The Establishment of Optimum Conditions for Saccharification in Manufacturing Red Ginseng Sikhye

Sang-Sun Hur# and Suk-Won Choi*

#Dept. of Oriental Medicine and Food Biotechnology Joongbu Univ., Keumsan, 312-940
*B&L AGRO Inc., 12F, Daeryung BLDG, Munrae 5-ga, Youngdeungpo-gu, Seoul, 150-958

(Received September 13, 2007; Accepted November 16, 2007)

Abstract: Red ginseng sikhye is one of Korean unique beverages with the addition of effective ingredients of ginseng. Considering economical and mechanical efficiency and quality of sikhye, the optimum conditions for saccharification is to saccharify at 90 degree celsius for 3 hours in the composition of 4% of malt, 20% of steamed rice, and 6% of red ginseng power. The red ginseng sikhye has high soluble solid content over 33% compared with conventional commercial sikhye. On the other hand, ginseng sikhye, which shows low pH, has more or less higher acidity than conventional commercial one. Especially the turbidity of the red ginseng sikhye is much higher than that of commercial sikhye, due to as high amount of rice as 20% compared with 3% in the commercial one. The use of high quantity of rice affected the level of turbidity in red ginseng sikhye. In this study, we wanted to establish optimum conditions for saccharification in manufacturing red ginseng sikhye which contains effective herbal medicinal ingredients maintaining the original taste of traditional sikhye.

Key words: red ginseng, sikhye, saccharification, optimum process, soluble solid content

INTRODUCTION

Sikhye is one of traditional beverages in Korea1. Drinking sikhye constantly promotes digestion, loses weight, and makes feel better2. It was usually taken as a seasonal drink especially in winter time season to be served for dessert. Unlike tea and coffee, Sikhye is prepared through the complicated process. Therefore, it is hard to manufacture it in the house not only for the new generation, but also for the adult3. On the other hand, red ginseng is a kind of ginseng with dark brown color. Korean red ginseng containing over 30 kinds of saponins are recognized as a health food for anti-diabetes, improvement of function of intestine, protection of liver function, anticancer, antiaging, improvement of sexual dysfunction, decrease of hangover, depressant of blood pressure and promotion of mental activity4-6.

With the development of food processing technology, consumers have demanded traditional food made from natural resources. Sikhye is one of the beverages corresponding to the consumers’ demand. However, mass-produced sikhye in industrial scale with home-made one due to lack of quality improvements and industrial rationalization of processing. Most of all, the main problem of mass-produced sikhye is that it loses its native taste with the addition of sugar owing to a falling-off of sweetness through various processes. Most researches about sikhye are focused on the changes of ingredients during processes or recipe7-10. On the other side, it is necessary to maintain its native taste and characteristics to increase competitiveness of sikhye within the country and to globalize it as the Korean traditional beverage. Because the traditional food of common knowledge could not be protected by law, it is better idea to integrate functional foods as well as modern manufacturing methods with traditional ones.

This study was performed to show fundamental data to establish manufacturing processes for the new-style beverage, red ginseng-sikhye, with sikhye’s native taste and herbal medicinal characteristics of ginseng at the points of saccharification and quality changes by the addition of red ginseng.

MATERIAL AND METHODS

Materials
The rice used in this study was Icheon-Rice which was...
cultivated near Icheon, Kyunggi-do and the malt was pro-
duced at Hamyang-Nonghyup which is a branch of 
NACF (National Agricultural Cooperative Federation) in 
Korea.

Ginseng was selected from 4-year-old fresh ginseng 
harvested at Geumsan, Chungcheongnam-do. For the study, 
ginseng was steamed at 95°C for 4 hours to make red gins-
eng and dried at 40°C in a hot air drying machine until 
moisture content reached 13% and then pulverized to 
#60~#80 mesh.

Methods of manufacturing red ginseng sikhye

The amounts of red ginseng were 2, 4, 6, 8% (v/v) 
made up with 10, 15, 20, 25% (v/v) of rice and digested 
during 12 hours followed after putting 2-fold of water. After 
that, the mixtures of rice and red ginseng were steamed by 
an autoclave for 1 hour at 105°C and then cooled to be 
used as raw materials for saccharification of sikhye.

In the preparation of malt, the supernatant extracted 
hourly (0~4 hour) from steamed mixture at 60°C of malt 
(40~55%) and water (5-fold of malt volume) mixed to 
raw materials for saccharification. The temperature of 
saccharification processes was increased every 10°C 
ranged from 60 to 90°C for 6 hours. We had analyzed sol-
uble solid content, pH, total acidity and transparency dur-
ing saccharification processes for red ginseng-sikhye as 
temperature changes.

Quality analysis

Soluble solid content of sikhye measured by refractome-
ter (Hand refractometer, Atago, Japan) was expressed to 
°Bx. The pH value was measured at room temperature by 
pH meter (PP-50, Eyela, Japna). Total Acidity(%, w/v) 
was measured from 10 mL of sample by adding 0.1N NaOH until reached to pH 8.3 and then converting the 
amount of used NaOH to acetic acid according to the 
AOAC method\(^{11}\). Turbidity measured transmittance(%) 
using spectrophotometer(shimadzu UV-1601) at the 
wavelength of 675 nm.

RESULTS AND DISCUSSION

Optimum condition for malt extraction

Fig. 1 shows the result of soluble solid content measure-
ments from malt extractions every hour from 0 to 4 hours 
at 60°C at the conditions of malt preparation ranged from 
40 to 55% of malt with 5-fold water. Malt concentration 
was plateau between 2 to 3 hour after extraction because 
of starch residue. Soluble solid content increased but 
started to decrease after 3 hour. Generally, the more malt 
the less processing time. But, high malt price reduces the 
amount of malt added. It is the same as beer brewing pro-
cess in which corn or rice is added in order to less the 
amount of malt. It is also better to less malt usage because 
free amino acids ,which cause amino-carbonyl reaction, 
are abundant in malt\(^{12}\).

In general, bitter taste diminishes as the malt content of 
sikhye increases, while the strength of turbidity, saccharin-
ity, and viscosity of sikhye increases. Considering the eco-
nomical efficiency and saccharinity of the malt content, 
our results indicate that the optimum condition for red 
ginseng sikhye processing is the extraction of 40% of malt 
for 2 hours.

Effect of malt and rice on soluble solid content

Two hundreds grams of rice corresponding to 20% of 
total weight was saccharified at 60°C for 6 hours with 
combinations of 2, 4, 6, 8 and 10% of malt. Fig. 2 shows 
the changes of soluble solid content following the addi-
tion of malt. As the amount of malt was increased, soluble 
solid content was positively increased. However, it was 
adequate to use 4% of malt to saccharify 200 g of steamed 
rice in the consideration of malt price, the time required, 
and flavor. In other side, we fixed the amount of malt 
extractions to 4% and varied the amount of steamed rice to 
10%, 15%, 20%, and 25% respectively. The time required 
to process was set to 6 hour.

Fig. 3 shows changes of soluble solid content on steam-
ing rice content in saccharification process. As the