高麗人蔘學會誌
Korean J. Ginseng Sci. Vol. 1, No. 1, pp. 29—31(1976)

Biochemical Studies on the Chemical Components of Korean Ginseng(III)

Effects of Ginseng Components on the Activity of Succinate Dehydrogenase

Sae Hee Chang, Inwon Park, Youn Young Lee and Jong Sang Park

Department of Chemistry, Seoul National University, Seoul 151, Korea

Abstract

Succinate dehydrogenase was activated by ethyl acetate extract from the methanol extract of white ginseng previously treated with petroleum ether and ethyl ether to remove all highly nonpolar components, and the residual aqueous solution from the ethyl acetate extraction. Also, all of the extracted fractions of red ginseng except the ether extract gave positive results. On the contrary to some suggestions by other workers that alkaloids of ginseng may enhance the succinate dehydrogenase activity, our results show that the alkaloids may have exhibited some inhibitory effect on this enzyme.

The effects of ginseng extracts on the activity of lactate dehydrogenase, alcohol dehydrogenase, and succinate dehydrogenase were studied by many workers[1~3]. Cho *et el.*[1] observed that alkaloids of ginseng extract stimulated the activity of succinate dehydrogenase. On the other hand, Joo *et al.*[2] observed that saponins of ginseng extract stimulated the activity of succinate dehydrogenase.

We attempted to study the effect of ginseng extract on the activity of succinate dehydrogenase partially purified from bovine liver.

Materials and Methods

1. Materials

Six-year old white ginseng was provided by the Central Research Institute, Office of Monopoly, Korea, and red ginseng was purchased from Office of Monopoly.

2. Methods

Preparation of Succinate Dehydrogenase. Succinate dehydrogenase was prepared from bovine liver by the method of Keilin and Hartee modified by Bonner[5].

After washing 150 g of fresh tissue with water, the tissue was mixed with phosphate buffer(0.02 M, *p*H 7.4) and sand, and ground well in a mortar. The ground mixture was centrifuged for 20 minutes at 1500 x g. The supernatant was adjusted to *p*H 5.4 while it was kept at 0° to 4°. Immediately after this step, the resulting suspension was centrifuged to obtain the precipitate. The precipitate was dissolved in 10 m*l* of phosphate buffer (0.1M, *p*H 7.2). The protein content of the final solution was 0.08 mg/m*l*.

Fractionation of Ginseng Extract. The same fractions which were prepared for our works on aminoacyl-t-RNA synthetase were used(see elsewhere in this issue).

Enzyme Assay. Enzyme assay was carried out by the method of Bonner[5]. The enzyme reaction mixture contained 0.3 m*l* of 0.1 M potassium cyanide, 0.3 m*l* of 0.01 M potassium ferricyanide, 0.2m*l* of 0.2 M sodium citrate, 0.3m*l* of enzyme solution, and 20 μl of ginseng extrat in final volume of 3 m*l*. The phosphate buffer (*p*H 7.2) concentration of the enzyme assay mixture was adjusted to 0.1 M. The control was complete reaction mixture except that ginseng extract was omitted. The control was used as the blank for measuring the optical density. After the incubation for 40 minutes at 20° the decrease in optical density of potassium ferricyanide was measured at 400nm.

Results and Discussion

The effects of ginseng extract on the activity of succinate dehydrogenase is given in Table I. Data represent the percent increase in activity compared to that of control. The overall data show that the active components which stimulate the activity of succinate dehydrogenase are polar substances. We can easily make this conclusion from the fact that the stimulatory effect of ethyl acetate extract (fraction W_4), for white ginseng, is rather low, whereas the aqueous extract of its mother liquor(fraction W_{5-a}) has much higher stimulatory effect. On the other hand, all the fractions of red ginseng extracts except the ether extract have stimulatory effect. It is specially remarkable that water extract of red ginseng exerts highly stimulatory effect. Because most of the alkaloids are usually extracted by ethyl ether, fraction R_2 of red ginseng should contain much alkaloid. The observation that ether extract of red ginseng has inhibitory effect on the activity of succinate dehydrognase is contrary to the findings of Cho *et al.*[2] Rather, saponins or the other polar substances are the possible active components, as indicated by Joo *et al.*[3].

Table I. The effect of several fractions of ginseng extract on the activity of succinate dehydrogenase. Data are represented in percent increase of the activity of enzyme compared to that of control.

White Ginseng	Fraction	W_{H_2O}	W_1	W_3	W_4	W_5	W_{5-a}	W_{5-b}
	Percent increase of enzyme activity	−29	−29	−3.8	+9.7	−4.1	+44.5	−3.2
Red Ginseng	Fraction	R_{H_2O}	R_1	R_2	R_3	R_4		
	Percent increase of enzyme activity	+132.3	+150.3	−32.3	+38.7	+1.2		

Acknowledgment

This work was supported by the research grant of the Central Research Institute, Office of Monoply, Seoul, Korea.

Literature Cited

1. Cho, Y. D., Han, J. H., and Kim, O, H.: *Korean Biochem. J.*, 71, 85(1974).
2. Joo, C. N., You, H. S., Lee, S. J., and Lee, H. S.: *Korean Biochem. J.* 6, 177(1973).
3. Joo, C. N., Choe, R. S., Chung, R. P., Lee, S. J., and Kim, O. H.: *Korean Biochem. J.*, 7, 75(1974).
4. Joo, C. N., Yoon, B. H., Lee, S. J., and Han, J. H.: *Korean Biochem J.* 7, 231(1974).
5. Bonner, W.: In '*Methods in Enzymology*' 1, Colowick, S. P. and Kaplan, N. O.(eds.), 722 (1955).

〈Received 29 April 1976〉

한국 인삼 성분들에 관한 생화학적 연구(Ⅲ)

인삼 성분들이 숙신산 탈수소효소의 활동성에 미치는 영향

장세희 · 박인원 · 이윤영 · 박종상

서울대학교 자연과학대학 화학과

초 록

숙신산 탈수소효소의 활동성은 홍삼의 초산에틸 추출액과 초산에틸 추출모액의 수용성 추출액 분획들에 의하여 활성화되었으며, 홍삼의 에테르 추출액 분획을 제외한 모든 분획들에 의하여 활성화되었다. 다른 사람들이 알칼로이드류는 숙신산 탈수소효소의 활동성을 증진시킨다는 암시와는 반대로 저자들의 연구결과는 오히려 인삼의 알칼로이드들은 이 효소의 활동성에 대하여 방해효과를 가졌음을 알려주었다.