

Review Article

The effect of chickpeas metabolites on human diseases and the application of their valuable nutritional compounds suitable for human consumption



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Article info

Received: 02 Mar 2023

Revised: 26 May 2023

Accepted: 15 Jul 2023

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Keywords:

Cancer Prevention, *Cicer Arietinum*, Diabetes Management, Digestive Health, Heart Health, Weight Management

ABSTRACT

Legumes provide a major portion of protein and calories in the diet of many people around the world. Among different legumes, chickpeas have higher bioavailability and protein. Legumes are the second most important source of human food after the cereal family. Among them, chickpea with 15 to 25% of protein rich in essential amino acids such as arginine, leucine, isoleucine, lysine, valine, threonine, methionine and cysteine, phenylalanine and tyrosine, this plant causes fertility due to nitrogen fixation. The content chickpea is not only a source of protein, but also a source of dietary fiber, resistant starch, polyunsaturated fatty acids, vitamins and minerals, especially folate, calcium, magnesium and potassium. Regarding chickpea milk, plant milk consumers have accepted chickpea extract well. Due to the effective compounds, it is necessary to study the process of human health. In this research, the evaluation of published articles was used and the extracts of these studies were used to compile this article. Reading this article inspires the reader with a favorable view about planting peas in the field and their properties in the body. It is recommended that according to the properties of chickpeas, food industry researchers, plant breeding researchers and other related experts should provide more extensive research works to identify its useful aspects for the healthy and organic production of this valuable plant. Finally, it should be seriously included in the household basket to have a healthy human body.

1. Introduction

Pea (chickpeas) is a one-year plant that it has a relatively high protein content and play a very important role in the cycle of food security in the world and especially in the development of countries like Iran [1]. Iran is one of the most important Asian countries in the cultivation and production of chickpeas [2].

Legumes are the second most important source of food for human after the cereal

family. Among them, peas with 15 to 25% protein rich in essential amino acids such as arginine (9%), leucine (7%), isoleucine (4%), lysine (7%), valine (4%), threonine (4 percent), methionine and cysteine (2.5 percent), phenylalanine and tyrosine (8 percent) [3, 4]. Due to nitrogen fixation, this plant causes soil fertility and reduces the need to use chemical fertilizers [5].

Pea seeds have different carbohydrates, which are divided into two groups: 1- available (mono and disaccharides), 2-

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unavailable (oligosaccharides, resistant starch, non-cellulosic polysaccharides, Pectins, hemicelluloses and cellulose). They become those that are available and are digested enzymatically in the small intestine, and those that are not available are not digested in the small intestine [6-8]. The purpose of this article is to review the scientific literature related to the nutritional aspects of chickpeas and their relationship with genetic diversity in order to select a low-expectation genotype that contains desirable nutrients and the relationship between chickpea consumers and human health, which is the concern of humanity today.

2. Chickpea seed compounds

Chickpea content is not only a source of protein, but also a source of dietary fiber, resistant starch, polyunsaturated fatty acids, vitamins and minerals, especially folate, calcium, magnesium and potassium (Table 1).

3. Chickpea's medicinal properties

Chickpeas, also known as garbanzo beans, are a type of legume that has been cultivated and consumed for thousands of years. In addition to being a nutritious source of protein, fiber, and complex carbohydrates, chickpeas have been found to have several medicinal properties. Here are a few [9-11]:

Heart Health: Chickpeas contain several nutrients that are beneficial for heart health, including fiber, potassium, magnesium, and folate. These nutrients can help to lower blood pressure, reduce inflammation, and improve cholesterol levels.

Diabetes Management: Chickpeas are a low-glycemic index food, meaning they have a slower and more gradual effect on blood sugar levels compared to high-glycemic index foods. This can be helpful for people with diabetes in managing their blood sugar levels.

Digestive Health: The high fiber content in chickpeas can help to improve digestive health by promoting regular bowel movements and preventing constipation. Additionally, the prebiotic fiber in chickpeas can help to feed the beneficial bacteria in the gut, improving overall gut health.

Cancer Prevention: Chickpeas are rich in antioxidants, which can help to prevent damage to cells from harmful free radicals. Additionally, the fiber in chickpeas can help to reduce the risk of colon cancer by promoting the growth of healthy gut bacteria and reducing inflammation.

Weight Management: The combination of protein and fiber in chickpeas can help to promote feelings of fullness and reduce appetite, making them a good food choice for weight management. Overall, chickpeas are a nutritious and versatile food that can provide several health benefits. Incorporating them into your diet can be a great way to improve your overall health and well-being [12, 13].

4. Chickpeas and Heart Health

Chickpeas, also known as garbanzo beans, are a great source of plant-based protein, fiber, and several important nutrients such as iron, magnesium, and folate. They are also rich in antioxidants and have been linked to various health benefits, including heart health. Research suggests that incorporating chickpeas into your diet may help lower your risk of heart disease. One study found that consuming chickpeas regularly can help reduce levels of "bad" LDL cholesterol, which is a major risk factor for heart disease. Another study showed that a diet rich in legumes, including chickpeas, was associated with a lower risk of heart disease. Chickpeas are also a good source of potassium, a mineral that helps regulate blood pressure. High blood pressure is a major risk factor for heart disease, so consuming foods that are high in potassium, such as chickpeas, may help lower your risk. In summary, incorporating chickpeas into your diet can provide numerous health benefits, including supporting heart health. However, as with any food, it's important to consume chickpeas in moderation as part of a balanced diet [14, 15].

5. Chickpeas and Cancer

Chickpeas, also known as garbanzo beans, are a nutritious food that has been studied for their potential health benefits, including their relationship with cancer. While research in this area is still ongoing, some promising findings suggest that chickpeas may have a

protective effect against certain types of cancer. One study found that consuming legumes, such as chickpeas, regularly was associated with a lower risk of developing colon cancer. Another study found that a diet rich in legumes may be associated with a lower risk of developing breast cancer. Additionally, chickpeas are a good source of fiber, which has been shown to reduce the risk of colon cancer. Chickpeas also contain a range of antioxidants, such as flavonoids and phenolic acids, which may help to prevent

damage to cells and DNA that can lead to cancer. Furthermore, they contain compounds called saponins, which have been shown to have anti-cancer properties in laboratory studies. While more research is needed to fully understand the relationship between chickpeas and cancer, incorporating them into a healthy and balanced diet can offer a range of nutritional benefits that may help to reduce the risk of various diseases, including cancer [17-19].

Table 1. Nutritional characteristics of chickpeas [16]. This table is Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Row	Foodstuff	Unit	Nutritional value per 100 grams	
			dry peas	Cooked peas
1	Macronutrients			
1-1	Energy	Kcal	378	164
1-2	Protein	g	20.47	8.86
1-3	fat	g	6.04	2.59
1-4	carbohydrate	g	62.95	27.42
1-5	fiber	g	12.2	7.6
1-6	sugar	g	10.7	4.8
2	Minerals			
2-1	Calcium	mg	57	49
2-2	iron	mg	4.31	2.89
2-3	Magnesium	mg	79	48
2-4	phosphorus	mg	252	168
2-5	potassium	mg	718	291
2-6	sodium	mg	24	7
2-7	Zinc	mg	2.76	1.53
2-8	copper	mg	0.656	0.352
2-9	Manganese	mg	21.306	1.030
3-10	Selenium	µg	0	3.7
3	Vitamins			
3-1	Vitamins C	mg	4	1.3
3-2	thiamine	mg	0.477	0.116
3-3	Riboflavin	mg	0.212	0.063
3-4	niacin	mg	1.541	0.526
3-5	Pantothenic acid	mg	1.588	0.286
3-6	Vitamins B6	mg	0.535	0.139
3-7	folate	µg	557	172
3-8	Colleen	mg	99.3	42.8
3-9	Vitamins B12	µg	0	0
3-10	Vitamins A	IU	67	27
3-11	Vitamins D	µg	0	0
3-12	Vitamins K	µg	9	4
3-13	Vitamins E	mg	0.82	0.35
4	Fats			
4-1	saturated	g	0.603	0.269
4-2	It has a monounsaturated ring	g	1.377	0.583
4-3	Has unsaturated rings	g	2.731	1.156

6. Chickpea and diabetes

Chickpeas can be a beneficial food for people with diabetes. Chickpeas are a great

source of complex carbohydrates, fiber, and protein, all of which can help regulate blood sugar levels. The fiber in chickpeas can slow

down the absorption of sugar into the bloodstream, which can prevent blood sugar spikes. This can help people with diabetes maintain more stable blood sugar levels over time. Additionally, the protein in chickpeas can help keep you feeling full for longer, which can help prevent overeating and maintain a healthy weight. Maintaining a healthy weight can be important for managing diabetes. However, it's still important to pay attention to portion sizes when consuming chickpeas, as they do contain carbohydrates. Consult with a registered dietitian or healthcare professional to determine the appropriate portion sizes and how they can fit into your overall diabetes management plan [[17-21](#)].

7. Chickpeas and Fertility

Chickpeas, also known as garbanzo beans, are a nutritious legume that has been consumed for centuries as a dietary staple in many cultures around the world. There is limited scientific evidence to suggest that they have a direct impact on human fertility. However, a healthy and balanced diet that includes chickpeas as part of a varied and nutrient-rich diet may indirectly support fertility by promoting overall health and well-being. For example, chickpeas are a good source of folate, which is important for women who are trying to conceive as it can help reduce the risk of birth defects. It is important to note that fertility is a complex issue, and many factors can impact a person's ability to conceive, including age, genetics, and lifestyle factors such as diet, exercise, and stress levels. While incorporating chickpeas into a healthy diet is a good choice for overall health and wellness, it is serious to speak with a healthcare provider if you are experiencing fertility issues [[22-24](#)].

8. Chickpeas and Kidney Disease

Chickpeas are a great source of protein, fiber, vitamins, and minerals. However, for individuals with kidney disease, it is important to consume them in moderation. Chickpeas are high in potassium, phosphorus, and protein, which can be problematic for those with kidney disease. When the kidneys are not functioning properly, they may not be able to filter these nutrients out of the blood

efficiently, leading to a buildup of waste products in the body. In general, it is recommended that individuals with kidney disease limit their intake of potassium, phosphorus, and protein. One serving of chickpeas, which is about $\frac{1}{2}$ cup, contains around 200-250 mg of potassium, 110-150 mg of phosphorus, and 6-8 gr of protein. It is possible to include chickpeas in a kidney-friendly diet, but it is important to monitor your portions and consume them in moderation. Additionally, individuals with kidney disease should be cautious about consuming canned chickpeas, as they may be high in sodium. It is important to rinse canned chickpeas thoroughly before consuming them to reduce their sodium content [[11](#), [25](#), [26](#)].

9. Chickpeas and liver disease

Chickpeas, also known as garbanzo beans, are a great source of plant-based protein, fiber, vitamins, and minerals. They are a staple in many diets around the world and have been shown to have several health benefits, including reducing the risk of heart disease and improving blood sugar control. As for liver disease, chickpeas may have some beneficial effects due to their high fiber content. A diet rich in fiber has been shown to improve liver function and reduce the risk of non-alcoholic fatty liver disease (NAFLD), a condition characterized by the accumulation of fat in the liver. In addition, chickpeas are also a good source of antioxidants, which can help protect the liver from oxidative stress and damage. However, it is important to note that chickpeas should not be relied upon as a treatment for liver disease, and individuals with liver disease should consult with their healthcare provider to determine the most appropriate dietary recommendations for their specific condition [[27-29](#)].

10. Chickpea and lungs disease

Chickpeas are a type of legume that is high in fiber, protein, and various vitamins and minerals. They are generally considered to be a healthy food choice and are part of many traditional diets around the world. As for lung disease, there is currently no evidence to suggest that consuming chickpeas is harmful to lung health. Some studies have suggested that consuming a diet rich in legumes like

chickpeas may be associated with a lower risk of respiratory disease. That being said, if you have a pre-existing lung condition, such as chronic obstructive pulmonary disease (COPD) or asthma, it is important to follow your doctor's advice regarding your diet and any potential dietary triggers that may exacerbate your symptoms. Chickpeas are a type of legume that is high in fiber, protein, and various vitamins and minerals. They are generally considered to be a healthy food choice and are part of many traditional diets around the world. As for lung disease, there is currently no evidence to suggest that consuming chickpeas is harmful to lung health. In fact, some studies have suggested that consuming a diet rich in legumes like chickpeas may be associated with a lower risk of respiratory disease. That being said, if you have a pre-existing lung condition, such as chronic obstructive pulmonary disease (COPD) or asthma, it is important to follow your doctor's advice regarding your diet and any potential dietary triggers that may exacerbate your symptoms [18, 30-32].

11. Chickpea fatty acids

Oleic acid is a monounsaturated fatty acid that is also found in high levels of olive oil. Studies have shown that a diet high in oleic acid may lower LDL ("bad") cholesterol levels, improve insulin sensitivity, and reduce inflammation in the body. These effects may help reduce the risk of cardiovascular disease, type 2 diabetes, and other chronic diseases. Linoleic acid is an essential omega-6 fatty acid that plays a role in brain function, growth and development, and maintaining healthy skin and hair. However, excessive consumption of omega-6 fatty acids relative to omega-3 fatty acids (found in sources such as fatty fish, flaxseed, and chia seeds) can contribute to inflammation in the body. Therefore, it is important to maintain a balanced intake of omega-6 and omega-3 fatty acids. Chickpeas also contain smaller amounts of saturated fatty acids, which have been linked to an increased risk of cardiovascular disease and other health issues when consumed in excess. However, the overall nutrient profile of chickpeas is considered to be healthy, and their consumption has been associated with a range of health benefits, including improved

blood sugar control, lower blood pressure, and reduced inflammation [33-35].

12. Chickpea composition for macromolecules

Chickpeas, also known as garbanzo beans, are a rich source of macronutrients, including carbohydrates, protein, and dietary fiber. Here is the approximate macronutrient composition of chickpeas per 100 grams: Carbohydrates, 27 grams; Protein, 9 grams; Fat, 6 grams and Fiber, 7 grams. Chickpeas are also a good source of several essential micronutrients, including iron, magnesium, potassium, and folate. They are a staple food in many cultures and are commonly used in dishes such as hummus, falafel, and curries [36-38].

13. Plant milk is an alternative to animal milk with an emphasis on chickpeas

Recently, the demand for cow's milk substitutes has been increasing. Plant-based milks have become increasingly popular. From soy to barley and almond, there is a wide range of non-dairy milks available in the market. These substitutes are called vegetable milks, which are water-soluble extracts based on vegetables, legumes, grains, pseudo-grains, or nuts. Since legumes are rich in protein, they are an attractive option in the development of new products. Pea is one of them, which is rich in fiber and minerals. In a study, plant milk consumers accepted chickpea extract with 10 and 30% coconut well. This drink has a good nutritional composition (such as protein, carbohydrates, fat and calcium) compared to cow's milk and other common cow's milk substitutes such as oat, almond and rice extract. Therefore, it may be a potential substitute for cow's milk [39, 40]. Chickpea milk has fewer calories than cow's milk and thus it is a more suitable drink for weight loss. Unlike dairy milk, chickpea milk does not contain lactose or gluten, therefore it reduces the risk of allergy and sensitivity in people who are lactose and gluten intolerant [21, 41].

14. Plant-Based Milk Types

Plant-based milks are non-dairy alternatives to cow's milk that are made from a variety of plant-based sources. They have

become increasingly popular over the years due to concerns about animal welfare, environmental sustainability, and health. Here are some common types of plant-based milks:

- ✓ Soy Milk: Made from soybeans, this milk has a creamy texture and is rich in protein.
- ✓ Almond Milk: Made from almonds, this milk is low in calories and has a nutty flavor.
- ✓ Coconut Milk: Made from the flesh of coconuts, this milk is high in fat and has a sweet flavor.
- ✓ Oat Milk: Made from oats, this milk is creamy and has a mild, sweet flavor.
- ✓ Rice Milk: Made from rice, this milk is thin and sweet, and is often used as a base for smoothies.
- ✓ Hemp Milk: Made from hemp seeds, this milk has a nutty flavor and is rich in omega-3 fatty acids.

Plant-based milks can be used in many of the same ways as cow's milk, such as in coffee, tea, and cereal, baking, and cooking. It's important to note that different plant-based milks have varying nutritional profiles, so it's important to choose one that meets your individual needs [[21](#), [39](#), [42](#), [43](#)].

15. Superiority of plant-based milks to animal-based milks

The superiority of plant-based milks over animal-based milks depends on the specific context and individual needs. Here are some potential benefits of plant-based milks [[44-47](#)]:

- ✓ Lower in Saturated Fat: Many plant-based milks, such as almond and oat milk, are lower in saturated fat than cow's milk. High intake of saturated fat has been linked to an increased risk of heart disease, so switching to plant-based milks may be beneficial for those looking to reduce their intake of saturated fat.
- ✓ Lactose-Free: Plant-based milks are naturally free from lactose, making them a suitable option for people who are lactose intolerant or have a dairy allergy.

- ✓ Environmental Sustainability: The production of plant-based milks has a lower environmental impact than the production of cow's milk, due to factors such as lower greenhouse gas emissions and water usage.
- ✓ Nutritional Diversity: Different types of plant-based milks have varying nutritional profiles, which can allow for a more diverse range of nutrients in the diet. For example, soy milk is high in protein, while almond milk is a good source of vitamin E.
- ✓ Animal Welfare: Choosing plant-based milks over animal-based milks can support animal welfare, as it reduces the demand for dairy products that are often associated with the inhumane treatment of animals. It's important to note that some plant-based milks may contain added sugars and other additives, so it's important to read labels and choose options with minimal added ingredients. Additionally, cow's milk is still a good source of several important nutrients, such as calcium and vitamin D, so it's important to ensure that any dietary changes are made in consultation with a healthcare professional to ensure adequate nutrient intake.

16. Chickpea milk alternative

Chickpea milk is a type of plant-based milk made by blending chickpeas with water and straining the mixture. It is a vegan alternative to cow's milk and is also lactose-free, making it a good option for people with lactose intolerance or allergies. Chickpea milk has a slightly nutty flavor and a creamy texture, similar to cow's milk. It is also a good source of protein, fiber, and other essential nutrients. Chickpea milk can be used in the same way as cow's milk in recipes, such as smoothies, baked goods, and sauces. It is also a great addition to coffee or tea. Chickpea milk is easy to make at home, and there are also commercial brands available in many supermarkets and health food stores [[40](#), [48](#), [49](#)].

17. Chickpea Milk Benefits

Chickpea milk, also known as garbanzo milk, is a plant-based milk alternative that is

gaining popularity among those who are looking for dairy-free or vegan options. Chickpea milk is made by blending soaked chickpeas with water and then straining out the pulp. It has a creamy texture and a mild, nutty flavor. From a nutritional perspective, chickpea milk can offer several benefits. Chickpeas are a good source of plant-based protein, fiber, and minerals such as iron, magnesium, and zinc. Chickpea milk can also be fortified with vitamins and minerals to increase its nutritional value. Compared to cow's milk, chickpea milk is lower in calories and saturated fat. It is also naturally free from lactose and cholesterol, which makes it a good option for those who are lactose intolerant or have high cholesterol levels. However, it's important to note that store-bought chickpea milk may contain added sugars, stabilizers, and preservatives, which can negate some of its health benefits. It's best to look for unsweetened varieties or make your chickpea milk at home to ensure that it's as healthy as possible. Overall, chickpea milk can be a nutritious and tasty alternative to dairy milk, especially for those who are looking to reduce their intake of animal products. As with any food, it's important to consume chickpea milk in moderation as part of a balanced and varied diet [48-51].

18. Problems of high nutritional use of chickpeas

Although the consumption of edible chickpea seeds contains nutritious compounds and has various properties, excessive use of this valuable seed has side effects. Peas are categorized in the group of flatulent legumes, and therefore, excessive consumption of them causes abdominal bloating and discomfort in the human stomach. Of course, different people may have temporary abstinence from using this seed [21, 51, 52].

19. Calories in peas and weight control

Pea seeds have very high calories. People who are looking for weight loss, usually their food preference is to use low-calorie foods. Regardless of its very high calories, chickpeas have a relatively high amount of protein, fiber and minerals and a low amount of fat. Therefore, it can be a good choice in healthy

nutritional diets and helps to lose weight due to delaying the emptying of the stomach and slowing it down. In general, diets with high fiber, low energy density and moderate protein are particularly important for weight control. In addition, chickpea consumption has been suggested as an effective marker of metabolic syndrome and cardiovascular disease in human and animal intervention studies [16, 53].

20. Chickpeas for weight loss

Chickpeas are a nutritious and versatile food that can be a part of a healthy weight loss diet. One cup (164 grams) of cooked chickpeas contains approximately 269 calories, 12.5 grams of protein, 45 grams of carbohydrates, 10 grams of fiber, and 4 grams of fat. While chickpeas are relatively high in calories compared to some other vegetables, they are also very nutrient-dense and provide a range of important vitamins and minerals. In addition, their high fiber and protein content can help you feel fuller for longer, which may help with weight loss by reducing overall calorie intake.

If you're looking to incorporate chickpeas into your weight loss diet, it's important to keep portion sizes in mind. While chickpeas are healthy, eating too many calories, even from healthy sources, can still lead to weight gain. You can add chickpeas to your meals in a variety of ways, such as tossing them into salads, using them in soups and stews, or blending them into dips like hummus. Just be mindful of how much you're consuming and aim to balance your chickpea intake with other nutrient-dense foods [14, 17, 54].

21. Digestive system health

Dietary fiber is an indigestible component of plant foods that contains poly/oligosaccharides, lignin and other plant materials. Dietary fibers are divided into soluble fibers and insoluble fibers. Soluble fibers are slowly digested in the large intestine, while insoluble fibers are indigestible and promote bowel movements. Similar to other plant foods, a significant increase in dietary fiber intake has been observed in legumes. According to human study reports, when chickpeas are added to the diet, overall improvement in bowel health

(as defined by increased stool frequency), ease of bowel movements, and softer stool consistency is reported during the chickpea diet. Comparison with normal diet has been observed [14, 17, 18].

22. Chickpea and digestion

Chickpeas are a rich source of dietary fiber, protein, and other nutrients. As such, they can have both positive and negative effects on the human gastrointestinal system, depending on various factors such as preparation, consumption amount, and individual differences. In general, consuming chickpeas can promote digestive health by increasing the bulk and softness of stool, which can alleviate constipation and promote regular bowel movements. The high fiber content of chickpeas can also help feed the beneficial bacteria in the gut, which can improve gut microbiota diversity and function. However, some individuals may experience discomfort, bloating, or gas after consuming chickpeas due to their high content of oligosaccharides, which are complex carbohydrates that can be difficult for the body to digest. In these cases, soaking or sprouting chickpeas before cooking can help reduce the oligosaccharide content and improve digestion. Overall, consuming chickpeas in moderation as part of a balanced diet can be beneficial for human gastrointestinal health. However, individuals with pre-existing gastrointestinal conditions or sensitivities should consult with a healthcare professional before adding chickpeas to their diet [55-58].

22. Conclusion

The information provided in this scientific report shows the potential nutritional importance of chickpeas and their role in improving nutrition and human health. Chickpeas are an affordable source of protein, carbohydrates, minerals and vitamins, dietary fiber, folate, beta-carotene, and health-promoting fatty acids.

Scientific studies show evidence of the potential beneficial effects of chickpeas in reducing the risk of various chronic diseases. Although information on the role of chickpeas in disease prevention and the mechanisms of action are not widespread to date, this is

probably due to the complex nature of the disease and the various factors that influence its occurrence. The scientific community must do more activities to discover the mechanisms related to the prevention of diseases by peas and to explain how food bioactive substances from foods like peas can affect human health and of course, the nutrients in peas may differ from one specific genotype to another, so by using the genetic diversity of this valuable plant, you can choose a variety that has more nutrients and helped to produce it for the health of the human society that is concerned about health.

Conflict of Interest

The authors hereby declare that they have no conflict of interest.

Author's contributions

All authors equally participated in designing experiment analysis and interpretation of data. All authors read and approved the final manuscript.

Ethics approval and consent to participate

No human or animals were used in the present research.

Consent for publications

All authors have read and approved the final manuscript for publication.

Availability of data and material

The authors have embedded all data in the manuscript.

Informed Consent

The authors declare not used any patients in this research.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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How to Cite This Article:

Kakaei M, Rehman FU, Fazeli F (2024) The effect of chickpeas metabolites on human diseases and the application of their valuable nutritional compounds suitable for human consumption. Cellular, Molecular and Biomedical Reports 4 (1): 30-42. doi: 10.55705/cmbr.2023.395591.1153

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