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Effect of black sesame seeds (*sesamum indicum* L.) consumption on sleep quality among thai elderly

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Abstract

Insomnia remains one of the most common sleep disorders encountered among the elderly. and overall prevalence of insomnia symptoms ranges from 30-48%. In Thailand, the prevalence of insomnia among the elderly has been reported at 46.3%. Currently studies, black sesame seed can be a source of micronutrient (These nutrients include minerals and vitamins) that may impact important nerve-signaling chemicals or neurotransmitters of sleep regulation, including serotonin, NDMA, glutamate, and melatonin secretion. The present study aimed to investigate the effects of black sesame seeds consumption on sleep quality among Thai elderly. The study was performed as a randomized controlled clinical trial with 3 paralleled groups (2 intervention and 1 control group) over 12 weeks. Sleep quality assessed by questionnaire The Pittsburgh sleep quality index: PSQI The results showed that sleep quality increased significantly among subjects consuming 20 g/d of black sesame seeds (powdered roasted black sesame) daily for 12 weeks (P=0.006) compared with the control group (0.90) and no adverse events relating to black sesame seeds were confirmed. In the future, black sesame seeds could be consumed as a supplement for a safe potential treatment to improve sleep quality and for those who have sleep problems.

Keywords: Black sesame seeds, Sleep quality, Thai elderly

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1. Introduction

The elderly population continues to increase rapidly from the currently 205 million individuals aged 60 years or older to a projected 2 billion by 2050. (United Nations, 2001). Insomnia remains one of the most common sleep disorders encountered in the elderly population (Foley *et al.,* 1995). As many as 50% of the elderly complain about difficulty initiating or maintaining sleep (Morin & Benca, 2012), (Shochat *et al.,* 2001). The overall prevalence of insomnia symptoms ranges from 30 to 48% among the elderly (Crowley, 2011), (Klink *el at.,* 1992), (Ohayon, 2002). In Thailand, the prevalence of insomnia in the elderly population has been reported at 46.3%. A random sample of 40,111 individuals was selected from those individuals over 60 years of age and the incidence of insomnia in a population aged 65 years or older was approximately 5%. Many various potential causes of unrestful sleep among the elderly, include emotional stress, physiologic changes of aging including circadian rhythm disorders, psychosomatic disorders, effects of medication and, serious underlying medical conditions (Subramanian & Surani, 2007), (Verhoeven *et al,* 2014). In addition, decreased nutrient intake, absorption, retention, and use (Abbasi, 2012). Recent studies have revealed a reverse relationship between dietary and serum nutrient levels and sleep problems (Afaghi *et al.,* 2008) (Grandner *et al.,* 2014) (Bertisch *et al.,* 2014). Macronutrients intake serves as a modifiable factor for sleep deprivation and sleep problems. Although micronutrient intake (these include minerals and vitamins) has not received as much attention, experimental studies have indicated that micronutrients may impact important nerve–signaling chemicals or neurotransmitters of sleep regulation, including serotonin, N–methyl–D–aspartate (NDMA), glutamate and melatonin secretion (Ursin, 2002) (Sowa–Kucma *et al.,* 2008) (Honma *et al.,* 1992). Sesame (*Sesamum indicum* L.) is one of the world's important oil crops. Its primary marketable products are whole seeds, seed oil and meal. Sesame is grown for its seeds and the primary use of the sesame seed is as a source of oil for cooking. Sesame oil is highly stable and rarely turns rancid in hot climates. The seeds are rich in unsaturated fatty acids where the composition is 14% saturated, 39% mono–unsaturated, and 46% polyunsaturated fatty acids. Carbohydrates in sesame seed are composed of 3.2% glucose, 2.6% fructose and 0.2% sucrose while the remaining quantity comprises dietary fiber. As a good source of protein, it yields between 20% and 25% protein (Cano–Medina *et al.,* 2011). Sesame seeds are also used fully for humans as they are digestive, rejuvenating, anti-aging and rich in micronutrients such as vitamins E, A and B complex. The dietary fiber is an excellent source of phosphorus, iron, magnesium calcium, manganese, copper and zinc. In addition to these important nutrients, sesame seeds contain two unique substances, sesamin and sesamolin. Both of these substances belong to a group of special beneficial fibers called lignans (sesamin,

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sesamolin, sesaminol and sesamolinol) (Bukya & Vijayakumar, 2013). Further, they have desirable physiological effects including antioxidant activity, blood pressure and serum lipid-lowering potential as proven in animal and human experiments (Sirato-Yasumoto *et al.,* 2001) (Pathak *et al.,* 2014). However, the effect of black sesame seed consumption on sleep quality has been minimally reported in the literature. Therefore, the present study aimed to investigate the effects of black sesame seed consumption on sleep quality among Thai elderly.

2. Materials and methods

2.1 Subjects

Elderly men and women aged between 60 and 80 years experiencing insomnia participated in the study (insomnia was diagnosed according to the Pittsburgh Sleep Quality Index: PSQI) and were recruited from the Elderly Club in Vachira Hospital. Exactly 33 volunteers were enrolled in the study following the inclusion criteria. These included not taking any supplements known to affect weight loss in the last six months, no allergy to legumes and sesame products, no cigarette smoking and alcohol consumption. The study protocol was approved by the Declaration of Helsinki by the Ethics Review Committee for Human Research, Faculty of Public Health, Mahidol University, and signed informed assent was received from all subjects.

2.2 Study design and method

The study employed a parallel-comparison design over a 12-week period. Subjects were matched in each group based on sex, age, body weight and BMI, sleep duration and then randomized to one of three groups: 1. control, 2. crushed roasted black sesame and 3. powdered roasted black sesame. After randomization, subjects in the control group were asked to maintain their usual dietary intake levels during the study. Subjects in intervention groups consumed 30 g/d of black sesame seeds (crushed roasted black sesame) and 20 g/d of black sesame seeds (powdered roasted black sesame) daily for 12 weeks. The supplement compositions are shown in Table 1.

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Table 1 Nutrition information of black sesame seeds per 1 tablespoon (15 g)

	Nutrition information	
	Crushed roasted black sesame	**Powdered roasted black sesame**
Total fat (g)	4.5	4.5
Saturated fat 1 (g)	1	0.5
No cholesterol		
protein (g)	4	5
Carbohydrates (g)	3	4
Dietary fiber (g)	1	4
Calcium (%)	20	35
Magnesium (%)	15	25
Iron (%)	25	25

3. Results and discussion

Thirty-three insomnia subjects were recruited in the study according to the inclusion criteria and a randomized controlled clinical trial using three parallel groups was conducted among elderly men and women aged 60 to 80 years. Simple random sampling was used to divide subjects in three groups (two intervention and one control) with an intervention of 12 weeks. All subjects completed the study, and baseline characteristics in the three groups of intervention at baseline did not significantly differ (Table 2). In addition, all subjects were observed to experience no adverse events after consuming the black sesame seeds. In our study, the randomized sleep quality was increased significantly among subjects consuming black sesame seeds at 12 weeks (P=0.006) compared with the control group (0.90) as shown in Table 3. Similar results have been revealed previously by Jellin *et al.* (2000) reporting uses of sesame oil as a therapy for relieving insomnia. Moreover, Takemoto *et al.* 2015 reported the evaluated consumption of sesame lignans to supplement significant improvements in sleep at 12 weeks compared with 0 weeks (P=0.002)., No significant differences were observed regarding the crushed roasted black sesame and control groups. This result was due to micronutrient of a black sesame seed (These nutrients include minerals and vitamins) may impact important nerve-signaling chemicals or neurotransmitters of sleep regulation, including serotonin, NDMA, glutamate and melatonin secretion. (Ursin, 2002, Sowa-Kućma *et al.,* 2008 and Honma *et al.,* 1992). Furthermore, no adverse events relating to black sesame seeds were confirmed. Additionally, powdered roasted black sesame groups compared between and with crushed roasted black sesame groups, indicated that sleep quality was

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significantly improved during the 12 weeks. No significant difference was observed in the crushed roasted black sesame groups, and the two treatment groups had significantly higher sleep quality the that of the control group.

Table 2 Baseline characteristics of subjects: comparisons among groups

Characteristic of subjects	Control Group (n=11)	Crushed roasted black sesame Group (n=11)	Powdered roasted black sesame Group (n=11)	P value
Sex				
Male, n (%)	1 (9.1)	1 (9.1)	2 (18.2)	0.7524
Female, n (%)	10 (90.9)	10 (90.9)	9 (81.8)	
Age,	71.90	66.45	68.63	0.192
average (SD)	(6.31)	(5.67)	(8.32)	
Height (Cm),	152.18	153.86	152.72	0.811
average (SD)	(5.90)	(6.76)	(5.88)	
Weight (Kg),	56.29	57.65	60.50	0.610
average (SD)	(11.06)	(7.35)	(11.3)	
BMI (Kg/m^2),	24.20	24.14	25.76	0.533
average (SD)	(3.92)	(3.32)	(3.22)	
Sleep duration (hr)	5.90	6.63	6.00	0.288
average (SD)	(1.17)	(0.92)	(1.32)	

*The P-value <0.050 is considered a significant difference for the confidence interval of 95%

Table 3 Sleep quality of intervention and control groups (weeks 0-12) for study of black sesame seeds consumption

Weeks	Control Group (n=11)	Crushed roasted black sesame Group (n=11)	Powdered roasted black sesame Group (n=11)	P value
0	5.81 (2.96)	5.21 (3.16)	5.45 (2.29)	0.900
12	6.63 (2.61)	4.18 (2.56)	3.27 (1.73)	0.006**
P value	0.413	0.102	0.002**	

* The P-value <0.050 is considered a significant difference for the confidence interval of 95%

** The P-value <0.01 is considered a significant difference for the confidence interval of 95%

4. Conclusion

Black sesame seeds exhibit high nutritive and therapeutic qualities. Sesame is a rich source of macronutrients and micronutrients including proteins, dietary lignans, vitamins, calcium, phosphorous and in future, could be consumed as a supplement for a safe potential treatment to improve sleep quality and for those who have sleep problems.

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