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Research Paper

Quality Evaluation of Potato Starch Incorporated Chicken Meat Momos

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ABSTRACT

The chicken momos were prepared by replacing refined wheat flour with potato starch at three different levels i.e. P1 (4% potato starch), P2 (6% potato starch) and P3 (8% potato starch) and compared with control (C) with no added starch. The mean cooking yield, moisture content, carbohydrates and energy values increased significantly ($P<0.05$) but the mean protein and fat content decreased. The textural parameters i.e. hardness, adhesiveness, springiness, cohesiveness, gumminess and chewiness values increased slightly in a non significant manner but L*, a*and b* values differed significantly ($P<0.05$). Scores for mean appearance and color and texture was higher for 4% potato starch incorporated chicken momos. Chicken meat momos incorporated with 4% potato starch were selected as the best treatment on the basis of physico-chemical properties and sensory evaluation.

Keywords : *Chicken momos, Color estimation, Potato starch, Texture profile analysis*

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INTRODUCTION

Currently the consumers are much more aware about the nutritional requirements of their health than before and they need healthy, safe and convenient food with pleasant appearance and taste. Starches are commonly added to meat products and are popular not only for their functional properties but also to extend the lean meat portion of products. The effect is based on the ability of starch to gelatinize when heated in water containing medium thereby binding relatively large amount of water. Potato starch is most commonly used as an extender or binder in meat and meat products which is often considered as an ideal product due to its low gelatinization temperature, high water binding capacity, high viscosity and clarity in solution (Zhang and Barbut, 2005). Starches are multifunctional food ingredients with several beneficial properties like adhesion, binding, emulsion stability, gelling and moisture retention. The ready to cook snack food like chicken momos are the steamed meat product and much relished by large section of society. The quality attributes of meat momos mainly depends on the characteristics of dough as well as on the filling content like an enrobed products. The demand of chicken meat is very high due to presence of easily digestible protein and other essential nutrients; it is free from religious taboo and easily available in the market. Potato starch may act as fat replacer and may improve textural, color and sensory properties of chicken momos dough. Therefore the present study was carried out with objective to improve quality characteristics of chicken meat momos with incorporation of potato starch at different levels.

MATERIALS AND METHODS

The experiment was conducted in the Department of Livestock Products Technology, College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura. Dressed carcasses were procured from authorized meat shops, Mathura whereas other ingredients were procured from standard firms. Three different treatments replaced with potato starch were assigned in meat momos as: P1- 4% potato starch, P2- 6% potato starch and P3- 8% potato starch and Control without potato starch. The formulation of filling material and dough is given in Table 1 and 2.The chicken meat was cooked under moist heat in pressure cooker at 121^0C for 15 minutes. The boiled chicken meat and condiments used for filling were manually chopped separately with hand vegetable chopper. 5 g dough was taken, rolled in round shape and filled with 15 g of filling material and the edges were closed properly. The meat momos were shaped manually at ambient temperature followed by cooking in momo steamer for 30 minutes. The product was analyzed for pH, cooking yield, weight increase (Ozkaya and Kahveci 1990), proximate composition (AOAC 1995), water activity, energy content (oxygen bomb calorimeter), color values (lightness, redness and yellowness), texture profile analysis (stable Micro system TA.XT-2i-25) and sensory evaluation (Keeton *et al.* 1983) on the basis of 8 point hedonic scale. Data

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were analyzed statistically on 'SPSS-19.0' software package as per standard methods (Snedecor and Cochran 1994).

Table 1: Formulation used for filling material to prepare the chicken meat momos

Ingredients	Percent (%)
Chicken meat	50
Condiments	38.5
Refined wheat flour	5
Spices	2
Chilli	3
Salt	1.5

Table 2: Formulation of dough for chicken meat momos covering replaced with potato starch

Ingredients	C	P1	P2	P3
Refined Wheat Flour	100	96	94	92
Potato starch	-	4	6	8
Refined oil	4	4	4	4
Salt	0.5	0.5	0.5	0.5

Water was added as per the requirement

RESULTS AND DISCUSSION

***Physico-chemical and proximate parameters*:** The mean pH, cooking yield, weight gain and water activity values for various treatments containing different levels of potato starch are shown in Table 3. There was no significant (P>0.05) difference in pH between control and treatments however cooking yield increased significantly (P<0.05) with incorporation of potato starch. The possible reason behind this might be increased water retention capacity of momos prepared by incorporation of potato starch. Katsanidis *et al*. (2001) also observed that dehydrated potato powder (composed of 85% starch) improved the cooking yield and reducing the rancidity in beef patties. The weight gain and water activity had no significant (P>0.05) difference however increased slightly due to higher cooking yield of treatments.

The moisture content increased significantly (P<0.05) in treatments which might be due to around 19% moisture in potato starch. Starches are hydrophilic in nature and may retain water in product. The observation is in agreement with findings of Muthia *et al*. (2010) who also reported that addition of potato flour with tapioca, wheat and sago flours increased the moisture content in duck sausages. The fat content decreased non significantly (P>0.05) in order of C>P1>P2>P3 because starches act as a potent fat replacer. A significant (P<0.05) difference was recorded in all the treatments and control for carbohydrate and energy content but non significant difference in ash content.

Color estimation: The mean color values of chicken momos incorporated with potato starch are shown in Table 4. There was a significant (P<0.05) difference in mean lightness and redness value but lightness value increased and redness decreased with increased level of potato starch. The main effect of potato starch seems to be its increased lightness (Vickery and Rodgers, 2002; Dzieszuk*et al*. 2005; Liu *et al*. 2008). The

Table 3: Physico-chemical properties and proximate analysis (Mean±SE) of chicken momos incorporated with potato starch

	C	P1	P2	P3	Treatment mean
pH	5.74±0.07	5.75 ±0.19	5.76 ±0.02	5.78±0.07	5.76 ±0.05
Cooking yield	106.71^{b} ±0.15	107.05^{a} ±0.04	107.09^{a} ±0.08	107.09^{a} ±0.14	106.98 ±0.06
Weight gain	6.46 ±0.19	6.46±0.03	6.46±0.12	6.47±0.12	6.46 ±0.06
Water activity	0.98 ± 0.01	0.98±0.01	0.98 ±0.01	0.98±0.01	0.98 ±0.01
Moisture (%)	58.43^{b} ±0.27	60.09^{a} ±0.38	60.26^{a} ±0.45	61.06^{a} ±0.23	59.96±0.25
Protein (%)	18.80^{a} ±0.42	16.67^{b} ±0.28	16.68^{b}±0.29	16.64^{b}±0.40	17.19 ±0.40
Fat (%)	3.67±0.14	3.03±0.29	3.18±0.24	3.23±0.27	3.28±0.12
Carbohydrate(%)	18.12^{b}±0.69	20.11^{a} ±0.56	20.92^{a} ±0.62	21.23^{a} ±0.60	20.09 ±0.38
Ash (%)	0.96 ±0.018	0.95±0.019	0.95 ±0.017	0.94±0.021	0.95±0.01
Energy (kcal/g)	4.91^{a} ±0.02	4.84^{ab} ±0.03	4.81^{b} ±0.03	4.78^{b}±0.006	4.8±0.01

Overall means bearing different superscripts between rows differ significantly (P<0.05); n=6

yellowness value increased in non significant manner which might be due to slight yellow colour of potato starch. Muthia*et al*. (2010) observed the highest yellowness value in the duck meat sausages containing potato flour.

Table 4: Color values (Mean±SE) of chicken momos incorporated with potato starch

	C	P1	P2	P3	Treatment mean
Lightness (L^*)	44.66^{c}±0.08	45.83^{b} ±0.09	46.25^{b}±0.20	47.37^{a}±0.34	46.03±0.22
Redness (a^*)	4.42^{a}±0.01	2.69^{b}±0.03	2.71^{b}±0.23	2.73^{b}±0.06	3.14±0.16
Yellowness (b^*)	12.17±0.55	12.64±0.29	12.68±0.04	12.73±0.07	12.5±0.15

Overall means bearing different superscripts between rows differ significantly (P<0.05); n=6

Texture profile analysis: The texture profile values for various treatments are shown in Table 5.Thehardness, adhesiveness, springiness, cohesiveness, gumminess and chewiness values increased non significantly with the potato starch incorporation. The hardness and moisture content of product are highly correlated to each other so both increased with increased potato starch level. Carballo *et al*. (1996) also observed that the presence of starch led to significant increase in the values of hardness of bologna sausage. A normal fat content, a relatively high level of starch resulted in a harder and springiness structure than low fat products but was not able to reduce gumminess of low fat sausages as compared with full fat products (Pietrasik 1999). Dzieszuk *et al*. (2005) suggested that use of potato starch at levels higher than 4% has a detrimental effect on sausage hardness and gumminess. In reduced fat turkey batters modified potato starch increase hardness and cohesiveness with no effect on springiness (Hachmeister and Herald 1998).

Table 5: Texture profile analysis (Mean±SE) of chicken momos incorporated with potato starch

	C	P1	P2	P3	Treatment mean
Hardness (N/cm^2)	66.34±1.26	66.86±6.21	67.15±7.10	67.73±7.19	67.02±2.78
Adhesiveness (Ns)	-0.46±0.03	-0.43±0.06	-0.43±0.09	-0.43±0.07	-0.44±0.03
Springiness (cm)	0.41±0.04	0.42±0.08	0.42±0.09	0.42±0.07	0.42±0.03
Cohesiveness (ratio)	0.063±0.01	0.063±0.01	0.064±0.01	0.064±0.01	0.064±0.01
Gumminess ($N/cm^{2)}$	28.98±3.87	28.99±5.14	28.99±5.14	29.01±5.13	28.99±2.26
Chewiness (N/cm)	8.43±1.09	8.46±1.22	8.48±1.25	8.48±1.24	8.46±0.56

Overall means bearing different superscripts between rows differ significantly (P<0.05); n=6

Sensory evaluation: Various sensory parameters including overall acceptability scores of various treatments are shown in Table 6. Appearance and color scores were significantly (P<0.05) higher in P1 than control and other treatments as semi trained sensory panelists liked the slight yellow color of chicken momos provided by potato starch at lower level, but there was no significant (P>0.05) difference in between C, P2 and P3. Flavor, texture, saltiness and meat flavor intensity scores had no significant (P>0.05) difference, however mouth coating scores of C and P1 were significantly (P<0.05) higher than P2 and P3. The appearance and colour values decreased with potato starch addition due to slight yellowish appearance which was highest in P2 and P3 treatment but desirable in P1. The incorpoartion of potato starch at 4% leevl also enhanced flavour and texture scores due to crunchyness of potato starch but decreased at higher levels (6 and 8%) because of increased moisture content and stickiness of product. Liu *et al*. (2008) observed that addition of modified potato starch increased sausage tenderness and improved juiciness. Yanqui *et al*. (2008) reported that dumplings containing 2% potato starch was scored highest for color and appearance and other parameters. Overall acceptability scores of P1 had no significant (P>0.05) difference with C, however OA scores of P2 and P3 lowered significantly (P<0.05) than C and P1. Therefore chicken momos incorporated with 4% potato starch in dough were selected as the best treatment.

Table 6: Sensory attributes (Mean±SE) of chicken momos incorporated with potato starch

	C	P1	P2	P3	Treatment mean
Appearance & color	5.59^{b}±0.09	6.00^{a}±0.11	5.48^{b}±0.12	5.44^{b}±0.14	5.62±0.09
Flavor	5.51±0.17	5.44±0.17	5.35±0.18	5.21±0.20	5.37±0.09
Texture	4.85±0.15	4.92±0.17	4.70±0.13	4.66±0.14	4.78±0.07
Saltiness	6.18±0.15	5.62±0.19	5.85±0.20	5.85±0.20	5.87±0.09
Mouth coating	5.62^{a}±0.12	5.55^{a}±0.11	4.98^{b}±0.14	4.63^{c}±0.11	5.19±0.09
Meat flavor intensity	5.96±0.16	5.70±0.18	5.62±0.15	5.55±0.22	5.71±0.09
Overall acceptability	5.85^{a}±0.11	5.65^{a} ±0.09	5.01^{b} ±0.12	4.66^{c}±0.13	5.29±0.08

Overall means bearing different superscripts between rows differ significantly ($P<0.05$); n=6

CONCLUSION

Potato starch incorporated chicken meat momos had crispy texture, appealing appearance, desirable color and high cooking yield as compared to control. Addition of starch improved nutritional quality of chicken moms in terms of lower fat content due to fat replacing activity of potato starch. It can be concluded that chicken momos with 4% potato starch by replacing refined wheat flour were the most acceptable on the basis of various physico-chemical properties and sensory evaluation.

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