

Hair Growth Promotion with Black Soybean Extracts: case series

Ho-young Sung¹, Kyeong Han Kim^{2*}

¹Resam Korean Medicine Clinic, Seoul, Republic of Korea

²Department of Preventive Medicine, College of Korean Medicine, Woosuk University, Jeonju, Republic of Korea

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*Corresponding Author

Kyeong Han Kim

Department of Preventive Medicine,
College of Korean Medicine, Woosuk
University, Jeonju 55338, Republic of
Korea

Tel: +82-63-290-9031

E-mail: solip922@hanmail.net

Black soybean (BS) is widely thought to prevent or alleviate hair loss, which has been demonstrated by in vitro experiments. However, few clinical studies have directly assessed the effect of BS on hair growth. To assess the safety and efficacy of BS, we administered BS extract to 10 adult patients for 3 months without any other hair products and treatments. The number and diameter of hair lost from washing were examined every 4 weeks. In addition, the participants' satisfaction with their hair condition was also measured using the VAS (1 to 10) before and after treatment. The mean number of lost hair was 140.7 (SD 59.4) at baseline and 38.8 (SD 54.4) after 12 weeks, and the diameter of lost hair was 72.4 μm (SD 11.9) at baseline and 80.4 μm (SD 8.8) after 12 weeks, which indicated a statistically significant improvement ($p = 0.002$, $p = 0.022$, paired t-test). The satisfaction score was significantly increased from 6.10 (SD 1.2) to 8.2 (SD 1.1) after 12 weeks. These results suggest that BS extract may promote hair growth and prevent hair loss.

Keywords: black soybean, extract, hair loss

INTRODUCTION

The growth of hair is not continuous and is divided into the anagen phase (3-6 years), catagen phase (2-3 weeks), and telogen phase (2-4 months), and the growth cycle is repeated 10-20 times in a lifetime. Around 80-90%, 5%, and 10% of all hair are in the anagen phase, catagen phase, and telogen phase, respectively. In addition, approximately 50-100 hair strands are lost per day [1, 2].

Hair loss refers to a prolonged period of telogen phase or an increase in the number of telogenic hair follicles, resulting in excessive hair loss compared to normal conditions [3]. Hair loss can be caused by excessive stress, malnutrition, local infection of the scalp, decreased hair follicle function due to male hormones, decreased scalp physiological function, and incorrect use of hair care products [4]. Recently, the number of people with hair loss has increased considerably due to increased stress and changes in the diet. Therefore, there has been considerable interest in hair loss prevention not only among middle-aged men but also among young and female individuals [4].

Extensive research on hair loss prevention agents has been conducted, and various products have been developed; however, there is still a lack of effective and safe agents. In this study, we examined the effectiveness of black soybean (BS) as a health food to prevent hair loss and promote hair growth.

BS is a main source of protein and is known to contain cysteine, an essential ingredient for hair growth, which is also effective in preventing hair loss [5, 6]. In addition to large amounts of protein, BS contains lecithin, phytoestrogen, unsaturated fatty acids, and anthocyanins, indicating that it has various pharmacological activities, including antioxidant, anticancer, anti-obesity, and estrogenic effects [7-12]. BS can also improve blood circulation through the inhibition of thrombogenesis, and vitamin E, unsaturated fatty acids, and anthocyanins in BS have been reported to help smooth blood circulation in the peripheral blood vessels [13, 14]. Based on preclinical studies, BS is thought to be effective in preventing hair loss by nourishing the hair roots through improved scalp blood circulation. However, there is a lack of clinical research on whether BS extract prevents hair loss or improves hair growth when applied to the

scalp. Here, we assessed the hair condition of participants who used BS extract for 12 weeks.

MATERIALS AND METHODS

1. Ethical considerations

This report included 10 participants who agreed to the publication of their cases and signed informed consent forms. This case series was approved by the institutional review board of Woosuk Hospital of Korean Medicine (No. I-2007/006-006).

2. Materials and usage

The substances used in this study were extracted from 13 medicinal herbs such as BS and green tea in an 80°C water bath for 3 hours. The extract was mixed with purified water and 1,2-hexanediol and filtered twice.

The participants applied the extract to their hair and scalp more than once a day. They washed their hair with clean water after application for 10 minutes and did not use other hair products, including shampoo, for 3 months.

3. Evaluation

The participants' information, including age, gender, number and diameter of lost hair while washing, and satisfaction score for hair condition, is presented in [Table 1](#).

The participants used filters to block the drain before washing their hair and collected lost hair after washing. The collected hair was sent to the researchers. Hair samples were collected three times: before, 6 weeks after, and 12 weeks after using the

extract. The researchers measured the number of lost hair and the diameter of 5 randomly selected hair strands using an optical microscope (300×) and a calibration slide (1 mm/100 Div. × 0.01 mm). The participants' satisfaction with their hair condition was measured with a 10-point VAS twice: before and 12 weeks after using the extract.

4. Statistical analysis

All data were subjected to a normality test. Wilcoxon signed rank and paired t-tests were performed. A p value less than 0.05 was considered to indicate a statistically significant difference. SPSS 15.0 for Windows (IBM, Chicago, IL) was used for all analyses.

RESULTS

The average age of the participants was 60.4 (SD 7.7) years, consisting of 9 females and 1 male. They were slightly depressed or worried about losing their hair but were never diagnosed with alopecia. The number of hair lost from washing before using BS extract varied from 47 to 223. All 10 participants were not currently on medication or other treatments for hair loss. Before the study, 3 participants were using shampoo for hair loss, and 7 participants were using regular shampoo. None of their parents had alopecia, and they did not have any other uncomfortable physical symptoms.

The participants each used BS extract for 3 months from January 2020 to June 2020 according to the following guidelines:

- (1) Wash the hair with clean water.
- (2) Use your fingers to apply BS extract on the scalp for at

Table 1. Summary of participant information

Participant	Age	Gender	Number of lost hair	Diameter of lost hair	Satisfaction score
1	65	F	101	60	6
2	58	F	211	74	4
3	65	F	223	68	5
4	41	F	112	70	8
5	57	F	218	92	7
6	63	F	148	92	5
7	62	F	109	66	6
8	69	M	98	58	7
9	64	F	140	66	6
10	60	F	47	78	7

least 2 minutes and leave them for 10 minutes.

(3) Wash the head again with clean water.

(4) Do not use other hair products such as shampoo and conditioner.

For the first week, 6 of the 10 participants complained that their hair was itchy or not washed properly, and the other 4 participants said that they were slightly uncomfortable. From 3 to 6 weeks after using BS extract, 8 participants could feel that their hair loss area was decreasing; however, 2 participants observed no significant difference. After 12 weeks, 9 participants said that their hair loss area was significantly reduced after using BS extract; however, 1 participant did not notice a great difference. Before using BS extract, the average number of lost hair during washing was 140.7 (SD 59.4); this was reduced to 58.0 (SD 32.9) after 6 weeks and 38.8 (SD 54.4) after 12 weeks. The average number of lost hair for 10 participants for 12 weeks after using BS extract was verified by paired t-test, which demonstrated statistical significance; thus, the number of lost hair was significantly reduced ($p = 0.002$). However, for a 60-year-old woman, the number of lost hair was 47 prior to the use of BS extract, and after 6 weeks, the number of lost hair was 64; thus, the results did not apply to all individuals. Five strands of lost hair were randomly selected for each individual to evaluate their thickness, and the results are as follows: 72.4 μm (SD 11.9) at baseline before using BS extract, 74.0 μm (SD 8.8) after 6 weeks, and 80.4 μm (SD 8.8) after 12 weeks. Overall, the hair diameter was increased by 11% after 12 weeks compared to that before using BS extract, and paired t-test showed a statistically significant increase ($p = 0.022$) (Table 2).

Of the 10 participants, 7 participants felt that their hair had become voluminous 4 to 6 weeks after using BS extract, and 5 participants did not feel that their hair had become thicker after using BS extract. No side effects were reported except for itchy head when using BS extract for 12 weeks. In addition, 8 participants said that they felt uncomfortable when leaving the extract on their scalp for 10 minutes. The overall participants' satisfaction with their hair condition before and 12 weeks after

using BS extract was measured using the VAS, and there was a statistically significant increase from 6.10 (SD 1.2) to 8.2 (SD 1.1) after use ($p = 0.007$) (Fig. 1).

DISCUSSION

According to the Korean medical literature, BS is rich in high-quality protein, minerals (e.g., potassium, calcium, and iron), vitamin B groups, and vitamin E, which can support smooth blood circulation, thus preventing hair loss and keeping hair healthy [15, 16]. BS has long been used as a health food for hair loss prevention or as a raw material for herbal medicine prescriptions. Therefore, we investigated whether BS extract has the same effect when applied directly to the scalp.

In this study, BS extract was applied to the scalp more than once a day, and after 12 weeks, changes in both the number of lost hair and the diameter of hair were significantly different. The number of lost hair was decreased from an average of 140.7 before the start of treatment to 38.8 after treatment. In addition, the thickness of hair was 72.4 μm (SD 11.9) at baseline before using BS extract and 80.4 μm after 12 weeks.

Dermal papilla cells are the cells at the bottom of the hair root, which play a core role in hair growth, including the thickness and number of hair. In addition, improved blood circulation in the scalp capillaries provides adequate nutrients to the epithelial cells of the hair roots, stimulates the hair roots, and leads to thick and healthy hair growth [17, 18]. The results of this case study are consistent with those of a previous study showing the induction of the proliferation of hair papillary cell lines (DB6) separated from the beard of mice treated with 10 ppm of black bean extract [19].

In this study, the participants thought that lost hair was reduced and hair was enriched. However, few participants felt that their hair became thicker. Therefore, there was no change to the extent that they could physically feel the thickness of their hair. The overall participants' satisfaction with their hair condition was increased from 6.10 (SD 1.2) to 8.2 (SD 1.1), indicating that

Table 2. Changes in the hair condition after 12 weeks of treatment with BS extract

Classification	Before treatment	6 weeks after treatment	12 weeks after treatment	p value
Number of lost hair	140.7 \pm 59.4	58.0 \pm 32.9	38.8 \pm 54.4	0.002
Diameter of lost hair	72.4 μm \pm 11.9	74.0 μm \pm 10.3	80.4 μm \pm 8.8	0.022
Satisfaction score	6.10 \pm 1.2	-	8.2 \pm 1.1	0.007

p value was calculated between 0 and 12 weeks.



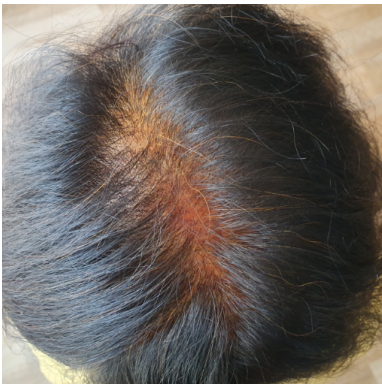
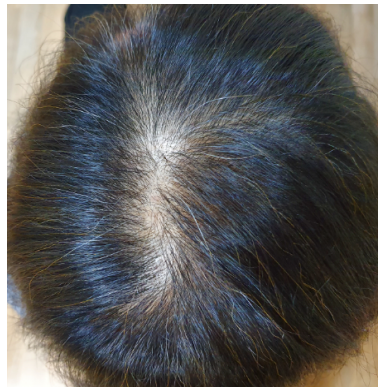


Participants	Before	12 weeks after
1		
2		
3		

Figure 1. Image showing the hair condition after 12 weeks.

the satisfaction level was high.

However, in the early days of use, there were cases of discomfort when leaving the extract on the scalp for 10 minutes. In addition, some complained of itching or a slight sting in the early days of use; however, the symptoms were eventually overcome. Therefore, the symptoms may be regarded as those that can occur when the use of hair products such as shampoo and conditioner is discontinued.

Overall, the application of BS extract to the scalp led to hair

growth promotion, which is thought to result from activated breast papillary cells, expanded capillaries, and improved blood flow. Recently, a growing number of individuals are suffering from hair loss due to a Western lifestyle, industrialization, and stress, and research has been actively conducted to develop various treatments to address this problem. However, the widely used minoxidil and finasteride are effective only during the treatment period, and long-term treatment has side effects such as dermatitis; thus, the development of safe and effective hair

loss prevention agents is necessary [20, 21]. In the case of BS, which has typically been consumed as a health food, there are no such side effects. Considering the excellent hair loss prevention and hair growth-promoting effects observed in this study, BS extract may be used for hair loss treatment.

CONCLUSION

BS extract may promote hair growth and prevent hair loss.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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ORCID

Ho-young Sung, <https://orcid.org/0000-0001-7011-6277>

Kyeong Han Kim, <https://orcid.org/0000-0003-4868-9145>

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