

**METHOD FOR REMOVING UNHEALTHY RAPIDLY DIGESTED STARCH
FROM FOOD IN AN ELECTRIC COOKING APPARATUS, AND
APPARATUS**

5 FIELD OF INVENTION

The present invention relates to a method for cooking food and an apparatus. More particularly, the invention relates to a method for removing unhealthy rapidly digested starch (RDS) from food in an electric cooking apparatus and an apparatus.

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BACKGROUND OF THE INVENTION

Rice is a staple food in many countries and is consumed almost always on a daily basis particularly in Asian countries. However, cooked rice contains high amounts of
15 Rapidly Digested Starch (RDS) that cause a rapid rise in blood glucose levels of individuals that consume it. The high RDS content in rice has prevented people diagnosed with diabetes, obesity and cardiovascular problems from consuming rice. Conventional rice cookers only allow one method to cook rice, in which a certain ratio of rice and water is added into a container and boiled until the rice has absorbed
20 most of the water while the rest is evaporated due to the boiling process until the rice is cooked. The starch can be categorised into amylose which is a Slowly Digested Starch (SDS) and amylopectin which is a Rapidly Digested Starch (RDS). In this process all the contents of the rice including the RDS and SDS components of rice are retained during the cooking process and thereafter consumed. Such cooked rice is
25 not healthy as all of its RDS content remains back after the water has evaporated. Moreover, any essential nutrients like vitamins are destroyed due to boiling of the rice. Therefore a conventional rice cooker would not be able to cook rice in such a way that the unhealthy Rapidly Digested Starch content is removed.

30 Therefore, there is a need for a proper process that can be implemented in the rice

cooker to remove unhealthy Rapidly Digested Starch from it and retain all essential nutrients within it such that a healthy food can be cooked.

SUMMARY OF INVENTION

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The present invention provides a method for removing unhealthy rapidly digested starch (RDS) from food in an electric cooking apparatus, comprising the steps of: receiving, via a user interface, inputs relating to the food content and water level contained within an inner container, where the inner container is removably fitting in
10 a hollow segment of an outer container; detecting and maintaining, by a temperature controller, a cooking temperature at a pre-determined value and for a pre-determined time period based on the inputs, so as to release only unhealthy starch from the food to be dissolved into the water while retaining all essential nutrients in the food; and, draining, via a channel, the water from the inner container.

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Preferably, the detected cooking temperature is gelatinization temperature of the food.

Preferably, the method further comprises the steps of removing excess moisture in the food by the temperature controller by keeping the food warm.

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Preferably, the food is rice, pasta, potato, noodles or any other suitable carbohydrate.

The present invention also provides an electric cooking apparatus comprising: an outer container having a hollow segment; an inner container removably fitting into the
25 hollow segment; a channel is provided at the bottom of the inner container to allow water to be drained out wherein the channel funnels to an opening at a distal end; a user interface is provided to receive inputs relating to the food content and water level contained within the inner container; and, a temperature controller is provided to detect and maintain a cooking temperature at a pre-determined value and for a pre-
30 determined time period based on the inputs, wherein a user inputs via the user

interface inputs relating to the food content and water level contained within the inner container and the temperature controller detects and maintains the cooking temperature at the pre-determined value and the pre-determined based on the inputs, so as to release only unhealthy starch from the food to be dissolved into the water while retaining all essential nutrients in the food.

Preferably, the electric cooking apparatus further comprises an electromagnetic device is mounted on the outer surface of the channel for regulating the water drained out from the opening by controlling a means for stopping the flow of water.

Preferably, the electric cooking apparatus further comprises a heating element positioned underneath the inner container and supported on the base of the outer container.

Preferably, the electric cooking apparatus further comprises a water collection member located below the outer container, wherein the water collection member is separately placed without any contact with electrical components of the apparatus, and has an opening exactly under the channel, and the channel is distanced from the opening of the water collection member through a casing.

Preferably, the electric cooking apparatus further comprises a mesh surface placed at the bottom of the inner container, wherein the mesh surface directly supports food above the channel, allowing only water to be drained out while retaining the food in the inner container.

Preferably, the channel is formed at the center of the bottom of the inner container and comprises a cylindrical segment and a tapered segment funneling to the opening at the distal end; and the heating element is a heating coil mounted against an outer surface of the bottom of the inner container for surrounding the cylindrical segment of the channel.

Preferably, the means for stopping the flow of the water is a metal ball that is spherical, ellipsoidal, or any suitable shape that prevents water flow through the channel.

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Preferably, when the electromagnetic device is closed, the metal ball is naturally located between edges of the opening of the channel for preventing the water from flowing through the opening; and when the electromagnetic device is turned on, the metal ball is magnetically pulled close to the vicinity of the electromagnetic device,
10 and is retracted from the opening that closes the channel, and the water flows from the inner container to the water collection member through the channel.

The present preferred embodiments of the invention consists of novel features and a combination of parts hereinafter fully described and illustrated in the accompanying
15 drawings and particularly pointed out in the appended claims; it being understood that various changes in the details may be effected by those skilled in the arts but without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other features, aspects and advantages of the present invention will be more fully understood when considered with respect to the following detailed descriptions, appended claims and accompanying drawings wherein:

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Fig 1 shows cross sectional view of an electric cooking apparatus for cooking food (housing is not shown);

Fig 2 shows the apparatus while water is being drained (housing is not shown); and

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Fig 3 is a flow chart that illustrates the steps implemented in the electric cooking apparatus to remove starch from food.

DETAILED DESCRIPTION OF THE INVENTION

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The present invention relates to method for removing unhealthy rapidly digested starch (RDS) content from food in an electric cooking apparatus. Hereinafter, the invention shall be described according to the preferred embodiments of the present invention and by referring to the accompanying description and drawings. However, it is to be understood that limiting the description to the preferred embodiments of the invention and to the drawings is merely to facilitate discussion of the present invention and it is envisioned that those skilled in the art may devise various modifications without departing from the scope of the appended claim.

15 Referring now to Fig. 1, shows a cross sectional view of an apparatus for cooking food. The apparatus comprises an outer container (110) with a hollow segment (111) and a base (112), a cylindrical inner container (120) that is removably fitted into the hollow segment (111) of the outer container (110) and a water collecting means (130) which forms a platform of the apparatus. The water collecting means (130) is positioned below the outer container (110). The inner container (120) accommodates a mixture of food (101) and water (102). The food (101) may be starchy food such as rice, noodles and pasta, but are not limited to these examples. The apparatus further comprises a heating element (140) positioned underneath the inner container (120) and supported on the base (112) of the outer container (110).

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The apparatus additionally comprises a housing (not shown) which houses the outer container (110) and an electronic controller (160) with a display screen (180) being accommodated at the side of the outer container (110). The apparatus further comprises a lid (not shown), hinged on the edge of the housing (not shown) adjacent to the opened end of the hollow segment (111) for covering the inner container (120)

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when the food is being cooked.

A channel (121) is provided at the bottom of the inner container (120) to allow the water (102) to be drained out. To ensure the food (101) is not drained together with the water (102), a meshed surface (150) is placed at the bottom of the inner container (120). Therefore, the meshed surface (150) would support the food (101) directly above the channel (121), allowing only the water (102) to be drained while the food (101) stays in the inner container (120).

The channel (121) of the inner container (120) is fitted and protrudes through an opening at the base (112) of the outer container (110). The water collecting means (130) is provided with an opening which is positioned directly below the channel (121) such that when the water is drained from the inner container (120) through the channel (121), it is collected at the water collecting means (130). The channel (121) is held a distance away from the opening of the water collecting means (130) by the housing (not shown). The water collecting means (130) is placed separately and not in contact with the electrical components of the apparatus to minimise the risk of damaging them. The water collecting means (130) is essentially a reservoir for containing the drained water (103) temporarily and is detachable from the housing (not shown) to be emptied when necessary.

As shown in Fig. 2, the channel (121) is preferably formed at the centre of the inner container's bottom and funnels to an opening (124) at a distal end of the channel (121). In a preferred embodiment, the channel (121) comprises a cylindrical segment (122) and a cone-shaped segment (123) which funnels to the opening (124) at its tip. The shape of the channel (121) which is similar to that of a funnel allows the draining of the water to be more effective because the space provided by the cylindrical segment (122) allows the water (102) to be temporarily held before it is discarded through the opening (124). This encourages a continuous flow of water.

The heating element (140) of the present invention are preferably heating coils which are mounted against the outer surface of the bottom of the inner container (120) such that heat can be transferred efficiently from the heating element (140) to the inner container (120) via conduction to cook the food as shown in Fig. 1. The heating coils
5 surround the cylindrical segment (122) of the channel (121).

Still referring to Fig. 1, the apparatus is provided with an electromagnetic device (170) and a means for stopping the flow of water through the opening (124) of the channel. The means for stopping the flow of water is preferably a metal ball (190).
10 The metal ball (190) is preferably spherical but may be ellipsoidal or any appropriate shape to stop the flow of water through the channel (121). The electromagnetic device (170) and the metal ball (190) work in tandem to stop or allow the flow of water through the channel (121). Since the channel (121) funnels the flow of the water through the cone-shaped segment (123) in a continuous manner, the metal ball (190)
15 stops the flow by closing the opening (124) at the tip of the cone-shaped segment (123). The metal ball (190) is fabricated such that it is slightly bigger than the opening of the channel (121). The diameter of the metal ball (190), is larger than the diameter of the opening (124), therefore, when the apparatus is arranged in an upright manner, gravitational pull would cause the metal ball (190) to roll towards the funnel opening
20 (124), at a neutral position.

The electromagnetic device (170) is mounted to the outer surface of the channel (121) and abuts the cone-shaped segment (123). Therefore, the electromagnetic device (170), does not, in any way, come in contact with the water to avoid damaging it. The
25 electromagnetic device (170) regulates the water that is being drained by controlling metal ball (190). As shown in Fig. 1, with the electromagnetic device (170) turned off, the metal ball (190) would naturally sit between the edges of the channel's opening (124), stopping the flow of water (102) through the opening (124). Upon turning on the electromagnetic device (170), the metal ball (190) is magnetically pulled towards
30 the proximity of the electromagnetic device (170) therefore retracting it from closing

the opening (124) of the channel (121) as shown by Fig. 2. With the metal ball (190) retracted, water flows through the channel (121) from the inner container (120) to the water collecting means (130).

- 5 The metal ball (190) can be easily removed from the channel (121) to be cleaned and does not require cumbersome dismantling of the apparatus. To remove the metal ball (190), the user only needs to remove the meshed surface (150) from the bottom of the inner container (120).
- 10 The food cooking apparatus works as a typical household food cooker that can be used for cooking rice, noodles, pastas and the like but has an additional feature of regulating the draining of water from the food being cooked to ensure that the cooked food is properly cooked and starch content is removed. The cooking of the food is achieved by filling the inner container (120) with a preferred ratio of food and water,
- 15 closing the lid and selecting a preferred cooking option.

In a preferred embodiment, water can be added continuously to the food while it is being cooked to replace the drained water. That way, the food can be continuously rinsed such that the starch contained in the water and the food can be removed

20 through different stages of rinsing. Water may be added to the food via a duct (not shown) which extracts clean water from a clean water storage (not shown). Clean water may be sprayed into the inner container as water droplets or flowed into the inner container from the wall of the inner container through a plurality of small water inlets.

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The user interface or electronic controller (160) and the corresponding display screen (180) enable the user to provide inputs such as type of food and water level in the inner container (120).

- 30 The temperature controller is arranged in the apparatus. Based on the inputs provided

by the user, the temperature controller determines optimum cooking temperature of the food. The optimum cooking temperature is maintained at a pre-determined value and for a pre-determined time period based on the inputs, so as to release only unhealthy RDS from the food to be dissolved into the water while retaining all
5 essential nutrients in the food.

The user switches on or off the apparatus through an on/off switch on the user interface. Then the user would be prompted to select whether to cook the food conventionally or automatically. Selecting the conventional sub-option the user would
10 be prompted via the interface to enter the type of rice and water level in the inner container (120). Based on the input provided, the temperature controller detects the cooking temperature at a pre-determined value and maintains the rice at that cooking temperature for a pre-determined time to gelatinize the rice. So as to release the unhealthy RDS from the rice to be dissolved into water while the essential nutrients
15 are retained within the rice. The cooking time may also be pre-programmed in the temperature controller. Upon the completion of the pre-determined time period the water can be allowed to be drain out from the channel (121). The food warm is kept warm so has to maintain the texture of the rice.

20 Selecting the automatic sub-option, a sensor is provided in the inner container (120) which is pre-programmed to detect the type of foods such rice, potatoes, noodles and pasta. Also, the sensor is pre-programed to detect the level of the water in the inner container (120). Based on the data from the sensor, the temperature controller detects and maintains the cooking temperature at the pre-determined value and at the pre-
25 determined time period to gelatinize the rice. In this stage the unhealthy RDS is released into water to be dissolved into the water simultaneously the essential nutrients are retained within the rice. Upon the completion of the pre-determined time period the electromagnetic device (170) is activated to allow the water to drain out from the channel (121) automatically. The temperature controller keeps the rice warm
30 to remove the excess moisture contained so as to maintain the texture of the rice.

The method steps are explained with respect to cooking the rice. However, this method is not limited to rice, it is applicable to noodles, pasta, potatoes and any other suitable food item.

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Referring now to Fig. 3, the steps implemented in the electric cooking apparatus to remove unhealthy RDS from rice begins at step (210): a user inputs via a user interface the inputs relating to type of the rice and water level filled in the inner container (120).

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Next, at step (220), a temperature controller detects optimum cooking temperature based on the inputs provided. The optimum cooking temperature is a gelatinization temperature of the rice which is already pre-determined and it is different for different types of the rice. Based on the type of the rice the cooking temperature is different for
15 different types of rice, for example: the gelatinization temperature for short grain rice is preferably at 75 °C to 85 °C, medium grain rice is preferably at 80 °C to 90 °C and long grain rice is preferably at 90 °C to 95 °C.

Then, at step (230), the detected cooking temperature of the rice is maintained for a
20 pre-determined time period based on the input. For example, the time period required for the short grain rice is preferably 4 to 6 minutes, medium grain rice is preferably 5 to 8 minutes and long grain rice is preferably 8 to 12 minutes. In this step, the rice is not allowed to boil and the temperature is maintained for long enough such that the unhealthy RDS from the rice is released to be dissolved into the water. At the same
25 time it doesn't allow the rice wall to break such that amylose and essential nutrients of the rice are retained within the rice.

Next, at step (240), upon the completion of gelatinization period the water is drained through the channel (121) in the inner container (120) automatically by the
30 electromagnetic device (170).

Then, the rice is kept warm where the excess moisture is removed such that the texture of the rice is maintained.

5 The rice cooked in the electric cooking apparatus preferably Grayns Rice Cooker using this process implemented in it has a higher Amylose to Amylopectin ratio. This provides a healthier carbohydrate almost on par with Oats that provides the energy while digesting slowly into our blood stream without spiking blood glucose levels and keeping us full for longer. Further, the rice cooked has a lower Glycemic Load by
10 almost 35 to 40 % when compared to rice cooked in conventional rice cookers. The lower Glycemic Load on our bodies provides better Weight Management and better Diabetic Control.

Although this disclosure has described and illustrated certain preferred embodiments
15 of the invention, it is to be understood that the invention is not restricted to those particular embodiments. Rather, the invention includes all embodiments which are functional or mechanical equivalence of the specific embodiments and features that have been described and illustrated.

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CLAIMS

1. A method for removing unhealthy rapidly digested starch (RDS) from food in an electric cooking apparatus, comprising the steps of:
 - 5 receiving, via a user interface, inputs relating to the food content and water level contained within an inner container (120), where the inner container (120) is removably fitting in a hollow segment of an outer container (110);
 - detecting and maintaining, by a temperature controller, a cooking temperature at a pre-determined value and for a pre-determined time period based on the inputs, so
 - 10 as to release only unhealthy starch from the food to be dissolved into the water while retaining all essential nutrients in the food; and,
 - draining, via a channel, the water from the inner container (120).
2. The method according to claim 1, wherein the detected cooking temperature is
- 15 gelatinization temperature of the food.
3. The method according to claim 1 further comprising the steps of removing excess moisture in the food by the temperature controller by keeping the food warm.
- 20 4. The method according to claim 1 wherein the food is rice, pasta, potato, noodles or any other suitable carbohydrate.
5. An electric cooking apparatus, comprising:
 - an outer container (110) having a hollow segment (111);
 - 25 an inner container (120) removably fitting into the hollow segment (111);
 - a channel (121) provided at the bottom of the inner container (120) to allow water (102) to be drained out, wherein the channel (121) funnels to an opening (124) at a distal end;
 - a user interface, provided to receive inputs relating to the food content and
 - 30 water level contained within the inner container (120); and,

a temperature controller, provided to detect and maintain a cooking temperature at a pre-determined value and for a pre-determined time period based on the inputs,

wherein a user inputs, via the user interface, inputs relating to the food content and water level contained within the inner container (120) and the temperature controller detects and maintains the cooking temperature at the pre-determined value and the pre-determined based on the inputs, so as to release only unhealthy starch from the food to be dissolved into the water while retaining all essential nutrients in the food.

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6. The electric cooking apparatus according to claim 5, further comprising an electromagnetic device (170) mounted on the outer surface of the channel (121) for regulating the water drained out from the opening (124) by controlling a means for stopping the flow of water.

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7. The electric cooking apparatus according to claim 5, further comprising a heating element (140) positioned underneath the inner container (120) and supported on the base (112) of the outer container (110).

20 8. The electric cooking apparatus according to claim 5, further comprising a water collection member (130) located below the outer container (110), wherein the water collection member is separately placed without any contact with electrical components of the apparatus, and has an opening exactly under the channel (121), and the channel (121) is distanced from the opening of the water collection member (130)
25 through a casing.

9. The electric cooking apparatus according to claim 5, further comprising a mesh surface (150) placed at the bottom of the inner container (120), wherein the mesh surface directly supports food above the channel (121), allowing only water (102) to
30 be drained out while retaining the food in the inner container (120).

10. The electric cooking apparatus according to any of claims 5-9, wherein the channel (121) is formed at the center of the bottom of the inner container (120) and comprises a cylindrical segment (122) and a tapered segment (123) funneling to the opening (124) at the distal end; and the heating element (140) is a heating coil mounted against an outer surface of the bottom of the inner container (120) for surrounding the cylindrical segment (122) of the channel (121).

11. The electric cooking apparatus according to claim 10, wherein the means for stopping the flow of the water is a metal ball (190) that is spherical, ellipsoidal, or any suitable shape that prevents water flow through the channel (121).

12. The electric cooking apparatus according to claim 11, wherein when the electromagnetic device (170) is closed, the metal ball (190) is naturally located between edges of the opening (124) of the channel (121) for preventing the water (102) from flowing through the opening (124); and when the electromagnetic device (170) is turned on, the metal ball (190) is magnetically pulled close to the vicinity of the electromagnetic device, and is retracted from the opening (124) that closes the channel (121), and the water flows from the inner container (120) to the water collection member (130) through the channel (121).

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