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Development of Pet Chews Utilizing Pig Ear Lobes – A Traditional Approach Using Solar Drying Method

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ABSTRACT

Pig slaughter is mainly done in India for its meat and offal's, along with them, other edible by-products like ears, feet, lard, blood, bones etc are also obtained which has a great potential to utilise in the preparation of pet foods in traditional methods. The present work was designed in order to utilize the pig ear lobes as dried pet chews by using traditional methods like solar drying method which serves as cost effective method for preparation of feed stuff for pet animals. Solar drying method was initially standardised by drying the pig ear lobes in solar dryer at different time intervals of (T1-3day solar drying, T2-4day solar drying, T3-5 day solar drying) along with control which was dried under sun (37oC ± 1o C) for one day and their quality was analysed. The results revealed significant ($P<0.05$) differences for treatment samples when compared to control sample for all the parameters studied, except for crude protein, cohesiveness and overall acceptability which was insignificant. Texture profile analysis revealed significant ($P<0.05$) differences among all the samples for hardness, springiness, chewiness. However, sensory evaluation results revealed high scores for the sample which was solar dried for 4 days (T2) when compared with the other treatments.

KEY WORDS: Ear lobes, Pet chews,Pigs, Solar drying.

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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 (BAHS, 2020).Currently, India ranks fifth in terms of total meat production in the world with an annual production of 8.60 million tonnes. The meat industry in 2019-20 has witnessed a steady growth of 5.98% over the previous year i.e.2018-19 (BAHS, 2020).In comparison with other livestock species, pigs have a great potential to contribute to faster economic return to the farmers, because of certain inherent traits like high fecundity, better-feed conversion efficiency, early maturity and short generation interval. 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).The pet food industry traditionally has utilized a wide range of protein sources including meat and bone meals, poultry meals and poultry by-products meals (Fahey, 2004).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).Dental and joint treats are commonly sold functional treats.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. Pig ears are an excellent source of protein, which aids in helping dogs form new skin cells, hair growth, and build muscle tissue. In addition, they are rich in Omega-3 and Omega-6 fatty acids for cholesterol regulation to maintain a healthy heart. Drying is one of the most popular and basic method of traditional food preparation. In the olden days the surplus food is dried and utilised as food source during lean periods by several human races. Drying removes the available water and there by prevents spoilage caused by bacteria and fungi. It also makes the food lighter and makes the food flavour stronger. Traditionally drying of foods involves several methods like sun drying, solar drying and oven drying. Among all the drying methods, solar drying has the advantages of preserving the food from dirt and pest attack, besides an economical method for preservation of different foods by means of drying principle. With this basic background a scientific study has been carried out in order to utilise the pig ear lobes as pet chews using traditional solar drying method.

MATERIALS AND METHODS

In the present study pig ear lobes were collected in a hygienical manner from the pigs that were slaughtered in the Department of Livestock Products Technology, College of Veterinary Science, Tirupati and the collected samples were scalded, singed, scraped and washed thoroughly.The ears were cooked along with addition of 10% salt for one hour and dried under solar drying conditionsfor different days (T1–3day solar drying, T2 – 4day solar drying, T3-5 day solar drying) along with control which was dried under sun (37^{o} C ± 1^{o} C) for one day. The solar dried products under different days duration were analyzed for various physico-chemical parameters like cooking yield (Murphy et al*.,* 1975), pH (Troutt et al.,1992), water activity (aw), proximate composition (AOAC, 2016), microbiological profiles (APHA, 2007),texture profile analysis (Bourne, 1978), tyrosine content (Strange et al*.,* 1977), lipid oxidation (Witte et al.,1970) and sensory evaluation (Keeton, 1983).The obtained data were subjected to one-way ANOVA for quality parameters (Snedecor and Cochran, 1995) and Duncan's multiple range test (Steel and Torris, 1981) for comparing the means to find the difference between groupsand their interaction for various parameters in different experiments. The smallest difference for two means to be significantly different ($P < 0.05$) was reported.

RESULTS AND DISCUSSION

The influence of solar drying method on pig ear lobes dried at different days on physico-chemical, textural, sensory, microbial characteristics of dried pet chews are presented in tables1 & 2.

The range of cooking yield (%) for pet chews was in between 39.13 and 47.4 and there was no significant ($P>0.05$) difference found for cooking yield within the treatments for solar dried pet chews (T1, T2 and T3).Ferreira et al.(2013)reported cooking loss was lower in the meat that was salted with10 per cent NaCl and then cooked. The pet chews that were solar dried for 5 days (T3) had significantly ($P<0.05$) lower pH than controland there was no significant ($P>0.05$) difference found for pH within the treatments for solar dried pet chews (T1, T2 and T3).Rahman et al. (2005) 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 traditional dried meat products had a pH of about 6.0 and could be stored at room temperature.The results are in agreement with Shibyet 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 solar dried for 5 days (T3) had significantly ($P<0.05$) lower percent moisture than control and there was slight significant ($P<0.05$) difference found for percent moisture within the treatments for solar dried pet chews (T1,

T2 and T3). The control (C) pet chews had significantly (P<0.05) higher percent crude protein than T1, T2 and T3. There was no significant (P>0.05) difference found for percent crude protein within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 5 days (T3) had significantly (P<0.05) higher total ash than controland there was no significant (P>0.05) difference found for total ash within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 5 days (T3) had higher percent ether extract than controland there was significant (P<0.05) difference found for percent ether extract within the treatments for solar dried pet chews (T1, T2 and T3). Ferreira et al. (2013) reported that the salting process reduced the moisture content of dried salted pork meat and had higher ash value. Akonor et al. (2016) observed higher fat value in oven-dried meat compared to solar dried meat.

Table 1. Physico-chemical, sensory and microbial quality parameters of solar dried pet chews

Parameter	Control	T1	T2	T3
Physico chemical properties (n=6)				
Cooking yield (%)	$47.4^{b}\pm0.41$	$40.8^{a}\pm1.17$	$39.7^{a}\pm0.92$	$39.1^{a}\pm0.82$
pH	$6.44^{b}\pm0.02$	$6.34^{a}\pm0.012$	$6.3^{a}\pm0.018$	$6.28^{a}\pm0.008$
Water activity	$0.77^{b}\pm0.008$	$0.67^{a}\pm0.005$	$0.65^{a}\pm0.003$	$0.65^{a}\pm0.002$
Moisture(%)	$24.8^{c}\pm0.44$	$12.7^{b}\pm0.25$	$11.74^{b}\pm0.21$	$10.14^{a}\pm0.35$
Protein(%)	64.2±0.63	61.6±0.58	61.4±0.74	62.1±0.68
Total ash(%)	$8.25^{a}\pm0.29$	$11.7^{b}\pm0.36$	$11.9^{b}\pm0.21$	$12.5^{b}\pm0.29$
Ether extract(%)	$8.82^{a}\pm0.19$	$10.02^{ab}\pm0.35$	$10.75^{bc}\pm0.25$	$11.78^{c}\pm0.34$
Sensory Evaluation(n=6)				
Appearance	$5.0^{a}\pm0.00$	$6.33^{b}\pm0.33$	$7.0^{b}\pm0.00$	$6.66^{b}\pm0.33$
Texture	$4.33^{a}\pm0.33$	$6.33^{b}\pm0.33$	$6.66^{b}\pm0.33$	$5.66^{ab}\pm0.33$
Odour	$5.0^{a}\pm0.00$	$6.66^{b}\pm0.33$	$7.33^{b}\pm0.33$	$6.33^{b}\pm0.33$
Overall acceptability	5.33±0.33	6.33±0.33	6.66±0.33	6.33±0.33
Microbial evaluation(n=6)				
Total Plate Count (log 10 CFU/g)	$2.68^{c}\pm0.024$	$1.88^{a}\pm0.041$	$2.04^{ab}\pm0.043$	$2.1^{b}\pm0.05$
Coliforms(log 10 CFU/g)	ND	ND	ND	ND
Yeast and Mould(log 10 CFU/g)	$1.8^{c}\pm0.026$	$1.10^{b}\pm0.017$	$0.92^{a}\pm0.018$	$0.9^{a}\pm0.011$

Mean values in the rows bearing different superscripts differ significantly (P<0.05)

Texture profile analysis

The pet chews that were solar 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 solar dried pet chews (T1, T2 and T3). The pet chews

that were solar dried for 5 days (T3) had significantly (P<0.05) lower springiness than control there was significant (P<0.05) difference found for springiness within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 4 days (T2) and 5 days (T3) had lower cohesiveness than control and T2samples and there was no significant (P>0.05) difference found for cohesiveness within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar 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 solar dried pet chews (T1, T2 and T3). Kovacevic et al. (2010) reported significant differences in dried pork sausages for hardness, springiness, cohesiveness 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 solar dried for 5 days (T3) had significantly (P<0.05) higher L*(lightness) value than controland there was significant (P<0.05) difference found for L*(lightness) values within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 5 days (T3) had significantly (P<0.05) higher a* (Redness) value than controland there was no significant (P>0.05) difference found for a* (Redness) values within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 4 days (T2) had significantly (P<0.05) higher b* (yellowness) value than controland there was slight significant (P<0.05) difference found for b* (yellowness) values within the treatments for solar dried pet chews (T1, T2 and T3).Kovacevic et al. (2010) 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.

Table2. Texture profile and Instrumental colour analysis of solar dried pet chews

Texture Profile Analysis(n=6)				
Hardness	16764^{a}±882	26458^{b}±1858	32353^{c}±634	41886^{d}±391
Springiness	2.75^{d}±0.04	1.84^{c}±0.046	1.38^{b}±0.10	0.73^{a}±0.004
Cohesiveness	0.92±0.035	0.93±0.19	0.86±0.08	0.869±0.029
Chewiness	36615^{c}±1156.28	27956^{b}±295.17	24059^{ab}±1909.57	21700^{a}±559.57
Colour Analysis (n=6)				
Lightness (L^*)	29.23^{a}±0.57	32.14^{b}±0.93	34.7^{bc}±0.29	35.54^{c}±0.71
Redness (a^*)	6.67^{a}±0.24	8.26^{b}±0.31	8.49^{b}±0.32	8.89^{b}±0.18
Yellowness (b^*)	9.11^{a}±0.37	12.48^{b}±0.34	13.35^{b}±0.58	10.3^{a}±0.11

Mean values in the rows bearing different superscripts differ significantly (P<0.05)

Sensory evaluation

The pet chews that were solar dried for 4 days (T2) had significantly (P<0.05) higher appearance scores than controland there was no significant (P>0.05) difference found for appearance scores within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 4 days (T2) had significantly (P<0.05) higher texture scores than control and there was slight significant (P<0.05) difference found for texture scores within the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 4 days (T2) had significantly (P<0.05) higher odour scores than controland there was no significant (P>0.05) difference found for odour scores within

the treatments for solar dried pet chews (T1, T2 and T3). The pet chews that were solar dried for 4 days (T2) had higher overall acceptability scores than T1 and T3and there was no significant (P>0.05) difference found for overall acceptability scores. Donfrancesco et al. (2014) reported that appearance and colour of pet food had high influence in pet owner's acceptability and acceptance of pet food. Nayar et al.(2014) reported that sensory attributes were higher in hot air oven dried goat meat cubes.

Microbiological profiles

The pet chews that were solar dried for 3 days (T1) had significantly (P<0.05) lower total plate counts (log 10 CFU/g) than control and there was significant (P<0.05) difference found for total plate counts (log 10 CFU/g) within the treatments for solar dried pet chews (T1, T2 and T3). For the solar dried pet chews no coliforms were detected in all the treatments along with control samples.The pet chews that were solar dried for 5 days (T3) had significantly (P<0.05) lower yeast and mould counts (log 10 CFU/g) than controland there was significant (P<0.05) difference found for yeast and mould counts (log 10 CFU/g) within the treatments for solar dried pet chews (T1, T2 and T3). Kharb et al. (2008) reported that dried meat products obtained from precooked meat has absence of coliforms compared to raw dehydrated meat products. Rahman et al. (2005) observed that sun dried goat meat samples showed significantly higher aerobic plate counts compared to other methods of drying.

CONCLUSION

It can be concluded that pet chews can be successfully prepared from pig ear lobes adopting 4 days of solar drying technique.

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