

Studies on quality characteristics of chilgoza nut and oil

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ABSTRACT

Chilgoza is one of the famous edible pine nuts among 29 edible pine nuts found in the world. This nut is widely distributed in tribal areas of Himachal Pradesh and varies in its quality characteristics from location to location as has been found in present studies. Its nuts are considered to be the rich source of various nutrients including proteins, carbohydrates, fibers, minerals besides its higher amount of oil. Its oil is of very good quality free of cholesterol and a rich source of fatty acids like linoleic, oleic and palmitic acid.

Keywords: Chilgoza; *Pinus gerardiana*; pine nut; oil; characteristics

INTRODUCTION

India has got its wide ranging environmental regimes and diverse biological communities. Among this diverse flora there are about 29 species of edible pines which are utilized at least by indigenous tribal culture in the world. *Pinus gerardiana* popularly known as 'Chilgoza' or 'Neoza' is considered to be an integral part of fragile ecosystems of the great Himalayas in the Indian sub-continent. It is widely distributed in India, Afganistan, Tibet, Baluchistan (Pakistan) (Dogra 1964, Critchfield and Little 1966) between 2000 and 3350 m elevation. In India it is found in Kinnaur and

Chamba districts of Himachal Pradesh and some parts of Jammu and Kashmir. There are more than 2060 ha of chilgoza forests spread throughout the tribal area of HP. It is an evergreen pine tree having height of 17 to 27 meters and girth of 2 to 4 meters (Bhattacharyya et al 1988). On an average one tree yields about 7.4 kg of nuts per year. Chilgoza is prized for its edible and highly nutritious nuts in the raw or cooked form (Gupta 1945). It is considered as one of the important dry fruits of the tribal area having carminative, stimulant and expectorant properties. Its kernels are rich source of oil proteins and carbohydrates. It is an important local food source and is

considered to be a great delicacy (Facciola 1990).

Very few studies have been carried out in India with respect to the quality of nut as well as its oil. Therefore studies were conducted to see nut as well as its oil quality at two popular locations Kalpa and Pooh, Kinnaur, HP.

MATERIAL and METHODS

Mature chilgoza cones were procured from one location of each Kalpa and Pooh blocks of Kinnaur district of HP. Nuts were extracted from cones by following the technique as suggested by Thakur et al (2009).

In physical characteristics the random sample of 50 nuts of each location was selected and used to study the various physical parameters. The colour of nuts and kernel was compared with the colour chart of Royal Horticultural Society, London. The water activity (wa) of the nuts was estimated with water activity meter (HygroLab 3 model) from M/S Rotronicag Switzerland. The chemical characteristics such as proteins were analysed as per the Lowry's method (Thimmaiah 1999). The phenol sulfuric acid method was used to estimate the total carbohydrates (Sadasivam and Manickam 1996). The moisture, total solids, oil and ash content of nuts and kernels were estimated as per method given by Ranganna (1986). Quality of oil was recorded as per standard

methods given by Ranganna (1986) whereas the composition of fatty acids was got done from CFTRI, Mysore.

The experiments were replicated as per replications (n) mentioned in the respective tables. Statistical analysis of data of various attributes including physico-chemical characteristics was carried out by CRD (Mahony 1985).

RESULTS and DISCUSSION

The data in Table 1 show the physico-chemical characteristics of chilgoza nuts which indicate slight differences in the two sites with respect to most of the characteristics. These differences might be due to the age of the tree and soil moisture conditions of the area from where the samples were collected.

The mean of each characteristic of nuts of both the locations was calculated as given in the Table 1. The average length, breadth and quotient of nuts were 19.55 mm and 4.05 mm and 4.83 respectively. The mean length, breadth and quotient of kernel from both the blocks were recorded as 15.40 mm, 3.22 mm and 4.63 respectively. The average weight of each nut was recorded as 0.50 g whereas kernel had average weight as 0.36 g.

The volume and specific gravity of nuts were observed as 7.75 ml and 0.058 respectively. The colour of nuts was recorded as brown 200 D and of kernel as

Quality characteristics of chilgoza

Table 1. Physico-chemical characteristics of chilgoza nuts collected from two sites of Kinnaur

Characteristic	Location		
	Kalpa	Pooh	Mean
Physical			
Length of nut* (mm)	19.90	19.20	19.55
Breadth/ diameter of nut* (mm)	4.10	4.00	4.05
Nut quotient ¹	4.85	4.80	4.83
Weight of nut* (g)	0.474	0.423	0.50
Colour of nut**	Brown 200 D	Brown 200 D	
Volume of nut ² (ml)	8.00	7.50	7.75
Specific gravity of nut*	0.059	0.056	0.058
Length of kernel* (mm)	15.80	15.00	15.40
Breadth /diameter of kernel* (mm)	3.23	3.20	3.22
Kernel quotient ³	4.58	4.68	4.63
Weight of kernel* (g)	0.367	0.360	0.36
Colour of kernel**	Greyed yellow 162 D	Greyed yellow 162 D	
Oil yield (%) on dry weight basis	49.90	49.00	49.45
Chemical***			
Total oils (%)	7.41	7.52	7.33
Total protein (%)	2.09	2.15	2.12
Total carbohydrates (%)	4.12	4.20	4.16
Total solids (nuts) (%)	71.41	72.80	72.11
Total solids (kernels) (%)	73.50	74.70	74.10
Ash (%)	2.72	2.75	2.74
Moisture (nut) (%)	28.60	27.20	27.90
Moisture (kernel) (%)	26.50	25.30	25.90
Water activity (fresh)	0.907	0.892	0.900

**Colour compared with the colour chart of Royal Horticultural Society, London,

*n= 50, ¹Nut quotient= length/breadth, ²Volume of nuts= water displaced by nuts

³Kernel quotient= length/breadth, ***n= 3

Table 2. Quality and fatty acid composition of oil extracted from chilgoza nuts

Parameter	Mean
Butyrefractometer reading (%)	74
Index of refraction	1.4963
Specific gravity at 25°C	0.892
Acid value (mg KOH/g)	5.61
Free fatty acids (g), oleic acid	0.540
Tintometer Colour Unit (TCU)	
Yellow	16.0
Red	1.00
Blue	0.10
Iodine Value	86.21
Peroxide value	4.02
Saponification Value	187.5
Fatty acid composition (%)	
Stearic acid (C _{18:0})	0.3
Linoleic acid (Omega-6)	51.3
Linolenic acid (Omega-3)	1.5
Oleic acid (Omega-9)	39.7
Arachidic acid (C _{20:0})	2.1
Palmitic acid	7.2

grey yellow 162 D. The oil yield on dry weight basis was 49.45 per cent. As far as the chemical characteristics were concerned oils, proteins and carbohydrates in the freshly extracted nuts were observed as 7.33, 2.12 and 4.16 per cent respectively. Nuts and kernel from both the blocks had moisture as 27.90 and 25.90 per cent and total solids as 72.11 and 74.11 per cent respectively. Water activity of freshly extracted nuts was recorded as 0.900. Higher amount of ash content (2.74%) was observed in the nuts from both the blocks.

Data in Table 2 show the quality characteristics of oil extracted from the

chilgoza nuts. Its butyrefractometer reading, refractive index, specific gravity at 25°C were recorded as 74 per cent, 1.4963 and 0.892 respectively. The Tintometer Colour Units (TCU) of oil were observed as red (1.0), yellow (16.0) and blue (0.10). The various other quality characteristics of oil like acid value were recorded as 5.61 mg KOH/g, free fatty acid as 0.540, iodine value as 0.10, peroxide value as 86.21 and saponification value as 187.5. The fatty acid composition of oil showed that it contained highest amount (51.3%) of linoleic acid (omega-6) followed by 39.7 per cent oleic acid (Omega-9), 7.2 per cent palmitic acid, 2.1

per cent arachidic acid, 1.5 per cent linoleinic acid (omega -3) and 0.3 per cent stearic acid.

It can be concluded that chilgoza nuts are rich source of various quality characteristics and its oil is rich source of some poly unsaturated fatty acids which are useful from health point of view.

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