Effect of *Ragi* (*Eleusione coracana*) for the development of value added products and their nutritional implication

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**ABSTRACT**: The paper is an extension of minor research project titled effect of *Ragi* (*Eleusione coracana*) for the development of value added products and their nutritional implication. The present study was carried out to utilize, develop and evaluate value added products of underutilized grains like *Ragi* for their sensory characteristics. The products which Uttpam, with in the ratio of 75 per cent semolina and 25 per cent *Ragi* flour. Cutlets, with in the ratio of 60 per cent potato, 15 per cent bread and 25 per cent *Ragi*, 60 per cent bread. Disco wheel with in the ratio of 60 per cent bread, 15 per cent vegetables and 25 per cent of *Ragi*, respectively. All the products were found acceptable by the panel of judges. It is concluded that all the four products viz., uttpam, cutlets, disco wheel, were acceptable in terms of colour, flavour wise uttpam, Disco wheel (90 %) liked very much as cutlets (75 %) liked moderately. Over all acceptability of uttpam, disco wheel were high whereas cutlets was least acceptable. So, incorporation of *Ragi* flour into existing dietary pattern is very beneficial because of its therapeutic benefits.

**KEY WORDS**: *Ragi*, Cereals, Value added, Nutritional implication

the Himalaya regions. It is an underutilized grain which is inexpensive, easy to cook and rich in vitamins and minerals and in addition, provides roughage. Majority of people in India are economically poor and their choice for a balanced diet is further restricted by poverty and insufficient supply of nutrition foods. In order to arrest the situation, much attention has been centered on the exploitation and utilization of unusual plant materials like Ragi for foods (Marfo et al., 1988) consumed regularly, Ragi could help in keeping malnutrition, degenerative diseases and premature aging at bay. Green Ragi is recommended for conditions of blood pressure, liver disorders, asthma and heart weakness. Green Ragi is also recommended to lactating mothers in condition of lack of milk production. Ragi is an extremely nutritious cereal and is very beneficial for maintaining a good health. Ragi roti, Ragi dosa, Ragi porridge, Ragi upma, Ragi cakes, Ragi biscuits are few popular dishes of Ragi (http://www.nutritiousIndianrecipes.recipe.in).

Ragi is usually converted to flour and variety of preparation like cheela, ladoo, salty porridge. Traditionally it is used as an infant weaning food in south India (Meera, 1997).

Cereals form a major portion of human diet and are an important source of starch and other dietary carbohydrates (dietary fibre), which play an important role in the energy requirement and nutrient intake of human. The millets are with higher fibre content and their protein quality and mineral composition contribute significantly to nutritional security of a large section of population residing in the millet growing areas, considered to be the most disadvantaged groups (Desai, 2010).

Millets are most recognized nutritionally for being a good source of minerals magnesium, manganese and phosphorus. Research has linked magnesium to a reduced risk for heart attack and phosphorus is important for the development of body tissue and energy metabolism. Millets are also rich in phytochemicals, including phytic acid (Shashi et al., 2007).

Finger millet also known as Ragi in India is one of the important cereals occupies highest area under cultivation among the small millets. Finger millet is comparable to rice with regard to protein (6-8 %) and fat (1-2 %) and is superior to rice and wheat with respect to mineral and micronutrient contents. It is a major source of dietary carbohydrates for a large section of society. Additionally Ragi has enormous health benefits and also a good source of valuable micro-nutrients along with the major food components. In order to develop the value added food products based on Ragi, that can able to enrich the nutritional value and also beneficial for good health is the current need for the wellbeing of the society. Food is consumed in combinations (Lakshmi and Sumathi, 2002).

Nutritional composition of Ragi:

Ragi is considered to be a coarse grain as compared to rice because of its fibrous seed coat. It being unique among cereals, Ragi is very rich source of calcium containing 0-3 to 0.4 g as compared to other minerals like phosphorus, iron, magnesium and fibre. Its protein is relatively better balanced because Ragi contains more enzymes like lysine, threonine and valin then other millets (Ravindran, 1991).

Therapeutic value:

Ragi is rich in calcium which helps in strengthening bones. It is an excellent source of natural calcium for growing children and people. Ragi consumption helps in development of bones in growing children and maintenance of bone health in adults. Ragi keeps disease such as osteoporosis at bay and could reduce risk of fracture (http://www.naturalhealthcure.org/food/healthy-benefits-of-cereals.html).

■ RESEARCH METHODS

When the quality of product is assessed by mean of human sensory organs, the evaluation is said to be sensory or subject or organoleptic. Every time food is eaten a judgement is made.

Sensory quality is a combination of different senses of perception coming into play in choosing and eating a food. Appearance, flavour and mouthfeel decide the acceptance of the food (Srilakshmi, 2007).

■ RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads:

Sensory evaluation of uttpam:

The mean score of sensory evaluation of uttpam is presented in Table 1 and Fig. 1.

Uttapam prepared by the semolina received a score of 8.0, 8.1, 8.0, 7.8, 8.0 and 8.2 in the sensory characteristics like colour, appearance, aroma, texture, taste and overall acceptability. It was overall rated in the
Ragi uttapam prepared by the combination of Ragi in semolina received a score of 9.0, 8.9, 9.0, 9.1, 9.2 and 9.2 in the sensory characteristics like colour, appearance, aroma, texture, taste and overall acceptability. It was overall rated in the range of liked very much by the panelist.

Sensory evaluation of cutlate:

The mean score of sensory evaluation of cutlate is presented in Table 3 and Fig. 3.

Cutlates prepared by the bengal gram received a mean score of colour 8.5, appearance 8.4, aroma 8.3, texture 8.4, taste, 8.4 and overall acceptability 8.5 for all the organoleptic characteristics on the 9 points hedonic scale.

The mean score of sensory valuation of Ragi cutlate is presented in Table 4 and Fig. 4.
Ragi cutlates prepared by the combination of Bengal gram and Ragi received a mean score of colour 9.1, appearance 9.2, aroma 9.2, texture 9.4, taste, 9.2 and overall acceptability 9.2 for all the organoleptic characteristics on the 9 points hedonic scale. It was overall rated in the range of liked very much by the panel of judges.

**Sensory evaluation of disco wheel :**

The mean score of sensory evaluation of disco wheel is presented in Table 5 and Fig. 5.

<table>
<thead>
<tr>
<th>Product</th>
<th>Variable</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard disco wheel</td>
<td>Colour</td>
<td>8.5 ±0.70</td>
</tr>
<tr>
<td></td>
<td>Appearance</td>
<td>8.3 ±0.94</td>
</tr>
<tr>
<td></td>
<td>Aroma</td>
<td>8.4 ±0.84</td>
</tr>
<tr>
<td></td>
<td>Texture</td>
<td>8.1 ±0.88</td>
</tr>
<tr>
<td></td>
<td>Taste</td>
<td>7.9 ±0.83</td>
</tr>
<tr>
<td></td>
<td>Overall acceptability</td>
<td>8.4 ±0.69</td>
</tr>
</tbody>
</table>

**Ragi disco wheels prepared by the combination of bread and Ragi received a mean score of colour 8.9, appearance 9.2, aroma 9.2, texture 8.9, taste 9.0 and overall acceptability 8.7 for all the organoleptic characteristics on the 9 points hedonic scale. It was overall rated in the range of liked very much by the panel of judges.**

**Conclusion :**

The study was carried out in Moradabad town where Ragi was selected purposively for the present investigation. The Ragi cereal was obtained in the month of June to September. Nutritional and organoleptic evaluation of Ragi products was done. Standardization of different recipes of Ragi cereal was carried out by a panel of 10 judges. The present investigation was undertaken to study utilization of Ragi for the development of value added products.

**Organoleptic evaluation of Ragi products :**

Thus, from the observation made in this study, it is concluded that all the four products viz., uttpam, cutlets, disco wheel, were acceptable in terms of colour, flavour wise uttpam, disco wheel (90 %) liked very much as cutlets
(75 %) liked moderately. Over all acceptability of uttpam, disco wheel were high whereas cutlets was least acceptable.

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