



Potential of Dry *Khirmi* (*Manilkara hexandra* Roxb.) Fruits as Nutritional Substitute

Kanak Lata, Sanjay Singh, Raj Kumar and Shakti Khajuria

ICAR-Krishi Vigyan Kendra, Panchmahal 389 340 (Gujarat)

ABSTRACT

Panchmahal district of Gujarat is having large undulating and hilly areas and scattered plantation of khirmi (*Manilkara hexandra* Roxb.). Khirmi fruit is very potential minor fruit as it is full of antioxidants, minerals and other phytochemicals. Dried fruits of khirmi are used by the tribals and other local people during fast in many festivals and treated as raisins. Recently, Central Horticultural Experiment Station, Vejalpur has developed khirmi variety Thar Rituraj which is early, semi-spreading type, regular bearer, semi-dwarf and starts flowering in 4th year after planting. For easy harvesting, proper canopy architecture (plant height up to 3.0-4.0 m) is required and for this, annual pruning (25-40 % of annual growth) during June-July is very effective. A total of 10 genotypes were used for chemical analysis. The experiment was laid out in completely randomized design with 3 replications. Fresh fruits of khirmi (Thar Rituraj) recorded 5.10 g average fruit weight, 24.80° Brix T.S.S., 0.35 per cent titratable acidity, 17.90 per cent total sugar and 28.40 mg/100g vitamin C and carotene (6.90 mg/ 100g). Dried fruits after one year recorded 64.20° Brix T.S.S., 45.70 per cent total sugar and 1.30 per cent acidity. It may be concluded that sun drying with the application of castor oil on the khirmi fruits is very economical and eco friendly technology for the resource poor farmers. There is need for further popularization of dried khirmi fruits as nutritional substitute.

Key Words: Antioxidants, Minerals, Nutritional value, Phytochemicals.

INTRODUCTION

Khirmi (*Manilkara hexandra* Roxb.) is an economically multipurpose tree of the family Sapotaceae (Singh *et al*, 2015; Singh *et al*, 2017; Singh *et al*, 2019). The tree is medium size, evergreen with spreading growth habit. It bears oval, sweet edible fruit with one or more seeds. It is commercially used as a rootstock for vegetative propagation of sapota in different parts of the country. The fruit is good source of iron, sugars, minerals, protein and carbohydrate etc. The plant can tolerate drought conditions if occurs for some time as well as heavy rainfall conditions. Hot semi-arid zone is characterized by the low annual rainfall (750 mm) and the rainy spells are confined to 3 wet m (July to September) and the remaining parts of the year are dry months. The rains are also erratic and often come in a few storms of short duration which results in great runoff without charging the

soil moisture profile resulting into water stress in soil during major parts of the year. Arid and semi-arid regions have peculiar eco-climatological features in which several major agronomical crops fail to sustain. It is very hardy and thrives well on rocky and gravelly soils.

Panchmahal is a tribal populated district of the Gujarat. Climatologically, it comes under semi-arid zone. This region is endowed with plenty of scattered khirmi plants in nearby villages and on the fringes of the cultivable land. Fresh fruits produced in these areas are sold locally by the rural people at very cheap rate (Lata *et al*, 2019). Tribal people collect the fruits and sell to local traders @Rs 20 to 30/- per kg. Farmers were not adopting any technology for value addition of fresh khirmi fruits. Present study was undertaken with objective to develop the low cost and eco friendly technology of value addition in khirmi to support nutritional

Table 1. Fruit quality attributes of Khirni genotypes.

Genotypes	Fruit weight (g)	TSS (° Brix)	Acidity (%)	Total sugar (%)	Vitami C (mg/100 g)	Carotene (mg/100 g)
CHESK1	4.15	22.10	0.36	15.20	27.13	4.50
CHESK2	4.26	23.12	0.35	15.40	26.40	5.50
CHESK3	3.10	22.10	0.36	15.12	25.12	5.50
CHES K4	3.42	23.20	0.32	15.45	30.26	5.70
CHESK5	3.25	22.11	0.31	13.82	29.25	5.00
CHESK6	3.11	22.89	0.28	13.93	24.53	4.80
CHESK7	4.89	21.10	0.39	13.10	28.10	5.20
CHESK8	5.10	22.22	0.37	14.12	26.20	5.40
CHES K9	4.35	23.10	0.39	15.15	25.13	5.19
Thar Rituraj	5.15	24.89	0.36	17.93	28.45	6.80
CD(P=0.05)	0.12	1.13	0.09	0.45	0.52	0.32

security for the resource poor farming community. Krishi Vigyan Kendra, Panchmahal organized training programme for value addition of khirni fruit to popularize among the local communities with the collaboration of ICAR-C.H.E.S., Godhra.

MATERIALS AND METHODS

Fruits of 10 genotypes were collected from experimental orchard of ICAR-Central Horticultural Experiment station, Godhra and used for physico-chemical analysis. The experiment was laid out in completely randomized design with 3 replications, parameters on fruit quality attributes were observed on 1.0kg fruits each treatment. Number of fruits per treatment varied in each genotype according to its size. For drying, well ripened fruits free from any bruising, blemishes and injury of different genotypes were collected, they were dried and evaluated for different fruit quality attributes. Total soluble solids, Vitamin C, total sugar and carotene content were analyzed by the method advocated by AOAC (1980). Ten farm women were trained as panelists to evaluate the product. Each farm women was asked to taste the coded samples and score each product for preference on a five-point scale, ranging from most preferred (5) to the least

preferred (1). This process was repeated three times and the results were recorded for statistical analysis. The mean data were statistically analyzed as per method given by Gomez and Gomez (1984). The data statistically calculated as per method given by Snedecor and Cochran, (1994).

For sun drying of fruits, the flow chart is as under:

Fresh ripened fruits □ sorting □ washing □ sun drying for one week (42 ± 2 °C) □ cleaning of dried latex from skin of fruits □ application of castor oil (50 ml/ kg fruits) □ storage in glass jar.

RESULTS AND DISCUSSION

The fruit weight ranged from 3.10-5.10g and found to be highest in Thar Rituraj, followed by CHESK1 and CHESK7. Khirni fruits were rich source of total soluble solids, sugars, vitamin C and carotene and these values varied significantly in different genotypes. Total soluble solids and total sugar content of fruits ranged from 21.10 to 24.89° Brix and 13.10 to 17.93 per cent, respectively in different genotypes.

The highest Total soluble solids (TSS) was recorded in Thar Rituraj (24.89° Brix) followed

Potentia of Dry *Khirmi*

Table 2 Preference mean scores for dried khirmi fruits.

Time period during storage after months	Appearance	Color	Texture	Flavor	Taste	Over all	Grading
2	3.50	3.50	3.60	3.40	3.65	3.52	I
4	3.50	3.50	3.50	3.40	3.60	3.52	I
6	3.40	3.40	3.50	3.30	3.60	3.44	II
8	3.40	3.40	3.50	3.30	3.50	3.40	II
10	3.30	3.40	3.50	3.30	3.40	3.38	III
12	3.30	3.40	3.50	3.30	3.40	3.38	III

by CHESK3 and CHESK7. Maximum total sugar content was found in CHESK5 (17.93%), closely followed by CHESK4 (15.45%) and CHESK2 (15.40%). Vitamin C content was found to be highest in CHESK4(29.25 mg/ 100g) closely followed by Thar Rituraj (28.45 mg/100g) , CHESK7(28.10 mg/ 100g) and CHESK1(27.13 mg/ 100g), whereas CHESK6 recorded the lowest (24.53 mg/ 100g). Singh *et al*(2017) and Malik *et al* (2013) have also recorded the variation in fruit quality attributes in different khirmi genotypes. Carotene content varied from 4.50-6.80 mg/100g being highest in Thar Rituraj, closely followed by CHESK2 and CHESK3. The remarkable variability was observed in relation to fruit quality attributes of khirmi (Patel *et al*, 2009; Malik *et al*, 2010; Malik *et al*; 2012, Lata *et al*, 2019). Dried fruits after one year recorded 64.20^o Brix T.S.S., 45.70 % total sugar and 1.30 % acidity.

The data (Table2) revealed that the overall highest grade (3.52) was given up to 4th m of storage by the panel, followed by 6 and 12 m after storage. For appearance, product got maximum score (3.50). The highest score (3.60) for texture of product was given after 2 and 4 m of storage. The preference mean scores for flavor of the product were noted to be maximum up to 4th day of storage. The highest score (3.6) for the taste of the product was found on 2nd and 4th m of storage.

CONCLUSION

Selected khirmi fruits of different genotypes were cleaned with water followed by sun drying for a week (42± 2 °C). After drying, latex were cleaned from fruit surface followed by polishing with castor oil @ 50 ml/ kg fruits and storage in glass jar. It may be concluded that sun drying with the application of castor oil on the khirmi fruits is very economical and eco friendly technology for the resource poor farmers. There is need for further popularization of dried khirmi fruits as nutritional substitute.

REFERNCES

- AOAC (1980). *Official methods of Analysis*. Association of official Agricultural Chemists. 13th Edn. Washington, D.C.
- Gomez K A and Gomez A A (1984). *Statistical Procedure for Agricultural Research* (2nd Edn.), John Wiley and Sos Inc., New York.
- Lata K, Kumar R and Singh S (2019). Khirmi chuhara: A phytochemically rich nutritional substitute for tribal farmers. *Indian JAarid Hort* 1(1):67-68.
- Malik S K, Choudhary R, Kumar S, Dhariwal O P, Deswal R P S and Chaudhary R (2012). Socio-economic and horticultural potential of Khirmi [*Manilkara hexandra* (Roxb.) Dubard]: a promising underutilized fruit species of India. *J Res Crop Evol* 59 (6):1255-1265.
- Malik S K, Chaudhury R, Dhariwal O P and Bhandari D C (2010). *Manilkara hexandra* (Khirmi). In: Genetic Resources of Tropical Underutilized Fruits in India. NBPGR, New Delhi, pp. 99-112.
- Malik S K, Kumar S, Choudhary R, Kole P R, Chaudhary R and Bhat KV (2013). Assessment of genetic diversity

Lata et al

- in khirni [*Manilkara hexandra* (Roxb.) Dubard]:An important underutilized fruit species of India using random amplified polymorphic DNA markers. *Indian J Hort* **70**(1): 18-25.
- Patel P R and Rao T V R (2009). Physiological changes in relation to growth and ripening of khirni [*Manilkara hexandra* (Roxb.) Dubard] fruit. *Fruits* **64** (3):139-146.
- Singh Sanjay, Singh A K, Apparao V V and Bhargav R (2015). Thar Rituraj: A new khirni variety. *Indian Hort* **60**(6):14-15.
- Singh, Sanjay, Singh A K, Appa Rao V V and Bhargawa R (2017).Genetic divergence in khirni (*Manilkara hexandra*) under semi- arid ecosystem of western India. *Indian J Agric Sci* **87**(3):337-41.
- Singh Sanjay, Singh A K, Mishra D S, Appa Rao V V and Saroj P L (2019).The Khirni (*Monilkara hexandra* Dubard). CIAH/ Tech/Pub. No. 79, ICAR-CIAH, Bikaner, pp1- 25
- Snedecor G W and Cochran W G (1994). *Statistical Methods*, 7th Edn. Oxford IBH Publishing Co., Calcutta, India.

Received on 01/11/2019 Accepted on 08/12/2019