

## Formulation of healthy food products from cocoa and soybean to prevent osteoporosis

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### Abstract

Cocoa is a commodity that has very broad benefits, especially in the food, beverage, and pharmaceutical industries. Soybean is a commodity that has a high nutritional content and is a cheap source of protein. Soybeans contain an average of 35% protein and 18-20% fat. Besides, soy fat contains several important phospholipids such as lecithin, sefalin, and lipositol. Soybeans are also a source of vitamin B, vitamin E, vitamin K, calcium, phosphorus, and phytoestrogens. Phytoestrogens, which are active substances contained in soybeans, are recommended as an alternative hormone replacement therapy to prevent osteoporosis and show beneficial effects on bone health. Therefore, it is necessary to formulate healthy food products from cocoa and soybean commodities. There are four formulas tested chocolate soy beverage. Determination of the best formula by organoleptic test in 3 age groups, adolescents, adults, and the elderly. Testing of nutritional content in the form of proximate, calcium, amino acids, isoflavones, phytate), and fatty acids. Based on the best formula organoleptic test results produced chocolate soy beverage composition consisting of 4.25% moisture content, the ash content of 2.44%, 40.71% protein, 13.9% fat, carbohydrates 37.88%, crude fiber 0.84 %, calcium 0.44%, phytic acid 0.35%, total flavonoids 0.22%, catechins 0.12%. Amino acid composition consists of L-aspartic acid 2,256%, L-serine 1,456%, L-glutamine acid 3,948%, glycine 1,463%, L-histidine 2,250%, L-arginine 2,250%, L-threonine 0,912%, L-alanine 0.777%, L-proline 0.935%, L-tyrosine 1.135%, L-valine 0.683%, L-methionine 0.345%, L-lysine HCL 1.469%, L-isoleucine 0.736%, L-leucine 1.653%, L-phenylalanine 1.761% . While the fatty acid composition consists of palmitic acid 4.27%, stearic acid 2.40%, oleic acid / ω9 8.70%, linoleic acid / ω6 8.33%, linolenic acid / ω3 0.82%, arachidic acid 0 , 13%. The selected formula can be a good supplement product to prevent osteoporosis.

### Introduction:

Osteoporosis is a skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, resulting in increased fragility and subsequently enhanced fracture risk (WHO, 1994). In postmenopausal condition, a decline in secretion of

estrogen is accompanied by impaired inflammatory and oxidative status. Both conditions enhance bone resorption and inhibited bone formation and thereby are involved in the pathogenesis of osteoporosis. Soybean was also reported to have positive effect on human health. Soybeans contain bioactive compounds such as isoflavones, which may act similarly to estrogen. Soybean products were proved to reduce the risk of coronary heart disease and its consumption showed protective effects on the risk for endocrine-related gynecological cancers To delay or avoid functional impairments, it is crucial to focus on early prevention of osteoporosis, as prevention is the most effective approach to combat osteoporosis; and since its reversal will be difficult when bone loss takes place. Within a population, the distribution of bone mass becomes more variable, in part due to differences in height and other skeletal dimensions as adult size is attained, the timing and magnitude of peak bone mineral accrual, the cessation of bone accretion, and lifestyle factors. This period of rapid accretion may be a time of both opportunity and vulnerability for optimizing peak bone mass.

Because the demand for cocoa is ever growing, it is very likely the production will not be able to keep up. This would lead to the rise of prices of cocoa. Finding a substitute for cocoa is becoming very important. Carob powder produced from seedless pods is suggested as a cocoa alternative. Considering carob as a source of many health beneficial compounds, while cocoa has some limitation in consumption due to the caffeine and theobromine content we decided to investigate how substituting cocoa powder with carob powder affects the sensory perception and color in prepared bakery products. The content of sterols, tocopherols, isoflavones content and antiradical activity were also studied.

### Conclusion:

The beneficial effects of cocoa cannot be disregarded as cocoa in the absence of sufficient dietary calcium still presented some protective effects on bone. We propose with proper dosing, together with an adequate calcium intake, cocoa may be able to present antiosteoporotic properties more efficiently.