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Development of Ready to Serve Beverage from Kokum Residue Powder and its Quality Evaluation

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A B S T R A C T

Kokum fruit is used for preparing of syrup, *agal* (salted juice) sol curry etc. Rind also has much commercial application such as colour pigment, wine, concentrate and *amsol* (Wet rind) etc. Kokum RTS is generally prepared from kokum juice after extraction from rind. The kokum rind residue left after the juice extraction goes waste. Hence the main aim of the study is to use the waste for value addition, taking this into account the research was conducted on utilization of Kokum rind waste for RTS preparation and its quality evaluation. There were six treatments comprising of storage days viz. 0 days, 30 days, 60 days, 90 days, 120 days, 150 days. The instant RTS was prepared at every 30 days interval from stored kokum residue powder up to 150 days and analysed the physicochemical composition and sensory quality at each 30 days interval.

Introduction

Kokum (*Garciniaindica* Choisy), a tropical spice tree native of Western Ghats of India. It is distributed throughout western peninsular coastal regions and the adjoining Western Ghats of Maharashtra, Goa, Kerala and Karnataka. Kokum fruit is cardio tonic, anthelmintic, anti-acidic and useful in piles, dysentery, tumours and pains. It is called as Indian spice with pleasant acceptable flavour and has sweet acidic (sour) taste which makes it popular food additives. It can be used as culinary agent in food, pharmaceuticals and neutraceuticals product development. The fresh rind of kokum contains 80 % moisture, 1

% protein, 1.7 % tannin, 0.9 % pectin,14% crude fibre,4.1% total sugar, 1.4% fat (Krishnmurthy *et al.,* 1982; Baliga *et al.,* 2011). According to phytochemical investigation, when kokum fruits compared with any other natural sources of anthocyanin, kokum rind contains the highest concentration of anthocyanin (2.4 g/100 g of kokum fruit) (Nayak *et al.,* 2010). Anthocyanin is responsible for scavenge free radicle activity and antioxidant activity.

The rind also contains hydroxy citric acid (Verghese, 1996) which is an anti-obesity agent and yellow crystalline compound named as garcinol acted as an anticancer agent. Considering the increasing importance of its antioxidant activities and other functional components, the crop has been identified for consumption and development. It provide more nutrition than simple nutrition hence foods rich in preparation from kokum and its syrup can be considered as functional foods (swami *et al.,* 2014).

After 7-8 years the mature kokum trees comes into the flowering in the month of November to February and fruits are harvested in the month of April- May (Baliga *et al.*,2011). Fruit has very short life of 2-3 days after ripening and its utility starts only after processing of rind. As kokum is not available all over in year, it can be preserved by making it as a powder to use it for preparation of RTS (Bafna, 2013). Kokum in powder form have many advantages, including ease of packing, mixing, and use anywhere. The ripe kokum fruit is red or dark purple coloured containing 3-8 large seed. Kokum seeds with pulp are removed and rind is separate for drying. Drying of the rind decreases the water activity favourable for the growth of microbes which consequently increases the storability of rind (Baliga *et al.,* 2011). Dried rind and juice has much commercial application such as colour pigment, wine, concentrate, RTS, Syrup and powder etc. After extraction of juice from rind, rind residue goes waste cannot be utilized further. The present research work based on the utilization of kokum rind residue by making its powder which can be utilized for preparation of RTS. During processing and storage of Kokum Residue Powder a number of changes occur in it that affects the quality (physicochemical composition) of RTS prepared from it. Hence the present study was conducted on physicochemical changes in Kokum residue powder during storage and effect of storage of Kokum residue powder on quality of RTS.

Materials and Methods

The experiment was conducted in the laboratory of Post Graduate Institute of Post Harvest Management, Roha to develop the process of preparation of RTS from Kokum rind residue powder and studied the physicochemical changes in Kokum rind residue powder during storage and also finds out the effect of storage of Kokum rind residue powder on quality of RTS. The kokum fruits required for conducting research were collected from the kokum orchards of Dr. Balasaheb Sawant Kokan Krushi Vidyapeeth, Dapoli. After harvesting fresh ripe, mature fruits were selected, washed, cut into two halves and the juice from fruit rind was extracted by pressing the kokum rind with the help of basket press. The kokum pomace rind residue left Juice extraction was analysed before drying for the chemical parameters such as the T.S.S., titratable Acidity, reducing and total sugar, anthocyanin, and moisture. Kokum pumice rind after extraction of juice was treated with 10% salt then it kept for drying in cabinet dryer. The drying was carried out at 60^0c for 72 hrs. The dried rinds were grinded in a mixer grinder and the powder was prepared. The dehydrated kokum pumicerind residue powder were sealed in airtight 400 gauge LDPE plastic bags, labelled

and store at a cool and dry place in ambient condition. At every thirty days interval, Kokum rind residue powder is used for preparation of RTS and studied the physicochemical changes in Kokum residue powder during storage and also the effect of storage of Kokum residue powder on quality of RTS. There were six treatments comprising of storage days viz. 0 days, 30 days, 60 days, 90 days, 120 days, 150 days. The instant RTS was prepared at every 30 days interval from stored kokum residue powder up to 150 days. The Total soluble solid content was measured using at ago hand refractometer. Titratable acidity was estimated by methods suggested by Ranganna (1997). The product was also evaluated for sensory attributes like colour, flavour, taste and overall acceptability by a panel of 5 judges on 9 point hedonic scale (Amerine *et al.,* 1965) during storage. The powder was mixed in cold water, strain it and add the required quantity of sugar in powder form to the clear juice.

The total soluble solid and acidity of the powder was analysed to calculate actual amount of sugar and citric acid to be added in the RTS. It gives excellent taste; flavor and mouth feel to the consumers as that of traditional RTS prepared from fresh kokum rind. It can be formulated as and when required. The prepared Kokum Residue powder mixture can be used as and when desires to prepare the RTS. This product can be available in the form of powder. As the kokum having cooling effect the people enjoying this beverage at anywhere in any season because the material is easily available for preparation of drink in sachet (Fig. 1–3).

Physicochemical evaluation of Kokum residue powder and RTS

Colour evaluation

The colour of kokum residue powder and RTS prepared from it was measured using a Konica Minolta-CR-410 Chroma Meter and expressed as L*, a* and b* values. L* value gives a measure of the lightness of the product colour from 100 for perfect white to 0 for black, as the eye would evaluate it.

The redness/greenness and yellowness/ blueness are denoted by a* and b* values, respectively. The colour of the samples was measured after putting the samples in front of smallest aperture

Moisture content

Moisture content of powder was measured by using Moisture analyser

Total Soluble Solid

Total soluble solid of kokum RTS was determined by Digital refractometer (Make Atago)

Titrable Acidity

1 g sample of product dissolved in 100 ml distilled water, add 2 to 3 drops of phenolptheline indicator then titrate it with 0.1 N NaOHtill pink colour appears. Titrable acidity can be calculated as, Titrable Acidity *Burette* R*eading x*0.1*x*0.064*x*100

Weight of sample

Total sugar

Determination of total sugar was carried out through Lane and Eynon Method as described by James (1995).

Sensory evaluation

Sensory evaluation of all the prepared kokum RTS was done by taste panel. The tasting panel was consisting of 10 members. They were asked to evaluate the color, flavor and

overall acceptability by a scoring rate on a 9scale. 9= Like extremely, 8=Like very much, 7= Like moderately, 6= Like slightly, 5= neither like nor dislike, 4=Dislike slightly, 3= Dislike moderately, 2=Dislike very much and 1=Dislike extremely. The different preferences as indicated by scores were evaluated by statistical methods.

Results and Discussion

Residual analysis of kokum pomace rind before drying

During the course of investigation chemical composition of kokum pomace rind after extraction of juice and before processing was studied.

The data in relation to estimated values for chemical components are furnished in the Table no. 1.

Physicochemical changes in Kokum residue powder

The changes in physicochemical composition of instant RTS prepared from Kokum residue powder of different storage treatments are presented in the table no. 1

The TSS of Kokum residue powder significantly decreased with increasing storage period from beginning to end of storage.

Acidity

The titrable acidity of kokum pomace rind powder witnessed a decreasing trend during storage period of 150 days. The decline in titrable Acidity (%) with increasing storage in the present study was supported by the previous report on foam mat dried mandarin powder by (Kadam *et al.,* 2010).

Moisture

The moisture content of the kokum residue powder was significantly increased from 6.04 to 10.78 %during storage period. The changes in moisture content during storage might be due to the environmental changes that increases Relative humidity outside the packaging material. Decrease in environmental temperature resulted in an increase in the relative humidity outside the packaging material which was further responsible for movement of water vapour inside the packet (Wilson *et. al*., 2013)

Total sugar

The total sugar content of kokum residue powder was maximum just after drying but it was minimum at the end of storage. The total sugar of the kokum residue powder was significantly decreased from 17.62 to 10.84during advancement of storage period. The decrease in total sugars might be due to the non-specific hydrolysis of macromolecules, interconversion of sugars and aggregation of monomers during storage Similar results were obtained by Pareek and Kaushik(2012) in Indian gooseberry (*Emblicaofficinalis* Gaertn.) powder during storage.

Effect of storage of Kokum residue powder on Chemical parameters of Instant RTS

The changes in physicochemical composition of instant RTS prepared from Kokum residue powder of different storage treatments are presented in the table no. 2.

TSS

The data presented in the table no. 3 revealed that TSS of RTS prepared from kokum residue powder of different storage treatments decreased significantly with increase in storage period.

Table.1 Residual analysis of kokum pomace rind before drying

Sr. No.	Particular	Mean
1.	T.S.S (^{0}B)	15.88
2.	Moisture (%)	78.13
3.	Acidity (%)	4.32
4.	Reducing Sugar (%)	5.92
5.	Total Sugar (%)	6.92
6.	Anthocyanin (mg/100g)	3.99

Table.2 Changes in physicochemical composition of kokum residue powder

Storage Days	TSS (^{0}B)	Titratable Acidity (%)	Moisture	Total Sugar
0	20.21	11.16	6.04	17.62
30	19.42	10.87	6.50	15.20
60	18.70	10.87	7.32	14.83
90	18.07	10.37	9.61	13.27
120	17.37	9.09	10.40	12.14
150	17.30	8.58	10.78	10.84
S.Em ±	0.45	0.27	0.45	0.97
CD	1.38	0.85	1.37	2.98

Table.3 Effect of storage of kokum residue powder on physicochemical chemical parameters of instant RTS

Storage Days	TSS (^{0}B)	Titratable Acidity (%)	Colour Value			Sensory		
			L*	a*	b*	Colour	Flavour	Overall acceptability
0	11.67	0.23	84.33	18.82	4.10	8.50	8.17	8.33
30	11.30	0.21	85.82	16.23	6.47	8.00	8.00	8.00
60	11.00	0.18	87.47	12.11	6.48	7.89	7.83	7.86
90	10.82	0.16	88.29	9.83	2.92	7.61	7.78	7.64
120	10.67	0.13	88.72	8.58	3.17	7.50	7.61	7.61
150	10.00	0.12	91.13	7.08	3.19	6.67	7.00	6.83
S.Em±	0.29	0.024	1.30	2.29	1.63	0.31	0.16	0.21
CD	0.90	0.074	3.99	7.13	-	0.96	0.48	0.64

Fig.1 Flow chart of preparation of kokum residue powder

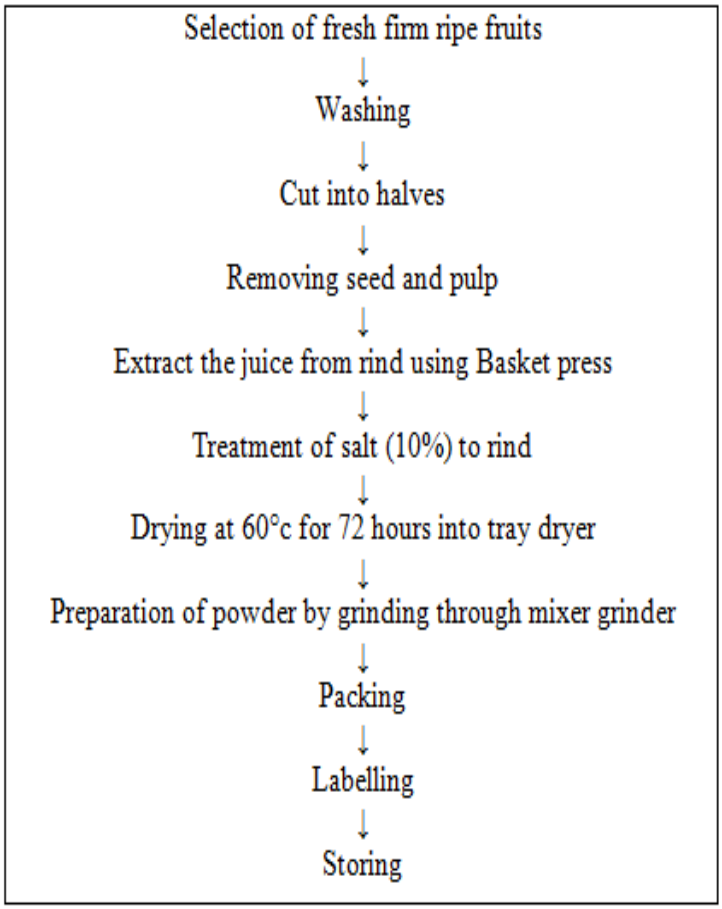


Fig.2 Preparation of instant RTS from kokum residue powder

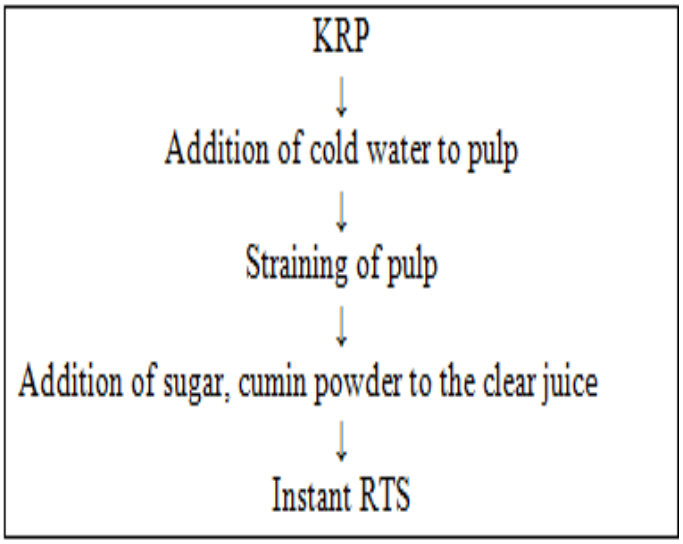
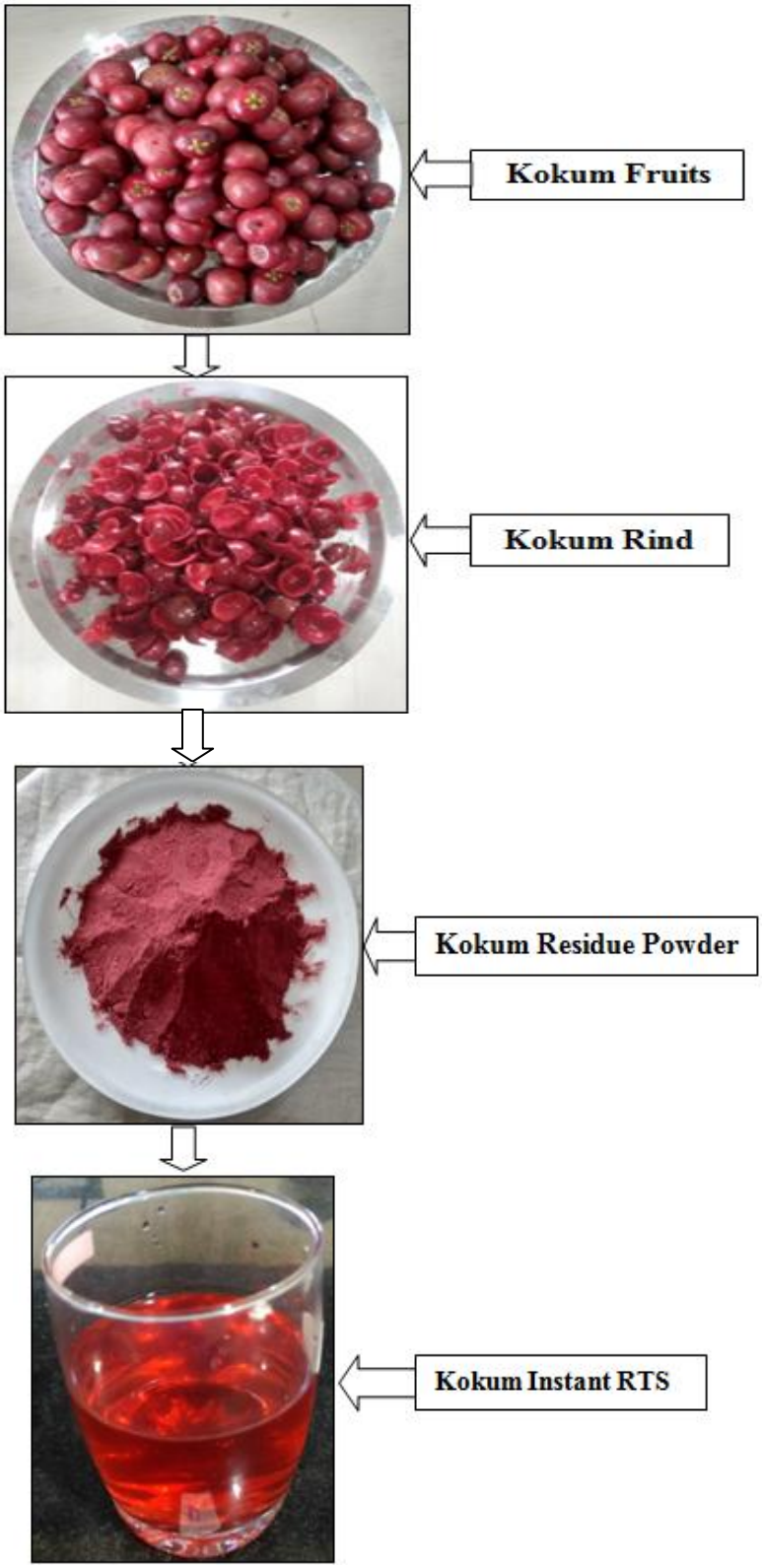


Fig.3 Process technology for preparation of Kokum instant RTS



Among RTS prepared from Kokum Residue Powder of different storage treatments significantly maximum TSS (11.67) was recorded in RTS prepared from 0th days storage and at par with 30,60 and 90 days of storage, whereas minimum TSS (10.00) was recorded in RTS prepared from 150 days storage of kokum residue powder.

Titrable acidity

The Titrable acidity of RTS prepared from kokum residue powder of different storage treatments decreases significantly from 0.23 to 0.12 with increase in storage period. The maximum acidity (0.23) was recorded in RTS prepared from 0th days storage and at par with 30 days, 60 days of storage kokum residue powder.

Colour parameter

L* Lightness is significantly varied during all storage treatments. Among RTS prepared from Kokum residue powder of all storage periods significant decrease in L* value was observed from 84.33 to 91.13.The maximum L* value was observed in RTS prepared from Kokum residue powder of 150 days storage. Hunt and Krof, (1985) reported that the L* is mostly related to moisture content. The increase in L*value of RTS could be related to moisture content of powder. As discussed above the moisture content of powder increased during storage period. Similar findings were observed by the Pez J.F. *et al.,* (2008) in orange powder.

a* and b*

The redness a* value of RTS prepared from Kokum residue powder of all storage periods exhibited significant changes during storage. A decreasing trend in redness a* value from 18.82 to 7.08 was observed in RTS prepared from 0th days storage of Kokum residue powder to 150th days storage of Kokum residue powder. However, b* value exhibited non significant differences amongst RTS prepared from all storage treatments of kokum residue powder. Maximum b* value (4.10)was recorded in RTS prepared from 60th days storage of Kokum residue powder followed by decline up to 150th days storage Kokum powder. The decrease in a* and b*values could be related with the loss in the anthocyanin pigments during storage of Kokum powder. Anthocyanins are responsible for red-blue colouration in kokum. The decrease in anthocyanin content probably due to oxidation as well as due to condensation of anthocyanin pigments with ascorbic acid(Choi *et al.,* 2001)It must be also taken into account the influence of browning reactions on some changes in a* and b* coordinates Pez J.F. *et al*., (2008).

Organoleptic

The organoleptic rating of RTS of different storage treatments are presented in table no.3. It is evident from the table no. 3 that all the organoleptic qualities were recorded significantly affected. Among RTS prepared from storage treatments of Kokum residue powder, significantly maximum organoleptic mean score for flavour (8.17) of RTS was observed in 0th storage treatments of Kokum residue powder but at par with 30th days, 60th days and 90th days storage. Similarly, mean organoleptic score for colour (8.50) of RTS was recorded significantly higher in 0th days and at par with30thdays and 60thdaysstorage. The overall acceptability score of RTS prepared from Kokum residue powder was recoded significant changes in respect of all storage treatments. Kokum RTS prepared from Kokum residue Powder up to 120th days of storage may be acceptable.

From the present investigation, it could be concluded that the Kokum ready to serve beverage prepared from kokum rind residue powder was acceptable throughout the storage period of 120 days at ambient conditions. The kokum rind residue powder can be packed in plastic packs up to 4 months which gives acceptable flavour and colour when it is stored at normal temperature.

References

Amerine, M.A., Pangborn, R.M. and Rocssler, E.B. (1975). Principle of sensory evaluation of food. Academic Press, London, UNITED KINGDOM.

Bafna, P.G. (2013) Process development of Kokum RTS beverages using response Surface Methodology (RSM) *International J. of food and nutritional sciences* 2(2): 2320 –7876.

Baliga, M.S., Bhat H.P., Pai, R. J., Boloor, R., Palatty, P.L. (2011). Chemistry and medicinal uses of underutilized Indian (*Garcinia indica*) tree: A review. *Food Research International*,44:1790-1799.

Choia, M.H., Kima, G.H., Leeb, H.S. (2002). Effects of ascorbic acid retention on juice color and pigment stability in blood orange (*Citrus sinensis*) juice during refrigerated storage, *Food Res. Inter.* 35(8):753-759.

Hunt, M.C. and Kropf, D. (1985). Fresh and Cured Meat Color Analyses. Muscle Food Symposium, Institute of Food Technologist Annual Meeting, paper no 151. Manhattan (Kansas): Kansas State University.

Kadam, D.M., Rai, D.R., Patil, R.T., Wilson, R.A., Kaur, S. and Kumar, R. (2011). Quality of fresh and stored foam mat dried Mandarin powder. *International J. of food science and Technol.*, 46: 793–799.

Kadam, D. M., Wilson, R.A., Kaur, V., Chadha, S., Kaushik, P., Kaur, S., Patil, R.T. and Rai, D.R. (2012). Physicochemical and microbial quality evaluation of foam-mat-dried pineapple powder. *Int. J. Food Sci. Technol*. 47: 1654–1659.

Krishnamurthy N., Lewis, Y.S. and Ravindranatha B. (1982). Chemical constitution of Kokum fruit – rind. *J. of Food Science and Technol*., 19: 97-100.

Nayak, C. A., Rastogi, N. K., Raghavarao, K.S.M.S. (2010). Bioactive Constituents Present in *Garcinia indica* Choisy and its Potential Food Applications: A Review *International Journal of Food Properties* 13: 441–453.

Panse, V.G. and Sukhantme, P.V. (1985). Statistical method of agriculture. Indian Council of Agricultural Research, New Delhi, INDIA.

Pareek, S. and Kaushik, R. A. (2012). Effect of drying methods on quality of Indian gooseberry (*Emblica officinalis* Gaertn.) powder during storage. *J. Sci. Industrial. Res.* Vol. 71 pp.727-732.

Pez, J.F., Nadal, E. S., Navarro, C., Sayas, E., Martos, M.V. and Alvarez J.A.P. (2008).Storage stability of a high dietary fibre powder from orange by-products.*Int. J. of Food Sci. and Technol.* 2009, 44, 748–756.

Swami, S.B., Thakor, N.J. and Patil, S.C. (2014). Kokum (*Garcinia indica*) and its Many Functional Components as Related to the Human Health: A Review. *J. of food research and Technol*., 2 (4): 130-142.

Ranganna, S. (1997). Handbook of analysis and quality control for fruits and vegetable products. 2nd Ed. Tata McGraw Hill Publishing Company Ltd., New Delhi, INDIA.

Verghese, J. (1996). The world of spices and herbs. *Indian Spices*, 34(1 & 2): 11-12.

Wilson, R.A., Kadam, D.M., Chadha, S., Grewal, M.K., Sharma, M. (2013).Evaluation of physical and chemical properties of foam-mat dried Mango (*Mangifera indica*) powder during storage. *J. of Food Processing and Preservation*, 38: 1866–1874.

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