

Effects Of Daily Black Walnut Consumption On Blood Lipid Levels

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ABSTRACT

English walnuts have recently been marketed for their cardiovascular benefits. These walnuts are related to those from the black walnut, an indigenous tree species of North America. Favorable changes in blood lipid profile with consumption of English walnuts have been the major focus of the proposed health benefits and have been attributed to the fatty acid content of the nuts. In contrast, black walnuts, which are harder to harvest and more expensive, have not been studied for their health benefits. The purpose of our research is to verify the fatty acid compositions of English versus black walnuts and compare how consumption of these nuts affects blood lipid levels. Thirty-six subjects (female=20, male=16), age 62 ± 12 years, were recruited and randomly assigned to either English or black walnut groups (18 subjects per group). Venous blood was collected for measurement of total cholesterol, low-density lipoprotein, high-density lipoprotein, and triglyceride levels following a 12-hour fast before and immediately after 28-30 days of walnut consumption. Subjects consumed approximately 1 ounce of provided and pre-weighed nuts daily at the time and situation of their choice. They also reported usual food consumption and current medications and were weighed before and after the nut treatment. We verified the fatty acid composition of both walnut types by gas chromatography and both nut types had fatty acid profiles consistent with the USDA food and nutrient database. The fatty acid profiles of the two nuts varied significantly as expected. Despite the variations in nutrient content, both types of nuts had positive effects on blood lipid profiles.

INTRODUCTION

English walnuts are a food high in omega-3 fatty acids that has been linked to improved blood lipids and better overall cardiovascular health. A recent study has found that a diet including 64 grams of walnuts per day reduced the total cholesterol of the average participant by five percent and the LDL “bad cholesterol” by nine percent in six weeks (Kearney et al., 2004). Researchers in another study found that in four weeks of consuming 40-65 g walnuts per day, participants’ total cholesterol decreased by seven percent, LDL decreased by nine percent, and HDL “good cholesterol” remained the same (Ros et al., 2004). A third study showed a nine percent increase in HDL over an eight-week period when participants were fed only 20 grams of walnuts per day (Zibaenezhad et al., 2005). Based on the previous research, it has been shown that walnuts are beneficial in the fight against high cholesterol; however, all of the previous studies have been done with only one type of walnut, the English walnut.

English walnuts originated in Persia and were improved to produce a larger size and quality nut by the Greeks. The trees were spread through Europe by the Romans and were brought to America by Spanish missionaries who settled in California in the 1800’s (Malcom, 2006). Today, California produces 99% of the commercially produced English walnuts in the country (Boriss, 2006). The major benefit of the English walnut is its thinner easy-to-crack shell.

Black walnuts have not been studied with regard to cardiovascular or other health benefits. Black walnuts are native to North America and are found predominately in the eastern United States. While black walnuts are very meaty with a lot of flavor, the nuts are hard to crack and there is little commercial production. Based on their color and flavor, black walnuts may contain a significant amount of antioxidant chemicals that may be further protective to the cardiovascular system. The purpose of our research is to verify the fatty acid compositions of English versus black walnuts and how consumption of these affect overall cardiovascular health.

METHODS

The Institutional Biohazard Committee and Institutional Review Board for the Protection of Human Subjects at UW-L approved our protocol. Black walnuts were obtained through donation, cracked, and 30g portions (approx. 1oz) were placed in individual bags. Thirty-gram portions of unsalted English walnuts, purchased from the People's Food Coop, were also placed in individual bags. Thirty-six subjects were recruited primarily through newspaper. Upon completion of the informed consent, subjects' heights and weights were measured. A list of medications and a food frequency questionnaire were also completed at this time. Venous blood was drawn by trained phlebotomists, from an arm vein in fasted subjects before and after nut consumption. Technicians blind to subject condition at Gundersen-Lutheran Hospital Diagnostic Laboratory analyzed the lipid samples. Subjects were randomly assigned to black or English walnuts and instructed to eat 1 30g bag each day for 28-30 days. Subjects were also informed to keep eating what they had been previously and add the walnuts in addition. All subjects reported that nuts were eaten as directed and no other changes in the usual diet or medications occurred. The SPSS® general linear model with repeated measures procedure was used with one within-subjects factor with two levels (pre and post nut consumption) and two between-subjects factors (nut type and gender) for each dependent variables: TOTAL CHOLESTEROL, HDL, LDL, TRIGLYCERIDE, TOTAL CHOLESTEROL:HDL RATIO, WEIGHT, AND BMI.

RESULTS

The subject characteristics are presented in Table 1 below. There were no significant differences in age or BMI among the four groups stratified by nut treatment and gender. However, the males in the black walnut group had significantly lower total cholesterol and LDL cholesterol than males in the English walnut group (Figure 1). Women also had significantly higher HDL (Figure 1) and lower body weight (data not shown) compared to men. Significant within subject effects (pre to post nut consumption) on TOTAL CHOLESTEROL ($p=0.028$, Figure 2) and LDL (0.017, Figure 2) demonstrate that nut consumption, regardless of nut type lowers and thus improves these lipid panel variables. More over there were several significant between subjects effects of nut type and gender and nut by gender interactions (Figure 3). Significance (*) was determined at $p<0.05$.

Table 1. Subject characteristics.

	BW FEMALE	BW MALE	EW FEMALE	EW MALE
SUBJECT NUMBER	N = 10	N = 8	N = 10	N = 8
AGE (MEAN±SD)	63 ± 11	58 ± 13	61 ± 14	63 ± 10
BMI (MEAN±SD)	28 ± 6	28 ± 6	29 ± 8	29 ± 4

Abbreviations: BMI = Body mass index, BW = black walnuts, EW = English walnuts

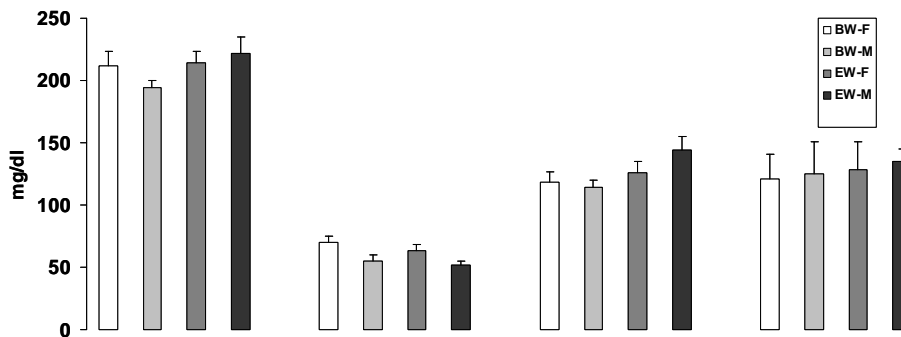


Figure 1. Group blood lipid levels before nut consumption. First cluster is TOTAL CHOLESTEROL followed by HDL, LDL, and TRIGLYCERIDE.

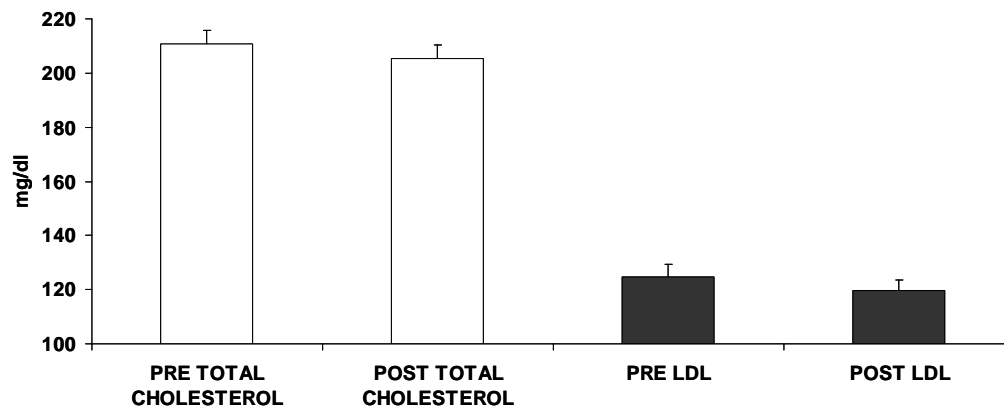


Figure 2. Significant improvements of TOTAL CHOLESTEROL (white bars, N=36, p=0.028) and LDL(gray bars, N=36, p=0.017) with nut consumption, regardless of nut type.

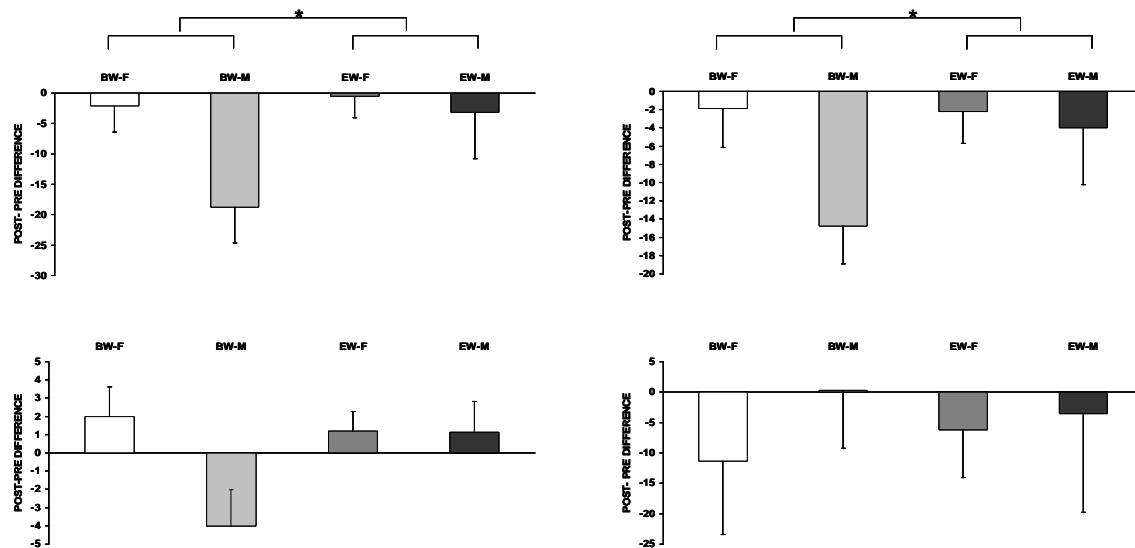


Figure 3. Post- minus pre-consumption differences in total cholesterol (top-left), LDL cholesterol (top right), HDL cholesterol (bottom left) and triglyceride (bottom right) in gender-separated (F=female, M=male) black walnut (BW) and English walnut (EW) groups.

DISCUSSION

Walnut consumption decreased total cholesterol by 2.7% and LD by 4.2% consistent with previous studies regardless of the type of nut. Black walnut consumption led to significantly more improvement than English walnuts. Walnut consumption did not significantly affect triglyceride, HDL, or total cholesterol to HDL ratio; however, there were several cases where borderline significance (0.05-0.10) was observed reflecting trends that may be more or less established when the crossover study is complete. Males seemed most responsive to the superior lipid improving effects of black walnuts with regard to total and LDL cholesterol levels as clearly shown in Figure 3. As there was no significant gain in weight with nut consumption, the apparent lipid improvement effects do not come at the expense of weight maintenance. Currently, the crossover phase of this study is being completed.

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