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Formulation and evaluation of Indian traditional sweet Panjiri substituted with pearl millet (*Pennisetum glaucum* L.)

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Abstract
Panjiri is a traditional sweet which is made from wheat flour and sugar. The study involves substitution of wheat flour by pearl millet and refined sugar by jaggery powder for the purpose of preparing a product that is nutritionally rich, aiming at not losing the authenticity of the traditional *panjiri* yet trying to modify it in a way to enhance its health benefits. Different combinations of *panjiri* were prepared; the control sample (S0) contains only wheat flour which is the standard product, second sample (S1) contains 100% pearl millet flour and the third product (S2) contains both wheat and pearl millet flour in equal proportions that is 50% each. The proximate analysis, antioxidant properties, mineral content, organoleptic properties and shelf life study of all the combinations was carried out. The moisture content varied from 9.37±0.91 to 9.61±1.74%, the lowest observed for S1. The sample S1 has highest protein and ash content (which is 7.02±0.58% and 1.95±0.13% respectively). The highest fat content of 23.64% in S1 persists because of its formulation that is 100% pearl millet flour. The carbohydrate content varied from 60.54±0.90 to 62.57±1.03%, S2 possessing the lowest value and S1 highest. S0 had lowest antioxidant activity (16.17±0.82%) followed by S2 (26.45±1.16%) and then S1, (30.8±1.24%). The total phenolic content of S0 was least (210.5±1.4310 µg FAE/g) and it was highest for S1 (436.27 µg FAE/g). Out of all the samples, S1 has the highest whereas S0 has the lowest mineral content. From the mean scores of the organoleptic analysis, S2 was accepted and liked the most by the panelists followed by S1 and S0.

Keywords: Traditional food, nutrition, supplementary food, antioxidant

Introduction
Nutrition is the key to a healthy life and it plays a crucial role in the maintenance of physical and mental wellbeing throughout the life. Scarcity and lack of nutrition might cause serious conditions of malnutrition, impaired and improper growth, reduced working capacity, poor social and mental development (Stein 2010) [32]. India is amongst the top countries to have the highest burden of malnourished children and women in the world, almost twice that of Sub-Saharan African countries (Deaton & Dreze, 2009; Gragnolati *et al*., 2005) [10, 12]. Protein energy malnutrition is one of the major health problems in India which leads to childhood mortality, permanent impairment of physical and mental growth and various other morbidities of survivors (Krishnan *et al*., 2012) [19]. Malnutrition is a serious concern for any country to look up for. It is not only associated with inadequate protein but also inadequate essential amino acids and energy supply for a proper and healthy body functioning. (Stein, 2010) [32]. Poor nutrition and bad eating habits right from a very young age can prove to be disastrous for any individual and can lead to various serious or chronic health issues (Willett *et al*., 2017) [35]. For children right from the age of 6 months and for women, consumption of supplementary food and functional foods can provide helpful treatment to reduce the chances of malnutrition and them at as a source for balanced diet (Michaelsen *et al*., 2009) [25].
The indigenous traditional sweets have gained immense demand recently. Amongst a huge variety of these Indian sweets, some are still not as popular as others. *Panjiri* is one such traditional sweet made from wheat flour and sugar and is prepared during festivals like Janmasthmi as Prasad (Karwasra *et al*., 2021) [17]. *Panjiri* is usually prepared from the blend of cereals such as wheat, rice and maize with sugar, ghee and various dry fruits.

But these cereals are comparatively low in protein and it is also well known that cereal based foods are low in energy and nutrient density (Baskran *et al.*, 1999) [6]. Substituting *panjiri* with millet, which are nutritionally rich as compared to cereals and provides minerals, fibers, vitamins and are gluten free as well, can play an important role in enhancing the overall nutritional quality of *panjiri*, (Kaur *et al*., 2021) [17].

Millet is a generic term used for cereal species having small sized grains, almost around one quarter to one tenth the size of wheat kernels, which form heterogeneous group and referred along with maize and sorghum as "coarse cereals" (Taylor, 2017) [33]. Verily, some of these millet species are more distantly related with each other than, wheat and barley (Jaybhaye *et al*., 2014) [15]. Millets are nutritionally comparable or even superior to major cereals with respect to proteins, energy, vitamins and minerals. These can be a promising alternative in overcoming the problem of food insecurity and malnutrition (Kumar *et al*., 2018) [20]. Millets are a rich source of minerals, nutraceuticals and higher dietary fibers as that of rice or wheat. Small millets are more nutritious than fine cereals and are good source of phosphorous and iron. Millets are valuable for their high content of vitamin B, folic acid, phosphorus, iron and potassium and in addition to this, millets are gluten free, easy to digest and are a great source of antioxidants and perhaps have anti carcinogenic properties (Rao *et al*., 2017) [9]. Certain studies and observations have shown that the regular consumption of whole grain cereals and their products protects against the risk of diabetes mellitus, gastrointestinal diseases and cardiovascular risks (McKeown, 2002) [24]. Using millets as wholegrain makes the essential nutrients (like, dietary fibers, minerals, phenolics and vitamins) concentrated in outer layer of the grain or the seed coat form the part of the food and offer their nutritional and health benefits (Dayakar *et al*., 2017) [9]. Pearl millet contains magnesium, which aids in reducing respiratory problems among asthma patients and alleviating the effects of migraines. The fibre content of pearl millet plays a crucial role in decreasing the occurrence of gallstones. Specifically, the insoluble fibre found in pearl millet helps reduce the excess bile in our system, as an excess amount of bile can lead to the formation of gallstones (Malik, S. (2015) [21] and hence, Food and Agriculture Organization (FAO) and Integrated Child Development Scheme (ICDS) anticipated the development of locally sourced supplementary food using indigenous cereals and legumes (Imtiaz *et al*., 2011) [14].

The study involves the substitution of wheat flour by pearl millet and refined sugar by jaggery powder for the purpose of preparing a product that is nutritionally rich and is much healthier than the traditional sweet. The study also aims at not losing the authenticity of the traditional product that is *panjiri* yet trying to modify it in a way to make it nutritionally better and enhancing its health benefits.

Materials and Methods

Procurement of raw material

Wheat flour and pearl millet flour was procured from a local market in Greater Noida, Uttar Pradesh, India. Jaggery powder was purchased online from a manufacturer. All other reagents and solvents used were of analytical grade.

Preparation of *Panjiri*

Different combinations of *panjiri* i.e. standard and modified *panjiri* were prepared using pearl millet and jaggery powder. Each flour was blended with equal proportions of jaggery powder for the *panjiri* formulation. The total sample weight for each sample of *panjiri* was 300 g.

Various proportions of flour and jaggery powder were roasted using equal amounts of ghee in pan on an induction heater at 160 °C for 4 min each. After thorough mixing of each lot of flour and ghee, roasting was done with constant movement of mass to avoid burning with heat. Once the color changed to reddish brown, the vessel was removed from the induction heater and cooled for 1-2 min. Jaggery powder was then added to the vessel and ingredients were mixed together until nicely blended.

The control sample (S0) contains only wheat flour which is the standard product. The second sample (S1) contains only 100% pearl millet flour and the third product (S2) contains both wheat flour and pearl millet flour in equal proportions i.e. 50% each. (Salve *et al*., 2011) [31], prepared the traditional *panjiri* by roasting the wheat flour at 70-80 °C, and then mixing it with refined sugar.

Figure 1: S_0

Figure 2: S_1

Figure 3: S_2

Table 1: Formulation of different treatment

Treatment	Symbol	Wheat flour (g)	Pearl millet flour (g)
100% WF + 0% PMF	S0	150	0
0% WF + 100% PMF	S1	0	150
50% WF + 50% PMF	S2	75	75

Where, WF= wheat flour & PMF= pearl millet flour

(Note: Quantity of jaggery powder and ghee was kept same in all the treatments i.e. 100 g and 50 g respectively. Also the cooking time and cooking temperature for all the treatments was same i.e. 4min and 160 °C

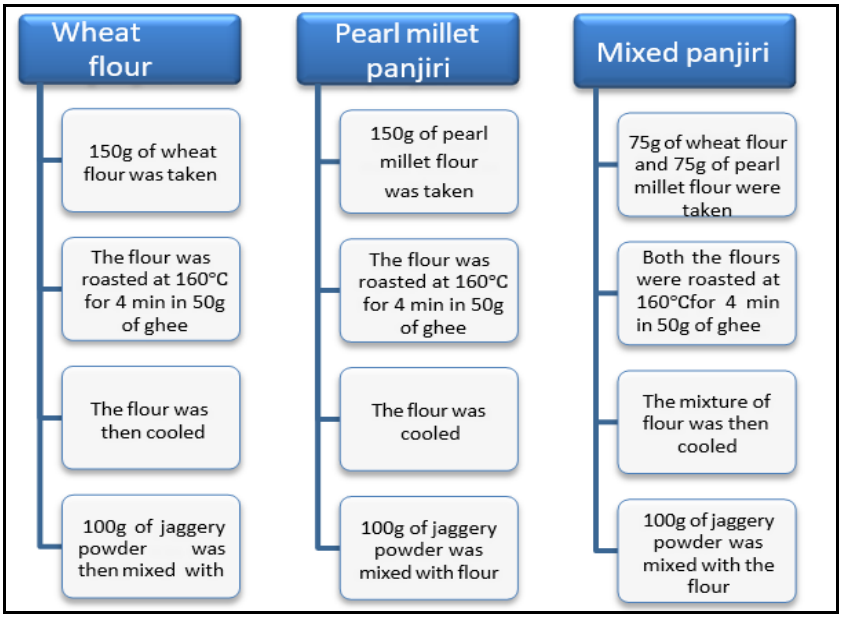

Fig 4: Flow diagram of *panjiri* preparation

Proximate Composition

The moisture content was determined on dry weight basis in which 5 g of the sample was dried in an oven at 105 °C for 16 hrs and weighed AOAC Method No: 934.01 (2005). Ash content of the sample was determined by taking 1 g of sample in a pre-weighed silica crucible in which preliminary ashing was done by slow heating on flame to allow smoking off fat, then incinerated in a muffle furnace at 500°C for 5hrs then cooled and weighed using AOAC Method No: 923.03 (2005). Fat content was estimated by the Soxhlet method as described in AOAC Method No: 920.39 (2005), in which petroleum ether is used as a solvent to extract fat from the sample. Protein content was estimated by determining total nitrogen content using standard Micro-Kjeldhal method in which nitrogen in the compound was converted into ammonium sulphate by digesting the compound with conc. sulphuric acid. Ammonium sulphate thus obtained was decomposed by alkali and the liberated ammonia was absorbed in boric acid and titrated against standard sulphuric acid/ hydrochloric acid by following the procedure as described in AACC Method No: 46-10.01 (2010). The crude fiber content was estimated by subjecting sample to acid digestion followed by alkali digestion and the remaining residue was weighed and ashed. The loss of weight after ashing was the crude fibre content of the feed as mentioned in AACC Method No: 32-10.01 (2010). Anthrone method was used to determine carbohydrate content, described by Sadasivam and Manickam (2005) [30].

Antioxidant properties of *Panjiri*s

Antioxidant activity (AOA)

Antioxidant activity of the samples will be determined by using method described by Brand- (Williams *et al*., 1995) [7]. DPPH (2, 2- diphenyl-1-picrylhydrazy) solution was added of about 2.9 ml to 0.1ml of methanolic extract of the sample. The mixture was then placed in dark for 1hr and the decrease in absorbance at 517nm was determined using spectrophotometer as percentage inhibition (%I) of DPPH (where, I = DPPH inhibition %).

Total phenolic content (TPC)

The total phenolic content was determined on the basis of the method described by Sharma & Gujral, (2010). The sample was first extracted with 4ml of acidified methanol at room temperature using a shaker for about 2hrs. This mixture was centrifuged at 3000xg for 10min. The supernatant was added for determining the total phenolic content. 200µl of extract was added to 1.5 ml freshly diluted. Folin & Ciocalteu's phenol reagent and the mixture was then allowed to equilibrate for 5 min. It was then mixed with 1.5ml of sodium carbonate solution. Then after the incubation at room temperature for 90min, absorbance of the mixture was noted using a spectrophotometer at 725nm.

Mineral Composition

Pearl millet has various minerals present in it, iron being the major one. So, the iron content, calcium content and phosphorus content of the samples were determined.

The iron content was determined according to the method of Florence *et al*., 2014 [11]. The sample was wet ashed using sulfuric acid, nitric acid and hydrochloric acid. An aliquot of the extract was treated with thioglycollic acid and the color was noted using a photometer at 535nm. The iron content in the sample was calculated in the form of standard curve and expressed as mg/100 g of sample. Calcium content of the sample was also calculated according to the method described by Florence *et al*., 2014 [11]. The silica free solution of the cereal ash was neutralized using an acid and methyl red indicator solution. The calcium in sample was then converted to calcium oxalate and precipitate by pH adjustment. The calcium content was determined by titration of the calcium oxalate with standard potassium permanganate. The calcium content was calculated on the basis of following relationship and the results were expressed as mg/100 g of sample. The phosphorus content of the sample was determined using the method described by Florence *et al*., 2014 [11]. In this, the sample was dried to ash using a carbonate nitrate fusion mixture. The ash was then extracted with TCA, acid molybdate solution and 1, 2, 4 amino napthol sulphuric acid reagent. A blue color with the intensity proportional to that of the phosphorus content was produced. The intensity of the blue color was read using a photometer at 660nm.

Organoleptic properties

The sensory evaluation of the samples was done by using 9-point hedonic scale method. The *panjiri* samples were subjected

to sensory analysis by a panel of twenty untrained judges who examined and evaluated the product. The panelists aged between 20- 65 years included students, research scholars, faculties, family and friends. "The sensory analysis of the samples was carried out under ambient conditions in a comfortable and quite area without any distractions under proper lighting and controlled temperature.' The product samples were served randomly afterlabeling with digits (1, 2 and 3). Each panelist was given a rating score card based on 9-point hedonic scale to rate the *panjiri*s for various parameters ('9- like extremely,8- like very much, 7- like moderately, 6-like slightly, 5- neither like nor dislike, 4- dislike slightly, 3- dislike moderately, 2- dislike very much, 1- dislike extremely'). Mineral water was given as palate cleansers between each sample and after palate cleansing a pause of around 15-20sec was given before the next tasting. The evaluation was based on the attributes; appearance, taste, aroma, texture, color and overall acceptability. The scores were noted and final readings were taken out after calculating the mean.

Microbiological analysis

A period microbial examination was used to examine the microbiological life of the *Panjiri*. It is the ideal evaluation of the prepared product's quality. Total Plate Count (TPC) along with yeast and mold counts as well as coliform counts were conducted over a 28-day period, 7 days apart (held at room temperature (250 C) with a relative humidity of 25.0%), to measure the microbiological quality. (An airtight container served as the packing material for the manufactured product during the study period).

Shelf life study

The shelf life of the samples was tested on the basis of moisture content, peroxide value and sensory characteristics during the storage period of 45 days under ambient conditions. The moisture content was determined according to the methods of AOAC, (1990) as described in sections above. The sensory characteristics were determined using 9-point hedonic scale method as described in previous section. Peroxide value of the samples was determined using method described by AOCS, (1998). It was determined when the iodine liberated from potassium iodide was titrated with sodium thiosulphate solution.

Results and Discussions

Proximate composition

The proximate compositions of different treatments are presented in Table 2. Moisture, ash, crude fiber, crude protein, crude fat and carbohydrates content of control and modified *panjiri* were calculated. The moisture content varied from 9.37 to 9.61%, the lowest was observed for S1 and highest for S0. It is also observed that the sample S1 has the highest protein content which is 7.02% as well as highest ash content which is 1.95% (which symbolizes the mineral amount). S0 has the lowest fat content i.e. 19.38%. On the other hand the highest fat content of 23.64% in S1 persists because of its formulation i.e. 100% pearl millet flour. As the pearl millet flour has the higher fat content so does the sample S1.

Out of all the three samples S2 possess values between S0 and S1 for each proximate composition. The average values of S2 are a result of its formulation which is 50% wheat flour and 50% pearl millet flour. The carbohydrate content varied from 60.54 to 62.57%. S2 possessing the lowest value (60.54%) and S1 the highest (62.57%).

In the earlier study by (Karwasra *et al*., 2021) [17], the moisture, ash, protein, fat, fibre and carbohydrates content of wheat flour *panjiri* was identified to be 1.24, 0.82, 8.76, 13.60, 1.18 and 87.57%, respectively. In the study of (Salve *et al*., 2011) [31], the results of proximate analysis of wheat flour *panjiri* was moisture 1.52%, ash 0.72%, protein 12.2%, fat 13.91%, fiber 1.31% and carbohydrates 71.20%.

Table 2: Proximate composition of different treatments

Product	Moisture (%)	Ash (%)	Crude fat (%)	Crude protein (%)	Crude fiber (%)	Carbohydrates (%)
S0	9.61±1.74	1.66±0.52	19.38±0.84	6.78±0.45	4.98±0.20	62.57±1.03
S1	9.37±0.91	1.95±0.13	23.64±1.05	7.02±0.58	5.28±0.47	58.02±1.12
S2	9.52±0.88	1.43±0.26	21.67±0.93	6.84±0.39	5.62±0.29	60.54±0.90

Data are presented as mean±SD (n=3)

Antioxidant properties

The antioxidant properties of the samples are presented in Table 3. The antioxidant activity and total phenolic compounds of the samples were calculated. The antioxidant activity varied from 16.17 to 30.8%. S0 had the lowest antioxidant activity which is 16.7 followed by S2, 26.45% and then S1, 30.8%. Therefore it is concluded that, S1 had the highest antioxidant activity. The total phenolic content of S0 was least i.e. 210 µg FAE/g and it was highest for S1 i.e. 436.27 µg FAE/g. The total phenolic content of S2 was between that of S0 and S1.

It is seen from the study of Karwasra *et al*., (2021) [17s] that the antioxidant activity and the total phenolic content of whole wheat flour *panjiri* was found as 17.45% and 230.82 µg FAE/g, respectively.

Table 3: Antioxidant properties of samples

Parameters	Treatments		
	S0	S1	S2
AOA (%)	16.17±0.82	30.8±1.24	26.45±1.16
TPC (µg FAE/g)	210.5±1.43	436.27±1.05	351.06±0.91

Data are presented as mean±SD (n=3)

Mineral Content

The mineral content of all the samples of *panjiri* are presented in Table 4. The values presented in the table shows that the calcium content varied from 18.57 to 40.38 mg/100 g. The *panjiri* prepared from whole wheat flour, S0, showed the lowest value for calcium, 18.57 mg/100 g, amongst all three. The highest content of iron, calcium and phosphorus was seen in S1, the values being, 11.24 mg/100 g, 40.38 mg/100 g, and 279.15 mg/100 g, respectively. S2 shows average values for all the minerals in comparison with S0 and S1. The mineral content significantly increases as the percentage of pearl millet increases. It is observed that, out of all the samples, S1 has the highest mineral content whereas S0 has the lowest mineral content. The highest mineral content of S1 is associated with the presence of pearl millet in it.

In the study of Karwasra *et al*., (2021) [17], it is detected that the calcium content, iron content and phosphorus content of the whole wheat flour *panjiri* was 20.13, 1.23 and 111.65 mg/100 g, respectively. Also from the study of Salve *et al*., (2011) [31], the calcium, phosphorus and iron content of wheat flour *panjiri* was found to be 24.52, 126.01, and 2.6 mg/100 g.

Table 4: Mineral compositions of samples

Constituents (mg/100 g)	Treatments		
	S0	S1	S2
Calcium	18.57±0.64	40.38±0.97	29.11±0.50
Iron	2.01±0.15	11.24±0.43	5.47±0.08
Phosphorus	101.32±0.77	279.15±0.68	168.93±0.82

Data are presented as mean±SD (n=3)

Organoleptic properties

Sensory properties of the samples were calculated on the basis of 9-point hedonic scale method. The sample S1 had the highest score for taste i.e. 8. The color of S1 is the result of the presence of pearl millet flour that gives it a beautiful golden brown shade as compared to S0 and S2 which have wheat flour along with pearl millet flour. It was seen from the score table that panelists liked the appearance, aroma and texture of treatment S2 the most as it shows the highest values i.e., 8.3, 6.68 and 6.2, respectively. The poor texture and color of S1 is because of the wheat flour content. The mean score of appearance was highest for S2 followed by S0 and then S1. The taste attribute was highest for S1 i.e. 8 and lowest for S0. It can therefore be concluded that from the above mean scores, S2 was accepted and liked the most by the panelists followed by S1 and S0.

In the study of Salve *et al.*, (2011) [31] it was seen that the sensory attributes of the wheat flour *panjiri* were decreased on the addition of soy flour and chickpea flour. Also the study of Karwasra *et al.*, (2021) [17] showed average results of sensory quality characteristics of whole wheat flour *panjiri*. It was observed from their study that wheat flour *panjiri* is well acceptable overall.

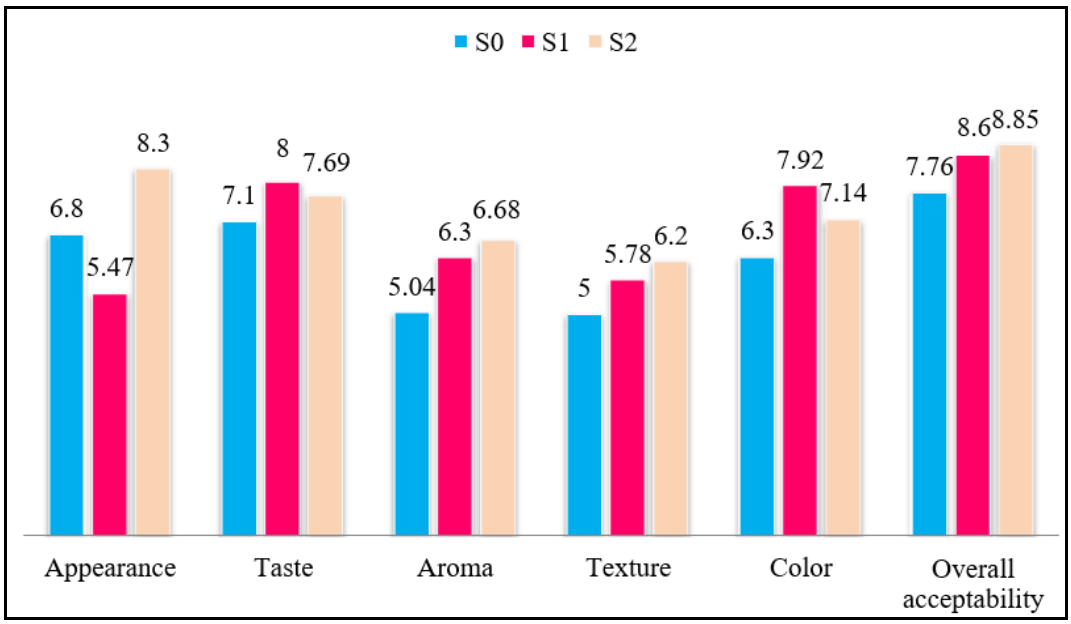

Fig 5: Sensory evaluation of different treatments

Shelf life Study

The storage qualities of all the samples are presented in Table 5 and 6. The samples were studied for the changes in moisture content, peroxide value (PV) and sensory characteristics during storage at ambient conditions. The shelf life testing was done over a period of 45 days. The moisture content of all the samples increased with the passing days and is depicted in Table 5. The highest moisture content after 45 days of storage was noted in S0 which is 11.27% whereas the lowest was noted in S2 which is 10.49%. The variation in moisture content after 15 days for all the samples was least.

Table 5: Changes in moisture content during storage

Storage days	Moisture content (%)		
	S0	S1	S2
0	9.67±0.41	9.37±0.85	9.52±0.17
15	9.88±0.70	9.64±0.27	9.73±0.59
30	10.13±0.56	9.98±1.10	10.02±0.33
45	11.27±1.03	10.51±0.69	10.49±0.91

Data are presented as mean±SD (n=3)

The peroxide value of all the samples increased significantly during storage as shown in Table 6. S0 had the lowest peroxide value on day 0, which is 1.78 meq/kg followed by S2 and then S1. It increased gradually over passing days but the lowest values were obtained for S0. It is observed that S1 had highest peroxide value after 45 days i.e. 21.06 meq/kg. S2 showed values between S0 and S1 throughout the storage.

Table 6: Changes in peroxide value during storage

Storage days	Peroxide value (meq O_2 / kg)		
	S0	S1	S2
0	1.78±0.61	10.32±0.57	4.66±0.92
15	2.05±0.15	12.47±0.43	6.81±0.73
30	2.94±0.38	19.13±0.85	9.25±0.24
45	3.56±0.72	21.06±1.12	11.73±0.65

Data are presented as mean±SD (n=3)

The changes in sensory characteristics during storage are shown in Table 7. It observed that sensory attributes of the samples decreased on storage.

Table 7: Sensory evaluation of samples during storage

Storage	Color			Taste			Aroma			Overall acceptability		
days	S0	S1	S2	S0	S1	S2	S0	S1	S2	S0	S1	S2
0	6.35	7.92	7.14	7.17	8.28	7.69	5.04	6.39	6.68	7.76	8.66	8.85
15	6.34	7.53	7.02	6.88	7.57	7.25	5.04	6.12	6.50	7.51	8.62	8.53
30	5.87	6.62	6.13	6.34	7.41	7.21	4.75	5.89	6.21	7.02	8.14	8.21
45	5.12	5.91	5.56	6.10	7.03	6.92	4.31	5.42	6.09	6.83	7.73	7.84

It is observed that the color of the samples became darker during storage. The sensory scores of color attribute for all treatments decreased significantly. The changes in color through 45 days are shown in Figure 6. It was seen that after 45 days the color score of S_0 had lower value *i.e.* 5.12 whereas S_1 had highest value *i.e.* 5.91.

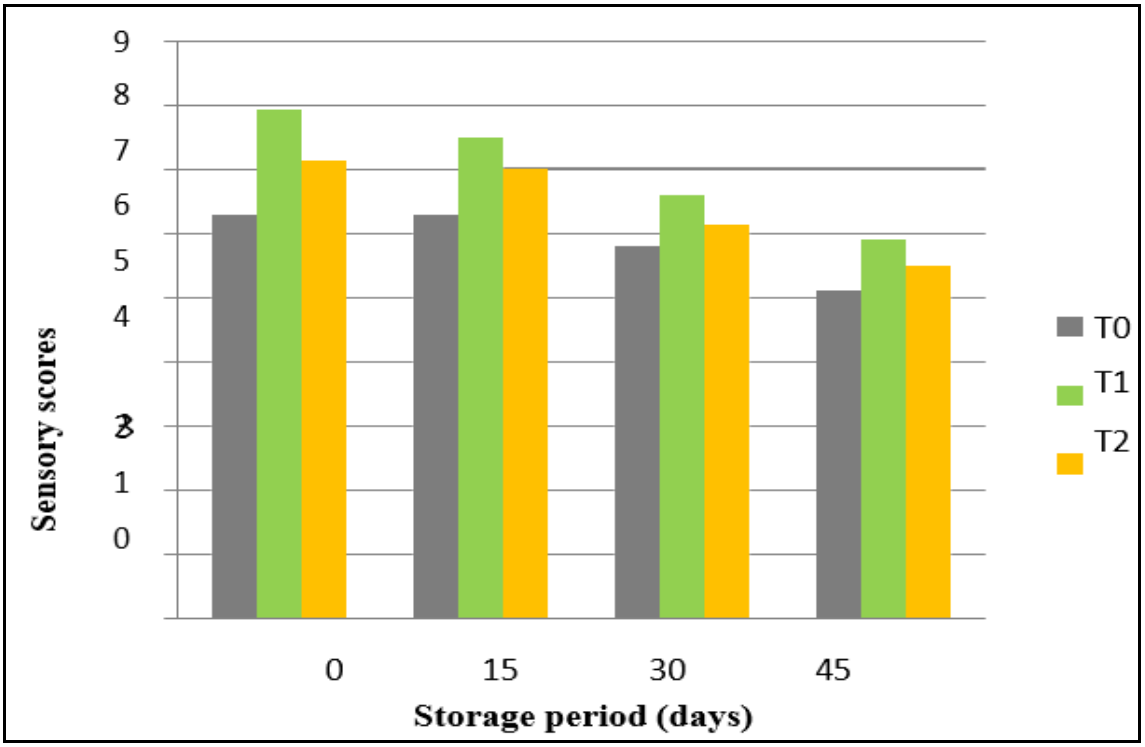

Fig 6: Color changes during storage

The analysis of the variance of taste revealed that there was a significant change in the taste of the *panjiries* when they were stored. Figure 7 shows that the taste of S_1 was more acceptable with a score of 7.03 than S_0 with the score 6.10 and S_2 with the score 6.92, after 45 days.

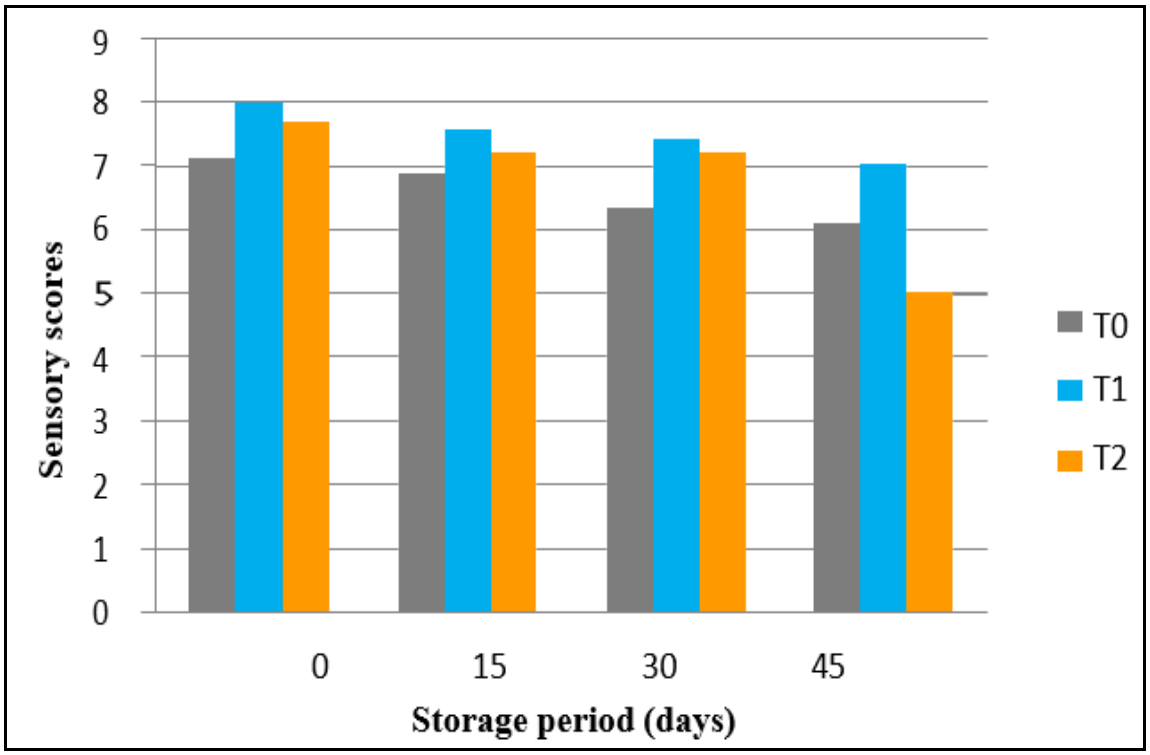

Fig 7: Taste change during storage

The changes in aroma of the samples during storage of 45 days are shown in Figure 8. It is seen that the scores for aroma decreased significantly during storage. S_0 had the lowest scores throughout storage whereas S_2 had the highest scores. After 45 days of storage S_2 had the highest score *i.e.* 6.09 and S_0 had the lowest score *i.e.* 4.31.

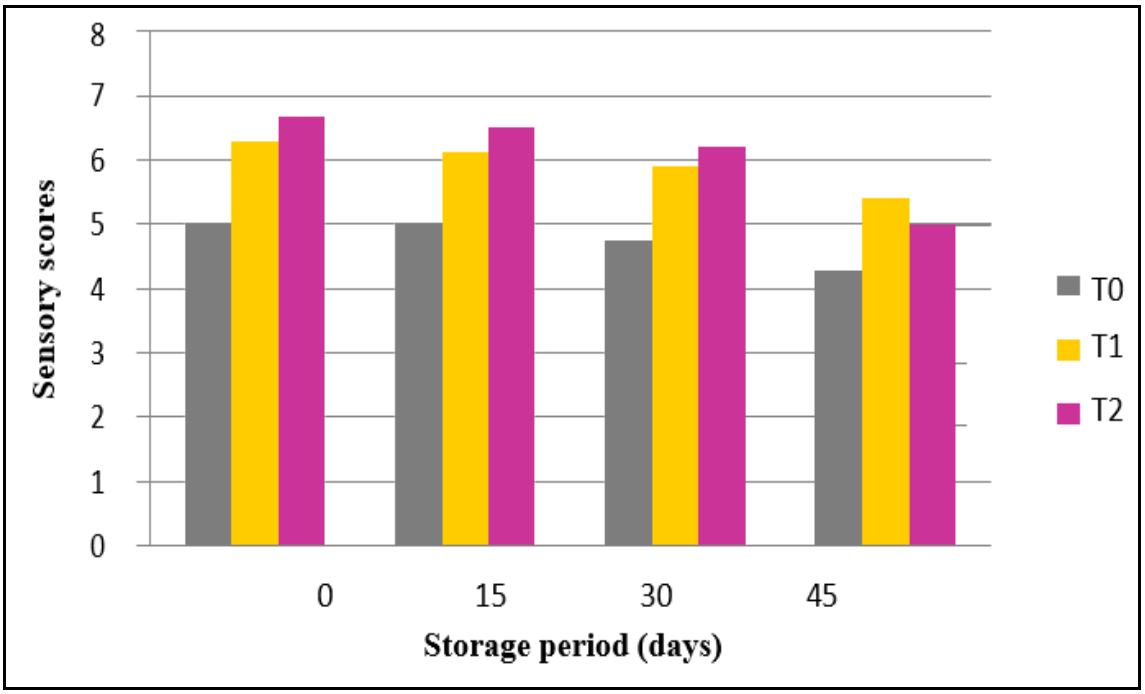

Fig 8: Aroma changes during storage

The results of overall acceptability of all the samples also decreased and are depicted in Figure 9. S_0 was least acceptable after 45 days with the score of 6.83 Whereas S_2 was the most acceptable with the score of 7.84.

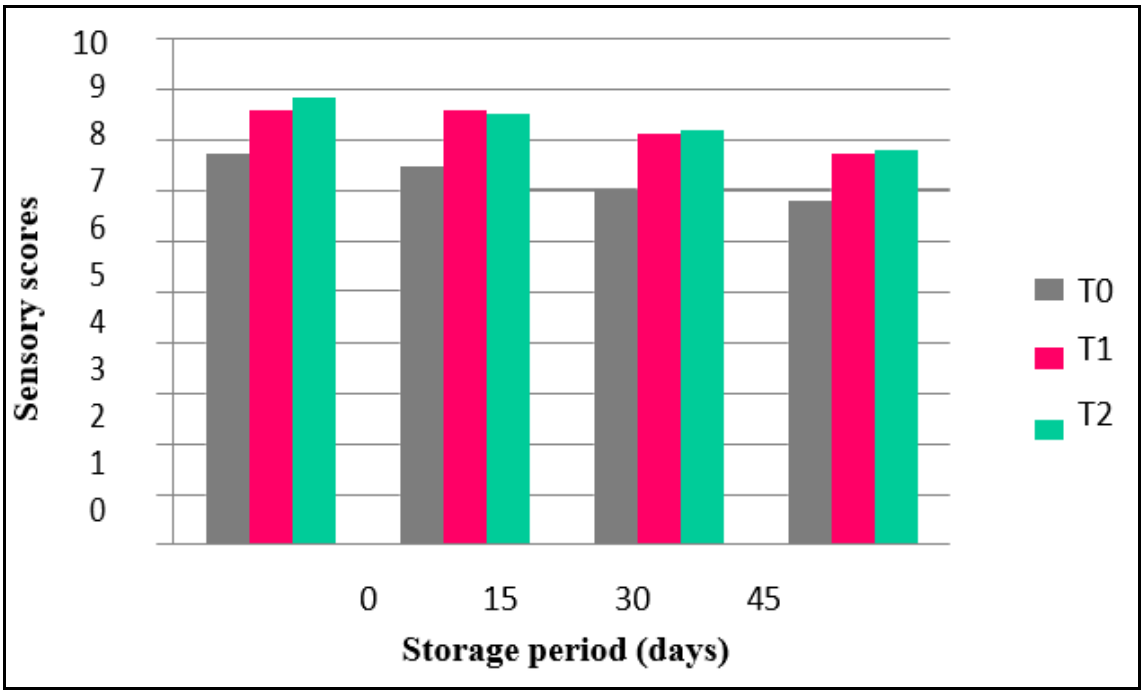

Fig 9: Overall acceptability after storage

Conclusion

It is concluded from the study that the new product so developed, that is the pearl millet substituted *panjiri*, is nutritionally rich. In comparison to the control product, the pearl millet panjiri has higher protein, ash, and fiber content. Therefore the modified panjiri is nutritionally better than the traditional panjiri. The panjiri prepared using both wheat flour and pearl millet flour in 50% composition shows average results that are better and higher than the control sample but low as compared to the panjiri with 100% pearl millet flour. The presence of pearl millet and jaggery in T_1 makes it best nutritionally out of all the three samples that were prepared. The sensory properties of T_2, which is the panjiri with 50% wheat flour and 50% pearl millet flour, were foremost. So, it is observed that T_2 has stronger organoleptic properties than T_0 and T_1. However, sample T_2 is better than T_1 only in terms of appearance, aroma and texture. The peroxide value of T_1 increased significantly during storage as compared to T_0 and T_2. There was also increase in moisture content of all the samples during storage. The moisture content and peroxide values during storage for T_2 were between T_0 and T_1. The sensory attributes of all the *panjiries* also reduced during storage. Hence, it is

concluded that T_1 has a lower shelf life than T_0 and T_2. It is also noted that T_2 has an average shelf life, both in terms of moisture content or peroxide value and sensory characteristics, which is desired and well acceptable.

It is concluded that the nutritional components significantly increased on substitution of wheat flour with pearl millet flour and refined sugar with jaggery powder. The investigation carried out seems to fulfill the nutritional requirements at lower costs. On the basis of the observation it is concluded that the pearl millet flour substituted panjiri could be considered the best from the overall nutritional and sensory point of view. The product is beneficial for the individuals suffering from malnutrition and anemia. It fulfills the basic nutritional demands along with providing an appetizing taste. It is overall acceptable in terms of health benefits for people suffering from malnutrition or anemia. It also proves to be a good and 41 advantageous product for pregnant women and for postpartum healing. It has a shelf life of about 30 days. Hence, the product is said to be good in all terms and it possess good consumer acceptability.

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