

ORIGINAL ARTICLE

Cornelian cherry (*Cornus mas L.*) Extract affects Glycemic status in Wistar rats

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ABSTRACT

The aim of present experiment was to investigate the possible effects of ip-injected (peripheral) cornelian cherry fruit (CCF) extract on serum glucose and insulin levels of experimental rat model. Animals were assigned into 6 experimental groups; group 1 as control 1 or intact group (without any injection treatment), group 2 as control 2 or placebo group (injected with solvent without CCF extract), and 4 groups with injection respectively with 50, 100, 200, and 400 mg/kg BW CCF extract. Blood samples were centrifuged and serums were analyzed for determination of insulin and glucose concentrations. There was no any significant difference for insulin level among experimental groups; control group when compared with injected groups. There is a significant decrease for blood glucose concentration in CCF-injected groups in comparison with control ($P < 0.01$). Glycemic status is not in according to linear trends with increasing CCF concentration. In conclusion, infusion of CCF extract can have considerable hypoglycemic effect, whereas there is not significant elevation in insulin level (hyperinsulinemia). Infusion of 50 mg/kg BW cornelian cherry fruit extract is efficient for hypoglycemia. Greater amounts (100, 200 or 400 mg/dl) had not more hypoglycemic effect.

Keywords: Cornelian cherry, Glycemic status, Insulin.

Received 12.06.2013 Accepted 16.07.2013

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INTRODUCTION

Cornelian cherry (*Cornus mas L.*) is a medicinal plant with various functional aspects in traditional medicine (table 1). Hyperglycemia is a biomarker of diabetes and diabetic complications [1]. Currently, Sujatha and Shalin, [2] had published a systematic review that shows potential of herbal drugs for treatment of hyperglycemia and control of diabetes, more efficient than some chemical drugs. A biochemical study on enzymes involved in glucose metabolism show that herbal product such as Terminalia species affects α -glucosidase activity as an inhibitor [3]. The cornelian cherry (*Cornus mas L.*) is a medicinal plant with hypoglycemic effect [4-6]. It has extensive grown in some part of Europe and Asia includes Iran [7]. The analysis of biochemical characterizes cornelian cherry fruit (CCF) obtained from Arasbaran region (northwest of Iran) had shown higher concentration of ascorbic acid content (183.25 to 299.5 mg/100g), phenolic compounds (2695.75 mg galic acid/ 100g fresh fruit) and total antioxidant capacity equals to 82.37% [8]. The glucose and sucrose contents of fruit are in low concentration, and Fe, Ca, vitamins (α -tocopherol, biotin, riboflavin and ascorbic acid) are in high concentration in fresh cornelian fruit [9]. About mineral contents, K, Na, Fe, Zn, and Mn, the levels noted for CCF juice were higher than in other juices (plum, pear, and apple). CCF juice is rich in various essential elements and might be considered as an important dietary mineral supplementation for individuals deficient in nutritional elements [10]. About medicinal aspects of fruit and its application in ethno-pharmacology or novel medicine, the literatures had listed various and multifunctional species for cornelian cherry. The table 2 is the summary of results obtained from related studies (table 1).

The experiments in relation to hypoglycemic effect of CCF were conducted in pathological or no healthy conditions (diabetic or obese) [4-6]. Bolleddula et al., [15] had shown that CCF extract from fruits induced insulin secretion in mouse pancreatic beta cell culture. Only in Rasoulia et al., [16], the dietary whole dried CCF was used. So, the aim of present experiment was to investigate the possible effects of ip-injected (peripheral) CCF extract on serum glucose and insulin levels of experimental rat model.

Medicinal effect	Experimental model	Experimental condition	Reference
Antioxidant	-	<i>In vitro</i>	Ersoy et al., [11]
Bactericide	Bacillus and E.coli	<i>In vitro</i>	Krisch et al., [12]
Fever treatment and bactericide	human	<i>In vivo</i>	Dulger and Gonduz. [13]
Fever, diarrhea and kidney and urinary bladder dysfunction treatment	human	<i>In vivo</i>	Zargari, [9]
Hypo-lipidemic, hyper-insulinemic effect and weight losing	Obese mouse	<i>In vivo</i>	Jayaprakasam et al., [14]
Hyper-insulinemic and hypoglycemic	Diabetic rat	<i>In vivo</i>	Shamsi et al., [6]
Hypo-lipidemic	Diabetic rat	<i>In vivo</i>	Mirbadal and Shiridel, [5]
Hypo-lipidemic, weight losing, low abdominal fat deposition	Obese mouse	<i>In vivo</i>	Seymour et al., [4]

Table1. The medicinal species of cornelian cherry fruit (CCF), based on literature review

MATERIALS AND METHODS

96 wistar rats with 200±20 g body weight were selected for present study. Experiment was conducted in animal room with 40-60 Rh and 22±2 °c temperature. Animals were assigned into 6 experimental groups; group1 as control 1or intact group (without any injection treatment), group 2 as control 2 or placebo group (injected with solvent without CCF extract), and 4 groups with injection respectively with 50, 100, 200, and 400 mg/kg BW CCF extract. After one week adaptation period, extract of CCF were injected to animals due to IP(Intra- Peritoneal)-injection. Group placebo had received solution (saline) without CCF. After 48h, the blood samples were taken from heart, following anesthesia. Blood samples were centrifuged and serums were analyzed with ELISA method for determination of insulin and enzymatic method for glucose (Pars-Azmoon kit) concentrations. Obtained data analyzed with SAS software Ver. 9.1 were subjected to Duncan multiple range tests to detection on possible significant differences between means of groups. Experiment was conducted in according to animal ethics.

RESULTS AND DISCUSSION

Analyzed data for serum glucose and insulin of animals are presented in table 2.

There was no any significant difference for insulin level among experimental groups; control group when compared with injected groups. There is a significant decreases for blood glucose concentration in CCF-injected groups in comparison with control ($P<0.01$) (table2), although decreases in glucose level is not in according to linear trends with increasing CCF concentration.

Variable	Insulin <i>mU/L</i>	Glucose <i>mg/dl</i>
Groups		
Group 1 <i>Control; intact</i>	13.0	199.6 ^a
Group 2 <i>Control; placebo</i>	12.8	188.4 ^{ab}
Group 3 <i>50 mg/kg BW CCF</i>	12.0	145.6 ^c
Group 4 <i>100 mg/kg BW CCF</i>	12.0	155.2 ^c
Group 5 <i>200 mg/kg BW CCF</i>	12.5	160.6 ^{bc}
Group 6 <i>400 mg/kg BW CCF</i>	11.9	148.0 ^c
P value	0.5111	0.0046
SEM*	0.4369	10.5017

Table2. Glycemic status of Wistar rats injected with CCF extract

* Standard error of means.

- Different letters (a, b, and c) shows significant difference, $p<0.05$.

Present results for glycemic status are in agreement with Shamsi et al., [6] in diabetic rats. In Shamsi et al., [6] study, diabetic rats received dried CCF meal has improved glycemic status in comparison with control-diabetic animals, but there was no any considerable difference between insulin levels of

healthy/control and healthy/CCF animals. In Rasoulia et al., [16] dietary CCF supplementation for one or two time/daily had significant effect on glycemic status with elevation of insulin and decreases in glucose level, but supplementation of three times has moderate effect on insulin level, and the glucose level of this group (4 times/daily) was similar with control. Results of present study for insulin level (table2) was in agreement with Rasoulia et al., [16] with there was no significant effect of CCF on insulin level when supplemented more than three times. It will be known that so many metabolic factors and pathways are in relation to glucose metabolism in healthy individuals. It seems that the hypoglycemic effect of CCF was not correlated to insulin elevation in healthy condition. It is possible that CCF can improve sensitivity of cells to insulin, without need to more insulin releases. Although in diabetic condition, CCF may triggers insulin releasing and other endocrine factors related to glucose metabolism, when cellular sensitivity to insulin is minor. In conclusion, infusion of CCF extract can have considerable hypoglycemic effect, whereas there is not significant elevation in insulin level (hyperinsulinemia). Infusion of 50 mg/kg BW cornelian cherry fruit extract is efficient for hypoglycemia. Greater amounts (100, 200 or 400 mg/dl) had not more hypoglycemic effect.

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How to cite this article

Mohammad Narimani-Rad, Morteza Zendehtdel, Mehran Mesgari Abbasi, Bita Abdollahi, Alireza Lotfi: Cornelian cherry (*Cornus mas* L.) Extract affects Glycemic status in Wistar rats. *Bull. Env. Pharmacol. Life Sci.*, Vol 2 (9) August 2013: 48-50