Development and evaluation of watermelon rind crackers

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***Abstract*- Watermelon is a sweet and refereshing low calorie summer fruit. It provides hydration ans also essential nutrients, including vitamins, minerals and antioxidants. Watermelon rind may be eaten and it is full of vitamins C, B6 & A. The watermelon rinds contain citrulline, which help in fight free radical damage and boost immune system. The objective of the research was to develop watermelon rind Crackers and evaluate for its sensory and nutritional qualities. The procedure for watermelon rind crackers was standardized and then four different variations were developed using sugar, ajwain, kasturi methi and chat masala. Sensory analysis of the developed products was conducted by semi trained panelists using 9 Point hedonic scale, for consumer acceptability. The results of the sensory evaluation score showed that variation I, watermelon rind crackers with sugar was highly acceptable and which is on par with control crackers with respect for appearance, colour, texture and taste. This was followed by variation II, watermelon rind cracker with ajwain, was also acceptable by the consumer. But the variation III, watermelon rind crackers with kasturi methi were not much acceptable by consumer due to changes of colour, taste of the crackers. It can be concluded that the watermelon rind crackers with the sugar was preffered the most by the panelists. The other watermelon rind crackers was enhanced by adding chat masala, ajwain are also good, but crackers with sugar was liked the most compare to others. Nutritional composition of standardized watermelon rind crackers was determined by conducting proximate analysis and according to shelf life study the standardized watermelon rind crackers was remained fit for a period of 30days for consumption.**

***Keywords*: Watermelon rind, antioxidant, citrulline, crackers, 9 point hedonic Scale.**

INTRODUCTION

Watermelon is a sweet and refreshing low calorie summer fruit. It provides hydration and also essential nutrients, including vitamins, minerals, and antioxidants. Watermelon is around 90% water, which makes it useful for staying hydrated in the summer.(Iqbal, at.el., 2015). Watermelon rinds, usually a light green or pale green color, are also edible and contain many hidden nutrients, but most people avoid eating them due to their unappealing flavor. Most people throw away the watermelon rind. Rind not only contains plenty of health- promoting and blood-building chlorophyll, but the rind actually contains important amino acid citrulline than the flesh. Citrulline is a non-protein amino acid and was first identified from watermelon. Citrulline is used in the nitric oxide system in humans and has antioxidant and vasodilation roles (Chakrabarty, at.el., 2020)

The edible rind makes up approximately 40% of the total watermelon mass yet is often discarded as waste. Direct disposal of the rind waste is causing environmental issues, though several approaches of reusing watermelon rind have been investigated in a laboratory scale. The specialized function of the rind's polysaccharide composition (pectin and fiber) has been considered a potential reason for its reuse. It would be favorable to take advantage of the nutritional potential of rind and create commercial value, rather than limiting it to agricultural waste. Approaches have been introduced to reduce the accumulation of solid watermelon waste by converting the rind's polysaccharides into other products such as biosorbent, bioremediation, biochar and bioethanol. Additionally, watermelon rind has been studied as a source of nutritional food ingredients such as antioxidants, amino acids , and pectin, especially citrulline. In processed foods, rind has been tested in pickled form and in jam. Watermelon rind in powder form has been examined to apply in carbohydrate- based goods including cakes, cookies, noodles, beef patties, and pork patties. Furthermore, a few studies have Investigated watermelon rind as possible growth medium for microbials. .[Badry, *et al.*, 2014].

MATERIALS AND METHODS:

The experiment was conducted to study the effect of incorporation of different levels of Watermelon rind paste in order to produce good quality crackers. The present study on "Development and Evaluation of Watermelon (*Citrullus lanatus*) Rind Crackers for its sensory, shelf-life and consumer acceptability" was carried out at Department of Food and Nutrition, School of Home Science, Smt. V.H.D. Central Instituite of Home Science and Research centre, Maharani Cluster University, Bangalore during the year 2023. Watermelon (rind) were purchased from local market of Bangalore city, Karnataka, India. Remaining Raw materials such as Wheat flour (Maida), Sugar powder, Fat (oil) and Cumin seeds purchased from local market. The good quality and fresh watermelon fruit were procured from the local markets of Bengaluru, Karnataka, India.

Processing of watermelon to get watermelon rinds

The watermelon fruit were washed under running tap water and they were cleaned by using a clean cloth. A Watermelon pulp was separated from watermelon rind by using a knife and peeled by using a peeler. The rind was cut into small cubes.

Formulation of watermelon rind crackers

The crackers were made in the department of Food and Nutrition, School of Home Science, Smt. V.H.D. Central Instituite of Home Science and Research centre, Maharani Cluster University, Bangalore, using the standard recipe consisting of refined wheat flour, chilli powder, cumin seeds, sodium bicarbonate (Begum *et al.*, 2022). Various sample of watermelon rind crackers were standardize. Four variations were prepared T1 control, T2 (watermelon rind + wheat flour with sugar), T3 (watermelon rind + wheat flour with ajwain), T4 (watermelon rind + wheat flour with kasturi mehti), T5 (watermelon rind + wheat flour with chat masala) respectively. The other ingredients such as cumin seeds, salt, oil and water was calculated. Formulation for crackers preparation is summarized in Table 1. Firstly, watermelon rind paste is prepared with peeling, washing, chopping and cooking. Then all the ingredients were mixed along with watermelon paste according to proportions and a dough was prepared. Method used was baking on medium flame for 3-5 minutes. After baking, crackers were Cooled to room temperature and packed in alluminium foil for further chemical analysis and sensory evaluation (Fig. 1 and 2).

Fig.1 Flow chart of preparation of watermelon rind crackers

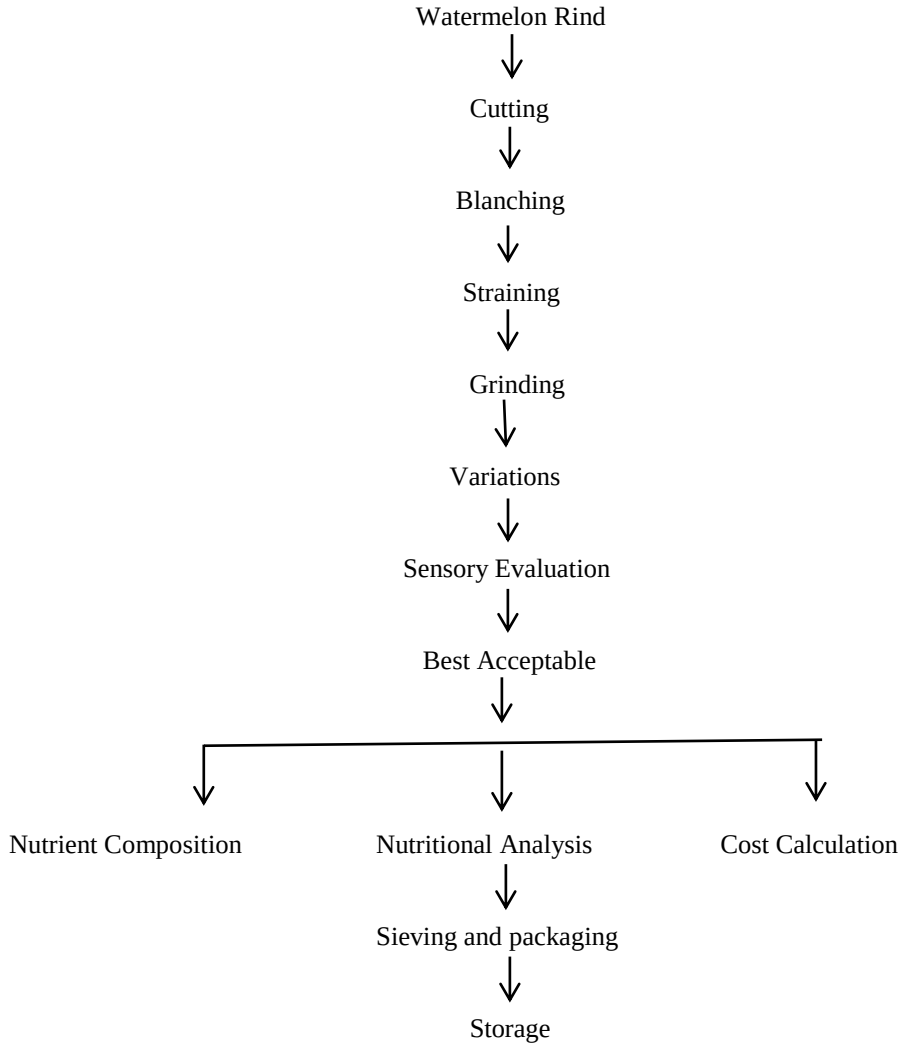


Fig.2 Schematic flow diagram of preparation of crackers

Weighing

Mixing

Dough making

Baking and Cooling

Organoleptic evaluation of the developed products

The products were subjected to sensory evaluation on a nine-point hedonic scale and the Sensory quality attributes, *viz.*, appearance, color, texture, flavor, taste and overall acceptability (Amerine *et al.*, 1965).

Statistical Analysis:

Statistical Analysis was done using computer software. The analysis was done by application of ANOVA at 5% significance level.

RESULT AND DISCUSSION:

TABLE - 1: Mean scores for the sensory evaluation of crackers samples

MEAN	T1	T2	T3	T4	T5
Appearance	7.96	8	7.76	7.76	7.54
colour	8.02	8	7.9	7.68	7.68
Taste	7.86	7.78	7.54	7.44	7.4
Flavor	7.96	7.92	7.66	7.48	7.66
Texture	8.06	7.92	7.86	7.64	7.56
Overall acceptability	8.06	8.1	7.76	7.76	7.76

Table 1: summarized the mean scores of hedonic sensory evaluations for color, taste, texture, flavour, appearance and overall acceptability of crackers samples. As can be seen watermelon rind crackers with substitution of sugar, ajwain, kasturi mehti and chat masala had a significant effect on all sensory parameters of the crackers samples. The appearance and texture were not significantly different in sugar (T2) and chat masala (T5) . However, they showed high scores in taste and texture compared to and ajwain (T3) and kasturi methi (T4). Generally, addition of WRC had significant effects on sensory attributes and overall acceptability of crackers samples. Addition of WRC caused darker color and crisp texture, which at level of 80% seem acceptable for consumers (Table 1). For consumers, color of the crackers is one of the important factors in sensory evaluation depending on their perception of crackers type. Average scores of crackers for flavour which can be determined by the sense of smell, was significantly lower in T2 WRC and T4 WRC compared to T3 WRC and T4 WRC which showed addition of ajwain and kasturi mehti, more than 5% has a negative effect on final product in terms of aroma. As shown in (Table 1), same trend observed in taste, texture and appearance. However, sample of T2 has more acceptability, compare to T3, T4 and T5 by panellists. Therefore, WRC received acceptable scores for all samples, since had an overall acceptability of 8.00.

TABLE - 2 Nutritional composition of watermelon rind crackers:

	Watermelon rind crackers
Moisture (%)	10.72
Protein (%)	1.20
Carbohydrates (%)	74.7
Fat (%)	7.96
Ash (%)	1.75
Fiber (%)	5.12
Calcium (%)	105.79

Potassium(%)	772.59

*(AOAC)

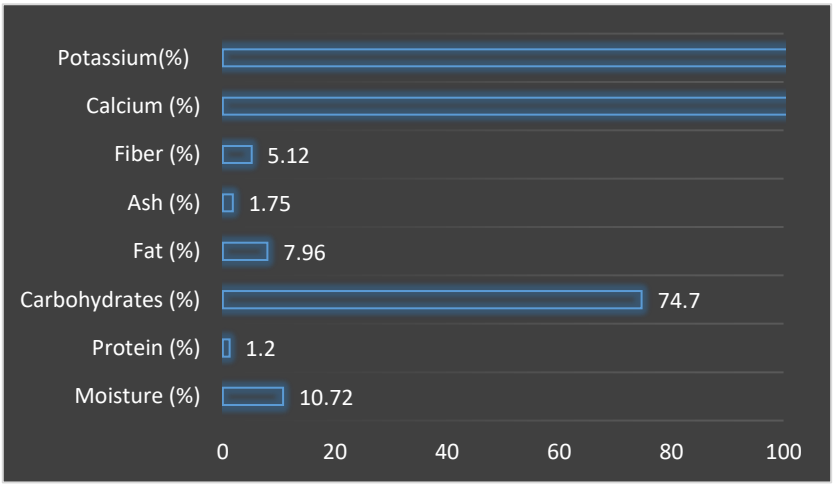
The compositions of watermelon rind Crackers (WRC) are shown in Table 2. According to the obtained results, all the parameters were significantly different ($p<0.05$). The WRC had a significantly high amount of TS (89.28g/100 g of dry matter) and ash (12.61 g/100 g of dry matter) than wheat flour. However, it had a lower level of moisture (10.72g/100 g of dry matter) and protein (11.21 g/100 g of dry matter) and energy (337.26 kcal/100g) than wheat flour. watermelon rind crackers was packed in alluminium foil and kept for storage study at room condition. Further crackers was subjected to sensory evaluation on 1st, 15th and 30th day intervals. It was observed that T2 sample had scores of 8, 8, 7.7, 7.9, 7.9 and 8.1 for appearance, colour, taste,lavour, texture and overall acceptability respectively. Whereas T3 sample had scores of 7.7, 7.9, 7.5, 7.6, 7.8 and 7.7 for appearance, colour, taste, flavour, texture and overall acceptability. and T4-T5 samples have scores ranging from 7.5- 7.7 (appearance), 7.6 (texture), 7.4-7.6(colour), 7.4-7.6 (flavour), 7.4 (taste) and 7.7 (overall acceptability) at the end of the 30th day. It was observed that T2 was more acceptable than the other three variations after 30th days of sensory evaluation with a score of 7.7 for overall acceptability, which was found comparatively high than the other three variations. Hence, the results indicated that as the storage period increased sensory scores of the watermelon rind crackers decreased.

This is support for the present study, Begum(2022), The results revealed that the consumption of petha is safe up to 30-45 days of storage was found to be good for storage at room temperature. According to Chakrabarty et al. (2020), Based on the sensory evaluation, noodles supplemented with watermelon rind may be a convincing option for the public in terms of a food product based on nutritional value rather than taste. The results were almost similar with the study of Iqbal (2015), The overall acceptability of the cake sample incorporatin watermelon rinds flour was more acceptable and significantly better from other cake samples prepared with watermelon rinds flour.

Proximate composition of watermelon rind crackers

The results obtained from the present study indicated that moisture and protein content was decreased slightly. However, the other nutrients like fat, crude fibre, carbohydrate and minerals content was similar as with the results of Deepa Madalageri (2015).

Fig.3 Proximate composition of crackers prepared with incorporation of watermelon rind crackers



The highest ash (1.75%) were observed in sample T2 (WRC with sugar). In this research, fat content (7.96%) were observed (Fig.3), the total carbohydrate (74.7%), whereas sample T2 resulted higher calcium and potassium (105.79 and 772.59) content of WRC might be possible reason behind the decreasing of fat and increasing of carbohydrate content in supplemented crackers. By addition of wheat flour there is increase in the carbohydrate percentage in crackers is due to presence of high calories in wheat flour .

CONCLUSION

In conclusion the based on obtained results, the incorporation of WRC and wheat flour in given ratio caused significant influence on sensory and physico chemical attributes. By addition the level of WRC incorporated into wheat flour, the darkness of crackers samples were ignificantly increased. Crackers samples substituted with sugar, ajwain, kasturi mehti and chat masala. Sugar had the highest mean scores of overall acceptances among samples. Watermelon rind crackers had good acceptability by the consumers and it could be stored at air tight room temperature for the period of maximum 30days respectively on the basis of consumer acceptability, microbiological and sensory parameters could be stored at air tight room temperature for the period of maximum 30days respectively on the basis of consumer acceptability, microbiological and sensory parameters. Therefore, this knowledge can be used to make commercial products which can be economically fair with high nutritional quality and good health benefits with an option for byproduct utilisation also. The introduction of such new technology, would increase overall economic, society health and well-being.

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