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Kheer: Traditional food for good health: A review

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Abstract

Kheer is one of the simple traditional food, which fits in every situation and common between all community of people. Conventionally this is prepared by cooking rice with sugar or jaggery in milk till the moment that rice starch gets gelatinized. Changes in food propensities and way of life of individuals additionally demands for the nutritive rich food, with lesser preparation time and economically affordable price. To satisfy this condition different strategies were adopted like use of different base product, use of milk from different sources, different processing techniques and development of 'Ready to eat' or 'Ready to serve food' sources and ready mixes, which are acquiring prevalence now a days. Along with large scale production and changed base products, consumer acceptance and cost of production of these modified product is also considered. RSM (Response surface methodology) and central composite design (CCD) are commonly used to check the consumer acceptability and advancement of moment kheer blend.

Keywords: Traditional food, kheer, nutritional, cereals, pulses, instant kheer mix, economical

Introduction

India ranks first in milk production, accounting for 18.5% of world production, achieving annual output about 187.7 million tones during 2018-2019 (Alok *et al.*, 2010) [2]. The per capita availability of milk in India has increased from 176grams per day in 1990-91 to 394grams per day by 2018-19 (Bhosale *et al.*, 2020) [5]. With this increase in the production, utilization of this resource changes from simple form to complex form of products. Out of total food products prepared from the milk around 50 to 55% of milk delivered in India is changed over into different conventional milk items including various dairy deserts. Among these 'Kheer' is the very popular, traditional and a simple desert, which suits for any kind festivals (Gupta *et al.*, 2014) [10] and appreciated by all segments of the general public due to its great taste, higher nutrients and tangible properties, from the antiquated time.

Kheer can be defined as a semi solid cereal based dairy desert get ready by cooking rice with sugar or jaggery in milk till the moment that rice starch gets gelatinized. (Jha *et al.*, 2015) [12]. It is many times decorated with raisins, cashew nuts, pistachios or almonds and sometimes flavored with cardamom, saffron and so forth. (Borad *et al.*, 2017) [6].

Kheer has the situation with regal treat. No dining experience is viewed as complete without kheer. Hindu folklore alludes to kheer as the heavenly nectar, "Amrit" and gives it a position of conspicuousness among food as the mystery of everlasting status (immortality) – 'the life giving food'. The Hindu word Kheer is gotten from the Sanskrit 'ksheer' for milk and 'kshirika' for any dish arranged with milk. Kheer is known by various names, in various parts of the country, for example, 'kheer' in North Western area, 'payasam' in Southern locale, 'payas' in Eastern district, 'phirni' in Northern area, 'kheech' in Mewar locale and 'payesh' in Bengal. (Aneja *et al.*, 2002) [3]

History also tells about the journey of this traditional food. An improved dish of rice cooked in milk first discovers notice as 'payasa' in Buddhist-Jain writing in 400B.C. Payasam is milk based delicacy also well known in the southern parts of India. It looks like Kheer of North India and has comparative formal undertones. Kheer from jowar is referenced in the fourteenth century 'Padmavat' of Gujarat. Today, different oats and grain items (vermicelli, sevlan, Phirni) are likewise utilized in kheer preparation. (Barela & Shelke, 2017) [4].

Tragically, with just like the case with other native milk items, solid endeavors have been deficient in building up a huge scope creation cycle of production. Uses of science and innovation inside the food framework have permitted creation of nourishments in satisfactory amounts to address the issues of the general public as it has developed. (Gupta *et al.*, 2014) [10].

Kheer is traditionally made at homegrown and cottage scale with an unadulterated innovation base. Therefore, it has less keeping quality for 2-3 days considerably under refrigeration. Regular Kheer is sold in the nearby market with no obvious packaging. Despite the fact that regularly, implication of Kheer implies a milk-rice based item a few varieties in Kheer incorporates items dependent on wheat (Dalia), semolina, pearl millet, makhana, and so forth, A prepared kheer blend would beat the issue of keeping quality as well as increase the value of the item via giving convenience (Venugopal 2005) [24]. Items advanced with the wellbeing credits of practical fixings would be protected and seen as likely novel food sources for wellbeing advancements in next couple of years. (Chatterjee *et al.*, 2010)

Changes in food propensities and way of life of individuals additionally demands for the nutritive rich food, with lesser preparation time and economically affordable price. Which can be convinced by developing 'Ready to eat' or 'Ready to serve food' sources and ready mixes for various food items, which are acquiring prevalence now a days. (Kadam *et al.*, 2011) [13].

Now the concept of kheer is changed from rice based kheer to few strategy for kheer arrangement by utilizing different based items, for example, Pulse based kheer (Bengal gram kheer, Green gram kheer), Cereal based kheer (Rice kheer, Pal kheer, Wheat kheer, Rice suji Kheer, Gogdi kheer, Avalakki kheer), Tuber crop based kheer (Sabakki kheer, Kaddu ki kheer, Movina kheer), Fruit based kheer (Mango kheer, Jackfruit kheer), Seed based kheer (Poppy seed kheer). (Unnikrishnan *et al.*, 2000) [22] with the concern of improving the nutritional quality of the food.

One of the new methods being utilized for this advancement of ideal food items to improve their nutritive quality is measure streamlining. RSM (Response surface methodology) has been utilized to create and streamline the handling boundaries of a few prepared to-eat and prepared to-reconstitute items with high nutritive quality. (Gupta *et al.*, 2014) [10].

Cereal Based Kheer

(Chavhan *et al.*, 2019) [8] The examination work named "Usage of khamang rice (*Oryza sativa*) for the readiness of kheer" was done in which Milk was normalized to 4 percent fat and the kheer arranged with expansion of khamang rice at 1.5% (T₁), 2% (T₂), 2.5%, (T₃) and 3% (T₄) percent by weight of milk. It is surmised that unrivaled quality kheer can be set up by expansion of 3% of khamang rice. Complete solids, protein and debris level of kheer were expanded with increment in the degree of khamang rice and fat and dampness rate were diminished with increment in the degree of khamang rice.

(Kadam *et al.*, 2011) [13]. The examination was embraced so as to build up an appropriate detailing of kheer prepared blend utilizing ground Basmati rice of uniform grain size, powdered pure sweetener and entire milk powder (WMP) in various extents. Kheer prepared blend detailing containing 25% rice and equivalent extents of sugar and WMP i.e. 37.5 percent of each delivered the alluring quality kheer in regard of colour and appearance, consistency, flavor and large agreeableness. Simmering of rice and utilization of saffron tone didn't show any critical impact on the tactile credits of kheer.

(Mukhekar *et al.*, 2019) [17]. Treatment blends were utilized (T₀) 5% of bubbled Basmati rice powder, Govindbhog rice powder 3.5% (T₁), 4% (T₂) and 4.5% (T₃) with consistent 8%

sugar level. Treatment T₁ (3.5 percent rice powder) in cow milk was liked by the adjudicators than the control test taking everything into account. The mean score for body and surface of kheer for treatment T₁ was most elevated (8.50) than others. It is closed from the current investigations that, the great nature of Kheer can be set up by utilizing 3.5 percent Govindbhog rice powder with 8% sugar.

(Solanki *et al.*, 2018) [21] Research on Finger Millet Kheer shows that with the increase in the level of finger millet incorporation is directly proportional to the increased protein and carbohydrate content, but the acceptability of the kheer decreases. Cost of production increases with increase in level of incorporation of finger millet powder in a kheer.

(Bunkar *et al.*, 2014) [7] The target of this examination was to upgrade the way toward assembling moment kheer blend dependent on pearl millet rather than rice. Dairy whitener, pearl millet and powdered sugar were the reactions concentrated by utilizing the 3-factor Central Composite Rotatable Design. The definition with 15 g sugar, 30 g dairy whitener and 20 g pearl millet was discovered reasonable for getting dry kheer blend. General arrangement and reconstitutability of the blend Pearl millet dry kheer blend could be reconstituted into kheer in only 5 min when contrasted with 40-45 min for making regular rice-based kheer (Jha *et al.* 2002) [12]. Nonetheless, reconstituted item didn't break down well at 25, 50 and 75 ° C and powder bumps were coasting on a superficial level. Reconstitution in the proportion of 1:2, 1:3 and 1:4 yielded an item with inadmissible consistency. Item with 1:6 proportion of reconstitution was thick and goeoy.

(Kaur & Patel, 2017) [15] were worked on the preparation of DFFK with reduced fat was prepared by developing liquid/cream phase and particulate phase separately and at the end these two phases were mixed. In order to get a high dietary fiber and structural consistency of a kheer, pure oat fiber (6.6 percent by weight), psyllium husk (5 percent by weight), MCC (15.4 percent by weight), and Inulin (73.0 percent by weight), were blended in liquid/cream phase. Interestingly they were noted that this innovative approach results in 38.71% reduced fat with 3.31g of dietary fiber/100 kcal.

(Kashyap *et al.*, 2018) [14]. Conducted a research on some physical attributes like bulk density, particle density, porosity and cooking time kodo based and kutki based kheer mixes. Increased the millet grit in kheer mix decrease the particle density and porosity % of kheer mix. The preparation time for kheer increased with increases the level of millet grit in mixes, it indicated that the % of incorporation of grit directly proportional to the time required for the preparation.

(M. Singh *et al.*, 2017) [19] studied the modification process for commercial production of rice kheer. The present study was aimed at using unit operation based equipment in integrated manner for commercial production of kheer with quality comparable to traditional product. Scraped surface heat exchanger (SSHE) was used for intensive heat treatment necessary for rapid concentration thus exploiting its high heat transfer characteristics and conical process vat (CPV) was employed for imparting desirable texture and flavor at low temperature heating for starch gelatinization. Trials for kheer production were conducted at different process parameter i.e. initial concentration of milk in SSHE (20%, 24%, 28%) and conical vat steam pressure (1.5, 2.0, 2.5 kg/cm²). The effect of process parameters was studied on different responses viz acidity %, viscosity of milk serum, hardness of cooked rice

grains, sensory attribute and processing time. The results showed that process parameters had no effect on acidity. The lower hardness (2.82 – 5.15N) of cooked rice indicated proper cooking of rice. Kheer prepared from concentrating milk upto 24% TS in SSHE and processed in CPV at 2kg/cm² was found best with maximum overall acceptability score. Production time of kheer can be reduced from 63min in conventional system to 33.5 min in mechanized inline system.

Fruit Based Kheer

(Adil *et al.*, 2015) ^[1] Analysis of reconstituted kheer for shelf life with pumpkin flesh kheer as a control shows decreased sensory score with increase in level of pumpkin powder treatment. 1% of pumpkin powder and 43% of skim milk powder consider as the most acceptable from this analysis but interestingly there is no significant difference between control and all the treatments for standard plate count and yeast and mould count at 5% level of significance. (Pumpkin Based kheer)

Pulse based kheer

(Gupta *et al.*, 2014) ^[10] In the current undertaking, an adjusted moment kheer blend was concocted wherein cowpea and malted wheat flour were added alongside rice, skim milk powder and sugar. Response surface methodology (RSM) and central composite design (CCD) were utilized in advancement of moment kheer blend. Variations of moment kheer blends were attempted and tried for agreeableness utilizing shifting measures of various fixings. Cycle factors were measures of cowpea, cowpea drenching time and measure of malted wheat flour and reactions were protein, crude fiber and generally speaking adequacy. Regression models and reaction surface plots were created and amplex was tried with regression coefficients (R²) and the absence of fit tests. The ideal moment kheer blend had 12 g cowpea, with 4 hours of drenching time and 5.01 g malted wheat flour. Its reactions were 10.273 g protein, 0.076 g crude fiber and 8.052 in general agreeableness loved profoundly.

Based on Milk and Milk products

(S. P. Singh *et al.*, 2018) ^[20] Aspartame is used in the channa kheer preparation instead of sugar for development of dietetic food for customer. Channa is a product obtained by acid coagulation of milk near its boiling point followed by removal of whey. Kheer with 0.010% aspartame got 8.35 highest score on 9 point hedonic scale compare to other treatments. Microbiological standards of Yeast and Mould count, SPC count is not exceeded the limit and while coming to the coliform count it is zero. (Process optimization of channa kheer)

(Bhosale *et al.*, 2020) ^[5] combination of both finger millet and paneer mixed kheer was trialed with three different combinations, sensory evaluation score was given by considering rice flour kheer as a control whereas different level of finger millet flour in kheer blended with paneer as a treatments with constant sugar rate (8%) and paneer shreds (8%). Treatment containing 1.5% finger millet flour in kheer blended with paneer got the highest score over the rest of the treatments. 124.30 Rs./Kg is the estimated cost of production. (S-9-10-255)

(Barela & Shelke, 2017) ^[4] did investigation on “studies on acceptability, chemical composition and cost structure of kheer prepared from cow milk blended with coconut milk” was taken to utilize valuable, nutritious coconut milk with

cow milk for preparation of kheer and to obtain value added products. Cow milk was blended with coconut milk as T₁(100:00), T₂(90:10), T₃(80:20), T₄(70:30) and T₅(60:40) all five treatments were replicated for five times. It was observed that overall acceptability of kheer prepared from cow milk blended with coconut milk in proportion 80:20 found superior while for 90:10,70:30 and 60:40 had fair quality. Regarding chemical quality fat and total solid content of product increased significantly while protein content decreased significantly with increase in the rate of addition of coconut milk. The cost of kheer was increased with increase in the levels of blending of coconut milk in cow milk. Hence it may be concluded that coconut milk could be successfully utilized for the preparation of kheer.

(Gupta *et al.*, 2020) ^[11]. Studied on sensorial and physico chemical properties of optimized almond supplemented paneer kheer. Almond supplemented paneer kheer was prepared using different levels of almonds, milk paneer ratio and sugar levels to optimized process for its manufacture and to study its sensory and chemical characteristics. Initially, there are 45 treatment combinations used for starting trials were conducted by the blending of the different ingredients of almond as paste form that is 0,2,4,6 and 8%, milk paneer ratio viz; 850:150g, 900:100g and 950:050g and 2,3, and 4% sugar used to finalize for the further analysis. After the analysis of this treatment combinations, that control and optimized almond supplemented paneer kheer combinations were found significantly higher that is almond 0% milk paneer ratio 900:100g and sugar 3% and almond 6%,milk paneer ratio 900:100g and sugar 3% respectively for further analysis. The mean score for flavor sweetness, color and appearance, consistency and overall acceptability of control and optimized almond supplemented paneer kheer viz; 8.10, 8.40,8.05,8.15 and 8.22 and 8.60, 8.65,8.65 and 8.63 score were found respectively. The best quality of almond kheer was prepared by incorporated 6% almond, 900:100g milk paneer ratio and 3% sugar. It can conclude that the raising demand for fresh dairy products especially paneer based supplemented products is widening the base of the modern dairy sector.

(Gautam *et al.*, 2013) ^[9]. This experiment was conducted on channa kheer a desert containing channa and sugar, it is popular in Indian sub continent. Manufacturing of channa kheer it is based on milk fat, aspartame, acesulfame-k and sucralose was optimized. Aspartame and acesulfame-k it contain at the level of 0.015% and sucralose at the level of 0.05% where found to be the most appropriate levels for channa kheer replacing conventional product. Formulation suggested that is 7.28 for sweetness, 8.06 for colour and appearance, 7.04 for texture, 7.79 for flavor, 6.69 for overall acceptability and 4820g s for consistency.

Instant Kheer Mixes

(Kokani, 2019) ^[16] Earthy colored rice is wealthy in dietary fiber content. It is answerable for decrease of insulin and glycemic files. Among the readied 3 examples, Sample T₃ which arranged by Brown rice have better characteristics as think about than test T₁ and T₂ which arranged by wada Colum and indrayani rice individually. It was presumed that the moment earthy colored rice kheer blend can be put away in Aluminum pockets or HDPE pockets at room temperature for a very long time about 3 months.

(Vashistha & Argade, 2019) ^[23]. Kheer have an extremely restricted timeframe of realistic usability and hard to industrially marketed. This study was led with a target to

create moment kheer-blend, on the grounds that few conventional nibble nourishments offering accommodation to cheap food industry. Distinctive blend levels of entire milk powder (WMP) and skim milk (SMP) powder (50 to 65%), sugar (25 to 35%) and uniform broken (1mm) basmati rice (10 to 15%) were gone after for advancement of moment kheer-blend. WMP (57.5%) based reconstituted kheer with sugar (30%) and rice (12.5%), and SMP (52.5%) with sugar (35%) and rice (12.5%) were exceptionally adequate by the specialists. Kheer-blend dependent on WMP showed essentially higher fat and protein content with lower carbs than SMP based kheer-blend. It is inferred that SMP (52.5%) based kheer-blend in with 35% sugar and 12.5% rice is suggested for buyers inclining toward low fat weight control plans.

(Sarma *et al.*, 2016) [18]. Studied on the development of ready to cook instant kheer mix. The study was conducted among farmers / farm women of Hailakandi district during the year 2013-14. A total number of 40 randomly selected respondents from 4 different blocks were interviewed informally to collect the information on their technology in relation to kheer preparation. For preparation of 1kg kheer mix required ingredients were maida (1400g), refined oil (90ml) and water (350ml). The instant kheer mix was prepared by adding 6 table spoon of refined oil to 1400 g of refined flour (maida) and mixed properly followed by adding of 350 ml of cold water to make the dough manually. The prepared dough was shaped manually into approximately 0.8cm long and 0.2cm thick structures, sun dried for 2-3 days by spreading in a thin layer over a cloth and covering with a transparent plastic sheet. The mix prepared were packed in airtight polypropylene bags and stored as ready to use kheer mix. It was observed that 70% of the members liked extremely, 25% of the members liked very much and 5% of the members liked moderately.

Studied the physico-chemical properties of instant kheer mix. The process was developed for the production of instant kheer mix, which comprised separate preparation of the instantized liquid milk phase of the product and instantized rice grains, later to be mixed together to yield reconstitutable kheer. The process involved standardization of buffalo milk followed by vacuum concentration, addition of ground rice flour and part sugar, pre-heating the slurry for gelatinization of starch and finally spray-bed drying.

The powder was then mixed with ground sugar through dry blending. The instant kheer mix thus obtained was analysed for its physico-chemical properties. The freshly prepared powder had a good flowability and fairly high loose and packed bulk densities corresponding to a particle density of 1.25g cm⁻³, occluded air content of 6.63 cm³. 100g⁻¹, interstitial air content of 45.00 cm³. 100g⁻¹ and porosity of 44.80%. It showed an insolubility index of 4.00ml, wettability of 2.00 min and dispersibility of 75.38%.

Conclusion

Being a traditional, simple, nutritionally rich food product with less preparation time and economically affordable cost scale made these product more convenience to satisfy the need of the present generation with some improved technology. Kheer with different base products, and processing methods can make it nutritively more rich products. Development of 'Ready to eat' or 'Ready to serve food' sources and ready mixes for various food items made these simple products available for a longer time and easily handled food products

with good acceptable quality.

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