ABSTRACT

Aims: To incorporate date seed powder in the preparation of cookies and to perform the quality evaluation of the cookies.

Study Design: Experimental design.

Place and Duration of Study: College of Food Science and Technology, PJTS Agricultural University, Rudrur, from March 2021 to August 2021.

Methodology: The cookies were prepared by formulating trials. For test samples the refined wheat flour was replaced with date seed powder in different proportions. Sensory evaluation was performed to know the acceptability of the cookies. Quality evaluation was performed for the control sample and the most accepted cookies.

Results: Results of sensory evaluation showed that 12% date seed powder incorporated cookies was highly acceptable with a score of overall acceptability 8.3. Carbohydrates, protein, fat, fiber content of the standardized cookies was found to be 60.57%, 5.78%, 22%, 5.26% respectively. The physical parameters like diameter, thickness and spread ratio increased with supplementation of date seed powder.
Conclusion: Date seed powder rather discarding as waste; can be used to develop innovative products. Date seed powder can be used to develop products with functional and nutraceutical use.

Keywords: Date seeds; fiber; cookies; quality evaluation.

1. INTRODUCTION

Date palm plays an important role in the economic and social life of the people in the date producing countries [1]. The date is an important agricultural crop in most of the Middle East countries and date is a staple food for millions of people in the world. It is an important plant in arid region. *P. dactylifera* (date palm) is a flowering plant species belongs to the palm family of *Arecaceae* [2].

The fruit of the date palm is composed of a fleshy pericarp and seed that is usually oblong, ventrally grooved, with a small embryo and a hard endosperm. Date seeds constitute 10-15% of the weight of date fruit. The seed characteristics of date varieties change according to variety and environmental conditions. Soil fertilization [3], irrigation, daily temperatures, duration of the growing period and other post-harvest treatments (further drying or moistening of the fruit) are the factors which can affect on physical properties of the date fruits. It is conceivable that these factors are also likely to affect those of the date seeds [4].

The length, width and weight of the seeds range from 1.2-3.6 cm, 0.6-1.3 cm and 0.5-4 g, respectively. Date seeds contain high levels of valuable bioactive compounds and dietary fiber [5].

The seeds are mainly utilized as animal feeds by cattle, sheep, camel, and poultry industries. Roasted and powdered date seeds are used by some rural communities as coffee substitutes and coffee like preparations made from date seeds [6]. Date seeds do not have a smell or odorless and has a slightly bitter taste blend. In general, it has a light and dark brown [7]. Date seeds are reported to contain many minerals such as sodium, potassium, magnesium, calcium, phosphorus, iron manganese, zinc, copper, nickel, cobalt, chromium, lead and cadmium [8]. Dates provide a good source of energy (213 and 314 kcal/100 g—fresh and dried respectively) mostly due to the high carbohydrate content, averaging 54.9 and 80.6 g/100 g for fresh and dried fruit, respectively. Date seeds were found to be excellent source of dietary fiber and their variety level was between 64.5 and 80.15 g/100 g fresh weight [9].

Cookies have now become loved fast food products for every age group. These are easy to carry, tasty to eat, cholesterol free and reasonable at cost. In India about 25% of the wheat is used in the preparation of baked goods [10] States that have large intake of biscuits and cookies are Maharashtra, West Bengal, Andhra Pradesh, Karnataka, and Uttar Pradesh. Cookies are one of the best-known quick snack products. They are characterized by a formula high in sugar and shortening and low in water. The main ingredients of cookies are wheat, flour, fat, and sugar. Water is also added, helping the process of making cookies but is not a final ingredient, that is it is not a component of final food product. The chemical composition of cookies is of significance importance as they contain 22-30% of fat, 4-8% protein contents and 60-70% carbohydrates. Cookies require soft dough, while biscuits require hard dough. Cookies are little heavier than biscuits, whereas, biscuits are fluffier than cookies. Cookies contain more sugar than biscuits.

2. MATERIALS AND METHODS

2.1 Experimental Materials

The raw materials used were dates, refined wheat flour, shortening, sugar, baking powder and vanilla essence were procured from the local market at Rudrur, Nizamabad. Chemicals such as Mercuric oxide, Potassium sulphate, Sodium hydroxide, Boric acid, Hydrochloric acid, Petroleum ether and Sulphuric acid were purchased from M/s Telangana scientific Pvt Ltd, Hyderabad, Telangana state.

2.2 Preparation of Date Seed Powder

Dates were purchased from the local market. The seeds from the dates were separated manually and dried; then grinded into powder.

2.3 Preparation of Date Seed Powder Incorporated Cookies

The cookies were prepared using the following method shown in Fig.1 with standard control
recipe and formulated trials (Table 1) For test samples, the refined wheat flour in the formulation was replaced with date seed powder @ 6, 12 and 18 percent (w/w) as shown in Table 1 [11].

The quantity of ingredients for the formulation of cookies was given in table 1.

2.4 Physical Analysis of Cookies

The determination of diameter, thickness was done by following the method of AACC (2000) [12]. Spread ratio was determined from the diameter and thickness using the formula:

\[
\text{Spread ratio}: D/T \quad \text{Where, } D \text{ is the diameter and } T \text{ is the thickness of cookies.}
\]

2.5 Chemical Analysis of cookies

2.5.1 Estimation of moisture content

Moisture content of the developed products was measured by using standard method [13].

2.5.2 Estimation of Protein content

Protein estimation was done by micro-kjeldahl method [14].

2.5.3 Estimation of Fat content

Fat content was estimated by Soxhlet method AOAC (2000) [12] using the automatic SOCS Plus Solvent Extraction System.

2.5.4 Estimation of Ash content

The total ash content of given food sample was estimated by using AOAC (2016) [13] method.

2.5.5 Estimation of Crude fiber

Crude fiber content was determined by standard method (AOAC 2016) [13].

2.5.6 Estimation of carbohydrate content

Carbohydrate is done by difference method. Carbohydrates can also define chemically as neutral compounds of carbon, hydrogen and oxygen.

\[
\text{Carbohydrate} \% = 100 - (\% \text{ Moisture} + \% \text{ Ash} + \% \text{ Fat} + \% \text{ Protein})
\]

Net carbohydrates= Actual carbohydrates- fiber

Weighing of ingredients according to the set formulation

↓
Mix all dry ingredients (flour and leavening agent)

↓
Sieving

↓
Creaming (Mixing of sugar and shortening)

↓
Mix cream with dry ingredients to form a homogenous mass

↓
Making small balls rolling into sheet

↓
Cutting of sheet with cutter to make cookies

↓
Place the cookies in a baking pan greased with hydrogenated vegetable oil

↓
Baking at 160ºC for 15 min

↓
Allowing the cookies to cool at room temperature

↓
Packaging in polythene bags

↓
Storage at room temperature

Fig. 1. Flow diagram for preparation of cookies
Table 1. Formulation of date seed powder incorporated cookies

<table>
<thead>
<tr>
<th>Ingredients(g)</th>
<th>Control</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined wheat flour</td>
<td>50</td>
<td>47</td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td>Date seed powder</td>
<td>-</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Shortening</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Sugar</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Leavening agent (baking powder)</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Water</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Flavour (vanilla essence)</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

F1- control sample  
F2-with 6% date seed powder  
F3-with 12% date seed powder  
F4-with 18% date seed powder

2.6 Sensory Analysis

The sensory evaluation of prepared samples was carried out by a 10 member trained panel comprised of undergraduate students and academic staff members of the faculty who had some previous experience in sensory evaluation. The panel members were requested in measuring the terms identifying sensory characteristics and in use of the score. Judgment were made through rating products on a 9 points Hedonic Scale with corresponding descriptive terms ranging from 9 'like extremely to 1 'dislike extremely’. The format for sensory evaluation card [15].

3. RESULTS AND DISCUSSION

3.1 Preparation of Products

The procedure for preparation of cookies is followed as shown in flow sheet. The resulted products from four formulations of one control sample and 3 formulations of date seed powder incorporated cookies varied in physical, chemical and organoleptic properties. The prepared cookies are shown in Fig. 2, 3, 4 & 5.

3.2 Physical Analysis of Cookies

Date seed cookies were evaluated for the physical parameters like diameter, thickness, spread ratio and spread factor. The results were presented in Table 2.

Physical characteristics of the cookies were presented in table. It was found that the diameter of the cookies increased with the increased level of date seed powder. There was an increase in the thickness with by increasing supplementation. With the increase in date seed powder the spread ratio also increased gradually.

Spread factor also increased with the increase in date seed powder.

Similarly physical analysis of cookies was carried out by Raihan et al. [16]. Diameter, thickness and spread ratio was determined for cookies.

3.3 Organoleptic Evaluation of Cookies

Sensory evaluation acceptance tests were performed for cookies; which were formulated by the addition of date seed powder in different proportions to know the acceptability of the prepared products by using Hedonic scale. Judgement were made through rating products on a 9 points Hedonic scale with corresponding descriptive terms ranging from 9 ‘like extremely’ to 1 ‘dislike extremely’. The acceptance scores assigning for various sensory parameters like appearance, colour, flavour, texture, taste and overall acceptability.

It was observed that the highest overall acceptability score was awarded for sample F3 8.3 because it got acceptable results in flavour, colour, texture whereas the lowest value received for sample F4. The next parameter i.e., colour serves as the important parameter for the acceptance of food samples. The highest score found in sample F3 8.1 because of its acceptable colour whereas the lowest score was observed for the sample F1 7.2. The texture profile F2, F3 received the equal sensory score which was notes as 8.4. The highest value of flavour obtained for F3 and lowest for the sample F4 6.5. M. Nasir et al., (2010) done sensory evaluation for cookies prepared with defatted maize germ by using 9-point hedonic scale in order to check the acceptability of cookies. All the sensory scores including overall acceptability revealed that the cookies with acceptable quality could be prepared with added defatted maize germ [17].
Table 2. Physical analysis of cookies

<table>
<thead>
<tr>
<th>S.no</th>
<th>Parameter</th>
<th>F1 (control)</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diameter (mm)</td>
<td>41.98±0.04</td>
<td>45.9±0.02</td>
<td>47.17±0.3</td>
<td>48.18±0.04</td>
</tr>
<tr>
<td>2</td>
<td>Thickness (mm)</td>
<td>8.10±0.01</td>
<td>8.4±0.03</td>
<td>8.52±0.02</td>
<td>8.56±0.04</td>
</tr>
<tr>
<td>3</td>
<td>Spread ratio</td>
<td>5.18±0.01</td>
<td>5.46±0.03</td>
<td>5.53±0.02</td>
<td>5.62±0.01</td>
</tr>
<tr>
<td>4</td>
<td>Spread factor</td>
<td>51.8±0.01</td>
<td>54.6±0.03</td>
<td>55.3±0.02</td>
<td>56.2±0.01</td>
</tr>
</tbody>
</table>

Values are means ± SD of three independent determinations

3.4 Proximate Composition of Control Sample and Optimized Cookies

The cookies were optimized with help of sensory analysis. Proximate composition of control cookie sample and optimized sample i.e., date seed powder cookies (12% date seed powder) were shown in table 3.

It was observed that the moisture content of control sample is less 3.2% compared to date seed cookies 4.9%. The protein content significantly increased from 2.91% to 5.78%. It was observed that fibre content in the optimized cookies was 5.26% which is more as compared to control sample. Similarly increase in the proximate composition was observed for date seed powder incorporated biscuits by Vinita et al. [18]. The powder of seeds from four varieties of date fruit were incorporated in biscuits @ 5, 10 and 15% levels. The study revealed that the date seed powder can be acceptable up to 5% and the nutrient composition of supplemented biscuits had higher content of fibre.

Similarly, proximate analysis of the cookies prepared from wheat/cooking banana flour blend was carried out by China M. A. H et al. [19]. The moisture, protein, carbohydrate, fat, crude fibre and ash content of the cookies were determined using the methods described by AOAC.
Table 3. Proximate composition of control sample and optimized cookies

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameter</th>
<th>Control</th>
<th>Date seed cookies (F3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moisture (%)</td>
<td>3.2 ± 0.16</td>
<td>4.9 ± 0.25</td>
</tr>
<tr>
<td>2</td>
<td>Ash (%)</td>
<td>0.54 ± 0.11</td>
<td>1.49 ± 0.07</td>
</tr>
<tr>
<td>3</td>
<td>Protein (%)</td>
<td>2.91 ± 0.23</td>
<td>5.78 ± 0.27</td>
</tr>
<tr>
<td>4</td>
<td>Fat (%)</td>
<td>23 ± 0.28</td>
<td>22 ± 0.37</td>
</tr>
<tr>
<td>5</td>
<td>Carbohydrates (%)</td>
<td>69.54 ± 0.49</td>
<td>60.57 ± 0.34</td>
</tr>
<tr>
<td>6</td>
<td>Fiber (%)</td>
<td>0.85 ± 0.14</td>
<td>5.26 ± 0.25</td>
</tr>
</tbody>
</table>

Fig. 6 Organoleptic evaluation of cookies

4. CONCLUSION

From the study it can be concluded that date seed powder is the potent source of all the major nutrients. Due to its high nutrient content it can be used in preparation of variety of products. It can be used in the preparation of bakery, confectionery and snack products. The products made with date seed powder was found acceptable in terms of taste, colour and flavour. Date seed powder can be used to develop special products for functional and nutraceutical use.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here: https://www.sdiarticle5.com/review-history/78461

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