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Development and storability assessment of cumin based value added product jeeroli

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Abstract

Cumin has been found to possess various pharmacological activities and also has ophthalmic effects due to the presence of various healthy chemical constituents. It is commonly used as a condiment and flavoring agent in many dishes. The quantity used in traditional practices is too low while consumption. To ensure consumption of cumin in daily life, a value added product named *jeeroli* (sweet sour balls made from cumin) was prepared and development process standardized. Jeeroli was prepared through dry roasting of jeera followed by cooling and coarse grinding. After grinding various combinations were tried using black salt, sugar, rock salt, lemon juice, sugar, dry mango powder and asafetida. Combination which performed best in sensory evaluation was selected to further studies. Shelf life based on sensory evaluation, moisture content antioxidant activity and microbial load it was found that jeeroli is safe to consume till 180 days of storage and could be explored as potential cumin based value added product for product diversification.

Key words: Antioxidant, cumin, jeeroli, phenol, shelf life, value addition.

Introduction

Cumin (*Cuminum cyminum* L.), commonly known as 'Jeera' or 'Zeera' is an important spice used in Indian kitchens for flavouring various food preparations (Lal *et al*., 2014). Cumin is the second largest popular spice after black pepper in the world. It is very pungent and aromatic, and is used in both forms whole and/or ground. Though cumin is a native of Egypt, it is mostly produced in India. India is the largest producer of cumin in the world. Apart from India it is also grown in North Africa, China and America. Cumin is one of the main ingredients in curry powders to most Indian food. India produces 70% of the world supply and consumes 90% of that (which means that India consumes 63% of the world's cumin (Dar *et al*., 2019). Besides that Syria (7%), Iran (6%), and Turkey (6%) are other cumin producing countries. The remaining 11% comes from other countries. In total, around 300,000 tons of cumin per year is produced worldwide. In 2018-19 the production estimation for cumin in India was around 0.61 million tons and area of about 1.03 million ha and the average yield was 0.59 tons per hectare (DSAD, Kozhikkode, 2018-19). Gujarat and Rajasthan are the two main production centers in India. Of these Rajasthan was estimated to produce 28 million tons in 67 million ha in the year 2018-2019 (Kozhikkode, DASD, Calicut). Cumin consumption in Indian diets occupies a remarkable place. Indian curries are seasoning based preparations. After heating oil the first ingredient exposed to oil to release aroma and flavor is cumin. Cumin has a warm aroma due to its essential oil content. Its main constituent aroma compounds are cuminaldehyde (a promising agent against alpha-synuclein aggregation) and cuminic alcohol. Cumin is the key ingredient in preparation of different curry mixes in India. Except curry the famous “Dhal Tadka” is seasoned dhal preparation with cumin. “Zeera polav” is seasoning the rice with exclusive aroma of cumin. Except seasoning cumin is dry roasted and after cooling converted into powder to sprinkle on buttermilk, yogurt and raita. Indians have strong history of consumption of cumin as breast milk stimulator (food which is believed to stimulate milk production in lactation) and improves digestibility of milk to infant. It is also believed that consumption of cumin in lactation helps to shed off extra weight gain by human body during pregnancy (Morsy *et al*., 2018). Essential oil of cumin counteracts acute acetaminophen hepatotoxicity Ebada (2018).

Alcohol and water extract of cumin are reported to possess many nutraceutical properties like antiallergic, antioxidant, anti-platelet aggregation and hypoglycemic. Hodi *et al.* (2018) reported that significant reduction in plasma concentration of total cholesterol and low-density lipoprotein cholesterol after cumin supplementation. Cumin and value added products from cumin can be a good source of nutraceuticals with many

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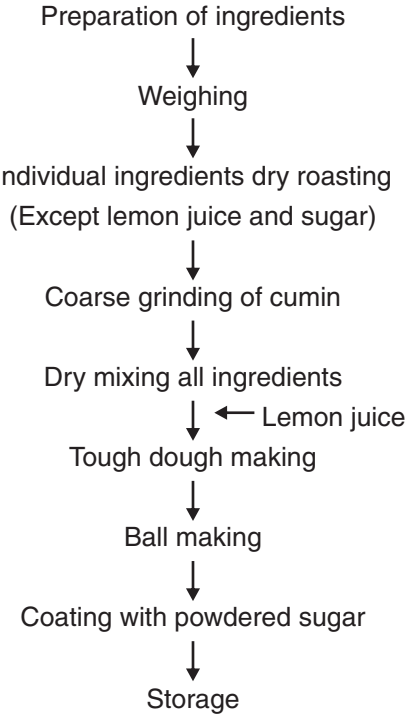
biological activities (Soubhagya, 2013). Cumin seeds in various forms can be used as a source of medicinally important compounds for their use in developing functional foods also (Agarwal *et al.*, 2019). Dar Eajaz Ahmad (2019) beamed light on the nutritional profile of cumin and states that it is rich in total dietary fibre (10g $100g^{-1}$), calcium (931 mg $100g^{-1}$), iron (66.36mg $100g^{-1}$), Magnesium (366 mg $100g^{-1}$) phosphorous (499mg $100g^{-1}$) and niacin (4.58mg $100g^{-1}$).Thus consumption of cumin is highly favorable for all the age groups. Value added products from cumin, *viz.*, cumin powder, essential oil and oleoresin are commercially viable products and find application in food processing industries. Cumin can be considered as a health promoting food additive as it contains significant proportions of monounsaturated fatty acids (MUFA) but as a spice, cumin is consumed in low quantities which may not be sufficient to provide the health effects (Sowbhagya, 2013). Food processing involves changes in structural integrity of the plant material and this produces both negative and positive effects on their antioxidant activity. The antioxidant activity is diminished owing to inactivation of antioxidant compounds caused by different chemical reactions enhanced by the effect of heat. The positive effects of food processing include in some cases, transformation of antioxidants into more active compounds, such as the deglycosylation of onion quercetin, as well as an increase in the antioxidant activity owing to inhibition of enzymes (Jana *et al.*, 2007). With the increasing awareness and demand for functional foods, the consumption of cumin in different forms (e.g., as an ingredient of a ready to drink beverage, as a mouth freshener) can be popularized. However, the effective dosage to get maximum health benefits for an individual should be worked out. Therefore the aim of the present study was to extract out the potential of antioxidental properties of cumin in the form of succulent jeeroli as well as effect of processing on antioxidant, total phenols and flavanoid content in the key ingredients of jeeroli.

Material and methods

The study was carried out during 2019-2020 at post harvest technology laboratory of ICAR-NRCSS, Ajmer. Cumin was the base ingredient of jeeroli hence, cumin seeds were procured from farm section of ICAR-NRCSS, Tabiji, Ajmer. Collected seeds were cleaned to remove dust particles and stones if any. Beside this other ingredients such as black salt, sugar, rock salt, lemon juice, dry mango powder, asafetida was procured from the local market of Ajmer, Rajasthan. Asafetida is the magical spice which corrects the digestion system. Cumin seeds were first roasted, cooled and then coarsely grinded with the help of domestic grinder. After grinding all ingredients were mixed except lemon juice. A little amount of powdered sugar was kept for further use. After dry mixing of all the ingredients, lemon juice was added slowly to prepare hard dough. Dough was divided into uniform portions and after rolling each portion small sweet sour ball (i.e. goli in hindi) were prepared. As balls were prepared immediately placed on a flat tray which have a layer of powdered sugar and thoroughly rolled over the sugar so that sugar properly coat the balls properly. Small balls means goli with base cumin (Jeera in hindi) named as jeeroli. Different combinations were tried to standardize the jeeroli with the key ingredients.

Development process of Jeeroli



Jeeroli development and suitability consideration through organoleptic evaluation carried out by a semi trained panel comprising 15 panelists from the ICAR-NRCSS, Tabiji, Ajmer, Rajasthan (India).They were pre-selected on the basis of good health conditions, time availability, no allergy plants products and willingness to participate. Panelists were then subjected to preface insight tests to look into their ability to recognize basic taste, basic aromas, and to describe basic attributes in prepared products by triangle method (Byer 1953, Amerine, 1965). The panelists performed organoleptic appraisal by 9 point hedonic test (Peryam, 1952) to

assess the overall products preferences. The antioxidant activity was evaluated on the basis of its activity in scavenging the stable DPPH (1, 1-Diphenyl-2-picrylhydrazin) radical, using a slight modification of the method described by Shimada (1992) expressed as mg GAE/L. The microbial counts for bacteria, yeast and mould in products were observed as per Speck (1985) method. Jeeroli samples were packaged in low-density polyethylene and stored for 180 days at 29°C and 70 % relative humidity. The samples were tested in three replicates and data was analyzed statistically for mean value and standard deviation using online OPSTAT software.

Results and discussion

Sensory characteristics of jeeroli

Sensory evaluation was one of the earliest methods of quality control and it is sill widely used in food industry. Using sensory analysis to assess food products provides valuable information and insights that can be utilized to ensure consumer expectations are met or exceeded. Provide answers to very important questions about the products that translate directly to revenue and market success. Therefore, sensory evaluation was performed for jeeroli at an interval of two months till six months. Over all acceptability was recorded 8.1 ± 0.60, 8.0 ± 0.83, 7.9 ± 0.39, 7.5 ± 0.32 respectively for fresh (0 days), after 60 days, after 120 days and after 180 day old jeeroli (Fig. 1). All the sensory attributes revealed that there was slight decrease in quality but even jeeroli was good to eat up to 180 days of storage. Which was clearly indicates that the product can be preserved till six months. That might be due to that essential oil and essence is capable of inhibiting food borne pathogens and extend the shelf-life of processed food (Smith-Palmer *et al.*, 1998). Spices are aromatic or pungent vegetable substances used in small quantities to enrich, alter or mask the flavour of food (Al-Mofleh, 2010). They prolong the storage life of foods by preventing rancidity and oxidation of lipids (Kelen and Tepe, 2008). Sensory shelf life testing (SSLT) is a vital tool for a food or beverage manufacturer. Its value extends beyond the standard issuing of 'best by' or 'best before' date (Kilcast, 2016).

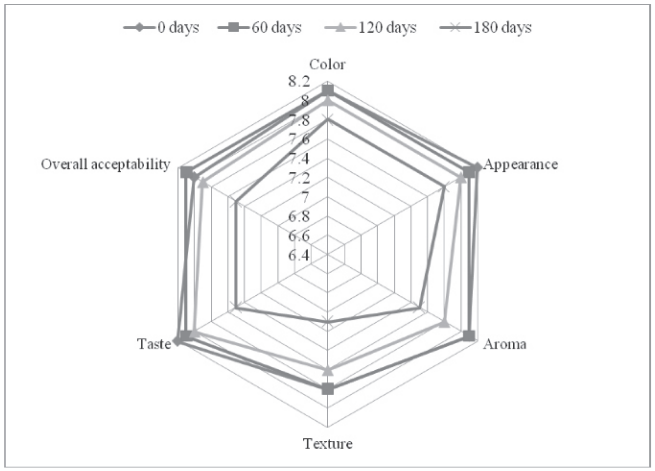


Fig 1. Antioxidant activity of jeeroli at different storage intervals

Effect on of storage duration on moisture content

The effect of storage on the moisture contents of the jeeroli was also recorded (Fig. 2). The moisture contents of the jeeroli increased during storage, and this observation conforms to the findings of Yilmaz and Öğütcü (2015). This may have been due to the permeability of the packaging materials. Moisture content and water activity have effect on the qualities of food during storage (Takeungwongtrakul & Benjakul, 2017, Nwosu & Akubor, 2018, Balestra *et al.*, 2019). The more available the moisture content, the higher the activity of the spoilage agents. Foods such as jeeroli require low moisture permeability-packaging so as to preserve their crispiness (Duta *et al.,* 2019).

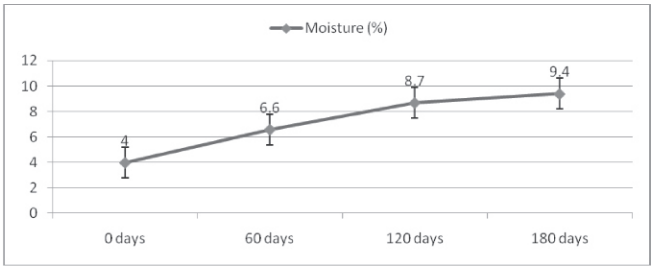


Fig. 2. Changes in moisture content of jeeroli at different storage intervals

Effect on of storage duration on antioxidant activity

Cumin seed is a good source of these bioactive compounds which also possess good antioxidant activities against free radicals Juhaimi & Ghafoor (2013). The antioxidant activity as DPPH of methanolic extracts of jeeroli at different storage intervals is shown in Figure 2. Data indicated that decreasing trend in DPPH radical scavenging (%) was recorded during storage of 180 days from 84.3 to 81.46. The decrease in ascorbic acid, total poly phenols and total flavonoids content led to a decrease of antioxidant activity. Tomczak (2007) also observed a decrease in antioxidant activity during storage of black chokeberry juice concentrate. The reason for decrease in antioxidant activity during storage may be attributed to dilution of antioxidant components by increased moisture and also to possible oxidation of

antioxidant components under favorable conditions during storage. Camire *et al.* (2005) while working on lipid oxidation in extruded corn reported that phenolic components are lost during storage. Tomczak Walkowiak- (2007) reported that during storage antioxidant activity decreased in black chokeberry juice concentrates. Dar *et al.* (2016) also reported in decrease in physiochemical, total phenolic content and antioxidant properties of bran enriched snacks during storage.

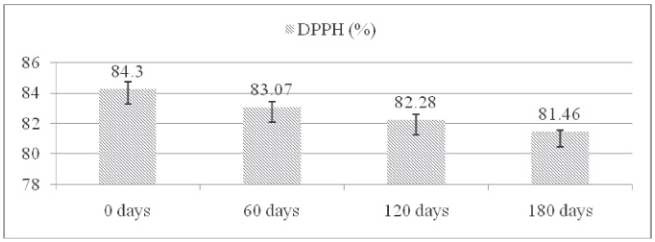


Fig. 3 Antioxidant activity (DPPH) during storage

Effect on microbial load during storage of jeeroli

Contamination of foods by mould or bacteria is common. Hence, their presence in the finished product is considered unfit for consumption (Ranganna, 1986). The micro organisms in processed foods are sometimes inherent to the external environment. It is virtually impossible to process the foods to sterile products without altering the organoleptic changes in many cases. The total plate count (cfu g^{-1}) of jeeroli is presented in Table 1. Microbial load was recorded through serial dilution method after every 60 days interval for both bacterial count and fungal count. It is clear that there is no microbial growth in the jeeroli at initial stage. The microbial loads of the jeeroli increased during storage indicating that the storage condition was favorable to microbial growth. However, the increase in microbial load after 180 days of storage was negligible ($4.00x10^2$) and safe for consumption. Therefore that bacterial load was within safer limits which ensure the consumption till six months. There was no fungal growth observed in the product till 180 days. Butt *et al.* (2004), Seevaratnam *et al.* (2012) and Nagi *et al.* (2012) also observed an increase in microbial loads of wheat flour and biscuits during storage. This result also conforms to the report of Jan *et al.* (2017).

Table 1. Bacterial load of jeeroli during storage

S. No.	Storage period	Mean	St .dev	SE (m)
1.	Fresh (0 day)	0	0	0
2.	60 days	1.33×10^2	0.47×10^2	0.27×10^2
3.	120 days	2.67×10^2	0.47×10^2	0.27×10^2
4.	180 days	4.00×10^2	0.82×10^2	0.47×10^2

Conclusion

Jeeroli was studied for its shelf life sustainability and found safe to consume till 180 days of storage. Jeeroli has also expressed a good amount of antioxidant capacity which is good to consumed by human. This study proves that the intake of cumin can be quantified in good amounts as it is loaded with the antioxidants. As cumin is used in seasoning agent in Indian meals in very less quantity except seasoning, it is consumed only in medicinal form occasionally. Thus jeeroli provides a healthy alternative to individual in a succulent form. Value addition in spices is very scarce. So this study also helps to drag a step ahead towards value addition of cumin.

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