Hypocholesterolemic Effects of Pressed and Solvent-Extracted Fruit Seed Oils

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ABSTRACT
Heart disease causes 25% of mortalities in United States. Adequate unsaturated fat intakes could reduce the risk. The research objective was to investigate the effectiveness of mechanical-pressed and solvent-extracted grape, tomato, and pomegranate seed oils in lowering plasma and liver cholesterol using hamster models. In the fruit seed oil (FSO) diets, pressed and solvent-extracted seed oils were used to partially replace butter in the control (C) diet. The results showed that FSO diets significantly reduced blood triglycerides and low-density lipoproteins (LDL). The FSO diets did not improve total triglycerides profiles in liver, but they did slightly increase hepatic total cholesterol and cholesterol esters. No significant differences in lipid modulating properties were observed between solvent-extracted and pressed oils. Partial replacements of saturated fat in high-fat diets with tomato, pomegranate, and grape seed oils from both pressing and solvent extraction could effectively reduce triglyceride levels and improve HDL/LDL ratio in blood.

INTRODUCTION
Cardiovascular heart disease (CVD) is the leading cause of mortality and morbidity in the United States. Major risk factors of CVD include high blood pressure, high low-density lipoprotein cholesterol (LDL), and smoking. In contrast, high-density lipoprotein cholesterol (HDL) can inhibit lipid oxidation in LDL and facilitate LDL clearance from plasma. Thus, diets that can reduce LDL levels and promote HDL levels are highly recommended. Positive effects of monounsaturated and polyunsaturated fatty acids in CVD prevention are well established. Tomato, grape, and pomegranate seed oils contain more than 75% unsaturated fatty acids. Incorporating these specialty fruit seed oils in daily diets could potentially improve cardiovascular health.

OBJECTIVES
- To study the efficacy of tomato, grape, pomegranate seed oils, and pomegranate defatted meals in reducing triglyceride and cholesterol levels using hamster models.
- To compare nutritional properties between mechanically-pressed and solvent-extracted fruit seed oils.

RESULTS AND DISCUSSIONS

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Plasma triglycerides and cholesterols

Figure 2. Total triglycerides in plasma
Figure 3. Cholesterol levels in plasma

Liver triglycerides and cholesterols

Figure 4. Total triglycerides in liver
Figure 5. Cholesterol levels in liver

Liver fat contents in the treatment groups were higher than those in the control. This suggested that fat transport from plasma into liver was enhanced in treatment diets. For hepatic total triglycerides, there were no significant differences among the control and FSO diets as well as between pressed and hexane-extracted oils (Fig. 4). Hepatic total cholesterol in all FSO were slightly higher than in the control (Fig. 5). Free cholesterol and cholesterol ester concentrations were elevated in all treatment diets, possibly due to activations of LDL uptake and lipid esterification by LDL-receptors in liver tissues.

CONCLUSIONS
Polyunsaturated fatty acid-rich tomato, grape, and pomegranate seed oils exhibited cardioprotective activity by reducing plasma LDL and LDL/HDL ratios, even when they were used as partial replacements for saturated fats. Oil extraction methods did not affect nutritional properties of the fruit seed oils. Consumption of these fruit seed oils as parts of a heart-healthy diet is highly recommended.

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