J.Meat Sci., 2012, 8(1&2) : 76 - 79 Research Note

Effect of Incorporation of Glutinous Rice Flour on Quality of Duck Meat Salamis

Nashrin Jebin, S.K. Laskar, M. Hazarika*, D.R. Nath, Z. Rahman, D.M.Chavhan
College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati- 22, Assam

ABSTRACT

This study was carried out with the aim to develop duck meat salamis with incorporation of glutinous rice flour. Four different formulations *viz.* Control, A, B and C were prepared by adding decreasing levels of duck fat (15, 10, 8 and 5 %) and increasing levels of glutinous rice flour (0, 5, 7 and 10 %), respectively and subjecting to certain quality evaluation for emulsion stability, cooking loss, proximate composition and organoleptic evaluation. Emulsion stability was found to be significantly ($P < 0.01$) higher in formulation C as compared to that of control. Proximate composition of salamis revealed a significant ($P < 0.01$) decrease in the per cent moisture content from control (65.27 ± 0.29) to formulation C (65.04 ± 0.23). There was a significant ($P < 0.01$) decrease in the per cent ether extract from control (16.67 ± 0.20) to formulation C (11.98 ± 0.23), however, a significant rise ($P < 0.05$) in the per cent crude protein content from control (14.36 ± 0.19) to the formulation C (14.41 ± 0.27) was observed. The overall acceptability of formulation B (7.75 ± 0.19) was significantly ($P < 0.01$) higher as compared to the Control (7.23 ± 0.16), A (7.41 ± 0.17) and C (7.54 ± 0.18). From the above study, it can be concluded that suitable fat reduced duck meat salamis can be prepared successfully and that the best product can be obtained by incorporation of 8 per cent duck fat and 7 per cent glutinous rice flour.

Key words: *Duck meat salami, glutinous rice flour, quality characteristics.*

Duck meat combines the attributes of red meat containing high levels of phospholipids, precursors of aromas and the dietetic characteristics of poultry meat containing high levels of unsaturated fatty acids representing around 60 per cent of total fatty acids (Baeza, 2006).

Duck meat plays an important role in the total poultry meat production in Assam as duck population occupies the second highest position in our country. Although duck meat is relished and well accepted by the consumers, many consumers are obsessed with the fear of high content of fat in duck meat. The demand for low fat duck meat products is increasing among the consumers. Out of several methods for reducing fat content in processed meat products, one is incorporation of non meat cereal products in the meat formulations of comminuted meat products. In the light of the above facts, this study was conducted to prepare low fat duck meat salamis by incorporating glutinous rice flour which is available in Assam and North Eastern Region and often used as an ingredient of many traditional food items. This rice is also called Sticky rice, Sweet rice, Waxy rice, Botan rice, Mochi rice and Pearl rice (Alden, 1996). Glutinous rice (*Oryza sativa* L.) has no or negligible amount of amylose but contains high amount of amylopectin, a distinguishing characteristic from other types of rice. This amylopectin is responsible for the sticky quality of glutinous rice (Kenneth and Michael, 2002). Though the name glutinous rice indicates presence of gluten in it but actually does not contain gluten and is therefore safe to be included in diet. Taking into account the sticking and emulsifying properties of glutinous rice, it provides a possible scope to utilize the same for preparation of fat reduced duck salamis.

Local ducks (*Pati*) were collected from the nearby market and were scientifically slaughtered in the

*Corresponding author, e-mail: mineswarh@rediffmail.com

semi-mechanized poultry dressing unit of the LPT Department, C.V.Sc., A.A.U., Khanapara. Also good quality glutinous rice (*Ranga bora*) was purchased from the nearby local market and was soaked overnight and finely ground to flour in a hand grinder. The deboned meat along with heart, liver and gizzard was cut into small cubes of 3 cm size and thereafter ground in a mincer through 4 mm plate. Salt (2.5 %) and sodium nitrite (0.02 %) were added to the minced meat. Ingredients were then thoroughly mixed and stored at 4 ± 1°C for next 24 hours to facilitate proper curing. Meat emulsions were prepared by mixing lean portion of duck meat (85 %) in all the formulations thoroughly with duck fat (DF) and glutinous rice flour (RF) at four different levels viz. Control (15 % DF + 0 % RF), A (10 % DF + 5 % RF), B (8 % DF + 7 % RF) and C (5 % DF + 10 % RF). During mixing of lean, duck fat and glutinous rice flour, necessary seasonings (spices/condiments) were also added. The meat emulsions were then stuffed into artificial casings with the help of a mechanical stuffer. The stuffed salamis were weighed, labelled and smoked at 50°C for ½ hour in the smoke house and then cooked at 75°C for 45 minutes till the internal temperature reached to 70°C. Salamis were cooled down with chilled water and kept overnight at refrigeration temperature for chilling. The chilled salamis were peeled and sliced into 0.5 cm thickness and randomly packaged into sterilized polyethylene bags. The duck salamis were then evaluated for different qualitative traits.

Cooking loss was determined as the difference between cooked and raw weight and expressed in percentage. Stability of meat emulsion was determined as per the procedure of Mongale *et al.* (1985). The proximate analysis was carried out by A.O.A.C. (1990) methods. The organoleptic evaluation of the product was done with the help of semi-trained panelists using 10 point hedonic scale. Seven trials were conducted and the data obtained were subjected to statistical analysis as per the method outlined by Snedecor and Cochran (1994).

The results of organoleptic evaluation of duck meat salamis are presented in Table 1. The mean values for colour, flavour and tenderness scores increased significantly ($P < 0.01$) with reduction in levels of fat and increasing levels of rice flour. The variation in the colour might be ascribed to the fact that decreasing of fat content increased the colour intensity of the product (Hughes *et al.,* 1998). In addition to this, the light pink colour of *Ranga bora*/glutinous rice which is red in colour might have contributed to the increased intensity of colour of the salamis with increasing levels. The mean values for juiciness score of duck salamis decreased significantly ($P < 0.05$) with decreasing levels of fat and increasing levels of rice flour. This might be due to reduction in fat and moisture content with simultaneous increase in the levels of rice flour in different formulations compared to that of control. The results of the present study are well in accordance with the findings of Claus and Hunt (1991) in low fat bologna. Nag *et al.* (1998) also reported significantly ($P < 0.05$) lower juiciness score in chicken nuggets due to extension with rice flour. Significantly ($P < 0.01$) higher score was obtained for overall acceptability in formulation B (7.75) as compared to control (7.23),

Table 1. Effect of incorporation of glutionous rice flour on organoleptic quality (Mean ± SE) of duck meat salamis.

Parameters	Control	A	B	C
Colour	6.93 ^{a}± 0.29	7.02 ^{b}± 0.22	7.14 ^{c}± 0.14	7.25 ^{d}± 0.16
Flavour	6.80 ^{a}± 0.22	7.11 ^{b}± 0.17	7.29 ^{c}± 0.16	7.41 ^{cd}± 0.15
Juiciness	7.48 ^{a}± 0.25	7.39 ^{ab}± 0.20	7.36 ^{abc}± 0.19	7.25 ^{cd}± 0.17
Tenderness	7.14 ^{a}± 0.15	7.29 ^{b}± 0.17	7.41 ^{c}± 0.17	7.50 ^{cd}± 0.19
Overall acceptability	7.23 ^{a}± 0.16	7.41 ^{b}± 0.17	7.75 ^{c}± 0.19	7.54 ^{d}± 0.18

Means bearing different superscripts within the row differ significantly ($P<0.05$).

Table 2. Effect of incorporation of glutinous rice flour on the physic-chemical quality of duck meat salamis (Mean ± SE).

Parameters	Control	A	B	C
Cooking loss (%)	13.33 ± 0.14	13.21 ± 0.20	13.11 ± 0.45	12.87 ± 0.41
Emulsion stability (ml/100g)	1.97 ^{a} ± 0.03	1.53 ^{b} ± 0.11	1.18 ^{c} ± 0.05	0.69 ^{d} ± 0.10
Moisture (%)	65.27 ^{a} ± 0.29	65.11 ^{b} ± 0.25	65.09 ^{bc} ± 0.21	65.04 ^{d} ± 0.23
Protein (%)	14.36 ^{a} ± 0.19	14.37 ^{ab} ± 0.14	14.37 ^{bc} ± 0.18	14.41 ^{bcd} ± 0.27
Fat (%)	16.67 ^{a} ± 0.20	15.49 ^{b} ± 0.19	14.86 ^{c} ± 0.11	11.98 ^{d} ± 0.23
Ash (%)	1.323 ±0.121	1.325 ±0.106	1.326 ±0.125	1.327 ±0.156

Means bearing different superscripts within the row differ significantly (P<0.05)

A (7.41) and C (7.54) samples. This might be due to awarding of better scores for colour, flavour, juiciness, tenderness and good taste contributed by glutinous rice flour flavour components and moderate quantity of fat in the formulation B. Similar results were also obtained by Siddappaji *et al.* (2003) in fish sausages prepared with addition of 11 per cent rice flour.

The results of cooking loss, emulsion stability and proximate analysis are presented in Table 2. No significant differences in per cent cooking losses were found among the samples. However, a reducing trend in cooking loss was observed as the fat was substituted gradually by glutinous rice flour. This might be due to good water binding capacity of rice flour and formation of a strong emulsion (Reddy and Rao, 1996). Duck meat salami containing 5 per cent duck fat and 10 per cent glutinous rice flour (formulation C) had shown significantly higher ($P < 0.01$) emulsion stability in comparison to the other three formulations viz. control (15 % duck fat and 0 % glutinous rice flour), A (10 % duck fat and 5 % glutinous rice flour) and B (8 % duck fat and 7 % glutinous rice flour). Better gelatinization property of the starch present in the rice flour coupled with appropriate levels of duck fat and meat protein formed a strong emulsion (Puolanne and Rucesunen, 1983). The present finding was in close agreement with the report of Nag *et al.* (1998) who studied the emulsion stability of chicken nuggets extended with rice flour at four different levels. The mean per cent moisture content of duck salamis decreased significantly ($P < 0.01$), the highest being in control (65.27) followed by A (65.11), B (65.09) and C (65.04) samples, however, a contrasting value in per cent crude protein content was observed. The protein contents were significantly ($P < 0.05$) increasing with increased addition of glutinous rice flour. The lowest protein percentage was found in control (14.36) and the highest was in formulation C (14.41). Such an increase in protein content might be due to the gradual reduction of fat content in the formulations of duck meat salami which resulted in the increase of protein concentration. (Mc Keith and Merkel, 1991). The mean values of per cent ether extract revealed a significantly ($P < 0.01$) decreasing trend from control (16.67) to formulation C (11.98). Nag *et al.* (1998) also observed a similar trend in the per cent ether extract content in chicken nuggets, incorporated with 0 and 15 per cent rice flour respectively. A minor increase in the mean per cent total ash content was revealed by the salami samples due to addition of rice flour without any significant differences. Such an increase in total ash content might be ascribed to the presence of mineral matters in the rice flour as reported by Das *et al.* (2005). From the above study, it is concluded that duck meat salamis with acceptable organoleptic and chemical attributes can be developed with incorporation of glutinous rice flour in the formulations.

The authors thank the Dean, College of Veterinary Science, Assam Agricultural University (A.A.U.), Khanapara, Guwahati -22 for the necessary facilities provided to carry out the study.

REFERENCES

Alden, L. (1996). Cook's Thesaurus : Rice. http://www.foodsubs.com Retrieved 2006-03-02.

AOAC (1990) Official Methods of Analysis of the Association of Official Analytical Chemist, 15th Edn., USDA, Washington, D.C.

Baeza E (2006) Paper published in symposium COA/ INRA Scientific cooperation in Agriculture.Taiwan, R.O.C.,Nov 7-10.

Claus JR and Hunt MC (1991) Low-fat, high-added-water bologna formulated with texture-modifying ingredients. J. Food Sci. 56 : 643- 647, 652.

Das P, Neog P, Laishram PD and Gogoi M (2005) Nutrient composition of some cereals and pulses based recipes of Assam, India. J. Hum. Ecol., 17 (4): 237-246.

Hughes E, Mullen AM and Troy DS (1998) Effect of fat level, tapioca starch and whey protein in frankfurters formulated with 5 % and 12 % fat. Meat Sci., 48 : 169-180.

Kenneth M O and Michael D P (2002) Molecular evidence on the origin and evolution of glutinous rice. Genetics 162 (2): 941–950.

Mc Keith FK and Merkel RA (1991) Technology of developing low-fat meat products. J. Anim. Sci. 69 : 116- 124.

Mongale CW, Carpenter JA and Reagan JO (1985) J. Food Quality.8: 145.

Nag S, Sharma BD and Kumar S (1998) Quality attributes and shelf life of chicken nuggets extended with rice flour. Indian J. Poultry Science 33 (2) : 182-186.

Puolanne EJ and Rucesunen M (1983) Fleischwirstschaft (Abst), 63 : 631- 633.

Reddy P and Rao TS (1996) Influence of binders and refrigerated storage on quality characteristics of chicken patties. Indian J. Poultry Science 31 (2) : 110-114.

Siddappaji S, Thippeswamy S and Annappaswamy T S (2003) Studies on fish sausage incorporated with rice flour at cooler storage temperature. SDMRI Research Publication, Suganthi Devadason Marine Research Institute, 44 – Beach Road, Tuticorin – 628 001, Tamil Nadu, India, 3 : 77-82.

Snedecor G W and Cochran WG (1994) Statistical Methods, 1st Edn. East West Press Pvt. Ltd., New Delhi.