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(71) Applicant *(for all designated States except US)*: **BAKEY'S-FOODS PRIVATE LIMITED** [IN/IN]; Plot No. 95/1, Phase-2, Ida Cherlapally, Hyderabad 500 051, Andhra Pradesh (IN).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DURR, Anu, Kashyap** [IN/IN]; House No. 5-9-240/45, Block 8, J.J. Nagar Post, Shaili Gardenia, Yarpal, Hyderabad 500 087 (IN). **RAYAPUDI, Rama, Devi** [IN/IN]; Flat No.202, Mitra's Jeevan Sadan, House N0.16-11-17/A/1/1, Saleem Nagar Colony, Malkapet, Hyderabad 500 036 (IN). **PEESAPATY, Narayana** [IN/IN]; 416, Chippendale 1-7-12, Golkonda Cross Roads, Musheerabad, Hyderabad 500 020 (IN).

(74) Agent: **KOTNI, Raj, Latha**; Tempus Law Associates, #100/1, Ravi Chambers, Kavuri Hills, Madhapur (Behind PBEL Corp. Office), Hyderabad 500 033 (IN).

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(54) **Title**: ECO-FRIENDLY AND BIODEGRADABLE EDIBLE UTENSILS INCLUDING CUTLERY AND CHOPSTICKS AND METHODS OF MAKING THEM

(57) **Abstract**: Eco-friendly, biodegradable and edible cutleries, chopsticks, and all utensils used to lift food into mouth wherein the cutleries, chopsticks, and all other such utensils are made of flours having about 65% w/w or above carbohydrate content and contain no added preservatives or chemical additives and having a shelf life of a year or more. The method of preparing Eco- friendly, biodegradable and edible cutleries, chopsticks, and all utensils used to lift food into mouth.

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Eco-friendly and biodegradable edible utensils including cutlery and chopsticks and methods of making them

Field of the invention:

The invention relates to a novel method of making eco-friendly and biodegradable edible utensils. More particularly, the invention relates to novel method of making eco-friendly and biodegradable cutleries which term includes spoons of all shapes and sizes, forks, knives, chopsticks and all other such items that are used to lift food into the mouth. The invention also relates to eco-friendly and biodegradable edible utensils including but not limited to eco-friendly and biodegradable edible cutleries, including chopsticks. The eco-friendly and biodegradable edible utensils of the invention are prepared from healthy and hygienic edible materials and can be consumed by the user after their use as utensils, or if thrown away, they biodegrade naturally within less than two days.

Background of the invention

Now-a-days certain things have become part of our daily routine life which play very important role in our busy schedules from morning till night. With increased use of various carcinogenic, toxic and harmful chemicals present in everything which we eat, drink or use and with increased cases of cancer, dermatological, cardiovascular and other diseases, it is very important to keep ourselves fit and avoid the use or contact of such harmful contaminants in what we eat, drink or use.

Worldwide focus has shifted towards coming closer to the nature and various natural practices like yoga and meditation are being adopted to keep oneself fit. In addition to that, use of various organic food materials which claim to be produced using natural fertilizers and herbal pesticides without any harmful chemicals and synthetic materials, is also growing very rapidly. However, in-spite of taking precautionary measures discussed above, it has not been possible for everyone and more precisely for anyone, to safeguard himself from use or contact of these harmful chemicals. However, one should keep trying to minimize the use of such contaminants in his routine life to the possible extent.

Further use of various non-biodegradable materials, more particularly, plastic materials, has generated a new worldwide challenge to handle and dispose such plastic materials which are polluting the world environment and affecting the balance of eco-system. These plastic materials, being non-biodegradable, remain in the environment unaffected and in-turn pollutes the environment.

Conventionally, in developing or under-developed countries, waste materials are disposed by burning or burying them under ground. These plastic materials when disposed by burning become even more dangerous and lethal due to various toxic and carcinogenic particles and free radicals reaching into air and environment.

Typically, among other things which we come across in our routine life, utensils are of great importance. Various utensils which we generally use in our routine life can be named as cups, bowls, plates, cutleries, bottles etc. Generally, utensils and cutleries are made of silver, steel, aluminum, brass, copper or any other alloy, wood or plastics. Utensils made of metals and alloys are generally re-used after washing and cleaning whereas, those made of wood and plastic utensils may be re-used or thrown away. Re-use of these utensils comes with the advantage of multiple times use of the utensil but it also has certain limitations like cost of the utensils, their safe storage, proper hygienic cleaning of the utensil before and after use. An improperly cleaned utensil can carry various harmful pathogens, dust particles and chemicals used in the cleaning. The proper cleaning can be altered due to various reasons including poor handling by the person responsible, poor quality of cleansing material used, contamination in the water used for washing and cleaning or even deficiency of clean and hygienic water. Carrying these utensils, more particularly, cutleries in travels and journeys is generally not very user friendly due to scarcity of clean and hygienic water for cleaning and their safe storage.

Initially, with advancement in the polymer chemistry and invention of plastics, these appeared to be a good alternative to metals and wood and therefore, use of plastics in manufacture of various utensils, articles, apparatuses, carry bags etc was in high demand. But, after the outcome of serious environmental problems associated with the use of plastics,

use of plastic articles is discouraged worldwide. Further, plastic cutleries are also associated with the problem of consumption of dangerous and carcinogenic chemicals when cutlery is used without proper washing after coming out of the factory, as stringent food safety measures are rarely followed by the manufacturers. Plastic cutleries manufactured out of petroleum by-products are often produced in unhygienic manner and packed and sold in the market and generally used by the consumers without taking necessary precautions of washing and cleaning the same. Typically, plastic cutleries are meant for disposed after single use but these thrown-away cutleries are collected and re-used by beggars and poor or re-sold in the market without even proper washing and cleaning.

In addition, certain communities use utensils made of wood. More specifically, these include chopsticks. Chopsticks of disposable kind are the most damaging to the environment. One of the reasons attributed to the shrinking forest cover in East Asia is the growing demand for these disposable wooden chopsticks. The problem is severe that Government of China has imposed an environment tax and now is even contemplating to ban use of such chopsticks. Use of wooden cutlery cannot be encouraged as increased demand of wooden cutleries would lead to more trees being cut down, which has its own adverse effect on the environment like global warming, shift in season patterns, change in rainfall pattern and magnitude etc. What is most notable is, despite the realization that increased use of disposable chopsticks is leading to depletion of forests. Not much prior art is available on application of edible materials for manufacture of these products as an alternative to wood. The efforts by the Governments of these countries are more towards reducing its use in the present form rather than looking for alternatives, a gap, which this invention aims to bridge.

Thus, the use of metal, alloy, wood and plastic utensils and cutleries has several disadvantages like cost, safety, less user friendly, health hazards and adverse effects on human, animal and the environment.

Therefore, there is always a need for an alternative to these metal, alloys, wooden or plastic utensils and cutleries which could overcome various problems associated with these utensils and cutleries as discussed in above paragraphs. An eco-friendly, biodegradable, edible utensil and cutlery made from safe, hygienic and healthy edible (agriculturally produced) materials

which can be consumed after the use or if thrown away would biodegrade within two days, should be the best solution to the above problems.

Conventionally, commercial production of edible utensils and cutleries has been largely restricted to making plates. However, while eating plates are generally placed on table or held in hand. There is a general revulsion to eat what is fallen on the table or eat what is held in hand for long because of dirt and sweat in hands. Therefore, although these plates are edible, rarely they are consumed after use as plate. Due to these hygienic limitations, these plates are more preferably used and sold as pet food, rather than for human beings. Conventional edible utensils also often consist of plasticizers, rendering them to be non-palatable for human being.

In the prior art, various other efforts have also been made, one of them being edible straws with and without added flavors introduced inside them, However, insignificant market presence of these products in the market doubts commercial success of such edible straws.
US Patent 3493382 discloses a method of producing molded edible products consisting of a liquid mixture comprising glycerin and/or propylene glycol, carrageen and tapioca starch, injecting this mixture into moulds and heating the mixture till it solidifies in the mould of desired shape. Evidently, commercial application of such product may not have been found feasible, since products made of such materials are not seen in the market. Further, ingestion of glycerin and propylene glycol and the health implications from the same leaves enough doubts on edibility of these products.

US Patent 5378418 discloses a method of making articles of edible or easily biodegradable material without using either a plasticizer or a lubricant comprising mixing animal connective tissue protein with starch and extruding the mixture and molding by injection molding to form the article.

However, addition of animal tissues in the article disclosed in this patent restricts its use on mass level. Due to religious restrictions on eating any non-vegetarian food products or food products which carry traces of any animal part or component or non-halal or non kosher

produced non vegetarian food products, articles made by the method disclosed in this US patent cannot be used by the followers of those religions.

WO 96/020604 discloses a method for preparing an edible eating or drinking utensil comprising: producing an edible mixture; forming an edible utensil from said edible mixture; and heating said edible utensil to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

This prior art appears to be relevant to the present invention disclosed herein after in given paragraphs under respective heads, but the difference lies in the combination of the edible mix, the bio-chemical description of the edible mix and the process of molding the product into the desired shapes.

Further, process disclosed in both the above specified prior art documents involve extrusion methods. The extrusion process has various limitations like this process is energy intensive and unless the output product is linear in shape, extrusion generally results in concentric ring-like formations and thus diminishing the strength of the product. Furthermore, extrusion makes the material to smear against the walls into which it is extruded and thus reduces the possibility of a smooth surfaced product being made.

Some other less relevant prior art documents include US Patent 5447584, which discloses a method for constructing art and crafts using water soluble compositions of low density comprising starch, polyalkylene glycol, binding agents and water. The method of preparing the crafts and toys employs extrusion method.

WO/2005/021633 relates to a composition for use in making a starch-based food or beverage container, the formulation allows the container to be water resistant for certain amount of time without the need of any water resistant coating.

Further, WO/2008/090195 discloses biodegradable compositions consisting of starch, plasticizing agent, protein, cross-linking enzyme and water. The biodegradable articles which can be prepared with the composition may be trays, bowls, plates, cutlery, cups or bottles.

All these inventions are largely based on injection or extrusion methods of production, which are energy intensive processes. This invention aims to overcome this by making the products through non-injection and non-extrusion based methods.

The present invention is also an improvement over Indian Patent Application No. 284/KOL/2006, filed by one of the inventors of this application which comprises a process of making edible cutlery comprising preparing a dough of rice and wheat flour in a boiling water at temperature between 90 to 110^0 C, rolling thick slices of 1.5 to 2.25 mm size, molding desired shape and baking at 175 to 190^0 C. This invention has certain limitations like it is limited to edible cutleries made from only rice and wheat flour in the ratio of 0.8 to 1.2:0.8 to 1.2. The dough is made only with the boiling water whereas, in absence of any lubricating or softening agent, cutleries may develop cracks on baking and are too hard to be eaten. In absence of any flavor and taste enhancers and sweetening agents, it is not palatable and not preferred for eating. Further, in absence of any defined kneading process, gelatinization of the starch is not done properly.

The present invention overcomes various disadvantages of the available prior arts discussed herein above paragraphs.

Objects of the invention

The primary object of the invention is to provide a novel method of making eco-friendly, biodegradable, edible utensils and cutleries that does not employ injection or extrusion methods for moulding.

Another object of the invention is to provide a method of making eco-friendly, biodegradable, edible utensils and cutleries from safe, hygienic and healthy food materials.

Another object of the invention is to provide eco-friendly and biodegradable utensils and cutleries which can be consumed after the use or otherwise if thrown away, would biodegrade naturally within two days.

Another object of the invention is to provide edible utensils and cutleries which are safe, healthy, have low fat and are devoid of any harmful chemicals and contaminants, including even preservatives.

A further object of the invention is to provide eco-friendly, biodegradable, edible utensils and cutleries with are user friendly and do not require pre-washing and cleaning.

Summary of the invention

The invention relates to a method of making eco-friendly, biodegradable, edible utensils produced from safe, hygienic and healthy food materials which can be also be consumed by the user after their use as utensils.

Flours of suitable food materials, rich in starch content are selected from cereals, millets, lentils, fruits and vegetables rich in starch content. The dough is obtained by kneading the flour. Flour of one single food material or a combination of two or more can be kneaded to obtain the dough. Total carbohydrate content of the dough obtained by kneading of the flour should be 65% w/w or above, of the total dough volume.

The kneading of the flour can be done with water, milk, oil or any other material in cold, hot or boiling form at a temperature suitable for kneading. The said liquid used for kneading the flour may be plain i.e. only with natural taste of the liquid without any added flavor or it may be sweetened and / or salted as per the requirement.

In one embodiment, when utensils are made for diabetic patients or patients with high blood pressure, sweetening agents and salts are not used.

In another embodiment, adding suitable micro or macro nutritional elements can fortify the product and enhance the nutritional intake by the consumers.

Kneading can be done with any of the liquid or a combination of two or more liquids with 55% to 75% w/w of the total flour weight. Complete or partial gelatinization of the starch is done in the process of kneading. Kneading is done with a liquid at temperature between 65^0 C to 90^0 C or boiling water or water steam.

Stirring time in kneading is adjusted as per the temperature of the liquid. The starch present in the flours get gelatinized and acts as binding force that holds all the particles in the flour or flour mix together to form tight yet pliable dough.

The dough should be tight for it to be converted into the desired shapes therefore, once the process of gelatinization is complete, dry flour can be added to get the required consistency of the dough.

A small quantity of a lubricating agent like vegetable fat, vegetable oils, butter, clarified butter, , etc can be added in the dough in between 2 to10% w/w of the total weight of the dry flours.

Kneaded dough is put into a mold of predetermined shape and size and cured either through direct heating of the molds or through baking with or without steam at temperature in between 150o C to 400°C over a period of 3 to 15 minutes, to obtain utensils of desired shape and size.

Detailed description of the invention

Detailed embodiments of the present invention are disclosed herein below. However, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms. The scope of the invention is not limited to the disclosed embodiments and terms and phrases used herein are not intended to be limiting but rather to provide an understandable description of the invention. The invention is defined by claims

appended hereto.

According to the present invention, eco-friendly, biodegradable, edible utensils are produced from safe, hygienic and healthy food materials. The invention discloses a method of making eco-friendly and biodegradable edible utensils which can be consumed by the user after their use as utensils, or if thrown away, they biodegrade naturally within less than two days.

The utensils produced by the method include plates, trays, cups, bowls and cutleries of desired shape and sizes. In one embodiment of the invention, the utensils prepared by the method of present invention are cutleries of different design, shape and sizes, including chopsticks.

According to the invention, suitable food materials, rich in carbohydrate content are selected. Such carbohydrate rich materials are, but not limited to, cereals, millets, lentils, fruits and vegetables rich in starch content. Selected carbohydrate rich materials are properly cleaned and washed to remove any impurities, foreign bodies and chemicals used on them as pesticides or preservatives. The carbohydrate rich material is then ground/mashed into fine particles to prepare the flour.

The flour of the food material obtained above is used as basic material for making the edible utensils of the invention. Already ground/mashed and ready-to-use flour of selected carbohydrate rich food material commercially available in the market can also be used for as basic material to perform the method of the invention and to make the edible utensils of the invention.

The said flour is used for preparation of dough. The dough is obtained by kneading the flour of carbohydrate rich food material described as above. The dough can be kneaded with flour of one single raw food material or a combination of two or more.

In preferred embodiment of the invention, total carbohydrate content of the dough obtained by kneading of the flour should be 65% w/w or above, of the total dough volume. Such carbohydrate rich dough may be prepared with the flour of single food material or a

combination or two or more. The kneading of the flour is done with a suitable liquid comprising, but not limited to, water, milk, oil or any other material in cold, hot or boiling form at a temperature suitable for kneading. The said liquid used for kneading the flour may be plain i.e. only with natural taste of the liquid without any added flavor or it may be sweetened and / or salted as per the requirement. Sugar is preferably used as sweetening agent and edible salt is used for salty taste.

In one embodiment, when utensils are made for diabetic patients or patients with high blood pressure, sweetening agents and salts are not used.

In another embodiment, adding suitable micro or macro nutritional elements can fortify the product and enhance the nutritional intake by the consumers.

Kneading can be done with any of the liquid or a combination of two or more liquids selected from the above can be used. The liquid medium to be applied for making the dough should be 55% to 75% w/w of the total flour weight.

In one preferred embodiment of the invention, complete or partial gelatinization of the starch present in the flours is done in the process of kneading. Although any standard method known in the art can be used for starch gelatinization, However, in preferred embodiment of the invention, the gelatinization of starch comprises stirring the flour or flour mix at ambient temperatures in a liquid, wherein, liquid is any liquid or a combination of two or more, selected from the list described in above paragraphs. Kneading is done with a liquid at temperature between 65^0 C to 90^0 C.

In one embodiment of the invention, kneading is done with hot water at temperature between 65°C to 90°C water. In another embodiment of the invention, kneading is done with boiling water. In another embodiment of the invention, kneading is done with steam.

In all the embodiments described above, stirring time in kneading is adjusted as per the temperature of the liquid. The gelatinized starch acts as binding force that holds all the particles in the flour or flour mix together to form tight yet pliable dough.

The kneading process should be long enough to achieve a fair degree of homogenization in the dough more particularly, when flour being used is a mix of two or more different flours. For this purpose any standard procedure can be adopted such as kneading by hand or through spiral kneaders or bread dough kneaders, etc.

The dough should be tight for it to be converted into the desired shapes. Therefore, the application of the liquid medium should be just enough. Since the liquid required for gelatinization or even partial gelatinization process is more than the liquid required to make a tight dough of the flours therefore, once the process of gelatinization is complete, dry flour can be added later to get the required consistency of the dough.

To prevent the starch material to stick to the surfaces of the shaping molds, a small quantity of a lubricating agent can be added in the dough. The lubricating agent can be selected from fat such as vegetable oils, butter, clarified butter, , etc. The lubricating agent is added in between 2 to10% w/w of the total weight of the dry flours. It is also desirable to apply the fat treated with anti oxidants. Such treated fat can also be applied on the surface of the shaping molds to prevent the dough from sticking to the surface.

Utensils and cutleries of different desired designs shape and size can be formed from the dough obtained above. For this purpose, the kneaded dough is put into a mold of predetermined shape and size and cured either through direct heating of the molds or through baking with or without steam at temperature in between 150° C to 400°C over a period of 3 to 15 minutes. The temperature requirements and the duration of curing depend on the thickness of mold in which it is being cured, the thickness of the material which is being cured and the type of curing equipment like, type of oven being used.

The process of putting the kneaded dough into the molds can be through passing it through a series of rollers and converting it into a sheet. For this purpose, the dough is gradually

reduced in thickness. The reduction in thickness is done preferably in three to four stages until the desired gauge of the sheet is achieved. The sheet is then manually or automatically pressed into moulds of desired shape, cut along the periphery of the product and cured by heating till it hardens. This process can be applied to any shape and structure – be it a deep-bowled Asian soupspoon or conically linear or angular chopsticks. Innovations can also be made to add color and or taste by adding pulp of vegetables such as spinach for green, carrot for yellow, beet root for red to increase the visible appeal of the product.

It needs specific mention that injection or extrusion based molding equipments are not used in the process, instead, the process is based on sheeting the dough and pressing it inside the moulds in such a manner that it shapes and cuts along the periphery and cured by heating

The moulds thus filled with the material to be cured can be made to pass through the curing region in the form of a train or allowed to pile in regular stacks of alternatively facing layers and then shifted to the curing region. This helps in reducing the human element in the production process and thus reduces the cost of production.

The material inside the molds get released as a fully formed piece of cutlery which can be manually or automatically passed into a packaging system, from where it gets packed for further transportation to the market.

Molds and die of desired shape and size may be used to make the utensils of desired shape and size.

Following examples have been given only for better understanding of the invention and is not limiting to the spirit and scope of the claims.

EXAMPLE 1:

1 Kg of commercially available wheat flour was mixed with 500 ml of cold water and kneaded to form a tight dough. 20 - 50ml of vegetable oil was added to this to prevent it from

sticking to surfaces while shaping it into desired forms. This dough was made to pass through a series of rollers by which process the dough came out in the form of a sheet. This sheet was placed on the moulds either automatically or manually in the pre-designed moulds for shaping into the desired shapes. The moulds were cleaned (which ever needed) of any peripheral flashes that were sticking to the moulds. These were then baked at temperatures between 150°C to 400°C for a period between 3 to 15 minutes. The baked shape was then removed from the moulds and packed for further disposal.

EXAMPLE 2:

In another example, commercially available wheat and rice flours were used. 1/2 Kg of wheat flour was mixed with ½ Kg of rice flour and kneaded with 300 ml of cold water and 300 ml of hot milk to form tight dough. 30 ml of fat, pre-treated with anti-oxidant, was added to this to prevent it from sticking to surfaces while shaping it into desired forms. This dough was made to pass through a series of rollers by which process the dough came out in the form of a sheet. This sheet was placed on the moulds either automatically or manually in the pre-designed moulds for shaping into the desired shapes. The moulds were cleaned of peripheral flashes that were sticking to the moulds. These were then baked at temperatures between 150°C to 400°C for a period between 3 to 15 minutes. The baked shape was then removed from the moulds and packed for further disposal.

In the examples 1 and 2 above, the whole grain wheat flour and machine polished refined rice flour were used. However, refined wheat flour and hand pounded rice flour or any other commercially available forms of rice can also be used for the purposes. Additionally, fortification of the flours with added micro and macro nutrients can also be done.

EXAMPLE 3:

1 Kg of sorghum whole grain was cleaned for separation of any foreign bodies, washed and dried in air at room temperature. The obtained sorghum whole grain was boiled in alkaline calcium hydroxide solution (CaOH solution) for about 15 minutes and allowed a seeping time of 15 hours. After that grains were dried and grounded. The flour was then mixed with

700 ml of hot water with a temperature around 60^0 C and kneaded into tight dough. 50 ml of butter was added to this to prevent it from sticking to surfaces while shaping it into desired forms. This dough was made to pass through a series of rollers by which process the dough came out in the form of a sheet. This sheet was placed on the moulds either automatically or manually in the pre-designed moulds for shaping into the desired shapes. The moulds were cleaned of peripheral flashes that were sticking to the moulds. These were then baked at temperatures between 150°C to 400°C for a period between 3 to 15 minutes. The baked shape was then removed from the moulds and packed for further disposal.

We claim:

1. Eco-friendly, biodegradable and edible cutleries, chopsticks, and all utensils used to lift food into mouth wherein the cutleries, chopsticks, and all other such utensils are made of flours having about 65% w/w or above carbohydrate content and contain no added preservatives or chemical additives and having a shelf life of a year or more.

2. The eco-friendly, biodegradable and edible cutleries, chopsticks, and other such utensils used to lift food into mouth add to nutritive intake of the consumer by virtue of the fact that these are made of food materials and therefore offer scope for enhancing nutritive quality by fortification with other nutritional inputs.

3. The eco-friendly, biodegradable and edible cutleries, chopsticks, bowls and plates as claimed in Claim 1, wherein, the production process, does not involve injection or extrusion methods, but is based on sheeting and shaping process.

4. The eco-friendly, biodegradable and edible cutleries, chopsticks, and all other such utensils used to lift food into mouth as claimed in claim 1, wherein said carbohydrate rich edible flours are selected from a group comprising cereals, millets, lentils, fruits, vegetables and any other agricultural produces

5. A method of making eco-friendly, biodegradable edible utensils used to lift food into mouth as claimed in Claims 1 through 4 comprises the steps of :
   a) stir mixing one or more carbohydrate rich flour having at least 65% w/w carbohydrate with a liquid to gelatinize the inherent starch
   b) adding a lubricating agent to the dough
   c) sheeting the dough
   d) forming the dough into the desired shapes
   e) baking the formed shapes

f) *obtaining the finished shapes, which are eco friendly, biodegradable and* edible utensils as claimed in Claim 1

6. A method as claimed in claim 5, wherein said carbohydrate rich edible flours are obtained from a group comprising cereals, millets, lentils, fruits, vegetables and any other agricultural produces.

7. A method as claimed in claim 5, wherein kneading is done with water, wherein the water is hot at temperature range between 65^0 C and 90^0 C or cold at room temperatures or in the form of steam.

8. A method as claimed in claim 5, wherein a flavoring agent or a sweetening agent or a natural coloring agent or salt or a nutrient is added either with the flours or mixed with the liquid.

9. A method as claimed in claim 8, wherein the nutrient is a macronutrient or a micronutrient.

10. A method as claimed in claim 7, wherein weight of water used for kneading is 55% to 75% of total flour weight.

11. A method as claimed in claim 7, wherein additional dry flour is added if needed to obtain tight dough.

12. A method as claimed in claim 5, wherein lubricating agent is selected from the group comprising of vegetable oil, butter, clarified butter and any other edible fats or oils with or without anti-oxidants.

13. A method as claimed in claim 5, wherein the said lubricating agent added is in the range of 2 to 10% w/w of the total weight of flours.

14. A method as claimed in claim 5, wherein the sheeting is done by passing the dough through a series of rollers.

15. A method as claimed in claim 5, wherein the forming is done by automatically or manually transferring the sheeted dough into pre determined shapes or moulds.

16. A method as claimed in claim 5, wherein said baking is done at a temperature in the range of 150^0 C to 400^0 C and at a time in the range of 3-15 minutes.

17. A method as claimed in claim 16, wherein said baking is done with dry heat or steam.

18. Eco-friendly, biodegradable edible utensils used to lift food into mouth produced by process of preceding method claims.

AMENDED CLAIMS
[received by the International Bureau on 04 June 2012 804.06.2012)]

1. Eco-friendly, biodcgradable and edible cutleries, chopsticks, and all utensils used to lift food into mouth repetitively during a single meal without any significant deformation during use, having smooth surfacc and resembling conventional cutlery in shape and size, wherein the cutleries, chopsticks, and all other such utensils are made of carbohydrate rich edible flours, prepared utilizing gelatinization of inherent starch in the flour and containing no added preservatives or chemical additives and having a shelf life of a year or more.

2. The eco-friendly, biodegradable and edible cutleries, chopsticks, and other such utensils used to lift food into mouth without getting deformed while being used repetitively, add to nutritive intake of the consumer by virtue of the fact that these are made of food materials and therefore offer scope for enhancing nutritive quality by fortification with other nutritional inputs comprising added nutrients.

3. The eco-friendly, biodegradable and edible cutleries, chopsticks, and all utensils used to lift food repetitively into mouth during a single meal without any significant deformation during use as claimed in Claim 1, wherein, the production process, does not involve injection or extrusion methods, but is based on sheeting and shaping process.

4. The eco-friendly, biodegradable and edible cutleries, chopsticks, and all other such utensils used to lift food into mouth as claimed in claim 1, wherein said carbohydrate rich edible flours are not limited to cereals and millets but can also include lentils, fruits, vegetables and root or stem tubers.

5. A method of making eco-friendly, biodegradable edible utensils used to lift food into mouth as claimed in Claims 1 through 4 comprises the steps of:
a) stir mixing one or more carbohydrate rich flour having at least 65% w/w carbohydrate with water at a temperature to gelatinize the inherent starch
b) adding a lubricating agent to the dough, to prevent sticking of dough to the rolling surface or on the mold surface

c) sheeting the dough by passing through series of rollers
d) forming the dough into the desired shapes in fully enclosed moulds
e) baking the formed shapes within the moulds
f) obtaining the finished shapes, which are eco friendly, biodegradable and edible utensils as claimed in Claim 1

6. A method as claimed in claim 5, wherein kneading is done with water, wherein the water is hot at temperature range between 65^0 C and 90^0 C or in the form of steam.

7. A method as claimed in claim 5, wherein a flavoring agent or a sweetening agent or a natural coloring agent or salt or a nutrient is either mixed with the liquid and added to the flours or is added directly to the flours.

8. A method as claimed in claim 8, wherein the nutrient is a macronutrient or a micronutrient.

9. A method as claimed in claim 7, wherein weight of water used for kneading is 45% to 75% of total flour weight.

10. A method as claimed in claim 7, wherein additional dry flour is added if needed to obtain tight dough.

11. A method as claimed in claim 5, wherein lubricating agent is selected from the group comprising of vegetable oil, butter, clarified butter and any other edible fats or oils with or without anti-oxidants.

12. A method as claimed in claim 5, wherein the said lubricating agent added is in the range of 2 to 10% w/w of the total weight of flours.

13. A method as claimed in claim 5, wherein the sheeting is done by passing the dough through a series of rollers.

14. A method as claimed in claim 5, wherein the forming is done by automatically or manually transferring the sheeted dough into pre determined shapes or moulds.

15. A method as claimed in claim 5, wherein said baking is done at a temperature in the range of 150^0 C to 400^0 C and at a time in the range of 3-15 minutes.

16. A method as claimed in claim 16, wherein said baking is done with dry heat or steam.

17. Eco-friendly, biodegradable, smooth surfaced edible utensils used to lift food repetitively into mouth during a single meal without any significant deformation during its use, obtainable by process of preceding method claims.

STATEMENT UNDER ARTICLE 19

The present invention relates to eco-friendly and biodegradable edible utensils and the method for preparing the same. The novelty of the present invention lies in the method adopted for preparing the dough which is to be used in making of the edible utensils. The said method relies on the process of gelatinization of the starch which is inherently present in the flours. Gelatinization of the starch results in making of tight dough which is pliable and can be shaped to form smooth surfaced products which facilitate easy scooping of the food and whose size and shape resembles that of a conventional cutlery. The gelatinization is achieved while kneading the dough, by using water which is hot i.e. at a temperature range between 65^0 C and 90^0 C or is in the form of steam. The dough can be prepared using flours obtained from cereals as well as from lentils, pulses, fruits, stem and root tubers which are typically not used in the bakery products. Products of present invention have very low porosity and hence can be applied even in liquid foods (hot or cold). The products can be used repetitively to lift food into mouth without any significant deformation which makes the product re-usable if so desired by the user. In addition the nutritive quality of the products of the invention can be enhanced by fortification with nutritional inputs such as nutrients like micronutrients and macronutrients which will add to the nutritive intake of the consumers.

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/000048

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L1/00 A23P1/10 A47G21/10 A21D13/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23L A23P A47G A21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, BIOSIS, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	claims 1-6 column 1, lines 1-24	5-8,11

X	GB 2 266 216 A (PELETIES CHRISTAKIS [CY]; TOMPKINS GEOFFREY WILLIAM [GB]) 27 October 1993 (1993-10-27)	1-6,8, 10-14, 17,18
A	examples 1,2 claims 1-12 page 1, line 1 - page 2, line 8	7,9,15, 16

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A	figures 1-5 paragraphs [0007] - [0012], [0033] - [0036] claims 1-20	6-17

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 March 2012	05/04/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Barac, Dominika

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	column 2, line 42 - column 3, line 31	7,9,10, 12,13
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INTERNATIONAL SEARCH REPORT

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