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TITLE OF THE INVENTION

Fat metabolism accelerating composition, and food or beverage containing it

Field of the Invention

The present invention relates to a fat metabolism accelerating composition which has an effect for accelerating the consumption of fat during exercise, and food or beverage containing it.

Background of the Invention

By the increase of calorie intake reflecting the Europeanization and Americanization in dietary life in recent years and the decrease of calorie consumption due to the lack of exercise, the number of people who store excessive calorie as a body fat and are in obese condition, has increased.

Accordingly, exercise for increasing the calorie consumption is one of effective methods for solving obesity (slimming). The exercise is classified into two types, i.e. anaerobic exercise in which the exercise intensity is high and carbohydrate is mainly consumed as an energy source, and aerobic exercise in which the exercise intensity is low and fat is mainly consumed as an energy source. Namely, it is necessary to raise the rate of the aerobic exercise to consume the fat.

However, as it is said that "do walking for at least 30 minutes for health maintenance", it is necessary for

consumption of fat by the aerobic exercise to continue the exercise for a relatively long period of time while keeping the exercise intensity low, and patience is demanded to some extent, and it is therefore difficult to make successive practice.

Accordingly, a diet supplement or beverage by which a larger amount of fat can be consumed by the same quantity of exercise has also been developed.

Since the consumption of fat is in proportion to the free fatty acid concentration in serum, it is at first necessary to increase the free fatty acid concentration in serum during the exercise. For example, caffeine has an effect for accelerating lipolysis and increasing the free fatty acid concentration in serum, and it is known that when caffeine is ingested before exercise, the fat is utilized much more (Jacques L. et al, J. Apply. Physiol., 59(3), 832-837 (1985)).

Further, since Garcinia (Garcinia Cambodia) has been widely used as a diet supplement, since hydroxycitric acid ((-)-hydroxycitric acid (HCA), hereinafter the same applies) contained in its seed vessel inhibits the storage of excessively ingested carbohydrate as a body fat, some recent research has reported that it is capable of accelerating the fat consumption during the exercise (Japan Agricultural Chemical Academy, Summary of 1999 annual meeting), 2p440D).

However, even if a diet supplement or drink

containing conventional caffeine or Garcinia is ingested, the effect for accelerating the fat consumption is not satisfactory.

Namely, the reason is that since the free fatty acid in serum can not utilized as the energy source till taken in mitochondria, no adequate effect for accelerating the fat consumption can be obtained simply by increasing the free fatty acid concentration in serum.

Summary of the Invention

Accordingly, it is an object of the present invention to provide a fat metabolism accelerating composition by which much more quantity of fat can be consumed with the same load of exercise (intensity and time) by ingesting it before exercise, and food or beverage containing it.

The present inventor has conducted extensive studies to accomplish the above object, and as a result, he has found that the fat consumption during the exercise can be accelerated at a higher rate than expected, by ingesting Garcinia extract and caffeine in combination.

Namely, one aspect of the present invention is a fat metabolism accelerating composition which comprises Garcinia extract and caffeine as effective ingredients.

In the fat metabolism accelerating composition of the present invention, it is preferred to contain the Garcinia extract and caffeine so that the ratio of a hydroxycitric acid content contained in the Garcinia extract to a

caffeine content is within a range of 1.25 to 30 : 1 as a mass ratio.

Since the fat metabolism accelerating composition of the present invention contains the Garcinia extract and caffeine as effective ingredients, the free fatty acid concentration in serum is increased and concurrently the fatty acid is efficiently utilized as an energy source, whereby the fat consumption can be increased.

Further, another aspect of the present invention is food or beverage which comprises the fat metabolism accelerating composition.

In the food or beverage of the present invention, it is preferred to contain the Garcinia extract in an amount of 125 to 1,500 mg in terms of hydroxycitric acid and the caffeine in an amount of 50 to 200 mg, per meal.

Since fat can be efficiently consumed by ingesting the food or beverage containing the fat metabolism accelerating composition of the present invention before exercise, much more amount of fat can be consumed by the same quantity of exercise.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the present invention, the Garcinia extract is an extract obtainable by extraction from the seed vessels of Garcinia (such as Garcinia Cambodia, Garcinia Indica, and Garcinia Atroviridis) with hot water or water-containing alcohol, and contains hydroxycitric acid. Such Garcinia

extract is commercially available, for example, "Garcinia extract S" (tradename, manufactured by Nippon Shinyaku Co., Ltd.) and the like.

Further, caffeine is widely contained in coffee or tea. However, in the present invention, it is preferred to use its extract, i.e. ones containing caffeine concentrated to some extent. Such caffeine (i.e. extract of caffeine) is generally commercially available, for example, "Cha-nomoto" (tradename, manufactured by Shiratori Seiyaku K.K.) and the like.

In the fat metabolism accelerating composition of the present invention, it is preferred to contain the Garcinia extract and caffeine so that the ratio of a hydroxycitric acid content contained in the Garcinia extract to a caffeine content is within a range of 1.25 to 30 : 1 as a mass ratio. More preferred is 7.5 to 10 : 1. When the incorporation ratio of the Garcinia extract to caffeine is within the above range, the fat can most efficiently be consumed.

It is believed that the mechanism for accelerating the fat consumption by the fat metabolism accelerating composition of the present invention, is as follows.

Firstly, lipolysis is accelerated by caffeine, whereby the free fatty acid concentration in serum is increased. On the other hand, the structure of hydroxycitric acid is analogous to that of citric acid, and since it shows antagonistic action against the metabolism

of citric acid in the cell, the amount of acetyl-CoA as its metabolite is decreased. Malonyl-CoA as a metabolite of acetyl-CoA inhibits the transfer of fatty acid into mitochondria. By the decrease of acetyl-CoA as the precursor, malonyl-CoA is decreased and as a result, the transfer of the fatty acid into mitochondria is unrestrained and the fat can efficiently be consumed as an energy source.

The fat metabolism accelerating composition of the present invention may be added to various food or beverage, for example, drinks, jelly, candy, gum, cereal, biscuit, chocolate, ham and the like. Among them, it is preferred to add it to food or beverage which is easily ingestible before exercise, for example, a jelly drink or a sports drink (isotonic drink). Further, an excipient, a sweetener or the like may be added to the fat metabolism accelerating composition to form tablets, capsules or the like.

It is preferred to add the fat metabolism accelerating composition of the present invention to the food or beverage so that the Garcinia extract (in terms of HCA) is within a range of 125 to 1,500 mg and the caffeine is within a range of 50 to 200 mg, per meal. It is more preferred to contain them so that the Garcinia extract (in terms of HCA) is within a range of 750 to 1,000 mg and caffeine is within a range of 50 to 100 mg, per meal. If the HCA content is less than 125 mg or the caffeine content is less than 50 mg, the effect for accelerating the fat

metabolism tends to be poor, such being undesirable.

Further, if the HCA content exceeds 1,500 mg, sourness tends to be strong, such being undesirable. If the caffeine content exceeds 200 mg, it might bring about an excessive strain the heart depending upon the constitution of each person, such being undesirable.

Test Example 1

To judge that either carbohydrate or fat is actually utilized as an energy source in the body, a gas analysis of expired gas is conducted and a respiratory quotient (RQ) is determined. For example, in an anaerobic exercise wherein carbohydrate are mainly consumed as the energy source, RQ becomes close to 1.0, and in an aerobic exercise wherein fat is mainly consumed as the energy source, RQ becomes close to 0.7. Accordingly, it can be decided that when RQ is high (close to 1.0), carbohydrate are mainly utilized, and as RQ decreases, fat becomes to be mainly utilized.

Using a healthy male (28 years old) and a healthy female (24 years old), the following test was carried out.

A mixture of 1,500 mg of a Garcinia extract (a HCA content: 50 mass%, hereinafter the same applies) and 100 mg of caffeine, was administered to each of them, and 30 minutes later, an aerobic exercise was conducted by a 30 minutes-load of exercise with a bicycle type ergometer (tradename, "Aerobike EZ101, manufactured by Combi corp.) while the pulse was monitored so that 65% $\text{VO}_{2\text{max}}$ (maximal oxygen consumption) would be maintained. The expired air

discharged during the exercise was completely collected with a respiratory metabolism system (tradename, "Aerosystem AE-10", manufactured by Minato Ikagaku K.K.), and the concentrations of oxygen and carbon dioxide were measured. Then, based on the expired gas data of the last 5 minutes (from 25 to 30 minutes) in which they became accustomed to the machine, the ratio (%) of the fat in the consumed energy was calculated by the following formulae (1) to (5).

$$C = 4.114VCO_2 - 2.908VO_2 - 0.032 \quad \text{Formula (1)}$$

wherein C is an oxidized amount of carbohydrate (g) (hereinafter the same applies), VCO_2 is a discharged amount of carbon dioxide (liter/ml) (hereinafter the same applies), and VO_2 is a consumed amount of oxygen (liter/ml) (hereinafter the same applies).

$$F = 1.689 (VO_2 - VCO_2) - 0.024 \quad \text{Formula (2)}$$

wherein F is an oxidized amount of fat (g) (hereinafter the same applies).

$$Ce = 4 \times C \quad \text{Formula (3)}$$

wherein Ce is a catabolism energy of carbohydrate (kcal) (hereinafter the same applies).

$$Fe = 9 \times F \quad \text{Formula (4)}$$

wherein Fe is a catabolism energy of fat (kcal) (hereinafter the same applies).

Ratio of an energy derived from the fat in the consumed energy during the exercise

$$= \{Fe / (Ce + Fe)\} \times 100 \quad \text{Formula (5)}$$

Further, the same tests as the above were carried out with respect to a case where nothing was ingested (control), a case where the Garcinia extract (1,500 mg) alone was ingested, and a case where caffeine (100 mg) alone was ingested, and the ratios (%) of energies derived from the fat in the consumed energy during the exercise were calculated.

The results are indicated in Table 1.

Table 1

	Male	Female
Control	19.1 $\pm$ 3.2 %	15.6 $\pm$ 3.9 %
Garcinia extract alone	30.6 $\pm$ 4.3 %	24.1 $\pm$ 1.8 %
Caffeine alone	25.3 $\pm$ 1.9 %	18.9 $\pm$ 0.6 %
Garcinia extract and caffeine	41.4 $\pm$ 2.5 %	31.0 $\pm$ 4.0 %

The ratio is represented by average value $\pm$ standard deviation (n=3).

From Table 1, it was found that when both male and female ingested the Garcinia extract and caffeine in combination, the ratios of energies derived from the fat to the overall consumed energy increased synergistically, as compared with the cases where either one component was ingested.

Incidentally, in the case of the male, with respect to the ratio of energy derived from the fat to the overall consumed energy in the case where the Garcinia extract alone was ingested, the increment A1 as compared with the control was 11.5%. Further, with respect to the ratio of energy derived from the fat to the overall consumed energy

in the case where the caffeine alone was ingested, the increment B1 as compared with the control was 6.2%. On the other hand, with respect to the ratio of energy derived from the fat to the overall consumed energy in the case where the Garcinia extract and caffeine were ingested in combination, the increment C1 as compared with the control was 22.3%. Accordingly, $C1 > A1 + B1$, and it is therefore evident that the use of both in combination brought about the results higher than the expectation.

Similarly, in the case of the female, with respect to the ratio of energy derived from the fat to the overall consumed energy in the case where the Garcinia extract alone was ingested, the increment A2 as compared with the control was 8.5%. Further, with respect to the ratio of energy derived from the fat to the overall consumed energy in the case where the caffeine alone was ingested, the increment B2 as compared with the control was 3.3%. On the other hand, with respect to the ratio of energy derived from the fat to the overall consumed energy in the case where the Garcinia extract and caffeine were ingested in combination, the increment C2 as compared with the control was 15.4%. Accordingly, $C2 > A2 + B2$, and it is therefore evident that the use of both in combination brought about the results higher than the expectation, as in the case of the male.

Example 1 (Jelly beverage)

Respective materials were mixed in the proportional

ratio as indicated in Table 2, and a jelly beverage (200 ml/bag) was prepared in accordance with a conventional method.

Table 2

Materials	Incorporated amount (200ml/bag)
Garcinia extract	1.50 g
Caffeine (extract)	0.10 g
Maltodextrin	3.00 g
Reducing maltose syrup	2.70 g
Fructose	2.00 g
Gelling agent	1.80 g
Concentrated fruit juice	1.00 g
Sodium citrate	0.75 g
Sweetener (L-phenylalanine compound)	0.03 g
Flavor	0.20 g
Purified water	186.92 g

Example 2 (Refreshing water)

Respective materials were mixed in the proportional ratio as indicated in Table 3, and refreshing water (350 ml/can) was prepared in accordance with a conventional method.

Table 3

Materials	Incorporated amount (350ml/can)
Garcinia extract	1.50 g
Caffeine (extract)	0.10 g
Maltodextrin	9.00 g
Reducing maltose syrup	5.00 g
Fructose	3.50 g
Concentrated fruit juice	3.50 g
Sodium citrate	0.70 g
Sweetener (L-phenylalanine compound)	0.08 g
Flavor	0.40 g
Purified water	326.22 g

Example 3 (Tablets)

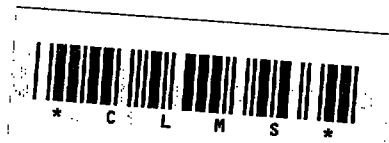
Respective materials were mixed in the proportional ratio as indicated in Table 4, and tablets (300 mg/tablet) were prepared in accordance with a conventional method.

Table 4

Materials	Incorporated amount (300mg/tablet)
Garcinia extract	210.0 mg
Caffeine (extract)	16.7 mg
Reducing maltose syrup	15.0 mg
Reducing palatinose	9.0 mg
Crystalline cellulose	27.0 mg
Fermented milk powder	7.5 mg
Sucrose ester	12.0 mg
Flavor	1.5 mg
Sweetener (L-phenylalanine compound)	1.3 mg

As mentioned above, according to the present invention, it is possible to provide a fat metabolism accelerating composition by which fat can efficiently be consumed, by using the Garcinia extract and caffeine in combination.

Accordingly, by ingesting a food or beverage containing the fat metabolism accelerating composition before exercise, it becomes possible to consume the fat efficiently and consume the fat in a higher amount with the same quantity of exercise.



What is claimed is:

1. A fat metabolism accelerating composition, which comprises Garcinia extract and caffeine as effective ingredients.

2. The fat metabolism accelerating composition according to Claim 1, wherein the fat metabolism accelerating composition contains the Garcinia extract and caffeine so that the ratio of a hydroxycitric acid content contained in the Garcinia extract to a caffeine content is within a range of 1.25 to 30 : 1 as a mass ratio.

3. Food or beverage, which comprises the fat metabolism accelerating composition as defined in Claim 1 or 2.

4. The food or beverage according to Claim 3, wherein the food or beverage contains the Garcinia extract in an amount of 125 to 1,500 mg in terms of hydroxycitric acid and the caffeine in an amount of 50 to 200 mg, per meal.