

CHANGES OF INGREDIENTS IN THE PROCESS OF COOKING OF SESAME OIL

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ABSTRACT: *Seasame oil is the most stable vegetable oil against oxidation. It has been revealed that the oxidative stability of seasame oil is due to the lignans such as sesamole, sesamolinol, pynoresional, sesaminol, etc., contained in it. Sesamol is obtained by the hydroxylation of sesamolin. The reaction is hydroxylation which is generally promoted by acid and heat. The changes of the concentration of lignans and 7 – tocopherol of Ksira – Bala Taila were determined by HPLC assay. Sesamol, a strong antioxidant, increased in the process of cooking, which may be concerned with the meaning of cooking.*

INTRODUCTION

Fats from animal or plants origin have been used for many treatments in Ayurveda. In general, fats relieve Vata owing to its unctuousness. Seasame oil, one of the most popular vegetable oils, is the best alleviator of Vata among other fats and its is used most frequently in Panchakarma Charaka said that seasame oil can cure many diseases in combination with various drugs (Sanyoga) or after the various kind of cooking (Sanskara). Seasame oil medicated with various herbs is used most frequently in Panchakarama treatment which is the characteristic rejuvenating therapy of Ayurveda. Adding to that, he said that he regular massage with seasame oil can enhance strength and reverse aging process (Ca. Su. 27; 287). Ayurveda has appreciated the importance of seasame oil (Su. Su. 45 : 130).

In experimental study of modern medicine, it has been found that seasame oil is the most stable vegetable oil against oxidation (1). The stability of seasame oil against oxidation is owing to the lignans such as sesamol, sesaminol phynoresinol, sesamolinol and so on contained in the oil (2). Sesamol is the most famous and strong antioxidant of the lignans. Table 1 shows main ingredients and their activities in the seasame oil.

Table 1 Main ingredients of seasame oil (2)

1. Saturated fatty Acids : Palmitic acid
2. Nonsaturated fatty Acids : Linoleic acid, oleic acid oleic acid
3. 7 – Tocoferol : 1 / 10 of anti-oxidative activity of a-tocopherol

4. Lignans : Sesamol Sesamol :
antioxidant, antimicrobial (1,2,4).

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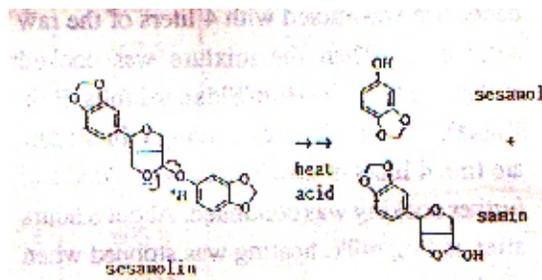


Fig. 1 The reaction of sesamol to sesamol

The characteristics of sesame oil is the its content of lignans adding to the usual fatty acids. However the content of sesamol in the raw sesame oil is very low (2). Sesamol is obtained by the hydroxylation of sesamol (Fig. 1).

The hydroxylation reaction is generally promoted by heat and acid.

Recent experiments have revealed that oxygen radicals such as superoxide anion. Hydroxy radical and peroxy radical are the most important causative factors of aging, carcinogenesis, atherosclerosis and cataract and so on. The modern medicine has been certificating the possibility that the antioxidants such as β -carot in ro a - tocopherol can prohibit the pathological process (3).

The antioxidative activity of lignans may explain the rejuvenative effects of the Panchakarma. Recent researches have also

reported that sesamin, another lignan, decrease plasma and liver cholesterol level in mice (4) and it has the powerful protective activity against liver damage by alcohol and tetrachlorocarbon (5). Sesamin has also the inhibitory activity against the 5 - desaturase an enzyme related to the prostaglandine synthesis (4). The presence of the lignans in the sesame oil or Panchakarama.

It is worth to notice that Sharnagadhara Samhita written in the 12th century said that insufficient cooking of oil is ineffective and cause sluggishness of metabolism. Further the Samhita said that medicated oils should not be kept overnight because there will be accumulation of better qualities (Sha. Ma. 9 : 17 - 19). Ayurveda recommends using the medium or high cooked oils for external massage (6). Therefore an experimental study was planned to analyse the changes of ingredients (Lignans) in the process of

cooking of most common medicated sesame oil, Ksira – Bala Taila.

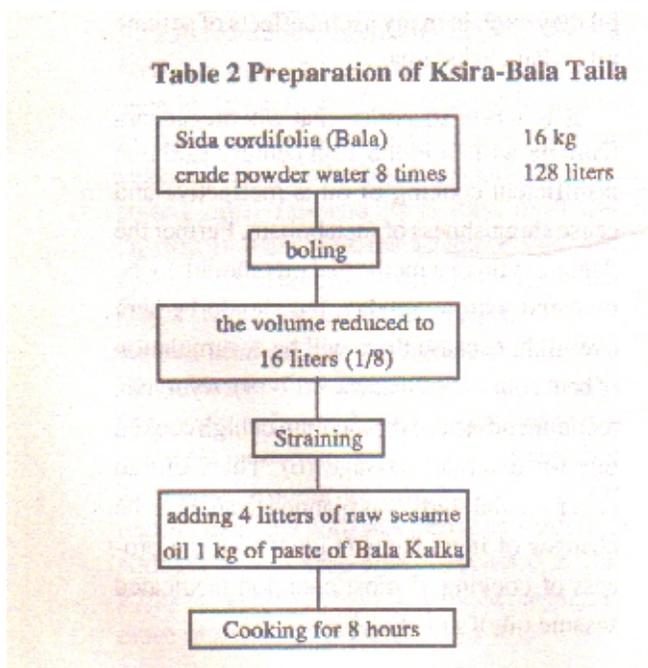
Method

1. Preparation of Ksira – Bala Taila (6) :

16 kg of crude powder of *Sida cordifolia* (Bala) was taken and added with eight times of water (128 liters), and boiled immoderate fire until its volume reduced to 16 liters (1/8). The strained decoction was mixed with 4 liters of the raw sesame oil. Then the mixture was cooked alongwith 1 kg of paste of *Sida*

cordifolia (Bala Kalka). After boiling for overnight in moderate fire, 4 liters of cow's milk was added and further cooking was continued. About 8 hours after adding milk, heating was stopped when all the water had been boiled out. Just before stopping the heat, three kinds of medicated oil was gained according to the grade of cooking. The sample of mild cooking was obtained just by stopping the heat. The sample of medium cooking was obtained by heating a little more.

Table 2 Preparation of Ksira – Bala Taila



The one of high cooking was obtained by heating for more long time (within 15 minutes).

1. mild cooking (stopped heating as soon as all the water had been boiled out)

2. medium cooking (add heating a little more)
3. high cooking (heat more for about 15 minutes)

2. **Determination of lignans in the oil :** Sesame oil samples at various stages of cooking were analysed by HPLC (High Performance Liquid Chromatography);

Shimazu Japan). The samples were filtered with W type 0.45 m pore size miliporefilter and dissolved in two time of volume of chloroform and applied to the HPLC (Column : A – 312 S – 5 YMC pack, ellutant : water / methanol = 3/7, flow rate = 1.0 ml/min., Detector; 290 nm UV). The area was calculated by Chromatopack (Shimazu, Japan).

3. Determination of 7 tocopherol in the oil: Sesame oil at various stages of cooking were analysed by HPLC. The samples were filtered with W type 0.45 m pore size miliporefilter and dissolved in two time of volume of chloroform and applied to the HPLC (Column : Develosil – ODS 10, ellutant : methanol, Flow rate = 2.5 ml / min., Detector : Fluoresence Ex. 298 nm, Em. 325 nm.)

Table 3 The concentration of lignans and 7 – tocopherol of Ksira – Bala Taila at various stages of cooking.

Description	Concentration (mg/100 g oil)			
	Sesamol	Sesamin	Sesamolin	7 – Tocopherol
Raw sesame oil	Trace	636.7	295.8	49.0
Mixed with decoction of Bala	Trace	662.5	3.96	43.5
After overnight boiling	4.8	696.3	387.2	4.2
After adding milk	4.8	661.5	378.4	n.d.
Mild cooking (mrudu paka)	11.4	645.3	360.4	n.d.
Medium cooking (Madhya paka)	13.4	605.8	37.1	n.d.
High cooking (khara paka)	18.4	627.9	387.7	n.d.

n.d. : not detectable

Results and Discussion

Table 1 and Fig.2 show that in the process of cooking the content of sesamol increases. Sesamol is one of the most strong antioxidative lignans in the sesame oil. This means that the high cooked oil may have stronger antioxidative activity than the raw sesame oil or other sesame oils not fully cooked. The content of 7 – tocopherol

of cooked sesame oil decreased. However, the anti-oxidative activity of 7 – tocopherol is one tenth of a – tocopherol (2). So, the contribution of 7-tocopherol on the anti-oxidative activity would be small.

In general, the antioxidants have useful effects against aging, carcinogenesis,

atherosclerosis and many other diseases (3). The meaning of cooking of the sesame oil may be increasing sesamol content and then to provide the antioxidative activity to the medicated oils. The sesame oil endowed with antioxidative activity may shown many useful effects against aging or other pathological conditions described in the text books of Ayurveda.

Fig. 2 shows the sudden appearance of unidentified peak which has more low polarity than sesamol. Any other authors have no referred to this substance. The appearance of this substance occurred by the

heating for only few minutes at the terminal stage of cooking. There was not the peak of fig. 2 (5). The substance differentiates high cooking from medium or soft cooking. It may explain the meaning of high cooking and further the mechanism of effectiveness of oil massage of Panchakarma. We are now on the research to identify the structure and property of this substance.

The analytical study of sesame oil in the process of cooking should be necessary to make clear the mechanism of many Ayurvedic treatments.

Column: A-312 S-B HPLC pack, eluent: water/ethanol = 3/7, flow rate = 1.0 ml/min., Detector: 290 nm UV.

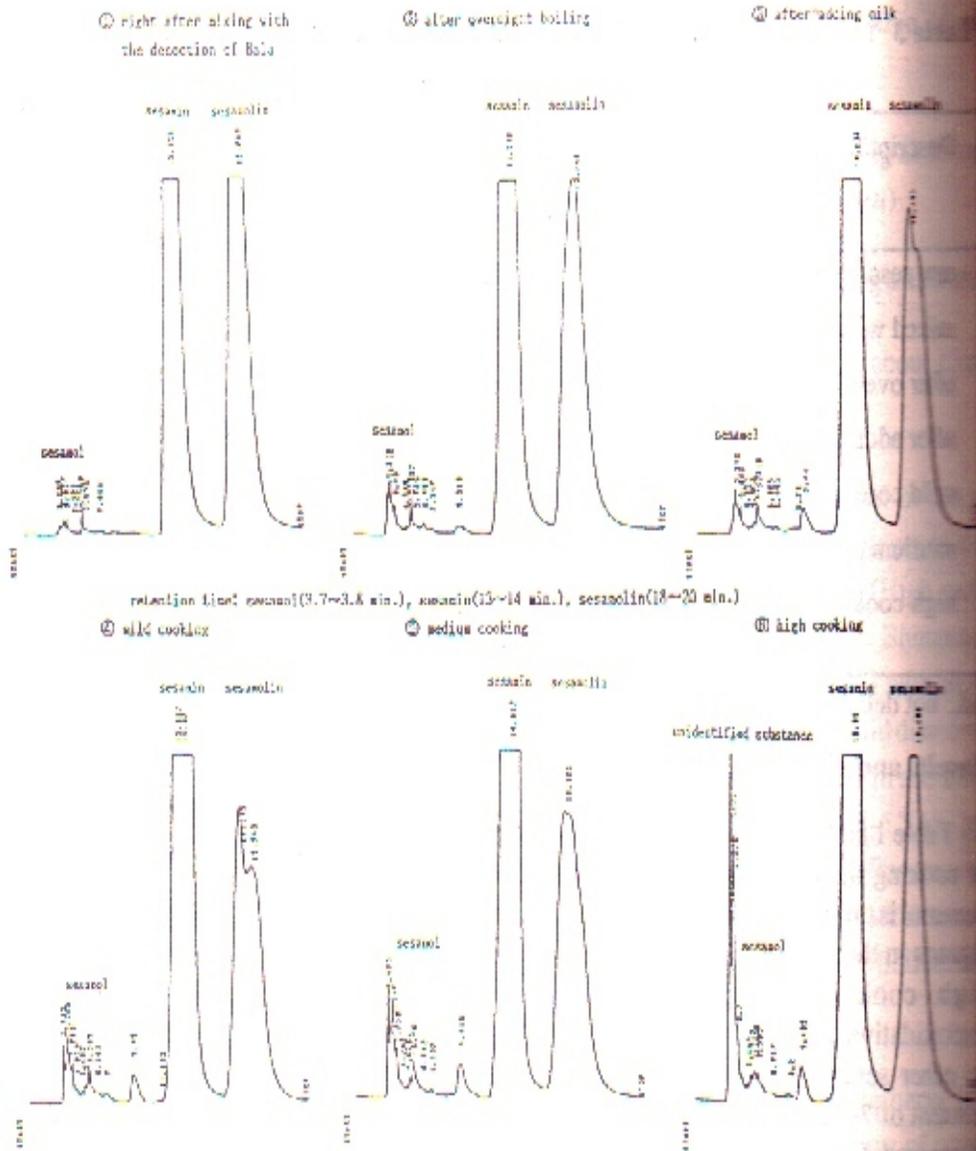


Fig. 2 HPLC charts of the samples of variously cooked sesame oils

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