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Studies on screening of rose petal powder (*Rosa indica*) for preparation of *Sanwa* (*Echinochloa frumentacea,* the barnyard millet) *Kheer*

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Abstract
In view of the growing thrust towards value-addition of milk products the present investigation was aimed at Screening of rose petal powder (*Rosa indica*) for preparation of *Sanwa* (*Ech. frumentacea,* the barnyard millet) based *Kheer*. To prepare this innovative, fibre and iron content enhanced product, barn yard flour, full fat milk (Fat 6% and 9% SNF), sugar and ready-to-use bio-organic rose petal powder (Make: Indus Valley) was used. The prepared product was evaluated for sensory quality through a panel of trained judges by employing 9-point Hedonic scale. The rose petal powder was added @ 1.5 g, 2 g, 2.5 g and 3 g per kg of the product. Results on sensory evaluation of the product revealed that the value-added *kheer* prepared by incorporating 1.5 g rose petal powder was liked the most with highest average score of 8.158. It is concluded that barnyard millet-based value-added *kheer* can be prepared by incorporating 1.5 g powder of rose petals.

Keywords: *Sanwa* (*Ech. frumentacea*), *kheer*, value-addition, rose petal powder

1. Introduction
The milk production of India was 208.3 million tons during the year 2020-2021. India accounts for 22% of total world's milk production which retains India's position as a top producer of milk since last two decades. Milk is regarded as almost an ideal food and is daily consumed either as liquid milk or through various dairy products *Kheer* is an indispensible part of Indian cuisine as it is prepared in every home during festivals. It is appreciated by and large due to its great taste and simple method of production.

Kheer is an Indian dessert prepared by partial dehydration of whole milk in a *karahi* over a direct fire with sugar and usually rice or occasionally semolina (De *et al.,* 1976 [4]; Bhosale *et al.,* 2021) [2]. In holy scripture word "*Kheer"* is derived from the Sanskrit word 'ksheer' for milk and 'kshirika' for any dish prepared with milk (Desale *et al.* 2018) [5]. It is known by different names in different parts of country *viz.* 'Kheer ' in north-western region, 'Payasam' in southern region, 'Payas' in eastern region, 'Phirni' in northern region and as 'Kheech' in Mewar region of Rajasthan and 'Payesh' in Bengal (Aneja *et al.,*2002) [1]. The Hindu customs term it as the heavenly nectar, "Amrit" and gives it a position of exclusive among food.

The millets are a group of highly variable small-seeded grasses, widely grown around the world as cereal crops or grains for fodder and human food. Millets play important role in our daily life. More than 1/3rd of the world's population consumes millets and it is the 6th most important cereal crop in terms of world's agricultural production. India, Nigeria and China are the largest producers of millets, accounting for more than 55% of the global production. Barnyard millet is also one of the important types of millet. It belongs to genus *Echinochloa*, comprising of two major species i.e. *Ech. esculenta* and *Ech. frumentacea*. Both the species are acceptable for human consumption and animal feed. The latter is known as an Indian barnyard millet *sanwa* millet, Japanese millet, billion-dollar grass or Jhangora (in Hills of Uttarakhand) (Pandey *et al.* 2021) [6].

Barnyard millet is rich in antioxidants, minerals and good source of iron, protein and dietary fiber. It is superior to rice as it releases sugar and mixes in blood very slowly after long time of eating, it feels fuller for longer time. It comes under the category of low glycemic index (GI) food and is beneficial for diabetics as it reduces blood glucose and lipid level. It is also gluten free which is best for "celiac" population, intolerant to gluten. These millets plays an important role in curbing malnutrition.

Owing to the growing health consciousness, educated people prefer the natural flavourants in the foods. Markets are flooded with arrays of flavors, very few are of organic nature and rich in nutricontent. The rose belonging to the family *Rosaceae*, is used in decoration purposes and disposed off after its use. It contain many nutrients, especially antioxidant, minerals and vitamin A, C, D B3 and E, contributing great health properties. It has proved medicinal value as the petals were used to treat ulcers, gum disease and urinary tract infections in women.

Milk is deficient in iron, fiber and antioxidant and if fortified with barnyard millet and rose petals it can fulfill the deficiency of these nutrients in milk. It leads to one of the best examples to make it "superfood" and can aid to irradicate the menace of malnutrition. Thus value-added sanwa-based *kheer* fortified with rose petal powder would be an attempt towards an innovative product.

2. Materials and Methods

The study was carried out in the Department of Dairy Technology College of Dairy Science and Food Technology, Raipur (Chhattisgarh). The raw materials, *Sanwa* (Barnyard Millet), Amul Gold milk (Full fat milk), refined cane sugar of commercial-grade (Brand: Madhur) and Ready to use "Indus valley" company's Bio organic rose petal powder were used in the study and material was purchased from local market of Raipur (CG).

2.1 Preparation of *Kheer*

For preparation of *kheer* Milk with fat 6% and SNF 9% of "Amul" brand was taken. Milk was heated at simmering temperature around 85^0C. The milk was continuously heated till 25% reduction of original volume reaches. Then, *Sanwa* (Barnyard Millet) which was washed under running water and soaked for 20 minutes was added to milk and cooked over low flame till *Sanwa* gets properly cooked. Then after sugar was added @ 6% of the milk and heating of milk continued. At last stage of *kheer* rose petal powder was added to the *kheer*, cooking continues for 5 minutes and off the flame. The prepared *kheer* was packed in polystyrene cups and then stored in refrigeration at temperature.

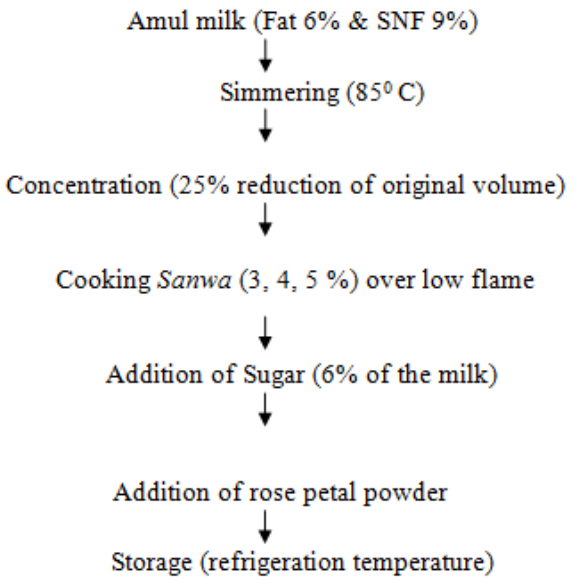

Fig 1: Flow chart of Rose petal powder added *Sanwa* (Barnyard Millet) *Kheer*

2.2 Preparation of Rose petal powder added *Sanwa* (Barnyard Millet) *Kheer*

The reference method for preparation of *kheer* with some changes was taken from Chapke (2005) [3]. For the preparation of *kheer* High fat milk with fat 6% and SNF 9%, *Sanwa* (Barnyard Millet), Sugar (Brand: Madhur) and Ready to use "Indus valley" company's Bio organic rose petal powder was purchased from local market of Raipur (CG).

2.2.1. Screening of rose petal powder for preparation of *Sanwa* (Barnyard Millet) *kheer*

For preparation of rose petal powder added Sanwa (Barnyard Millet) *kheer* the preliminary trails were taken and in the trail the rose petal powder addition rate was taken from 1.5gm(T1), 2gm (T2), 2.5gm (T3) and 3 gm (T4) per 100gm. On the basis of sensory analysis the result was found that the rate of addition above 2gm gives harsh flavor to the product was found unacceptable by the judges. The addition rate of 1.5 gm rose petal powder was found best among all.

2.3 Sensory evaluation

The developed rose petal powder added Sanwa (Barnyard Millet) *kheer* samples prepared with different variation rate of rose petal powder were taken from the refrigerator just before sensory evaluation. For sensory evaluation 50 ml capacity odorless polystyrene cups with lid were selected. All samples of *kheer* were evaluated for sensory attributes *viz*. color and appearance, Body and Texture, flavor and overall acceptability by faculty members from College of Dairy Science and Food Technology, Raipur by using a 9-point hedonic scale scorecard. Panelists were asked to rinse the mouth with lukewarm water between the samples.

2.4 Statistical Analysis

All the data in the present study were taken as a mean of four replicates and subjected to statistical analysis using 'Completely Randomized Design' in WASP - Web Agri Stat Package 2.0 (www.ccari.res.in) [8].

3. Results and Discussions

3.1 Sensory Evaluation of rose petal powder added *Sanwa* (Barnyard Millet) *Kheer*

The sensory evaluation is a science that measures, analyzes, and interprets the reaction of people to products as perceived by the senses of sight, smell, taste, touch and it differentiate the perceptible in terms of color and appearance, body and texture, flavor and overall acceptability as follows.

3.1.1. Color and appearance

The data from Table 1 showed that the values of color and appearance values of treatments T1, T2, T3 and T4 ranges from 7.673 to 5.755. The incorporation of rose petal powder @ 1.5 gm/100 gm i.e. T1 showed highest value among all treatments. The color and appearance is the first observation of any product as well as it decides acceptance of products through vision. The values significantly showed the effect of rose petal powder in *kheer*.

3.1.2. Flavor

Flavor is an indication of the essential character of something. Also, it can be defined as, either the sensory perception of taste or smell, or a flavoring in food that produces such perception. Aroma compounds are volatile and are perceived

primarily with the nose, while taste refers to the proximal sense that requires direct contact of food with stimuli on the tongue to determine the quality of the ingested food (Romagny *et al.,* 2017) [7]. The values of flavor from the Table 1 showed decreasing order for the treatments i.e. 7.978 (T1), 7.070 (T2), 6.490 (T3) and 5.715 (T4). The highest score obtained was of T1. The addition of lower concentration of rose petal powder in *Kheer* was acceptable. This might be due to particular rose flavor of species (*rosa indica*) which was acceptable at some extent and if it was added in more concentration than 1.5 gm/100 gm then it gives harsh taste to product.

3.1.3. Body and Consistency
The data showed in Table1 showed that the score of treatment T1 had highest value among all treatments. The values ranges from 8.150 to 5.963. If we increased rate of addition of rose petal powder decreases the body and consistency of the *kheer*.

3.1.4. Overall Acceptability
The values presented in Table 1 indicated that the overall acceptability scores of prepared *kheer* were 8.158, 7.150, 6.475 and 6.050 respectively. It was observed that the *kheer* prepared with addition of 1.5 gm rose petal powder had the highest overall acceptability score of 8.158 and was found superior to the rest of the product.

Table 1: Effect of addition of rose petal powder on sensory quality of *Sanwa* (Barnyard Millet) *Kheer*

Sensory Attributes	T1	T2	T3	T4	CD at 5%
Color & Appearance	7.673^{a}	6.743^{b}	6.315^{c}	5.755^{d}	0.334
Flavor	7.978^{a}	7.070^{b}	6.490^{c}	5.715^{d}	0.339
Body & Consistency	8.150^{a}	6.850^{b}	6.625^{b}	5.963^{c}	0.569
Overall acceptability	8.158^{a}	7.150^{b}	6.475^{c}	6.050^{d}	0.213

4. Conclusion
The color and appearance, body and consistency, flavor and overall acceptability of rose petal powder added k*heer* are important features and the flavor and overall acceptability of the rose petal powder added *Sanwa* (Barnyard Millet) *kheer* decides the acceptance of the product. In the, present investigation 1.5 gm of rose petal powder addition was superior in all the sensory attributes of prepared *kheer*. Therefore; the 1.5 gm rose petal powder addition was selected for development of *Sanwa* (Barnyard Millet) *kheer*.

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