Agricultural Sciences Journal
Available online at http://asj.mnsuam.net/index.php
ISSN 2707-9716 Print
ISSN 2707-9724 Online

Research Article

PRODUCT DEVELOPMENT OF FROZEN AND DEHYDRATED PHALSA (*GREWIA ASIATICA*)

Saira Nawaz[1], Ambreen Naz[1]*, Afshan Shafi[1], Muhammad Amin[1], Umar Farooq[1]
[1]*Department of Food Science and Technology, MNS-University of Agriculture Multan, Pakistan*
**Corresponding author: amber1912@yahoo.com*

ABSTRACT
Phalsa (*Grewia asiatica* L.) belongs to family Malvaceae is a delicious fruit with wide range of therapeutic benefits. The current research work was planned to develop cream cheese using frozen and dehydrated (F & D) phalsa. The developed product quality and acceptability was subjected to sensory evaluation followed by various analysis to check the microbial activity of frozen & dehydrated phalsa-based product. The microbial count was 18cfu/mL in frozen phalsa-based product while 14cfu/mL in dehydrated phalsa-based cream cheese. On comparison it is concluded based on results that dehydrated phalsa-based product was proved to be most effective as compared to frozen phalsa-based product.

Keywords: **Dehydrated phalsa-based product, Frozen phalsa-based product, Microbial count.**

1. INTRODUCTION
The syrupy and fleshy product of a tree or plant that contains seed and can be eaten as food is called fruit. Fruits are used for making juice and squash which are observed as very nourishing drinks by home-grown people. Sweet taste of fruits is due the sugar which is palatable by the human digestive system. Fruit juices may be encouraged with other nutrients to further enhance its nutritional input to the diet. The fruit juices have gotten an important place in current diets of people (Ene-Obonget al., 2016).

(Received: 24 December 2019, Accepted: 4 April 2020)
Cite as: Nawaz, S., Naz, A., Shafi, A., Amin, M., Farooq U. 2020 Product development of frozen and dehydrated Phalsa (*Grewia asiatica*). Agric. Sci. J. 2(1): 16-22

Phalsa fruit belongs to family Tiliaceae. The chromosomal status of phalsa is 2n=18. In fact, it is said to be the 3rd summer favorite fruit after mango and papaya (Sastri, 2003). This fruit comprises high quantity of carbohydrate (6.8 to 25.8%), acid (0.42 to 2.5%), and sugar with minute protein and fat. It comprises of high quantity of antioxidant and vitamin A. Phalsa is a shrubby and hardy in wildlife and is developing in arid and hot areas. Dry land horticulture and silviculture are preferred for the phalsa fruit. Small fruits high perishability of fruits, and uneven ripening are the problems which are complications limiting its status (Abid, 2012).

This fruit has various nutrients including vitamin A, ascorbic acid. These fruits must be used during the time period of 24 hours after picking due to its high perishability. This fruit has crimson red to dark purple color and pleasing taste. The extracted juice of phalsa has crimson red to purple color and is very popular. The native system of medicine regarded this fruit at high rate. The eatable portion of this fruit differs from 69-93 percent and this fruit contains 50-60 percent juice (Boora and Bons, 2015).

Phalsa is a good source of carbohydrates and dietary fibers. Greater amount of carbohydrate indicates that phalsa can be used as major cause of energy to stop

marasmus especially in kids. Higher amount of nutritional fiber specifies phalsa is useful for cardiac diseases, obesity, cancer and diabetes. Different products of phalsa fruit have been made due to its high nutritious value.

Different products of phalsa fruit have been prepared already like Jam, Chutney, Phalsy ka Sherbet, Pies and Squashes etc. Phalsa commercially cultivated in the states of Gujarat, Haryana, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh, Maharashtra, Bihar, West Bengal and Andhra Pradesh. It is mostly used as fresh fruit and has cooling effect.

Evaluation of frozen and dehydrated phalsa is done on physicochemical basis, Development of value-added products of phalsa and sensory evaluation of innovative phalsa product are the specific objectives of this study.

2. MATERIALS AND METHODS

The proposed research was carried out in the FST lab of Department of Food Science and Technology, MNS University of Agriculture, Multan. In the current proposed research plan locally, available phalsa was used for making different value-added products.

Procurement of raw material

Phalsa was purchased by considering the quality traits of fruits like color, shape and freshness from local market of Multan. The fruit was cleaned followed by washing to remove dust and other foreign material.

Storage of material

Phalsa fruit was frozen at -70ºC for further analysis and the particular amount of phalsa was dehydrated in Rose petal drier at 45ºC for 6 hours for dehydration. Resultant phalsa sample i.e. frozen (F) and dehydrated (D) had been used for further analysis and product development.

2.1. Characterization of phalsa

The sample of frozen and dehydrated phalsa was prepared. Afterwards, various analysis including physicochemical profiling, mineral assay and juice extraction was carried out.

NFE%=100(Crudefat+Crudeprotein+Ash+Crude Fiber) %.

2.2. Cream cheese development

Frozen (F) and Dehydrated (D) phalsa-based cream cheese was prepared in the FST lab of Food science department located at MNS University of Agriculture Multan. Simple cheese was prepared 1st by pasteurizing 2kg milk in the water bath. Temperature was checked with thermometer and at 70°C 6-gram citric acid was added in the milk. After few minutes cheese curd was appeared at the top. Cheese (casein protein) was separated from the remaining portion (whey protein) and squeezed. Cheese curd was converted into thread form and then mixed with required amount of cream, milk and sugar and then blended all these components with blender for a fine texture. This blended cheese was poured in 4 equal size pots in equal amount which were labelled with T0, T1, T2, T3. After this phalsa fruit pulp was prepared by separating the fruit pulp from seeds. This pulp was grinded in the grinder and a fine smooth puree was prepared. This fine puree was added in different fraction in these pots which are filled with cheese. T0 was a control sample and about 5% phalsa puree was added in the pot labelled T1 and 10% puree was added in the 2nd pot labelled T2 and 15% puree was added in the T3 and mixed properly then served to people (AOAC).

Table 2.1. Treatments prepared from frozen phalsa pulp

Treatments	Frozen phalsa pulp
T_0	Control
T_1	5% phalsa pulp
T_2	10% phalsa pulp
T_3	15% phalsa pulp

Table 2.2. Treatments prepared from dehydrated phalsa pulp

Treatments	Dehydrated phalsa pulp
T_0	Control
T_1	5% phalsa pulp
T_2	10% phalsa pulp
T_3	15% phalsa pulp

2.3. Cream Cheese analysis

2.3.1.Microbial analysis

Total plate, mould & yeast counts of cream cheese were determined according to respective method (FAO, 1992). A sample of 50 ml was homogenized with butter fields phosphate buffer (pH 7.2). Samples serial dilution was prepared by pouring 1ml blended sample into 9 ml sterile phosphate buffer in test tube. After dilution process these contents were mixed in vortex mixer for 10 sec. One ml of each dilution was poured into petri dishes with plate count agar and mixed with medium triplicate.

2.3.2. Sensory evaluation

The prepared cream cheese treatments were subjected to sensory evaluation to check the sensory acceptance product by using 9-point hedonic scale system following the directions of Meilgaard *et al.* (2007).

2.3.3. Statistical analysis

The data obtained from research work was subjected to statistical analysis.

3. RESULTS & DISCUSSION

3.1. Comparative Study: Frozen & Dehydrated phalsa-based product

Figure: 1. Frozen Phalsa based Product

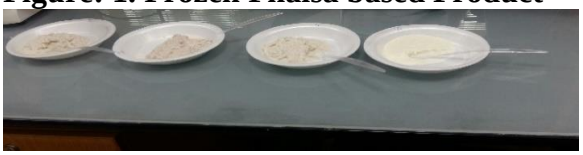

Figure: 2. Dehydrated Phalsa based Product

3.2. Color (F & D Phalsa)

Color of frozen and dehydrated Phalsa based product ranged from 7.03±3.67 to 7.28±3.74 and 6.92±0.93 to 8.00±0.80 respectively. Control treatment T0 has high scores but T1 treatment scored less as compared to T0. Treatment T0 has high score and other treatments have low color scores. While the statistical results indicated that overall acceptability scores for dehydrated phalsa color were observed high in T0 treatment of dehydrated phalsa-based product whereas the lowest scores were found in T1 and T2 treatment as shown in Table. Current findings for color acceptance of frozen phalsa-based product are in corresponding with the results of Palazolo et al. (2005). It was found that current frozen cream cheese was accepted for its color by the consumer. While the recent result of dehydrated product result is in variation with the results of Evert and Olson (2000). Current dehydrated product was accepted for color by consumers. Comparatively frozen phalsa-based product was given high acceptance score than dehydrated phalsa-based product.

3.3. Flavor (F & D Phalsa)

Flavor of frozen and dehydrated phalsa-based product ranged from 6.92±1.98 to 7.06±1.63 and 7.46±0.83 to 7.69±0.66 respectively. The statistical results have shown that treatment T0 attained high scores and T1 treatment of flavor scored low because in these treatments different concentration of frozen phalsa were added which has proved best fraction for the flavor of frozen phalsa-based cream cheese as shown in Table. While the statistical results indicated that high flavor scores were observed in T1 treatment of dehydrated phalsa-based product whereas the lowest flavor scores were found in T2 treatment as shown in Table.

Current findings for flavor scores of frozen phalsa-based products are in variate with the results of Adams et al. (2003). It was found that current frozen cream cheese is accepted for its flavor by the consumer. While the recent result of dehydrated product is in variate with the results of Ahn and Kwak (2004). Current dehydrated product was for flavor by consumer. Comparatively frozen phalsa-based product was given high acceptance scores than dehydrated phalsa-based product.

3.4. Aroma (F & D Phalsa)

Aroma of frozen and dehydrated Phalsa based product ranged from 6.51±1.81 to 6.84±2.28 and 7.46±1.18 to 7.79±0.68 respectively. The statistical result specified that aroma scores for frozen phalsa were observed high in T0 treatment of frozen

phalsa-based product whereas the lowest aroma scores were found in T2 as shown in Table. While the statistical results indicated that flavor scores for dehydrated phalsa were observed high in T0 treatment of dehydrated phalsa-based product whereas the lowest flavor scores were found in T3 treatment as shown in Table.

Current findings for aroma acceptance of frozen phalsa-based product are similar with the results of Fox (2010). It was found that current frozen cream cheese is highly accepted for its aroma by the consumer. While the recent result of dehydrated product aroma is in variate with the results of Kosikowski (2015). Current dehydrated product is accepted for aroma by consumers. Comparatively frozen phalsa-based product was given high score of acceptance than dehydrated phalsa-based product.

3.5. Texture (F & D Phalsa)

Texture of frozen and dehydrated phalsa based product ranged from 6.75±2.13 to 7.29±2.11 and 7.46±0.779 to 7.86±0.875 respectively. The numerical results of frozen phalsa product have shown that the outcomes were highly substantial. Treatment T0 of flavor was highly scored because in these treatments specific concentration of frozen phalsa was added which has proved best concentration for the flavor of frozen phalsa-based cream cheese. While the statistical results indicated that texture scores for dehydrated were observed high in T0 treatment of dehydrated phalsa-based product whereas the lowest texture scores were found in T2 and T3 treatment as shown in Table.

Current findings for texture scores of frozen phalsa-based products are in variate with the results of Hynes et al. (2003). It was found that current frozen cream cheese given was for its texture by the consumer. While the recent result of dehydrated product texture is corresponding with the results of Lawrence et al. (2012). Current result of dehydrated product was also accepted for texture by consumers. Comparatively frozen phalsa-based product was given high acceptance score than dehydrated phalsa-based product.

3.6. Appearance (F & D Phalsa)

Appearance of frozen and dehydrated phalsa based product ranged from 6.93±2.17 to 7.34±1.64 and 7.29±0.46 xto 7.88±0.54 respectively. The statistical results indicated that appearance scores for frozen phalsa were observed higher in T0 treatment of frozen phalsa-based product whereas the lowest appearance scores were found in T2 as shown in Table. While the statistical results indicated that appearance scores for dehydrated phalsa-based cream cheese were higher observed in T3 treatment of dehydrated phalsa-based product whereas the lowest flavor scores were found in T2 treatment as shown in Table.

Current findings for appearance acceptance of frozen phalsa-based products are in variate with the results of Fox (2010) and their result was 6.40 scores. It was found that current frozen cream cheese is for its appearance by the consumer. While the recent result of dehydrated product appearance is corresponding with the results of Kosikowski (2015) and their result was 5.35 scores. Current result of frozen product appearance was given high acceptance score than dehydrated phalsa-based product.

3.7. After taste (F & D phalsa)

After taste of frozen and dehydrated Phalsa based product ranged from 6.96±2.10 to 7.12±1.69 and 7.58±0.50 to 8.38±0.68respectively.The statistical results indicated that after taste scores for frozen phalsa were observed higher in T3 treatment of frozen phalsa-based product whereas the lowest after taste scores were found in T2 as shown in Table. While the statistical results indicated that after taste scores for dehydrated phalsa-based cream cheese were observed high in T0 treatment of dehydrated phalsa-based product whereas the lowest after taste scores were found in T2 treatment as shown in Table.

Current findings for after taste scores of frozen phalsa-based products are in variate with the results of Hynes et al. (2003). It

was found that current frozen cream cheese is accepted for its after taste by the consumer. While the recent result of dehydrated product after taste is corresponding with the results of Lawrence et al. (2012). Current result of dehydrated product after taste was also accepted by consumers. Comparatively dehydrated phalsa-based product was given high acceptance scores than frozen phalsa-based product.

Table 1: Mean table for sensory characteristics of Frozen & Dehydrated Phalsa

Treatment(F)	Color	Flavor	Aroma	Texture	Appearance	After taste	Acceptance
T_0	7.28±3.74	7.06±1.63	6.51±1.81	6.95±1.71	7.34±1.64	6.91±1.76	7.01±1.83
T_1	7.03±3.67	6.92±1.98	7.28±3.74	6.75±2.13	7.28±2.03	6.96±2.10	7.02±2.31
T_2	7.03±3.67	7.03±3.67	7.29±2.11	7.29±2.11	7.19±2.08	7.12±2.23	6.96±2.24
T_3	7.03±3.74	6.92±2.21	6.84±2.28	6.87±2.09	6.93±2.17	7.12±1.69	7.28±1.51
Treatment(D)	**Color**	**Flavor**	**Aroma**	**Texture**	**Appearance**	**After taste**	**Acceptance**
T_0	8.00±0.80	7.69±0.66	7.79±0.68	7.86±0.875	7.45±0.83	7.86±0.74	7.66±0.72
T_1	7.31±1.04	8.17±0.80	7.48±0.57	7.48±0.574	7.52±0.74	7.62±0.68	8.38±0.68
T_2	6.92±0.93	7.46±0.83	7.79±0.59	7.46±0.779	7.29±0.46	7.33±0.92	7.63±0.58
T_3	7.46±1.18	7.54±0.51	7.46±1.18	7.46±1.179	7.88±0.54	7.58±0.50	7.58±0.50

3.8. Overall acceptability (F & D Phalsa)

Overall acceptability of frozen and dehydrated phalsa based product ranged from 6.96±2.24 to 7.28±1.51 and7.58±0.50 to 8.38±0.68 respectively. The numerical consequences specified that overall acceptability scores for frozen phalsa after taste scores were observed high in T3 treatment of frozen phalsa-based product whereas the lowest overall acceptability scores were found in T2 treatment as shown in Table. While overall acceptability scores for dehydrated phalsa-based cream cheese were observed higher in T1 treatment of dehydrated phalsa-based product whereas the lowest overall acceptability scores were found in T3 treatment as shown in table.

Current findings for overall acceptability scores of frozen phalsa-based products are in variate with the results of Palazolo et al. (2005). It was found that current frozen cream cheese is not accepted by the consumer. While the recent result of dehydrated product overall acceptability is corresponding with the results of Evert and Olson (2000). Current result of dehydrated product overall acceptability was highly accepted by consumers. Comparatively frozen phalsa-based product was given high acceptance score than dehydrated phalsa-based product.

3.2.Product analysis of Frozen & Dehydrated Phalsa based product

Microbial analysis (Dehydrated and frozen phalsa)

Microbial load of frozen and dehydrated phalsa based product ranged from 0.55±0.55 to 3.02±3.02 and 10.23±1.12 to 21.50±0.76 respectively. Microbial status of phalsa-based cream cheese revealed that higher microbial load was observed in frozen phalsa-based cream cheese whereas the lowest microbial count was observed in dehydrated phalsa-based cream cheese.

Current findings of total plate count for frozen Phalsa based product are in corroboration with the results of Acevedo (2001) while present findings of total plate count for dehydrated phalsa-based product are in corresponding with the result of Andrews and Harris (2000). Furthermore, they stated that the microbial load of any fruit depends upon the storage conditions of the fruit. According to the current research results were highly significant but comparatively microbial load is high in

frozen phalsa-based product as compared to dehydrated phalsa-based product. The comparatively low microbial count in dehydrated phalsa-based cream cheese was might be due to the reason that moisture content was reduced during storage of dehydrated phalsa (used in dehydrated phalsa product) which was necessary for the growth of microbes.

Table 2: Mean table for microbial analysis of Frozen & Dehydrated Phalsa

Treatment(F)	Mean±S.D
T_0	0.79±0.79
T_1	2.23±2.23
T_2	3.02±3.02
T_3	0.55±0.55
Treatment(D)	**Mean±S.D**
T_0	10.23±1.12
T_1	15.83±2.69
T_2	16.00±1.53
T_3	21.50±0.76

4. CONCLUSION

Grewia asiatica (Phalsa) is a minor fruit having high nutritional value which is equal to the major fruits. Major fruits are normally used more than minor fruits. We have discussed about the Cream cheese product of dehydrated & frozen phalsa on different parameters. Comparatively, dehydrated and frozen Phalsa based product (Cream Cheese) results proved that dehydrated Phalsa based product proved to be most operative for each parameter as compared to frozen Phalsa based product.

5. REFERENCES

AACC. 2000. Approved Methods of the American Association of Cereal Chemists, 10th Ed. The American Assoc of Cereal Chem, St. Paul, Minnesota, USA.

Abid, M., S. Muzamil, S. N. Kirmani, I. Khan and A. Hassan. 2012. Effect of different levels of nitrogen and severity of pruning on growth, yield and quality of phalsa (Grewiasubinaequalis L.). Afr. J. Agric. Res. 7: 4905-4910.

Adams, M. L., D.M. Sullivan, R.L. Smith, E.F. Richer. 2003. Evaluation of direct saponification method in determination of cholesterol in meats. J. Assoc. Off. Anal. Chem. 69: 844-846.

Ahn, J., H.S. Kwak. 2004. Optimizing cholesterol removal in cream using β-cyclodextrin and response surface methodology. J. Food Sci. 64: 629-632.

Ahuja, I., R. Kissen, and A.M. Bones. 2012. Phytoalexins in defense against pathogens. Trends in plant sci, 17: 73-90.

Boora., R. S., and H.K. Bons. 2015.The minor fruits-health treasure. Kisan world, 42: 32-33.

Ene-Obong, H.N., H.O Okudu and U.V Asumugha. 2016. Nutrient and phytochemical composition of two varieties of Monkey kola (Cola parchycarpa and Cola lepidota): an under utilised fruit. Food Chem.193: 154-159.

Everet, E., N. Olson. 2000. Dynamic rheology of renneted milk gels containing fat globules stabilized with different surfactants. J. of Dairy Sci, 83: 1203–1209.

Fox, P. F. 2010. Rennets and their action in cheese manufacture and ripening. Biotechnol Applied Biochem., 10: 522–535.

Haq, Q.S., L. Tao, F. Sun and S. Yang. 2014. A fast and robust sparse approach for hyperspectral data classification using a few labeled samples. IEEE Transactions on Geosci and Remote Sensing., 50: 2287-2302.

Hynes., E., A. Delacroix-Bouchet, C. Meinardi, C. Zalazar, C. 2003. Relation between pH, degree of proteolysis and consistency in soft cheeses. Australian J. Dairy Technol, 54: 24–27.

Kassim, N.K., M. Rahmani, A. Ismail, M. A. Sukari, G.C.L., Ee, N.M. Nasir, and K. Awang. 2013. Antioxidant activity-guided separation of coumarins and lignan from Melicope glabra (Rutaceae). Food chem. 139: 87-92.

Kosikowski, F. V. 2015. Cheese and fermented milk foods (2nd Ed.). Brooktondale, NY: F. V. Kosikowski and Associates, pp. 405–406.

Kumar. S., A.L. Yadav, G. Vishwakarma and D.K. Yadav. 2014. Effect of foliar feeding of nutrients and plant growth regulators on physico-chemical attributes of phalsa (Grewiasubinaequalis DC). Res. Environ. Life Sci., 7: 317-318.

Lawrence., R. C., L. D. Creamer, J. Gilles, J. 2012. Texture development during cheese ripening. J. Dairy Sci, 70: 1748–1760.

Meilgaard, M.C., G.V. Civille and B.T. Carr. 2007. Sensory evaluation techniques, 4th Ed. C.R.C. Press L.L.C., New York.

Muller, L., K. Frohlich and V. Bohm. 2011. Comparitive antioxidant activities of carotenoids measured by ferric reducing antioxidant power (FRAP), ABTS bleaching assay (alpha-TEAC), DPPH assay and peroxyl radical scavenging assay. Food Chem. Article in press.

Palazolo., G.G., D.A. Sorgentinib, J.R. Wagner. 2005. Coalescence and flocculation in o/w emulsions of native and denatured whey soy proteins in comparison with soy protein isolates. Food Hydrocolloids., 19: 595–604.

Sastri, B.N. The Wealth of India Raw Material Number 4 Grewia Linn; Council of Scientific and Iindustrial Res: New Delhi, India. 2003: 260-266.

Sharma., A., B. Patni, D. Shankhdhar and S.C. Shankhdhar. 2013. Zinc–an indispensable micronutrient. Physiol Molecular Bio. Plants. 19: 11-20.