Instant mixes are more popular as it requires little preparation time and gives uniform quality attributes. Considering the today’s busy life style and need of instant food in every family, the multigrain instant kothimbir vadi mix was considered the utmost important. In the multigrain as cereals flours (sorghum, wheat, pearl millet, finger millet and brown rice), pulses flours (dals of bengal gram, moong, and urad) and spices (dried coriander leaves, powders of turmeric, dhania, cumin seed, ginger, garlic, and green chilli), sesame seeds, asafoetida and salt were used. The flours and powders were prepared in the laboratory. Seven different treatments were maintained. The most acceptable treatment was screened out by sensory quality evaluation panel members. Amongst, the most acceptable treatment (T7) was selected (highest score) and further used for bulk preparation, then the flour mix was packed in standy pouches and stored under ambient conditions for studying the changes in quality attributes such as proximate constituents, microbial count (TPC) and sensory quality parameters for a period of 60 days storage by following sampling protocol on every 15th day. From the results, it was observed that the instant mix had exhibited the values of proximate constituents 0 day analysis, moisture (5.4%), protein (11.73%), fat (0.93%), carbohydrates (78.74%), crude fibre (6.8%), ash (3.2%) and energy value (370 Kcal) per 100g. The same constituent values analysed on 60th day and compared with that of the 0 day values did not show any significant statistical differences. Similarly, the microbial count (TPC) estimated on 0 day and that of on 60th day storage did not show any significant differences at various dilutions. Likewise, for the sensory quality evaluation, the store sample (instant mix) was converted into vadi on each sampling day and then given to the 20 semi-trained panel members using 5-point hedonic scale. The means of mean score of the sample evaluated on 0 day and that of on 60th day storage did not show any significant changes in the overall sensory quality attributes (colour, texture, aroma, taste, appearance and overall acceptability). From the results, it is concluded that the multigrain instant kothimbir vadi mix was found to be remained in good condition for a storage period of 60 days under ambient conditions without showing any sign of spoilage.

**Keywords:** instant, multigrain, kothimbir vadi
Introduction

Indian nuclear families are compelled to go out for job; hence they do not have sufficient time to cook food at home. The present trends, therefore of instant food mixes are popular among these young families. A variety of instant mixes are widely available in market since it can be used instantly at home scale level, assured by the manufacturer for its quality and shelf life. Traditional foods play an important role in local identity, consumer behaviour, the transfer of cultural heritage for future generations and the interaction of this heritage with the rest of the world (Sarangam et al., 2015). The consumption of coarse grains and millets have been reported to decreased the incidence of diabetes, cardiovascular diseases, cancer and obesity which are increasing in an exponential manner globally and to combat them a rise in demand for food containing complex carbohydrates with high dietary fibre and health beneficial phytochemicals has been in demand (Agarwal and Verma, 2016).

Apart from balanced nutrition, multigrain product provides variety of phytochemicals, flavors which improve the textural and sensory quality of the product (Dahatonde et al., 2018). A combination of cereals and pulses always gives us balanced nutritious food containing lysine and methionine. Addition of vegetables (GLV) with these items will certainly improve the significant level of vitamins, minerals, nutraceuticals, dietary fibre and a lot of health benefits. Hence in many Indian ethnic food preparations, cereals and pulses are mixed at desirable proportions (Gopalan et al, 2014).

The objectives of study were to enhance the nutritional profile and quality of instant multigrain kothimbir vadi mix to optimise the recipe by incorporating cereal grain flours (sorghum, wheat, pearl millet, finger millet and brown rice), pulses flour (bengal gram dal, moong dal, urad dal) and spices powders (dried coriander leaves, turmeric, dhania, cumin seed, ginger, garlic, and green chilli), sesame seeds, asafoetida and salt so as to standardise it during development, processing, packaging, storage and quality evaluation of instant vadi mix.

Materials

Kothimbir vadi is a savory cilantro cake that is first steamed and then deep-fried until crisp.

This is an essential Maharashtrian dish. It is made with besan flour (chickpeas flour) tempered with mustard, cumin seeds, ajwain, hing for flavoring spiced with crushed green chillies and lots of kothimbir (freshly chopped coriander leaves) added to form a batter and is steamed and then fried as fritters. This delicious vadi can also be served with garlic chutney, coconut chutney, tomato sauce or a hot cup of tea.

Multigrain instant kothimbir vadi mix was developed using various grains, cereals, pulses, and other raw materials i.e. (sorghum flour, wheat flour, pearl millet flour, finger millet flour, brown rice flour, soaked bengal gram flour, moong dal flour, urad dal flour, dried coriander leaves, turmeric powder, dhania powder, cumin seed powder, ginger powder, garlic powder, green chilli powder, sesame seeds, asafoetida and salt).

The dehydration processing technique is used for drying the coriander leaves (cilantro) which is the major ingredient used in the product. The main purpose of dehydration is to extend the shelf life of the food by a reduction in water activity. Considering the present scenario of the food habit of nuclear families, there is a great demand for ready-to-eat and ready-to-cook food. Therefore the present experiment dissertation of kothimbir vadi and its flour blend is developed by using different proportions.

The requirement of Materials: The equipment machinery facilities were availed from the Department of PG FSN, SNDT College of Home Science.

Equipment

For processing:
A) Cabinet dryer
B) Digital weighing balance
C) Sealing machine
D) Laminar flow
E) Microwave oven

For Proximate Analysis
A) Hot air oven
B) Muffle Furnace
C) Soxhlet fat extraction apparatus
D) Microkjeldhal assembly (digestion, distillation and titration apparatus)
E) Microbial glasswares and colony counter

**Methods**

The raw material grains and dals, after procuring from the market were cleaned, roasted, separated, and pulverized using laboratory mill to make flours of sandy texture sieve through 60 mesh sieve. Further stored in polyethylene bags separately for next use.

- Recipe for Maharashtrian Kothimbir Vadi

The standard recipe of kothimbir vadi as suggested by Dalal (2013) was used for the vadi preparation with some modifications.

Weighing the ingredients, multigrain flours, *dal* flours, powders of turmeric, *dhania*, ginger, garlic, green chilli, dried coriander leaves, *asafetida*, salt, oil, etc.

↓

Addition of water in the mixture

↓

Preparation of dough (loose)

↓

Shape it into round cylindrical log by rolling with hand palms

↓

Placing in a greased perforated sieve

↓

Steaming it in an idli steamer after placing the sieve for about 20 min

↓

Remove, cool, cut into thin slices using knife

↓

Take little oil in a non-stick frying pan, heat it, place the slices and shallow fry at both sides till it become brown and crispy

↓

Serve immediately with sweet date chutney and green chutney

Figure no.1 Flow Chart for Kothimbir Vadi preparation
**Figure no.2** Preparation of Multigrain Instant Kothimbir Vadi Mix (flour blend)

Procurement of grains, *dais*

↓

Cleaning

↓

Roasting them independently, grinding using laboratory mill, sieving through 60 mesh sieve

↓

Weighing, mixing the flours, powders of ginger, garlic, dried coriander leaves, *dhania*, cumin seed, turmeric, green chilli, sesame seeds, asafoetida, salt, etc.

↓

Soaking bengal gram *dal* overnight and dehydration of *dal* followed by pulverizing into fine flour and store in bags

↓

Mix well

↓

Filling in standy pouches under laminar flow condition

↓

Sealing hermetically

↓

Labelling and storage under clean, dry place (ambient condition)

↓

Storage studies for quality evaluation (Physical, Chemical/Proximate constituents, microbial (TPC) and sensory quality attributes)

---

**Figure no.3** Dehydration of coriander leaves, ginger, garlic and green chilli

Procurement of raw material (fresh)

↓

Cleaning, washing and draining

↓

Removal of inedible part (skin, stalk end, papery layer, roots, etc)

↓

Blanching in a microwave oven at high power for 6 sec coriander leaves, 10 sec ginger slices, garlic pills and chilli pieces

↓

Remove & cool in deep freezer (30 min)

↓

Place on an aluminium tray lined with thin plastic sheet

↓

Dehydrate each separately in a cabinet dryer at 50-55°C for about 6 hrs coriander, 10 hrs ginger, garlic and green chilli pieces.

↓

Remove after it become crispy dry

↓

Cool to room temperature

↓

Grind the ginger, garlic and green chilli pieces separately using laboratory hammer mill and then sieving through 60 mesh sieve

↓

Packaging independently in polyethylene bags (200 g)

↓

Sealing (dried coriander leaves store in the bags as such) and seal it (make air tight)

↓

Use these dehydrated ingredients in the above multigrain instant *kothimbir vadi* mix

---

**Formulation of Treatment details**

Various treatments were carried out to finalise ingredient formulation for fresh kothimbir vadi. The same formulation was used further in making of instant mix. (T=Trials)
Multigrain Instant Kothimbir Vadi Mix

Table no.1 Treatment details of the combination of different ingredients used for Multigrain Instant Kothimbir Vadi Mix

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
<th>T7</th>
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<tr>
<td>Spelled flour</td>
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<td>7.0</td>
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<td>13.0</td>
<td>14.0</td>
<td>15.0</td>
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<td>Pearl millet flour</td>
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<td>3.0</td>
<td>4.0</td>
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<tr>
<td>Ragi flour</td>
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<td>7.0</td>
<td>6.0</td>
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<td>Brown Rice flour</td>
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<td>3.0</td>
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<tr>
<td>Bengal Gram flour</td>
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<td>Soaked Gram flour</td>
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<td>Millet Dal flour</td>
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<td>Oatmeal flour</td>
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<td>10.0</td>
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<td>8.0</td>
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<tr>
<td>Coriander leaves</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fresh Coriander leaves</td>
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<td>15.0</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Dried Coriander leaves</td>
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<td>-</td>
<td>15.0</td>
<td>10.0</td>
<td>10.0</td>
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<tr>
<td>Cumin Seed Powder</td>
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<td>0.05</td>
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<td>0.1</td>
<td>0.1</td>
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<tr>
<td>Dandal Powder</td>
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<td>2.0</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>2.0</td>
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<tr>
<td>Turmeric Powder</td>
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<td>0.35</td>
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<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
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<tr>
<td>Green Chilli Paste</td>
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<td>3.0</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Green Chilli Powder</td>
<td>-</td>
<td>-</td>
<td>3.0</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
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<tr>
<td>Ginger Powder</td>
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<td>0.75</td>
<td>0.75</td>
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<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Garlic Powder</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>1.5</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Sesame Seed</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Asafoetida</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
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<tr>
<td>Salt</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</tr>
</tbody>
</table>

Sampling protocol
The sampling protocol was maintained on every 15th day for total 60 days storage.

Storage and Quality evaluation
The store samples were evaluated for their changes during storage for various quality attributes.

Changes in proximate constituents
01. Moisture, protein, fat, carbohydrates, total fibre content, ash (minerals) content, energy value, salt (%), vitamin C content were determined by using standard methods of analysis. (Ranganna, 2014)

02. Microbial Evaluation—Total Plate Count (cfu/ml)
The microbial examination for total plate count of the multigrain instant kothimbir vadi mix sample stored was conducted on every 15th day of storage as per the standard procedure. (Ranganna, 2014)

03. Sensory quality evaluation—
The sensory evaluation of the instant mix was carried out on each sampling day by preparing kothimbir vadi, following standard method and then given to the sensory quality evaluation to the 20 semi-trained panel members using 5-point hedonic score (for the parameters like colour, taste, texture, aroma, appearance and overall acceptability). (Ranganna, 2014)

Results and Discussion
The data on various aspects of the experiment were collected according to the protocol and tabulated into the respective tables.

The proximate analysis of the product developed and the changes that occurred in the various quality parameters during the storage period of study was evaluated and presented in Table no.2

Table no.2 Changes in proximate...
Constituents of the Multigrain Instant Kothimbir Vadi Mix during storage under ambient conditions per 100gm*

From the data given in the table above, it is observed that the values of moisture content in the instant mix on 0-day analysis were 5.4% and that of on the 60th day was 5.6%. The values for protein content on the 0-day storage sample were 12.29% and that on the 60th day, it was 12.26%. The value of fat content on 0 days was 0.93% and on the 60th day, it was 0.96%. The carbohydrate content on 0 days was 78.18% and that of on 60th day was 78.24%. The fiber content on 0 days was 6.8% and on 60th day, it was 7.10%. The ash (minerals) content on 0 day was 3.2% and on 60th day 3.5%. The energy value on 0 day was 370 Kcal and that of on 60th day sample was 369 Kcal/100gm. The salt (NaCl) content value on 0 day was 3.82% and on 60th day, 3.09%. The Vitamin C (ascorbic acid) content on 0 day was observed 9.92 mg and on 60th day 9.93 mg/100gm sample. There were no statistically significant differences (P<0.05) observed in all parameters studied in the values of 0 day and that of the 60th day analysis.

Changes in microbial composition TPC CFU/ml during the storage period

From the data presented in the above table, it is seen that the total plate count on 0 days At dilution 10-2 was no growth cfu/ml and that of on 60th-day storage sample it was also no growth cfu/ml. As it was the dehydrated product, there were no significant differences observed in the values on 0 day and that of on 60th day of storage. Thus, the sample was found to be remained in good condition without showing any sign of spoilage as far as microbiological changes are concerned.

Changes in sensory quality attributes

The data on changes in sensory quality for the attributes (colour, texture, taste, aroma, appearance and overall acceptability) evaluated for 0 day sample and 60th day storage sample is presented Table given below.

<table>
<thead>
<tr>
<th>Sensory quality attributes</th>
<th>Storage Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 day</td>
</tr>
<tr>
<td>Colour (5)</td>
<td>4.46</td>
</tr>
<tr>
<td>Texture (5)</td>
<td>4.14</td>
</tr>
<tr>
<td>Taste (5)</td>
<td>4.30</td>
</tr>
<tr>
<td>Aroma (5)</td>
<td>4.25</td>
</tr>
<tr>
<td>Appearance (5)</td>
<td>4.34</td>
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<tr>
<td>Overall acceptability (5)</td>
<td>4.30</td>
</tr>
<tr>
<td>Means of mean</td>
<td>4.30</td>
</tr>
<tr>
<td>Rank</td>
<td>I</td>
</tr>
</tbody>
</table>

Table no.3 Changes in sensory quality attributes of the Kothimbir Vadi of 0 day and 60th day storage sample*

*Key Score: 5= Excellent, 1= Very Poor Rank: - I= point >4.0 and above II= point < 4.0

There were no significant differences observed in all the quality attributes when evaluated for 0 day sample of kothimbir vadi and compared with that of 60th day sample. Hence, as far as the changes in sensory quality attributes are concerned, the instant mix was found to be remained in good condition upto a storage period of 60 days.

Thus, considering the overall quality parameters, changes in the proximate constituents, microbial profile and sensory quality attributes, the multigrain instant kothimbir vadi mix was found to be remained in good condition without showing any sign of spoilage for a storage period of 60 days under ambient condition. It could be therefore exploited on commercial scale for instant kothimbir vadi mix.

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