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Research Article

PHYSICO-CHEMICAL EVALUATION FOR ASSESSING THE GENUINITY OF GINGELLY OIL (TILA TAILA) IN KERALA MARKET

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ABSTRACT

Gingelly oil or Sesame oil (Tila taila) is an edible vegetable oil obtained from Sesame seeds (*Sesamum indicum* Linn. Family: Pedaliaceae). Sesame oil is most widely used in Ayurveda as a base to prepare many medicated oils and also in the preparation of other formulations such as avaleha. As it is having high demand the chances of adulteration are more. The genuinity of gingelly oil (tila taila) in commercial market of Kerala was assessed by evaluating and comparing the physico-chemical characters of market samples of sesame oil with that of genuinely prepared sesame oil. Physico chemical parameters such as Acid value (AV), Iodine value (IV), Refractive index (RI) Saponification value (SV), Specific gravity (SG) and Moisture content were evaluated and were compared with those of genuine sample, API[5] and AGMARK[7] standards. Rancidity test, Boudoin's test, Tests for detection of Mineral oil and Cotton seed oil were also done

Key words: Gingelly oil, Tila taila, Physico-chemical analysis, Sesame oil

INTRODUCTION

The drug treatment in Ayurveda primarily consists of many formulations. Gingelly oil or Sesame oil (Tila taila) is widely used in Ayurveda for paana, vasthi, abhyanga and is used as a base to prepare many medicated oils and as an ingredient in various other formulations such as avaleha. For maintaining the quality of treatment using these formulations, and to ensure the effectiveness and consistency in their performance, the crude drugs used in their preparation has to be standardized and quality parameters has to be evaluated[1]. According to acharya Charaka, Tila taila is the best among all oils[2]. Gingelly oil or Sesame oil (Tila taila) is an edible vegetable oil obtained from Sesame seeds (*Sesamum indicum* Linn. Family: Pedaliaceae). Sesame oil is more expensive than other vegetable oils and is very popular as edible oil having a characteristic flavour and exceptional resistance to rancidity. Hence its chances of adulteration are more. Sesame oil is usually adulterated with a wide variety of non-edible oils like crude castor oil, mineral oils, cheap edible oils such as linseed, cotton seed, watermelon seed, rubber seed, tea seed etc. Though Agmark standards are available for sesame oil[7], there were reports that in many places lamp oil (which is not of food grade and is a mixture of other cheaper oils) being sold as gingelly oil. The consumer Guidance Society of India (CSGI) reported that 64% of loose edible oils sold in the market were adulterated.

In India, sesame cultivation is spread across all the parts except in northern and north-eastern region. However, a small amount of sesame is cultivated as a summer crop under irrigated conditions in eastern and southern parts of country covering states of West Bengal, Bihar, Orissa, Andhra Pradesh, Tamil Nadu and Kerala[3].Due to the absence of large scale commercial cultivation of sesame in Kerala, there are only a few sesame oil extraction units. The extraction units in Kerala import sesame seeds from other states such as Andhra Pradesh and Tamil nadu, and extract sesame oil using expellers. Solvent extraction of sesame oil is not practiced by most of them. Conventional method of oil extraction was practiced by a few extraction units only. Most of the sesame oil brands available in Kerala commercial market are from Tamil Nadu and Andhra Pradesh. Detailed studies regarding the evaluation of genuinely of gingelly oil (Tila taila) available in Kerala market has not been carried out till now. Hence the present study is undertaken which will be useful to pharmaceutical industries and practitioners of Ayurveda for the authentication of the commercially available samples of Tila taila.

MATERIALS AND METHODS

Sample Collection And Evaluation

Tila

10 kg of the genuine sample of Tila (*Sesamum indicum* Linn. – cultivar ACV-3: Thilak) was purchased from Kayamkulam. It was then authenticated by The Project Director, ORARS, Kayamkulam. This was cleaned, dried in the sun for three days and stored in airtight polythene bags. A representative sample was analyzed for its genuinity as per the standards mentioned in Ayurvedic Pharmacopoeia of India[4] The rest of the sample was used for extraction of genuine sample of Tila taila, using conventional method.

Tila Taila- Evaluation of Genuine Tila Taila

Method of Preparation of Genuine Tila Taila and its Analysis

10 kg of seeds were used for extraction of genuine sample of Tila taila, using conventional method at Kayamkulam. At first, about three fourth of the sesame seeds were placed in the mortar. A motor is attached to the machine which drives the

pestle and crushes the seeds. 500g of jaggery is added and when the seeds are pulverized about 180 ml of water is sprinkled around the pestle and 120 ml poured into the pit. After 5 minutes, 300ml of water is poured evenly around the pit. After 45 minutes the oil started oozing out and at that time 100ml of water is sprinkled over it. the oil is collected after pressing the oil cake. In this way 10kg seeds were pressed and 4.2kg of oil was obtained.

The genuine sample of tila taila thus obtained was kept in sun for 10 days for the complete evaporation of moisture and for sedimenting. It was then stored in air tight glass bottle and was labeled as 'K'. The genuine Tila taila was analyzed for various physico-chemical parameters such as Acid value (AV), Iodine value (IV), Refractive index (RI) Saponification value (SV), Specific gravity (SG) and Moisture content. Rancidity test, Boudoins test, tests for detection of mineral oil and cotton seed oil were also done

Method of Market Sample Collection of Tila Taila and its Analysis

A preliminary survey was conducted to identify the available brands of Tila taila in Kerala market. 25 brands were identified from fourteen districts. Ten brands were selected randomly from the list using lottery method. For each brand, three samples with different batch numbers were purchased. Thus a total of 30 market samples were collected for the study. The brands were labeled alphabetically from A to J and the different batch numbers from brand were labeled 1, 2 and 3. Thus the samples from the first brand were labeled A1, A2 and A3. All the thirty samples were analyzed for the physico-chemical parameters such as Acid value (AV), Iodine value (IV), Refractive index (RI) Saponification value (SV), Specific gravity (SG) and Moisture content. Rancidity test, Boudoins test, tests for detection of mineral oil and cotton seed oil were also done and the result obtained was compared with that of genuine sample (K).

Physicochemical Evaluation- Tila Taila

The following tests were done to evaluate the physico-chemical parameters as per the methods described in The Ayurvedic Pharmacopoeia Of India, Part1 Volume–6(Department Of Ayurveda, Yoga-Naturopathy, Unani,Siddha and Homoeopathy. Ministry Of Health And Family Welfare,Govt.Of India:2008)[5] and India FSSA. Manual For Analysis Of Fats And Oils. (New delhi: Ministry Of Health and Family Welfare;2012)[6]

1. Determination of moisture content
2. Determination of specific gravity
3. Determination of refractive index
4. Determination of saponification value
5. Determination of acid value
6. Determination of iodine value
7. Test for presence of sesame oil (baudouin test)
8. Test for presence of cottonseed oil (halphens test)
9. Detection of mineral oil (holde's test):
10. Rancidity test (kreis test)

RESULTS

Table 1: The price of market samples per 100ml

Sl no:	Brand	Price /100ml
1	A	17.75
2	B	19.5
3	C	15-20
4	D	21
5	E	21
6	F	19.5
7	G	17.75
8	H	25
9	I	27
10	J	19

Table 2: Comparison of physico chemical characters of genuine and market samples of Tila taila

Sl No:	Brand	AV	IV	SV	RI	SG
1	A1	5.98	113.05	187.52	1.466	0.9151
2	A2	6.07	114.38	182.5	1.4662	0.9176
3	A3	5.77	115.03	185.04	1.4662	0.917
4	B1	1.91	115.1	195.93	1.47	0.9162
5	B2	2.24	117.38	195.27	1.468	0.9138
6	B3	2.12	117.69	193.69	1.47	0.9149
7	C1	6.29	86.97	188.78	1.467	0.9164
8	C2	6.61	100.67	182.32	1.468	0.9161
9	C3	6.2	104.07	186.4	1.466	0.9156
10	D1	6.27	109.32	172.53	1.466	0.9164
11	D2	6.77	113.12	177.81	1.4662	0.9161
12	D3	6.23	106.47	175.78	1.469	0.916
13	E1	7.15	114.92	187.24	1.464	0.9155
14	E2	6.41	118.05	184.7	1.464	0.9157
15	E3	6.26	114.6	189.07	1.467	0.9156
16	F1	3.26	108.38	199.67	1.466	0.9173
17	F2	3.06	108.74	198.57	1.467	0.9178
18	F3	3.2	113.89	199.19	1.466	0.9173
19	G1	7.61	97.66	186.31	1.468	0.8989
20	G2	7.03	93.34	182.87	1.469	0.8985
21	G3	7.75	95.9	183.74	1.4692	0.899
22	H1	1.57	98.7	170.92	1.463	0.9199
23	H2	1.02	100.22	171.76	1.469	0.9202

24	H3	1.14	99.34	173.05	1.466	0.9203
25	I1	1.73	86.31	164.27	1.467	0.916
26	I2	1.8	82.22	162.66	1.468	0.9142
27	I3	1.83	86.01	164.48	1.4674	0.9154
28	J1	1.83	101.78	168.92	1.466	0.9148
29	J2	1.99	108.01	169.53	1.4662	0.9279
30	J3	1.93	102.97	167.12	1.466	0.9252
31	K	1.46	103.9	189.09	1.466	0.917
32	API	< 2.0	103-116	188-195	1.4650-1.4665	0.9160-0.9190
33	AGMARK	0.5 -6	105 t-115	188 – 193	1.4646 -1.4665	0.915 - 0.919

Table 3: Comparison of physico chemical characters of genuine and market samples of Tila taila

Sl.no:	Sample	Moisture content	Boudoins test	Mineral oil	Cotton seed oil	Rancidity test
1	A1	Nil	++	Nil	Nil	+
2	A2	Nil	++	Nil	Nil	+
3	A3	Nil	++	Nil	Nil	+
4	B1	Nil	++	Nil	Nil	-
5	B2	Nil	++	Nil	Nil	-
6	B3	Nil	++	Nil	Nil	-
7	C1	Nil	+++	Nil	Nil	+
8	C2	Nil	+++	Nil	Nil	+
9	C3	Nil	+++	Nil	Nil	+
10	D1	Nil	++	Nil	Nil	+
11	D2	Nil	++	Nil	Nil	+
12	D3	Nil	++	Nil	Nil	+
13	E1	Nil	+++	Nil	Nil	+
14	E2	Nil	+++	Nil	Nil	+
15	E3	Nil	+++	Nil	Nil	+
16	F1	Nil	+++	Nil	Nil	-
17	F2	Nil	+++	Nil	Nil	-
18	F3	Nil	+++	Nil	Nil	-
19	G1	Nil	+++	+++	Nil	-
20	G2	Nil	+++	+++	Nil	-
21	G3	Nil	+++	+++	Nil	-
22	H1	Nil	+++	Nil	Nil	-
23	H2	Nil	+++	Nil	Nil	-
24	H3	Nil	+++	Nil	Nil	-
25	I1	Nil	+++	Nil	Nil	-
26	I2	Nil	+++	Nil	Nil	-
27	I3	Nil	+++	Nil	Nil	-
28	J1	Nil	+++	Nil	Nil	-
29	J2	Nil	+++	Nil	Nil	-
30	J3	Nil	+++	Nil	Nil	-
31	K	Nil	+++	Nil	Nil	-

DISCUSSION

Due to lack of proper parameters for the standardization of herbal preparations, several instances of substandard, adulterated crude drugs occur. The quality control of herbal crude drugs and their bio constituents is of prime importance in ensuring therapeutic efficacy. The preparations used in ayurveda have to be standardized in order to get the optimal concentration of known active constituents and in preserving their activities on various physicochemical parameters. The present study assessed the genuinity of gingelly oil (Tila taila) available in the commercial markets of Kerala with the aid of physico-chemical evaluation. The genuinity of the market samples were assessed by evaluating and comparing their physico-chemical characters with that of genuinely prepared sesame oil. The preliminary parts of study included sample collection and the pharmacognostical and phytochemical evaluation of Tila (*Sesamum indicum* Linn.) The characters of seeds matched with the API standards. The genuine sample of Tila taila was prepared from this sesame seeds.

The study was conducted in two parts. Physico-chemical evaluation of genuine Tila taila, and physico-chemical evaluation of market samples and the results were compared with that of genuine sample (K), API and AGMARK standards. Various physico chemical parameters such as Acid value (AV), Iodine value (IV), Refractive index (RI) Saponification value (SV), Specific gravity (SG) and Moisture content were evaluated which would reveal the quality and potency of oil. Rancidity test, Boudoin's test, tests for detection of mineral oil and cotton seed oil were also done.

During sample collection, it was observed that most of the sesame oil brands available in Kerala commercial market were from Tamil Nadu and Andhra Pradesh. The price of market samples showed variations from Rs 15 to Rs 27 per 100ml. The cost of sesame seeds range from Rs 180 to Rs 200 per kg(black variety). The oil yield is 40-60%. The conventionally prepared Tila taila (K) cost Rs 54.50 per 100 ml. The price of market samples per 100ml is given in table 1.

The physico-chemical evaluation was conducted in Drug Standardization Unit, Govt. Ayurveda College, Thiruvananthapuram. Market samples of gingelly oil (Tila taila) showed variations in their physico chemical parameters when compared with the genuine sample and most of the samples didn't satisfy all the parameters in API[(1)] and AGMARK[(2)] standards. The genuine sample met all the standards described in API and AGMARK (Table 2). The collected data on

quantitative physicochemical evaluation which includes Acid value (AV), Iodine value (IV), Refractive index (RI) Saponification value (SV), Specific gravity (SG) for genuine and market samples of gingelly oil (Tila taila) collected from the districts of Kerala were subjected to descriptive statistics and the results were compared with genuine sample. The significant difference in the physico-chemical values of market samples were statistically tested using one sample t test.

Acid Value- The brands A,C,D,E,F,G,I and J showed significant increase in their Acid Values at 1% level ($P<0.01$). Brand B showed significant increase at 5% level ($P<0.05$) and the brand H showed no significant difference in Acid Value ($P>0.05$) when compared with genuine sample.

Iodine Value- The brands A,B,E,H and I showed significant increase in their Iodine Values at 1% level($P<0.01$) when compared with the genuine sample. Brand G showed significant increase in iodine value at 5% level ($P<0.05$). Brands C,D,F and J showed no significant difference in their Iodine Value ($P>0.05$)when compared with genuine sample.

Refractive Index- Brand B,G and I showed significant increase in Refractive Index at 5% level ($P<0.05$). Brands A,C,D,E,F,H and J showed no significant difference in their Refractive Index ($P>0.05$) when compared with genuine sample.

Saponification Value- The brands F,H,I,J showed significant increase in their Saponification Values at 1% level as compared to genuine sample. The brands B,D and G showed significant increase at 5% level and the brands A,C and E showed no significant differences in their Saponification Values as compared to genuine sample

Specific Gravity- The brands E,G and H showed significant increase in their Specific Gravity at 1% level when compared with genuine sample. The brand D showed significant increase at 5% level and the brands A,B,C,F,I and J showed no significant differences in their Specific Gravity as compared to genuine sample. Moisture content was absent in both genuine and market samples.

Test for presence of sesame oil (baudouin test) is an identity test for sesame oil. The test was positive in all samples Test for presence of cottonseed oil (halphens test) was done to check the presence of cottonseed oil in the sesame oil samples. The test was negative in all samples. Detection of mineral oil (holde's test) was performed in all samples. The test was positive in all the three samples of brand G. Rancidity test (kreis test) was positive in 12 samples, which indicate inadequate processing and storage.(Table 3) .

CONCLUSION

The market samples of gingelly oil (Tila taila) showed variations in their physico chemical parameters when compared with the genuine sample. The genuine sample which is prepared using conventional method met all the standards described in API and AGMARK. Mineral oil which is a harmful adulterant, was detected in all the three samples of brand G.

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