



RESEARCH ARTICLE.....

# Effect of vacuum tumbling on sensory quality of marinated chicken products

Prashant Singh, Sanjay Yadav, **Ashok K. Pathera** and D.P. Sharma

**ABSTRACT.....** A study was undertaken to assess the effect of vacuum tumbling on sensory quality of marinated chicken products from breast and leg meats. Chicken cut up parts (breast and leg individually) along with marinade were vacuum tumbled for 0 h, 1 h, 2 h and 3 h duration. Breast and leg samples were also marinated for 6 h (traditional marination) each without vacuum tumbling. Control, tumbled and traditionally marinated samples for each type of meat were cooked in an oven at 170°C for 40 minutes. Increased tumbling time resulted in an improvement in sensory scores of marinated chicken leg and breast. Vacuum tumbling of breast cuts for 2 h results in better tenderness scores and equivalent flavour, texture, juiciness and overall acceptability scores as that of 6 h of traditional marination. Vacuum tumbling of leg cuts for 2 h resulted in better flavour, texture, tenderness and overall acceptability scores and equivalent juiciness scores as that of 6 h of traditional marination. The vacuum tumbling for 2 h and 3 h resulted in statistically similar sensory scores. It was concluded that 2 h of vacuum tumbling can be used in place of 6 h of traditional marination for development of marinated chicken products from breast and leg cuts.

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## INTRODUCTION.....

Marinade technology is being used in meat industry since many years. The word marinate is derived from the Latin word *Marinus* and refers to soaking/pickling in salt brine (Bjorkroth, 2005). The word 'marine' refers to the seawater used to preserve food before the advent of refrigeration. It was likely to have originated from the process of preserving and brining, when sailors who spent long periods at sea used these methods to preserve

their food supply and prevent starvation (Anonymous, 2003). At present marination is commonly employed by the restaurant industry and fast food outlets as well as by consumers at home to incorporate particular flavours or colours in poultry and meat products. On a bigger scale, marination of meat with salt and phosphate solutions is done to improve its yield and quality. The demand for marinated meat and chicken products is growing continuously across the world.

Traditionally, marinating consists of submerging or soaking the meat in marinade and letting the ingredients diffuse into the meat with passage of time. However, this method requires long time, usually few hours to few days. Also regular and proper distribution of ingredients is not possible in this method. To overcome these problems, newer methods of marinating like tumbling, massaging and injection pumping are being used. Tumbling is a physical process that involves meat rotating, falling and contacting with metal walls and paddles in a drum. This process provides a transfer of kinetic energy to extract protein that forms a binding agent for muscle fibers. The functions of tumbling are to improve yield, increase tenderness and cohesiveness and gain faster and more uniform ingredient distribution in the meat (Cassidy *et al.*, 1978 and Krause *et al.*, 1978). Keeping above points in view this study was conducted to develop marinated chicken breast and leg cuts by using vacuum tumbling technology and study the effect of vacuum tumbling on sensory quality of chicken marinated breast and leg meats.

## RESEARCH METHODS.....

### Preparation of marinated chicken product:

#### *Slaughtering and dressing of birds:*

The broiler chickens were slaughtered and dressed as per the standard procedure in the slaughter house of the department. Dressed carcasses were washed thoroughly, breast and leg meat cuts were separated from the dressed carcasses and stored in deep freezer (-18<sup>o</sup> C) for further use.

#### *Standardization of vacuum tumbling schedule:*

Marinade was prepared by dissolving 20 g salt, 20 g spice mix, 4 g sodium tripolyphosphate (STPP), 50 g condiments in 100 ml of water. Above marinade was used for marinating 1 kg of meat. Chicken cut up parts (breast and leg individually) along with marinade were put in vacuum tumbler and subjected to vacuum tumbling for 1 h, 2 h and 3 h duration. Control was vacuum tumbled and marinated for 0 h. Breast and leg samples were also marinated for 6 h (traditional marination) each without vacuum tumbling. Control and tumbled samples for each type of cut were cooked in an oven at 170<sup>o</sup> C for 25 minutes. The samples were turned upside down and cooked for another 15 minutes. Treatments were as under:

– Control-B/ Control-L: Chicken breast/ leg meat cuts marinated in water based marinade and vacuum tumbled for 0 h.

– BW-1/LW-1: Chicken breast/ leg meat cuts marinated in water based marinade and vacuum tumbled for 1 h.

– BW-2/LW-2: Chicken breast/ leg meat cuts marinated in water based marinade and vacuum tumbled for 2 h.

– BW-3/LW-3: Chicken breast/ leg meat cuts marinated in water based marinade and vacuum tumbled for 3 h.

– TM-B/TM-L: Chicken breast/ leg meat cuts marinated for 6 h in water based marinade (traditional marination) without vacuum tumbling.

### Sensory analysis :

A semi trained panel consisting of scientists and post graduate students evaluated the sensory attributes *viz.*, colour, flavour, texture, tenderness, juiciness and over all acceptability (OAA) of marinated chicken products using a 8-point descriptive scale ( 8= excellent and 1= extremely poor).

### Statistical analysis:

Data obtained were subjected to statistical analysis using Duncan's Multiple range test by using SPSS software to find out the significant difference at 5 per cent significance level in the mean values.

## RESEARCH FINDINGS AND ANALYSIS.....

The results of sensory analysis are presented in Table 1. No significant difference was noticed in colour scores between control, vacuum tumbled and traditionally marinated treatments within breast and leg meat cuts. Both the control treatments had sensory scores of less than 6.0 meaning less than moderate acceptability for sensory attributes other than colour. Scores for flavour, texture, juiciness, tenderness and OAA increased with increase in vacuum tumbling time in both the meats. 2 h and 3 h vacuum tumbling of breast meat resulted in flavour scores statistically similar to traditionally marinated breast. Flavour scores of 2 h and 3 h vacuum tumbled leg meats were significantly higher than traditionally marinated leg. Uniform ingredient distribution due to tumbling resulted in better perception of flavour, which resulted in an increase in flavour scores. Ockerman and Organisciak

**Table 1: Effect of vacuum tumbling on sensory scores of marinated chicken breast and leg**

Treatments	Colour	Flavour	Texture	Juiciness	Tenderness	OAA
<b>Chicken breast</b>						
Control-B	7.33±0.49 <sup>a</sup>	5.58±0.47 <sup>c</sup>	5.75±0.40 <sup>b</sup>	5.67±0.44 <sup>b</sup>	5.67±0.39 <sup>d</sup>	5.83±0.44 <sup>b</sup>
BW-1	7.08±0.51 <sup>a</sup>	6.33±0.44 <sup>b</sup>	6.00±0.37 <sup>b</sup>	6.00±0.43 <sup>b</sup>	6.08±0.42 <sup>c</sup>	6.08±0.36 <sup>b</sup>
BW-2	7.13±0.38 <sup>a</sup>	7.17±0.39 <sup>a</sup>	7.17±0.44 <sup>a</sup>	7.33±0.49 <sup>a</sup>	7.42±0.51 <sup>a</sup>	7.25±0.45 <sup>a</sup>
BW-3	7.00±0.43 <sup>a</sup>	7.42±0.51 <sup>a</sup>	7.42±0.42 <sup>a</sup>	7.50±0.48 <sup>a</sup>	7.50±0.48 <sup>a</sup>	7.46±0.40 <sup>a</sup>
TM-B	7.33±0.49 <sup>a</sup>	7.17±0.44 <sup>a</sup>	7.08±0.51 <sup>a</sup>	7.17±0.39 <sup>a</sup>	7.00±0.43 <sup>b</sup>	7.08±0.51 <sup>a</sup>
<b>Chicken leg</b>						
Control-L	7.17±0.39 <sup>a</sup>	5.50±0.52 <sup>c</sup>	5.83±0.44 <sup>c</sup>	5.75±0.40 <sup>d</sup>	5.83±0.39 <sup>c</sup>	5.83±0.54 <sup>c</sup>
LW-1	7.00±0.37 <sup>a</sup>	6.63±0.43 <sup>b</sup>	6.75±0.45 <sup>b</sup>	6.88±0.43 <sup>c</sup>	6.92±0.47 <sup>b</sup>	6.92±0.47 <sup>b</sup>
LW-2	7.00±0.48 <sup>a</sup>	7.42±0.51 <sup>a</sup>	7.42±0.51 <sup>a</sup>	7.33±0.44 <sup>ab</sup>	7.50±0.52 <sup>a</sup>	7.38±0.48 <sup>a</sup>
LW-3	6.92±0.42 <sup>a</sup>	7.50±0.43 <sup>a</sup>	7.67±0.49 <sup>a</sup>	7.42±0.47 <sup>a</sup>	7.67±0.49 <sup>a</sup>	7.63±0.48 <sup>a</sup>
TM-L	7.25±0.45 <sup>a</sup>	6.92±0.47 <sup>b</sup>	6.96±0.40 <sup>b</sup>	7.00±0.48 <sup>bc</sup>	7.00±0.43 <sup>b</sup>	6.92±0.47 <sup>b</sup>

Control-B = chicken breast marinated and vacuum tumbled for 0 h; BW-1, BW-2, BW-3 = chicken breast vacuum tumbled for 1, 2 and 3 h, respectively in water based marinade; TM-B = chicken breast marinated traditionally for 6 h.

Control-L = chicken leg marinated and vacuum tumbled for 0 h; LW-1, LW-2, LW-3 = chicken leg vacuum tumbled for 1, 2 and 3 h, respectively in water based marinade; TM-L = chicken leg marinated traditionally for 6 h.

n=12, mean ± SD; Means with different superscripts within a column differ significantly (p<0.05).

(1978) reported that tumbling increased the migration of sodium chloride and other additives in tumbled meats. Results of this study are in agreement with literature. Acton (1972) in poultry loaves and Harmon *et al.* (1992) in restructured dry cured hams had reported that tumbling significantly improved the flavour scores.

Except treatment BW-1, all other vacuum tumbled treatments in both types of meat had significantly higher texture and juiciness scores in comparison to their respective controls. No significant difference was noticed in texture and juiciness scores of treatments BW-2, BW-3 and TM-B in breast meat. In leg meat, LW-2 and LW-3 had significantly higher texture scores than treatment TM-L. Juiciness scores of treatment LW-2 were comparable with treatment TM-L while LW-3 had significantly higher juiciness scores in comparison to treatment TM-L. Better retention of marinade due to vacuum tumbling might have resulted in better juiciness scores. Vacuum tumbling and traditional marination resulted in an increase in tenderness in both leg and breast meat cuts. Progressive and significant increase in tenderness was noticed with increase in vacuum tumbling time in both types of meat. Tenderness scores of 2 h and 3 h vacuum tumbled breast and leg meat cuts were significantly higher than respective traditionally marinated cuts. Dzudie and Okubanjo (1999) had reported that

disruptive effect of tumbling on the muscle sarcolemma accounted for the increased juiciness and tenderness of the products. Results are in agreement with the study of Boles and Shand (2002) who reported that application of short tumbling improved tenderness of roast beef. Yadav *et al.* (2014) had also reported a significant increase in sensory scores of chevon rolls due to vacuum tumbling. OAA scores increased with increase in vacuum tumbling time. Except treatment BW-1, all other vacuum tumbled treatments in both types of meat had significantly higher OAA scores in comparison to their respective controls. OAA scores of traditionally marinated breast and leg meats were also significantly higher than control breast and leg, respectively. Better flavour, texture, juiciness and tenderness scores of vacuum tumbled and traditionally marinated breast and leg meats resulted in better OAA scores.

It was concluded that 2 h of vacuum tumbling could be used in place of 6 h of traditional marination for development of marinated chicken products from breast and leg cuts.

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