till further use.

Pasting profile

The pasting profile of the potato flours was studied using a Rapid Visco-Analyzer (Model RVA-3, Newport Scientific Pvt. Ltd., Australia). 3g of flour sample was mixed with 25ml of distilled water in the RVA sample canister to make a total of 28 g of flour suspension. The flour suspension was held at 50 °C for 1 minute and later heated to 95 °C for 3 minutes. The suspension was held at 95 °C for 3 minutes before it was subsequently cooled to 50 °C over a period of 4 minutes and then held at this temperature for 2 minutes. RVA parameters i.e. pasting temperature, peak viscosity, hold viscosity, final viscosity, breakdown and set back viscosity were recorded. All the measurements were replicated thrice.

Color profile of prepared potato flours

Color values of prepared potato flours were depicted using a Minolta Chroma colorimeter model CR200 (Minolta Co., Osaka, Japan). The measurements were displayed in *L*:* lightness, *a*:* redness and *b*:* yellowness. The colorimeter was calibrated with standards provided by the manufacturer

Statistical analysis

The data was subjected to one-way analysis of variance (ANOVA) using SPSS version 11.0 (Statistical Package for Social Sciences).

RESULTS AND DISCUSSION

Pasting behavior

The pasting characteristics of raw (uncooked) and pre-cooked potato flours as determined by Rapid Visco Analyzer (RVA) is presented in Fig. 1. RVA measures the resistance of starch to shearing forces under defined hydration and temperature regimes. Significant difference ($P<0.05$) in pasting behavior was observed among raw and processed flours. Peak viscosity (PV) occurs at the equilibrium point between swelling and polymer leaching (which cause an increase in viscosity) and rupture, and polymer alignment (which cause it to decrease) [8]. Higher PV was observed in raw potato flour than processed flour (Fig. 1).The decline in viscosity of processed potato flour might be due to gelatinization of starch during the blanching step.

Following PV at high temperature, the flour samples were held for some time at this temperature. During this holding period, the flour samples were subjected to a period of mechanical shear stress which further disrupted the starch

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granules. Higher Hold Viscosity (HV) was observed in raw potato flour (4872) than processed flour (2943) (Fig. 1). As explained by Abiodun et al [8], the ability of flour samples to withstand heating and shear stress had been reported to be an important factor for many processes.

Breakdown is a measure of susceptibility of cooled starch granules to disintegrate and has been reported to be of great industrial importance. The pre-cooked flour displayed lower (345cP) breakdown in viscosity compared to uncooked flour (3288cP) (Fig. 1). BV is known to affect stability of flours [7]. In this study, a lower viscosity achieved in processed flour is of great significance in preparation of weaning and supplementary foods [1].

Raw potato flour sample displayed higher Final Viscosity (FV) and Set back Viscosity (SV) compared to processed flour sample (Fig. 1). SV is the recovery of the viscosity during cooling of the heated starch suspension [10]. Setback phenomenon causes hardening of cooled starch suspensions due to amylose retrogradation. Lower SV of pre-cooked flour obtained in this study is indicative of their lower ability to retrograde. Retrogradation phenomenon is of great industrial significance since it affects textural attributes in starchy foods. Thus, low SV attained in processed flour is particularly important in soups and sauces formulations which undergo loss of viscosity as a result of retrogradation.

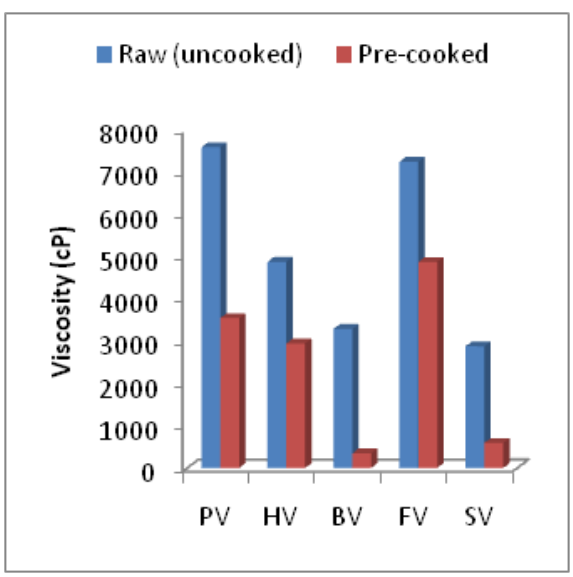

Fig. 1 Pasting profile of raw and pre-cooked potato flours

Color attributes

Color is one of the important physical parameters often used by the manufacturers and consumers to qualitatively assess the eminence of food products. The color of potato flour as affected by pre cooking is depicted in Fig. 2. *L** (lightness) value for pre-cooked and raw flour was 66.82 and 62.18, respectively. Flour obtained by pre-cooking was brighter than raw potato flour which might be due to non-enzymatic browning reaction which had occurred in raw flour sample due to absence of browning inhibitor (potassium metabisulphite). Sulphites are widely used to inhibit both enzymatic and non-enzymatic reactions occurring in fruits and vegetables [11]. *a** and *b** values which depict redness and yellowness of the samples were also higher in pre-cooked potato flour (Fig. 2).

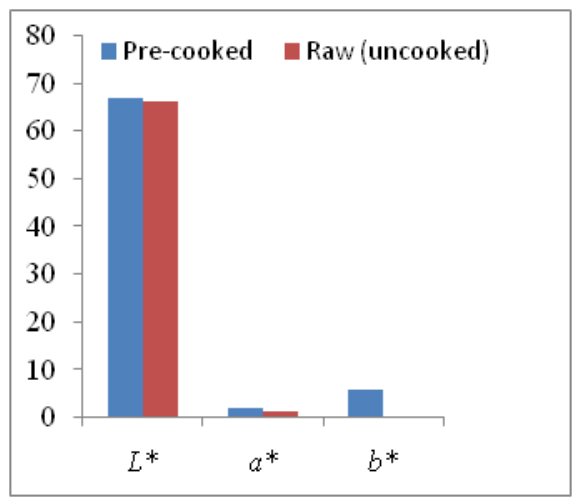

Fig. 2 Color characteristics of raw and pre-cooked potato flours

Conclusion

The results of the present study concluded that pre-cooking improved the functional and color attributes of potato flour, making it more desirable for food supplementation. Pasting profile of pre-cooked potato flour displayed lower viscosities compared to raw flour indicating their application in food industry, particularly in infant baby food formulation.

REFERENCE

[1] Yadav AR, Guha M, Tharanathan RN and Ramteke RS (2006). Influence of drying conditions on functional properties of potato flour. Eur Food Res Technol., 223: 553-560. | [2] Marahwa RS (1997). Processing of potatoes: current status, need, future potential and suitability of Indian varieties – A critical appraisal. J Food Sci Technol., 34: 457-471. | [3] Singh N, Kaur SP, Kaur L and Sodhi NS (2005). Physico-chemical, rheological and chapatti making properties of flours from some Indian potato cultivars. J Food Sci Technol., 42(4): 344-348. | [4] Kulkarni KD, Govind N and Kulkarni D (1997). Production and use of raw potato flour in Mauritian traditional foods. Food Nutr Bull., 17: 162-168. | [5] Pant S, Kulshreshtha K (1995). Physical characteristics of potato flour made from six varieties. J Food Sci Technol., 32: 71-73. | [6] Marwaha RS and Sandhu KS (2003). Yield, sensory and nutritional qualities of potato flours prepared from low and high dry matter cultivars stored at different temperatures. J Food Sci Technol., 40(6): 638-645. | [7] Kaur M, Sandhu KS and Kaur J (2013). Pasting properties of Tamarind (Tamarindus indica) kernel powder in the presence of xanthan, carboxymethyl cellulose and locust bean gum in comparison to rice and potato flour. J Food Sci Technol., 50(4): 809-814. | [8] Abiodun OA, Omolola OA, Olosunde OO and Akinoso R (2013). Effect of pre-cooking and particle size distribution on the pasting and functional properties of Trifoliate (Dioscorea dumetorum) yam flour. British J Appl Sci Technol., 3(4): 847-859. | [9] Muyonga JH, Ramteke RS and Eipeson WE (2001). Prehydration steaming changes physico chemical properties of unripe banana flour. J Food Process Pres., 25: 35-47. | [10] Singh N, Sandhu KS and Kaur M (2004). Characterization of starches separated from Indian Chickpea (Cicer ariethnum L.) cultivars. J Food Eng., 63: 441-449. | [11] Illeperuma DCK and Wickramasinghe NK (2000). Suitability of locally available potato varieties for chipping. J Natn Sci Foundation Sri Lanka., 28(2): 143-151. |