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Review Article

Role of Edible Seeds and Nuts for Immunity Development in Human Body

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Abstract

Adequate nutrients are required for all cells to develop immune systems. Seeds are rich in proteins, healthy fats, fibres and minerals such as magnesium potassium, calcium, iron and zinc and contain a number of vitamins such as B₁, B₂, B₃ and vitamin E. Commonly edible seeds used in human diet are pumpkin seeds, opium seeds, flax seeds, sesame seeds, sunflower seeds, mustard seeds, amaranth seeds, oat seeds, barley seeds, black rice seeds, brown rice seeds, quinoa seeds, nigella seeds and millet seeds. Nuts are rich in high calorific value, unsaturated fatty acids, dietary fibres, proteins, antioxidants, vitamins E, B₆, folic acid, niacin, and minerals such as magnesium, zinc, iron, copper, selenium, phosphorus, and potassium and low in saturated fats and cholesterols. Popular edible nuts include almonds, cashewnut, brazil nuts, pistachio nuts, walnuts, and pea nuts. Among vitamins, C, E, D and B₆; minerals including zinc, selenium and amino acids like glutamine play a vital role in developing immune systems in the human body.

Key words: Edible, seeds, nuts, vitamins, minerals, immunity

Introduction

The immune system should be constantly alert to monitor for signs of invasion or danger. Cells of the immune system must be able to distinguish self from non-self and furthermore differentiate between non-self-molecules which are harmful as received from pathogens and non-self-molecules obtained from foods (Caroline et al, 2019). Adequate nutrients are needed for all cells to develop immune systems. A single nutrient can exhibit diverse immunological effects like vitamin E acting as both antioxidant, inhibitor of protein kinase C activity and interact with enzymes and transport proteins (Lee and Han, 2018). Besides, minerals such as zinc (Berin, 2012) and selenium (Rayman,



2012), amino acids like glutamine (Cruzat et al, 2018) and vitamin D (Baeke et al, 2010) play a vital role in developing immune systems in the body.

Seeds are rich in proteins, healthy fats, fibres and minerals such as magnesium potassium, calcium, iron and zinc and contain vitamins such as B₁, B₂, B₃ and vitamin E. Fatty seeds are enriched with antioxidants which prevent fats from rancidity. Popular edible seeds include pumpkin seeds, opium seeds, flax seeds, sesame seeds, sunflower seeds, mustard seeds, amaranth seeds, oat seeds, barley seeds, black rice seeds, brown rice seeds, quinoa seeds, nigella seeds and millet seeds. Nuts are rich in high calorific value, unsaturated fatty acids, dietary fibres, proteins, antioxidants, vitamins E, B₆, folic acid, niacin and minerals like magnesium, zinc, iron, copper, selenium, phosphorus and potassium and low in saturated fats and cholesterols. Common edible nuts are almonds, cashewnut, brazil nuts, pistachio nuts, walnuts and pea nuts.

Role of seeds for immunity development in human body

Seeds are a good substitute for meat, fish, and eggs since they are rich sources of fibre, protein, iron, zinc and vitamins. Seeds should be eaten with vitamin C rich foods such as tomato, capsicum and citrus juices to increase iron absorption. Most of edible seeds help to reduce the risk of heart diseases, diabetes and regulate body weight. Seeds like flax seeds, rich in Omega 3 fatty acids and fibres produce energy and boost up immunity. Turmeric containing curcumin increases immunity via boosting proteins in our body. Pumpkin seeds, rich in zinc, help in development and functioning of body's infection fighting white blood cells. Protein rich oilseed meals obtained from soybean, peanut, rapeseed, and flaxseed when mixed with other ingredients like cereal grains can provide nutritionally balanced feeds (Sarwar et al., 2011a). Oilseeds are high in fat, protein, and fibre contents, but low digestible carbohydrates levels, and these characteristics have been related with decreased levels of glucose and insulin, low glycemic index, and high satiety (Kim et al, 2017). Hemp seed oil can supply an adequate number of antioxidants, carotene, phytosterols, phospholipids and several minerals including calcium, magnesium, sulfur, potassium, phosphorus, along with modest amounts of iron and zinc. Mustard seeds are rich source of many health benefiting minerals. Calcium, manganese, copper, iron, selenium, and zinc which help in body metabolism and nervous systems. The Cucurbit seeds and their defatted cakes are rich in proteins (28 to 40.49% and 61 to 73.59%, respectively). They also contain high lipid levels similar to other oilseeds. These seeds are considered as sources of proteins and oils (Mercy et al., 2005). Edible seed consumption may be adjuvant for the management of obesity and other inflammatory diseases (Carrera-Quintanar et al, 2018).



Role of nuts for immunity development in human body

Nuts are also a source of tocopherols, mainly found in almond and hazelnut (Kornsteiner et al, 2006), and high contents of phytosterols and carotenoids as in pistachio nuts (Yang, 2009). Phenolic compounds are the most abundant in nuts, especially flavonoids and tannins, largely found in walnuts and pecans (Venkatachalam and Sathe, 2006). Nuts help in weight regulation through fat absorption in the body, promotion of fullness and suppression of hunger and balance of energy expenditure. Frequent nut consumption is associated with lower risk of dying from heart diseases because of rich sources of healthy unsaturated fats, protein, fibre, phytochemicals, vitamins, and minerals. Nuts are the best sources of healthy fats such as monounsaturated and polyunsaturated fats, and low in unhealthy saturated fats. Both polyunsaturated and monounsaturated fatty acids help to reduce low density lipoprotein (LDL) cholesterol in the body. LDL cholesterol can help to build plaque inside the arteries, which causes them to become narrow and subsequently can lead to coronary heart disease. In addition to reducing LDL cholesterol, nuts also help to maintain healthy blood vessels and blood pressure through their arginine content, and reduce inflammation in the body through their high antioxidant content. Nut consumption can reduce incidence of gallstones in both genders and diabetes in women. Besides, it has beneficial effects on hypertension, cancer, and inflammation. Interventional studies have suggested that nut intake has a cholesterol-lowering effect, even in the context of healthy diets, and there are prominent beneficial effects on oxidative stress, inflammation, and vascular reactivity. Blood pressure, visceral adiposity and the metabolic syndrome also appear to be positively affected by nut consumption (Emilio Ros, 2010).

Edible seeds for used in human diet

Sunflower seeds: These seeds are rich in nutrients. The mono- and polyunsaturated fats present in sunflower seeds have a clear health benefit, especially related to heart health and risk of cardiovascular disease. The seeds are also sources of vitamins and minerals, including vitamin E having strong anti-inflammatory properties and low risk of heart disease), folate for DNA synthesis, phosphorus for development of bone health, selenium, an antioxidant that protects against cell damage, manganese having bone production capacity, copper which helps with heart health and immune function, B₆ for cognitive development and function and zinc for metabolism and immune function.

Pumpkin seeds: Seeds are flat, dark green seeds, with some encased in a yellow-white husk. They are malleable, chewy in texture, and sweet, pleasantly nutty flavoured. Due to their high zinc content, seeds are important for prostate health. A quarter cup of pumpkin seeds containing half of the



recommended daily amount of magnesium is essential for heart formation and maintenance. It helps to control blood pressure and prevent sudden cardiac arrest, heart attack, and stroke. Seeds help to boost up the immune system and fertility. They also contain sterols linked with protection against hormone-based cancers. Pumpkin seeds may help in preventing diabetic complications by decreasing oxidative stress through insulin regulation. Pumpkin seeds are rich in the amino acid tryptophan, which is important in the production of serotonin, one of the major components of our mood. A handful of roasted pumpkin seeds may help to keep up spirits high and avoid depression. Having pumpkin seeds a few hours before bed, along with a small piece of fruit, is also beneficial for melatonin and serotonin production to help promote a restful night's sleep. In addition, pumpkin seeds contain some omega-3 fatty acids, vitamin E, folate and magnesium that can help maintain heart health.

Hemp seeds: A wonderful source of vegetarian protein, hemp seeds are ideal to be included into diets of vegans and vegetarians alike. More than 30% of the seeds are filled with protein while the rest of it with other very important nutrients. They contain pretty amount of every essential amino acid that our body cannot synthesize on its own. Hemp seeds are also said to contain a fatty acid compound called gamma-linolenic acid having anti-inflammatory properties.

Flax seeds: These are also called linseeds, and are considered the most nutrient dense seeds. Due to the presence of anti-oxidants like lignans and omega-3 fatty acids, flaxseeds help in lowering cholesterol levels in the body very effectively. As a result, the risk of getting heart diseases goes down to a minimum. Flaxseeds also happen to reduce blood pressure whilst also preventing the growth of cancerous tumours in the body.

Mustard seeds: Yellow, brown or rarer black mustard seeds are all members of the family Brassicaceae that includes cruciferous vegetables. Mustard seeds contain adequate amount of protein. They are a rich source of much health benefiting minerals. Calcium, manganese, copper, iron, selenium and zinc are some of the minerals especially concentrated in these seeds. Calcium helps to develop bone and teeth. Manganese is used by the body as a co-factor for the antioxidant enzyme superoxide dismutase. Copper is needed in the production of red blood cells. Iron is required for the formation of red blood cell and cellular metabolism. Mustard seeds and its oil are traditionally used to relieve muscle pain, rheumatism and arthritic pain. The mustard oil is applied over scalp and is reported to stimulate hair growth. Ground seeds act as a laxative, stimulant to gastric mucosa and increase intestinal secretion (Sarwar et al., 2009).



Nigella seeds: It is very popular in various traditional systems of medicine like Unani and Tibb, Ayurveda and Siddha. Seeds and oil have been used in various systems of medicines and food. The seeds are widely used in the treatment of different diseases and ailments. In Islamic literature, it is considered as one of the important forms of healing medicine. It has been recommended for use on regular basis in Prophetic Medicine as antihypertensive, liver tonics, diuretics, digestive, anti-diarrheal, appetite stimulant, analgesics, anti-bacterial and in skin disorders (Ahmad et al, 2013).

Poppy seeds: Poppy seeds provide 525 calories and are rich sources of thiamin, folic acid and several essential minerals such as calcium, iron, magnesium, manganese, phosphorus and zinc. The seeds contain 6% water, 28% carbohydrates, 42% fat, and 21% protein. Poppy seeds are important food items and the source of healthy poppy seed oil. The most important application of Papaver alkaloids is because of their analgesic properties. Primarily, purified opium i.e. dried latex from the plant capsule is indicated to be the major therapeutic component for treating dysentery, diarrhea, spasms, pain etc. In Ayurveda, purified opium is reported to balance Vata and Kapha, Doshas and enhance Pitta Dosh. It is well known that opium contains analgesic (morphine, codeine, thebaine) as well as other therapeutic (sanguinarine, papaverine etc.) alkaloids.

Sesame seeds: It is a common ingredient in various dishes across throughout the world such as bread meals, soups, crackers, and meat cuisines. Sesame seeds are rich in dietary fibre, protein, vitamin B, copper, manganese, calcium, and magnesium. They have many health benefits such as preventing diabetes, reducing risk of cancer, protecting DNA from radiation damage, reducing signs of aging, facilitating digestion, boosting oral health, and lowering the risk of cardiovascular disease.

Amaranth seeds: These grains are usually simmered and added to flour, cereals, salads, and soups. These are the rich sources of protein as well as fiber, vitamin B, folate, manganese, magnesium, phosphorus, and iron. They have several health benefits including lowering cholesterol, reducing inflammation, aiding in weight loss, maintaining healthy cholesterol levels, improving the immune system, supporting individuals with celiac related diseases, eliminating constipation and bloating, reducing risks of colon cancer and strengthening heart health.

Oat seeds: A type of cereal grain, oats are popular amongst mankind, especially when it added to breakfast. They are commonly used to make oatmeal, flour, cakes, cookies, and cereal. Of all the cereal grains, oats are highest in protein and the lowest carbohydrates. They have several health benefits including lowering cholesterol levels, increasing appetite-control hormones, preventing heart disease, reducing the risk of type-2 diabetes, controlling diabetes, and improving the immune system.



Barley seeds: It is one of the most commonly used cereal grains after wheat, corn, and rice. Everywhere barley is used as an essential ingredient to make bread, casseroles, cookies, soups, and stews. Malted barley can also be used as a sweetener. It is filled with nutrients, vitamins, and minerals such as dietary fiber, niacin, vitamin B, thiamin, riboflavin, manganese, selenium, phosphorus, and copper. It has several health benefits including controlling diabetes, preserving skin elasticity, boosting the immune system, maintaining colon health, preventing heart disease and cancer, and reducing the risk of osteoporosis.

Black rice: This rice is the most nutritious of the rice varieties. Black rice is gaining international recognition for its health benefits. Black rice is a great alternative to white rice because of its rich nutritional properties. This grain is full of antioxidants, vitamins, and nutrients that help support a healthy immune system. It contains 18 amino acids, iron, zinc, copper, carotene, and fiber. Similar to other rice grains, black rice contains no gluten. Black rice has several health benefits including decreasing chances of a heart attack and stroke, improving digestive health, helping detoxify the body of harmful build-ups, aiding in healthy weight loss, preventing diabetes and obesity.

Brown rice: Brown rice is a whole grain rice that is much healthier than white rice. Brown rice is often considered as a nutritious alternative for popular rice dishes such as vegetable bowls or rice cakes. Besides, it can also be ground up into brown rice flour that can be used for breading, thickening sauces, and gluten free baking. Brown rice is rich in several nutrients such as calcium, iron, magnesium, manganese, phosphorous, potassium, selenium, vitamin B, vitamin E, and vitamin K. It is also a great source of essential fatty acids, protein, and fiber. It has a number of health benefits including preventing heart disease, reducing risk of cancer, maintaining weight control, managing diabetes, and lowering cholesterol levels.

Soybean seeds: These are species of legumes, native to East Asia and grown throughout the world. Food products made from soybean include vegetable protein, soy vegetable oil, soy milk, soy sauce and tofu. Soybeans are enriched with dietary fiber, vitamin K, vitamin B, manganese, iron, phosphorus, and magnesium. It contains the large amount of protein and ideal foods for vegetarians and vegans. It has several health benefits including preventing osteoporosis, managing weight, preventing heart attack, improving blood circulation, fighting against sleep disorders, lowering cholesterol levels, regulating digestion, and boosting metabolic activity in the body.

Millets: Millets are nutritionally superior to major cereals (wheat and rice) for carbohydrate and energy, and are good sources of protein, high dietary fibre, vitamins, minerals, antioxidants and micronutrients. Finger millet grains contain some essential minerals such as calcium (Ca), phosphorus



(P) and vitamins. Pearl millet grains are richest in Fe (6.4 mg/100 g) among various cereals. It is packed with resistant starch, soluble and insoluble dietary fibres, minerals, and antioxidants. The protein content of proso millet is significantly richer in essential amino acids (leucine, isoleucine, and methionine) than wheat protein. The rich source of vitamins and minerals of millets performs vital role in our body to boost our immune response towards pathogens. Immunity provides protection to life, mediated through cellular response, and humoral immune response. The body promotes systematic immune processes by regulating the formation of T lymphocytes, antibodies, and cytokines.

Quinoa: Quinoa is a highly popular cereal edible seeded food source in America, Canada, China, and Europe. It is most commonly used as a rice substitute and is also ground up into powder or flower flour to create bread, halwa, cereal flakes, and chips. Quinoa is packed with protein, fiber, folate, vital amino acids, vitamin B, thiamin, manganese, magnesium, phosphorus, and copper. It has several health benefits including preventing gallstones, regulating digestion, protecting organ health, maintaining blood glucose and cholesterol levels, and managing weight.

Edible nuts used in human diet

Almonds: These are types of dry fruits that are usually consumed to prevent and fight off colds. They are small in size but they are packed with a lot of nutrients like vitamins and minerals and healthy fats. Almonds have several health benefits including lowering blood pressure, controlling blood sugar, regulating cholesterol level, alleviating constipation, respiratory disorders, and anemia; help in hair repair and growth, nail strengthening, and dental strength and care. They have Vitamin E and C which are great immune boosters. It is rich in antioxidants that regulate free radicals to prevent infections, with an anti-inflammatory effect, immune-boosting properties, and anti-hepatotoxic effect. Almonds improve the movement of food through the colon and therefore preventing build-up and possibly the subsequent colon cancer. The presence of Vitamin E reduces the risks of heart diseases and coupled with magnesium prevent heart attacks. Almond oil is an important nutritive element providing good health and functioning of the nervous systems. As a dry fruit, it contains riboflavin and L-carnitine which is associated with increased brain development and activity. The vitamins, minerals, and phosphorus are found to be linked with bone development and strengthening. Almond oil is popularly used for massaging and improves skin appearance and reverses signs of aging.

Cashew nut: These are kidney shaped and are grown in subtropical climates like Brazil, Vietnam, Africa and coastal India. They are famous for their sweet buttery taste and for being a great source of minerals and nutrients. They are sold both raw or roasted and salted or unsalted. Cashews are loaded



with well-balanced nutrient profile. They possess 62 percent monounsaturated fat (MUFAs), 18 percent polyunsaturated fats (PUFAs) and good amount of protein. Cashews are rich in magnesium which is very important for many biochemical reactions in the body like energy creation, muscle movements and nervous system regulation. Cashews can provide nearly 100 per cent of recommended daily copper intake. It is an important nutrient for the growth of new blood vessels and for maintaining healthy immune system. Cashews also contain vitamin C and B, which are important blocks of the body and maintain good health. Zinc obtained from a plant based food like cashews is very beneficial to boost up immune systems in the body.

Walnuts: Walnuts are an excellent source of several vitamins and minerals, including copper and vitamin B₆. Copper found in fresh walnuts helps to maintain bone, nerve, and immune system. Vitamin B₆, strengthens the immune system and support nerve health.

Pistachios: These are rich in vitamin B₆ which is required for a healthy immune system. Vitamin B₆ found also promotes blood flow by helping to carry oxygen through the bloodstream to cells, and helps maintain the health of lymphoid glands, such as the thymus, spleen and lymph nodes. All of these things can help in the production of white blood cells that defend the body from infections.

Brazil nuts: Brazil nuts contain several mineral nutrients including selenium, zinc and iron which are vital for the immune system. Brazil nuts are most renowned for their high selenium content. Selenium is an essential microelement that is needed daily for a healthy immune system and it helps to prevent damage to our nerves and cells.

Peanuts: They are rich in protein, monosaturated fats, niacin and manganese. Protein serves as vital nutrient for growth and maintenance of muscle and body organs such as skin and hairs. They serve as a protective function against cancers, heart diseases, nerve diseases and viral or fungal infections. Monosaturated fats reduce the low-density lipoprotein cholesterol levels and thereby the risks of coronary heart diseases. Niacin plays an important role in energy production through the synthesis of food and helps to develop a healthy immune system in the body. Manganese helps in skin integrity and blood sugar control.

Conclusions

Our immune systems used to play a tremendous job at fighting off foreign cell to protect us against illness. Our bodies develop proteins called antibodies that eliminate abnormal cells. There are certain foods available to be included in our diet which are vital for the normal function of our immune systems. Vitamins A, D, E, C, B₆ and minerals like zinc, selenium are the nutrient profiles which are necessary for developing immunity in human body. Keeping in view the grave situation of COVID



19 edible seeds and nuts can be included in our diet to boost up immunity of individuals until the suitable vaccine is available.

References

- Ahmad, A., Husain, A., Mujeeb, M., Shah Alam Khan, Najmi, A.K., Ali Nasir Siddique, Z. A. Damanhoury, and Firoz Anwar (2013). A review on therapeutic potential of *Nigella sativa*: A miracle herb. *Asian Pac J Trop Biomed.* **3**(5): 337–352
- Baeke, F., Takiishi, T., Korf, H., Gysemans, C. and Mathieu, C. (2010). Vitamin D: Modulator of the immune system. *Curr. Opin. Pharmacol.* **10**: 482–496.
- Berin, M.C.(2012) Mucosal antibodies in the regulation of tolerance and allergy to foods. *Semin. Immunopathol.* **34**: 633–642.
- Carrera-Quintanar, L., López Roa, R.I., Quintero-Fabián, S., Sánchez-Sánchez, M.A., Vizmanos, B. and Ortuño-Sahagún, D. (2018). Phytochemicals that influence gut microbiota as prophylactics and for the treatment of obesity and inflammatory diseases. *Mediators Inflamm.* 1–18.
- Caroline, E. Childs, Philip, C. Calder and Elizabeth A. Miles (2019). Diet and immune function. *Nutrients.* **11**, 1933.
- Cruzat, V., Macedo Rogero, M., Noel Keane, K., Curi, R. and Newsholme, P. (2018). Glutamine: Metabolism and immune function, supplementation and clinical translation. *Nutrients.* **10**: 1654.
- Emilio Ros (2010). Health benefits of nut consumption. *Nutrients.* **2**(7): 652–682.
- Kim, Y., Keogh, J.B. and Clifton, P.M. (2017). Benefits of nut consumption on insulin resistance and cardiovascular risk factors: Multiple potential mechanisms of actions. *Nutrients.* **9**: 1271.
- Kornsteiner, M., Wagner, K. and Elmadafa, I. (2006). Tocopherols and total phenolics in 10 different nut types. *Food Chem.* **98**: 381–387.
- Lee, G.Y. and Han, S.N. (2018). The Role of vitamin E in immunity. *Nutrients.* **10**: 1614.
- Mercy, B.A., Elie, F., Clerge T., Martin, F. and Felicite, M.T. (2005). Nutritive value of some Cucurbitaceae oilseeds from different regions in Cameroon. *Afr. J. Biotechnol.* **4**(11):1329-1334.
- Rayman, M.P. (2012). Selenium and human health. *Lancet.* **379**: 1256–1268.
- Sarwar, M., Ahmad, N. and Tofique, M. (2011a). Impact of soil potassium on population buildup of aphid (Homoptera: Aphididae) and crop yield in Canola (*Brassica napus* L.) *Field. Pak. J. Zool.* **43** (1):15-19.
- Sarwar, M., Ahmad, N., Khan, G.Z. and Tofique, M (2009). Varietals resistance and susceptibility in mustard (*Brassica campestris* L.) Genotypes against Aphid, *Myzus persicae* (Sulzer) (Homoptera: Aphididae). *The Nucleus.* **46**(4):.507-512.
- Venkatachalam, M. and Sathe, S.K. (2006). Chemical composition of selected edible nut seeds. *J. Agric. Food Chem.* **54**: 4705–4714.
- Yang, J. (2009). Brazil nuts and associated health benefits: A review. *LWT-Food Sci. Technol.* **42**: 1573–1580.

