

Antioxidant effect of tunic onion powder in cooked pork sausages

K. Shimada, Barana C. Jayawardana, K. Uchino, K.-H. Han, M. Fukushima, M. Sekikawa

Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Hokkaido 080-8555, JAPAN

University of Peradeniya, Peradeniya, KY 20400, SRI LANKA

*Corresponding author (phone : +81-155-49-5560; fax: +81-155-49-5577; e-mail: kshimada@obihiro.ac.jp)

ABSTRACT - this study aims to evaluate the effect of tunic onion powder (TOP), which was prepared from tunic onion, on the antioxidant activity in cooked pork sausages. Addition of 0.1% TOP exhibited the same antioxidant activity as of 0.1% BHT in pork sausages prepared without sodium nitrite. Addition of TOP into cured sausages did not affect the antioxidant ability of sodium nitrite, though there is a slight difference in the color values when TOP added to the cured and uncured sausages. Among the tested characters, sensory panelists accepted all the characters in cooked cured sausages including TOP. These results suggest that TOP has potential as sausage seasoning.

Index Terms – Onion, quercetin, TBA, Antioxidant

1. INTRODUCTION

Flavonoids are potential antioxidants in food lipid systems (Pratt and Hudson, 1990; Shahidi et al., 1992; Shahidi and Wanasundara, 1995). Quercetin is a typical flavonoid widespread in plant foods such as onions and broccoli (Hertog et al., 1992; Yoo et al., 2010) may be useful as an antioxidant in controlling lipid oxidation, which is a major quality deteriorating factor in muscle foods. Onion powder is a spice which is made from dried

bulb onions. After consumption of onion bulbs tunics generally consider as the waste even though they contain a lot of functional nutrients such as quercetin, dietary fiber etc. Thus, powder produce from onion tunics is a low cost seasoning material which may be rapidly accepted by consumers, as it is considered as a natural product. Therefore, in this study we prepared cooked pork sausages by adding tunic onion powder as an ingredient, and evaluated the lipid oxidation during storage.

2. MATERIALS AND METHODS

2.1. Processing of cooked pork sausages and sampling

Commercially available tunic onion (*Allium cepa*) powder (TOP, Emile 1300) was supplied by Yamaura emile product co. (Nagano, Japan). The composition per 100 g of manufactured TOP was as follows: 1.3 g polyphenol, 58.0 g dietary fiber, 6.4 g protein, 1.8 g lipid, 22.8 g carbohydrate, 37.2 mg sodium, 1250 mg calcium, 1260 mg potassium, 213 mg magnesium. 0.39 mg copper, 2.58 mg zinc, 6.04 mg manganese (Yamaura emile product Co., Nagano, Japan). The cooked pork sausages consisted of lean pork and the following ingredients (in g/kg of lean pork) were added: sodium chloride (20), lard (200), ice (200), TOP (0.1, 1, 2, 3, 4) or BHT (1). Chopped meat and ingredients mixture was manually

stuffed into collagen casing (#300, Nippi Inc., Japan). Sausages were cooked for 30 min at 63°C core temperature.

2.2. Analysis of 2-thiobarbituric acid reactive substances (TBA)

The effect of Quercetin was evaluated on the oxidative stability of cooked pork sausages, during storage at 37° C, by measuring thiobarbituric acid reactive substances (TBA) values. The antioxidant levels of TBA values were compared to the negative and positive standard of synthetic antioxidant; BHT as controls. 0.2 Grams of sample were taken and TBA values were extracted for 1 hr at 4 °C with 4.25 ml of TBA solution containing 0.28% TBA, 0.009% BHT, 0.4% SDS, 1.2M acetate buffer, pH3.5, and the extract was heated in a boiling water bath (90 °C) for 60 min. After cooling, 1 ml of distilled water and 5 ml of n-butyl alcohol : pyridine were added to the extracts and mixed using vortex mixer. The mixtures were centrifuged at 3,000 rpm for 10 min at the room temperature. After centrifugation, upper phase was pipetted into test tubes. The absorbance of sample was read against the appropriate blank at 538 nm. The amounts of TBA were expressed as µg of malondialdehyde (MDA) per kg of sausage.

2.3. Instrumental color measurement

Effect of the AE on color properties (*L**, *a**, *b** and hue angle) of cooked pork sausages was evaluated by Chroma Meter Minolta CM-2600d spectrophotometer (Minolta, Japan) throughout the 5 days storage period at 37°C.

2.4. Sensory analysis

The organoleptic assessment was performed by a sensory panel composed of 55 members by using paired test for color, flavor, taste and texture for cooked pork

sausages.

2.5. Statistical analysis

All data were analyzed by analysis of variance with Turkey-Kramer test and student t-test (PASW statistics version 18.0, SPSS Inc., 2010), with $P < 0.05$ as the minimum acceptable probability for differences between means.

3. RESULTS AND DISCUSSION

The effect of different concentrations of TOP on TBA values in cooked uncured pork sausages during the 5 days storage at 37° C is shown in Figure. 1. All five concentrations (0.01, 0.1, 0.2, 0.3 and 0.4%) of TOP and 0.1% BHT significantly ($P < 0.05$) reduced the TBARS values compared with the control (0 % TOP) throughout the storage period. Furthermore, it was observed that TBA values remained constant throughout the storage period in TOP concentrations of 0.1% or over (0.2, 0.3 and 0.4%) and 0.1% of BHT, indicating very strong antioxidant effect. Furthermore, TOP showed similar antioxidative capacity as 0.1% BHT at the concentration of 0.2%. Observation of TBA values of cooked cured pork sausages prepared with 0.008% sodium nitrite is shown in Figure 2. As expected, when treated with 0.1% TOP, sausages showed significantly low ($P < 0.05$) TBA values throughout the storage period compared to the cured sausages without TOP treatment. Addition of TOP did not affect the *L** and *b** values, but tend to increase the *a** values in uncured sausages. Whereas addition of 0.1% TOP did not affect *a** and *b** values in cured pork sausage, but showed a tendency to decrease *L** value (data not shown). Sensory test was performed for comparing the cured pork sausages added with 0.1%

TOP and the control (0% TOP) (Figure 3). There were no significant differences observed in the tested sensory characters between two groups (Figure 3).

4. CONCLUSION

This study concluded that the addition of 0.1% TOP provides an antioxidant benefit to the cooked uncured pork sausages stored at 37° C, which is comparable with the 0.1% of synthetic antioxidant BHT. This antioxidative ability was also not changed in cooked cured pork sausages. Thus, TOP has potential as sausage seasoning.

ACKNOWLEDGEMENT

This work was partially supported by a grant from the Cooperation of Innovative Technology and Advanced Research in Evolutional Area (CITY AREA).

REFERENCES

1. Hertog, M. G., Hollman, P. C. H., Katan, M. B. (1992) Content of potentially anticarcinogenic flavonoids of 28 vegetables and 9 fruits commonly consumed in the Netherlands. *Journal of Agricultural and Food Chemistry*, **40**, 2379-2383.
2. Yoo, K. S., Lee, E. J., Patil, B. S. (2010) Quantification of quercetin glycosides in 6 onion cultivars and comparison of hydrolysis-HPLC and spectrophotometric methods in measuring total quercetin concentrations. *Journal of Food Science*, **75**, C160-C165.
3. Patt D.E. and Hudson B. J. F. (1990) Natural antioxidants not exploited commercially, in *Food Antioxidants*, Ed by Hudson B. J. F., Elsevier Applied Science Publishers, London, UK. pp171-191.
4. Shahidi, F., Wanasundara, P. K. J. P. D. and Hong, C. (1992) Antioxidant activity of phenolic compounds in meat model system, in *Phenolic Compounds in Food and their Effects on Health. 1. Analysis, Occurrence, and Chemistry* (ACS Symposium series 506), Ed by Ho, C.-T., Lee, C. Y. and Huang, M. T., American Chemical Society, Washington, DC, USA. pp 214-222.
5. Shahidi, F. and Wanasundara, U. (1995) Effect of natural antioxidants on the stability of canola oil in *Food Flavors: Generation, Analysis and Process Influence*, Ed by Charalambous, G. Elsevier Applied Science Publishers, London, UK. pp 469-479.

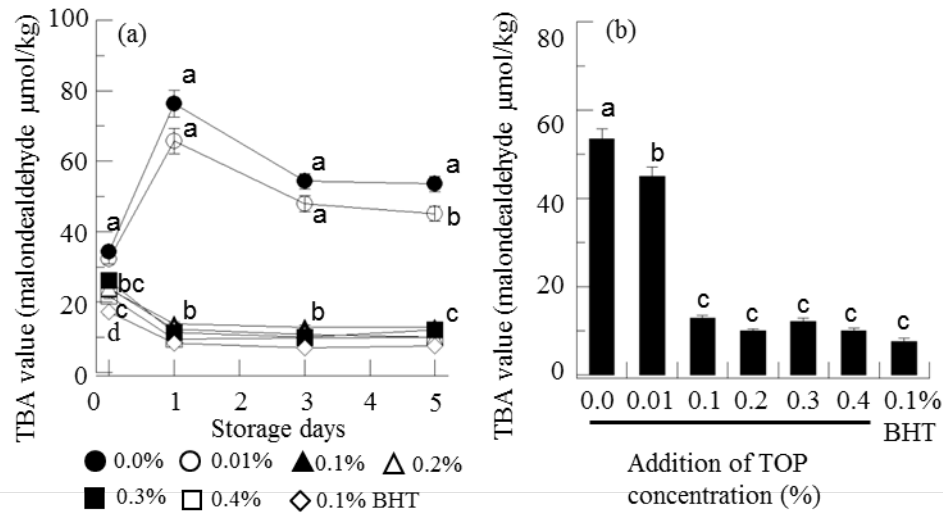


Figure 1. Effects of different concentration of TOP on TBA values of sausage stored at 37°C. (a) Changes in TBA values during 5 days storage, (b) TBA values at 5th day. Different superscript letters indicate significant differences ($p < 0.05$).

Figure 2. Changes in TBA content of sodium nitrite added cooked pork sausages during storage periods. Closed circles show 0%TOP + 0.008% NaNO₂, Open circles show 0.1% TOP + 0.008% NaNO₂. * indicates significant difference ($p < 0.05$).

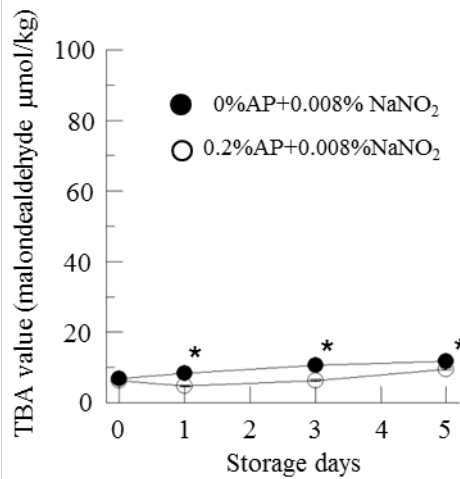


Figure 3. Panelist number for different sensory characters of cooked cured pork sausages. Sensory test was analyzed by pair test method. Black color columns show panelist number for sausages without TOP. White color columns show panelist number for sausages added with 0.1% of TOP. *None of sensory characters shows significant difference

