Comparison of chlorophyll a and chlorophyll b in dried tea leaves products

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ABSTRACT

Green tea ranks as one of the most popularly consumed beverages in the world since it has several health benefits, such as the preventing oxidative damage implicated in cardiovascular health and chronic inflammatory diseases and the inhibition of carcinogenesis. The aim of this research was studied chlorophyll a contented in dried leaves products. The method was selected 8 dried leaves products at Kalasin, Thailand. The chemical method was used methanolic solution extract and detected by spectrophotometer measurement at 653 and 666 nm for analysis chlorophyll a and chlorophyll b. The results found that chlorophyll a of dried tea leaves product samples A, B, C, D, E, F, G, H were 6.92± 0.87, 16.68 ± 1.36, 23.06± 0.11, 22.99± 0.06, 17.07± 4.14, 18.22±0.31, 21.44±0.23 and 21.20± 1.05 mg/L, respectively. Chlorophyll b of dried tea leaves product samples A, B, C, D, E, F, G, H were 3.83±0.26, 27.80± 4.89, 3.53±0.17, 3.78±0.02, 37.87±0, 22.47±0.15, 10.60±0.97 and 11.50±4.40 mg/l, respectively. The conclusion was found that the highest chlorophyll a was tea leaves product sample C. Sample C was green tea products from Cambodia. The highest chlorophyll b was tea leaves product sample E. Sample E was green tea products from Japan. Chlorophylls provide natural colors and beneficial health effects. Chlorophylls, which are generally composed of chlorophyll a and b in a ratio of 3:1, are the most common green pigments in plant leaves however, are depend on process and types of green tea.

Keywords: Tea leaves, chlorophyll a, chlorophyll b and health benefits**.**

INTRODUCTION

Tea consumption has several health benefits to human beings, among which the prevention of cancer is of special interest to most scientists. The anti-cancer properties of tea are mainly attributed to catechins, a group of polyphenolic compounds. Tea, the product from the leaves of *Camellia sinensis*, is one of the most popular beverages in the world (Kang Wei et al., 2011).

Tea is one of the most widely consumed non-alcoholic beverages in the world and imparts marked benefits to human health, such as providing antioxidant activity and reducing the risk of cardiovascular disease and some forms of cancer. Under certain environmental conditions, such as low temperature or

abnormal light intensity, the albino tea cultivars generate yellowish to off-white leaves which are deficient in chlorophyll. Compared to normal green cultivars, albino tea germplasm is precious, due to the special flavor, distinct leaf color and scarcity. Studies have been published for only a select few of the albino tea cultivars which are commercially grown. Chemical analyses and expression profiling of the genes related to chlorophyll biosynthesis in these albino cultivars have begun to reveal the basis of tea leaf albinism at the levels of biochemistry and molecular biology. However, changes in comprehensive metabolic profiles of albino tea cultivars and their impact on tea quality need to be determined to further improve tea quality (Lin Feng et al., 2014).

These health advantages are derived from the secondary phytochemicals, specifically the high content of phenolic compounds. In addition, tea leaves contain lipophilic pigment metabolites, which are chlorophyll a and b. The lipophilic pigment metabolites, the levels of carotenoids and chlorophylls consist of less than 1% dry weight in fresh green tea leaves. Green tea ranks as one of the most popularly consumed beverages in the world since it has several health benefits, such as the preventing oxidative damage implicated in cardiovascular health and chronic inflammatory diseases and the inhibition of carcinogenesis (Jinwook Lee et al., 2015). Chlorophyll is the green pigment vital for photosynthesis. In factor, leaf color is useful for experienced farmers to predict tea quality. Therefore, it could be speculated that chlorophyll contents might be associated with catechin biosynthesis (Kang Wei et al., 2011).

The aim of this research was studied chlorophyll a and chlorophyll b contented in difference dried tea leaves products at Kalasin, Thailand.

MATERIALS AND METHOD

The method was selected 8 dried tea leaves products that sold at Kalasin, Thailand. Eight samples such as samples A and E were Japanese green tea products, samples B, D and F were Thailand green tea products, sample C was Cambodia green tea product, sample G was England green tea product and finally sample H was Taiwan green tea product, respectively.

The chemical analysis was used methanolic solution extract and detected by spectrophotometer measurement at 653 and 666 nm. The concentrations of chlorophylls were determined according to the equations reported by Nuno Rainha et al., 2011 and Klomsakul Pongsathorn et al., 2012 as follows:

$$\text{Chlorophyll a (mg/L)} = 15.65\ Abs_{666} - 7.340\ Abs_{653} \quad (1)$$

$$\text{Chlorophyll b (mg/L)} = 27.05\ Abs_{653} - 11.21\ Abs_{666} \quad (2)$$

RESULTS

The results found that chlorophyll a of dried

tea leaves product samples A, B, C, D, E, F, G, H were 6.92± 0.87, 16.68 ± 1.36, 23.06± 0.11, 22.99± 0.06, 17.07± 4.14, 18.22±0.31, 21.44±0.23 and 21.20± 1.05 mg/L respectively. Chlorophyll b of dried tea leaves product samples A, B, C, D, E, F, G, H were 3.83±0.26, 27.80± 4.89, 3.53±0.17, 3.78±0.02, 37.87±0, 22.47±0.15, 10.60±0.97 and 11.50±4.40 mg/l (Table 1).

Tea Leaves (Samples)	Chollophy a (mg/l)	Chollophy b (mg/l)
A	6.92 ± 0.87	3.83±0.26
B	16.68± 1.36	27.80± 4.89
C	23.06±0.11	3.53±0.17
D	22.99±0.06	3.78±0.02
E	17.07±4.29	37.87±0
F	18.22±0.31	22.47±0.15
G	21.44±0.24	10.60±0.97
H	21.20±1.05	11.50±4.40

TABLE 1: Chlorophyll a and chlorophyll b of dried tea leaves product samples

Eight green tea samples such as samples A and E were Japanese green tea products, samples B, D and F were Thailand green tea products, sample C was Cambodia green tea product, sample G was England green tea product and finally sample H was Taiwan green tea product, respectively.

Chlorophyll pigments are green because they reflect green light (Kang Wei et al., 2011). There are different types of chlorophyll (chlorophyll a and chlorophyll b). These different types of chlorophyll are the same basic molecule with very slight differences in their chemical structures. The different chlorophylls have the same basic structure, they all reflect green light and so appear green, but their small structural differences cause them to be different shades of green (yellow green, teal green, forest green, blue green, etc.).

Tea (*Camellia sinensis*) is one of the most popular beverages worldwide due to its taste, aroma, and health effects. Young shoots of tea bushes are mainly processed into black tea, green tea, and oolong tea. Tea flushes have long been regarded as key contributors to tea quality, influencing at least 70% of the beverage quality. A tea flush contributes by several leaves and a bud harvested at suitable maturity. A flush composed of shoot with two leaves and one bud was usually used for green tea and black tea. Length of shoot, length and width of internodes, length, width and area of leaves, are the major indicators of the tea flush quality. The length, width, and surface area of tea leaves were negatively correlated with the aroma performance of green tea and the appearance of curly black tea but positively correlated with the color quality of black tea (Po-An Chena et al., 2015).

Tea is obtained from the leaves of the plant being green tea one of the most consumed types of tea. Historically, green tea has been consumed in Oriental countries like China and Japan, but its consumption in Europe and United States has increased in recent years due to its potential health benefits. Moreover, green tea extracts are also used as ingredients in other beverages (e.g. ready-to-drink beverages), in ice-creams, etc. Green tea leaves contain several bioactive compounds, such as methylxanthine alkaloids and phenolic compounds. Caffeine is the most abundant alkaloid in green tea, being the main responsible for the stimulating effects of tea. Caffeine content in tea leaves is usually around 2–5% mass of the dry weight. Some adverse well-known effects derived from caffeine consumption include sleep deprivation, rise in blood pressure, tachycardia, abortion and miscarriages, depending on the intake concentration (David Villanueva Bermejo et al., 2015).

CONCLUSION AND DISCUSSION

The highest chlorophyll a was tea leaves product sample C. Sample C was green tea products from Cambodia. The highest chlorophyll b was tea leaves product sample E that was green tea products from Japan. Sample C product was highest chlorophyll a because it was high teal green color. However sample E was highest chlorophyll b because it was high yellow green color. Chlorophylls provide natural colors and beneficial health effects. Chlorophylls, which are generally composed of chlorophyll a and b in a ratio of 3:1, are the most common green pigments in plant leaves however, are depend on process and types of green tea.

Chlorophyll is a green pigment that gives most plants their color. The reason that it is green is because it absorbs other colors of light such as red and blue, so in a way the green light is reflected out since the pigment does not absorb it. Plants contain other pigments that reflect different colors, but these are often masked by Chlorophyll. Chlorophyll pigments are green because they reflect green light. Plants and green algae (plants are really advanced green algae) contain chlorophyll a (which is teal green), chlorophyll b (which is yellow green), and beta-carotene (which is yellow), thus giving them a green color.

Green tea is currently one of the most commonly consumed beverages worldwide. Polyphenols and caffeine are important components of green tea due to their unique flavors and biological effects. Specifically, catechins, the main component of polyphenols, are known to have beneficial health effects on humans such as anticancer anti-inflammatory and antibiotic (Hyong Seok Park et al., 2012). Green tea products were many health benefits to people beings, among which the prevention of cancer (Kang Wei et al., 2011). These health advantages are derived from the secondary phytochemicals, specifically the high content of phenolic

compounds. The major phenolic compounds in tea leaves are flavonoids. In addition, tea leaves contain lipophilic pigment metabolites, which are chlorophyll a and b (Jinwook Lee et al., 2015). One way of improving the profitability of tea production is by planting high-yielding clones with excellent quality. But, high-quality tea can only be obtained from raw material with the correct quality potential. However, quantifiable breeding or selection criteria for quality have been elusive. Past tea breeding/clonal selection put emphasis mainly on yield and whatever high-quality material is in production now might not have been selected for this attribute. Traditional selection/ breeding methods for tea have relied on a combination of morphological characteristics, which are somewhat empirical and slow, and laborious to assess. Much high-yielding and good quality planting material has evolved by chance. Sensory evaluation has been the only method of assessing tea routinely but is applied after processing. Sensory evaluation is, however, subjective and is influenced by many factors outside quality. Development of reliable and quantifiable selection criteria for quality is therefore necessary (P. Okinda Owuor et al., 2007). Development of tea drink has been developed by producing ready-to-consume drink and some flavors are added. Actually a lot of flavoring agents for tea drink are sold in the market and also used for flavoring tea for soft drink. But normally they were not natural products, because of the price and quantity or yield, when they were extracted from natural sources (Wahyu Supartono et al., 2015).

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