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**Dr. R Rajkumar**  
Assistant professor,  
Department of livestock  
products Technology, (MST)  
Veterinary College and Research  
Institute, Namakkal, Tamil  
Nadu, India

**Dr. V Chandirasekaran**  
Associate professor and Head,  
Department of livestock  
products Technology, Veterinary  
College and Research Institute,  
Tirunelveli, Tamil Nadu, India

**M Geetha**  
Associate professor and Head,  
Department of Veterinary Public  
health and epidemiology,  
Veterinary College and research  
institute, Tirunelveli, Tamil  
Nadu, India

**M Muthulakshmi**  
Assistant professor,  
Department of livestock  
products Technology, Veterinary  
College and research institute,  
Namakkal, Tamil Nadu, India

**K Rajendra Kumar**  
Assistant professor,  
Department of poultry  
technology, CPPM, Housur,  
Tamil Nadu, India

**Corresponding Author**  
**Dr. R Rajkumar**  
Assistant professor,  
Department of livestock  
products Technology, (MST)  
Veterinary College and Research  
Institute, Namakkal, Tamil  
Nadu, India

## Preparation of moist pet food using retort process technology and its effect on the hunter laboratory colour values during storage

**Dr. R Rajkumar, Dr. V Chandirasekaran, M Geetha, M Muthulakshmi and K Rajendra Kumar**

### Abstract

A study has been made with an objective to prepare moist pet food with retort process technology and to evaluate the Hunter laboratory colour values such as L\*, a\*, b\*, Hue\* and Chroma\* values on the moist pet foods during storage up to 6 months. Hunter Lab Colour values such as L\*, a\*, b\*, Hue\* and Chroma\* angle value of the retort packaged moist pet food samples during ambient storage temperature had a significant difference ( $p < 0.05$ ) from one to six months. The L\* and a\* values of the moist pet food samples packed by retort packaging exhibited a decreasing trend from 1 to 6 months whereas the b\* value showed an increasing trend. Similarly, the Hue\* angle and Chroma\* angle values of the moist pet food samples packed by retort packaging method had an increasing trend till 6 months at ambient temperature.

**Keywords:** Moist pet food, retort process, colour values, pet food, moist, pet, hunter

### Introduction

Dogs are considered differently in different regions of the world due to traits such as loyalty, friendship, protectiveness, and affection. Dogs adapt to traditional eating patterns, which include meat, non-meat scraps, and leftover human food. These unsanitary meals, on the other hand, cause allergic reactions in pets. Concerns about animal health and the humanization of pets have spawned a market for pet food. Over the years, the trend of pet cafés and spas has grown in popularity, increasing demand for more pet food products in the Indian sub-continent. Presently, the dry pet foods available in the market. A nutritious, balanced diet is essential to Keep the dog in healthy condition. In this context, the moist type pet food varieties such as gravy with dry pellet, semi-moist, and moist dog foods have much higher palatability than dry pet food. A innovative study has been made with an objective to prepare moist pet food with retort process technology and to evaluate the Hunter laboratory colour values such as L\*, a\*, b\*, Hue\* and Chroma\* values on the moist pet foods during storage up to 6 months.

### Materials and methods

Ingredients for the preparation of moist pet food samples (Table 1) such as soya bean meal, maize, deoiled rice bran, rice flour and dicalcium phosphate, methionine, choline chloride, salt, additives, calcite powder, threonine, and antioxidants were purchased in the Feed mill unit, Department of Animal Nutrition, Veterinary College and Research Institute, Namakkal. Vegetables and millets were purchased in the local grocery store. The meat-based ingredients were purchased from M/S. Sivasakthi Farms and Hatcheries, Palladam, Tiruppur District, Tamil Nadu.

Meat preparation involves mincing the meat and ingredients by using a meat mincer (Mado primus, Germany). The non-meat ingredients are mixed with coarse ground meat and then precooked at a temperature of 100 °C for 5 minutes. After cooking the pet food slurries were cooled to 8-10 °C temperature. Then, the moist pet food slurries (250 g) were carefully filled in four laminated retort pouches. The retort processing of wet pet food diets was performed at the Department of Livestock Product Technology, Veterinary College and Research Institute, Namakkal, as per the procedure followed by Rajan *et al.* (2014) [1]. The hermetically sealed pouches on the trays were loaded in the retort machine (supplier-M/s. Lakshmi Engineering Works, Chennai). The filled and sealed pouches were subjected to thermal processing at 121.1 °C (corresponding to F<sub>0</sub> value of 5.2) and a total of 36 minutes required for thermal processing.

The pressure was maintained at 20 psi throughout the process. Rapid cooling was done to 55 °C. All the above retort processing procedures were controlled by the program by feeding or discharging compressed air through the automatic valve to the retort processing machine. After completion of the retort processing the processed retort pouches were stored at ambient temperature (35±2 °C) for further analysis.

The colour of the samples were determined objectively as per Navneet and Shitij (2011) [1] using Hunter Lab Mini Scan XE plus Spectrophotometer (Hunter Lab, Virginia, USA) with diffuse illumination. The instrument was set to measure Hunter L, a, and b values using illuminant 45/0 and 10° standard observers with an aperture size of 2.54 cm. It was calibrated using black and white calibration tiles before starting the measurement and colorimeter score recorded with 'L' of black equals zero and 'L' of white equals 100, 'a' of lower numbers equals more green (less red), higher numbers equal more red (less green) and 'b' of lower numbers equals more blue (less yellow), higher numbers equal yellow (less blue). The colour coordinates L (lightness), a (redness), and b (yellowness) of the samples were measured thrice, and mean values were taken. The colour of the product was measured after putting the product in front of the smallest aperture. Further, the Hue\* and Chroma\* angle values also studied. Hue\* angle is the name of the colour and is that quality by which we can distinguish colour families (red, green, blue, etc.) and is the result of differences in length of wave impulses on the retina producing the sensation of colour. Chroma\* angle expresses colour purity or saturation (Hunter and Harold, 1987) [3].

## Results and Discussion

Retort packaged moist pet food samples (Table 2) stored at ambient temperature, the L\* value (mean±SE) on day 0 was 33.82±0.72 and from 1 to 6 months were 30.10±0.56, 27.27±0.64, 25.23±0.24, 24.48±0.67, 23.58±0.54 and 22.34±0.62, exhibited a significant difference ( $p<0.05$ ) among the storage duration. Retort packaged moist pet food samples prepared with whole chicken stored at ambient temperature, the a\* value (mean±SE) on day 0 was 13.68±0.31 and from 1 to 6 months were 13.92±0.11, 13.92±0.14, 13.05±0.23, 12.92±0.36, 12.41±0.09 and 10.53±0.29, exhibited a significant difference ( $p<0.05$ ) among the storage duration. Retort packaged moist pet food samples stored at ambient temperature, the b\* value (mean±SE) on day 0 was 13.02±0.33 and from 1 to 6 months were 13.34±0.18, 13.88±0.12, 14.35±0.16, 15.17±0.19, 15.3±0.02 and 17.96±0.25, exhibited a significant difference ( $p<0.05$ ) among the storage duration. Retort packaged moist pet food samples stored at ambient temperature, the Hue\* angle value (mean±SE) on day 0 was 43.57±0.89 and from 1 to 6 months were 43.77±0.35, 44.91±0.37, 47.74±0.73, 49.61±0.74, 50.94±0.22 and 59.63±0.56, exhibited a significant difference ( $p<0.05$ ) among the storage duration. Retort packaged moist pet food samples, stored at ambient temperature, the Chroma\* angle value (mean±SE) on day 0 was 18.89±0.35 and from 1 to 6 months were 19.28±0.17, 19.66±0.13, 19.4±0.14, 19.94±0.31, 19.7±0.05 and 20.82±0.33, exhibited a significant difference ( $p<0.05$ ) among the storage duration. The overall treatment mean of retort packed samples' Lightness (L\* value), Redness (a\* value), Yellowness (b\* value), Hue\* angle and Chroma\* angle values were 26.69±0.62, 12.92±0.19, 14.72±0.25, 48.59±0.84 and 19.67±0.12 respectively.

Retort packed of moist pet food samples stored at ambient temperature, the L\* value (mean±SE) on day 0 was 33.82 and from 1 to 6 months, exhibited a significant difference ( $p<0.05$ ) among the storage duration (Table 1). Retort packed moist pet food samples stored at ambient temperature, the a\* value (mean±SE) on day 0 was 13.68 and from 1 to 6 months, exhibited a significant difference ( $p<0.05$ ) among the storage duration. Retort-packed moist pet food prepared with whole chicken and stored at ambient temperature, the b\* value (mean±SE) on day 0 was 13.02 and from 1 to 6 months, exhibited a significant difference ( $p<0.05$ ) among the storage duration. The retort-packed moist pet food samples stored at ambient temperature, the Hue\* angle value (mean±SE) on day 0 was 43.57 and from 1 to 6 months, exhibited a significant difference ( $p<0.05$ ) among the storage duration. The retort-packed moist pet food samples prepared with whole chicken stored at ambient temperature, the Chroma\* value on day 0 was 18.89 and from 1 to 6 months, exhibited a significant difference ( $p<0.05$ ) among the storage duration. The overall treatment mean of retort packed samples' Lightness (L\* value), Redness (a\* value), Yellowness (b\* value), Hue\* and Chroma\* value were 26.69, 12.92, 14.72, 48.59 and 19.67 respectively.

Literature on the Hunter Laboratory Colour values (L\*, a\*, b\*, Hue\* angle, Chroma\* angle) for the moist pet food samples are scanty, hence with the available literature, the colour values in the present study has been correlated. Bhadra *et al.* (2009) [4] reported that L\* ranged from 36.6 to 50.2, a\* ranged from 5.2 to 10.8, and b\* ranged from 12.5 to 23.4 among distiller's dried grains with solubles and the addition of higher amounts of solubles resulted in darker coloured distillers dried grains with solubles (reduced L\*) and less yellow colour reduced b\*). Colour parameters a\* and b\* had high correlations with water activity and moderate correlations with thermal properties which may be important for feed storage and further processing. Kingsly *et al.* (2010) [5] demonstrated that as the amount of condensed distillers solubles (DDGS) added to the coarse grains fraction is increased, L\* is reduced and a\* increases and the distiller's dried grains with solubles L\* and a\* values can be general indicators of nutrient composition changes among the DDGS samples. Cavalheiro *et al.* (2013) [6] studied three fermented cured sausages prepared with control (no ostrich meat) and (T1) 19.08 and (T2) 38.34 (percentage) of ostrich meat and pork meat and preserved with 20 percent potassium sorbate solution and ripened for 28 days, until reaching water activity of 0.87 for Hunter laboratory colour values and the L\* values were 44.12, 38.24, 36.08, a\* values were 11.77, 12.15, 14.03, b\* values were 3.38, 0.39, 0.31, Hue\* angle values were 16.01, 1.85, 1.25 and the Chroma\* values were 12.25, 12.16, 14.03 respectively. Chroma and Hue angles are based on a\* and b\* values; therefore, the changes in these values are caused by the due to protein denaturation and coagulation caused by the acid production as those in a\* and b\* values. In the present study related to the L\*, a\*, b\*, Hue\* angle and Chroma\* angle values can be correlated with the findings of Bhadra *et al.* (2009) [4], who reported the colour parameters had a high correlation with water activity and moderate correlations with thermal properties, further, Kingsly *et al.* (2010) [5] who found that the L\* and a\* can be general indicators of nutrient composition changes, Cavalheiro *et al.* (2013) [6] narrated that changes in colour values are due to protein denaturation and coagulation caused by the acid production.

**Table 1:** Hunter Lab Colour values (L\*, a\*, b\*, Hue\*, Chroma\* angle) of retort packaged moist pet food at ambient storage condition for six months period

Treatments (n=6)	Storage period (Months)							Overall treatment mean
	0	1	2	3	4	5	6	
Lightness (L* value)	33.82 <sup>e</sup> ±0.72	30.10 <sup>d</sup> ±0.56	27.27 <sup>c</sup> ±0.64	25.23 <sup>b</sup> ±0.24	24.48 <sup>b</sup> ±0.67	23.58 <sup>ab</sup> ±0.54	22.34 <sup>a</sup> ±0.62	26.69±0.62
Redness (a* value)	13.68 <sup>c</sup> ±0.31	13.92 <sup>d</sup> ±0.11	13.92 <sup>d</sup> ±0.14	13.05 <sup>bc</sup> ±0.23	12.92 <sup>b</sup> ±0.36	12.41 <sup>b</sup> ±0.09	10.53 <sup>a</sup> ±0.29	12.92±0.19
Yellowness (b* value)	13.02 <sup>a</sup> ±0.33	13.34 <sup>ab</sup> ±0.18	13.88 <sup>bc</sup> ±0.12	14.35 <sup>c</sup> ±0.16	15.17 <sup>d</sup> ±0.19	15.30 <sup>d</sup> ±0.02	17.96 <sup>e</sup> ±0.25	14.72±0.25
Hue* value	43.57 <sup>a</sup> ±0.89	43.77 <sup>a</sup> ±0.35	44.91 <sup>a</sup> ±0.37	47.74 <sup>b</sup> ±0.73	49.61 <sup>c</sup> ±0.74	50.94 <sup>c</sup> ±0.22	59.63 <sup>d</sup> ±0.56	48.59±0.84
Chroma* value	18.89 <sup>a</sup> ±0.35	19.28 <sup>ab</sup> ±0.17	19.66 <sup>ab</sup> ±0.13	19.40 <sup>b</sup> ±0.14	19.94 <sup>b</sup> ±0.31	19.7b±0.05	20.82 <sup>c</sup> ±0.33	19.67±0.12

Means bearing different superscripts between rows (a, b, c) differ significantly ( $p < 0.05$ ).

## Conclusion

From the above studies, it can be concluded that the moist pet food samples can be prepared by using retort process technology. The Hunter Laboratory Colour values such as L\*, a\*, b\*, Hue\* and Chroma\* angle value of the retort packaged moist pet food samples during ambient storage temperature had a significant difference ( $p < 0.05$ ) from one to six months. The L\* and a\* values of the moist pet food samples packed by retort packaging exhibited a decreasing trend from 1 to 6 months whereas the b\* value showed an increasing trend. Similarly, the Hue\* angle and Chroma\* angle values of the moist pet food samples had an increasing trend till 6 months at ambient temperature. The moist pet food can be prepared by using retort process technology and can be stored at ambient temperature for a period of six months without much alteration in the Hunter Laboratory Colour values.

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