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Standardization of the Process of Making *Kumal Chawl* in the Laboratory

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Abstract
This study was undertaken to standardize the process of making *kumal chawl* in the laboratory. *Kumal chawl* was prepared from both *chowkua* and *bora* paddy in the laboratory following the traditional method. The method for making *kumal chawl* was standardized after observing the steps of traditional method. The sensory attributes of both traditional and laboratory made products were evaluated. It was found that the laboratory prepared products were better than the traditional products in terms of all the sensory attributes.

Keywords: *Kumal chawl, chowkua, bora, dheki*

1. Introduction
Rice (*Oryza sativa*) is an indispensible cereal in diet of large population of the world, especially for people in Asia, but the consumption outside Asia has also increased, recently (Orthoefer, 2005) [7]. It provides the bulk of daily calories for many companion animals and humans (Ryan, 2011) [8]. Besides it is also used as a staple crop in Assamese dietaries, rice is also used to make various products. Both waxy and low amylose rice are preferred to make different types of these products. All the rice products are processed traditionally either for daily consumption as breakfast cereals or to celebrate festive occasions. *Kumal chawl* literally meaning soft rice, is one of the unique rice products of Assam and is prepared from both *chowkua* (low-amylase) and *bora* (waxy) paddy. It is a whole rice product and can be consumed with milk/ curd/ cream and sugar/ jaggery on simple soaking. But sometimes during summer it can be eaten with bengal gram, green chilli, onion, mustard oil and salt.
Rice not only forms the mainstay of the diet of the majority of people, but also bears a large influence on their life and economic condition (Ghose *et al.*, 1960) [2]. A striking feature in all Assamese rice products such as *kumal chawl*, *bhoja chawl*, *sandahguri*, *hurum* etc is that they are all obtained after parboiling either conventional or dry heat. Whatever amount is found locally is processed by the traditional household process on a large scale. These household processes are tedious and time consuming and product quality may not always be the same. Rice processing in Assam is performed solely by women and presently their processing and consumption on a regular basis as breakfast cereals are mostly confined to rural areas. It has now become imperative for processing Assamese rice products on a large scale to retain its popularity among the Assamese people who are now a day's being exposed to various other types of breakfast cereals marketed by multinational companies. It is the need of the hour to upgrade process technologies for making the rice products of Assam. Such upgraded technologies will help to set up small/large scale industries (Mahanta, 1997) [5]. In order to upgrade the technologies it is imperative to study the essential steps in the traditional process and develop their laboratory processes. So the present study was taken up to study the traditional process for making *kumal chawl* and standardize a laboratory process that can be used as a base for small/large scale industry for *kumal chawl* making.

Materials and Methods
2.1 Area Selection: The study was carried out in 3 randomly selected villages of Jorhat District namely Porbotia Gaon, Habungia Gaon and Kenduguri Brahmin Gaon. In each village, selected rural households were approached to demonstrate the traditional process for making *kumal chawl*. The female of the household demonstrated the process.

2.2 Collection of samples and standardization- Two varieties of *chowkua* namely *Teli chowkua* and *Saru chowkua* and *bora* rice namely *Kola bora* and *Jengoni bora* were used in the study to develop a laboratory process for making *kumal chawl*. All the paddy varieties were procured from local farmers in Porbotia Gaon, Jorhat. The paddy was cleaned to remove foreign materials, if any and packed in jute bags and stored at ambient conditions. In the laboratory the normal parboiling process of Bhattacharya and Ali (1985) [1] was followed with modifications in the method of soaking. Standardization work was carried out using different steaming time and temperatures.

2.3 Sample Identification- The 4 varieties that were selected for the standardization process in the laboratory namely *Saru chowkua*, *Teli chowkua*, *Kola bora* and *Jengoni bora* were coded as SC, TC, KB and JB respectively. Different processing variables were also coded in brief. The code-identified the pressure of steaming and the time of steaming. To illustrate, SC-98^0(1′)-0.75-10′ means *Saru chowkua* paddy was boiled for 1 min prior to soaking and parboiled at 0.75 Kg/cm^2 steaming pressure of 10 min.

2.4 Sensory evaluation of kumal chawl - The 6 collected samples of *kumal chawl* and the samples prepared in the laboratory were subjected separately to sensory evaluation using a 7-point Hedonic scale by a semi-trained panel consisting of 30 numbers of panelists of the Department of Food Science and Nutrition (O' Mahony, 1986) [6]. The judges evaluated the samples on the basis of colour, appearance, taste, aroma, texture, chewability and overall acceptability. Out of all the products, laboratory standardized samples for *chowkua* and *bora* paddy were found best in terms of all the sensory attributes and were therefore provided to 25 general consumers for testing the consumer acceptance.

Results and Discussion

3.1 Traditional process of making *kumal chawl*

The study of the traditional process revealed that rural processors made *kumal chawl* from both *chowkua* and *bora* paddy and 6 steps were followed for making *kumal chawl*. The steps in serial order were-

a) *Soaking of paddy*- The variation was observed in the duration of soaking which varied from 2hr to overnight (16-18 hr). According to the rural processors soaking shortened the cooking time. Sometimes they forego the soaking step if weather is found to be very sunny and clear after days of cloudy weather and complete the whole process in a single day.
b) *Parboiling of paddy*- The variation occurred in the time of boiling i.e. 35-80min in case of *chowkua* paddy, 50-70min in case of *bora* paddy and in the amount of water used for parboiling (i.e. the water level varied from 1/2″ to 6″). Generally when water bubbles appear rural processors usually covered the vessel which helped to cook paddy within a short span. They used an iron *karai* or a tin container to cook the paddy. In between cold water was added during boiling of paddy to maintain the water level. The endpoint of boiling was determined when almost all the paddy husks began to split. To equalise the splitting process in between stirring was done. *Chowkua* paddy was allowed to split more than *bora* paddy as it reduced time of soaking *kumal chawl* before consumption.
c) *Draining and heaping of parboiled paddy*: The water was drained from the boiling vessel by tilting the vessel and the paddy was shifted on to a bamboo colander to drain all the remaining water. The grains were heaped on the colander for 30-60 min to conserve the heat, which facilitated equal splitting of the husk.
d) *Drying of parboiled paddy*: The paddy was dried in the sun on the same day by spreading them on a bamboo mat or on cow dung layered mud floor. Continuous 5-6 hrs of sun drying was essential to dry up the paddy properly. For equal drying of each grain the rural processors generally turned over the paddy in between the drying process. For uniform drying, the paddy was kept in heaped for 20 to 30 min. The doneness of drying was confirmed when a breaking or snapping sound was heard on biting the paddy grain.
e) *Tempering*: The dry parboiled paddy was collected in a bamboo colander and left overnight as such to allow for uniformity in paddy moisture and then either stored as such until future use or milled for consumption.
f) *Milling of parboiled paddy*: After tempering, the paddy was dehusked and polished either in a *dheki* (a hand and foot operated milling and pounding unit) or in rice mills to obtain *kumal chawl*.

3.2 Sensory evaluation of the traditionally processed kumal chawl samples: Sufficient amount of boiled water was added to the 6 samples of *kumal chawl* and kept covered till the grains became soft and ready for consumption. The excess water was drained and samples were given to a semi-trained panel of judges for sensory evaluation.

Table 1: Mean scores of quality attributes of traditionally prepared *kumal chawl* samples on sensory evaluation.

Samples	Quality attributes							Average
	Colour	Appearance	Taste	Aroma	Texture	Chewability	Overall acceptibility	
Saru chowkua[a]	5.6±1.08	5.3±0.95	4.8±1.39	5.0±0.94	4.0±1.25	3.5±1.29	3.8±1.39	4.6
Saru chowkua[b]	5.6±0.52	5.5±0.53	5.2±0.63	5.6±0.97	5.2±1.03	4.9±0.74	5.5±0.71	5.4
Teli chowkua[b]	5.4±0.52	5.3±0.48	5.1±1.10	4.7±1.06	4.5±0.85	4.8±0.63	5.1±0.57	4.9
Teli chowkua[c]	5.6±0.52	5.5±0.53	5.8±1.14	5.2±0.92	5.1±0.88	4.8±0.92	5.2±0.92	5.3
Kola bora[a]	5.9±0.57	5.9±0.57	5.7±1.06	5.7±0.68	6.1±0.88	5.8±1.03	6.0±0.94	5.9
Kola bora[c]	5.8±6.3	5.9±0.74	5.3±1.49	5.3±0.95	5.0±0.94	4.4±0.97	4.8±1.03	5.2

a-*Kumal chawl* prepared in Habungia Gaon
b-*Kumal chawl* prepared in Porbotia Gaon
c-*Kumal chawl* prepared in Kenduguri Brahmin Gaon

From the Table 1 it was revealed that the products of Habungia and Porbotia Gaon were not equally liked by the Judges. However *Kola bora kumal chawl* of Habungia Gaon scored highest among all the 6 products i.e. 5.9. *Kumal chawl* prepared in Kenduguri Brahmin Gaon scored comparatively better than the other two villages i.e. 5.3 and 5.2 in *Teli chowkua* and *Kola bora kumal chawl* respectively. After observing the mean scores of the samples it was noted that all the samples got scores below 6 i.e. none of the samples were liked very much. This indicates that there is scope for further

improvement of the traditional process to obtain good quality *kumal chawl.*

3.2 Standardization of processing method of making *kumal chawl* in the laboratory: Two varieties of each *chowkua* (*Teli* and *Saru chowkua*) and *bora* (*Kola* and *Jengoni bora*) were selected to standardize the *kumal chawl* making process in the laboratory incorporating all the essential steps followed by rural processors. The processing steps are-

a) *Soaking*- Initially both *Saru chowkua* and *Kola bora* were taken to standardise. During each time 1kg of paddy was taken and water was brought to boil in an aluminium saucepan. *Saru chowkua* was added to boiling water and boiling was continued for 1 and 3 min, whereas *Kola bora* was boiled for 3 min. Amount of water taken was sufficient to immerse the paddy completely and in between stirring was done to disperse any air bubble. The vessel was removed from flame and covered with a lid. The saucepan was covered from all sides with the help of jute bags and towels and kept overnight (16-18hr) as such for soaking.
b) *Draining*- The water was drained and paddy was kept covered in a bamboo colander to avoid surface drying of moisture.
c) *Parboiling*: The 1 and 3 min boiled and soaked paddy of *saru chowkua* were steamed in an autoclave at pressures of 0, 0.5, 0.75 and 1kg/cm^2 for 10-25 min. In case of *kola bora* steaming pressure was 0kg/cm^2 for 10-20 min of steaming. Interesting observation here was that despite the high initial soaked paddy moisture, the steamed paddy did not show excessive kernel swelling.
d) *Drying*: It was observed that all the paddy grains had uniformly split after steam parboiling. Therefore, unlike the method followed by rural processors, the heaping of paddy after parboiling was not done. The required level of drying under strong sunlight was completed within 4-6 hr. The drying was done by spreading the paddy on an aluminium tray which easily got heated up with sunlight and facilitated the drying. All lumps in paddy due to stickiness in *bora* rice was broken intermittently for equal drying. After every 2 hr, the parboiled paddy was heaped to allow for tempering. During the drying of paddy, heaping helps to equalise moisture content and to remove moisture gradient within the grain and also increased milling yield (Luz *et al*., 1993) [4].
e) *Tempering*: After drying, paddy was kept on a concrete slab in a heap to allow for moisture equalisation and also to dissipate the heat that the paddy received during drying (Luh and Mickus, 1991) [3].
f) *Milling*: The milling was done with the help of husker and polisher for 30 sec. The milled *kumal chawl* was winnowed to remove dirt and husks which were remained during milling and stored under refrigerator for further use.

3.3 Sensory evaluation of the laboratory processed kumal chawl samples: For sensory evaluation 40 g of each sample was taken in a bowl and washed with cold water prior to soaking. Then to each bowl 4 tbsp of boiling water was added, stirred well and kept covered for 45 min in case of *Saru chowkua* and 25 min in case of *Kola bora.* From the table 2 it can be seen that the mean scores of all quality attributes of all samples of *kumal chawl* made from *chowkua* and *bora* rice were around the score of 6, i.e. the samples were mostly liked very much. Based on the scores of sensory evaluation *Teli chowkua kumal chawl* made with variable TC-98°(1′)-1-10′ obtained the highest mean overall acceptability score of 6.8 and *Kola bora kumal chawl* made with variable KB-98°(3′)-0-20′ got the highest score of 6.9were further selected for consumer acceptability study.

Table 2: Mean scores of the quality attributes of laboratory processed *kumal chawl* samples on sensory evaluation

Samples	Quality attributes							Average
	Colour	Appearance	Taste	Aroma	Texture	Chewability	Overal acceptability	
SC-98°(1′)-0.75-10′	6.7±0.48	6.2±0.42	6.3±0.42	5.9±0.74	6.2±0.42	6.6±0.52	6.6±0.52	6.4
SC-98°(1′)-1-10′	6.2±0.79	6.1±0.74	6.0±0.67	6.1±0.74	6.5±0.53	6.6±0.52	6.7±0.48	6.3
SC-98°(3′)-0.5-20′	6.1±1.10	6.1±1.10	6.2±0.79	5.9±0.88	6.3±0.48	6.6±0.52	6.3±0.48	6.2
TC-98°(1′)-0.75-10′	6.6±0.52	6.2±0.42	6.2±0.42	6.1±0.99	6.1±0.99	6.7±0.68	6.5±0.53	6.3
TC-98°(1′)-1-10′	6.4±0.69	6.3±0.82	6.4±0.84	6.2±0.42	6.4±0.69	6.8±0.42	6.8±0.42	6.5
TC-98°(3′)-0.5-20′	6.3±0.82	6.1±0.99	6.2±1.03	6.1±0.74	6.2±0.63	6.7±0.68	6.6±0.52	6.3
KB-98°(3′)-0-20′	6.6±0.52	6.3±0.48	6.5±0.53	6.5±0.53	6.5±0.53	6.7±0.68	6.9±0.32	6.6
JB-98°(3′)-0-20′	6.7±0.48	6.3±0.82	6.7±0.68	6.2±0.92	6.0±0.82	6.3±0.48	6.2±0.63	6.3

While observing the mean scores from Table 3 it became apparent that there was a wide variation among scores given to different sensory attributes. The scores ranged from 2-7 with a greater number of scores between 5-7. While comparing the mean scores of *kumal chawl* prepared from *Teli chowkua* and *Kola bora* it can be seen that *Kola bora kumal chawl* was judged better than *Teli chowkua kumal chawl*. The sensory scores for all attributes mostly ranged between 6-7 i.e. liked very much to like extremely. Overall acceptability of both the samples was almost equal and it was 6.0 for *Teli chowkua kumal chawl* and 6.1 for *Kola bora kumal chawl*. The consumer acceptability on an average revealed that both the products were liked very much.

Table 3: Mean scores of quality attributes of standardised laboratory processed *kumal chawl* samples on sensory evaluation by consumers

Sample	Colour	Appearence	Taste	Aroma	Chewability	Overall acceptibility
TC-98°(1′)-1-10′	6.3±0.90	6.3±0.79	5.6±0.92	5.5±1.04	5.8±0.87	6.0±0.77
KB-98°(3′)-0-20′	6.3±0.90	6.5±0.52	5.9±1.45	5.6±1.43	6.2±1.47	6.1±1.14

Conclusion- Study of the method demonstrations of traditional *kumal chawl* making processes for *chowkua* and *bora* paddy revealed that variations were there in the processing steps of soaking, parboiling, draining, drying and milling. Rural processors prepared *kumal chawl* from many *chowkua* and *bora* paddy varieties. The sensory evaluation of

6 traditionally prepared samples revealed that *kumal chawl* samples made in Kenduguri Brahmin Gaon got better score than the other two villages.Nine different sets of processing variables of *Saru chowkua kumal chawl* and two different processing variables of *Kola bora kumal chawl* were sensorily evaluated. The best set of processing variables i.e. in case of *Teli chowkua kumal chawl* of processing variable [TC-98°(1′)-1-10′] and in case of *Kola bora kumal chawl* of processing variable [KB-98°(3′)-0-20′] were given to general consumers to test the acceptability of the products. The study found that consumers liked both the *kumal chawl* samples very much. The standardised process will enable to develop a small/large scale industry for making *kumal chawl* such that the product is marketed commercially. The widespread availability of *kumal chawl* can in future open avenues for its incorporation in defence rations, its distribution during natural calamities to industry in the state of Assam.

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