International Journal of Research Studies in Biosciences (IJRSB)
August 2015, PP 43-47
ISSN 2349-0357 (Print) & ISSN 2349-0365 (Online)
www.arcjournals.org

Some Studies on Assessment of Physical Properties of Tamarind Pulp

Geetesh Sinha
Senior Research Fellow,
Department of Dairy Engineering,
College of Dairy Science and Food Technology,
CGKV, Raipur (C.G.)
geeteshsinha20@gmail.com

S. Patel
Professor and Head,
Department of Agricultural Processing & Food Engineering, Faculty of Agricultural Engineering, IGKV, Raipur (C.G.)
Patels47@radiffmail.com

A.K. Agrawal
Prof & Head,
Department of Dairy Engineering,
College of Dairy Science and Food Technology,
CGKV, Raipur (C.G.)
akagrawal.raipur@gmail.com

N. K. Mishra
Scientist,
Department of Agricultural Processing & Food Engineering, Faculty of Agricultural Engineering, IGKV, Raipur (C.G.)
nkm111@rediffmail.com

Amit Kumar Sinha
Subject Matter Specialist,
Krishi Vigyan Kendra, (IGKV) Dhamtari (C.G.)
sinha.amit76@yahoo.com

Abstract: *Tamarind is an economically important multipurpose spice which is grown both as domesticated spice in farmland and as wild in forest lands. Tamarind fruits can be processed in the variety of food products of commercial importance. The knowledge about physical properties of any biomaterial is essential to design its equipment for processing, storage, transportation and value addition. In the present investigation, some studies on the physical properties like length, width, thickness, volume, density, colour of tamarind pulp were carried out. The average length, breadth and thickness of tamarind pulp were found to be 9.04 cm, 4.03 cm and 0.115 cm respectively. The average weight, volume and true density tamarind pulp was found to be 6.874 g, 4.21 cm^3 and 1.48 g/cm^3 respectively. The total color difference was clearly observed that the tamarind pulp became darker, greener and bluer than it's initial stage and the total color (ΔE) was found to be 2.35, 3.11, 6.74, and 8.49 at each 15 days interval respectively.*

Keywords: *Physical properties, tamarind, pulp, colour, factors for machine design*

1. INTRODUCTION

Tamarind spice belongs to the dicotyledonous family leguminosae (fabacae) which is flowering plant with a total of 727 recognized genera. The number of its species is estimated to be more than 19 thousand [1]. Tamarind pods are collected from the tree and are sold in the local market [2]. India is the world's largest producer of tamarind. Out of 52 spices under the preview of Spice Board, the tamarind spice is at the sixth position in terms of export from India. The tree mostly grown wild, although it has cultivated to a limited extent. It is particularly abundant in the Indian states of Andhra Pradesh, Karnataka, Tamil Nadu, Madhya Pradesh, Bihar, West Bengal and Chhattisgarh. It is exported to various countries viz. United States of American, Australia, Shrilanka, Malaysia, Pakistan besides some European countries etc. Tamarind is a highly cross pollinated crop hence a wide variety is common in this spice [3]. As per the survey of minor forest produce of Chhattisgarh, the state is one among the major producer of tamarind [4]. The yearly production of tamarind is 50,000 tones out of which about 10,000 tones are used for processing and sold to other states. The pulp posses some medicinal value and is used to cure dysentery. The pulp can withstand thermal processing and maintains the original profile for sufficient temperature range.

In the present situation with increasing population pressure, demand for tamarind pulp has also increased considerably. The pulp is descanted form, can be stored well for extended period without refrigeration due to its high acid content which acts as a natural preservation.

2. MATERIAL AND METHODS

The samples tamarind pulps were purchased from the local market of Jagadalpur, Chhattisgarh. It is stored in room temperature. The analysis of physical properties of tamarind pulp which includes length, width, thickness, volume, pulp weight, volume, density, moisture content and colour of pulp. For each parameter 30 pulp samples were taken randomly and measurements were done separately.

2.1 Average Length (L), width (W) and Thickness (T)

Average Length, width and Thickness of tamarind pulp was calculated as follows

$$L = \sum_{i=1}^{n} \frac{L}{n} \quad (1)$$

$$W = \sum_{i=1}^{n} \frac{W}{n} \quad (2)$$

$$T = \sum_{i=1}^{n} \frac{T}{n} \quad (3)$$

Where, L, W, T refers to largest intercept (length), width and thickness (cm) and n express the number of sample, (n=30)

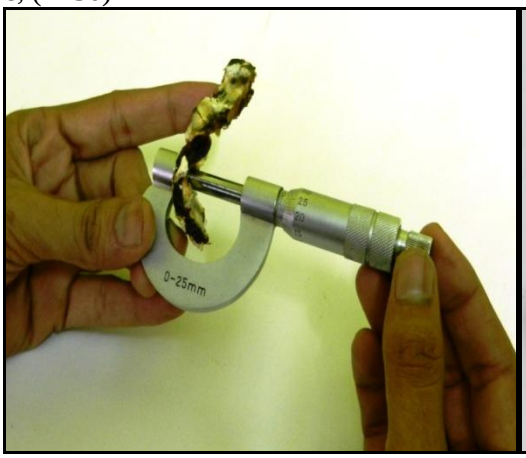

Fig.1 *Screw Gauge*

Fig. 2 *Weighing balance*

2.2 Volume of the tamarind pulp

The length, breadth and thickness were of tamarind pulp was measured assuming a perpendicular axis along its largest dimension (Fig. 1). The volume of the tamarind pulp was calculated by using the formula:

$$Volume = L \times W \times T \quad (4)$$

2.3 Tamarind pulp mass

The mass of tamarind pulp was measured by the electric balance having least count upto 0.01 g. Fig 2 shows the view of measuring of a single pod by using electronic balance.

2.4 Density of the tamarind pulp

The density (g/cm^3) of the tamarind pulp was calculated by using the formula:

$$\text{Density} = \frac{M}{V} \quad (5)$$

Where, V indicates volume (cm^3) of tamarind pulps.

2.5 Moisture content

From the table 1 it is clear that the moisture content of tamarind pulps was carried out by oven drying method [5]. The initial weight of container including sample was recorded and then kept in a hot air

oven, maintained to 70°C for 16-18 h. After drying, the final weight of container including sample was recorded. The percentage moisture content (wb) was estimated by the following expression.

$$\text{percentage moisture content (wb)} = \frac{W-w}{W} \times 100 \quad (6)$$

Where, W and w denotes initial weight (g) of sample and weight (g) of sample after drying.

2.6 Color of the pulp

The analysis of color of tamarind pulp was done using the Hunter Lab Spectrophotometer.

3. RESULT AND DISCUSSION

3.1 Length, width and thickness of tamarind pulp

The ranges of length of tamarind pulp were found to be 4.3 to 13.1 cm with an average length of 9.04 cm. The SD and coefficient of variance was found to be 2.8 and 31.6 % respectively. The width of the tamarind pulp was found to be in the range of 3.4 to 4.8 cm and the average width was found to be 4.03 cm. The SD and coefficient of variance was found to be 0.42 and 10.53 % respectively. The ranges of thickness of tamarind pulp were found to be 0.094 to 0.135 cm with an average thickness of 0.115 cm. The SD and coefficient of variance was calculated to be 0.013 and 11.24% respectively.

In the present investigation the length, width and thickness of tamarind pulp obtain were almost same as the findings of Benjamin and Seegobin [6] who found out that mean value of length, width and thickness had 12.96, 2.08 and 0.93 cm respectively.

Table 1. *Physical properties of tamarind pulp at moisture content (24% wb)*

Particular	Average	Range	SD	CV
Length (cm)	9.04	4.3-13.1	2.8	31.6
Width (cm)	4.03	3.4-4.8	0.42	10.53
Thickness* (cm)	0.115	0.094-0.135	0.013	11.24
Weight (g)	6.874	3.2-10.74	2.3	33.22
Volume (cm^3)	4.21	2.29-6.22	1.5	35.63
Density (g/cm^3)	1.48	1.3-1.67	0.4	23.46

* Thickness was measured with screw gauge in mm and afterward converted into cm

3.2 Weight of tamarind pulp

The table shows that the weight of tamarind pulps was found to be in the range of 3.2 to 10.74 g and the average weight of 6.874 g. The SD and coefficient of variance was calculated to be 2.3 and 33.22 per cent respectively.

The weight of tamarind pulp obtain in the experiment were found to agree to the findings of Challapilli [7]; Benjamin and Seegobin [6]; Hanamashetti and Sulikeri [8] and Ilango and Vijaylashkmi [9]. They reported that the wide variation for pulp weight ranging from 2.70 to 9.18 g.

3.3 Volume and density of tamarind pulp

The volume and density of tamarind pulp are also presented in Table 1. The volume and true density were found to be 4.21 cm^3 and 1.48 g/cm^3 on average of 30 tamarind pulps. The SD of volume and density was found to be 1.5 and 0.4 respectively. The coefficient of variation for volume and density was observed to be 35.63 and 23.46 respectively.

3.4 Colour

The color of the product was measured by the “Hunter –lab”. The analysis was done on up to 60 days at the interval of 15 days. For better representation of colour change it is shown in terms of L*, a* and b* values in Table 2.

Table 2. *Colour measurement of tamarind pulp at different time interval*

Days	L*	a*	b*
0th	59.38	6.42	20.42

15th	57.84	5.79	19.05
30th	56.03	4.68	16.53
45th	53.32	3.37	10.50
60th	51.40	1.37	2.48

Due to the absence of research on similar product no color data is available for the comparison. So, in this current research, the standard is taken as L*=59.38, a*=6.42 and b*= 20.42 which is the initial value of the color of the product.

$$\Delta L = L^* sample - L^* standard$$

$$\Delta a = a^* sample - a^* standard$$

$$\Delta b = b^* sample - b^* standard$$

+ ΔL means the sample is lighter than the standard, - ΔL means the sample is darker than the standard, + Δa means the sample is redder than the standard, - Δa means the sample is greener than the standard, + Δb means the sample is yellowier than the standard and – Δb means the sample is bluer than the standard.

From Table 2 it is observed that the value of L*, a* and b* reduces at each 15 days intervals. Hence it is clearly observed that the tamarind pulp became darker, greener and bluer than its initial stage. The total color (ΔE) difference at different 15 days intervals was evaluated by following formula:

$$\Delta E = \frac{(\Delta L^2 + \Delta a^2 + \Delta b^2)}{2}$$

At the end of 15 days, significant changes were occurred. The change in the colour difference from initial 0 to 2.35, 3.11, 6.74 and 8.49.

4. CONCLUSION

The knowledge of important physical properties such as length, breadth, thickness, weight, volume, density and colour is necessary for design of tamarind processing machines. For designing and development of machine the length, width and thickness of tamarind are important for dehulling and deseeding machine whereas density of tamarind pulp is necessary for tamarind briquetting machine. On the basis of the experiment, the average length, breadth and thickness of tamarind pulp was found to be 9.04 cm, 4.03 cm and 0.115 cm respectively. The average density of tamarind pulp was found to be 1.48 g/cm^3. It was also found that the value of L*, a* and b* reduces at each 15 days intervals. The total color (ΔE) difference was found to be 2.35, 3.11, 6.74, and 8.49 at each 15 days interval respectively. Hence, it is clearly observed that the tamarind pulp became darker, greener and bluer than its initial stage.

REFERENCES

[1]. Lewis G., Schrire B., Machinder B. and Lock M., Legumes of world. Royal Botnaic Gardens, Kew, (2005).

[2]. Singh D., Wangchu L. and Mood, S. K., Processed Products of Tamarind. Natural Product Radiance 6(4):315-317, (2007).

[3]. Geetha, V. Urigam tamarind - A unique variety. Spice India, 8(8):8-9, (1995).

[4]. Anonymous Chhattisgarh Rajya Laghu Vanopaj, Bajar Sarvekshan Prativedan, Report published from CGMFPFED. pp. 55-56 (2007).

[5]. Kakade A. P., Studies on storage of tamarind and processing of value added tamarind products. M. Tech. Thesis, IGKV, Raipur. Pp. 13 (2004).

[6]. Benjamin E. and Seegobin D., Preliminary investigations on the characterization and evaluation of tamarind (Tamarindus indica L.) Empowering farmers through agricultural research, Proceedings of Research Division, Ministry of Agriculture, Land and Marine Research Seminar Series held at Centeno, Trinidad and Tobago, pp 89-98(1999).

[7]. Challapilli A. P., Studies on evaluation of elite tamarind (Tamarindus indica L) types for quality, yield and multiplication by air layering. Unpublished Thesis, University of Agricultural Sciences, Dharwad. pp. 71-73 (1992).

[8]. Hanamashetti S. L. and Sulikeri G. S., Evaluation of promising genotype of tamarind Proceeding of Natiosed Symposium of Tamarindus indica L., Tirupathi (A.P.) organized by Forest Dept. of A.P., pp. 59-68 (1997).
[9]. Ilango K. and Vijaylakshami C., Effect of some growth regulators and chemicals on yield and quality attributes in tamarind, Orrissa. J. Hort., 30(1):35-39 (2002).

AUTHORS' BIOGRAPHY

Er. Geetesh Sinha did B. Tech (Dairy Technology) from College of Dairy Technology, Raipur and M. Tech. in Agricultural processing and Food Engineering at Faculty of Agricultural Engineering, IGKV, Raipur. At present, he is working as Senior Research Fellow under the project entitled "Zero energy integrated small milk production cum processing plant" in the Department of Dairy Engineering, College of Dairy Science and Food Technology, CGKV, Raipur. Er. Geetesh Sinha has Published 3 Scientific paper with 10 presentations in conference/symposia and more than 6 popular articles.

Dr. S. Patel, Professor and Head Department of Agricultural Processing & Food Engineering, Faculty of Agricultural Engineering, IGKV, Raipur. He is an Alumni of JNKVV, Jabalpur, and IIT, Kharagpur has about 30 year experience in teaching, research and extension work in field of Agricultural Processing, Food Engineering, Post Harvest Technology, Product Development and Value Addition. He has supervised more than 35 post graduate student from M. Tech. (Agricultural Processing and Food Engineering) degree. He is also supervising Ph. D. scholar. He has published 60 research papers in National and International journals and 20 bulletins/leaflets etc. He is also the research Engineer for All India Coordinated Research Project on Post Harvest Technology, ICAR funded project.

Dr. A.K. Agrawal, Professor and Head (Dairy Engineering), an alumni of JNKVV, Jabalpur, and IIT Kharagpur has about 30 year experience in teaching, research and extension work in Dairy Engineering field. He has supervised about 20 post graduate thesis leading to M. Tech. (Agricultural Processing and Food Engineering) and (Dairy Engineering) degrees. In his credit there are about 40 published research papers in National and International journals, with about 200 presentations in conference/symposia. He has played an important role in design and development of Indirect Solar Cabinet, Solar Water Heating System Assisted Paneer Manufacturing System etc. Presently he is also supervising RKVY project "Zero energy integrated small milk production cum processing plant" of Rs. 4.15 Crore as Principal Investigator.

Er. N. K. Mishra is working as Scientist, Department of Agricultural Processing & Food Engineering, Faculty of Agricultural Engineering, IGKV, Raipur (C.G.) since last 3 year. He has 9 years of experience in the field of teaching, research and extension. Through National Agricultural Innovative Project, he worked in the area of agricultural processing and made significant contribution in technologies suitable for rural development. He has published 13 research papers and 22 Bulletins/leaflets etc. Presently, he is serving as Co-P.I. in ICAR sponsored All India Coordinated Research Project related with Agricultural Processing and Post Harvest Technology.

Er. Amit Kumar Sinha is an Alumni of College of Dairy Technology, Raipur and M. Tech. in Agricultural processing and Food Engineering at Faculty of Agricultural Engineering, IGKV, Raipur. Presently, he is working as a Subject Matter Specialist in Krishi Vigyan Kendra, Indira Gandhi Krishi Vishwavidyalaya, Dhamtari since last 3 year. He has published 5 research papers in national and International journal, with about 8 presentations in conference/symposia. He has also published 30 extension folders/articles.