

**RESEARCH PAPER**

## **Process standardization and selection of a method of drying for the industrial production of rasona ksheerapakam - a dairy based nutraceutical**

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### **ABSTRACT**

In order to identify and standardize the unit operations in the industrial production of Rasona Ksheerapaka -a dairy based nutraceutical, an investigation was carried out. Study was also carried out to select the appropriate method of drying of the product. After conducting trials on popular industrial methods such as roller drying, cabinet drying and spray drying, sensory evaluation of the resultant product was carried out. The spray drying method was selected as suitable one for the industrial production of Rasona Ksheerapaka powder.

**Key words :** Process standardisation, Nutraceuticals, Spray drying

The nutraceuticals or the functional foods are majorly plant-based products and most of them being predominantly herbal. Hence clues to these nutraceutical products could be got from our ancient and traditional systems of medicine like Ayurveda and Siddha. Therefore, there is ample scope for India to develop a range of nutraceutical/health food products based on our traditional knowledge base in Ayurveda. And to succeed, these products have to be standardized with scientific validation to ensure safety and efficacy so as to instill confidence in the customers to use them.

Ksheerapakam is one of the most important and unique preparations found in Ayurvedic system, where milk is used as the medium of extraction of herbal medicinal components. Rasona Ksheerapakam, the product subjected in the present study is basically considered as a cardiac tonic.

As per the standard procedures mentioned in the ancient texts of Ayurveda, there are different types of methodologies available for the production of Ksheerapakam. In all these methods, the herbal ingredient is allowed to boil in milk along with water, for the purpose of extraction. One method of medicated milk preparation consists of boiling one part of prescribed drug with 8 parts of milk and 32 parts of water (1:8:32). Another method of preparation of medicated milk is by providing one part of drug, 15 parts of milk and 15 parts of water (1:15:15). The mixture is then subjected to mild heating till the volume is reduced to that of the initial volume of milk.

### **Limited shelf-life of Ksheerapakam:**

As the process of extraction is carried out by using

milk as the extracting media, the Ksheerapakam preparations need to be prepared on a daily basis. While administering this drug for various ailments, Ayurveda physicians found it relatively impractical, as the patients in the modern busy world are unwilling to carry out the lengthy and laborious preparatory procedures of the medicine

### **MATERIALS AND METHODS**

#### ***Identification of the unit operations involved in the preparation of Rasona Ksheerapakam :***

The conventional method of preparation of Rasona Ksheerapakam was observed at some of the traditional Ayurvedic medicine preparation units. The method of preparation involves boiling milk along with the drug, garlic in an open pan under direct flame using firewood. Manual scraping was carried out to get a uniform heating and also to prevent burning of the milk in the pan. The method of preparation was found both labour intensive and energy intensive. An alternative mechanism for boiling milk with less labour involvement and reducing energy requirement will help in getting a consistent uniform quality product and also enable mass production of the product. Boiling the milk along with the drug, garlic forms one of the main unit operations involved in the preparation of the product. Since the product is milk based, the storage of the product under ambient conditions is difficult. In order to improve the keeping quality of the product under ambient conditions converting the product into powder form by employing some drying technique is the only alternative. Hence, concentration and drying form the two unit operations involved in the preparation of the product on industrial

scale for long term storage.

### ***Selection of equipment and machinery for the industrial production of Rasona Ksheerapakam:***

In Ksheerapakam preparations, the most commonly adopted method is to boil the raw drug in milk and water. For the present study, the medicated milk was prepared following the standard procedure by adding 1 part of prescribed drug, Garlic with 8 parts of milk and 32 parts of water (1:8:32). Since boiling forms the main unit operation involved in the preparation of the product, the mixture was subjected to boiling using two different methods.

– The ingredients were boiled in a steam jacketed kettle of 80 liters capacity under a steam pressure of 2.5 kg/cm<sup>2</sup>. The product temperature was maintained at 102<sup>0</sup> C by regulating the steam pressure. The contents were constantly agitated manually by using a stainless steel ladle. The heating was continued till the total quantity of the product was reduced to the initial volume of milk taken.

– The ingredients were boiled in a LPG fired stainless steel motorized kettle of 40 liters capacity. A temperature of 102<sup>0</sup> C was maintained by controlling the flame of the burner. The kettle was provided with a stationery scrapper and the base of the kettle was rotated by a drive motor of 1.5 HP. Two numbers of stationery LPG burners were provided beneath the rotating base. This arrangement enabled to provide uniform heating and automated scrapping of the surface of the vessel. Agitation of the ingredients was also uniform.

### ***Selection of method of drying for increasing the shelf-life of the product:***

Converting the product into powder form will be an ideal solution to improve the keeping quality and also the marketability of the product. Preliminary trials were carried out for selecting the method of drying. Product was subjected to drying in a Twin Drum Roller Drier, Cabinet Drier, and Spray Drier. Product parameter such as uniformity of the product, better reconstitution, and overall acceptability of the prepared product were analyzed. The final product obtained from various methods of drying

was further subjected to sensory evaluation. The Rasona Ksheerapakam powder was reconstituted and was subjected to evaluation by a panel of four judges.

## **RESULTS AND DISCUSSION**

The results obtained from the present investigation are summarized below :

### ***Selection of equipment and machinery for the industrial production of Rasona Ksheerapakam:***

In order to select an efficient method of extraction of the medicinal component in milk, trials were carried out in an open pan steam jacketed vessel and LPG fired motorized kettle with stationery scrapper. The major disadvantage of the steam jacketed kettle was that, continuous and vigorous scrapping of the contents is required throughout the extraction process. Otherwise the product may get burned on the surface of the kettle. As the process should be supported by the uninterrupted supply of steam at a minimum pressure of 2.5 kg/cm<sup>2</sup>, the paraphernalia of a steam boiler must be provided. On the other hand, the LPG fired system was more user-friendly as the system was provided with a motorized vessel and scrapper. Thus, the necessity for continuous stirring was avoided, and labour component was reduced. On the end product side also, better uniformity was obtained in the second method.

### ***Selection of method of drying:***

Dehydration or drying is the oldest and most important method of food processing and dehydrated foods are convenient, versatile and incur less handling cost (Hayashi, 2003). Various methods of industrial drying methodologies such as Cabinet drying, Roller drying, Spray drying etc. are commonly used for drying of milk and milk products. The Rasona Ksheerapakam was subjected to three different types of drying such as Twin Drum Roller Drying, Cabinet Drying and Spray Drying. The products obtained by these methods were subjected for evaluation with respect to physical and sensory properties. The results are shown in Table 1.

Various sensory attributes of the products such as

**Table 1 : Comparative physical and sensory characteristics of spray dried, drum dried and cabinet dried Rasona Ksheerapakam powder**

Method of drying	Solubility index (ml)	Flavour	Mouth feel	Colour and appearance
Spray dried	1.0	Clean, rich and free from burnt flavour	Same as that of whole milk	Creamy white
Drum dried	14.5	Distinct cooked flavour	Slightly grainy feel	Slightly darker shade
Cabinet dried	18.5	Burnt flavour	Pronounced grainy feel	Darker shade

**Table 2 : ANOVA for sensory score of reconstituted Rasona Ksheerapaka powder that prepared from different drying methods**

Sensory attributes	Spray dried powder	Roller dried powder	Cabinet dried powder	CD <sub>0.05</sub>
Flavour	8.27±0.05 <sup>a</sup>	7.23±0.06 <sup>b</sup>	6.45±0.05 <sup>c</sup>	0.68
Colour and appearance	8.45±0.05 <sup>a</sup>	7.18±0.05 <sup>b</sup>	6.34±0.06 <sup>c</sup>	0.79
Mouth feel	8.54±0.06 <sup>a</sup>	7.3±0.05 <sup>b</sup>	6.33±0.06 <sup>c</sup>	0.82
Overall acceptability	8.62±0.03 <sup>a</sup>	7.43±0.05 <sup>b</sup>	6.18±0.06 <sup>c</sup>	0.89

Values are the average of four judges in three replications

colour and appearance, Mouth feel and Overall acceptability were evaluated. The results of the observations of a panel of four experienced judges with three replications of each parameter are given in the Table 2.

Lovesick (1998) reported spray drying as one of the widely adopted dehydration techniques for preparation of value added products, especially powder formulations. From the trials undertaken, it was evident that, the product obtained from spray drying technique resulted best quality since it possessed a lower solubility index (maximum solubility), better sensory qualities compared to the product obtained from drum drying and cabinet drying methods (Table 2). Hence, spray drying method was selected as the suitable method for the industrial production of Rasona Ksheerapaka powder.

### Conclusion :

The industrial production of Rasona Ksheerapakam can be mechanized and standardized by adopting standard methods of evaporation and industrial drying. Product with better shelf - life and sensory quality can be made available by subjecting the Ksheerapaka, to a standardized process

of spray drying. The trials and sensory evaluations revealed that, the most suitable method for the Rasona Ksheerapaka is the spray drying

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