STANDARDIZATION OF THE DIPPING TIME OF PANGASIUS FILLET IN TEA EXTRACT: A NATURAL ANTIOXIDANT

D. Pal, S. Chowdhury, S. Nath*, K. C. Dora and T. Murmu1

Department of Fish Processing Technology, Faculty of Fishery Sciences, W. B. U. A. F. S., Kolkata 700 094, India.
1Fishery Extension Officer, Govt. of West Bengal, India.
*e-mail: swarnadyutinath@gmail.com
(Accepted 17 May 2017)

ABSTRACT: Development of off-flavours, unpleasant odours, texture, discolouration and decrease in nutritious value are caused due to lipid oxidation which may be delayed by application of different chemical preservatives such as BHA and BHT in order to retain the good quality for longer and extend the shelf life during frozen storage of fish. Now a day, numerous studies are focused on using natural ingredients such as plant phenolics to enhance fish quality and shelf life instead of harmful synthetic preservatives. The young leaves of Camellia sinensis, containing high concentration of polyphenols, including catechins, theaflavins and thearubigins, has gained preference due to its antioxidant activity, hence can be used in place of potentially harmful synthetic antioxidants. Parallelly, both green and black teas are known to possess strong antibacterial activities which correspond to the presence of polyphenol compounds. During standardising green tea and black tea extract as a dipping medium for Pangasius fillet it is found that, significantly highest (p<0.05) weight gain of fillets was observed in BT1 (4.92±2.54%) at 15 minutes dipping time. In case of fillets dipped in Green tea extract (GT1), a gradual increase in scores of overall acceptability was observed reaching highest score of 6.07±0.36 for 10 minutes’ dip treatment with lighter fillet color (54.11±0.29) as compared to that of 15 minutes’ (51.74±5.04). The highest overall acceptability scores of 6.04±0.31 was obtained for 10 minutes’ dip treatment for BT1. Thus, it may be concluded that for both green and black tea extract, 10 minutes’ dip treatment gave products with best acceptability scores than 15 minutes’ because darker appearance after dip treatment resulted in poor color acceptance and higher phenolic absorption probably interfered with the flavor of fish as well, yielding poor flavor scores as compared to 10 minutes’ dip.

Key words: Green tea, black tea, antioxidant activity of tea, Pangasius fillet.

INTRODUCTION

Lipid oxidation is a major cause of muscle food deterioration leading to subsequent off-flavours, unpleasant odours, texture, discolouration and decrease in nutritious value (Frankel, 1998). To retain the good quality characteristics for longer and extend the shelf life during frozen storage of fish, chemical preservatives such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) have been widely used. Parallelly, numerous studies are focused on using natural ingredients to enhance fish quality and shelf life in order to avoid the use of harmful synthetic preservatives (Khanedan et al, 2011); Moreover, it has been shown that the incorporation of the antioxidants BHA, propyl gallate or citric acid into meat prior to freezing, considerably inhibited lipid oxidation, but did not effectively protect against the functional deterioration of the flesh- contained protein during short-term storage (Smith, 1987).

Many plant tissues are good sources of phytochemicals, notably phenolic and flavonoids (Gorinstein et al, 2005), that can act as the best alternative to the mutagenic food additives. Recently, plant phenolics have got an increasing interest in the food industry because they can retard the oxidative degradation of lipids and thereby improve the quality and nutritional value of food (Wojdylo et al, 2007).

Among the natural plant extracts, young leaves of Camellia sinensis has gained preference due to its antioxidant activity, hence can be used in place of potentially harmful synthetic antioxidants (Cao et al, 1996). Tea is particularly rich in polyphenols, including catechins, theaflavins and thearubigins, which are thought to contribute to the health benefits of tea. Green tea and fermented or black teas have long been acclaimed for their antioxidative effects upon various foodstuffs, the effect deriving from the presence of tea catechins (Chen and Ho, 1995). Green tea is known to have the highest...
antioxidant capacity compared to other teas (Vinson, 2000) and has greater antioxidant effect than vitamin C, vitamin E, BHA and BHT (Wanasundara and Shahidi, 1998).

Apart from antioxidant activity tea polyphenols are well-known for their antimicrobial properties. Both green and black teas are known to contain substances that possess strong antibacterial activities which correspond to the presence of polyphenol compounds (Sakanaka et al., 2000). In green tea, major antibacterial polyphenol compounds are the catechin groups (Ooshima et al., 1993). However, black tea contains also catechin groups at lower percentage but higher in tannins which can also act as important antibacterial polyphenolic compounds (Okubo et al., 1991). As lipid quality preservation is one of the major challenges associated with seafood raw material storage and subsequent processing for food use, the objective of the present study is to evaluate green tea and black tea extract as a dipping medium for Pangasius fillet.

MATERIALS AND METHODS

Ten gram of ground dry greenand black tea was added to 100 ml of distilled water and heated at 30-40°C for 45 min with a magnetic stirrer (DELTA Model HM-101, Industries LTD) as described by Sarah et al (2010). The mixture was then filtrated with a Wattman filtration paper No.42 and the filtered solution with soluble solid content was applied as green (GT1) and black (BT1) tea extract (TE) in the experiment.

The fishes, (approximately weighing10kg) purchased from local market in South Kolkata, were transferred to laboratory in iced condition and then beheaded, descaled, filleted and skinned manually. Fillets (50-70g) were cut from the fish under good hygienic and sanitary conditions to prevent any cross contamination. These fillets were used for further studies.

The method of dip treatment of fish fillet in tea extract was standardized based on time of dipping in extract. The selection of the suitable time of dipping for the extracts was based on the weight gain (%) of the fillets, color estimation and sensory scores. For each extracts weight gain (%) of fillets (randomly selected) was calculated at intervals of 2, 5, 10 and 15 minutes. The time at which the weight gain (%) maximum was determined.

The color of the fish fillet dipped in tea extracts was determined in quintuple using spectrophotometer (Colourflex EZ, Hunter associates Laboratory, Inc, Reston, VA) with illuminant of D 65/10°. This instrument was calibrated with black and white reference tiles before analysis. A horizontal section of fillet measuring approximately 5 mm was placed above the light sources and post processing L*(lightness), a*(redness/greenness) and b*(yellowness/blueness) values were recorded. The CIELAB (L*, a*, b*) color scale was used for the study.

Sensory evaluation of fillets was performed by a sensory panel composed of 15 experienced members to evaluate the raw fillets based on the color, flavor, texture and overall acceptability scores using a 7-points hedonic scale: 1 = dislike very much, 2 = dislike moderately, 3 = dislike slightly, 4 = neither like nor dislike, 5 = like slightly, 6 = like moderately, and 7 = like very much (Siah and Tahir, 2011).

RESULTS AND DISCUSSION

In this experiment, weight gain was observed by dipping fillets in tea extracts (GT1, BT1) for 2, 5, 10 and 15 minutes and expressed in percentage (Fig. 1). In all samples, an increase in fillet weight was observed as dipping time increased. All the samples exhibited significant gain in weight after 15 minutes of dipping as compared to 2, 5 and 10 minutes, among which significantly highest (p<0.05) weight gain of fillets was observed in BT1 sample showing a gain of 4.92±2.54% at 15 minutes dipping time. Gain in weight of Nile tilapia fillet soaked in the 2.5% NaCl control along with different phosphates was earlier reported by Wangtueai et al (2014).

From the data derived from instrumental determination of the color properties of Pangasius fillet dipped in different tea extracts for 2, 5, 10 and 15 minutes its evident that control sample (without dipping treatment) exhibited more brightness (L*) values than GT1 and BT1 treatments (Table 1). The redness (a*) increased in case of all samples except in GT1 treatments at 2 and 5 minutes. It was established that yellowness (b*) value

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Minutes</th>
<th>L*</th>
<th>a*</th>
<th>b*</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0</td>
<td>57.71±5.04</td>
<td>7.97±2.7</td>
<td>20.47±1.44</td>
</tr>
<tr>
<td>GT1</td>
<td>2</td>
<td>56.34±2.48</td>
<td>6.7±1.29</td>
<td>20.75±3.37</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>54.68±1.41</td>
<td>6.29±1.64</td>
<td>17.46±5.85</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>54.11±0.29</td>
<td>8.02±0.54</td>
<td>20.3±2.73</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>51.74±5.04</td>
<td>7.2±2.38</td>
<td>18.28±3.34</td>
</tr>
<tr>
<td>BT1</td>
<td>2</td>
<td>54.58±4.96</td>
<td>10.06±2.27</td>
<td>23.67±4.77</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>56.15±3.59</td>
<td>12.03±0.21</td>
<td>31.91±4.16</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>51.34±4.42</td>
<td>12.78±0.37</td>
<td>29.79±0.19</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>46.22±1.10</td>
<td>12.87±0.54</td>
<td>23.9±4.48</td>
</tr>
</tbody>
</table>

*Results are mean of five determinations (n=5) with s.d.
#Values of means vary significantly (p<0.05) among the treatments.
Dipping time of Pangasius fillet in tea extract

also increased in all samples except in GT1 treatments at 5, 10 and 15 minutes dipping time.

The sensory scores in terms of color, texture, flavor and overall acceptability of treatments (GT1 and BT1) after dipping in tea extracts for 2, 5, 10 and 15 minutes are given in Figs. 2 and 3. In case of fillets dipped in Green tea extract (GT1), a gradual increase in scores of overall acceptability was observed from initial value of 5.82±0.42 to a highest score of 6.07±0.36 for 10 minutes’ dip treatment (Fig. 2). After 15 minutes the scores decreased to 5.78±0.51 suggesting 10 minutes as better acceptable. Similar trend was observed for all the individual sensory parameters with the values of 10 minutes were color (5.87±0.64), texture (6.07±0.70) and flavor (6.27±0.46). The lightness/brightness (L*) values for GT1 samples (Table 1) derived from colorimetric analysis also suggests that 15 minutes’ dip treatment resulted in a darker fillet color (51.74±5.04) than 10 minutes (54.11±0.29). GT1 samples dipped for 10 minutes also recorded better redness (a*) values (8.02±0.54) than samples treated for 15 minutes (7.2±2.38). Yellowness scores (b*) also exhibited similar trend.

Similar trend was observed for fillet treated with black tea extracts. The highest overall acceptability scores of 6.04±0.31 was obtained for 10 minutes’ dip treatment

ACKNOWLEDGMENT

The authors are grateful to ICAR for their financial assistance. Panelists are gratefully acknowledged for their cooperation in sensory evaluation part of the present research.

REFERENCES


