THE RELATIONSHIP BETWEEN PLANT STEROLS INTAKE AND TOTAL BLOOD CHOLESTEROL LEVEL IN BOGOR RURAL AREA

Atikah Bararah, Nuri Andarwulan

1Department of Food Science and Technology, Faculty of Agricultural Technology, Bogor Agricultural University, Darmaga, Bogor, West Java, Indonesia

2email: atikah.bararah@gmail.com, 3nuri@seafast.org

ABSTRACT

Coronary heart disease (CHD) is the most common cause of death in Indonesia. Lowering cholesterol level is currently one of the most efficient and effective way to prevent or reduce the risk of CHD and other cardiovascular disease (CVDs). One of the compounds that have the cholesterol-lowering ability is plant sterols. To further research about plant sterol efficacy for health and its application as functional food ingredient in Indonesia, an up-to-date data about plant sterols dietary intake is required. The study was conducted with a cross-sectional design to estimates the plant sterols (PS) intake and its relationship with total blood cholesterol level in Bogor rural area. Data of plant sterols level in food obtained by secondary data and calculation of recipe. Based on the results, the level of plant sterols intake of total respondent was averagely 223.80 mg/day with no statistical difference between male and female intake (t(98) = - .036, p > 0.05). The plant sterols intake in all respondents was mostly contributed by cereals and cereals product (37.46%), followed by legumes and legume products (41.41%). According to Pearson correlation test, there was no association between daily intake of plant sterols and total blood cholesterol (P > 0.05), which mean that the intake level no yet have visible effect in lowering or raising total blood cholesterol levels in respondents with health nutritional status, but presumed maintain normal blood cholesterol levels in respondents.

Keywords: plant sterols intake, cholesterol, coronary heart disease, Bogor rural area
SUMMARY

Coronary heart disease (CHD) is the most common cause of death in Indonesia, representing 26.4% of death in 2001 (Sarimawar, Irianto, & Mulyono 2003). The major risk factor of CHD is the raised blood cholesterol as the impact of perennially unhealthy lifestyle and diet. Lowering cholesterol level is currently one of the most efficient and effective way to prevent or reduce the risk of CHD and other CVDs (Normen, Frohlich, & Trautwein 2004). One of the compounds that have the cholesterol-lowering ability is plant sterols. To further research about plant sterol efficacy for health and its application as functional food ingredient in Indonesia, an up-to-date data about plant sterols dietary intake is required. This study was conducted to obtain daily plant sterols intake, determine the consumption pattern of food containing plant sterols, and examine the relationship between the plant sterols intake and blood cholesterol levels in Bogor rural area. The results of this research were expected to be a part of cardiovascular disease prevention in Indonesia, particularly coronary heart disease, by using plant sterols as functional food ingredients.

The research was conducted in Bogor rural area, which began in June 2012 and was completed in November 2012. The research was conducted with a Cross Sectional design, with 100 respondents (50 males and 50 females) participated. Data about respondent characteristics was obtained with interview by using a set of questionnaire. Consumption data from individual subject was collected by using Food Frequency Questionnaire methods. Meanwhile, food composition database of plant sterol content was mainly obtained from secondary data to determine the plant sterols content in every food eaten. The daily plant sterols intake of respondent then counted. Once the intake of plant sterols obtained, the score between the groups (male and female) was statistically compared by Independent Sample T-Test. The relationship between daily plant sterols intake and total blood cholesterol were analyzed using Pearson correlation test.

The characteristics of respondents are divided into socioeconomic and nutritional status of respondents. Most of the respondents were in the range of 25-35 years (46% in male and 44% in female), with mostly complete their education at the primary school (50% male and 44% female), junior high school (20% male and 24% female), and senior high school (16% male and 16% female). The majorities of male respondents (40%) worked as a labor, while 80% of female respondents were unemployed and mostly a housewife. The results also showed that the majority of respondents from both groups of men (44%) and women (50%) had a family size ≤ 4 (small family) while their income per capita was still below the poverty line is as much as 48% of male respondents and 56% of women.

The nutritional status of respondents, based on Body Mass Index (BMI), ranged from underweight to overweight. In this study, shown in Figure 10, 86% of male respondents and 78% female respondents had a normal nutritional status. Most respondents also had normal blood pressure (<130/<85), i.e 70% of male and 74% of female. Based on the measurement of
blood cholesterol level, more than half of respondents (66% male and 90% female) had cholesterol levels <200 mg/dL, thus in desirable level of blood cholesterol.

In this study, food item predicted to contain plant sterols were categorized into 12 groups based on the dominant type of raw material; (1) beverages, (2) cereals and cereal products, (3) egg and egg products, (4) fish and fish products, (5) fruits and fruit products, (6) herbs, spices, and condiments, (7) meat and poultry products, (8) legumes and legume products including nut, (9) plant sterols fortified products, (10) snack foods, (11) supplements, (12) vegetables and vegetable products. There were several sub groups in each group, based on process and main raw material. The average level of food consumption in all respondents amounted to 886.14 g/capita/day, male respondents of 862.91 g/capita/day, and female respondents at 909.37 g/capita/day. Based on consumption per-eater only, all respondents consumed cereals and cereal products predicted to contain plant sterols, followed by legumes and legume products and vegetable and vegetables product at same level (99% eater).

Based on food consumption survey, there were 265 food items which consumed by respondents which categorized into 12 groups. Each groups contained several sub-groups which divided based on the processing and main raw material used. The data of food plant sterols level used was compiled from publications of scientific journals and USDA food database. As done in the previous study, the plant sterol content of all products of pure animal origin was set at zero, as was that of the following products: soft drinks, tea, coffee, cocoa drinks, sugar, honey, syrup, soy sauce, and local herbal drinks. The compilation result showed the three highest plant sterols contained sub-groups were all in legumes group, i.e. legumes, other; legumes, peanut based; and red bean soup. Animal based product, i.e. egg, fish, and meat also contained noticeable amount of plant sterols, probably due to their added ingredients.

Based on the calculation of plant sterols intake, the level of intake in total respondent was 223.80 mg/day. In comparison, the intake of plant sterols was slightly higher in female respondents than male respondents, respectively 224.19 ± 120.89 mg/day and 223.41 ± 97.64 mg/day, although the difference was not statistically significant (t(98) = - .036, p > 0.05). The main contributor of plant sterols intake consumed by all respondents were cereals and cereals product (37.46%), followed by legumes and legume products (24.21%), and snacks food (15.33%). According to Pearson correlation test, there was no association between plant sterols intake and total blood cholesterol with P value 0.873. No association means that the level of plant sterols intake consumed by 223.80 mg/day not yet have visible effect in lowering or raising total blood cholesterol levels in respondents with health nutritional status, but presumed maintain normal blood cholesterol levels in respondents. As mentioned by Carr et al. (2010), plant sterols intake from daily food can reduce the absorption of cholesterol, but that supplemental doses of plant sterols as much as 1.5-3 g/day are required to achieve maximal reductions in serum cholesterol.