International Journal of Food Science and Nutrition
www.foodsciencejournal.com
ISSN: 2455-4898, Impact Factor: RJIF 5.14
Received: 29-01-2021, Accepted: 03-03-2021, Published: 05-04-2021
Volume 6, Issue 2, 2021, Page No. 98-102

Studies on development of process technology for preparation of dry fruit balls incorporated with flaxseeds

Kokani Ranjeet Chunilal[1*], Roham Kunal Sudhakar[2]

[1] Principal, College of Food Technology Saralgaon Tal, Murbad, Thane, Affiliated to Dr. B.S.K.K.V. Dapoli, Maharashtra, India
[2] Student, College of Food Technology Saralgaon Tal, Murbad, Thane, Affiliated to Dr.B.S.K.K.V. Dapoli, Maharashtra, India

Abstract
The aim is to prepare Balls (ladoo) as a nutritional point of view and to provide convenience to the consumer. The ingredient which were used for preparation of balls is Dates (Phoenix dactylifera) which contains Energy: 282 cal., Protein: 2.5g. Carbohydrates: 75g, Fat: 0.4g etc. Vitamin B-6 (PYRIDOXINE) is present. Minerals such as Calcium, iron, Magnesium are present in Dates. The flax seeds are very important in regular diet for humans especially for females. They increase nutrient absorption, help in weight loss, gluten free, rich in antioxidants and omega 3 fatty acids. Owing to these health benefits, dietitians and doctors advise to take flax seeds every day. Balls (ladoo) is good and typically made from various flours and dry fruits by various ways. Balls (ladoo) are usually round, sweet, small or large in size. For preparation of Balls (ladoo) ingredients used are pitted dates, flax seeds, almonds, cashews, Jaggery syrup, oats etc. all these ingredients were finely Grounded. The formulation was made by varying levels of ingredients. For preparation of Balls (ladoo) all ingredients were roasted and then grounded into fine powder. The dates were pitted and then grounded in mixer grinder. All these grounded ingredients were made into dough by adding Jaggery syrup. Three trials have been done T1, T2, and T3 by varying proportion of all ingredients and T3 has been selected. Proximate composition of ladoo ware fat content was found out to be 7.08±0.02%, the protein content is 7.85±0.09 %, the total carbs are 58.40±0.07 %, the energy in ladoo was 328.72kcal and ash content is about 2.01±0.11% respectively). It was concluded that the Balls (ladoo) can be store for one month in High density polyethylene pouches at room temperature. These balls are rich source of iron so they satisfy consumer's needs.

Keywords: convenience L, health benefits, proximate composition, store

Introduction

Ladoo are ball shaped sweet popular in Indian's subcontinent. They are made up of different flours, sugar with added ingredients. This traditional Indian dessert is made with different types of flour that are mixed with sugar and shortening, then shaped into balls. Like many other dishes in India, laddu appears in numerous varieties and is created with a myriad of different ingredients. Tiny laddu balls can be made with various types of legume flour, most commonly chickpea flour, wheat flour, and even coconut flakes. Dried fruits or nuts are often incorporated to provide sweetness and modify the flavour. This old Indian confectionery was primarily created with flour and Jaggery. (Bhargavi Naidu and Kirti shrike, 2012).

The food product i.e. Ladoo developed from maize of high-quality protein due to having balanced amino acids compositions commonly known as Quality Protein Maize in combination with Ragi, green gram, gingelly seeds, amaranths and Jaggery was analysed for nutritional composition and tested for common acceptability. Iron and Calcium content was 13.23mg/100gms and 418.03mg/100gms, respectively. Acceptability score of food product was evaluated by 30 pregnant women by using 9-point hedonic scale. The score for different parameters such as colour, flavour, texture, taste and general acceptability were recorded. Score for all parameters was above 6 which indicated the acceptance of product. (Kumari Priyanka and Singh Usha, 2005).

The product made was Nutritious Ladoos which was mainly a galactagogue, made with the following ingredients dried dates, Garden cress seeds, dry coconut, Jaggery, Dink, Ghee. A galactagogue is generally given to a lactating woman which helps increasing the breast milk production. Ladoo is rich in fibre and other nutrients like calcium, phosphorus, iron, carotene, niacin and essential amino acid. (Savla Rutu, 2017).

Flaxseeds are scientifically known as Linumusitatissimum L and Latinusitatissimum means 'most useful'. It is a multi-farious crop (El-Beltagi, Salama, & El-Hariri, 2007) and is grown either for the production of oil or fibre (Diederichsen & Richards, 2003; Vaisey-Genser & Morris, 2003; Tour´e & Xueming, 2010). Flaxseed is also known as linseed and is thought to be one of the oldest cultivated crops with evidence of cultivation dating back thousands of years (Newkirk, 2008). Consumers are returning back to its use due to its multifarious health benefits. Flax is nature's miraculous plant and cures our heart, blood, joints, colon, ageing, brain and even peace of mind. Tawheed Amin, Monika Thakur *et.al,* (2014) Flax (Linum usitatissimum), also known as common flax or linseed, is a member of the genus Linum in the family Linaceae. It is a food and fibre crop cultivated in cooler regions of the world. Flaxseed contains high levels of protein, dietary fibre, several B vitamins, and dietary minerals. Flaxseeds are especially rich in thiamine, magnesium, potassium, and phosphorus (DVs above 90%). Flax contains hundreds of times more lignans than other plant foods. As a percentage of total fat, flaxseeds contain 54% omega-3 fatty acids (mostly ALA), 18% omega-9 fatty acids (oleic acid), and 6% omega-6 fatty acids (linoleic acid); the seeds contain 9% saturated fat,

including 5% as palmitic acid. Flaxseed oil contains 53% 18:3 omega-3 fatty acids (mostly ALA) and 13% 18:2 omega-6 fatty acids. (Robin G. Allaby, Georgy W. Peterson, David Andrew Merriwether, Yong-Bi Fu *et.al.*, (2005) [9].

Almonds (Prunus dulcis; Gradziel 2009) are a nutrient dense food, and extensive research during the last decade on the potential health benefits of almonds has linked consumption patterns to reduced risk of chronic diseases such as coronary heart disease. D.P. Richardson *et.al.* (2009). Almonds are 4% water, 22% carbohydrates, 21% protein, and 50% fat. In a 100-gram (3 1⁄2-ounce) reference amount, almonds supply 2,420 kilojoules (579 kilocalories) of food energy. The almond is a nutritionally dense food, providing a rich source (20% or more of the Daily Value, DV) of the B vitamins riboflavin and niacin, vitamin E, and the essential minerals calcium, copper, iron, magnesium, manganese, phosphorus, and zinc (G. Ladizinsky *et.al.*, (1999) [10].

Oats are unique among the cereals; one of the rich sources of dietary fibres among cereals belongs to the Poaceae family like all other grain varieties Butt *et al.*, (2008). Oats are generally considered- healthy", being touted commercially as nutritious which has led to wider appreciation of oats as human food. Oat grout or whole grains (after removal of hull) contain all three parts of the grain – the germ, endosperm and bran, rich in all valuable nutrients. A high intake of dietary fibre is positively related to several preventive medical and nutritional effects (Spiller 2001) e.g. Dietary fibre complex with its antioxidants and other phytochemicals is most effective against cardiovascular disease and some types of cancer, lowering lipid levels (Jacobs *et al*. 1998a; Jacobs *et al*. 1998b; Jacobs *et al*. 1998; Slavin *et al*. 2000; Thompson 1994).

Date palm (Phoenix dactylifera L.) is widely grown in the hot arid regions mainly in the Middle East and North Africa, and provides nutrition, as a staple food for centuries, food security, and raw material to the food industry. Date fruit is a rich source of sugar, nutrients and pharmaceutical secondary metabolites, and provide 3150 calories per kilogram, and contain a high percentage of carbohydrate (total sugars, 44 /88%), fat (0.2 /0.5%), 15 salts and minerals, protein (2.3 /5.6%), vitamins and a high percentage of dietary fibre (6.4 /11.5%). They contain calcium, magnesium, phosphorus, potassium, iron, zinc, copper, manganese, selenium, vitamins A, A1, B, B1, B2, B3, B5, B6, and C as well as a variety of amino acids. The flesh of dates contains 20% moisture, between 50 and 67% sugar, 2.5%, 2% protein and less than 2% each of fat, minerals and pectic substances. Dates also contain thiamine, riboflavin, niacin, and pantothenic acid. These vitamins and minerals help the body produce haemoglobin, which is a protein in red blood cells that binds to oxygen and carries oxygen from the lungs to tissues.

Jaggery is also known as Gur in north India and velllum or bellam in south India. It is having different names in different location depending upon its sources. Jaggery is a natural, traditional sweetener, prepared by concentrating the sugarcane juice. Jaggery prepared from sugarcane juice having lighter colour comparing to other jaggeries obtained from sap. Mineral like magnesium present in Jaggery strengthens human nervous system and helps to relax body muscles, gives relief from fatigue and takes care of blood vessels. Jaggery contains potassium and low amount of sodium which helps to maintain the acid balance in the body cells, and also combats acids and acetone and controls body blood pressure. Jaggery is called as rich source iron which helps to prevent anaemia. Because of its anti-allergic properties, it helps to relief tension and takes care of asthma (Kumar et. al., 2013, Singh et. al., 2011) [12]

Cashew (*Anacardium occidentale*) belongs to Anacardiaceae family. Edible cashew kernels have been used as snack for centuries. They are used as a major ingredient in sweets and cooking, particularly in Asian cuisine. Cashews are healthy and packed with minerals and nutrients such as phosphorus, copper, and magnesium, not commonly found in other foods. They are also rich in tocopherols and phytosterols. The cashews have moisture content up to 5%.

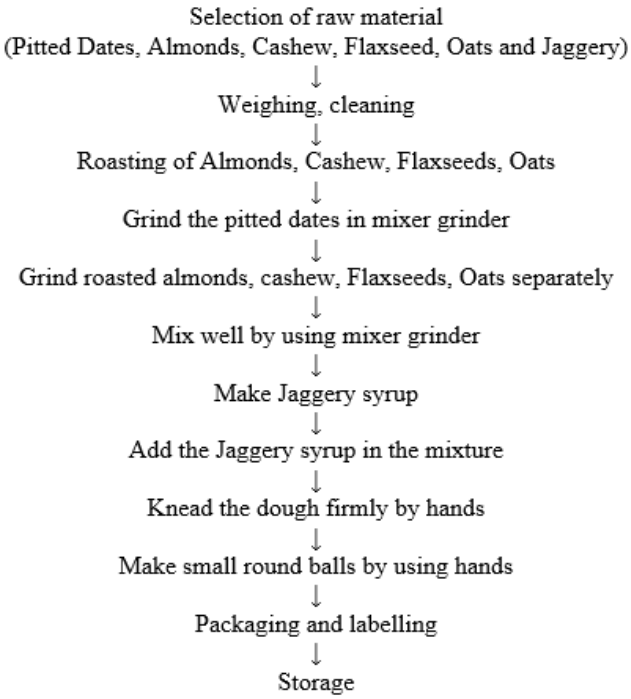
The product that I have designed is completely new in market. Ladoo are popular and healthy snack and there are high potentials to increase the nutritional value by incorporating several ingredients. In the present study, the iron content and protein content of snack were improved by incorporating dates, flax seeds and nuts etc. Snack food has increased urbanization and modernization. However, most of the snack contains high amount of fats, sugar and salts etc. and least amount of irons, proteins, dietary fibres and other minerals. Due to such situation consumers demand for healthy snacks is increasing. Thus, these ladoo can be considered as one of the most desirable snacks due to their good eating quality and superior nutritional properties. The current product is rich in iron which can come in handy to the pregnant women's as well as women having menstrual problems. In both the condition women's lack in blood this snack indirectly helps in increasing blood.

Material and Methods

Procurement of materials for Ladoo

Raw materials required during present investigation were procured from local market of Saralgaon such as Dates, Cashews, Almonds, Oats, Flax seeds and Jaggery. The raw material were cleaned and made free from foreign matters.

Flow Sheet for Preparation of Dry Fruit Balls Incorporated with Flaxseeds (Ladoo)



Physical Properties of Dry Fruit Balls Incorporated with Flaxseeds (Ladoo)

The colour of ingredients and product was determined by visual observations which was dark brown. The shape of the product was determined by visual observation which was round and dimeter observed by vernier calliper.

Chemical Properties of Dry Fruit Balls Incorporated with Flaxseeds (Ladoo)

Different chemical properties of samples were analysed for moisture content, ash, fat, protein and total carbohydrate. All the determinations were done in triplicate and the results were expressed as the average value. For moisture determination samples were dried in oven at 130ºC for 60 minutes. For ash determination samples were placed in muffled furnace at 550ºC to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using n. Hexane.

Sensory Evaluation

Prepared product was evaluated for sensory characteristics in terms of appearance, color, flavour, aftertaste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'. The obtained results were recorded in sensory score card.

Storage of Dry Fruit Balls Incorporated with Flaxseeds (Ladoo)

Storage of Dry Fruit Balls Incorporated with Flaxseeds (Ladoo**)** was done at two different condition *viz*., ambient storage (30˚C) for a month and cool storage (4 ˚C) for a period of two months.

Statistical analysis

The analysis of variance of the data obtained was done by using Completely Randomized Design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of P<0.05 level S.E. and C.D. at 5 per cent level is mentioned wherever required.

Result

Physical and Chemical Properties of Raw Materials

Physical and chemical Properties of Dates

Table 1

Parameter	Units	Parameter	Units
Size	4-5 cm	Ash	1.67%
Bulk Density	484 Kg/m³	Moisture Content	65.53%
True Density	554.5 Kg/m³	Fat	0.14%
Angle of repose	20.05°	Protein	1.50%

The physical parameters of dates were found to be Bulk Density (484 Kg/m³), angle of repose (20.05°), True Density 554.5 Kg/m³ and size (4-5cm) and The chemical parameters of Dates was found to be moisture content (65.53 %), fat (0.14 %), protein (1.50 %) and ash (1.67%) were more or less similar accordingly were more or less similar accordingly N.N. Desai and V.M. Modi et*. al.,* (2019) [6].

Physical and chemical Properties of flaxseeds

Table 2

Parameter	Units	Parameter	Units
Bulk Density	680-579 Kg/m³	Moisture Content	6.99%
True Density	1067-1147Kg/m³	Ash	4 %
Porosity	46.65-44.89%	Protein	21.76%
Angle of repose	27.6-35.80°	Fat	42.4%

The physical parameters of flaxseeds was found that the bulk density decreased from (680-579 Kg/m³) and true density increased from (1067-1147Kg/m³) were more or less similar accordingly were more or less similar accordingly K.K. Singh, D. Mirdula, P. Barnwal and J. Rehal *et. al.*, (2011).The porosity was found out 46.65-44.89% and Angle of repose 27.6-35.80° Amin M.N., Hossain M.A., and Roy K.C *et.al,* (2004). The chemical parameters of Flaxseeds were found out to be moisture content (6.99%), ash (4%), Protein (21.76%) and fat (42.4%) according to K.K. Singh, D. Mirdula, P. Barnwal and J. Rehal *et. al.*, (2011).

Physical and chemical Properties of Oats

Table 3

Parameter	Units	Parameter	Units
Bulk Density	729.5 to 540.073kg/m³.	Moisture Content	7.29%
True density	1250-1809.797 kg/m³.	Ash	3.5%
Angle of repose	26.86-38.7456°	Protein	15-17%
--------	----------	Fat	4.5%

The Physical Parameters of Oats was found that the bulk density varied from (729.5-540.073 kg/m³).and Angle of Repose (26.86-38.7456°) according to Seema Sangwan, Ramesh war singh, Sudhir Kumar Tomar *et.al,* (2014) [5] True density was 1250-1809.797 kg/m³. Chandan Solanki, Mridula D and R. K. Gupta *et.al,* (2019).The chemical parameters of oats were found out to be moisture content (7.29%).The Ash content is about (3.5%). Protein content was (15-17%) and fat was about (4.5%) according to Seema Sangwan, Ramesh war singh, Sudhir Kumar Tomar *et.al,* (2014) [5]

Physical and chemical Properties of Cashew

Table 4

Parameter	Units	Parameter	Units
Size	16mm to 20mm	Moisture Content	8%.
Bulk Density	343.31kg/m³	Ash	2.54%
True Density	299.73kg/m³.	Protein	21.3%
Angle of repose	23.61°	Fat	48.3 %

The physical parameters were found that the size (16mm-20mm), Bulk density (343.31 kg/m³), True density (299.73kg/m³) and Angle of repose (23.61°). The chemical Parameters was found out to be as follows moisture content (8%), Ash(2.54%), protein (21.3%), and fat (48.3 %) were more or less similar accordingly were more or less similar accordingly to Ricardo Rico, Monica Bullo, and Jordi Salas Salvado *et al.,* (2016).

Physical and chemical Properties of Almonds

Table 5

Parameter	Units	Parameter	Units
Size	25.33 to 25.66mm	Moisture Content	6.4%.
Bulk Density	525 to 655kg/m³	Ash	2.97%
True Density	1015 to 1115kg/m³	Protein	21.15%
Porosity	35.32% to 53.21%.	Fat	49.42 %

The physical Parameters ware Size 25.33 to 25.66mm, Bulk density was 525 to 655kg/m³. True Density 1015 to 1115kg/m³ and porosity was found out to be 35.32% to 53.21% according to C. Aydin *et al.* 2003) The protein content is about 21.15gms per 100gm (approx. 23 almonds). The fat count is about 49.42gms per 100gm. The average moisture content is about 6.4% in almonds. The ash content in almond is about 2.97%. David P. Richardson, Arne Atrup, Arnaud Cocaul and Peter Ellis *et.al*, (2009). Pola Sudhakar, Priyanka K, Angelena E. Peter, B. V. Sandeep, M Rameshwari, B. Ganga Rao *et. Al.*, (2018) [11]

Physical Properties of Ladoo

Table 6

Physical Properties	Ladoos
Colour	Dark brown.
Shape	Round
Diameter	2cm

Physical properties of ladoo ware colour of ladoo was found out to be Dark brown by visual Appearance. The shape is round examined by visual appearance and the diameter of the ladoo was 2cm measured by digital vernier calliper.

Chemical Properties of Ladoo

Table 7

Chemical Parameter	Selected sample
Ash	2.01±0.11%
Moisture	10.1±0.01%
Fat	7.08±0.02%
Protein	7.85±0.09%
Carbohydrate	58.40±0.07%
Energy	328.72kcal

It was evident from above tabulated that the chemical properties of ladoo ware fat content was found out to be 7.08±0.02%, the protein content is 7.85±0.09 %, the total carbs are 58.40±0.07 %, The energy in ladoo was 328.72kcal and The ash content is about 2.01±0.11% respectively.

Organoleptic Evaluation of Dry Fruit Balls Incorporated with Flaxseeds (Ladoos)

Table 8

Parameter	T1	T2	T3
Colour	08	7.5	08
Flavour	07	07	7.5
Taste	07	08	08
Texture	08	08	08
Appearance	7.5	7.5	7.5
Overall Acceptance	7.5	7.6	8

The sample T3 has highest score as compare to the other samples. The colour of T3 sample as per graph is 8 point while samples T1 (08), T2 (7.5). The flavour of sample T3 was acceptable with 7.5 while samples T1 (07), T2 (07). The texture of sample T3 was selected by 8 points while other samples points are T1 (8), T2 (8). The appearance of sample T3 was selected by 7.5 while other samples points are T1 (7.5), T2 (7.5). The taste of sample T3 was selected by 8 points while other sample are T1 (07), T2 (08). The overall acceptability of sample T3 was selected by 8 points while other samples points are T1 (7.5), T2 (7.6).

Conclusion

In the present study finally, it is concluded that Ladoos prepared from different variation of ingredients such as Dates, Almonds, Cashews, Oats, Jaggery Syrup and Flaxseeds has high Nutrition quality and also it is rich in Protein, carbohydrates and some vital minerals such as calcium and iron in proper amount and has great health benefits. The current product helps to produce blood and has great importance in human body these Ladoos are also developed considering the requirement of blood in pregnant women. These Dry Fruit Balls Incorporated with Flaxseeds is developed considering the requirement of blood in women. As women's go through menstrual cycle every month, they lose a lot blood from their body and many females suffer through Anaemia a very well know disease. The components in these Ladoos are recommended to increase blood in Ayurveda. The present investigation carried out for information of Ladoos in which T3 sample found more superior than sample T1 and T2 so, T3 sample is more acceptable on its sensory attributes.

Refrences

1. Anuradha Shekhar *et al.* "Shelf Life Study and Acceptability of Calpro Ladoo". Acta Scientific Nutritional Health 3.42019,10-13
2. Priyanka Shrivastav*1, Abhay Kumar Verma 2, Ramanpreet Walia 3, Rehana Parveen 4, Arun Kumar Singh (Sr.) 5 Jaggery: A revolution in the field of natural sweeteners, 2016.
3. Savla Rutu1*, Savla Pearl1 and Anuradha Shekhar1.,*et al.* A Shelf Life Study of Nutious Ladoo International journal of food and nutritional science.
4. Katare C, Saxena S, Agrawal S, Prasad GBKS, Bisen PS. Flax Seed: A Potential Medicinal Food. J Nutr Food Sci,2012:2:120.
5. Seema Sangwan1, Rameshwar Singh2*, Sudhir Kumar Tomar1 *et al.* Nutritional and Functional Properties of Oats: An Update, 2014.
6. Desai NN, Modi VM. Physical properties of Date fruits. *Int. J. Curr. Mirobial. App. Sci*, 2019:5(4):1243-1249.
7. C. Aydin / Journal of food Engineering 60, 2003, 315-320 Physical Properties of almond nut and kernel
8. S. Mohan Jain Department of Agricultural Sciences, University of Helsinki, PL-27, Helsinki, Health Benefits of date palm: phytochemicals and their functions, 2011
9. Robin G. Allaby, Georgy W. Peterson, David Andrew Merriwether, Yong-Bi Fu *et.al.*, (2005). Evidence of the domestication history of flax,2005.
10. Ladizinsky G, Genetic Resources and Crop Evaluation 01Apr 1999, 46(2):143-147
11. Pola Sudhakar, Priyanka K, Angelena E. Peter, B. V.

Sandeep, M Rameshwari, B. Ganga Rao *et. Al.,* (2018) A Study on the proximate composition and nutritive value of local tree almond, *Prunus amygdalus*
12. Singh J, Solomon S, Kumar D (2013) Manufacturing Jaggery, a Product of Sugarcane, As Health Food. Agrotechnol S11: 007. doi:10.4172/2168-9881.S11-007
13. Physical and chemical characteristics of cashew nut flour stored and packaged with different packages Bruna Carolina, GADANI Kelly, Márcia Lazarotto, MILÉSKI Lucas, Silva PEIXOTO, Juliana da Silva AGOSTINI Food Sci. Technol Campinas Oct./ Dec. 2017 Epub,2017:37(4).
14. Nejo, R, Oloko, S.A. Determination of Some Physical Properties of Cashew Nut IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 10, October 2016
15. Elina L, Vijay G. Incorporation of ground flaxseed into bakery products and its effect on sensory and nutritional characteristics – a pilot study. J Foodserv. 2009.
16. Oomah BD, Sitter L. Characteristics of flaxseed hull oil. Food Chem. 2009.