SHORT COMUNICATION

EGG PASTA (*ERIŞTE*) PRODUCED FROM WHOLE GRAIN OAT FLOUR

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Abstract

In this study, egg pastas (*eriştes)* were produced by incorporating refined or whole grain oat flours (ROF, WOF, respectively) at different levels (25, 50 and 100%; w/w) instead of bread wheat flour (BWF) according to the traditional *erişte* production. Some chemical and quality properties of *erişte*s were investigated and compared to the control *erişte*s prepared with BWF or durum semolina. The highest ash, protein and titration acidity contents were obtained with the *erişte* prepared with 100% WOF. The brightness (L*) values of the oat incorporated *erişte*s were lower than the controls. An increasing of WOF level caused gradually an increase in the redness (a*) of *erişte*s. The yellowness (b*) values of WOF incorporated *erişte*s were higher than ROF incorporated *erişte*s and control *erişte* produced with BWF. Cooking properties of *erişte*s prepared with oat flours were generally lower than those of controls. Total dietary fiber contents of *erişte*s prepared with ROF or WOF were in the ranges of 5.29–9.16%, or 8.41–18.25%, respectively. WOF containing uncooked *erişte*s had higher β-glucan content than those of ROF containing and control ones. β-glucan contents of oat included *erişte*s were in the range of 0.67–3.35% in uncooked form. Total phenolic compound contents of all cooked *erişte*s considerably decreased. Antioxidant activities of oat included uncooked *erişte*s were higher than that of controls.

Keywords: oat; whole grain; egg pasta; erişte; β-glucan.

Introduction

Oats have great potential as a health-promoting raw material in several types of foods. Oats have traditionally been used mainly as oatmeal, bran or flakes, which are used to produce porridge, bread and breakfast cereals. Oats are also used in various forms as an ingredient in pasta, biscuits, snack bars and beverages (Kaukovirta-Norja, Lehtinen, 2008). Oat ingredients can be added into a variety of consumer products to provide health-promoting properties, to adjust the flavor and visual appearance or to achieve technological goals. The health effects associated with oats relate essentially to the total dietary fibre and β-glucan contents of oat products (Kaukovirta-Norja, Lehtinen, 2008). The β-glucan of oat and barley has constantly been shown to lower low-density lipoprotein (LDL) and total cholesterol in concern with elevated cholesterol (Jones, 2008).

Pasta products have been consumed in Mediterranean countries for many centuries and it takes the second place after bread in consumption over the world (Torres et al., 2007). Fresh egg pasta (*tagliatalle, fettuccine and tagliolini*) is a typical product in Italy. It is made by hydrating durum wheat with water and eggs. After mixing and kneading, sheeting-rolls are used for shaping. Egg pasta, which is also a traditional product in west Black Sea region of Turkey, is usually called as '*Erişte*'. It is generally produced with a homemade style. The main ingredients of *erişte* are wheat flour, water, salt and egg. Semolina is rarely used in its production. The traditional production method differs in many ways from the industrial production method used in pasta companies. It is well known that production parameters highly affect not only quality characteristics but also sensorial and nutritional properties of pasta products (Petitot et al., 2007; De Zorzi et al., 2007; Manthey, Schorno, 2002; Alamprese et al., 2008). In the present study, *erişte* was produced by incorporating different levels of *whole grain or refined oat flours* (WOF, ROF, respectively) instead of bread wheat flour (BWF) in order to develop high fiber and healthy *erişteş* for consumers and to help producers for developing an alternative product. Then, some chemical and quality properties of *eriştes* were investigated and compared to the control *eriştes* prepared with BWF or durum semolina. Oat incorporated *eriştes* were also evaluated for some of their nutritional properties such as β-glucan, total dietary fiber, total phenolic compound contents and antioxidant activity.

Materials and Methods

Materials

ROF and WOF were obtained from the cereal flour wholesalers located in the city of İstanbul. Other ingredients including BWF, durum semolina, egg and salt were purchased from local markets. β-glucan and total dietary fiber assay kits were provided from Megazyme International Ireland Limited, Wicklow, Ireland. All other chemicals used in this study were analytical grade.

Methods

In the present study, *eriştes* were produced by incorporating ROF or WOF at different levels (25, 50 and 100%; w/w) instead of BWF in the formulation. *Erişte*s were produced according to traditional method that includes mixing of ingredients (2% salt, 70 g egg, 10% durum semolina added on 720 g flour basis) with reasonable amount of water (250–450 mL), sheeting of dough, pre-drying on the *sadj* (hot metal plate) at around 185 °C for 60–90 seconds, cooling to room temperature, cutting into small strands, final drying at room temperature for 1–3 days and storing in plastic bags. Two controls were produced using BWF and durum semolina. Production of *erişte*s was carried out as replicate. *Erişte* samples were ground and sieved from 500 μm steel sieve (Retsch, Haan, Germany) for analysis. The remaining parts of *erişte* samples were kept for testing cooking properties.

Moisture, protein (N×6.25), ash, crude oil and titration acidity of the samples were determined according to the Approved Methods of American Association of Cereal Chemists International (AACCI, 2000) following the Methods of 44-01, 46-12, 08-01, 30-10, 31-01, respectively.

Pigment contents of the samples were determined according to AACCI Standard Method No. 14-50 (AACCI, 2000).

The colour properties of *erişte* samples was measured using the *L* a* b** colour space (CIELAB space) with Minolta Spectrophotometer CM-3600d (Tokyo, Japan).

Cooking properties, such as optimum cooking time, volume increase, water absorption, cooking loss, were determined according to AACC Standard Method No.66-50 (AACCI, 2000). Protein loss was determined in cooking water as spectrophotometricaly following the method of Lowry et al. (1951). Total organic matter (TOM), representing the amount of surface material released from cooked *erişte* into the washing water after rinsing, was determined according to D'Egidio et al. (1982).

Total dietary fiber (TDF, %) and β-glucan (%) contents of *eriştes* were determined using Megazyme assay kits. Total phenolic compounds (TPC, %) of *erişte* samples were determined according to Gutfinger (1981). TPC were extracted with dimethyl sulfoxide. For the preparation of cooked *eriştes* in order to analyze β-glucan and TPC contents, *eriştes* were cooked at optimum cooking time, after removing excess water, samples were lyophilized, then ground and kept for analysis at 4 ˚C. Antioxidant activities of *eriştes* were expressed as DPPH (2,2-diphenyl-1 picryhydrazyl) scavenging activity (%) following the method of Yu et al. (2002). The concentration of DPPH in test solution was 25 μM. β-glucan, TDF, TPC and antioxidant activity results were calculated on dry weight basis (dwb).

All analysis was carried out as triplicate. The data was statistically evaluated by using SPSS for Windows (Version 16.0). GLM variance analysis was applied. When significant differences were found, the Tukey's-b multiple comparison test was used to determine the differences among means.

Results and Discussion

The crude oil and protein contents of ROF and WOF were 8.6 and 12.6%, and 7.3 and 14.8% on dwb, respectively. Total dietary fiber and β-glucan contents of ROF and WOF were 8.2 and 1.83%, and 23.2 and 3.77% on dwb, respectively.

The moisture contents of controls and oat incorporated *erişteş* changed in the range of 12.7–13.6%. The ash contents of oat incorporated *eriştes* were higher than control ones. The crude oil contents of oat incorporated *eriştes* were higher than controls and the crude oil contents of both types of *eriştes* increased with an increasing rate of oat incorporation. The protein contents of controls and oat incorporated *eriştes* changed in the range of 12.2–14.8%. The protein contents of WOF incorporated *eriştes* were generally higher than ROF incorporated ones ($p<0.05$). The titration acidity values of oat included *erişte*s were higher than control *erişte*s, and titration acidity value increased with an increasing level of oat flour in both types of *erişte*s. The highest ash, protein and titration acidity contents were obtained with the *erişte* sample prepared with 100% WOF (data not presented).

The pigment contents of *erişte*s prepared with both flour types gradually increased with increasing levels of ROF and WOF ($p<0.05$). The pigment contents of *erişte*s produced with WOF were higher than the *erişte* samples produced with ROF and control ones. The highest pigment content was obtained with the sample prepared with 50% WOF among the *erişte* samples.

The brightness (L*) values of the oat incorporated *erişte*s were lower than the controls. An increasing of WOF level caused gradually an increase in the redness (a*) of *erişte*s. The yellowness (b*) values of WOF incorporated *erişte*s were higher than ROF incorporated *erişte*s and control *erişte* produced with BWF. According to the statistical variance analysis results, the flour type affected the L*, a* and b* values, in addition, L* values were significantly affected by oat incorporation level ($p<0.05$).

In determining pasta quality, cooking properties are important quality constraints. Cooking properties, such as optimum cooking time (min), volume increase (%), water absorption (%), cooking loss (%), protein loss (%) and total organic matter (TOM, %) values of *erişte*s were studied in this research. It was found that the cooking properties of ROF or WOF including *erişte*s were generally lower than those of the controls. The optimum cooking times of the controls and oat incorporated *erişte*s changed in the range of 9.0–12.5 min. The optimum cooking times of oat included *erişte*s were lower than control ones. Lower optimum cooking time is a desirable for quick preparation of egg pastas. The optimum cooking times of WOF incorporated *erişte*s decreased while increasing an incorporation level. The highest cooking loss value was obtained with 100% WOF included *erişte* (data not presented). The protein loss values of WOF incorporated *erişte*s increased while increasing of WOF incorporation level in the formula ($p<0.05$). According to the statistical variance analysis results, the flour type had not any significant effect on cooking loss, protein loss and TOM values ($p>0.05$). Besides, an incorporation level had significant effect on cooking loss ($p<0.05$), but it had not any significant effect on protein loss and TOM values ($p>0.05$).

TDF contents of *erişte*s were determined only in uncooked form. TDF contents of *erişte*s produced with ROF or WOF were mostly higher than controls ($p<0.05$). TDF contents of *erişte*s produced with WOF were higher than that of the *erişte*s produced with

ROF. TDF contents of uncooked *erişte*s prepared with ROF or WOF were in the ranges of 5.29–9.16%, or 8.41–18.25%, respectively. The highest TDF content was determined in 100% WOF incorporated *erişte* (data not presented).

β-glucan contents of *erişte*s were determined in both uncooked and cooked forms. β-glucan contents of oat included *erişte*s were generally higher than control ones in both forms. β-glucan contents of oat included uncooked *erişte*s increased as increasing of oat flour incorporation level. WOF containing *erişte*s had higher β-glucan content than those of ROF containing and control *erişte*s in uncooked form. β-glucan contents of oat flour included *erişte*s were in the range of 0.67–3.35% in uncooked form. The highest β-glucan content was determined in 100% WOF incorporated *erişte* in its both uncooked and cooked forms.

TPC analysis was carried out in both uncooked and cooked *erişte*s. TPC contents of all cooked *erişte*s considerably decreased, it could be concluded that cooking affected TPC contents harmfully.

Antioxidant activity analysis of *erişte* samples was carried out in uncooked form only. It was found that antioxidant activities of oat flour included *erişte*s were higher than that of control ones. In addition, WOF incorporated *erişte*s had higher antioxidant activity than that of ROF included *erişte* samples (data not presented).

Conclusions

Erişte is a traditional product and it is usually made of BWF in west Black Sea region of Turkey. In this study, it was shown that *erişte* could be produced from oat flours by replacing with BWF in different ratios. Besides, it could be produced from 100% ROF or WOF as an alternative dietary fiber rich product. It is expected that oat flour incorporated *erişte*s will provide important health benefits for consumers and will be substitute product for homemade manufacturers. The results also showed that all oat flour included *erişte*s can be regarded as good sources of dietary fiber.

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