Processing and preservation of Ready - to - Eat mushroom based products in retortable pouches

Publication History
Received: 18 October 2015
Accepted: 25 November 2015
Published: 1 December 2015

Citation
Processing and preservation of Ready – to - Eat mushroom based products in retortable pouches
B.R.Suriya*, N.Varadharaju**, Z.John Kennedy** and Saraswathy Eswaran***

* Assistant Professor, Department of Food Processing Technology, PSG College of Arts and Science, Coimbatore-14, ** Department of Food and Agricultural Process Engineering, TNAU, Coimbatore-3, *** Managing trustee, Ramasamy Chinnamal Trust.

Abstract: Ready-To-Eat (RTE) foods are considered the “Ultimate processed foods” with very high value addition. Demand of ready-to-eat products is on a constant rise and hence ready-to-eat mushroom gravy and mushroom soup was prepared, packed and stored in retortable pouches. The mushroom was washed and sliced. The sliced mushroom of about 50g was filled in pouches followed by 50g curry concentrate (oil fried onions, garlic, ginger and spices). Mushroom soup of about 150g was packed. The filled pouches were sealed and then subjected to thermal processing in a pilot model steam air mix retort at 121\(^\circ\)C for specified process time for both the products calculated by Balls formula method. The processed pouches were cooled and stored in clean dry place at ambient conditions. pH, sensory evaluation and microbial analysis were carried out to determine the quality of the packed mushroom at regular intervals for a storage period of 3 months. The pH of mushroom gravy and soup was 5.65 and 6.00 respectively and this value remained constant throughout the storage period of 3 months. The sensory evaluation of both the product had a good overall acceptability.

Introduction
Rapid urbanization has meant that the associated sociological change is impacting on the lifecycle of a large segment of the population. Now-a-days many ready-to-eat products have flooded the market. This is resulting in enhanced demand of pre-packed and pre cooked ready-to-eat (RTE) foods. The availability of the self-stable, ready-to-eat foods in microovenable or reheatable packages is constantly in rise in the Indian market and in International market too. RTE foods are considered the “Ultimate processed foods” with very high value addition, since they offer the convenience of “eating off the shelf”, eliminating the kitchen drudgery associated with making a meal at home. Flexible retortable pouches are now replacing metal containers, which can improve the economy and increase consumer acceptance. With this global surveillance and visualizing the future perspectives on demand for ready-to-eat foods, an attempt was made to develop mushroom gravy and mushroom soup in retortable pouches.

Materials and method
Mushroom has a very short life and cannot be stored for more than a few days even at the best of conditions of storage; these are, therefore, processed in various forms for long-term storage. It is known that product made from the stored mushroom will not have the same delicacy as prepared from the fresh. In view of the growing market for ready-to-eat/serve food items and keeping in mind the popularity of Indian dishes world over, and high cost of tin cans it was thought to develop technology for ready-to-eat mushroom curry in flexible retortable pouches. The process flow chart is presented in the Fig. 1.1.
1. **Product formulation**
The product formulation of mushroom gravy and mushroom soup is given below

```
Selection of mushroom of uniform size  ↓
Washing  ↓
Cutting in to pieces of uniform thickness  ↓
Product formulation  ↓
Filling mushroom in retortable pouches  ↓
Sealing  ↓
Heat processing  ↓
Cooling  ↓
Removal of surface moisture  ↓
Labeling  ↓
Storing at room temperature  ↓
Conducting storage studies
```

Fig.1.1. Processing of ready-to-eat mushroom based products in retortable pouches

1.1 **Mushroom gravy**

The mushroom (100g) was cut in to four longitudinal pieces and was packed in 50g of curry prepared by the formula consisting of tomato (250g), onion (250g), garlic(100g), ginger(50g), red chilly powder(100g), oil(200ml), salt(50g), water(300ml), nutmeg, clove, mace(10g), turmeric powder(10g).
1.2 Mushroom soup

The mushroom was cut into four longitudinal pieces and soup was prepared by the formula consisting of onion (250g), butter (100g), pepper (50g), red chilly powder (50g), corn flour (50g), salt (50g). About 150g of soup was packed in each pack and sealed.

2. Thermal processing of pouches

The pouches filled with the products were thermally processed in the retort to obtain the commercial sterility. The pouches were processed at 121°C for the required process time. The process time was calculated by Balls formula method.

Storage studies

The storage studies were carried out for the packed ready-to-eat products in order to find its stability over the period of time.

3. pH of medium

pH is defined as the logarithm of the reciprocal of hydrogen ion concentration in g/lit. It is of importance as measure of the active acidity, which influences the flavour or palatability of a product and affects the processing requirements. The glass electrode pH meter was used for this purpose (Micro processor based pH meter, 1012E, Environmental and Scientific Instr.Co.). Initially pH meter was calibrated using freshly prepared buffer solution (pH 4 and 7). Then the readings were taken by dipping the electrode into the sample.

4. Microbial quality

Spoilage of foods by bacteria, yeast and fungi occurs during storage. The microorganisms grow under conditions favorable to them and render the food unacceptable and unfit for human consumption. Enumeration of these organisms is therefore necessary for proper quality control of retortable pouches packaged mushroom products. The dilutions up to 10^-6 was taken. Then the sample was taken from each dilution and the microbial growth test was replicated twice per dilution in sterilized Petri dish. The bacterial count was taken after 2 days whereas fungus and yeast counts were taken after four days (Rao, 1986). The number of organisms per gram of sample was calculated by the formula furnished below:

\[
\text{Number of colony forming units (cfu) per gram of sample} = \frac{\text{Mean number of cfu x Dilution factor}}{\text{Quantity of sample taken on weight basis}}
\]

5. Sensory Evaluation

Sensory analysis is a scientific method used to evoke, measure, analyze and interpret reactions to those characteristics of food and materials as they are perceived by the sensor of sight, smell, taste, touch and hearing. In general, sensory quality of food is the consumer’s reaction to the physical and chemical constituents of the food in its prepared and formulated form. An organoleptic evaluation of the product was done for colour, flavour, texture, taste and overall acceptability (Ranganna, 1977). All the samples were displayed to the judges under ambient conditions. Nine point hedonic scale was used as sensory evaluation score card to bring out the inherent characteristics of particular product.
Results and Discussion

1. Thermal process time calculation

   The process time required for button mushroom products packed in retortable pouches was calculated using Balls formula method. The temperature profile of the pouch center for thermal process is given in the table 1. The process time for mushroom gravy was found to be 17 minutes and that for mushroom soup was 18 minutes.

<table>
<thead>
<tr>
<th>Product</th>
<th>Time (minutes)</th>
<th>Retort temperature Tr (°C)</th>
<th>Product temperature t (°C)</th>
<th>Tr-t</th>
<th>Log (Tr-t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mushroom gravy</td>
<td>1</td>
<td>59.8</td>
<td>25.3</td>
<td>34.5</td>
<td>1.54</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>66.4</td>
<td>32.8</td>
<td>33.6</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>73.5</td>
<td>40.7</td>
<td>32.8</td>
<td>1.52</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>89.1</td>
<td>54.7</td>
<td>31.4</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>92.8</td>
<td>62.5</td>
<td>30.3</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>99.4</td>
<td>71.1</td>
<td>28.3</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>106.5</td>
<td>78.7</td>
<td>27.8</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>113.3</td>
<td>86.7</td>
<td>26.6</td>
<td>1.42</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>118.5</td>
<td>100.3</td>
<td>18.2</td>
<td>1.26</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>121</td>
<td>105.5</td>
<td>15.5</td>
<td>1.19</td>
</tr>
<tr>
<td>Mushroom soup</td>
<td>1</td>
<td>69.4</td>
<td>26.5</td>
<td>42.9</td>
<td>1.63</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>83.9</td>
<td>42.6</td>
<td>41.3</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>92.7</td>
<td>53.5</td>
<td>39.2</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>99.4</td>
<td>62.1</td>
<td>37.3</td>
<td>1.57</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>104.6</td>
<td>76</td>
<td>28.6</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>108.2</td>
<td>84.9</td>
<td>23.3</td>
<td>1.37</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>115.7</td>
<td>92.9</td>
<td>22.8</td>
<td>1.36</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>120.8</td>
<td>100</td>
<td>20.8</td>
<td>1.32</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>121</td>
<td>103</td>
<td>18</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Table 1. Temperature profile of ready-to-eat mushroom products packed in retortable pouches

2. Effect of pH on ready-to-eat mushroom products packed in retortable pouches

   The pH of mushroom gravy was found to be 5.65 and there was no appreciable change in pH during the storage period. At the end of the 3rd month the pH was maintained in the same level, denoting that the product remained same even after three months of storage. Similar trend was noticed with mushroom soup also having no change in pH (6) throughout the storage period. This result was in accordance with the studies conducted by Chandraskekar et al., (2001).
3. Microbial studies on button mushroom based ready-to-eat products packed in retortable pouches

The microbial count after 3 months in mushroom gravy was 13.67x10^3 and 6.33 x 10^2 cfu per gram of sample for bacteria and fungi respectively and for mushroom soup the microbial count was 17 x 10^3 and 8.33 x 10^2 cfu per gram of sample for bacteria and fungi respectively and yeast population was nil in both the product. The fungi population was less compared to bacterial count. These counts were well within the permissible limits of 30 x 10^6 cfu per gram of sample for canned vegetables (Sharma and Desai, 1978). Hence the packed mushrooms in retortable pouches were found to be microbiologically safe for a storage period of 3 months.

4. Sensory evaluation

Mushroom gravy had higher scores of colour, flavour, taste, appearance and texture compared to mushroom soup. However, the overall acceptability of both products obtained the same score.

Conclusion

The change in the life style of larger segment of population has resulted in the increasing demand for ready-to-eat foods in the market. Retortable pouches have an added advantage of reduced heat exposure resulting in maintaining the delicate flavor and taste of the product. Hence viewing the increasing demand ready-to-eat mushroom products packed in retortable pouches were developed and the overall acceptability of the products was good.

References

Investigation of shelf life and heat penetration attributes of ready-to-eat Fish peera from anchovy (stolephorous commersoni) in retort pouches. ABSTRACT Fish peera, a traditional product from anchovies, was prepared and processed at 121.1°C for 38 min in an over pressure autoclave in indigenously developed retort pouches having a three-layer configuration of 12.5 µm more. Fish products thermally processed in retortable pouches offer several advantages. Apart from being less expensive, these products can be stored at ambient temperature for more than 12 months without any refrigeration.