



## Value addition of agricultural produce towards immunity boosting and being self-reliant farmer

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### Abstract

The country, India, today is looking for trillion economies and making India as Atmnirbhar Bharta, therefore, no stone needed to be left unturned to reach the goal. With COVID-19 and its strains continue to threaten the world it is time that the consumers have safe immunity boosting products that can form a part of our daily lives and suits all ages and conditions. The Ministry of AYUSH has given directives to home based solutions to boost immunity system of the body. A number of agriculture produce that can be used to prepare value added products that are nutritious and can boost immunity. Experiments were conducted by using produce from different food groups to make it wholesome and complete meal as possible and at the same time ingredients that boost immunity were included, therefore, cereals, pulses, oil seeds, spices and condiments, fat and natural sugars and normal sugars were used to prepare ladoos that is most like in Indian population. There are many occasions in Indian culture where ladoos are offered to guests and family members, during spiritual occasions and even as regular use to boost instant energy during or after travel. The experiments used Wheat flour, gram flour (besan), roasted groundnut, sesame seeds, spices like Pippali, black pepper, dried ginger (sutha), Fennel seeds (Sauf), and cinnamon, for natural sugar and binding agent either dates or sugar were used. Other immunity and nutrition boosting ingredients were almonds, cardamom, ghee. The laddos prepared were presented to people of all age groups. The sensory studies revealed acceptability of the ladoos. The nutritive value of 100 gram ladoos was calculated from nutritive values of Indian foods tables published by National Institute of Nutrition, Hyderabad. It was found that the ladoos provided at least protein (10.6 grams), energy (318.8 Kcal), fat (11.5 grams), fibre (2.7 gram), Calcium (95.9 mg), iron (3.8 mg), carotene (50. Cal8 µg), thiamine (0.3 mg), riboflavin (0.11 mg), Niacin (4.78 mg), folic acid total (61.74 µg) and Vit C (1.3 mg). Most of the ingredients are available in large quantity with farm families who can boost their income by preparation and sale of unsold produce especially when the market is open and a number of choices are available to them.

**Keywords:** value added product, grains, spices, nutritive value

### Introduction

Health body builds stronger immunity and food is the key source of building immunity in human subjects. Immunity is defined as the ability of an organism to resist a particular infection or toxin by the action of specific antibodies or sensitized white blood cells. With respect to biology, immunity is the capability of multicellular organisms to resist harmful microorganisms and it can be defined as a complex biological system endowed with the capacity to recognize and tolerate whatever belongs to the self, and to recognize and reject what is foreign (non-self)<sup>[1]</sup>. Human immune system is a network of intricate stages and pathways in the body that protects us against these harmful microbes as well as certain diseases. It recognizes foreign invaders like bacteria, viruses, and parasites and takes immediate action. It's important to understand that humans possess two types of immunity: innate and adaptive. Innate immunity is a first-line defense from pathogens that try to enter our bodies, achieved through protective barriers. These barriers include (1) Skin that keeps out the majority of pathogens (2) Mucus that traps pathogens (3) Stomach acid that destroys pathogens (4) Enzymes in our sweat and tears that help create anti-bacterial compounds (5) Immune system cells that attack all foreign cells entering the body; whereas Adaptive or acquired immunity is a system that

learns to recognize a pathogen. It is regulated by cells and organs in our body like the spleen, thymus, bone marrow, and lymph nodes. When a foreign substance enters the body, these cells and organs create antibodies and lead to multiplication of immune cells (including different types of white blood cells) that are specific to that harmful substance and attack and destroy it. Our immune system then adapts by remembering the foreign substance so that if it enters again, these antibodies and cells are even more efficient and quick to destroy it. The immune system protects us from disease caused by bacteria, viruses and toxins, and helps remove foreign bodies and malignant cells from our system. In addition, the immune system is responsible for down-regulating immune responses against external harmless triggers such as food, or against the bodies' own tissue. Failure to do so can result in the development of allergy due to hyperactivity of antigens, inflammation (as body's innate immune response) or autoimmune disorders like lupus, rheumatoid arthritis, or type 1 diabetes are partly hereditary and cause hypersensitivity in which immune cells attack and destroy healthy cells. Literature reveal that factors can depress our immune system are Older age, Environmental toxins (smoke and other particles contributing to air pollution, excessive alcohol), Excess weight, Poor diet, Chronic diseases, Chronic mental stress and Lack of sleep

and rest. Eating enough nutrients as part of a varied diet is required for the health and function of all cells, including immune cells. Certain dietary patterns may better prepare the body for microbial attacks and excess inflammation. Animal studies have found that deficiencies in zinc, selenium, iron, copper, folic acid, and vitamins A, B6, C, D, and E can alter immune responses. These nutrients help the immune system in several ways: working as an antioxidant to protect healthy cells, supporting growth and activity of immune cells, and producing antibodies. Epidemiological studies find that those who are poorly nourished are at greater risk of bacterial, viral, and other infections [2].

Immunity starts in the gut with 70-80% of our immune cells live in the gastrointestinal tract<sup>2</sup> along with the 100 trillion gut bacteria that make up the gut microbiota. One of the major roles of the immune system in the gastrointestinal tract is to distinguish between harmless antigens, such as food, and health hazards. The development of a healthy immune system is therefore, reliant on the establishment of a healthy gut microbiota in early life, which is directly linked to nutrition [3].

The conditions caused by COVID19 has taught human race the lesson of caring about our body and its health especially the immune system. Viral diseases are extremely widespread infections caused by viruses, a type of microorganism. There are many types of viruses that cause a wide variety of viral diseases. The most common type of viral disease is the common cold, which is caused by a viral infection of the upper respiratory tract (nose and throat). Other common viral diseases include Chickenpox, Flu (influenza), Herpes, Human immunodeficiency virus (HIV/AIDS), Human papillomavirus (HPV), Infectious mononucleosis, Mumps, measles and rubella, Shingles, Viral gastroenteritis (stomach flu), Viral hepatitis, Viral meningitis, Viral pneumonia. Viral diseases are contagious and spread from person to person. When a virus enters the body and begins to multiply and infects through common ways like air and water. World in recent years had experienced many viral infections especially respiratory viral diseases are contagious and commonly affect the upper or lower parts of your respiratory tract<sup>[4]</sup>. The fatal power of COVID19 has taught world its lesson and importance of strengthening immunity of the body with all the possible knowledge and action.

Strong immunity through inclusion of immunity boosting food ingredients in daily food habit and healthy living lifestyle are the key to boost up immune system at all ages and health conditions. Ayurveda and modern medical science has also recognized the significance of agriculture produce /food as preventive and curative properties. Therefore, an attempt was made to develop products from various agriculture produce that provide nutritive support for strengthening the basic body well-being and are significant in boosting immunity especially with respect to respiratory health. The paper presents one of such product developed that can be consumed on daily basis by all age groups.

### Method and Materials

The experiment was conducted at Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) India, in light of the directives laid down by Ministries and the scientific knowledge of agriculture

produce that can boost immunity especially in times of COVID-19 and the new strains thereof that have come to surface in other countries. One of the products developed was lodoos, which is a common acceptable form of sweet that is used on various occasions as offering to Gods, festivals, offering to guests, events like marriage, birthdays and lactation period. Lodoos are also form part of celebrations of achievement. Traditionally, lodoos are made either from a cereal – rice or semolina called as Kasar or pluse – besan from which besan lodoos or boondi ladoo or motichur lodoos are prepared. An attempt was made to develop lodoos that are more wholesome in nutritive value by incorporating ingredients from multi-food groups by inclusion of food ingredients from different food group like cereals, pulses, oilseeds and nuts, sugars and spices that help in providing wholesome nutrition and step forward towards balanced diet. The present lodoos prepared did not use sugar or jaggery for sweetening that reduces the calorie content. The sweetness in the lodoos was brought through the natural sweetness of the food ingredient itself. Most of the ingredients used have nutritive and medicinal properties that enhance immune strength and protect the body from fatal conditions.

### Ingredients Used in the Experiment and Their Properties

1. Wheat flour - Wheat flour is a powder made from the grinding of wheat (a Cereals) used for human consumption [5]. It was used as a base ingredient for its nutritive properties. It is a rich source of energy and contained dietary fibre that is beneficial for gut health. Wheat is the agriculture produce that is harvested in the month of March and most commonly consumed food ingredients in various forms. It was included in the experiment for its properties of being able to be roasted that not only gives a pleasant fragrance but also increases the shelf life of the product.
2. Gram flour or besan is a pulse flour made from a type of ground chickpea called the gram chickpea. It is a staple ingredient for many Indian and South east cuisine. Gram flour contains a high proportion of carbohydrates,<sup>[1]</sup> higher fiber relative to other flours, no gluten,<sup>[2]</sup> and a higher proportion of protein than other flours. Protein is a body building component available in food products that is responsible for repair and maintenance of the cells and tissues also. When roasted it gives a good aroma to the product and increase self-life.
3. Groundnut, also known as peanut and pignut is one of the best sources of protein. Consuming groundnut is very beneficial for our health especially in winters. Peanut contains vitamin E, magnesium, foliate, copper and arginine [6]. Peanuts are as popular as they are healthy. They're an excellent plant-based source of protein and high in various vitamins, minerals, and plant compounds. They can be useful as a part of a weight loss diet and may reduce your risk of both heart disease and gallstones. Groundnut also contains a good amount of folate. Several studies have shown that women who had a daily consumption of 400 micrograms of folic acid before & during early pregnancy reduced the risk of having a baby born with a serious neural tube defect by up to 70 percent.
4. Sesame seed is one of the oldest oilseed crops is

- tolerant to drought-like conditions, growing where other crops fail. Sesame has one of the highest oil contents of any seed. With a rich, nutty flavor. In a 100 g (3.5 oz) amount, dried whole sesame seeds provide 573 calories and are composed of 5% water, 23% carbohydrates (including 12% dietary fiber), 50% fat, and 18% protein. Whole sesame seeds are rich (20% or more of the Daily Value), and contains vitamins and dietary minerals, especially iron, magnesium, calcium, phosphorus, and zinc.
5. Pippali is an ultimate remedy for all sorts of Kapha aggravating disorders like asthma, bronchitis, COPD, cough and cold symptoms. It provides relief from cough and congestion and also helps in removing phlegm deposits from the respiratory tract. Pippali also called Long pepper is a unique aromatic herb that has been with us for centuries owing to its extensive curative properties. The traditional herb goes by the botanical name Piper longum and comes from the Piperaceae family. The holistic science of ayurveda classifies this herb as a potent rejuvenative herb that has strong anti-ageing and aphrodisiac effects on the body and is widely used for treating diabetes, asthma, indigestion, cough and cold. Pippali contains certain compounds that have anti-asthmatic property.
  6. Ginger may help decrease inflammation, which can help reduce a sore throat and inflammatory illnesses. Ginger may help with nausea as well. Dry ginger facilitates weight loss by improving digestion, which helps in burning stored fat and processing glucose in the blood. It also speeds up metabolism and controls fat absorption, thanks to its thermogenic properties. Another benefit of dry ginger is its ability to curb hunger and overeating (Fernandes, 2016).
  7. Fennel Seeds (dry) *Foeniculum vulgare*, commonly known as fennel, is a flavorful culinary herb and medicinal plant. Fennel and its seeds offer a wide array of health benefits and may provide antioxidant, anti-inflammatory, and antibacterial effects. Fennel seeds are low in calories but provide many important nutrients. It also help curb appetite. Chewing fennel seeds is thought to help aid digestion and prevent gas. Fennel seeds pack a lot of fiber in their tiny forms.
  8. Cinnamon is a spice that is made from the inner bark of trees scientifically known as *Cinnamomum*. It has very high in the compound cinnamaldehyde, which is responsible for most of cinnamon’s powerful effects on health and metabolism. It helps your body fight infections and repair tissue damage. Studies show that Cinnamon and its antioxidants have potent anti-inflammatory properties. Cinnamon has been linked to a reduced risk of heart disease, the world’s most common cause of premature death.
  9. Ghee is a type of clarified butter that originated in ancient India. Ghee is typically prepared by simmering butter, which is churned from cream (traditionally made by churning the top most layer of dahi which is also called Bilona method), skimming any impurities from the surface, then pouring and retaining the clear liquid fat while discarding the solid residue that has settled to the bottom. It is composed of 62% saturated fat and 29% of monounsaturated fat. It contains 25 Gram/100 gram Omega-9 and a few amounts of Omega-6 fatty acid and Omega-6 and

- Omega -3.
10. Dates are the fruit of the date palm tree, which is grown in many tropical regions of the world. Dates have become quite popular in recent years. Almost all dates sold in Western countries are dried. You can tell whether or not dates are dried based on their appearance. Scientifically it is known as Phoenix dactylifera is the tastiest and highly nutritious fruit. Dates contain several nutrients that give various health benefits to your body from reducing cholesterol to healthy bones. Dates contain several nutrients that give various health benefits to your body from reducing cholesterol to healthy bones.
  11. Almonds are among the world’s most popular tree nuts. They are highly nutritious and rich in healthy fats, antioxidants, vitamins and minerals. Almonds boast an impressive nutrient profile. A 1-ounce (28-gram) serving of almonds contains (1) Fiber: 3.5 grams; Protein: 6 grams; Fat: 14 grams (9 of which are monounsaturated); Vitamin E: 37% of the RDI; Manganese: 32% of the RDI; Magnesium: 20% of the RDI, They also contain a decent amount of copper, vitamin B2 (riboflavin) and phosphorus. These antioxidants tend to build up in cell membranes in your body, protecting your cells from oxidative damage. Almonds are among the worlds best sources of vitamin E, which is lipid-soluble antioxidant found in high concentration in immune cells as compared to blood cells, with just 1 ounce providing 37% of the RDI. Nuts are low in cabs but high in healthy fats, protein and fiber. This makes them a perfect choice for people with diabetes. Another boon of almonds is their remarkably high amount of magnesium. Magnesium is a mineral involved in more than 300 bodily processes, including blood sugar control. Vitamin
  12. These ingredients were used in different proportion ratio and sensory test was conducted by presenting the laddoos to 100 individuals of all ages both to male and females.

**Results and Discussion**

The data on the study was consolidated and analyzed. The findings of the study were as follows:

The subjects belonged to age of 10 years to 60 years, from lower, middle and high income groups. They were educated between primary school to post graduate. The Table 1 presents the nutrients availability per 100 gram of the laddoo.

**Table 1:** Nutrients availability per 100 gram of the laddoo

S. No.	Nutrients (Units)	Availability per 100 gram
1.	Protein (gram)	10.6
2.	Eneergy (Kcal)	318.8
3.	Fat (gram)	11.5
4.	Fibre (gram)	2.7
5.	Calcium (mg)	95.9
6.	Iron (mg)	3.8
7.	Carotene (µg)	50.8
8.	Thiamine (0.)	0.3
9.	Riboflavin	0.1
10.	Nacin (mg)	4.8
11.	Folic acid	61.7
12.	Vit C	1.3

The ladoos prepared by processing wheat flour, gram flour, almonds, groundnut, gingelly seeds, dates, ghee along with spices that maintain respiratory health, it was found that the per 100 grams ladoos, the nutrient content was protein (10.6 gram), energy 318.8 Kcal, Fat 11.5 gram, calcium 95.9 mg, Iron 3.8 mg, catorene 50.8 µg, thiamine 0.3 mg, Riboflavin 0.1mg, Nacin 4.8 mg, Folic acid 61.7 mg and Vit C was 1.3mg per 100 gram of prepared ladoo.

### Sensory Evaluation

Sensory evaluation is the scientific discipline used to evolve, measure, analysis and interpret, reaction to those characterization of foods materials as they are perceived by the season of sight, smell, taste, touch and hearing (sound). The sensory attributes of the quality of food are measured to determine consumer's acceptable and affective product maximum production economic. The sensory attributes include colour, size, shape consistency of liquid and semi solids products, kinestics (texture, consistency and viscosity) and flavor (taste and odor) [8] During the organoleptic testing on 9 point Hedonic scale was used for sensory evaluation of the ladoos and The results revealed high acceptability of the multi-food group ladoos on appearance (colour and shape), flavor, aroma, taste, texture.

### Tentative Cost of per kg of ladoo

The cost of the ladoos was calculated based on the retail price of the ingredients. A total of 3.99 kgs of ladoos costed Rs 918.85 thus, the cost of the ingredients involved was Rs. 230.29. The input cost of the value added product will further lower down when farmer use their own produce. Strategies may be made to advertise the properties of the product and sale to reach most of the population for general well being and boost of immunity. The present situation of COVID19 and the new stains thereof make it the right opportunities that farmers can add value their own produce. The government has provided many choices for farmer to explore the sale of their value product some of which are FPOs, SHGs, e Haat. The ladoo in specific is also health friendly for people with condition of diabetics and cardiovascular issues.

### Conclusion

Value addition of agricultural produce always fetches additional dividends to the farmers for their produce. The farmer today must change the mind set to sale only the produce from their fields or storage structures to move a step ahead to value add their own produce as a alternative plan of action for food and nutrition security. Today, in light of a number of processing technologies and mechanization empower the farmer from traditional drudgery and maintain quality control of the products. The FPOs may act to develop their own chain of value addition of their products with a wing that looks into sale and marketing. Thus, Kisan or the farm families have ample opportunities towards being Aatm Nirbhar.

### Scope of Income Generation

Aatmanirbhar Bharat Abhiyaan or Self-reliant India campaign is the vision of new India envisaged by the Hon'ble Prime Minister Shri Narendra Modi. On 12 May 2020. The aim is to make the country and its citizens independent and self-reliant in all senses. He further outlined five pillars of Aatma Nirbhar Bharat –

Economy, Infrastructure, System, Vibrant Demography and Demand. Finance Minister further announced Government Reforms and Enablers across Seven Sectors under Aatmanirbhar Bharat Abhiyaan. Although the government has taken several bold reforms such as Supply Chain Reforms for Agriculture, Rational Tax Systems, Simple & Clear Laws, Capable Human Resource and Strong Financial System [9] there is need for the farm families of the country to come forward to use their agriculture farm produce for secondary agriculture. Stronger immune system is key to healthy minds and bodies are that will place India as well as global world in a win-win situation especially in the pandemic condition that has engulfed the human race. India has faced the COVID-19 situation with fortitude and a spirit of self-reliance, that is evident in the fact that from zero production of Personal Protection Equipment (PPE), sanitizers and now vaccines. India has a vast scope in agriculture and post-harvest technologies owing to its rich heritage of diversified agriculture produce that include crops, spices, fruits and vegetables and plantations, increasing the scope of formulating immunity boosting products for Indian and global population. Secondary agriculture focused value addition of agricultural produce in general and production of value added immunity boosting products in particular making our farmers (kisan) aatm nirbhar.

### Acknowledgment

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