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Maximizing Benefit of the Components of Custard Powder from Natural Sources

Nesreen M. El-Said Ali

Food Technology Research Institute, Agricultural Research Center, Giza, Egypt

Abstract: Custard is a mixture of (milk and eggs thickened by heat) which has been a part of European cuisine, that since Ancient Rome. Custards was packed in pastry (custard tarts), they were very popular in the middle centuries but in modern times, the name's custard is sometimes applied to starch-thickened preparations like Custard powder. The custard is known in many varies in their uses from a (thin sauce poured into a thick pastry cream) which have been on used to fill sweets and most common ingredients in custard to make sweets or candy sauces usually is (sugar, vanilla and corn starch). Broken rice is fragments of rice grains, broken in the field, during drying, during transport, or by milling. Mechanical separators are used to separate the broken grains from the whole grains and sort them by size. In this investigate now, was produced based custard powder from natural sources by mixing (millet and broken rice) together as well blending well with both of (vegetables and fruits) juices in particularly (dates/ red beet root/ golden berry/ wholly prickly pear) that is adding nutritional value and color characteristics of natural. Mixing millet and broken rice in ratio (50:50) is a new starch source promising which is suitable for the development of various based custard powder products as well value added and nutricetical colors by natural sources. The obtained results indicated that, a high quality of based custard powder could be manufactured from mixture powder millet, powder broken rice. The palatability of the formulated products was clear to add value to the produce and sensory attributes both of millet powder, broken rice powder the entire enriched products for custard powder as well palatable of the formulated products was added value to the as a novel produce. Organoleptic of both mixture (millet powder and broken rice powder) which had given very good degree for each of (dates, golden berry, wholly prickly pear) based custard powder than control sample. The study indicated that the fruit and vegetable juices were used to mixture for produce final custard as new product, they added to the quality required for cooking custard later, by containing vital compounds of antioxidants and other important nutrients.

Key words: Custard Powder · Products Innovate · Dates · Red Beet Root · Golden Berry · Wholly Prickly Pear · Millet Powder · Broken Rice Powder

INTRODUCTION

Custard is a yellow food made from extraction of grain-bearing plant with some flavouring substants which are added to make a cereal solid food. Custard is majorly an imported food, there is need for diversification by usage of other available food crops for replacement to reduce post-harvest losses and improve nutritional condition. Fruits and vegetables is a good source of calcium, copper, iron, potassium, magnesium and has similar levels of protein [1]. In view of the increasingly produced biofortified cassava roots in Nigeria, it becomes necessary to assess more of its utilization. This work was done to evaluate the nutritive value of custard powder produced from (High quality yellow cassava starch) HQYCS enriched with (Partially defatted soybean flour) PDSF at varying proportions as well proximate composition, carotenoid content, also both of functional and pasting properties of the mixture were determined. Gruel prepared from the mixture were evaluated for consumer the overall palatability using commercial custard as control [2]. Roots and tubers are the third important food crop of mankind after cereals and pulses. Queensland arrowroot (*Canna edulis* L.) is an underutilized tuber grown in many countries for its edible starchy rhizome. Canna starch powder is exceptional for its pure white colour and fine texture and these quality attributes are retained during storage. Ready-touse custard powder was standardized using canna starch and corn flour in different combinations. The overall

Corresponding Author: Nesreen M. El-Said Ali, Food Technology Research Institute, Agricultural Research Center, Giza, Egypt

palatability of custard prepared exclusively with rhizome starch (35%) was found to be 8.69 and was selected as the best combination [3]. Rice is most common cereal, serving as a stable food for approximately half of the global population. Over 2 billion people in Asia alone derive 80% of their energy needs from rice, which contains 80% carbohydrates, 7–8% protein, 3% fat and 3% fiber, which food always been preferred. Therefore, rice is a good candidate for natural sources for antioxidants and other medicinal properties and may hold the potential for the development of rice based functional foods, drugs, food preservative pharmaceuticals and cosmetic products [4]. Broken rice is a by-product from rice milling industry. It is a very good source for carbohydrates but low in fat. It could be used as an important ingredient for manufacture of many low cost and carbohydrates of rice are predominantly starch with small portions of pentosan, hemicelluloses and sugars. Broken rice could be used as an important ingredient for manufacture of many dairy products have low cost, low lactose and low fat. Rice protein has a comparatively high content of essential amino acids with high total digestibility of protein [5]. Broken rice kernel are often ground to flour. The recent increase in demand for rice flour has promoted interest in broken rice kernels [6]. It is enters in gluten free diets. Many gluten-free formulations use rice as a primary ingredient because it is naturally gluten-free. Rice is also increasing in popularity as an ingredient because of its hypoallergenicity [7-9]. Millet is one of the four most important cereals (rice, maize, sorghum and millets) grown in tropical semi-arid regions of the world primarily in Africa and Asia. Millet is rich in several nutrients as well as non-nutrients such as phenols. It has high energy, has less starch, high fiber (1.2g/100g, most of which is insoluble), 8-15 times greater á-amylase activity as compared to wheat, has low glycemic index (55) and is gluten free. The protein content ranges from (8 to 19%) and it is low in lysine, tryptophan, threonine and amino acids containing sulfur. The energy of millet is greater than sorghum and nearly equal to that of brown rice because the lipid content is generally higher (3 to 6%). Pearl millet can be recommended in the treatment of celiac diseases, constipation and several non-communicable diseases [10].Vegetables and fruits are indispensable for equilibrated diets since they contribute a crucial source of nutraceuticals in daily human life. The nutraceuticals are the substances found as a natural component of foods or other ingestible forms that have been determined to be beneficial to the human body in preventing or treating by improving physiological performance beyond adequate nutritional affects in a way that is relevant to either improved stage of health and well-being and reduction of risk of disease. Those components could be beneficial antioxidants, natural colorants (e.g. carotenoids), minerals, vitamins which often have added advantages. The promotion of healthy vegetable products has coincided with a surging consumer interested in the healthy functionality of food [11, 12].

Thus, the aim of this study, is to make custard in a new product formula by completely replacement corn starch with ratio (50% millet: 50% broken rice) as well using natural sources of colors (fruits / vegetable) juices, which could be a good diets in reduction of protein energy malnutrition in the developing countries later and can also increase varieties food and not just be used for dessert.

MATERIAL AND METHODS

Materials: All of the raw materials used in these experiments purchased from Giza market as fresh for both of vegetable and fruit in (summer /winter) season (2018) which included: red beet-roots (*Beta vulgarisrubra*), golden berry (*Physalisperuviana*), wholly prickly pear [*Opuntia ficus indica* (L.) Mill], by the way; (the origin of its thorns were removed by using a knife) and semi dry grade dates second class. Commercial custard (corn starch), for comparison, also [broken rice and millet pearl millet –Bajra (Pennisetum glaucum)] were purchased from the local market in Giza, (Egypt), for the manufacture of the similar innovator custard.

Methods

Preparation of Each Natural Extracts: Red beet- roots, golden berry, wholly prickly pear and dates, were washed with tap water and squeeze. All these extracts were filtered; golden berry and semi dry dates [(5 pieces) in cup of water], both separately, was mixed by hand blender to squeeze and the other form for wholly prickly pear was prepared with mixer. Also, the other form for red beet-roots was prepared in juice by carrot juicer.

Blending to Prepare Based Custard Powder: Broken rice and millet were blended by ratio (50%:50%), then were added where each of filtered extracts (fruits/ vegetable) by percent (150%) to previously blend powder and were mixed to gather well. It was left to absorb extracts completely for (30mins) approximately. It was put in fan's oven at 65°C followed by to 55°C, with stirring well, then reducing to 50°C and was left it overnight. Then it was

crushed with the help of a domestic blender and then sieved to obtain the four. The blends and ingredients used for production of based custard powder were processed. Finally, it was packed in a sealed glass container and stored in good place until the analyses were carried out.

Physical Parameters and Chemical Composition of Custard: General chemical analyses of samples was performed according to the method described in AOAC [13]. Moisture content, crude fat, crude fiber, ash, pH, total sugar and reducing sugars contents, crude protein as (total nitrogen content ×6.25) and total soluble solids were determined.

Antioxidant Activity 2, 2Diphenyl -1-1-picrylhydrazyl (DPPH) %: Anti-oxidant activity was determined by (DPPH) method according to the method described by Brands-Williams, *et al*. [14].

Non- Enzymatic Browning test [Color index at 420nm)]: The increases in absorbance of a sample extract at (440 nm) is taken as a measure of non-enzymatic browning, the color also was measured at 420nm. Extract of (4-5) gram sample with 100ml of 60% alcohol for 12 hr. and filter. For sample containing chlorophyll, shake the alcoholic extract with three lots of (50 ml) benzene. If the filtrate is not clear, will be re-filtered using filter aid. The color was measured at (440nm) using (60%) aqueous alcohol as blank, according to Ranganna [15].

Cooking Quality of Processed Custard: The cooking quality of the products based custard powder was increased both of weight and volume as well (time collects and density) upon cooking and evaluated according to the method described by Walsh and Gilles [16] as follows;

Five grams of each product based custard powder sample were cooked in (50ml) of boiling full cream milk. After cooking [control starch (6mins), red beet root (8min), golden berry (9mins), wholly prickly pear(16mins) and dates (19mins) respectively., . the samples were drained and weight. The weighted increase percentage was calculated as following:

$$\text{Weight Increases\%} = \frac{\text{Weight of cooked sample} - \text{Weight of uncooked sample}}{\text{Weight of uncooked sample}} \times 100$$

The increases in volume of product based custard powder samples after cooking which was determined by measuring cylinder and the percentage of volume increase (swelling %) was calculated as follows:

$$\text{Volume Increases\%} = \frac{\text{Volume of cooked sample} - \text{Weight of uncooked sample}}{\text{Volume of uncooked sample}} \times 100$$

Sensory Evaluations of Custard Product: For the sensory evaluation a simple hedonic scale with a small number of points (from 1 to 10) was used in order to evaluate the first impression. The quality attributes (color, taste, flavor, texture, appearance and overall palatability of the samples of based custard powder compared to custard corn starch (control) were tested. Using suggested scale was evaluated for their sensory characteristics by ten volunteers from the staff of the Processing Crops, Research Dep., Agric. Res. Center, Giza. Palatability is giving numerical scores to each of their attributes from 10 volunteers. The product was organoleptically judged by groups of (10) panel volunteers. The quality was scored on a scale (1 to 10). The following scale was applied to all samples for color, taste, flavor, Texture, Appearance and overall palatability as follows:

Excellent= (10), Very good= (8-9), Palatable = (6-7) and Unpalatable. = (0-5). These proportion were scored on a scale from 1-10 according to Watts, *et al*. [17].

Statistical Analysis: The obtained data were statistically analyzed by Analysis of Variance method using General Liner Model (GLM) procedure according to Sendecor and Cochran [18]. Means were obtained using Duncan's test at a degree of significance ($P \leq 0.05$). Statistical analyses were made using the procedure of the SAS software system program SAS [19].Statistical Analysis System. User's Guide: Statistics, SAS Institute Inc, Gary, Nc., USA.

RESULTS AND DISCUSSION

Custard is a yellow food made from flour grain with some flavoring added to make a based custard powder as food and is an imported food. To develop the custard powder industry using natural source raw materials such as blended (millet and broken rice) and had been mixed together with (fruits/vegetable) juices especially (dates/ red beet root/ golden berry/ wholly prickly pear). This process gives an added value represented by nutritional value and color characteristics and had good antioxidants activity which represented in (fruits/ vegetable) juices to produce based custard powder. Utilization of locally available millet and broken rice are improve based custard powder product as a good source of calcium, iron, potassium and magnesium has similar levels of protein as many other crops [20].

From the result in Table (1), moisture content of based custard powder samples was ranged between (9.38 to 6.68%) including control sample. There were no significant differences at $p \leq 0.05$., among samples compared to control custard powder. The control custard sample in powder case was (9.38%) had the highest compared to others samples, but in cooked case was (45.72%) had the lowest compered to others samples. On the other hand, the custard of all samples in cooked case were the highest value and also it could be observed that, there are no significant differences at $p \leq 0.05$., whenever the custard in powder case has low moisture content, this is enhance its storage stability might be due to voiding mould growth and other biochemical reactions.

Total soluble content of cooked custard samples were significant differences at $p \leq 0.05$., except the control sample which was the highest one (54.28%).

Total soluble solids were the highest one in dates based custard sample in cooked case (45.0%). This is because dates contain more sugar than the others, as well the least one was golden berry custard in cooked case with had (25.0%), but other values were similarity including the control in the same case.

The based custard powder of all samples had crude fibers content, was around (2.0%) except the control sample which was the lowest value as the data obtained by Felipe *et al.* [21]. In spite of the main constituents of the crude fibers are composed of cellulose and lignin are parts of (fruits / vegetable) for all based custard powder samples. The samples custard were very low fibers content, so the based custard powder samples are not classified as a fibers source food, since it had a fibers content extremely more little than (3.0%).

The fat content of based custard powder had high values and was ranged between (9.58% to 13.29%) including control. These are not being within the standards established by Agencia and Ancia [22], it should present a total fat level up to (6 g/100 g) in the laboration of any food products. Since the fat determination represents the amount of fat present in the food, if it value in fat content for any product was high, it could be lead to rapid spoiled process for the product. Consequently, this oxidative alters the organoleptic properties and nutritional value, transforming the food into a carcinogenic product due to the formation of free radicals [23].

Ash content of the food product refers to the inorganic residue remaining after the burning of organic matter. From the obtained results showed in Table (3), all samples had low ash content, where they were ranged between (2.25 % to 1.25%) except control sample was the lowest. Minerals content of ash was determined in all samples is not related to ash content as expect, where maybe due to constitute of based custard powder, that they had associated with the minerals presence in their constitutes compared to the control This is evidence that they had preserved after the dehydration process, showing that the preparation of powder from fruits and vegetables is rich in minerals required for human consumption.

The protein content (N×6.25) of base custard powder was around (10% to 15%) which higher than that established by ANVISA [22]. This powder adequate for incorporation into food formulations for the purpose of protein enrichment.

The soluble sugars content was studied and the results are given in Table (1). The obtained result were indicated that, their value were ranged from (16.26% to 3.20%) including control and because of dates treated sample contain more sugar (16.26%) which are good source for energy for the body as well red beet root was (3.20%) had the lowest one. Reducing sugars were more than non-reducing sugars where these decreases for non-reducing sugars may be to convert by action of acids in all treated based custard powder samples [24].

Colors index results were explained that, all treated custard powder samples had low values (0.134 to 0.373 nm) except control which was (2.273nm) of color index at (420nm) and there are no significant different among treated samples at $p \leq 0.05$., which indicates that, light absorption had occurred by treated custard powder samples on the contrary the control, because it is corn starch compound [25].

Plant pigments as well as other phytochemicals in grains have lately been attributed to positive nutritional properties, such as prevention of cardiovascular diseases and cancer. In this context, the samples based custard powder antioxidantive activity were investigated. The results presented in Table (2) of antioxidantive activity of the samples including based custard powder control were ranged between (93.82% to 72.81%). The based custard powder dates sample which was the lowest [26]. In this way, based custard powder samples present a significant amount of antioxidantive activity being able to act as natural antioxidants capable of reducing degenerative diseases such as arteriosclerosis, cardiovascular disease and cancer [27]. The preset study can guide in using (fruits / vegetable) juice which was found to provide the most desirable quality for based custard powder cooking later in terms of physical quality, sensory properties with enhanced antioxidant compounds [28].

Table 1: Chemical Composition of Processed based Custard in Case (Powder/ Cooked) on (dry weight basis)

	Parameters											
	Moisture Content (%)		Total Soluble (TS)	Total Soluble Solids (TSS)	Fibers (%)	Crude fat.		Protein. (%)	Total Sugars (%)	Reducing Sugars.	Non- Reducing
Samples	Powder	Cooking	Cooked.	Cooked.	Powder	Powder. (%)	Ash (%)	powder	powder	(%) powder	Sugars (%)
**Control – Starch	9.38^{a}	45.72^{b}	54.28^{a}	30^{b}	0.18^{b}	13.28^{a}	0.47^{c}	12.95^{c}	6.39^{bc}	5.73^{b}	0.21^{d}
***Red Beet Root -Custard	6.68^{d}	53.73^{a}	46.27^{d}	30^{b}	1.52^{a}	13.29^{a}	2.25^{a}	13.63^{b}	3.20^{c}	2.99^{c}	0.21^{d}
***Golden Berry –Custard	7.57^{c}	51.42^{a}	48.58^{b}	25^{c}	1.55^{a}	11.84^{b}	1.70^{b}	14.65^{a}	8.35^{b}	3.57^{c}	4.78^{a}
***Wholly Prickly Pear-Custard	8.16^{b}	52.46^{a}	47.54^{c}	30^{b}	1.58^{a}	11.48^{b}	1.25^{b}	9.72^{d}	9.92^{b}	6.10^{b}	3.82^{b}
***Dates - Custard	7.62^{c}	50.87^{a}	49.13^{b}	45^{a}	1.59^{a}	9.58^{c}	1.32 ^{b}	13.54^{b}	16.26^{a}	13.64^{a}	2.62^{c}

Means followed by different letters in the same column are significant differences at $p \leq 0.05$.

**Commercial Custard Powder (Starch)

***Red Beet Root, Golden Berry, Wholly Prickly Pear, Dates – (Treated Custard Powder) / ***Based Custard Powder (Millet 50% / Broken Rice 50%).

Table 2: Product characteristics of Colors Index / Total Antioxidants Activity (in powder case) and pH values (in cooked case) of Processed based Custard Powder on (dry weight basis)

Parameters Samples	Colors Index (420nm).	Antioxidantive Activity. (DPPH %).	pH cooked
**Control - Starch	2.273^{a}	88.55^{b}	6.97^{a}
Red Beet Root - Custard	0.373^{b}	93.82^{a}	7.00^{a}
Golden Berry - Custard	0.134^{b}	90.14^{a}	6.41^{c}
Wholly Prickly Pear - Custard	0.163^{b}	92.43^{a}	6.81^{b}
Dates - Custard	0.216^{b}	72.81^{c}	6.84^{b}

Means followed by different letters in the same column are significant differences at $p \leq 0.05$.

The pH value of custard in cooked case was indicated that, the samples (wholly prickly pear / dates) was the moderate values followed by the (red beet root / control) which was high value (7.0 -6.97), respectively, while golden berry sample was the lowest value (6.41). Starches make for a smoother texture and thicker mouth feel for custard, through affected by the value of pH, if the mixture pH is 9 or higher, the gel is too hard; if it is below 5, the gel structure has difficulty forming because protonation prevents the formation of covalent bonds. So the mean value must be moderate of pH [29]. Finally, it could be clearly concluded that, it is available technical inverse relationship among the values of pH and the affectivity of total antioxidants activity as well the degree of color stability of the custard product.

The obtained results for mineral composition Table (3) were quite significant differences at $p \leq 0.05$., with emphasis on Fe, Mn, Zn, Ca and Mg, serving more than (20%) of the daily nutrient intake index [30]. One of the most important minerals in the human diet, which prevents the incidence of anemia, is iron. Knowledge of the mineral composition of food products is fundamental to achieve food and nutritional security.

The Reference-Daily-Intake, FDI, [31] of iron for children $\geq$ 4 years old and adults of both sexes ranges from (18mg/kg). The several of based custard powder samples including the control had a content iron's values were (9.22 to 38.43) mg/kg. The incorporation of (fruits /vegetable) juices which had in this based custard powder making it available alternative for iron supplementation, given that this nutrient is the most common nutritional deficiency in developing countries, where Reference-Daily-Intake(RDI) for individual (18mg/kg).

Zinc (Zn); are essential micronutrients for humans and vital components of various enzymes responsible for cellular metabolism [32]. According to the results, Zn content in the based custard powder (red beet root) was (21.89mg/kg) and higher than other samples following by wholly prickly pear custard powder was (19.56mg/kg) compared to control was (2.42mg/kg), where reference-daily-intakes (RDI), of an individual is (11mg/kg).

Manganese (Mn); plays an important role in the development of bones and cartilage, as well as in the healing of wounds and constituents of various enzymes [33]. The based custard powder of all samples including the control were ranged between (13-22mg/kg), they could be covered the daily-intakes where reference-daily-intakes (RDI), of an individual is (2.3mg/kg). It could be demonstrated their potential utilized in food formulations [34, 35].

Phosphorus (P); is a mineral present in all cells of the human body playing important role in protein synthesis, growth maintenance and repair of cells and tissues. Golden berry based custard powder its value was (1689.53 mg/kg) which had the highest following by wholly prickly pear and red beet root as well dates based custard powder were (1645.74, 1605.55 and 1551.81 mg/kg) compared to control. They could be covered the daily-intakes where reference-daily-intakes (RDI), of an individual is (1.250mg/kg). The values of minerals found

make the incorporation as nutrient supplementation in food products promising, which are generally deficient in minerals essential for human nutrition [27].

Magnesium (Mg); is the essential intracellular cation for the physiological metabolism of the human body, because it intervenes to regulate the activity of more than 300 enzymatic reactions. Reference-daily-intakes (RDI) of an individual is (420mg/kg). All samples were the highest values, where they could be covered the daily-intakes compared to control which was the lowest.

Calcium (Ca); is one of the main minerals present. Golden berry based custard powder was (304.45mg/kg) contributing with 18.99% of the nutritional recommendation. The amount of calcium was found relatively low in the other samples compared to control except dates custard powder was the lowest (69.29mg/kg). Reference-daily-intakes (RDI) of an individual is (1.300mg/kg), where they could not be covered those daily-intakes.

Potassium (K); Reference-daily-intakes (RDI) of an individual is (4.700 mg/kg). Samples of based custard powdered (wholly prickly pear and golden berry) were (1393.81 and 1195.69mg/kg) respectively, contributing approximately with (10.5%) of the nutritional recommendation (RDI, 31)., compared to control which was (8964.34mg/kg).This mineral is very important for the human body, acts as the main enzymatic cofactor maintaining the acid-base balance of the human body, playing an essential role in the functioning of nerves and muscles and reducing the risk of stroke and coronary heart disease [36].

From the obtained results it could be observed that, Na mineral; was a high in both samples of based custard powder (red beet root) was (3487.36ppm) compared to control which was (2354.18ppm) while the others there are no significant differences at $p \leq 0.05$.,. Reference-daily-intakes (RDI) of an individual is (2.300 mg/kg).

The study conducted on based custard powder indicated that, the addition to gather (millet / broken rice) powder and mixing by (fruits/ vegetable) juices combination acted as thickeners and were effective in bringing the desired consistency which be added to the based custard powder when they were cooked [3]. The results presented in Table (4) show that some based custard samples in cooked case had given the highest in weight increase percentage. based custard (red beet root) which was (112%) had lower than the control (140%), on the contrary case, in volume cooking decrease percentage of the based custard control was the lower (0.04%) than based custard (red beet root) that was (0.20%) as well the other samples. Ratio loss in moisture content it could be concluded that, based custard cooked (red beet root) was the highest about nearly (700%) value following by (golden berry) was (641.74%) compared to control and the other samples.

The mean sensory scores of the custard cooked varieties are presented in Table (5). It was observed that, (wholly prickly pear, dates and golden berry) custard cooked samples were the most preferable acceptability than other samples including the control, while the lowest overall palatability was (red beet root) custard cooked than other. Although, sensory characteristics of cooked

Table 3: Main Minerals (mg/kg) Ash and (mg/100g) contents in Processed based Custard Powder on (dry weight basis)

	Main Minerals (mg/kg)							
Items	Fe	Mn	Ca	Mg	Na	K	Zn	P
*RDI.	18	2.3	1.300	420	2.300	4.700	11	1.250
**Control - Starch.	9.22^{b}	15.59^{ab}	509.49^{a}	80.82^{b}	2354.18^{a}	8964.34^{a}	2.42^{b}	113.54^{b}
Red Beet Root - Custard.	33.45^{a}	22.51^{a}	241.16^{b}	570.90^{a}	3487.36^{a}	748.68^{c}	21.89^{a}	1605.55^{a}
Golden Berry - Custard.	38.43^{a}	16.34^{ab}	304.45^{b}	505.34^{a}	320.09^{b}	1195.6.9^{b}	18.87^{a}	1689.53^{a}
Wholly Prickly Pear- Custard.	30.09^{a}	17.20^{ab}	237.53^{b}	549.44^{a}	189.38^{b}	1393.81^{b}	19.56^{a}	1645.74^{a}
Dates - Custard.	28.51^{a}	13.73^{b}	69.29^{c}	507.49^{a}	278.19^{b}	874.95^{c}	17.69^{a}	1551.81^{a}

Means followed by different letters in the same column are significant differences at $p \leq 0.05$.

* Reference-Daily-Intake (RDI) (mg/kg) for Adults / Children ≥4 Years, (www.fda.gov/nutritioneducation)

Table 4: Cooking Properties of Processed based Custard in Case Cooked

	Parameters				
Samples	Custard Thickness or (Gelatinization)/Bulk Density Time	Weight Increase (%) Bulk Density	Custard Collects or (Connectivity) Time	Volume Cooking decrease (%)	Ratio Loss in Moisture Content (%)
*Control -Starch	6min.^{e}	140^{a}	2min.^{d}	0.04^{d}	289.45^{d}
Red Beet Root – Custard	8min^{d}	112^{b}	6min.^{b}	0.20^{b}	693.60^{a}
Golden Berry- Custard	9min.^{c}	104^{b}	5min.^{c}	0.12^{c}	641.74^{a}
Wholly Prickly Pear – Custard	16min^{b}	84^{c}	10min.^{a}	0.44^{a}	582.60^{b}
Dates - Custard	19min^{a}	84^{c}	6min.^{b}	0.28^{b}	478.63^{c}

Means followed by different letters in the same column are significant differences at $p \geq 0.05$

Table 5: Sensory Evaluation of Processed based Custard in Case Cooked

Samples	Appearance (10)	Color (10)	Flavor (10)	Texture (10)	Taste (10)	Score (50)	Overall Palatability
Control – Starch	8.8^{a}	8.5^{b}	8.8^{a}	8.3^{bc}	8.6^{ab}	43.0^{a}	G
Red Beet Root- Custard	7.9^{c}	7.8^{c}	7.7^{b}	8.1^{c}	7.9^{b}	39.4^{b}	G
Golden Berry- Custard	8.3^{b}	8.5^{b}	8.8^{a}	8.7^{ab}	8.9^{a}	43.2^{a}	V
Wholly Prickly Pear- Custard	8.4^{ab}	8.8^{ab}	9.1^{a}	9.1^{a}	9.2^{a}	44.6^{a}	V
Dates- Custard.	8.5^{ab}	9.1^{a}	8.8^{a}	8.4^{bc}	8.7^{ab}	43.5^{a}	V

Means followed by different letters in the same column are significant differences at $p \leq 0.05$

custard samples including (appearance, texture, taste, color, flavor and overall palatability) were highly significant among them and there were significantly differences at $p \leq 0.05$. [29]. Thus, this observation suggests that, it could be use of (wholly prickly pear, dates and golden berry) as natural fruit juices where they were mixed with (millet / broken rice) custard powder which is based custard powder later it could be useful in food formulations as well may be desirable for making custard powder as new products. Color was enrich without artificial color that was added; hence it was keep samples colour as it is and average score was (43). The overall palatability of custard prepared exclusively with (corn starch) was found to be good. The mean scores of treated custard powder with (millet / broken rice) powder which had been saturated with (fruits/ vegetable) juices were found to be very good.

CONCLUSION AND RECOMMENDATION

There is an increasing interest in Gluten-Free (GF) products which of the prevalence of celiac disease. Sorghum, millet and rice flours are the most suitable cereal flours for GF products. Composite flours made by using millet grain can be used for preparation of various nutrient dense recipes which can be effectively used for supplementary feeding programs. Millet grains and its products such as bread flour are a good choice for people with a wheat allergy. The study concluded that based custard powder (millet with cracked rice) mixture by mixing (golden berry/ wholly prickly pear/dates and red beet root) juices as natural sources which have score between (43.2%) to (44.6%) resulted that, in most acceptable and rank between like very much to like extremely. This new product will help food industries to enrich the production of commercial custard with enhanced health beneficial properties and increased consumer acceptance. The novel product is homogeneous softness and flowing, not clumpy, homogeneous color according to its color, free from foreign odors and when cooked gives a cohesive texture like commercial starch custard.

Finally, it could be clearly concluded through this study, that it is available, technical and economic to produce custard from based custard powder (millet with broken rice) mixture by mixing (golden berry/ wholly prickly pear /dates and red beet root) juices. This product was palatable among the majority of consumers.

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