

# Formulation and Evaluation of Kodomillet (*Paspalum scrobiculatum*) Incorporated Breakfast Recipes and Snacks

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## Abstract

Millets are small seeded annual cereal grains and are particularly low in phytic acid and rich in dietary fibre. Kodomillet or varagu (*Paspalum scrobiculatum*) is nutritionally superior to rice and wheat in terms of higher content of dietary fiber, less fat and high protein. The study was undertaken to incorporate kodomillet in commonly consumed recipes of south India and evaluate the acceptability of these recipes on the basis of organoleptic parameters and analyse their nutrient content. Kodomillet was incorporated in 14 recipes either as a whole grain or in a powder form at 30 percent and 50 percent levels. The overall acceptability and mean scores for each recipe were analyzed by sensory evaluation through a formulated five-point scale and a panel of 30 semi trained panel members. The best acceptable recipe incorporated with varagu were analysed for selected nutrients using standardized methods. The findings of the study revealed that idli, puttu, adai, payasam, kozhukattai, laddoo and cutlet were best accepted when incorporated with varagu at 30 percent level and pongal had higher acceptability score at 50 percent level of incorporation. Kozhukattai incorporated with varagu at 30 percent level obtained the highest score among the recipes with the dietary fiber content of six gram.

**Keywords:** Incorporation, Kodomillet, Recipes, Sensory Evaluation

## 1. Introduction

The most important gift in life is good health with which debilitating diseases can be avoided and life span can be increased. Being physically healthy is of prime importance in life. It is fairly easy to achieve good health, but it involves certain changes in life style. Millets are small seeded annual cereal grains and are particularly low in phytic acid and rich in dietary fibre, iron, calcium and B vitamins. In the present era of food scarcity, there exists a need of diversity to use millets by

developing millet products<sup>1</sup>. The minor millets comprises of kodomillet (*Paspalumscrobiculatum*), little millet or samai (*Panicummilliare*), proso millet or pani Kodomillet (*Panicummillaceum*). These millets contain high energy value and are nutritious compared to other cereals.

Kodo millet is nutritionally comparable with other common cereals and even superior to rice and wheat in some aspects like minerals and fiber<sup>2</sup>. In India, different kinds of traditional foods are made from kodomillet which forms a staple diet for many rural and urban households<sup>3</sup>.

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Kodo millet acts as a digestive, appetizer and diuretic. Celiac patients can replace certain cereal grains in their diets by consuming such millets in various forms including breakfast cereals. Kodomillet is an amazing food source for human nutrition and health improvement as they are good sources of essential nutrients.

With this in view, the present study was carried out in order to identify and select locally available recipes for incorporation, incorporate Kodomillet in the selected recipes at different levels, evaluate the acceptability of these recipes on the basis of organoleptic parameters and analyse nutrient content of the best acceptable recipes

## 2. Materials and Methods

### 2.1 Identification and Selection of Locally Available Recipes for Incorporation

Food choices depend on energy and nutrients need, enjoyment, personal and family beliefs including cultural and environmental consideration and also play a major role in proper food selection of an individual. The botanical name of kodomillet is *Paspalum scrobiculatum* and it is commonly known as Kodomillet in Tamil. Kodomillet provides of 309kcal of energy, 8g of protein, 9g of fibre and 1.4g of fat. It has been found to be better than that of foxtail millet and contains less fat than other millets<sup>4</sup>. They contain less fat with high protein, energy and other nutrients. These are extra ordinarily superior to rice and wheat and therefore is the solution for many of the diseases and disorders that affect a vast majority of the Indian population. Hence, the investigator decided to incorporate Kodomillet in commonly consumed recipes of South India. Fourteen recipes which included breakfast items and snacks such as idli, dosa, chappathi, pongal, puttu, idiyappam, kozhukattai, poli, biscuit, soup, adai, payasam, cutlet and laddoo were selected for incorporation. Kodomillet was incorporated separately into these recipes to explore their nutritional quality and to enlighten their importance to the community.

### 2.2 Incorporation of Kodomillet in the Selected Recipes

The selected recipes were used as standards. Best quality of Kodomillet was selected, purchased, cleaned and were incorporated separately in each recipe either

as a whole grain or in powdered form at 30 per cent and 50 per cent levels. Kodomillet was roasted and incorporated in the form of flour in recipes like chappathi, puttu, idiyappam, poli, payasam, soup, kozhukattai, laddoo, biscuit and cutlet and as a whole grain in idli, dosa, adai and pongal. During the preparation, accurate weights, equal measures of ingredients, maintenance of temperature and time controls were followed for all the recipes. Vessels used for the preparation of recipes were cleaned and standardized in size and shape.

### 2.3 Sensory Evaluation of Selected Recipes

Sensory evaluation is a scientific tool that uses the human senses, smell, sight, taste, touch and hearing to examine the properties which influence the quality of the product.

A five point scale was formulated for studying the acceptance of the recipe in terms of appearance, colour, flavour, texture, taste and a score card was formulated to evaluate the grades according to the degree of acceptance. Thirty semi-trained panel members were selected based on their health, co-operation, willingness and knowledge of quality characteristics and sensory analysis of foods. All the fourteen recipes incorporated with Kodomillet at two different levels namely 30 per cent and 50 per cent were presented to the panel members for sensory evaluation at different points of time. To prevent any changes in their quality due to storage, temperature changes and reheating, recipes were evaluated immediately after preparation. The portion sizes for all the recipes were kept consistent and uniform. The scores obtained through sensory evaluation of the products by the panel members were recorded and the mean scores were calculated for each recipe.

### 2.4 Nutrient Analysis of Selected Recipes

The best acceptable recipe incorporated with Kodomillet were analysed for selected nutrients. Moisture, ash and dietary fibre were carried out AOAC method, carbohydrate by Anthrone method, protein by Macrokjeldhal's method, iron content by colorimetric method, calcium by titrimetric method and fat by Soxhlet extraction method. The energy value was calculated from the calorific values of carbohydrates, fat and protein by their calorific value.

### 3. Results and Discussion

#### 3.1 Acceptability Scores of Recipes Incorporated with Kodomillet

The acceptability scores of selected breakfast recipes incorporated with Kodomillet are presented in Table 1.

**Table 1.** Acceptability scores of selected breakfast recipes incorporated with kodomillet

Recipes	Mean Scores		
	Standard	30% Incorporation	50% Incorporation
Idli	4.3	4.0	3.7
Chappathi	4.5	3.5	3.2
Pongal	4.3	4.1	4.4
Puttu	4.3	4.2	4.2
Dosai	4.7	4.3	4.0
Adai	4.7	4.3	4.0
Idiappam	4.8	3.9	3.3

From the above table, it is revealed that the overall acceptability scores for Kodomillet incorporated idli at 30 per cent level obtained a mean score of 4.0 when compared to idli incorporated with Kodomillet at 50 per cent level which had a mean score of 3.7 and the standard idli had a mean score of 4.3. The overall mean scores of chappathi incorporated with Kodomillet at 30 per cent level scored 3.5 when compared to chappathi incorporated with Kodomillet at 50 per cent level which scored 3.2. The mean score of standard chappathi was found to be 4.5. The mean scores obtained from the above table revealed that Kodomillet can be incorporated at 30 per cent level in chappathi. Pongal incorporated with Kodomillet at 50 per cent level had a mean score of 4.4 when compared to pongal incorporated at 30 per cent level with Kodomillet which scored 4.1. Standard pongal had mean score of 4.3. This clearly indicates that Kodomillet incorporated at 50 per cent level to pongal can be suggested for preparation of pongal. Kodomillet incorporated in puttut 30 and 50 per cent level had a mean score of 4.2 and the standard puttu had a mean score of 4.3. Kodomillet incorporated in dosai at 30 per cent level had highest mean score of 4.3 when compared to Kodomillet dosai incorporated at 50 per cent level which had a mean score of 4.0. The standard Kodomillet dosai had a mean score of 4.7. Dosai incorporated with Kodomillet at 30 per cent level had

highest mean score obtained in sensory evaluation and it can be suggested to be the most acceptable recipe after incorporation. The overall mean score of Kodomillet incorporated adai at 30 per cent level had a mean score of 4.3 when compared to adai incorporated with Kodomillet at 50 per cent level had a mean score of 4.0. The mean score of standard adai was found to be 4.7. The highest score was obtained by adai incorporated with Kodomillet at 30 per cent level. The overall mean score of idiappam incorporated with Kodomillet at 30 per cent level had score of 3.9 when compared to idiappam incorporated at 50 per cent level which scored 3.3. The mean score of standard idiappam was found to be 4.8. The mean score obtained from the above table revealed that Kodomillet can be incorporated at 30 per cent level in idiappam.

The acceptability scores of selected snacks incorporated with Kodomillet are presented in Table 2

**Table 2.** Acceptability scores of selected snacks incorporated with kodomillet

Recipes	Mean Scores		
	Standard	30% Incorporation	50% Incorporation
Poli	4.6	3.9	4.0
Payasam	4.5	4.3	4.1
Soup	3.9	3.1	2.9
Kozhukattai	4.8	4.5	4.4
Laddoo	4.4	4.3	4.1
Biscuit	4.5	4.3	4.1
Cutlet	4.6	4.0	3.9

Poli incorporated with Kodomillet at 50 per cent level had a mean score of 4.0 compared to Kodomilletpoli incorporated at 30 per cent level which scored 3.9. The standard poli had a mean score of 4.6. The results of sensory evaluation indicated that Kodomillet incorporated at 50 per cent level had the highest mean score and this level can be suggested for preparation of poli. Payasam incorporated with Kodomillet at 30 per cent level had highest mean score of 4.3 when compared to Kodomillet payasam incorporated at 50 per cent level which scored 4.1. The standard Kodomilletpayasam had a mean score of 4.5. Thus it can be suggested that payasam incorporated with Kodomillet at 30 per cent level is the most acceptable recipe. The overall mean score for Kodomillet incorporated soup at 30 per cent level had a score of 3.1 when compared to soup incorporated with Kodomillet at 50 per cent

level which scored 2.9. The standard soup had a mean score of 3.9. As the highest score was obtained by soup incorporated with Kodomillet at 30 per cent level it can be suggested that this preparation is the most acceptable. Kozhukattai incorporated with Kodomillet at 30 per cent level had a mean score 4.5 when compared to 50 per cent level with the mean score of 4.4. The standard kozhukattai had a mean score of 4.8. As kozhukattai incorporated with Kodomillet at 30 per cent level had highest score by sensory evaluation, this preparation was considered to be the most acceptable. Kodomillet incorporated laddoo at 30 per cent level had the highest mean score of 4.3 when compared to Kodomillet laddoo incorporated at 50 per cent level which scored 4.1. The standard Kodomillet laddoo had a mean score of 4.4. The results indicated that laddoo incorporated with Kodomillet at 30 per cent level had the highest mean score in sensory evaluation and it is suggested to be most acceptable. The overall mean score for Kodomillet incorporated biscuit at 30 per cent level had a mean score of 4.3 when compared to biscuit incorporated with Kodomillet at 50 per cent level with the mean score of 4.1. The standard biscuit had a mean score of 4.5. As the highest score was obtained by biscuit incorporated with Kodomillet at 30 per cent level it can be suggested that this preparation is the best. Cutlet incorporated with Kodomillet at 30 per cent level had a mean score of 4.0 compared to Kodomillet cutlet incorporated at 50 per cent level which scored 3.9. The mean score of standard cutlet was found to be 4.6. The results of sensory evaluation revealed that Kodomillet

incorporated at 30 per cent level had the highest mean score and this level can be suggested for preparation of Kodomillet incorporated cutlet.

### 3.2 Nutrient Content of Recipes Incorporated with Kodomillet

The best acceptable recipes incorporated with Kodomillet were analysed to find out the nutrient content such as energy, protein, fat, carbohydrates, dietary fibre, calcium, iron and moisture. The nutrient content is given in Table 3.

The energy content of Kodomillet incorporated idli was found to be 201 kilocalories per 100g. The carbohydrate, protein and fat content were found to be 41g, 7g and 1g respectively. The calcium and iron content of Kodomillet incorporated idli was 56mg and 1mg respectively. The content of dietary fibre was 4g and it had a moisture content of 23.6 per cent (Figure 1).

Kodomillet incorporated chappathi contained 174 kilocalories of energy, 33g of carbohydrate, 6g of protein and 2g of fat. The calcium and iron content were 39mg and 1.6mg respectively. Dietary fibre content was found to be 6g and it had a moisture content of 20.8 per cent.

The amount of energy present in Kodomillet incorporated pongal was 246 kilocalories and the contents of carbohydrate, protein and fat were found to be 46g, 11g and 2g respectively. Calcium and iron content were found to be 85g and 1.5g. Kodomillet incorporated pongal contained 5g of dietary fibre and a moisture content of 25.2 per cent.

**Table 3.** Nutrient content of recipes incorporated with kodomillet

Recipes	Energy (Kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Dietary fibre (g)	Calcium (mg)	Iron (mg)	Moisture (%)
Idli	201	41	7	1	4	56	1	23.6
Chappathi	174	33	6	2	6	39	1.6	20.8
Pongal	246	46	11	2	5	85	1.5	25.2
Puttu	292	58	6	4	4	55	2.2	23.2
Dosai	223	41	8	3	5	58	1	25.6
Adai	270	45	18	2	4	67	1.9	24.2
Idiappam	194	36	8	2	4	62	1.4	23.1
Poli	318	51	15	6	5	58	1.1	23.6
Payasam	372	63	12	8	5	147	1.2	22.1
Soup	117	25	2	1	2	39	0.8	20.4
Kozhukattai	205	40	9	1	6	63	1.1	25.6
Laddoo	309	58	8	5	4	76	4.7	23.1
Biscuit	374	63	8	10	3	28	1	19.8
Cutlet	266	46	7	6	5	47	1.5	26.4

Kodomillet incorporated puttu was found to have an energy content of 292 kilocalories. It contained 58g of carbohydrate, 6g of protein and 4g of fat. The calcium content was found to be 55mg and the iron content was 2.2mg per 100g. Dietary fiber content of Kodomillet incorporated puttu was 4g and its moisture content was 23.2 per cent.

Kodomillet incorporated dosai contained 223 kilocalories of energy, 41g of carbohydrate, 8g of protein and 3g of fat. Calcium and iron content of dosai were 58mg and 1mg respectively. The dietary fibre in the developed recipe was 5g and the moisture content was 25.6 per cent.

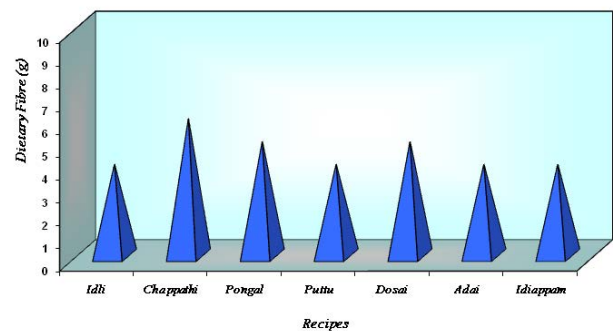
Kodomillet incorporated adai provided 270 kilocalories of energy, 45g of carbohydrate, 18g of protein and 2g of fat. The calcium and iron content were 67mg and 1.9mg respectively. Dietary fibre content was found to be 4g and it had a moisture content of 24.2 per cent. The energy value of Kodomillet incorporated idiappam was found to be 194 kilocalories. It contained 36g of carbohydrate, 8g of protein and 2g of fat respectively. The calcium content was found to be 62mg whereas the iron content was 1.4mg per 100g. Kodomillet incorporated puttu contained 4g of dietary fiber and 23.1 per cent of moisture.

Regarding the energy content of Kodomillet incorporated poli, it provided 318 kilocalories per 100g. The carbohydrate, and protein and fat content were found to be 51g, 15g and 6g respectively. The calcium and iron content of Kodomillet incorporated poli was found to be 58mg and 1.1mg. Kodomillet incorporated poli contained a dietary fibre content of 5g and moisture content of 23.6 per cent. The amount of energy present in Kodomillet incorporated payasam was 372 kilocalories and the content of carbohydrate, protein, fat were found to be 63g, 12g and 8g respectively. Kodomillet incorporated payasam contained 147mg of calcium, 1.2mg of iron and 5g of high dietary fibre with a moisture content of 22.1 per cent. The energy value of Kodomillet incorporated soup was found to be 117 kilocalories. It contained 25g of carbohydrate, 2g of protein and 1g of fat. Calcium was found to be 39mg and iron 0.8mg per 100g. Kodomillet incorporated puttu contained dietary fiber content of 2g and a moisture content of 20.4 per cent. Kodomillet incorporated kozhukattai had 205 kilocalories of energy, 40g of carbohydrate, 9g of protein and 1g of fat. The calcium and iron content were 63mg and 1mg respectively. Dietary

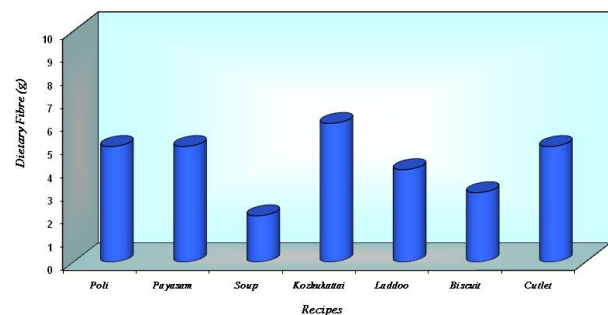
fibre content was found to be 6g and it had a moisture content of 25.6 per cent. Kodomillet incorporated laddoo contained 309 kilocalories of energy, 58g of carbohydrate, 8g of protein and 5g of fat. The calcium and iron values are found to be 76mg and 4.7mg. Dietary fibre of Kodomillet incorporated laddoo was found to be 4g and its moisture content was 23.1 per cent.

Kodomillet incorporated biscuit had 374kcal of energy, 63g of carbohydrate, 8g of protein and 10g of fat. The calcium and iron content were 28mg and 1.0mg respectively. Dietary fibre content was found to be 3g and it had a moisture content of 19.8 per cent (Figure 2).

The energy content of Kodomillet incorporated cutlet was found to be 266 kilocalories. 46g of carbohydrate, 7g of protein and 6g of fat were found in the recipe. The calcium content was found to be 47mg and the iron content was 1.5mg per 100g. The Kodomillet incorporated cutlet contained 5g of dietary fibre and a moisture content of 26.4 per cent.



**Figure 1.** Dietary fibre content of breakfast recipes incorporated with kodomillet.



**Figure 2.** Dietary fibre content of snacks incorporated with kodomillet.

## 4. Conclusion

From the foregoing results, it is revealed that of Kodomillet can be incorporated in commonly consumed recipes such as idli, chappathi, pongal, puttu, dosai, adai, idiappam, poli, payasam, soup, kozhukattai, laddoo, biscuit and cutlet. The sensory evaluation showed that all the recipes except pongal were best accepted at 30 per cent level and pongal had higher acceptability score at 50 per cent level of incorporation. It was evident from the study that recipes incorporated with Kodomillet at 50 per cent level were not as acceptable as recipes incorporated at 30 per cent level.

## 5. References

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