J. Meat Sci. 2022, 17(2): 30-35

Research Article

ACS Publisher
www.acspublisher.com

Journal of Meat Science

Year 2022 (December), Volume-17, Issue-2

ISSN 0975-5209 **(Print)**
ISSN 2581-6616 **(Online)**

Development of Pet Chews Utilizing Pig Ear Lobes by Sun Drying Method

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ARTICLE INFO

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Received 17-06-2022; Accepted 30-10-2022

DOI: 10.48165/jms.2022.170205

ABSTRACT

The slaughter of pig is mainly done for its meat and offal's, along with there is generation of other by-products like ears, feet, lard, blood, bones etc. There utilisation using traditional processing techniques can serve as a profitable enterprise for rural farmers. The present work was designed in order to utilize the pig ear lobes as dried pet chews by using traditional sun drying method which serves as feed stuff for pet animals. The pig ears were collected hygienically after slaughter and were then scalded, singed, scraped and then cooked in the presence of 10% Nacl for 1hour. Sun drying method was standardised at different days interval (T1-3 day sun drying, T2-4 day sun drying, T3-5 day sun drying) along with control which was dried in the sun ((37° C ± 1° C) for one day. In sun drying method the results revealed significantly (P<0.05) decreased values for treatment samples when compared to control sample for all the parameters studied such as cooking yield, pH, moisture content and water activity as except for crude protein, ether extract and overall acceptability which was insignificant as the duration of drying progressed. Microbial quality analysis revealed satisfactory scores for the parameters studied such as total plate count, yeast and moulds and no coliforms were detected in all the treatments. Texture profile analysis recorded desirable scores and differed significantly (P<0.05) among all the samples for hardness, springiness, cohesiveness and chewiness. However, sensory evaluation results revealed high scores for the sample which was sun dried for 4 days (T2) when compared with the other treatments. Sun drying for 4 days of pig ear lobes was found to be the best when compared with other sun drying conditions for preparation of pet chews and these are made easily and can last longer. Hence, it was concluded that the present work can be a good source of income for the pork processors mainly in the rural areas who can easily adapt this work as a small scale enterprise.

Key words: Million, Enterprise, Moisture, Significant, Treatments

INTRODUCTION

India is a mega-biodiversity nation endowed with a total livestock population of 535.78 million comprising of 192.49 million cattle, 109.85 million buffalo, 74.26 million sheep, 148.88 million goats, 9.06 million pigs and 851.81 million poultry (DAHD 2019). Currently, India ranks fifth in terms of total meat production in the world with an annual production of 8.60 million tonnes. Among the livestock species, pig finds an important place as it being reared mainly by socio-economically weaker sections of the society. Pet food is a collection of many inputs from many sources with one output, which goes into the home to be fed to the pet cat or dog (Thompson, 2008). Slaughtering of animals generates large amount of wastes that requires expensive investments to comply with national regulations for wastes disposal. If animal by-products are not effectively utilized, a valuable source of potential revenue is lost, and the added and increasing cost of disposal of these products is incurred by the industry. Feeding pets or giving them treats is a key moment which strengthens the bond between the owners and their animals. Pet treats often include ears, snouts, leg bones, intestine, trotters, bull penises and other by-products. The Indian pet food market is projected to register a Compound annual growth rate (CAGR) of 13.7% during the forecast period i.e. 2021-2026 (Mordor Intelligence, 2021). A well-balanced food for pets serves as an excellent medium for its health and growth. Daily consumption of specific dental chews by dogs can help reduce plaque and/or calculus accumulation (Quest, 2013). Dried pig ears as pet chews unlike bone and other tissue chews, are easy to digest. Ear cartilage serves as an excellent source of chondroitin sulphate which strengthen the bones in pet animals. The liver, tail, ears and feet of cattle have a protein level which is close to that of lean meat tissue, but a large amount of collagen is found in the ears and feet (Unsal and Aktas, 2003). Pig ears are an excellent source of protein, which aids in helping dogs form new skin cells, hair growth, and build muscle tissue. Preparation of pet chews from ears can be a promising enterprise which aids in effective utilization of by-products, providing nutrients to pets, income to processors and creation of employment opportunities.

With this basic background a scientific study has been carried out in order to utilise the pig ear lobes as pet chews.

MATERIALS AND METHODS

In the present study pig ear lobes were collected in a hygienical manner and the collected samples were scalded, singed, scraped and washed thoroughly. The ears were cooked along with addition of 10% salt for 1 hour and dried under sun drying conditions with different days interval (T1-3 day sun drying, T2-4 day sun drying, T3-5 day sun drying) along with control which was dried under sun (37^{o} C ± 1^{o} C) for one day. The developed product under different drying conditions were analyzed for various physico-chemical parameters like Cooking yield (Murphy *et al.,* 1975), pH (Troutt *et al.,* 1992), Water activity (a_w), Proximate composition (AOAC, 2016), Texture profile analysis (Bourne, 1978), Tyrosine content (Strange *et al.,* 1977), Lipid oxidation (Witte *et al.,* 1970), Microbiological profiles (APHA, 2007) and Sensory evaluation (Keeton, 1983).

RESULTS AND DISCUSSION

The influence of sun drying method on pig ear lobes under different time-temperature combinations on physicochemical, textural, sensory, microbial characteristics of dried pet chews are presented in below tables.

The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower cooking yield than control mainly due to the extended days of drying under sun which resulted in the loss of moisture and there was no significant (P>0.05) difference found for cooking yield within the treatments for sun dried pet chews (T1, T2 and T3).The results are in agreement to the findings of Ferreira *et al.,*(2013) who reported that cooking loss was lower in the meat that was salted with10 per cent NaCl and then cooked. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower pH than control and there was no significant (P>0.05) difference found for pH within the treatments for sun dried pet chews (T1, T2 and T3). The results are in accordance with Rahman *et al.,* (2005) who observed significant difference in pH values obtained from different drying(sun dried, air dried, vacuum dried, freeze dried) methods. Similar findings were also reported by Incze, (2004) in which he stated that traditional dried meat products have a pH of about 6.0 and can be stored at room temperature. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower water activity than control and there was slight significant (P<0.05) difference found for water activity within the treatments for sun dried pet chews (T1, T2 and T3).The results are in agreement with Shiby *et al.,* (2015) in which water activity differed significantly (P<0.05) based on the drying method used for preparation of dried chicken cubes whereas, Thorarinsdottir *et al.,*(2001) stated that water activity (a_w) content decreased along with the increase in salt level and drying time.

Proximate composition

The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower percent moisture than control and there was significant (P<0.05) difference in percent moisture among sun dried pet chews for T1 and T2 when compared with T3. Similarly, Ferreira *et al.,* (2013) reported that the salting process reduced the moisture content dried salted pork meat. Crude protein content has no significant (P>0.05) difference observed among control and sundried pet chews. The results obtained were similar to the findings of Ayanwale *et al.,* (2007) who reported that oven-drying and sun-drying increased the protein contents of the dried meat samples compared to the fresh samples. Among the treatments, pet chews that were sun dried for 3 days (T1) had significantly (P<0.05) higher percent total ash than control and there was significant (P<0.05) difference found for percent total ash within the treatments for sun dried pet chews (T1, T2 and T3) Similar results were reported Bouchefra *et al.,* (2019) who found variations in total ash content of El-Kadid (dried camel meat) processed by sundrying method. The Pet chews that were sun dried for 5 days (T3) had higher percent ether extract than C, T1 and T2 and there was no significant (P>0.05) difference found for percent ether extract within the treatments for sun dried pet chews (T1, T2 and T3).

Texture profile analysis

The scores recorded for various parameters of texture profile analysis of the finished product produced desirable results to fit the product under pet chews category. As the drying days progressed scores for hardness increased, springiness and chewiness scores decreased whereas cohesiveness did not differ. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) higher hardness than control and there was significant (P<0.05) difference found for hardness within the treatments for sun dried pet chews (T1, T2 and T3). As drying under sun progressed, which resulted the loss of moisture within the product. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower springiness than control and there was significant (P<0.05) difference found for springiness within the treatments for sun dried pet chews (T1, T2 and T3).The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower cohesiveness than control and there was slight significant (P<0.05) difference found for cohesiveness within the treatments for sun dried pet chews (T1, T2 and T3).The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower chewiness than control and there was significant (P<0.05) difference found for chewiness within the treatments for sun dried pet chews (T1, T2 and T3).The findings of the study are in agreement with Kovacevic *et al.,*(2010) who reported significant variable differences in various brands of dried pork sausages for hardness, springiness, cohesiveness which could be due to addition of salt and fermentation process during ripening and Nayar *et al.,* (2014) who compared hot air oven dried and microwave dried goat meat cubes and found lower springiness, cohesiveness values and reported significant differences for chewiness among the microwave and hot air oven treated dried goat meat cubes.

Colour analysis

The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) higher L*(lightness) value than control and there was significant (P<0.05) increased differences found for L*(lightness) values within the treatments for sun dried pet chews (T1, T2 and T3) which could be due to the impact of sun drying on the product. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) higher a* (Redness) value than control and there was no significant (P>0.05) difference found for a* (Redness) values within the treatments for sun dried pet chews (T1, T2 and T3). The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) higher b* (yellowness) value than control and there was slight significant (P<0.05) difference found for b* (yellowness) values within the treatments for sun dried pet chews (T1, T2 and T3). As the days of drying progressed the parameters such as lightness, redness and yellowness showed an increasing trend in the values recorded. The findings of the present study are in accordance with Kovacevic *et al.,* (2010) who reported similar range of L^* (lightness) values, a^*(Redness) values, b^* (yellowness) values in dried and smoked pork sausages. Similarly, Rahman *et al.,* (2005) reported that different drying methods have significant effect on the colour of the product.

Sensory evaluation

The pet chews that were sun dried for 4 days (T2) had significantly (P<0.05) higher appearance, texture, odour scores than control and there was no significant (P>0.05) difference found for appearance scores within the treatments for sun dried pet chews (T1, T2 and T3). The pet chews that were sun dried for 4 days (T2) had higher overall acceptability scores than C, T1 and T3 and there was no significant (P>0.05) difference found for overall acceptability scores within the treatments for sun dried pet chews (T1, T2 and T3) and hence based on the sensory findings T2 was found to be superior sensorily when compared with control, T1 and T3. Therefore product dried up to 4 days (T2) was found to be optimum in sun drying. All the

sensory scores recorded were well within the acceptable range for treatment samples when compared with the control which founds its suitability to be utilised as a food stuff for feeding of pets. The results are in congruent with Di Donfrancesco *et al.,* (2014) who reported that appearance and colour of pet food had high influence in pet owner's acceptability and acceptance of pet food.

Microbiological profiles

The pet chews that were sun dried for 3 days (T1) had significantly (P<0.05) lower total plate counts (log $_{10}$ CFU/g) than control and there was no significant (P>0.05) difference found for total plate counts (log $_{10}$ CFU/g) within the treatments for sun dried pet chews (T1, T2 and T3). No coliforms were detected in all the treatments along with control samples. The pet chews that were sun dried for 5 days (T3) had significantly (P<0.05) lower yeast and mould counts (log $_{10}$ CFU/g) than control and there was slight significant (P<0.05) difference found for yeast and mould counts (log $_{10}$ CFU/g) within the treatments for sun dried pet chews (T1, T2 and T3). The microbial parameters studied were well within the safe limits which makes the product microbiologically safe for consumption as pet chew and also the findings correlate with the water activity values recorded. The results are in accordance with Kharb *et al.,* (2008) who stated that dried meat products obtained from precooked meat has absence of coliforms compared to raw dehydrated meat products and similarly the results are in agreement with Rahman *et al.,* (2005) stated that sun dried goat meat samples showed significantly higher aerobic plate counts compared to other methods of drying.

Mean ± S.E values of physico-chemical and microbiological profiles for sun dried pet chews as influenced by different drying time-temperature combinations.

Parameter	Control	T1	T2	T3
Physico chemical properties and microbial parameters				
Cooking yield (%)	47.4^{b}±0.41	41.03^{a}±0.88	40.48^{a}±0.44	39.22^{a}±0.67
pH	6.44^{b}±0.02	6.32^{a}±0.011	6.33^{a}±0.015	6.3^{a}±0.011
Water activity	0.77^{c}±0.008	0.64^{b}±0.003	0.63^{ab}±0.001	0.62^{a}±0.003
Moisture	24.85^{c}±0.44	12.35^{b}±0.25	11.70^{b}±0.10	9.08^{a}±0.4
Protein	64.26±0.63	63.86±0.25	63.98±0.2	63.74±0.27
Total ash	8.25^{a}±0.29	11.29^{c}±0.34	10.7^{bc}±0.18	9.76^{b}±0.37
Ether extract	8.82±0.19	8.58±0.3	8.64±0.47	8.92±0.17
TPC	2.68^{b}±0.024	2.44^{a}±0.03	2.45^{a}±0.017	2.54^{a}±0.034
Coliforms	ND	ND	ND	ND
Yeast and Mould	1.8^{c}±0.026	1.4^{b}±0.033	1.31^{a}±0.017	1.27^{a}±0.015

Mean ± S.E values of texture profile analysis, colour analysis and sensory evaluation for sun dried pet chews as influenced by different drying time-temperature combinations.

Parameter	Control	T1	T2	T3
Texture Profile Analysis				
Hardness	16764.75^{a}±882.02	28763.18^{b}±924.51	34970.8^{c}±1567.93	42555.27^{d}±1194.83
Springiness	2.75^{c}±0.04	1.48^{b}±0.03	1.26^{b}±0.12	0.85^{a}±0.008
Cohesiveness	0.92^{b}±0.035	0.78^{ab}±0.032	0.89^{b}±0.037	0.67^{a}±0.038
Chewiness	36615.07^{c}±1156.28	30234^{bc}±577.71	26589.85^{b}±1039.05	17835.99^{a}±2673.03
Colour Analysis				
Lightness (L^{*})	29.23^{a}±0.57	32.08^{b}±0.06	32.94^{b}±0.93	37.66^{c}±0.69
Redness (a^{*})	6.67^{a}±0.24	8.3^{b}±0.16	9.00^{b}±0.27	9.16^{b}±0.25
Yellowness (b^{*})	9.11^{a}±0.37	13.08^{b}±0.32	10.6^{a}±0.33	13.46^{b}±0.54
Sensory Evaluation				
Appearance	5^{a}±0.00	6.33^{b}±0.33	6.66^{b}±0.33	6.33^{b}±0.33
Texture	4.33^{a}±0.33	6^{b}±0.00	6.66^{b}±0.33	6^{b}±0.00
Odour	5^{a}±0.00	6.33^{b}±0.33	6.66^{b}±0.33	6.33^{b}±0.33
Overall acceptability	5.33±0.33	6.33±0.33	6.66±0.33	6.33±0.33

CONCLUSION

With the above research findings, pet chews preparation utilising pig ear lobes under sun drying condition was standardised. Effective utilisation of different by products along with meat can yield more profits to the pork processors which was proved with the present research work. The pet chews which were dried at different days interval of 3, 4, 5 were found to be sensorily acceptable, microbiologically safe, nutritious and cost effective. However, the product dried up to 4 days recorded sensorily superior scores and hence can be concluded that sun drying was optimum up to 4 days for the preparation of pet chews for pig ear lobes. Also, the pig ear lobe which is mainly composed of cartilage will be very much relished by the pets when compared with pet chews prepared from bones and other sources. The findings of the present study thus can be utilised both at traditional level as well as industrial level thereby facilitating the processors to end up in profits.

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