Journal of Applied and Natural Science 8 (2): 1049 - 1052 (2016)

JANS

Effect of predrying treatments on the retention of quality characteristics of green peas (*Pisum sativum* L.) cv. Lincoln during mechanical drying

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Received: October 30, 2015; Revised received: February 27, 2016; Accepted: June 7, 2016

Abstracts: An experiment was conducted to standardize the predrying treatments with minimum loss to physico-chemical characteristics of green peas (*Pisum sativum* L.) cv. Lincoln during drying process. In this study, moisture content (73%), TSS (15^{o}B), chlorophyll content (28mg/100g) and ascorbic acid (54mg/100g) were recorded in green peas. Different predrying treatments used in this study for quality preservation of peas were T_0, T_1 and T_2. From this study, it was concluded that Na_2CO_3, NaCl and sugars were responsible for the preservation of green color/ chlorophyll in peas during drying. On the basis of sensory evaluation T_2 was found best among all because maximum green color was retained in this treatment. Therefore, it was further selected for physico-chemical analysis. After drying there was decrease in moisture content (4%), chlorophyll content (17mg/100g) and ascorbic acid content (37.6mg /100g) while increase in TSS (22^{0}B), reducing sugars (8.3%) and total sugars (20%) of peas. A rehydration ratio of 3:1 was observed for this treatment. This is a low cost technology for preservation of quality of peas. Dried peas can further be utilized for the preparation of various value added instant products round the year.

Keywords: Drying, Green peas, Predrying treatments, Quality

INTRODUCTION

Pea (*Pisum sativum* L.) is one of the most commonly grown food legumes in the world and it has been widely used in the human diet. Pea seeds consist of 23-25% of protein, 50% starch 5% soluble sugars including fibre, minerals, vitamins and phytochemicals in minor quantities. It originated in the Middle East and was later widely grown in temperate regions of the world, among them China, India, United States, France and Egypt are its major producers (Kumar *et. al.*, 2015). In India pea is grown over an area of 433.6 thousand hectare with a production of 3868.6 thousand tonnes and in Himachal Pradesh it is grown on 23.9 thousand hectare area with 271.1 thousand tonnes production (Anonymous, 2014).

Peas are prone to perish fast and they must be preserved well for later consumption and usage. Taking into consideration the seasonal availability and regional abundances along with perishability of green peas, drying of peas is becoming a preferred method to extend its shelf life and consumability. Generally, drying of most of the mature legume seeds is done by sun drying or mechanical drying but higher temperature and prolonged drying leads to adverse changes in colour, texture and flavour, thereby rendering the product with poor consumer acceptability and shelf-stability (Sharma *et al.*, 1987). Chemical changes mainly affect sensory properties such as colour, taste and aroma, whereas physical changes mainly influence the handling properties such as swelling capacity and cooking time (Pieternel *et al.*, 1995; Bhattacharya and Malleshi, 2012). In addition, predrying treatments can reduce some of the undesirable changes such as color and textural changes by inactivating enzymes and also reduce the drying time by relaxing tissue structure and can yield a good quality dried peas (Doymaz and Kocayigita, 2011). Purkayastha (2011) reported that blanching prior to drying or dehydration is required to inactivate peroxidase activity, protect colour, texture and nutrients. It also improved the rate of drying and produced product with lower acidity (Sharma *et al.*, 2015).

Peas can be best dried without much quality deterioration by using predrying treatments followed by mechanical dehydration and hence find great scope in incorporating the dried peas in various food products such as muffins and cakes, soup mixes, breakfast cereals, bakery, confectionery and dairy products, soups, purees, etc. to ensure round the year availability. In addition to preservation, drying lowers the cost of packaging, storage and transportation by reducing both of the weight and volume of the final product nutritional value and taste (Chauhan and Srivastava, 2009).

The existing demand of high-quality foods in the food market requires dried products with high nutritional and organoleptic properties with similar levels as found in the initial fresh product. Keeping in view the importance of peas in our diet, present study was conducted with the objective to retain the quality of peas during drying process by using low cost technology.

MATERIALS AND METHODS

The present study was conducted in the Department of Food Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni-Solan during 2014-15. Well filled tender green peas (Cv. Lincoln) were selected for this study. Green peas were procured from local growers. Various treatments applied for the retention of quality characteristics before drying of green pea seeds samples were T_0 (blanching in 2% NaCl for one minute and cooling), T_1 (blanching in 2% NaCl for one minute, cooling and dipped in 2% NaCl + 4% sugar solution for half an hour) and T_2 (blanching in 2% NaCl for one minute, cooling and dipped in 0.5% Na_2CO_3) followed by draining (Table 1). After that, samples of each treatment were dried at 60-63^{0}C for a period of 8-10 hours in a mechanical dehydrator as per Lal *et al.*, 1986.

Sensory and physico-chemical analysis

Sensory evaluation: Sensory quality parameters were determined by adopting a 9-point hedonic scale (1=dislike extremely, 9=like extremely) as per Ranganna, 1999. On the basis of sensory evaluation, the best treatment was selected for further study.

Table 1. Description of predrying treatments for drying of peas.

Treatments	Description
T_0	Blanching in 2% NaCl for one minute and cooling.
T_1	Blanching in 2% NaCl for one minute, cooling and dipped in 2% NaCl + 4% sugar solution for half an hour.
T_2	Blanching in 2% NaCl for one minute, cooling and dipped in 0.5% Na_2CO_3.

Table 2. Effect of various predrying treatments on the sensory quality attributes of peas.

Treatments	Colour	Flavour	Texture	Overall acceptability
T_0	5.8	6.5	6.2	6.4
T_1	7.3	7.0	7.4	7.2
T_2	8.5	7.8	7.8	8.5
$CD_{0.05}$	0.512	0.358	0.301	0.28

Table 3. Physico-chemical characteristics of green peas and dried peas.

Parameters	Green Peas*	Dried Peas*
Moisture %	73.0±0.94	4.0±0.26
TSS ^{0}B	15.0± 0.48	22.0±0.70
Chlorophyll content(mg/100gm)	28.0± 0.96	17.0±0.82
Ascorbic Acid (mg/100gm)	54.0±0.5	37.60±1.61
Reducing sugar%	0.80±0.02	8.30±0.07
Total sugar%	8.30±0.23	20.0±0.26
Fibre Content (%)	4.0±0.52	3.5±0.49
Ash Content (%)	1.73±0.04	1.82±0.07
Rehydration Ratio	3:1	

*Values are means ± SD of 3 replications.

Green peas and dried peas from the best treatment were analysed for various physico-chemical parameters as per standard procedures by Ranganna, 1999 and Gould, 1978. Moisture content was expessed in %, determined by oven dry method. Total soluble solids were expressed in ^{o}B, recorded with the help of Erma Hand Refractometer**.** Chlorophyll content was estimated by spectrophotometric determination and expressed in mg/100gm. Ascorbic acid was estimated by 2,6-dichlorophenol-indophenol visual titration method and expressed in mg/100gm. Reducing and total sugars were determined by Lane and Eynon method and expressed in % (Ranganna, 1999). Total ash was estimated as per Ranganna, 1999 and expressed in %. Determination of fibre content was done as per Gould (1978) and expressed in %. The rehydration ratio was estimated as the ratio of dehydrated sample weight to the drained weight of rehydrated sample.

Statistical analysis: The data pertaining to chemical characteristics obtained in this study were subjected to statistical analysis using CRD while those of sensory quality using RBD.

RESULTS AND DISCUSSION

As per sensory evaluation of different predrying treatments of green peas, the treatment T_2 was found best with an overall acceptability of 8.5 and was selected for physico-chemical analysis (Table 2). The physico-chemical characteristics of peas and dried peas are presented in Table 3. The data indicated that green peas (Cv. Lincoln) were having a moisture content (73%), TSS (15^{0}B), chlorophyll content (28 mg/100g)

and ascorbic acid (54 mg/100g). After drying there was decrease in its moisture content (4%), chlorophyll content (17 mg/100g) and ascorbic acid content (37.6 mg /100g) and increase in TSS (22^0B), reducing sugars (8.3%) and total sugars (20%).

After drying of peas, there was decrease in moisture content due to high loss of moisture at higher temperature. Increase in TSS (22^oB) during drying in this study might be due to conversion of left over polysaccharides into soluble sugars also reported by Muralikrishna *et al.* (1969). Reducing sugars increased in dried peas because of more rapid hydrolysis of polysaccharides and their subsequent conversion to reducing sugars at higher temperatures which has also been reported by Sagar *et al.*, 2000 in mango. Total sugar content (20%) also increased after drying due to moisture loss and concentration effect. Purkayastha, (2011).

Decreasing trend of ascorbic acid content (37.60 mg/100g) in blanched and dehydrated samples in this study is ascribed to heat labile nature of this vitamin. Minimum loss to vitamin C content was observed in T_2 followed by T_1 attributed to use of alkali in predrying treatments. Results are in line with Purkayastha, 2011 who also reported minimum loss to vitamin C by the use of alkali. In treatment T_2 maximum retention of green color was recorded which might be due to increase in pH. The chlorophylls are very unstable molecules and difficult to retain during food processing (Mackinney and Weast, 1940). When a vegetable become olive green on heating the chlorophyll has formed pheophytin. In the presence of alkali the pH of the peas is maintained around 8 it will help in the preservation of color (Blair and ayres, 1943).

Rehydration ratio of 3:1 was recorded in treatment T_2. Ali *et al*. (2015) reported that rehydration is maximised when cellular and structural disruptions such as shrinkage are minimised. The blanched samples dried faster than those in other pre-treatment. Jadhav *et al.*, 2010 reported that open sun dried samples of peas showed the lowest rehydration ratio (1.35) while freeze dried samples exhibited maximum rehydration ratio (2.19). Tosh *et al.*, (2013) reported 2.74% ash content of green peas while in this experiment ash content was estimated to be 1.73% in green peas and 1.82% in dried peas. Fibre content of 4.0% and 3.5% was reported in green and dried peas, respectively in this experiment.

Conclusion

It was concluded from this experiment that predrying treatments along with mechanical dehydration proved to be very useful in retaining the quality characteristics of finished products. Na_2CO_3, NaCl and sugars were responsible for the preservation of green color/ chlorophyll in peas during drying. The treatment T_2 (blanching in 2% NaCl for one minute followed by cooling then dipped in 0.5% Na_2CO_3 for half an hour) was considered best for drying of green peas. By adopting this low cost technology, peas can be dried with minimum loss to quality especially color and these can further be utilized for preparation of various instant value added products.

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