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Ankit Sharma
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

GR Singh
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

BR Singh
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Neelesh Chauhan
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Vivak Kumar
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

MK Yadav
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Tarun Kumar
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Ankur M Arya
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Ravi Kumar
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Correspondence
BR Singh
Department of Agricultural Engineering, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Sensory analysis of apple pomace powder stored in two different materials

Ankit Sharma, GR Singh, BR Singh, Neelesh Chauhan, Vivak Kumar, MK Yadav, Tarun Kumar, Ankur M Arya and Ravi Kumar

Abstract
The left-over residue after apple juice extraction is called apple pomace, amounting to about 20-30 % of the total processed apple fruits. To utilize this waste, apple pomace powder was prepared by two different dryers' viz. tray dryer and hot air oven (drying @ 60, 70 & 80 °C) and stored in HDPE and aluminum foil packaging. Apple pomace powder was then evaluated organoleptically during storage. Sample stored in aluminum foil package were found superior over the samples stored in LDPE, in all aspects.

Keywords: Apple pomace, sensory, overall acceptability, tray dryer, hot air oven

Introduction
The Apple is the pomaceous fruit of the apple tree, species *Malus domestica* in the rose family (Rosaceae). It is one of the most widely cultivated tree fruits, and the most widely known of the many members of genus *Malus* that are used by humans. Apples grow on small and deciduous trees. Apples are the most favored fruit of millions of people and are widely grown fruit in temperate regions of the globe (Kaushal *et al.*, 2002, Agrahari and Khurdiya, 2003) [2, 1]. Apple is the one of the important fruit crops known to mankind and is produced all over the world in the temperate climate. Presently, India is the largest producer of apples in the world contributing about one third of total apple production of the world with an annual production of 1.42 million tons from an area of 0.25 million/ hectare. It is the 4th major fruit crop of India (Govt. of India, 2011). Most of the production of the fruit is used for table purpose but apportion is being processed into various products of which apple juice is processed to a greater extent. Apple pomace is the main by-product resulting from pressing apples for juice or cider and it accounts for 25-35% of the dry mass of apple.
According to Ranganna (2001) [4] sensory quality is the combination of different sense of perception coming into play choosing and eating a food. The sensory attributes includes color, flavor, texture, and taste. As far as human beings are concerned, it is generally agreed that the sense of taste is limited to sweet, salty, sour and bitter. The dimensions of these tastes could be estimated chemically, but their optima in relation to consumer's preference, especially when they occur in combination with complex food are not fully understood. Bates and Roberts (2001) [3] studied that apple pomace, through traditionally utilized as cattle feed, only a fraction of apple pomace is used due to rapid spoilage of the wet pomace. Drying of the apple pomace seems to be a promising utilization way for animal feed or for further processing such as nutrient recovery. Fellows (2009) [5] dried Apple pomace powder and mixed into powder; it reduces off-odors as well as transportation and storage costs. It also provides convenient products that have extended shelf-life at ambient temperatures or ingredients that are more easily handled by food processors. The colour of apple pomace can be used as an indication of chemical changes during drying and provide information for incorporating apple pomace powder in other products.

Materials and methods
The experiments were carried out in the Food Processing Laboratory of the department of agricultural engineering and food technology, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, (UP) India.
Apple pomace powder was developed by two different drying methods viz. trey drying and hot air drying (at temperature 60, 70 and 80 ^{0}C) with pretreatments (ascorbic acid, L-Cystein and KMS) and stored in LDPE and aluminum foil package at room temperature condition.

Organoleptic evaluation of apple pomace powder was performed just after preparation and at interval of 30, 60, 120, 150 and 180 days with the help of 9 point hedonic table.
A panel of 10 judges scored the quality characters (color, appearance, aroma, taste and overall acceptability) of the samples on a nine point hedonic rating scale in the performa. The mean score was obtained from the values given by all the judges.

Table 1: Nine Point hedonic scale for sensory evaluation.

Sl No.	Feeling	Rating
1	Like extremely	9
2	Like very much	8
3	Like moderately	7
4	Like slightly	6
5	Neither like nor dislike	5
6	Dislike slightly	4
7	Dislike moderately	3
8	Dislike very much	2
9	Dislike extremely	1

Result and Discussion

The sensory quality attributes were evaluated for fresh as well as stored samples. The samples were served to a group of 10 semi-trained panelists comprising of male and female members of different age groups and eating habits. Color, texture, aroma and taste were selected as sensory quality attributes and overall acceptability was calculated for each type of samples.

Apple pomace powder stored in LDPE

The score for overall acceptability ranged from 8.343 – 5.221 in case of ascorbic acid treated samples, from 8.293 – 5.609 in case of L-Cystein treated samples and 8.281 – 5.795 in case of KMS treated samples (Table 2); in tray drying. In case of hot air drying, it ranged from 8.343 – 5.398 for ascorbic acid treated samples, from 8.293 – 5.815 for L-Cystein treated samples and 8.281 – 5.922 for KMS treated samples (Table3).

Table 2: Change in overall acceptability of the samples dried in tray dryer and store in LDPE.

Storage Period (days)	Ascorbic acid			L-Cystein			KMS		
	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C
0	8.287	8.343	8.187	8.293	8.268	8.237	8.237	8.206	8.281
30	7.857	7.887	7.781	7.931	7.962	7.918	7.931	7.825	7.943
60	7.425	7.375	7.256	7.518	7.537	7.364	7.055	7.456	7.493
90	6.887	6.868	6.731	7.125	7.100	6.875	7.162	7.100	7.037
120	6.381	6.350	6.200	6.725	6.743	6.537	6.656	6.675	6.631
150	5.933	5.863	5.724	6.336	6.348	6.053	6.229	6.316	6.215
180	5.455	5.363	5.221	5.942	5.957	5.609	5.836	5.938	5.795

Table 3: Change in overall acceptability of the samples dried in Hot air oven and store in LDPE.

Storage Period (days)	Ascorbic acid			L-Cystein			KMS		
	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C
0	8.287	8.343	8.187	8.293	8.268	8.237	8.237	8.206	8.281
30	7.921	7.923	7.800	7.976	7.988	7.971	7.969	7.912	7.957
60	7.478	7.422	7.377	7.617	7.612	7.600	7.055	7.522	7.588
90	6.936	6.901	6.796	7.226	7.250	6.973	7.213	7.178	7.103
120	6.423	6.417	6.317	6.813	6.863	6.648	6.736	6.755	6.703
150	5.995	5.939	5.872	6.472	6.532	6.233	6.315	6.424	6.323
180	5.524	5.452	5.398	6.101	6.177	5.815	5.939	6.060	5.922

Apple pomace powder stored in aluminum foil package

The score for overall acceptability ranged from 8.343 - 5.321 in case of ascorbic acid treated samples, from 8.293 – 5.709 in case of L-Cystein treated samples and 8.281 – 5.895 in case of KMS treated samples; in tray drying (Table 4). In case of hot air drying, it ranged from 8.343 – 5.498 for ascorbic acid treated samples, from 8.293 – 5.915 for L-Cystein treated samples and 8.206 – 6.022 for KMS treated samples (Table5).

Table 4: Change in overall acceptability of the samples dried in tray dryer and store in aluminum foil package.

Storage Period (days)	Ascorbic acid			L-Cystein			KMS		
	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C
0	8.287	8.343	8.187	8.293	8.268	8.237	8.237	8.206	8.281
30	8.157	8.287	7.981	8.231	8.362	8.118	8.231	8.225	8.143
60	7.925	7.675	7.456	7.918	7.837	7.564	7.455	7.756	7.693
90	7.087	7.068	7.031	7.325	7.300	7.175	7.362	7.300	7.337
120	6.581	6.650	6.300	6.925	7.043	6.637	6.856	6.975	6.831
150	6.033	6.063	5.824	6.436	6.548	6.253	6.329	6.516	6.315
180	5.655	5.463	5.321	6.142	6.057	5.709	6.036	6.038	5.895

Table 5: Change in overall acceptability of the samples dried in Hot air oven and store in aluminum foil package.

Storage Period (days)	Ascorbic acid			L-Cystein			KMS		
	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C	60 ˚C	70 °C	80 °C
0	8.287	8.343	8.187	8.293	8.268	8.237	8.237	8.206	8.281
30	8.221	8.323	8.000	8.276	8.388	8.171	8.269	8.312	8.157
60	7.978	7.722	7.577	8.017	7.912	7.800	7.455	7.822	7.788
90	7.136	7.101	7.096	7.426	7.450	7.273	7.413	7.378	7.403
120	6.623	6.717	6.417	7.013	7.163	6.748	6.936	7.055	6.903
150	6.095	6.139	5.972	6.572	6.732	6.433	6.415	6.624	6.423
180	5.724	5.552	5.498	6.301	6.277	5.915	6.139	6.160	6.022

Conclusion

Present study revealed that in case of LDPE packaging, more acceptability was found for the sample treated with L Cystein and dried under 70 ^{0}C in both cases of drying conditions, whereas in case of aluminum packaging samples treated with L Cystein and dried under 60 ^{0}C were found superior over others.

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