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【研究ノート】

Comparison of Antioxidative Activity among Different Types of *Hibiscus*

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Abstract

Increased longevity among the population of Okinawa has led to considerable international interest in the role that the local diet and custom might play in this phenomenon. The research has indicated that flowers used for the food have potential health benefit. To explore their value as functional foods, the antioxidative properties of *Hibiscus rosa-sinensis*, which is the most common flower in Okinawa, was evaluated. The antioxidative activity of three types of the flower—red, orange, and yellow—was assessed using a DPPH method. The antioxidative activity was found to be highest in the red flowers and lowest in the orange flowers, while the yellow flowers displaying the intermediate level of the activity. By comparing their colors to determine their antioxidative activity, we have found that this type of *Hibiscus* has high antioxidative activity and that there is no obvious regular pattern. In addition, the content of several types of carotenoid was measured in the yellow flowers. The level of cryptoxanthin was 158 μ g/100g.

1. Introduction

Increased longevity among the population of Okinawa has led to considerable international interest in the role that the local weather, custom, and social condition might play in this phenomenon. Among these factors, the diet (including the role of the food materials produced in Okinawa) and custom have attracted the most attention. According to the old Okinawan dietary therapy book [Tokashiki 1832], the flower and stalk of Daily Lily was traditionally used as a foodstuff, and that sustained use helps

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clear eyes and treat insomnia [Uezu 2006]. The research into the therapeutic properties of flowers has a long history, and the health benefit was well recognized by ancient people [Abe 2013]. Traditionally, flowers were eaten in order to stay healthy and beautiful and to treat illnesses. This custom still persists in Okinawa and is practiced, for example, in the drinking of Jasmine in Sanpin tea.

Hibiscus, a genus of flowering plants in mallow family, includes several hundred species, and is native to the temperate, subtropical, and tropical regions throughout the world [Matsuoka 1989]. *Hibiscus* is ubiquitous across Okinawa, where the warm weather favors its growth. The research has shown that *Hibiscus* has many properties. For example, it has been shown that the leaf extract of *Hibiscus rosa-sinensis* has potential effect on hair growth [Afhirajan 2003]. The plant is used not only in cosmetics but also as food throughout the world [Shewale 2012]. Moreover, it is also used in tea.

It has been suggested that there is relationship between illnesses and active oxygen in the body. According to the recent study, food materials containing high level of vitamins and polyphenol can help prevent diseases [Azuma 2001, Ito 1993, Kashimura 2007]. Therefore, in this study, we investigated the antioxidative activity of *Hibiscus*, which easily found in Okinawa, and compared it with other different colored *Hibiscus* species. In addition, the content of several types of carotenoid was measured in the yellow flower.

2. Materials and Methodas

2-1. Materials

2-1-1. Hibiscus

2-1-1-1. Red hibiscus

Hibiscus is an evergreen flowering shrub that is widely grown as an ornamental plant throughout the tropics and subtropics [Matsuoka 1989]. *Hibiscus rosa-sinensis* (“*Bussouge*”) was used. There are many types of Hibiscus and also many types of red flowers. Here the one called “Akabanah” in Okinawa was used.

2-1-1-2. Orange hibiscus

Hibiscus vs. Anily(orange) and *Hibiscus vs. Sunny* [Ocean Expo Park Management Center 2013. Jyukouen 2013] were used.

2-1-1-3. Yellow hibiscus

Yellow 1: *Hibiscus vs. Full Moon* [Jukouen 2013]. The petal was blooming in double. It is of the family Malvaceae and genus *Hibiscus*. Yellow 2: *Hibiscus vs. Anily* [Miyazaki Parks Association 2013]. In the state that orange was not mixed in, only the yellow petal was gathered.

2-2. Measurements

The antioxidative activity of three types of the flower—red, orange, and yellow—was assessed using the DPPH method [Myagmar 2000]. The content of several types of carotenoid was measured in the yellow flower (*Hibiscus vs. Anily*).

3. Results

After determining the antioxidative activity, we measured the weight of *Hibiscus* 30 minutes after the elimination of 50% DPPH. The antioxidative activity of each type of *Hibiscus* is presented in Figure 1, which shows that 30 minutes after the elimination of 50% DPPH, the antioxidative activity was highest in the red flowers and lowest in the orange flowers, while the yellow flowers displaying the intermediate level of the activity. The carotenoid content of a yellow flower is shown in Table 1.

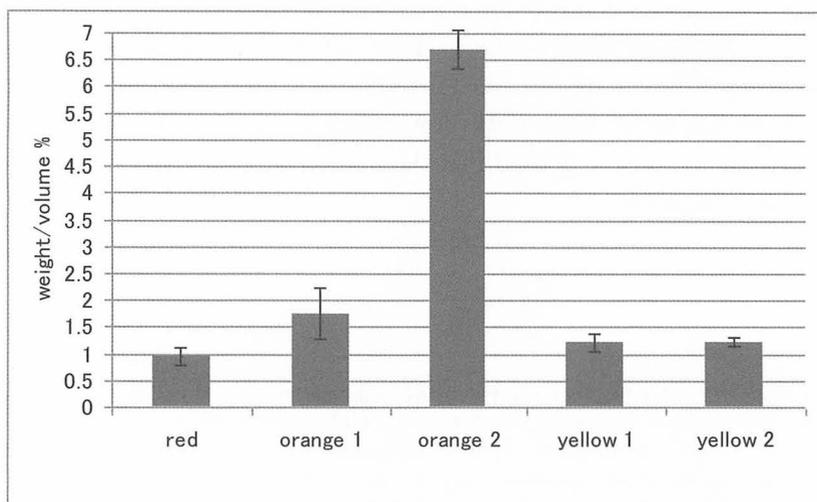


Figure 1 : The weight (weight/volume%) of *Hibiscus* 30 minutes after the elimination of 50% DPPH.

Red: *Hibiscus rosa-sinensis* Orange1: *Hibiscus vs. Anily*.(orange), Orange2: *Hibiscus vs. Sunny* Yellow1: *Hibiscus vs. Full Moon*, Yellow 2: *Hibiscus vs. Anily*.(yellow). N=3, Mean±S.D.

Table 1 : The carotenoids included in the yellow flower of the hibiscus (N=1)

α -carotene	7	($\mu\text{g}/100\text{g}$)
β -carotene	181	
Cryptoxanthin	158	
lutein	490	

4. Discussion

This research has shown that oil miso combined with the dry powder of Daily Lily helps maintain high oxidative activity, which also helps preserve food itself [Uezu 2006]. *Hibiscus rosa-sinensis* has higher antioxidative activity than Daily Lily. It can thus be used in food as an additive to keep food fresh. It can be used not only to preserve foods but also to increase antioxidative activity in the body, increasing our resistance to illness. Furthermore, because *Hibiscus* is native to the temperate, subtropical, and tropical regions, Okinawa is an ideal place to grow *Hibiscus*. From an economic perspective, *Hibiscus* can be produced cheaply in Okinawa.

Comparing the colors of *Hibiscus*, we have found that there was no obvious regular pattern in antioxidative activity. This is because there are approximately 200 species of *Hibiscus* [Matsuoka 1989], and antioxidative activity differs between species. On the basis of the findings of this study, it is inconclusive as to whether the color depth of a particular *Hibiscus* species is positively related to antioxidative activity. The only way to find a species containing higher antioxidative activity would be to conduct further experiments using different species. As for the carotenoid content of the yellow flower (fig. 1), the level was not so high. It was lower than the level in the day lily as I already reported [Uezu 2006]. It is supposed that the antioxidative activity of yellow hibiscus reflects polyphenolic power.

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