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Impact of Various Cooking Methods on Nutritional Composition of Food

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ABSTRACT
The two primary categories for dividing up these nutrients are called macro nutrients and micro nutrients. Proteins, carbs, fats, and fibre all make up what are referred to as macronutrients. Within living creatures, proteins are responsible for a huge variety of different tasks. These ingredients almost never get ruined in the cooking process. In the event that macronutrients are heated, this might result in their conversion into byproducts that are hazardous. The structure of nutrients can be altered by overcooking, which can also reduce the nutritional value of the meal. The fibrous structural proteins are characterised by an unusually high degree of stability. The fibrous functional proteins are the complete antithesis of the globular functional proteins. Hydrogen bonds are essential to the upkeep of their structure, but they are rapidly severed by factors like as high temperatures and high pH levels.

Keywords: *Different, Cooking Methods*

INTRODUCTION

As the price of food continues to skyrocket, maintaining a balanced diet has become an investment that must be made both monetarily and nutritionally. Therefore, it is imperative that the maximum nutritious portions be preserved during the preparation process in order to obtain the healthiest components possible from the meals we eat. The consumption of food is necessary for the development of any organism. The nutrients found in food that is gathered from the natural environment are in abundant supply. The two primary categories for dividing up these nutrients are called macro nutrients and micro nutrients. Proteins, carbs, fats, and fibre all make up what are referred to as macronutrients. Within living creatures, proteins are responsible for a huge variety of different tasks. These ingredients almost never get ruined in the cooking process. In the event that macronutrients are heated, this might result in their conversion into byproducts that are hazardous. The structure of nutrients can be altered by overcooking, which can also reduce the nutritional value of the meal.

The fibrous structural proteins are characterised by an unusually high degree of stability. The fibrous functional proteins are the complete antithesis of the globular functional proteins. Hydrogen bonds are essential to the upkeep of their structure, but they are rapidly severed by factors like as high temperatures and high pH levels. Denatured proteins are proteins that have had their three-dimensional structures altered to the point that they are unable to carry out the physiological functions that are necessary for their survival. Denaturation is defined as "to deprive of natural qualities: to change the nature or to modify the molecular structure of (as a protein or DNA) especially by heat, acid, alkali, or ultraviolet radiation so as to destroy or diminish some of the original properties and particularly the specific biological activity." This definition comes from the Merriam-Webster dictionary. In addition, the article from encyclopedia.com states that "the denaturation of proteins indicates that the structure of protein may alter when subjected to heat, acid, alkali, or bases." The biological activity of the denatured protein, such as the function of an enzyme, will be lost, but the nutritional value of the protein will not be affected.

When food is cooked, there is a greater risk of losing its vitamin content than losing its protein content. On the other hand, if food is cooked at a high temperature for an extended period of time, the proteins in the meal will lose their native structure and become denatured. As a consequence of this, these three things need to be taken into mind.

Cooking has an effect on the nutrients in food. It is possible, but one cannot be certain, that the food's nutrients will be preserved during the preparation process. When the manner of cooking is altered, the nutritional profile of the food undergoes profound transformations as a direct consequence. For instance, if we take a cursory look at the process of making wheat flour, we can see at a glance that the bleaching and extraction steps remove around sixty percent of the majority of the vitamin content. A similar phenomenon may occur when vegetables are cooked for extended periods of time, since this can cause them to lose more than half of their vitamin C content. It is possible that over two thirds of the vitamin C content in vegetables will be lost if they are cooked, canned, and then reheated.

Now, the issue that needs to be answered is why the meal has to be prepared. When foods like beans and legumes are boiled, the nutrients in those foods leach into the boiling water, which means that some of those nutrients are lost during the cooking process. This is a natural occurrence. Does this imply that one should consume the food in its raw form and not prepare it? No, this is not always the case since some foods, including as cereals, dry beans (both red kidney beans and white kidney beans), and eggs, should never be consumed in their raw state and should always be cooked first.

In addition to this, certain nutrients that would not be available in their natural state are made available when the food is cooked. For instance, grains contain phytic acid, which is a molecule that occurs naturally and has the potential to reduce the amount of grain minerals, such as iron and zinc, that are available to the body. When grains are processed and cooked, the amount of phytic acid they contain drops significantly—often by more than 50%. The concentration of phytic acid in uncooked grains can be reduced by sprouting the grains beforehand. Instead of eating grains raw, you should sprout them or boil them to reduce the effect of phytic acid, which blocks minerals, and increase the amount of minerals that are available to your body. When in their raw state, beans have an extremely high concentration of a molecule that has the potential to be hazardous and is termed phytohemagglutinin. It has been demonstrated that this lactic glycoprotein, when present in sufficient quantities, can interfere with the normal functioning of cellular metabolism. The researchers have also discovered that decreasing the cooking time and temperature to the appropriate levels results in a drop in the amount of hemagglutinin and other potentially hazardous chemicals.

In the case of eggs, there are two types of proteins: conalbumin protein, which may bind together with iron and inhibit its availability, and avidin protein, which can bind together with biotin (a B vitamin) and make it inaccessible. Both of these proteins are present. Cooking eggs helps denature both of these proteins, which can lead to an increase in the amount of iron and biotin that are readily available from egg consumption. It is essential to point out that the United States Centers for Disease Control and Prevention (CDC) estimates that one in every 20,000 eggs may be contaminated with the bacterium Salmonella. This bacterium is actually transferred from an infected hen to the egg prior to the formation of the shell, so it is important to note that Salmonella may be present in one egg in every 20,000. Therefore, maintaining a healthy diet while cooking is equally important.

LITERATURE REVIEW

Cirilo Nolasco-Hipolito 2002**.**Tilapia, which belongs to the genus Oreochromis, is a species of fish that is becoming increasingly popular for cultivation and retail sales due to the nutritional benefits it offers. These benefits include a high concentration of protein, vitamins, and minerals, as well as a low amount of the unhealthy saturated fats that are found in red meats. This study used an electric oven, a microwave, and steaming as its three different methods of cooking Tilapia in order to analyse the influence that different cooking techniques have on the chemical composition, Aw, and pH of the fish, in addition to the electrophoretic and fatty acid profiles. The investigation revealed that the nutritional components of tilapia had substantial (p 0.05) shifts when exposed to either of two temperatures or either of two concentrations. After the fish was cooked, the proteins in the tilapia were better retained by the use of the microwave and steaming. According to the findings of electrophoresis, the quantity of bands and the intensity of the bands both decreased as a function of the type of treatment that was applied to the meat. On the other hand, the method using an electric oven at two different temperatures resulted in the greatest increase in essential fatty acids (45% and 36%), with a slight decrease in the -6 family as a result of a likely hydrolysis or oxidation of the same. This was the method that produced the best results overall. The results of the steam cooking indicated a little increase in important fatty acids, but the proteins were better conserved in the microwave oven, indicating that this might be a useful method for cooking Tilapia.

The functional properties of foods and flours were the primary focus of the research. These functional properties included the following: bulk density, dextrinization, aeration, solubility, gelatinization capacity and temperature, water absorption capacity, oil absorption capacity, emulsion capacity, emulsion stability, foaming capacity, and gelatinization capacity and temperature. The functional qualities of food components describe how they behave throughout the preparation and cooking processes, as well as how they affect the completed food items in terms of appearance, texture, and structure, as well as how they taste. The functional qualities of foods and flours are determined by the structures of the various components of the food material, particularly the carbohydrates, proteins, fats and oils, moisture, fibre, and ash, as well as any additional ingredients or food additives that are added to the food (flour). Every component that goes into the making of a cuisine has a certain purpose, which frequently has an effect on the qualities that the food possesses. The majority of the procedures that foods go through start the process of developing certain useful characteristics. Foods and food items each have their own set of distinctive qualities called functional characteristics. For baby formulas, foods geared at preteens and teenagers, as well as adult foods, one of the most important quality characteristics of foods and flours is their functional qualities.

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S. B. Tyagi, MamtaKharkwal, Tanushri Saxena 2015. The development of the human species marks the pinnacle of evolution. Food is an essential component to its continued existence and is thus required by it. Both the raw and prepared forms of food may be consumed by humans. Cooked food is preferable to raw food for a variety of reasons, the most obvious of which is the increased health benefits associated with the former. However, most of the Indian community still adheres to the traditional culinary practises they were taught. Because food contains vital elements like protein, carbohydrate, fat, vitamins, and minerals, it is necessary for an organism to consume it in order for it to thrive. Vitamins are a type of nutrient that are necessary for the typical expansion and maturation of multicellular organisms. A lack of any of these vitamins, on the other hand, can result in a number of different disorders, including night blindness, hyperkeratosis, keratomalacia, and ariboflavinosis, amongst others. Large biological entities called proteins are made up of many chains of amino acids linked together in some way. Within living creatures, proteins are responsible for a huge variety of different tasks. It is essential to have an accurate understanding of the final output of the nutrients that are present in foods that have been cooked. This is one of the significant factors that adds to one's overall health. In the course of the research that was done on a variety of different food materials, it was discovered that the conventional cooking methods typically result in a loss in the nutritious value of the food. The amount of nutrients that are lost during cooking, including protein and vitamins, has been researched in a variety of food components and compared depending on the method used. The comparative investigation about the alterations in the levels of nutrients has been carried out. Lowry's method and titrimetric techniques were used to conduct an investigation on the decrease in the concentration of protein and vitamins. The purpose of this study is to determine whether or not the process of cooking alters the nutritional value of food.

RESEARCH MATHOLOGY

The initial stage of the research consisted of a chemical analysis of the seeds of amaranth, quinoa, kaiwa, and lupine in order to determine the percentages of moisture, protein, ash, and total dietary fibre present in each kind of seed. After that, the raw materials were subjected to further testing to assess the fatty acid composition, total phenolic content, and tocopherol levels.

In the second part of the study, extrudates were processed at two different temperatures for extrusion (140 and 160 degrees Celsius), with two different percentages of tested flours (20% and 50%, respectively). In addition to the fatty acid analysis, the tocopherol content, and the total phenolic content of the extrudates, further research was conducted on a number of other features of the extrudates. The effects of the extrusion processing on the nutritional characteristics and the long-term stability of bioactive compounds were the subject of additional study that was carried out. The links between the temperature that was present during the extrusion process, the amount of flour that was put to the test, and the type of flour that was utilised were investigated using statistical analysis as well.

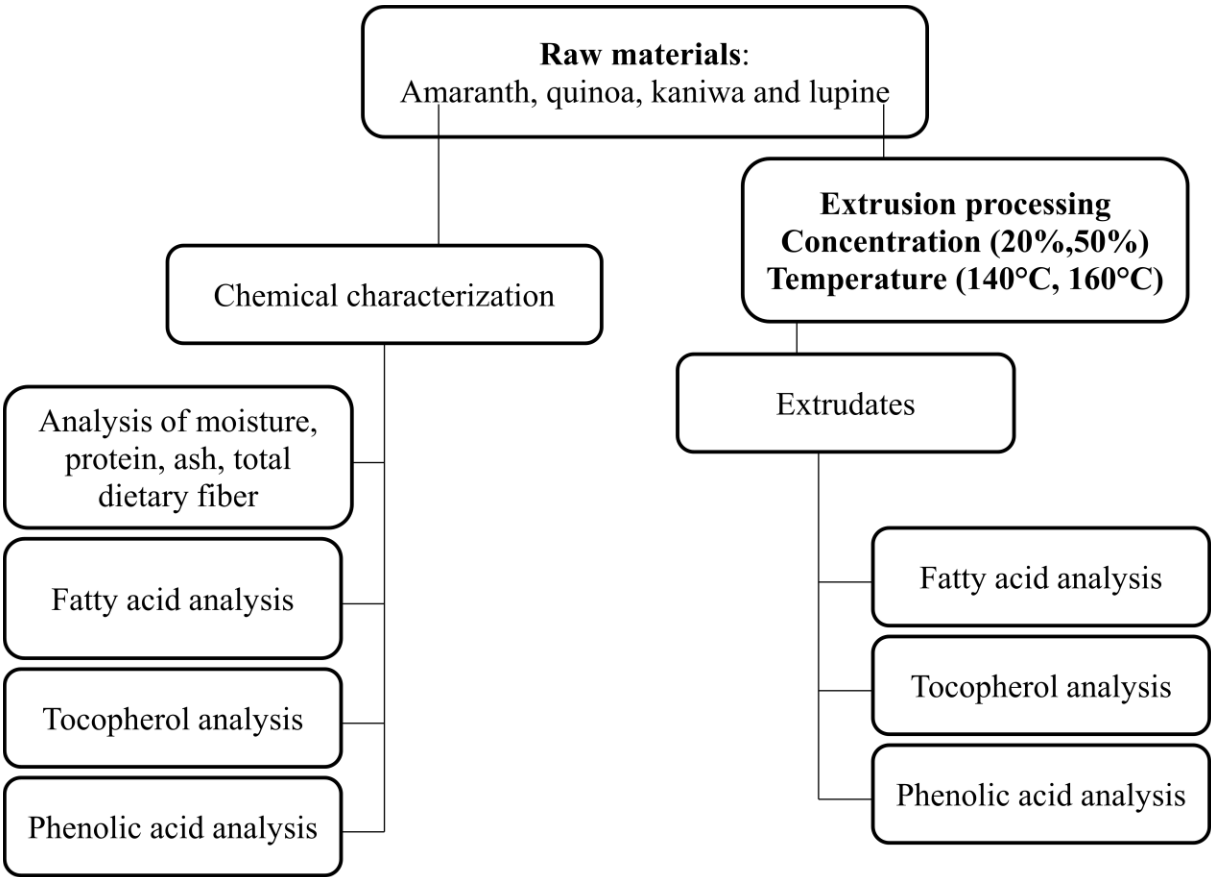

Figure. 1 Over view of the study

MATERIALS

Amaranth (Amaranthus caudatus) (Ziegler, Peru), quinoa (Chenopodium quinoa Willd) (Ziegler, Peru), and kaiwa (Chenopodium pallidicaule) (Ziegler, Peru) were all commercially accessible and were imported from Peru. The lupine, scientifically known as Lupinus angustifolius, was collected from the experimental fields in Viikki, which is located in Finland. Polenta (also known as Risenta, Prisma, and Helsinki, Finland) was purchased at a shop in the neighbourhood. The seeds were processed in the VTT Research centre in Finland, and the extrudate samples were milled into a powder with a particle size of 0.5 mm (Retsch ZM200, Haan, Germany). At a temperature of -18 degrees Celsius, the flour and the extrudate samples were kept in bags made of polyethylene that had been vacuum-packed. A twin screw extruder was utilised for the extrusion processing that was carried out (Thermo Prism PTW24, ThermoHaake, Polylab system, Germany). The speed of the screw was maintained constant at 500 revolutions per minute. The peristaltic pump was used to control the amount of water that was in the feed, which was 14%. (Watson Marlow 505S, Watson-Marlow ltd. Falmouth, Cornwall, UK). In addition to that, the temperature profile was modified. During the process of extrusion, the first section of the extruder was heated to 90 degrees Celsius, the second and third sections were heated to 95 degrees Celsius, the fourth section was heated to 100 degrees Celsius, the fifth section was heated to 110 degrees Celsius, and finally, the die section was heated to either 140 degrees Celsius or 160 degrees Celsius. During the extrusion operation, the extrudates with a content of between 20 and 50% of the flours that were evaluated were generated at two different temperatures: 140°C and 160°C for the extrusion. The chemical characterisation of the raw materials and the extrudates, as well as the determination of the bioactive chemicals, were both performed.

DATA ANALYSIS

When compared to the chemical make-up of flour made from amaranth, quinoa, and kaiwa, lupine flour had a significantly different profile (Table 1). When compared with amaranth, quinoa, kaiwa, and lupine, the moisture content of polenta flour (14.1%) was much greater. In comparison to other pseudocereals, such as quinoa, kaiwa, and amaranth, lupine has a much greater concentration of both protein and ash. When compared to the protein content of other pseudocereals, the amount of protein found in kaiwa (17 g/100 g d.m.) and amaranth (15-17 g/100 g d.m.) was very comparable, however the amount of protein found in quinoa was around 12-14 g/100 g d.m. correspondingly. The amount of protein and ash that was found in polenta was the lowest of all the grains. It was found that the lupine seeds had the highest concentration of dietary fibre, which averaged about 50 grammes per one hundred grammes of dry matter. The amount of dietary fibre found in kaiwa was quite high in comparison to the amounts found in amaranth and quinoa, which were both classified as pseudocereals. When compared to pseudocereals and legumes, the dietary fibre level of polenta flour contains the least amount of fibre overall at 5.8 grammes per one hundred grammes.

Table 1 Composition of polenta, amaranth, quinoa, kanya and lupine flours(n=3)

Content(g/100gd.m.)				
Material	Moisture(%)	Protein	Ash	Dietaryfiber
Polenta	14.1±1.0	8.2±1.1	0.4±0.1	5.8±0.3
Amaranth	11.3±0.5	16.1±1.3	2.41±0.04	8.3±1.9
Quinoa	11.8±0.4	13.1±0.4	2.2±0.3	9.1±2.6
Kañiwa	11.4±0.4	16.71±0.03	2.3±0.2	16.1±2.8
Lupine	11.9±0.3	28.7±0.4	3.61±0.03	50.1±2.6

Table 2 details the fatty acid profiles and total fatty acid content of flours made from polenta, amaranth, quinoa, kaiwa, and lupine. When compared to amaranth, lupine, and quinoa, the amount of total fatty acids that were found in kaiwa was the greatest (7790 mg/100 g dry matter). The overall fatty acid content of polenta was the lowest of all the grains. Linoleic acid, also known as C 18:2, was found in greater quantities in the flour samples. in contrast to the majority of other fatty acids. While the flours of amaranth, lupine, and quinoa had virtually identical amounts of their respective fatty acids, kaiwa had a much greater concentration of linoleic acid than the other three. The highest levels of linoleic acid (C 18:1) and oleic acid (C 18:1) were found in the flours made from kaiwa (2120 mg/100 g d.m.), followed by quinoa, lupine, and amaranth. Polenta had the lowest levels of linoleic, oleic, and linolenic fatty acids.

Table2Fatty acid compositionoffloursofamaranth,lupine,kañiwa,quinoaandpolenta(n=3)

Content(mg/100gd.m.)					
Fattyacid	Polenta	Amaranth	Quinoa	Kañiwa	Lupine
Palmiticacid (C16:0)	101±5	934±13	538±64	1080±30	570±24

Stearicacid(C18:0)	16±1	201±3	47±6	12.1±2.1	350±6
Oleicacid (C18:1)	190±13	1260±30	1730±50	2120±70	1300±40
Linoleicacid (C18:2)	510±40	2450±50	2560±40	3850±170	2740±190
Linolenicacid(C18:3)	16.2±1.8	53.1±1.1	270±30	420±20	390±30
Arachidicacid(C20:0)	4±0.1	47±1	40±5	60±1	56.2±1.1
Behenicacid (C22:0)	n.d.	17±9	78±7	51.1±1.2	56.2±0.1
Lignocericacid(C24:0)	n.d.	58.2±0.4	18.3±0.9	n.d.	n.d.
TotalFattyacids	830±60	5600±80	5500±520	7790±340	5512±700

CONCLUSIONS

The current study provided information on (1) the nutritional properties and the bioactive compounds of the flours of amaranth, quinoa, kaiwa, and lupine and (2) the effect of extrusion processing towards the nutritional properties and the stability of bioactive compounds in the extrudates of amaranth, quinoa, kaiwa, and lupine. The amaranth, quinoa, kaiwa, and lupine extrudates

In addition to being a rich source of bioactive chemicals, particularly phenolic compounds, the seeds of amaranth, quinoa, kaiwa, and lupine exhibited a good nutritional composition. Lupine seeds also included phenolic compounds. When compared to the flours made from amaranth, kaiwa, and quinoa, the protein and dietary fibre content that was produced by lupine resulted in a significantly greater concentration. The amount of oleic and linoleic acid found in flours made from kaiwa was the highest, followed by those made from quinoa, lupine, and amaranth. When compared to quinoa and amaranth, the levels of -tocopherol, -tocopherol, and total phenolic content found in the flours of kaiwa and lupine were shown to be significantly greater. The seeds of amaranth, quinoa, kaiwa, and lupine need to be examined further in order to identify the amount of individual phenolics that they contain and the level of antioxidant activity that they possess.

The composition of fatty acids in the extrudates of lupine that were treated at a temperature of 140 degrees Celsius and included 50% of the tested flour was significantly altered by the extrusion processing. In contrast, the extrudates containing amaranth, quinoa, and kaiwa were subjected to higher extrusion temperatures, which led to the oxidation of unsaturated fatty acids and a subsequent reduction in the quantity of unsaturated fatty acids. In comparison to the extrudates of amaranth, quinoa, and kaiwa, the preservation of unsaturated fatty acids was greater in the lupine extrudates. A comprehensive investigation on the impact that extrusion cooking has on the levels of dietary fibre, protein, and carbs in food might be helpful in the development of snacks that are high in protein and include a high level of dietary fibre.

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