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Development & standardization of buckwheat laddu with added walnut & pumpkin seed flour & their sensory attributes

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Abstract
Buckwheat is introduced into the diet as an alternative crop of renewed interest due to its nutritive & health promoting value. Buckwheat is a rich source of protein, crude fat, fiber, mineral & flavanoid. Mineral content in buckwheat is comparatively higher than common cereal cops. The aim of this research is to review the potential health benefit of buckwheat. Buckwheat is gluten free cereal grain, so it is beneficial to gluten intolerant people. It is rich in flavonoid rutin & fiber so it is beneficial to hypertensive people. Buckwheat is rich in quercetin and quercetin dense food product are beneficial for treatment of diabetes as well as treatment depression. The laddu was prepared by fortifying buckwheat with pumpkin seed & walnut flour the different sample were prepared BPW1, BPW2, BPW3, in the ratio of 60:40, 70:30, 80:20 respectively. The sensory evaluation of buckwheat laddu was carried out. The sensory results showed that BPW2 was rated most acceptable by a panel of judges on a nine point hedonic scale.

Keywords: buckwheat, gluten, flavonoid, sensory evaluation

Introduction
WHO describes diabetes as a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use insulin it produces. Insulin is a hormone that apart from regulating blood sugar, has got several other metabolic functions. Hyperglycemia or raised blood sugar, over time leads to serious damage to many of the body's systems, especially the nerves, kidneys, heart, eyes & blood vessels. The worldwide prevalence of T2 DM in increasing and more than 366 million people are expected to become diabetic by the year 2030 [1].

Buckwheat
Buckwheat (Fagopyrum esculentum), also known as common buckwheat, Because its seeds are eaten and rich in complex carbohydrates, it is referred to as a pseudocereal. Buckwheat is not related to wheat, although its not a grains but a fruit seed of a plant that belongs to the rhubarb family Buckwheat are rich in Quercetin, Rutin & may elevate insulin resistance glucose uptake enhancement in insulin resistance cells [2]. Buckwheat having quercetin which act as AMPK (adenosine monophosphate-activated protein kinase) activator. Metformin is an antidiabetic medicine which act as AMPK activator our food contain certain nutrients which act a AMPK activator like Coenzyme Q10 & Quercetin [3].
Journal of Agricultural and Food Chemistry have found new evidence that buckwheat may be helpful in the management of diabetes. In a placebo-controlled study, a single dose of buckwheat seed extract lowered blood glucose levels by 12-19% at 90 and 120 minutes after administration when fed to laboratory animals with chemically-induced diabetes. The component in buckwheat responsible for its blood glucose-lowering effects appears to be chiro-inositol, a compound that has been shown in other animal and human studies to play a significant role in glucose metabolism and cell signaling. While researchers do not yet know precisely how it works, preliminary evidence suggests chiro-inositol makes cells more sensitive to insulin and may even act as an insulin mimic [4].

Pumpkin Seed
The pumpkin seed (Cucurbita moschata) is an annual dicotyledonous vegetable, belonging to the Cucurbitaceae family [5]. Pumpkin seeds (PS), which used to be discarded after the preprocessing of the fruit, have been, nowadays, subjected to industrial processing and have been commonly commercialized as a savory appetizer. The application of these seeds can be considered a good alternative for the nutritional enrichment of food products.
Some scientific literature highlights its importance as a source of α and β-carotene, vitamin C, dietary fiber, minerals, and phenolic compounds. These nutrimental and bioctive components are very important in providing human health benefits [6].
The pumpkin seed is a rich source of nutrients & has many medicinal properties. Pumpkin seeds, generally thrown away are otherwise, a rich source of oil and nutrients and could be consumed as food [7]. Pumpkin seeds have a high nutritional value, provides good quality oil, and excellent source of protein [8].
The seed of pumpkin has pharmacological activities such as

antidiabetic, antifungal, antibacterial and antiinflammation activities, and antioxidant effects [9].

Honey

Evidence indicates that honey can exert several health-beneficial effects such as gastroprotective, hepatoprotective, reproductive, hypoglycemic, antioxidant, antihypertensive, antibacterial, anti-fungal and anti-inflammatory effects. Natural honey (NH) is a sweet liquid food of high nutritional value, and immense health benefits Honey is spoken of by all religious books, and accepted by all generations, traditions and civilizations, both ancient and modern. Honey, because of its lower GI and PII when compared with sucrose, may be used as a sugar substitute in patients with type 1 diabetes mellitus [11]. Honey and its components were found to have several health benefits with long-term usage. Honey showed beneficial effects, including weight improvement and reduction in blood glucose levels. The study conducted by Akhtar and Khan shows that low doses of honey may be a good alternative to sucrose as a natural sweetener for diabetic patients [12].

Olive Oil

Extra virgin olive oil is the main source of dietary fat in the Mediterranean diet. With its high content in monounsaturated fatty acids (MUFA), tyrosol, secoiridoids and lignans, consumption of extra virgin olive oil might exert beneficial effects in the prevention, development and progression of T2D [13].

Comprehensive meta-analyses showed significant inverse associations between high adherence to Mediterranean diet and risk of type 2 diabetes (T2D), and improvements in glycemic control among T2D patients following a Mediterranean diet compared with a low-fat diet [14].

Endoplasmic reticulum stress (ER) is a central mediator for pancreatic beta-cell dysfunction in type 2 diabetes.

An in vitro study published in Biochemical and Biophysical Research Communications, 2016, investigated if tyrosol, an antioxidant polyphenolic compound found in olive oil, could protect against beta-cell dysfunction. Researchers found that tyrosol did in fact protect against beta-cell ER stress-induced cell death, suggesting that it should be explored as a therapeutic agent for improving insulin resistance and diabetes

Walnut

Walnuts are rich in MUFAs and PUFAs**.** Studies indicated that higher intakes of MUFAs and PUFAs are associated with improvements in insulin sensitivity [15].

2 Materials & Methods

2.1 Ingredients

Buckwheat, pumpkin seeds (cucurbita moschata), olive oil, walnut, honey pure were obtained from the local market.

2.2.1 Cleaning

The Buckwheat grains were taken and cleaned to remove the stones, dust, woods and any other foreign materials from the grains.

2.2.2 Preparation of Buckwheat Flour

The clean and healthy buckwheat grain was used for preparation of flour. Buck wheat grain was finely grind in an electric grinder and passed through a 60 mesh size sieve. The powdered sample was stored in air tight container until further use for experiments.

2.2.3 Preparing of Pumpkin Seed & Walnut Flour

The seeds were obtained from pumpkin were cleaned by hand to remove broken seeds & foreign materials, then were crushed in household mill, as soon as, the walnut was crushed in household mill, then was stifled.

2.2.4 Prepation of Flour Mixture for Laddu

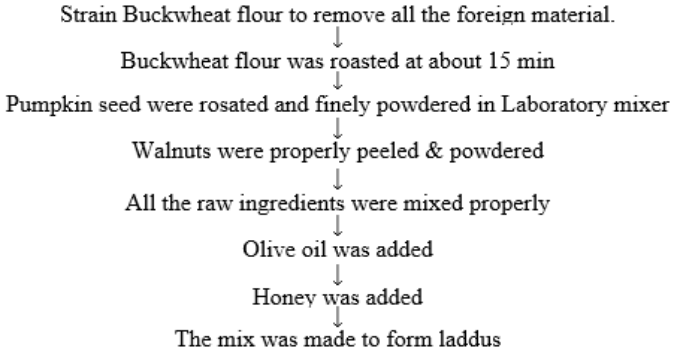
Formulation was prepared by blending buckwheat & pumpkin seed + walnut flour in different proportion. For the purpose of standardization of flour mixture, a no of preliminary trails were conducted. Different combination of buckwheat and walnut + pumpkin seed viz 60:40, 70:30, 80:20 were used to prepare flour mix for Laddu shown in Table no2.2.4.

Table 2.2.4: Preparation of Flour mix per 100 gm

Samples	Buck wheat flour	Pumpkin seed + walnut (Flour) (1:1)
BPW1	60	40
BPW2	70	30
BPW3	80	20

Where B – Buckwheat, P- Pumpkin seed, W- Walnut

2.2.5 Preparation of Laddu



The laddu was prepared after the flour preparation, following a standard formulation, with the addition of honey & olive oil are shown in Table 2.2.5

These flour were properly mixed and honey was added to the flour and after that olive oil is added frequently and make the soft dough. Dough was divided into small pieces and make small laddu.

Table 2.2.5: Standardization recipe of laddu

Ingredients	Amount in Gm
Buckwheat	100
Honey	50
Pumpkin seed powder	15
Walnut powder	15
Olive oil	15

2.3 Sensory Evaluation
Laddu were evaluated by a panel of judges. The parameters studied were colour, taste, flavour, texture and overall acceptability. The score card for the evaluation of the Laddu was provided along with instructions to each judge. The recipes were evaluated for sensory characteristics by the panel of judges.

3. Results and Discussion
3.1 Preparation of Flour Blends
To develop the flour blends, buckwheat flour and (walnut + pumpkin seed 1:1 ratio) were procured and processed separately. Then the flours were mixed in different ratio viz, 70:30, 60:40, 80:20.respectively were used to prepare 100g flour mix for laddu along with subsequent quantity of olive oil.

3.2 Sensory Evaluation of Laddu
Results of sensory evaluation of laddu prepared with 60, 70 and 80 % of buckwheat i.e BPW1, BPW 2 and BPW 3. It was found that replacement upto 30% of buck wheat by (walnut & pumpkin seed) was most acceptable by the trained sensory panel. Data revealed that the overall acceptability of sample BPW2 and Sample BPW 1 was 7.9 and 7.7. It was found that replacement of 60% Buckwheat flour by pumpkin seed & walnut flour was unacceptable by sensory panel because the appearance of the laddu was affected i.e. darker in colour and bitter in taste. Hence, in the present investigation buckwheat flour can be incorporated upto 30% was found most acceptable as a standardized recipe.

Table 3.2: Sensory score of the laddu prepared from flour mix.

Samples	Colour	Taste	Flavour	Texture	Appearance	Overall acceptability
BPW1	7.2	7.0	6.9	7.9	7.7	7.7
BPW2	7.8	7.5	7.1	7.6	7.2	7.9
BPW3	5.8	7.3	6.4	6.5	6.3	6.2

3.2.1 Colour
The analysis of variance of the color attribute revealed that there is significant change in colour of the laddu.It was shows that the colour at 80% buckwheat flour (BPW3) laddu got the lowest score at level of 70 % (sample BPW2) buckwheat flour laddu were most acceptable.

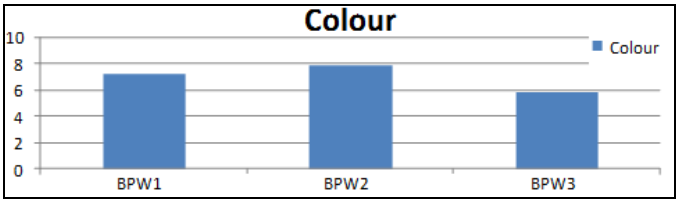


Fig 1

3.2.2 Taste
The analysis of variance of the taste attribute revealed that there was change in the taste of laddu due to addition of pumpkin seed & walnut buckwheat flour. It was shown that at level of 40% (BPW1) of pumpkin seed & walnut flour got the lowest score & the level of 30 % (BPW2) (pumpkin seed & walnut flour) got the highest score.

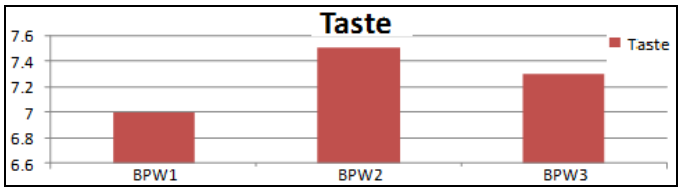


Fig 2

3.2.3 Flavour
The analysis of variance of the flavour attribute revealed that there was change in the flavour of laddu due to addition of walnut and pumpkin seed flour. It was shows that at the 30% (BPW2) level of pumpkin seed & walnut got the highest score whereas at level of 20% (BPW3) got the lowest score.

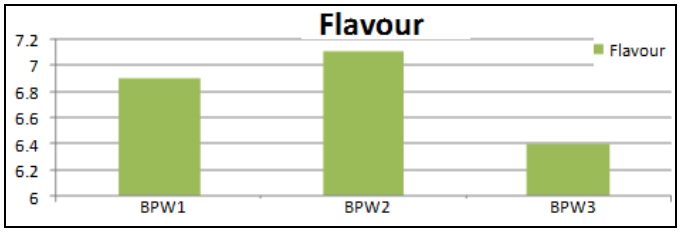


Fig 3

Texture
The analysis of variance of the texture revealed that there was significant effect on texture of the laddu when walnut & pumpkin seed flour was added. The result shows that the texture profile of laddu is higher in sample BPW1 & lowest in sample BPW3 the decrease in texture score of laddu due to decrease in walnut & pumpkin seed flour addition.

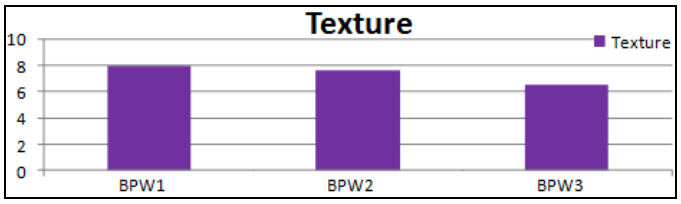


Fig 4

Overall Acceptability
The results of overall acceptability of laddu shows that the sample BPW2 In ratio of 70:30 was most acceptability other than two sample BPW1 (60:40) & BPW3 (80:20) as shown in figure.

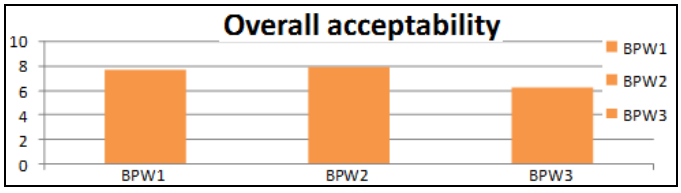


Fig 5

Conclusion
Buckwheat walnut & pumpkin seed flour taken in the

proportion of 70:30 had scored maximum for almost all sensory quality attributes such as colour, flavor, taste, texture & overall acceptability. Laddu preparation upto 30% replacement of buckwheat flour using walnut & pumpkin seed and 15% olive oil which according to the sensory result or panel members was the most accepted variation. It was found that replacement of 80% buck wheat flour by (walnut & pumpkin seed) was unacceptable by sensory panel because the appearance of laddu was not appropriate. Hence buckwheat flour can be incorporated upto 70% was found most acceptable as a standardized recipe.

Buckwheat is rich in complex carbohydrate, the carbohydrate content of buckwheat is 65.1% whereas the carbohydrate content wheat is 71.2% the protein contents of buckwheat is 10.3% whereas for wheat is 11.8% Buckwheat has excellent protein quantity in terms of amino acid composition. Buckwheat contain the high value of lysine (300 g per 100g protein) followed by other cereal grains. The biological value of buckwheat grain protein is also superior to many other food grains. The fiber content of buckwheat is 8.6% whereas for wheat is 1 %. The mineral content of buckwheat is 2.3 % where-as for wheat is 1.5 % buckwheat is rich in iron (60-100 ppm) zinc (20-30 ppm) selenium (20-50 ppm). Buckwheat contains no glutein, it may be eaten by people with glutein related disorders, such as celiac disease, non-celiac glutein sensitivity or dermalitis herpetiformis.

Rutin, a flavanoid which occurs in concentrations of 3-6% on dry weight basis, is the most important ingredient of buckwheat. It keep capillaries and arteries strong and flexible resulting in a decreased incidence of vascular complications such as retinal hemorrhage, apoplexy and coronary obstructions, Sterols in buckwheat prevent cholesterol from increasing in the blood serum. It has also been found preventative against high blood pressure or hypertension. Regular consumption of 30 g of buckwheat has been shown to lower blood pressure regardless of other factors such as age and weight [16].

Other flavanoid most abundantly found in buckwheat is quercetin. Quercetin dense food product are helping in lowering level of blood sugar. Quercetin act as natural mono amino oxidase inhibitor [17]. Monamine oxidase are the enzyme involved in removing the neurotransmitters, norepinephrine, serotonin & dopamine from the brain. Monamine oxidase inhibitors are given for the treatment of depression, dysthymia & anxiety.

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