International E-Seminar: Paper presentation

International Year of Pulses-2016

Shri P.K. Chaudhari Mahila Arts College, Sector-7, Gandhinagar, Gujarat, India

CELEBRATION EVENT for

Food and Agriculture Organization of The United Nations Viale delle Terme di Caracalla – 00153, Rome, Italy

The International Year of Pulses will raise awareness about important crops that are essential for sustainable agriculture and nutrition.

José Graziano da Silva, FAO Director-General

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**WHAT ARE PULSES?**

*Pulse* are a type of leguminous crop that are harvested solely for the dry seed. Dried beans, lentils, and peas are the most commonly known and consumed types of pulses.

**WHY ARE THEY IMPORTANT?**

- **Pulses contribute to food security at all levels**
  They are produced and consumed widely in developing countries.

- **Pulses have a high nutritional value**
  They are a critical source of plant-based proteins, amino acids, and other essential nutrients.

- **Pulses have important health benefits**
  They are recommended for preventing chronic diseases and obesity.

- **Pulses foster sustainable agriculture and contribute to climate change mitigation**
  Their nitrogen-fixing qualities can improve soil fertility and produce a smaller carbon footprint.
International Year of Pulses-2016

The 68th UN General Assembly declared 2016 the International Year of Pulses (IYP) (A/RES/68/231)

The Food and Agriculture Organization of the United Nations (FAO) has been nominated to facilitate the implementation of the Year in collaboration with Governments, relevant organizations, non-governmental organizations and all other relevant stakeholders.
Subject: Heighten public awareness of the nutritional benefits of pulses as part of sustainable food production aimed towards food security and nutrition. The
Year will create a unique opportunity to encourage connections throughout the food chain that would better utilize pulse-based proteins, further global production of pulses, better utilize crop rotations and address the challenges in the trade of pulses.

- Raise awareness about the important role of pulses in sustainable food production and healthy diets and their contribution to food security and nutrition;
- Promote the value and utilization of pulses throughout the food system, their benefits for soil fertility and climate change and for combating malnutrition;
- Encourage connections throughout the food chain to further global production of pulses, foster enhanced research, better utilize crop rotations and address the challenges in the trade of pulses.

What are pulses and why are they important?

Pulses are annual leguminous crops yielding between one and 12 grains or seeds of variable size, shape and colour within a pod, used for both food and feed. The term “pulses” is limited to crops harvested solely for dry grain, thereby excluding crops harvested green for food, which are classified as vegetable crops, as well as those crops used mainly for oil extraction and leguminous crops that are used exclusively for sowing purposes (based on the definition of “pulses and derived products” of the Food and Agriculture Organization of the United Nations).

Pulse crops such as lentils, beans, peas and chickpeas are a critical part of the general food basket. Pulses are a vital source of plant-based proteins and amino acids for people around the globe and should be eaten as part of a healthy diet to address obesity, as well as to prevent and help manage chronic diseases such as diabetes, coronary conditions and cancer; they are also an important source of plant-based protein for animals.

In addition, pulses are leguminous plants that have nitrogen-fixing properties which can contribute to increasing soil fertility and have a positive impact on the environment.
2016 INTERNATIONAL YEAR OF PULSES

nutritious seeds for a sustainable future

#IYP2016
fao.org/pulses-2016
International Seminar

On November 12, 2016

At Gandhinagar, India

http://www.pkchoudhariinhbartscollege.com/

A paper, photo and poster presentation of pulses will take place at an International Seminar.

By invitation only.

[Map of Gandhinagar]
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Pulses for Sustainable Food Security: Prospects and Challenges

Shri Ramilaben S Chaudhari
Shree J M Chaudhari Kanya Vidhyalaya, Gandhinagar (India)

BRIEF BACKGROUND OF PULSES

Pulses may be defined as the dried edible seeds of cultivated legumes. They belong to the family of peas, beans and lentils. The English word pulse is taken from the Latin pulse, meaning pottage or thick pap. Pulses are a large family and various species are capable of surviving in very different climates and soils.

Traces of pulse crops have been found from ancient times in archaeological sites of both the Old and New Worlds and they appear to have been among the earliest domesticated plants. These findings indicate an almost simultaneous arrival of cereals and pulses around 10,000 BC.

Pulses are cultivated in all parts of the world, and they occupy an important place in human diet. They however, make a much more important contribution to the diet of all classes of society in the East than in the West. In India especially, people who are mostly vegetarian depend largely on cereals and pulses as their staple food, which serve as the main source of dietary protein and energy.

NUTRITIONAL VALUE

Pulses contain more protein than any other plant. They serve as a low-cost protein to meet the needs of the large section of the people. They have, therefore, been justifiably described as 'the poor man's meat'. Their low moisture content and hard testa or seed-coat permits storage over long periods. In addition to providing dry pulses, many of the crops are grown for their green edible pods and unripe seeds. Nutritionally, immature fruits have distinctly different properties to those of the
mature seed, the protein content is lower but they are relatively richer in vitamins and soluble carbohydrates. The leaves and shoots of some of the crops are used as pot-herbs.

**PROTEIN CONTENT OF GRAINS (INDIAN NAMES)**

<table>
<thead>
<tr>
<th>Grain</th>
<th>Protein Content</th>
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<tbody>
<tr>
<td>Soyabean (Soybean)</td>
<td>43.2</td>
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<tr>
<td>Masur (Lentil)</td>
<td>25.1</td>
</tr>
<tr>
<td>Moong Daal</td>
<td>24.5</td>
</tr>
<tr>
<td>Chawli (Cow pea)</td>
<td>24.1</td>
</tr>
<tr>
<td>Moong (Green gram)</td>
<td>24</td>
</tr>
<tr>
<td>Udad Daal (Black gram dal)</td>
<td>24</td>
</tr>
<tr>
<td>Matki (Moth beans)</td>
<td>23.6</td>
</tr>
<tr>
<td>Rajma (Fr. Beans)</td>
<td>22.9</td>
</tr>
<tr>
<td>Chana (Bengal gram, roasted)</td>
<td>22.5</td>
</tr>
<tr>
<td>Kuleeth (Horse gram)</td>
<td>22</td>
</tr>
<tr>
<td>Chana Daal Peas (Dry)</td>
<td>19.7</td>
</tr>
<tr>
<td>Chana (Bengal grams)</td>
<td>17.1</td>
</tr>
<tr>
<td>Wheat</td>
<td>11.8</td>
</tr>
<tr>
<td>Bajra</td>
<td>11.6</td>
</tr>
<tr>
<td>Maka (Maize)</td>
<td>11.1</td>
</tr>
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<td>Maida (Refined flour)</td>
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Data source: National Institute of Nutrition, Hyderabad, India

In general, pulses contain 20 to 28 per cent protein per 100 gm. with the exception of soybean which has as much as 47 per cent. Their carbohydrate content is about 60 per cent per 100 gm. except soybean which has about 30 per cent. Pulses are also fairly good sources of thiamin and niacin and provide calcium, phosphorus and iron. On an average 100 gram of pulses contain energy 345 kcal, protein 24.5 gm., calcium 140 mg. phosphorus 300 mg., iron 8 mg., thiamin 0.5 mg., riboflavin 0.3 mg. and niacin 2 mg.

**NATURAL BENEFITS AND CURATIVE PROPERTIES**

The nutritive properties of pulses resemble in many respects those of the whole cereal grains; but there are important differences. First, the pulse protein is low in sulfur containing amino acids, but rich in lysine in which many cereals are deficient. A combination of pulses and cereal proteins may, therefore, have a nutritive value as good as animal protein. Secondly, pulses as a class are good sources of the B group of vitamins except riboflavin. More important, the greater part of these vitamins present in the harvested seeds is actually consumed. There are no losses comparable with those that may arise in the milling and cooking of cereals. Pulses are therefore, an excellent preventive against beriberi.

Thirdly, although pulses, like cereal grains, are devoid of Vitamin C, large amount of ascorbic acid are formed on germination. Sprouted pulses are, therefore, an important food which will protect against scurvy. Dietitians in Asian and African hospitals make beneficial use of sprouted pulses for their menus, especially when fresh vegetables and fruits are scarce or too expensive.

In health, the digestion of pulses and the absorption of their principal nutrients is practically complete and nearly as effective as is the assimilation of cereals. Their digestion, may, however, be incomplete in gastro-intestinal disorders. Only small quantities of well-cooked pulses should, therefore, be included in the diets of patients with stomach disorders.
USES

Pulses are used as a common food in various forms. Pulses, dehusked, decorticated and whole seed, are used as dhal and taken with rotli and cooked rice, Whole seeds take longer time to cook than the dehusked and decorticated ones which are relatively better digestible.

Pulses are also commonly used in the form of flour such as that of Bengal gram, green gram, and black gram, known as 'besan'. It is used for mixing with cereal flour in various proportions for rotli and other preparations.

The practice of utilizing germinated seed or sprouting or young seedlings of pulses as a fresh vegetable is widespread in the Orient. The storage of dried seed and their sprouting as required enables a continuous supply of fresh vegetable material to be produced. There is an amazing increase in nutrients in sprouted pulses when compared to their dried embryo. In the process of sprouting, the vitamins, minerals and protein increase substantially with corresponding decrease in calories and carbohydrate content.

Sprouting of the pulses not only improves nutritive value but also digestibility. During sprouting, starch is broken down to dextrin and maltose, and proteins are broken down to polypeptides, peptides and amino acids. Some of the bound iron is converted to a more readily assimilable form. Phosphorus is liberated from phytate. The ascorbic acid or vitamin C content rises from negligible levels in the seed to 12 mgs. per 100 gram after 4.8 hours of germination. Riboflavin and niacin contents increase significantly. These changes are brought about by enzymes which become active during germination.

OTHER HEALTH BENEFITS

- Pulses are part of a healthy, balanced diet and have been shown to have an important role in preventing illnesses such as cancer, diabetes and heart disease.
- Pulses are a low fat source of protein, with a high fibre content and low glycemic index.
- Pulses are very high in fibre, containing both soluble and insoluble fibres. Soluble fibre helps to decrease blood cholesterol levels and control blood sugar levels, and insoluble fibre helps with digestion and regularity.
- Pulses provide important amounts of vitamins and mineral. Some of the key minerals in pulses include: iron, potassium, magnesium and zinc. Pulses are also particularly abundant in B vitamins; including folate, thiamin and niacin.
- Pulses typically contain about twice the amount of protein found in whole grain cereals like wheat, oats, barley and rice, and in most developing countries constitute the main source of protein for most populations.
- In addition to contributing to a healthy, balanced diet, pulses nutritional qualities make them particularly helpful in the fight against some non-communicable diseases.
- The World Health Organisation estimates that up to 80% of heart disease, stroke, and type 2 diabetes and over a third of cancers could be prevented by eliminating risk factors, such as unhealthy diets and promoting better eating habits, of which pulses are an essential component.
- Pulses can help lower blood cholesterol and attenuate blood glucose, which is a key factor in against diabetes and cardiovascular disease. Eating pulses as a replacement to some animal protein also helps limit the intake of saturated fats and increases the intake of fibers.
Pulses have also been shown to be helpful in the prevention of certain cancers, because of their fiber content but also because of their mineral and amino-acid contents, in particular folate.

Pulses are included in all ‘food baskets’ and dietary guidelines. The World Food Programme (WFP) for instance includes 60 grams of pulses in its typical food basket, alongside cereals, oils and sugar and salt.

Encouraging awareness of the nutritional value of pulses can help consumers adopt healthier diets. In developing countries, where the trend in dietary choices tends to go towards more animal based protein and cereals, retaining pulses is an important way to ensure diets remain balanced and to avoid the increase in non-communicable disease often associated with diet transitions and rising incomes.

Several studies have shown that legumes are been associated with long-lived food cultures such as the Japanese (soy, tofu, natto, miso), the Swedes (brown beans, peas), and the Mediterranean people (lentils, chickpeas, white beans) and that they could be an important dietary factor in improving longevity.

**FOOD SECURITY**

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. Food insecurity is a major issue for many people and households in poor and developing countries—it is estimated that 795 million people are undernourished. Pulses can help contribute to food security in a number of ways.

**THREATS TO FOOD SECURITY**

- *Population growth:* The world’s population is growing rapidly and agricultural production must adapt accordingly, but in a sustainable way.
- *Malnutrition:* There are many countries where malnutrition is a particularly important issue and large regions of these countries could be used to produce pulses. In many countries meat, dairy and fish are an expensive source of protein and thus economically inaccessible for many.
- *Waste:* In developing countries, most losses occur during production or transportation whereas in developed countries waste occurs during consumption.

**HOW PULSES CAN HELP?**

- *They grow in areas with lesser amount of rain.* Draught resistant and deep rooting pulses can also supply groundwater to companion crops. This way, dry areas, where food security is a challenge, can enhance food production. There are many drought-resistant pulses, such as pigeon peas, bambara beans and lentils. These pulses can be cultivated in arid climates that have limited, and often erratic, rainfall of 300-450 mm/year. These are lands where other crops can fail or produce low yields.
- *They are “cash crops”.* They are solid in markets and can help poor farmers. Protein from pulses is less expensive than animal food.
- *They are shelf-stable with a low food wastage footprint.* If properly stored, pulses remain edible for several years, making them a smart option for households without refrigeration.
Since pulses are shelf stable, the proportion of food waste at the consumption stage due to spoilage is very low, which also helps to ensure household food security. Additionally, many pulses seeds are still able to germinate after being stored for a long period, allowing farmers, in some cases, to plant them in subsequent cropping seasons.

**Pulses in India**

India is aspiring to become self-reliant in pulses and oilseed production by 2022.

There are some challenges to this:

While it is certainly not impossible to achieve, there are significant issues to be addressed on priority. For example, first, to meet the gap in demand without imports, given the average yields, we need nearly 7 – 8 million additional ha of land. Where can this come from? We also need a holistic understanding of the food value chain, agrarian situation in the country, a review of current Ag-Food policies and investments in R&D and infrastructure for storage, food processing and marketing.

**Less obvious things about India’s pulse sector:**

To understand the whole picture, let’s go back a few hundred years ago when India’s culinary tradition, diets and cuisines were rich and possessed enormous diversity in using various commodities including pulses and minor millets. There was significant demand since the commodities were available at affordable prices or vice versa. Though the dynamics of both farming and household consumption changed dramatically particularly after the Green Revolution and become most skewed in favor of rice and wheat, pulses are one of the most basic staple food items, regardless of the side – North or South – of the great hills of Vindhya. Every household consumes pulses almost every day. But the type and preferences vary with culinary traditions, tastes, diets and socio-economic status.

In the South, sambar and rasam are the most basic foods made using toor dal (pigeon pea) to go with rice, while Indians in the North prefer masoor dal (red lentils ) boiled with spices as the perfect accompaniment with roti. Mung is used as whole or split and is used in many main courses and sweets. Chana (chick pea), the biggest pulse crop produced and consumed in India, is an essential ingredients in snacks, crispies and sweets across the country and used as both flour and as whole peas in curries.

Considering that India’s is not monolithic in the context of culture, every 100 kilometers everything from food, language, accents, culture and customs change dramatically. So the enormous diversity and uniqueness of cuisines and ingredients used need to be considered in order to understand the importance of pulses in Indian diets.

But what surprises me is the fact that India is the largest producer, consumer and also importer of pulses in the world, and this is not known to many including those who are working in the food and agriculture industry in the country. When I learned nearly 3 – 4 million MT of pulses are imported every year to India, as a vegetarian by religious and family tradition like millions of my fellow Indians whose diet primarily depends only on pulses for protein, I always wonder why the country has come to import pulses.

**What can farmers do by themselves to improve the situation?**
They should unite and cooperate to achieve more than what they can achieve individually. However upon careful introspection, it becomes evident that they are divided, or I would say kept divided, possibly due to their differences in political affiliations, entrenched cultural, religious and social (caste) systems etc. But the FPOs (Farmer Producer Organizations) are one of the several means that these small farmers can consider to not only gain bargaining power in the market but to make the sector resilient and profitable by investing in the sector, similar to what similar organizations do in Canada, Australia or USA.

**What is the best way to move forward?**

The situation calls for a holistic understanding of the issues affecting the pulses value chain, and major reforms in certain Ag-Food policies are critical needs of the hour. Also there is an increased need for more research and development (R&D) particularly in the public sector on the input side as well as food processing innovations where the goals are aligned with on-the-ground realities. Some may suggest allowing future trading and also export of pulses from India can be good for the sector, subject to sufficient safe guards to be put in place to prevent domestic prices from rising beyond affordable levels. These efforts may not only promote production but also create jobs in terms of encouraging the food processing sector to utilize more pulses in India.
Optimum Nutrition-A Tool for Effective Sports Performance

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INTRODUCTION

Nutrition is the selection of foods and preparation of foods, and their ingestion to be assimilated by the body. By practicing a healthy diet, many of the known health issues can be avoided. The diet of an organism is what it eats, which is largely determined by the perceived palatability of foods. When it comes to changing the look of your body, proper nutrition is more than important, it’s essential. The food you feed your body is the primary catalyst in changing how your body looks. In sports the maximum performance of the athlete based on their optimum nutrition. Sports nutrition looks at the intake of vitamins, minerals, supplements and organic substances such as carbohydrates, proteins and fats. The athlete needs to consider that nutrition is an important component of good health and for sports performances. The concepts of traditional sports nutrition, focused on exercise performance and recovery, with the concept of functional nutrition, which recognizes that every athlete responds differently to training, recovery, environmental factors and diet and therefore requires an individual approach. Sports nutrition experts therefore apply the latest sport science theories to optimize performance and recovery within a framework that also promotes long-term health. This approach ensures that you will receive a bespoke plan, tailored to your specific lifestyle, exercise and recovery requirements allowing you to gain maximum benefit in a practical, achievable and sustainable way. Importance of optimum nutrition for good sports performance At the most basic level, nutrition is important for sport performers because it provides a source of energy required to perform the activity. The food we eat impacts on our strength, training, performance and recovery. Not only is the type of food important for sports nutrition but the times we eat throughout the day also has an impact on our performance levels and our bodies ability to recover after exercising. Meals eaten before and after exercise are the most important in sports nutrition but you should really be careful with everything that you put into your body. As a general rule of thumb sports performers should eat about two hours before exercising and this meal should be high in carbohydrates, low in fat and low to moderate in protein. Carbohydrates are the main source of energy that powers your exercise regime and protein is required to aid muscle growth and repair. After exercising you need to replace the carbohydrates you have lost and you need to ensure proper muscle recovery by including protein in your post training meal. Far too often nutrition in endurance sports has all been about fuelling up on carbohydrate and keeping hydrated through fluid intake, and while these are still important issues to manage during exercise, replenishment post exercise is widely overlooked and neglected. The pressures of training and competition can make it difficult to gain the nutrition you need through consuming regular foods, therefore creating the demand for supplementation to maximize athletic performance. Products such as gels, bars and isotonic sports drinks make it possible for the modern day endurance participant to consume the nutrients they need when it’s not easy to take on whole foods e.g. during exercise or during periods of excessive training. Role of Nutrition in Sports Fitness and Performance Over the last decade, sports nutrition has come a long way. Modern whey protein and other sports supplements can offer a range of benefits. These can include high concentrations of protein proportionate to serving size, quality carbohydrates to aid endurance. Used in moderation and combined with a healthy overall diet, these kinds of supplemental nutritional items can really give your workout the edge it needs. Sports nutrition
assumes critical importance because long before deficiency symptoms start appearing, physical performance declines. It would not be prudent to think in terms of minimum needs to keep the blood levels or enzyme levels at normal limits. Rather attempts should be made to find out the level below which physical performance starts showing changes. The level, which permits the athlete to achieve the maximum possible physical performance, should be the minimum level aimed in the sports nutrition. Iron transports oxygen to all parts of the body, including muscles, and helps release energy from cells. If iron levels are low, you can feel tired and low in energy. Iron deficiency is a common problem for athletes, particularly women, vegetarians and adolescents. Hard training stimulates an increase in red blood cell production, increasing the need for iron. Iron can also be lost through damage to red blood cells and loss of blood from injury and sweat. Calcium. Adequate calcium consumption is necessary to develop and maintain strong bones that are resistant to fracture and osteoporosis in later life. Whilst most athletes will have above average bone mass, some female athletes are at high risk of developing osteoporosis prematurely. Loss of periods (known as amenorrhea) due to hard training and low body fat levels means that the body produces less estrogen, which stops bones from reaching peak mass and strength. Most athletes need three daily serves of dairy foods to ensure that they get enough calcium. A serve of dairy could include one glass (250mL) of milk, one tub (200g) of yogurt or two slices (40g) of cheese. Teenage athletes should aim for four serves to meet their increased recommended daily intake of calcium.

CONCLUSION

Food sources should always be considered as the first option for meals and snacks. Overuse may lead to inappropriate replacement of whole foods. Like many areas of nutritional science, there is no universal consensus regarding the effects of meal frequency on body composition, body weight, markers of health, and markers of metabolism, nitrogen retention, or satiety.

REFERENCES

The Protein Power of Pulses

Dr. Ratanben P. Solanki
Shree Mahila Arts & Home Science College, Kodinar, Gujarat (India)

WHAT ARE PULSES?

Pulses may be defined as the dried edible seeds of cultivated legume. They belong to the family of peas, beans and lentils. The pulses are a large family and various species are capable of surviving in very different climates and soils. Traces of pulse crops have been found from ancient times in archaeological sites of both the Old and New worlds and they appear to have been among the earliest domesticated plants. Pulses are cultivated in all parts of the world, and they occupy an important place in human diet.

The protein power of pulses is just one of the many reasons to make them an important addition to your healthy diet for 2016. Have you heard about Pulses? They have been around for 10,000 years and are among the most extensively used foods in the world and this year everyone is talking about them. Pulses are part of the legume family. Legume refers to the plants whose fruit is enclosed in a pod such as fresh peas and beans. Pulses however, are the edible dried seeds of the plants and are only those crops harvested solely for dry grain with lentils, chickpeas, beans and dried yellow and green peas being the most common pulses. Soy beans and peanuts are related to pulses because they are also the edible seeds of padded plants, but they differ due to their much higher fat content; pulses contain virtually no fat.

Why is everyone talking about pulses now? Recently the 68th UN General Assembly declared 2016 the International Year of Pulses and since Canada’s pulse industry meets the needs of over 150 markets around the globe; this is good news for Canadians. Over the past 20 years, Canada has emerged as the world’s largest exporter of lentils and peas, and one of the world’s top five exporters of beans. But it is their protein and nutrition profile that has us cheering.

NUTRITIONAL BENEFITS OF PULSES

The protein power of pulses makes them an important food for maintaining a healthy diet with an average of 15 grams of protein per cup. Pulses are very high in protein and fibre, as well as...
significant source of iron, zinc, folate, thiamin, niacin, potassium and magnesium. They are low in fat and consuming just 1/2 cup a day, can reduce LDL-cholesterol levels which can reduce the risk of heart attack and stroke.

Pulses such as lentils, peas, chickpeas and navy, black, roman, pinto, and kidney beans are a vital source of plant-based proteins and amino acids for people who do not eat, or wish to cut down on, red meat. Pulses typically contain almost twice as much protein as whole grain cereals like wheat, oats, barley and rice but should be eaten in combination with grains as part of a healthy vegetarian diet to ensure you are getting all the essential amino acids usually found in meat sources. Although high in carbohydrates, pulses have a low glycemic index which means they do not cause a fast rise in blood sugar making them beneficially for those with or at risk of diabetes. The soluble and insoluble fiber content of pulses helps with digestion and makes these tiny beans more filling than other foods, which helps you maintain a healthy diet.

**ENVIRONMENTAL BENEFIT OF PULSES**

In addition to their high protein content and nutritional profile and links to improved health, pulses are unique foods in their ability to reduce the environmental footprint. Pulses require little to no nitrogen fertilizer meaning they use half the nonrenewable energy inputs of other crops. Like their cousins in the legume family, pulses have nitrogen-fixing properties which can contribute to increasing the soil fertility, reduce global greenhouse gas emission and improve the environmental sustainability of annual crops. With so many nutritional and environmental benefits, there is good reason for pulses to become the new superfood of 2016.

**NUTRITIONAL AMOUNT IN PULSES**

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Amount</th>
</tr>
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<tbody>
<tr>
<td>Energy</td>
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</tr>
<tr>
<td>Protein</td>
<td>24.5 gm</td>
</tr>
<tr>
<td>Calcium</td>
<td>140 mg</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>300 mg</td>
</tr>
<tr>
<td>Iron</td>
<td>8 mg</td>
</tr>
<tr>
<td>Thiamine</td>
<td>0.5 mg</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>0.3 mg</td>
</tr>
<tr>
<td>Niacin</td>
<td>2 mg</td>
</tr>
</tbody>
</table>

**BENEFITS OF PULSES**

1. Bengal gram is very useful to treat diabetes. Experiments have shown that the intake of this pulse enhances the utilization of glucose.
2. Bengal gram is a valuable astringent for use in dyspepsia, vomiting, indigestion etc related disorders.
3. All the pulses are very rich in Iron thus are very good to cure anemia.
4. Cooked germinated gram is a wholesome food for children and individual. One must include these in their daily diet.
5. During menstruation, pulses are very good. It provides you energy and abides the pain.
6. The green gram is one of the healthiest stuff. It is the rich source of chlorophyll, thus enhances your immune system and body as well.

7. Pigeon pea which is also called ‘masoor dal’ is rich in Vitamin a, thus a very good thing for health purposes.

8. Bengal gram is very beneficial for skin and hair diseases. It cures allergic skin diseases like eczema, scabies, itching etc.

9. Black gram is valuable in digestive system disorders. It should be given in form of decoction.

10. A fine paste of pigeon pea shall be applied on the bald patches. It cures baldness.

11. The leaves of pigeon pea are the excellent remedy for Jaundice.

12. Pulses are always types of beauty-aid. It can be used as a face pack or mask too.

13. Water in which green grams are soaked is an excellent remedy for cholera, chicken-pox, typhoid, measles and many more.

**Sprouting of Pulses**

Sprouting is the practice of germinating seeds to be eaten raw or cooked. Sprouts can be germinated at home or produced industrially. They are a prominent ingredient of the raw food diet and common in Eastern Asian cuisine.

Sprouting, like cooking, reduces anti-nutritional compounds in raw legumes. Raw lentils for example contain lectins, antinutritional proteins which can be reduced by sprouting or cooking. Sprouting is also applied on a large scale to barley as a part of the malting process. A downside to consuming raw sprouts is that the process of germinating seeds can also be conducive to harmful bacterial growth.

**How to Grow Sprouts?**

Sprouts are very easy to prepare and require little or no maintenance. You can easily grow these seeds on your windowsill. Wash and soak the seeds and place them in a sprouter or jam jar. Leave it on a well-lit location and water it twice daily with 250 ml of filtered water. Germination time will vary between three to eight days, according to your room temperature. Harvest it early for a sweet taste. You can use the sprouts immediately without cooking or freeze them for future use.
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**Health Benefits of Sprouts**

1. **Prevent Premature Ageing:**
   Sprouts contain abundance of highly active antioxidants that prevent DNA destruction and protect us from the ongoing effects of aging. Now that’s something that all girls should take a note off!!!

2. **Pregnancy Protein Powerhouse:**
   Though sprouts are good for a pregnancy diet. Pregnant women need to be careful while consuming sprouts due to bacterial growth. When not cleaned and sprouted properly, sprouts pose a risk of salmonella and e-coli which cause diarrhea, nausea, abdominal cramping and fever and other serious illnesses in pregnant women. Pregnant women can opt for cooked sprouts. This amazing health benefit of sprouts is very beneficial for women.

3. **Boosts Blood Supply:**
   Sprouts improve blood circulation and strengthens and repairs capillaries to get strong and thick hair. It helps to generate new blood vessels and increases circulation to the scalp and follicles. A healthy blood supply is a good stimulant for hair growth.

4. **Rich in Vitamin A:**
   The high amounts of vitamin A in sprouts stimulate hair follicles and encourage the scalp to produce more hair. Vitamin A deficiency can lead to dry scalp, roots and strands, leading to hair loss. Thus, essential to encourage healthy hair growth.

5. **Rich Source of Antioxidants:**
Premature greying of hair is caused due to the oxidation of tissues. The potent antioxidants present in the sprouts prevent the corrosion of tissues, reducing the possibility of premature hair greying.

6. **Vitamin K Storehouse:**
   Sprouts contain Vitamin K, a fat soluble vitamin which builds protein in the scalp to maintain strong roots and strands.

7. **Rich in Iron:**
   Sprouts contain ample amounts of iron, which are required to carry oxygen to the scalp, roots and tresses. Hair that is starved from proper levels of iron may weaken and fall out.

8. **Rich in Zinc:**
   Sprouts contain zinc, a nutrient which contributes to sebum production in the scalp. This keeps the scalp, roots and hair strands hydrated. It also promotes regeneration of the scalp cells.

9. **Anti Dandruff:**
   Selenium in sprouts helps to kill Malassezia, a fungus which sheds dry fragments from the scalp. It wards off dandruff and removes the debris to encourage new hair growth. It also helps to alleviate itchy scalp because of its antifungal properties.

10. **Omega Acid for Healthy Hair:**
    Regular consumption of sprouts adds shine, elasticity and lustre to the hair. It contains omega 3 fatty acids which are vital for the nourishment of hair follicles. It combats dry and brittle hair, flaky scale and reverses hair loss. Sprouts also prevent the hair from appearing dull and lifeless.

11. **Corrects Hormonal Imbalances:**
    An imbalance in hormone is one of the biggest causes of hair loss in women. Sprouts help to achieve hormonal balance and restores vitality of the hair.

12. **Prevents Biotin Deficiency:**
    Biotin deficiency can cause brittle damaged hair. So consume ample amounts of sprouts to increase the levels of biotin and add inches to your current hair length.

**Hair Benefits of Sprouts:**

Healthy inside make us beautiful outside! The right food for hair growth is one of the most amazing hair growth tips ever. Here are some of the best known and effective benefits of sprouts for hair.

1. **Hair Growth:** Sprouts contain a decent amount of vitamin C, which is proven to promote healthy hair growth. It destroys the free radicals in the body which makes the hair weak, brittle and thin. It also prevents a variety of hair disorders like alopecia, hirsutism and even male pattern.

**Skin Benefits of Sprouts:**

Some of the benefits of sprouts for the skin include:

1. **Glowing Skin:**
   Eating healthy is the best way to ensure a better looking skin. Sprouts contain nutrition which maintain the health of the skin and enhance its glow.
2. Prevents Skin Cancer:
   Free radicals are caused by the constant exposure to sunlight and environmental pollution. The antioxidants in sprouts kill the free radicals to protect the skin from sun damage and skin cancer.

3. Hydrates the Skin:
   Pea sprouts are rich in vitamin B which prevents excess sebum production and helps in healthy skin formation. Drink a glass of pea sprout juice daily to get a well-hydrated and moisturized skin. You can also apply pressed pea sprouts on the face to get a fine and smooth skin.

4. Helps in Cell Regeneration:
   Include sprouts in your daily diet to increase the process of healing and rejuvenation of the skin. It also helps to heal the wound at a faster pace and replace damaged tissue. It lightens skin discoloration like freckles and age spots to get a clear and flawless skin.

5. Stimulates Collagen Production:
   Vitamin C in sprouts promotes better skin through the production of collagen. It provides elasticity to give you more youthful skin. This “protein like cement” supports and holds the body tissues and organs together. It rejuvenates the skin from the within and reduces wrinkles and other symptoms of ageing.

6. Acne Buster:
   Sprouts contain high levels of omega 3 fatty acids which decrease inflammation and reduce the risk of acne and other skin problems. It also helps to reduce skin problems like pruritus, scaling and erythema. Thus, consuming sprouts will give you a smooth and younger looking skin with a visible reduction in inflammatory conditions like acne and psoriasis.

7. Detoxifies the System:
   Sprouts contain silica a nutrient, which is required to rebuild and regenerate the skin’s connective tissues. It also removes toxins from the body that normally seep into the bloodstream causing dull and lifeless skin.

1. Sprouts should always be washed before consuming. This is to remove any fungus and pesticide residue. The surplus stem should be cut off and the leaves should be discarded. Stale, smelly and dull looking sprouts should not be consumed. Avoid cooking, roasting or frying sprouts as they lose their nutritive value when exposed to heat.
2. You can buy packaged sprout grains, cook the sprouts as a side dish or bake with sprouted grain flours. Sprouted grains can be enjoyed in risotto, pudding, and sandwiches and alone.
3. Baking is very easy with sprout flour. It creates a really nice texture and has a sweet and less harsh taste as compared to regular whole wheat flour. You can combine millet with sprouts flour to make tasty bread.
4. Salad is one of the best appetizers. When prepared with sprouts, the nutritional value of salad increases manifold. Sprouts can be used along tomatoes broccoli, onion, radish and cucumber to enhance the taste as well as nutritional value.

<table>
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<tr>
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<th>Ratio</th>
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<td>Vitamin B-6 (mg)</td>
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<td>0.45</td>
<td>0.91</td>
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</table>
5. Brussels sprouts taste best when prepared by sautéing in butter. Then, toss it with tomato, capsicum and Parmesan cheese. You can also toss sprouts with thinly sliced apples, thyme, olive oil and a dash of lime for a healthy salad. Mixed sprouts taste best with omelette and in a sandwich filling. You can also add sprouts to your soup and in vegetable smoothies. Two handfuls of sprouts count as one daily vegetable portion.

6. Sprouts can be steamed quickly in a small amount of water. This will minimize the nutrient loss but will also aid digestion. There are two ways in which you can steam sprouts; add sprouts to an inch of already boiled water or place in a vegetable steamer. After steaming for two minutes, uncover the pot to disperse the strong tasting sulfur compounds. Then, again cover the pot and cook the sprouts for 15 minutes. Check periodically by poking them with a fork. Cook them until they are tender.

Looking at the benefits of sprouts, it makes sense to include sprouts in your diet. Mix and match various sprouts and take a break while consuming sprouts. Your body needs to work extra hard to process these raw sprouts to opt for sprouts once a week or twice maximum. Enjoy sprouts and reap the benefits!

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Meaning, Facts, Types and Benefits of Pulses

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Saurashtra University, RajkotGujarat(India)

KEYWORDS

Meaning, facts, types and benefits of pulses

INTRODUCTION

Pulses, which include chickpeas/garbanzo beans, dry peas and lentils, are increasingly being recognized for their role in promoting good health. Researchers have reported that regular consumption of pulses may reduce the risk of heart disease, diabetes and certain types of cancer. Pulses are a versatile, easy-to-prepare ingredient that can be used in entrees, salads, breads and desserts. Pulses are a type of legume (seeds that grow within pods).

Pulses include chickpeas (also known as garbanzo beans), lentils and dry peas. Pulses provide protein, dietary fiber, and many vitamins and minerals. They also contain “phytochemicals” (plant chemicals), which may reduce the risk of certain types of cancer and other diseases. As a result of their nutritional properties, the 2010 U.S. Dietary Guidelines for Americans recommends more frequent consumption of lentils, dry peas and beans.

WHAT ARE PULSES?

Pulses may be defined as the dried edible seeds of cultivated legume. They belong to the family of peas, beans and lentils. The pulses are a large family and various species are capable or surviving in very different climates and soils. Traces of pulse crops have been found from ancient times in archaeological sites of both the Old and new worlds and they appear to have been among the earliest domesticated plants. Pulses are cultivated in all parts of the world, and they occupy an important place in human diet.

PULSES, a subgroup of legumes, are plant foods from the Leguminosae family (commonly known as the pea family). The edible seeds of pulses are eaten by humans and animals.

FAO calls pulses only legumes with dry, edible seeds, with low fat content, are classified as pulses.

FAO does not consider pulses legume species used as vegetables (e.g., green peas, green beans), for oil extraction (e.g., soybean, groundnut) and for sowing purposes (e.g., clover, alfalfa).

One of the five messages that FAO aims to highlight during the international year of pulses in 2016 - is the nutritional benefits of pulses and encourage a paradigm shift towards including more of this nutritional powerhouse in diets all over the world.
Malnutrition is one of the important contributors to many types of illnesses and, in some cases, lead to death. Malnutrition is a result of eating too little, too much or eating an unbalanced diet that does not contain the right quantity and quality of nutrients to be healthy.

Pulses typically contain about twice the amount of protein found in whole grain cereals such as wheat, which for most populations in developing countries they constitute a major source of protein.

Pulses are an excellent complementary food for infants and young children to meet their daily nutritional needs. They can be incorporated into children’s diets through family diets and school meal programmes in both developed and developing countries. Their high nutrient content also makes pulses ideal for vegetarians and vegans to ensure adequate intakes of protein, minerals and vitamins.

When combined with food high in vitamin C, pulses’ high iron content makes them a potent food for replenishing iron stores, particularly for women at reproductive age, who are more at risk for iron deficiency anaemia.

Older people can also benefit from eating pulses.

**GETTING THE MOST FROM YOUR PULSES**

In many cultures, pulses are considered as ‘protein for the poor’. There are a number of reasons why they are underestimated. The most common ones are: they can cause bloating, flatulence, and, unless they are soaked for hours, pulses take a long time to cook. Pulses contain some anti-nutrients, which are substances that reduce the body’s ability to absorb the various minerals that pulses contain.

Fortunately, many of these issues (bloating, flatulence, anti-nutrients and length of cooking time) can be overcome using traditional cooking techniques, such as soaking, germination (sprouting), fermentation and pounding. Traditional methods can also help to reduce the content of the anti-nutrients.

When other foods are combined with pulses, the nutritional value of pulses is further enhanced, as other foods help to ensure that the body is able to better absorb all the nutrients found in pulses. Here are a few examples:

1. When beans are eaten with other foods such as grains, the nutritional value of pulses is even greater as the body is better able to absorb iron and other minerals found in pulses.
2. Another way of increasing the body’s ability to absorb iron is to combine pulses with vitamin C rich foods (a good example is to sprinkle some lemon juice on lentil curry).
3. Drinking tea or coffee with meals, on the other hand, has the opposite effect.

There are so many ways to eat pulses.

They can be eaten at any meal. In some Asian countries, boiled chickpeas, mung beans and butter beans are a common sight at breakfast. They are also a favorite snack. In other parts of the world, bean burgers or falafel, made from ground chickpeas or fava beans or both, are eaten for lunch. Pulses, especially beans, can be added to soups, salads, and pasta sauces. In some parts of Italy, boiled beans and tuna fish is a common second course. Even children as young as six months can enjoy a puree of boiled pulses with other foods.
KEY FACTS

✓ With a low glycemic index, low fat and high fibre content, pulses are suitable for people with diabetes. Pulses increase satiety and help to stabilize blood sugar and insulin levels by reducing spikes after eating and improving insulin resistance making pulses an ideal food for weight management.
✓ Pulses may reduce the risks of coronary heart disease. They are high in dietary fibre, which is well known for reducing LDL cholesterol, a recognized risk factor in coronary heart disease.
✓ Pulses are good sources of vitamins, such as folate, which reduces the risk of neural tube defects (NTDs) like spina bifida in newborn babies.
✓ Pulses’ high iron content makes them a potent food for preventing iron deficiency anaemia in women and children especially when combined with food containing vitamin C to improve iron absorption.
✓ Protein quality matters, particularly for growth and development. The protein quality of vegetarian diets and plant-based diets is significantly improved when pulses are eaten together with cereals.
✓ Pulses are gluten-free.
✓ Pulses are rich in bioactive compounds such as phytochemicals and antioxidants that may contain anti-cancer properties.
✓ Pulses promote bone health.
✓ Phytoestrogens may also prevent cognitive decline and reduce menopausal symptoms.

DIFFERENT TYPES OF PULSES

Now, we shall be shortly talking about the different types of pulses.

1. **Bengal gram** - Bengal gram is also called ‘lal chana’ whose roasted flour is called ‘besan’. It is one of the richest sources of protein and is often used in salad dressing and an important part of diet. It is frequently used in Indian cooking as a thickener. It has a meaty rich flavor. Often stewed with vegetables like bitter gourd and squashes. Chana Dal with spinach and louki with chana dal are very popular dishes. In the Indian vegetarian culinary scenario, Bengal gram is a major ingredient. It is essentially used in making curries. In the southern India, unripe grams are picked and consumed as snack and the leaves are added in the making of salads. It is believed to have originated in western Asia.

2. **Black gram** - Black gram is one of the most highly prized pulses of India. It’s Indian name is ‘Urad’. It is produced in pods which are narrow, cylindrical and up-to 6 cm long. the outer skin is grayish black and the inner is creamy white and oval in shape. They are extensively used in India in various culinary preparations such as dosa, vada, papad and could be eaten raw when sprouted. Black urad dal when sprouted is very refreshing, healthy and nutritious and it can be used in several forms. Sprouts are fantastic addition to salads or you can make delicious chaat for snack. Growing sprouts is fun and they can be grown anytime anywhere. There are no complicated step to sprout these beans all you need a bowl, water and towel.

3. **Green gram** - Green gram is also called ‘green moong’ in Hindi terms. It is recognized as one of the healthiest gram and pulses of all. It is free from the heaviness and tendency to...
flatulence, which is associated with other pulses. People in the U.S. primarily eat green
gram as a sprout, and as a bean it cooks up fast and has a sweet flavor. With its high fiber
and nutrient content, it offers a number of health benefits. This very plant is native to
India since from the ancient times.

4. **Pigeon pea**-The pigeon pea is one of the important pulses in India. It is a woody, short-
lived perennial shrub plant. It grows up to 1-4 metres tall. It is also grown as an annual
herb. Its seeds are pinkish in colour and are also called ‘Masoor’ in Hindi. Seeds vary in
size, shape and colour. These are generally round as well as oval in shape. Pigeon pea is
probably a native to tropical Africa, where it is sometimes found wild or naturalized. Its
area of cultivation includes India, Malaysia, Indonesia, Philippens, The Caribbean, East
and West Africa.

**BENEFITS OF PULSES**

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typhoid, measles and many more.

So, in this way we saw different types of Pulses and its health benefits. These are one of the best
and the liked food crop all across the globe. Eat well and Live well!

**IMPORTANCE OF PULSES IN DIET**

Pulses may be defined as the dried edible seeds of cultivated legumes. They belong to the family
of peas, beans and lentils. The English word pulse is taken from the Latin pulses, meaning pottage or
thick pap. The pulses are a large family and various species are capable or surviving in very different
climates and soils.
Traces of pulse crops have been found from ancient times in archaeological sites of both the Old and New Worlds and they appear to have been among the earliest domesticated plants. These findings indicate an almost simultaneous arrival of cereals and pulses around 10,000 BC.

Pulses are cultivated in all parts of the world, and they occupy an important place in human diet. They however, make a much more important contribution to the diet of all classes of society in the East than in the West. In India especially, people who are mostly vegetarian depend largely on cereals and pulses as their staple food, which serve as the main source of dietary protein and energy.

**Food Value:**

Pulses contain more protein than any other plant. They serve as a low-cost protein to meet the needs of the large section of the people. They have, therefore, been justifiably described as 'the poor man's meat'. Their low moisture content and hard test or seed-coat permit storage over long periods. In addition to providing dry pulses, many of the crops are grown for their green edible pods and unripe seeds. Nutritionally, immature fruits have distinctly different properties to those of the mature seed, the protein content is lower but they are relatively richer in vitamins and soluble carbohydrates. The leaves and shoots of some of the crops are used as pot-herbs.

In general, pulses contain 20 to 28 per cent protein per 100 gm. with the exception of soybean which has as much as 47 per cent. Their carbohydrate content is about 60 per cent per 100 gm. except soybean which has about 30 per cent. Pulses are also fairly good sources of thiamin and niacin and provide calcium, phosphorus and iron. On an average 100 gram of pulses contain energy 345 kcal, protein 24.5 gm., calcium 140 mg. phosphorus 300 mg., iron 8 mg., thiamin 0.5 mg., riboflavin 0.3 mg. and niacin 2 mg.

**Natural Benefits and Curative Properties:**

The nutritive properties of pulses resemble in many respects those of the whole cereal grains; but there are important differences. First, the pulse protein is low in sulfur containing amino acids, but rich in lysine in which many cereals are deficient. A combination of pulses and cereal proteins may, therefore, have nutritive value as good as animal proteins. Secondly, pulses as a class are good sources of the B group of vitamins except riboflavin. More important, the greater part of these vitamins present in the harvested seeds is actually consumed. There are no losses comparable with those that may arise in the milling and cooking of cereals. Pulses are therefore, an excellent preventive against beriberi.

Thirdly, although pulses, like cereal grains, are devoid of Vitamin C, large amount of ascorbic acid are formed on germination. Sprouted pulses are, therefore, an important food which will protect against scurvy. Dietitians in Asian and African hospitals make beneficial use of sprouted pulses for their menus, especially when fresh vegetables and fruits are scarce or too expensive.

In health, the digestion of pulses and the absorption of their principal nutrients is practically complete and nearly as effective as is the assimilation of cereals. Their digestion, may, however, be incomplete in gastro-intestinal disorders. Only small quantities of well-cooked pulses should, therefore, be included in the diets of patients with stomach disorders.
Uses:

Pulses are used as a common foodstuff in various forms. Pulses, dehusked, decorticated and whole seed, are used as dhal and taken with chappatis and cooked rice; Whole seeds take longer time to cook than the dehusked and decorticated ones which are relatively better digestible.

Pulses are also commonly used in the form of flour such as that of Bengal gram, green gram, and black gram, known as ‘besan’. It is used for mixing with cereal flour in various proportions for chappatis and other preparations.

The practice of utilizing germinated seed or sprouting or young seedlings of pulses as a fresh vegetable is widespread in the Orient. The storage of dried seed and their sprouting as required enables a continuous supply of fresh vegetable material to be produced. There is an amazing increase in nutrients in sprouted pulses when compared to their dried embryo. In the process of sprouting, the vitamins, minerals and protein increase substantially with corresponding decrease in calories and carbohydrate content.

Sprouting of the pulses not only improves nutritive value but also digestibility. During sprouting, starch is broken down to dextrin and maltose, and proteins are broken down to polypeptides, peptides and amino acids. Some of the bound iron is converted to a more readily assimilable form. Phosphorus is liberated from phytate. The ascorbic acid or vitamin C content rises from negligible levels in the seed to 12 mgs. per 100 gram after 4.8 hours of germination. Riboflavin and niacin contents increase significantly. These changes are brought about by enzymes which become active during germination.

PULSES: IMPORTANT INGREDIENT FOR GOOD HEALTH

Dal chawal….. You may be bored of eating this every day, but you would agree that this is one thing that brings solace when you are out of home for many days. Pulses is an important part of the diet for most Indians.

A pulse is a general term that is used for peas, beans and lentils. In India, different communities prepare delicious recipes using pulses. For instance, the Parsis have their pulses cooked with mutton (Dhansak), and is a favorite among most non vegetarian eaters. The north Indians are well known for their rajma and chana while a Guajarati mithi dal is something you cannot resist. Bengali’s are known for their cholar dal and the south Indians for their sambhar.

Middle Eastern and Mediterranean cuisine uses a lot of chick peas while Mexican cuisines use kidney beans in various recipes.

Pulses are an important ingredient for good health hence used in various recipes. Let’s understand more about the health benefits of pulses and innovative recipes to add them to your diet.

HEALTH BENEFITS OF PULSES

According to a 2014 study published in the Canadian Medical Association Journal, eating one serving a day of pulses can significantly reduce your risk of cardiovascular disease. But it’s not just
your heart that can benefit from a diet rich in pulses. There are a whole heap of other benefits to be had from these nutritional powerhouses.

“Pulses are important in our daily diet as they are a good source of protein especially for vegetarians. Pulses are high in fiber, have low fat, no cholesterol, high protein, low glycemic index and high nutrient foods, says Nutritionist Pooja.”

**Good for heart:** Pulses help in maintaining a healthy heart. Studies suggest that regular intake of beans or pulses contribute to a reduction in serum cholesterol and other blood lipids which are a major risk factor for cardiovascular diseases.

**Helps in weight loss:** Regular intake of pulses may assist in weight management. Consumption of pulses increases the satiety level hence controls appetite and helps in weight loss. In a study published in the Journal of the American College of Nutrition, pulse-eating adults weighed about 7lb less and had slimmer waists than their pulse-dodging counterparts – yet they consumed 199 calories more a day. Scientists believe this is because pulse-based diets contain more arginine, an amino acid that’s been shown to increase both carbohydrate and fat burning. Try upping your pulse intake with a hearty lentil and broad bean stew or soup. Broad beans and lentils are a rich source of arginine as well as glutamine, another amino acid that has been tied to aiding weight loss.

**Anti-ageing:** As well as high antioxidant levels, beans and pulses are a rich source of the B vitamin folate, which is useful for helping your body repair damaged cells. For an age-defying lunchtime treat, try a mixed bean salad or stir fry incorporating pinto beans, black beans and aduki beans. When it comes to antioxidant protection, these three are top of the crop according to researchers from the US Department of Agriculture.

**Prevent fatigue:** With a low glycaemic index, beans provide a slow, steady source of glucose instead of the sudden surge (and crash) that can occur after eating simple carbohydrates. Cannellini beans are a great low glycaemic bean. Boost your breakfast by heating a can of cannellini beans with a can of chopped tomatoes, onions, garlic and herbs for 20 minutes. Pile onto some wholegrain bread for the ultimate beans on toast.

**Gut-friendly:** Filled with fibre, pulses can promote regularity by preventing constipation. Make your tummy smile with a quick and easy humous dip. Whizz a can of chickpeas with garlic, oil, lemon juice, cumin and salt in a food processor until smooth and creamy. Chickpeas are rich in prebiotic fibres, which act as food for the healthy bacteria in your digestive system, and are lower in natural sugars than other types of legumes making them easy to digest.

**Helps to maintain sugar levels:** Patricia Sadri, well known Nutritionist from DENMARC says “Pulses contain proteins and fiber. Fiber helps the insulin to work effectively. It also helps to lose weight which, in turn helps in maintaining good sugar levels. Having a regular intake of pulses plays an important role in maintaining a good sugar control”

**Helps to maintain blood pressure:** Pulses are rich in potassium and potassium counteracts the sodium solution in food and helps to lower blood pressure.

**Do non-vegetarians also need to add pulses to their daily diet?**

“Non -vegetarians must include pulses in their daily diet as they are a rich source of protein but along with this they are low in fat and high in fiber as compared to the non veg food which is high in protein but at the same time also high in fat and cholesterol and low in fiber” says Pooja.
Whole pulses can also be sprouted. Sprouting increases the health quotient of the pulses. "Sprouts have more protein, minerals and vitamin and are easy to digest than the dried seed," adds Nutritionist Sweta.

The most common way to consume pulses is through the dals, the classic Indian dish, but there are other interesting ways to use in your diet.

**USES OF PULSES**

- All the pulses are used in a variety of ways.
- Pulses are used as a common foodstuff in forms as pulses, de husked, decorticated and whole seed. These are used as a stuff material in chapatis etc.
- Pulses are also used in the form of flour such as that of Bengal gram, green gram, black gram which are often called ‘besan’.

**IMPORTANCE OF PULSE CROPS IN INDIA**

- Pulses are rich in proteins and found to be main source of protein to vegetarian people of India.
- It is second important constituent of Indian diet after cereals.
- They can be grown on all types of soil and climatic conditions.
- They give ready cash to farmer.
- Pulses being legumes fix atmospheric nitrogen into the soil.
- They play important role in crop rotation, mixed and intercropping, as they help maintaining the soil fertility.
- They add organic matter into the soil in the form of leaf mould.
- Pulses are generally not manured or require less manuring.
- They are helpful for checking the soil erosion as they have more leafy growth and close spacing.
- They supply additional fodder for cattle.
- Some pulses are turned into soil as green manure crops.
- Majority pulses crops are short durational so that second crop may be taken on same land in a year.
- They provide raw material to various industries.
- Ex. Dal industry, Roasted grain industry, Papad industry etc.

**CONCLUSION**

Pulses are a type of legume (seeds that grow within pods). Pulses include chickpeas (also known as garbanzo beans), lentils and dry peas. Pulses provide protein, dietary fiber, and many vitamins and minerals. Pulses may be defined as the dried edible seeds of cultivated legume. The edible seeds of pulses are eaten by humans and animals. Older people can also benefit from eating pulses.

Pulses contain some anti-nutrients, which are substances that reduce the body’s ability to absorb the various minerals that pulses contain. When other foods are combined with pulses, the nutritional
value of pulses is further enhanced, as other foods help to ensure that the body is able to better absorb all the nutrients found in pulses. There are so many ways to eat pulses. Pulses, especially beans, can be added to soups, salads, and pasta sauces. The protein quality of vegetarian diets and plant-based diets is significantly improved when pulses are eaten together with cereals. Pulses are gluten-free. Pulses promote bone health. During menstruation, pulses are very good. Pulses are always types of beauty-aid. The English word pulse is taken from the Latin pulses, meaning pottage or thick pap. Pulses contain more protein than any other plant. Pulses are therefore, an excellent preventive against beriberi. Sprouted pulses are, therefore, an important food which will protect against scurvy. Pulses is an important part of the diet for most Indians. Pulses is a general term that is used for peas, beans and lentils. In India, different communities prepare delicious recipes using pulses.

Pulses are high in fiber, have low fat, no cholesterol, high protein, low glycemic index and high nutrient foods, says Nutritionist Pooja. "Pulses help in maintaining a healthy heart.

Regular intake of pulses may assist in weight management. Cannellini beans are a great low glycemic bean. Patricia Sadri, well known Nutritionist from DENMARC says “Pulses contain proteins and fiber. Whole pulses can also be sprouted. Sprouting increases the health quotient of the pulses. Pulses are used as a common foodstuff in forms as pulses, de husked, decorticated and whole seed.

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Swati N. Vaghela
System Executive
Gandhinagar, Gujarat (India)

Detailed About International Year of Pulses 2016

☑ The 68th UN General Assembly declared 2016 the International Year of Pulses (IYP) (A/RES/68/231)

☑ The Food and Agriculture Organization of the United Nations (FAO) has been nominated to facilitate the implementation of the Year in collaboration with Governments, relevant organizations, non-governmental organizations and all other relevant stakeholders.

☑ Raise awareness about the important role of pulses in sustainable food production and healthy diets and their contribution to food security and nutrition;

☑ Promote the value and utilization of pulses throughout the food system, their benefits for soil fertility and climate change and for combating malnutrition;

☑ Encourage connections throughout the food chain to further global production of pulses, foster enhanced research, better utilize crop rotations and address the challenges in the trade of pulses.

What are Pulses?

Pulses are also known and often referred to as legumes (plants with a pod) which is a plant in the family Fabaceae, or the fruit or seed of such a plant. Legumes are grown agriculturally, primarily for their grain seed called pulse, for livestock forage and silage, and as soil-enhancing green manure. Pulse is the term for the edible seeds of legumes (plants with a pod), which includes:

- Dry peas
Pulse comes from the Latin word pulse meaning thick soup. Beans, peas, lentils, and chickpeas are all very nutritious. All pulses are very high sources of fiber, an excellent source of folate, an excellent source of iron if eaten with a source of vitamin C, high in complex carbohydrates, and low in fat. These nutritional attributes make a pulse an important part of any healthy diet and can help maintain a healthy weight. Pulses have additional benefits for people, who have diabetes, have high blood cholesterol levels, tend to be constipated, have celiac disease or who are vegetarians.

A BRIEF HISTORY OF PULSES

It is estimated that humans have been growing and eating pulses for more than 11,000 years. Pulses have a rich and colorful history of nourishing cultures all over the world. Here's a look back at pieces of pulse history through the ages Pulse Timeline is given below.

- Dry beans
- Lentils
- Chickpeas
- Soybeans (technically an oilseed)
1st Century AD
By this time in history, black-eyed beans/peas had spread from their native land in West Africa to the Mediterranean, Asia and India.

8th Century AD
Chickpeas were mentioned in a text written by Charlemagne, then King of the Franks, about how to manage his estates.

12th Century AD
Charles the Good, count of Flanders, mentioned peas in a literary document as a staple food for the French.

15th Century AD
Phaseolus beans, a form of pulse which had been grown in Mexico for thousands of years, were brought to Europe by Spanish explorers returning home after discovering America. From there Phaseolus beans spread throughout the world.

17th Century AD
Green peas were introduced to the court of Louis XIV of France.

17th & 18th Century AD
Fur traders in Canada and the United States were fuelled on their canoe adventures by pea soup made with whole yellow peas.

18th Century AD
Ground and roasted chickpeas were cited by a German writer as a substitute for coffee in Europe.

19th Century AD
Pea soup was manufactured and packaged to feed to German troops during the Franco-Prussian war.
19th Century AD

French Flageole beans (a French kidney bean) were bred from a mutant dwarf bean by a gardener just south of Paris and widely adopted.

20th / 21st Century AD

Global pulse production nearly doubles in three decades, to 70 million tonnes in 2010.

21st Century AD

United Nations recognizes the growing importance of pulses as the future food of health, nutrition and sustainability, by declaring 2016 the International Year of Pulses.

Types of Pulses

<table>
<thead>
<tr>
<th>Indian/Hindi Name</th>
<th>English name</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arhar / Rahar / Tur / Tuar</td>
<td>Pigeon pea / Red gram</td>
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<tr>
<td>Chana</td>
<td>Chickpeas (Brown)</td>
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<tr>
<td>Cholia / Hara chana</td>
<td>Chickpeas (Green)</td>
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<tr>
<td>Chana Daal</td>
<td>Split Bengal gram</td>
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<tr>
<td>Pulse Name</td>
<td>Description</td>
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<td>----------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Chawli / Lobhia</td>
<td>Black-eyed beans / Cowpea</td>
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</tr>
<tr>
<td>Daal</td>
<td>Pulses / Split beans / Beans</td>
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</tr>
<tr>
<td>Dalia</td>
<td>Broken wheat</td>
<td></td>
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<tr>
<td>Kabuli Chana / Chhole</td>
<td>Garbanzo beans / Chickpeas (White)</td>
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<tr>
<td>Kulthi</td>
<td>Horse gram</td>
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<tr>
<td>Kurmura</td>
<td>Puffed rice</td>
<td></td>
</tr>
<tr>
<td>Masoor</td>
<td>Red lentils</td>
<td></td>
</tr>
<tr>
<td>Matar</td>
<td>Pea</td>
<td></td>
</tr>
<tr>
<td>Moong</td>
<td>Green gram / Mung bean</td>
<td></td>
</tr>
<tr>
<td>Motth / Matki</td>
<td>Turkish gram / Moth bean</td>
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</tr>
<tr>
<td>Pulses</td>
<td>Description</td>
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<td>--------------------------------</td>
<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>Poha</td>
<td>Beaten rice</td>
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<tr>
<td>Rajma</td>
<td>Kidney beans</td>
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<tr>
<td>Til</td>
<td>Sesame</td>
<td></td>
</tr>
<tr>
<td>Urad Daal / Kaali Daal</td>
<td>Black gram / Black lentil (whole) / White lentil (dehusked)</td>
<td></td>
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<tr>
<td>Vaal</td>
<td>Field beans</td>
<td></td>
</tr>
</tbody>
</table>

**What do we get from Pulses?**

- Contain large amounts of Vitamins and Minerals Per Calorie
  - **Key Minerals:**
    - Iron
    - Potassium
    - Magnesium
    - Zinc
  - **Abundant in B Vitamins:**
    - Folate
    - Thiamin
    - Niacin

- High in Protein, essential in amino acids
- Rich in complex carbohydrates
- High in fiber
- Healthy Microbiome
HEALTH BENEFIT OF PULSES:

Prevent Heart Disease
Studies have shown that people who eat more legumes have a lower risk of heart disease, and the phytochemicals found in beans might be partially to thank, since they protect against

Fight Cancer
Beans contain a wide range of cancer-fighting plant chemicals, specifically, isoflavones and phytosterols which are associated with reduced cancer risk.

Lower Cholesterol
Beans provide the body with soluble fiber, which plays an important role in controlling blood cholesterol levels. Studies find that about 10 grams of soluble fiber a day—the amount in 1/2 to 1 1/2 cups of navy beans—reduces LDL cholesterol by about 10 percent. Beans also contain saponins and phytosterols, which help lower cholesterol.

Help in lose weight
A serving of beans will help you feel full more quickly, because the rich fiber content fills your stomach and causes a slower rise in blood sugar. That should stave off hunger longer and give you a steady supply of energy.

Manage Diabetes
Beans are a diabetes sufferer's superfood! The balance of complex carbohydrates and protein provides a slow, steady source of glucose instead of the sudden surge that can occur after eating simple carbohydrates.

HEALTH RISK

Cause Migraines
Some legumes can trigger migraines or an allergic reaction in some people. If this happens, talk to a doctor and eliminate the culprit from your diet.

Raise Blood Pressure
If you take a monoamine oxidase (MAO) inhibitor to treat depression, avoid fava beans because they can interact with your medication and raise blood pressure.

Interfere with Vitamin Absorption
Some beans, like soybeans, contain substances that interfere with the absorption of beta-carotene and vitamins B12 and D. The heat from cooking inactivates most of these substances, making vitamin absorption more likely. But it’s still smart to compensate for potential vitamin loss by consuming plenty of fresh fruits and yellow or dark green veggies (to up your beta-carotene) and lean meat (for vitamin B12).

Trigger gout
If you suffer from gout, talk to your doctor about your bean consumption. People with gout are often advised to forgo dried peas, beans, lentils, and other legumes because of their high purine content. In susceptible people, purines increase levels of uric acid and can precipitate a gout attack.
**Make Gassy**

While not technically a health risk, beans can cause an embarrassing flatulence problem, particularly dried beans, lentils, and peas. Help reduce gas production by changing the water several times during the soaking and cooking process, and always rinse canned beans. Adding herbs like lemon balm, fennel, and caraway, or combining cooked legumes with an acidic food, might also help prevent flatulence.
Economic Study in the area of Pulse Production for Agriculture sector in Gujarat

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FOREWORD

For any nation, the base of its economic development is dependent on its structure of capital and the physical infrastructure. Human resources development is the prime foundation for any prosperous Nation. For enhancing the process of Progress, qualitative human force is as much important as the volume of workforce in numbers. The qualitative human resources create a vital impact on the prosperity, economic progress and for a sustainable growth of any nation. The mental as well as physical fitness of the workers, the intelligence of the professional and the expertise of the organizers etc. can contribute for a strong nation. People with ill health ill-nourishment and half feed are less efficient and effective at the work, in comparison to the people who take awesome adequate and protein contented food. Ability and competence to perform has direct connection with the health of the people. As quoted under constitution of our country, It is utmost necessary for the Government, to provide with the sufficient facility to the people, so as to keep their health intact.

Currently this year 2016, is being celebrated as year of pulses Industry, on International level. The Secretary General of UNO, Mr Ban Ki moon has opined that, pulses are the global nutrients, which can be an effective solution to the problems like starvation and malnutrition, worldwide to face and overcome such situation. We can’t afford to remain inactive and reluctant towards the cultivation of crops like pulses and Grams etc. In the countries having under developed economy, people are used to have pulses as main course of their daily food. Though our government is very keen to maximize the production of pulses on international scale, the need is vital to have enough efforts through the way of public private partnership. The production of pulses should be geared up, using the new and latest technology, tools, modernization and machineries, at agricultural farms. Our joint efforts are on, to achieve the targets.

Let us now talk about the impact of pulses production, on the economy of our state, Gujarat

SCENARIO OF AGRICULTURE IN GUJARAT

In Gujarat, 2/3 of population is dependent on agriculture. Raw materials for our industries are being provided by this sector. The food grain and other primary necessities are coming through agriculture. About 55% of the land area of Gujarat has been brought under cultivation. The major portion of such cultivated land contains of dry area and of having irregular and inadequate rain fall. In some areas, there are no enough facilities of irrigation. Field areas for forest are not ideally ample. So such situation has its adverse effect on agriculture. However but, the agriculture sector has its own importance on the economic point of view. In the state, major part of the population plays its role either as farmers or farm labours. For enhancing the employment in the sector, it is utmost necessary to develop the ancillary activities in the sector. If the production increases the other Industries will automatically get bust up
During last several year due to certain reforms in the Agricultural policies, it has been noticed a quantum increase in the production of pulses and grains. Thus agriculture sector is our super power to progress

**CLIMATE IN GUJARAT**

A major variance in occurrence of rainfall in the various parts of the state is the salient feature of the monsoon. During the whole year the climate remains normally hot. At the western coast, due to Arabian sea and the Bay of Khambhat, the atmosphere generally remains rather calm and enjoyable. In the areas around Rajkot, Surendranagar, the climate remains dry weather shows 21 centigrade and rainfall is recorded around lesser than 50 C.M. In the district like Vadodara, Bharuch, Surat, Valsad and Dang the climate ranges around more than 100 C.M. in the district like Gandhinagar, Ahmedabad, Mahesana, Junagadh, Bhavanagar and Sabarkantha the climate remains around 22 c. and occurrence of rainfall is between 50 to 60 c.m. The climate, rainfall and the pattern of farming are categorized in to seven sub zones as agro climatic zones. However in the year 2015-16, due to good rainfall, there is increase in production of various crops like vegetables, food grains and pulses

**AGRICULTURAL LAND IN GUJARAT**

Soil in the State is mostly fertile and of black mud. The areas of land under cultivation keep on rotating in use, for taking the agriculture production. There has been tremendous increase in the crop of pulses due to new technological advancement in recent year. In the year 2015-16 due to better rainfall, the crops like **Tuar, Mug, Grams, Urad, Muth** and other such crops are produced in great quantum. With the constant and consistent efforts by the Govt. there is improvement in the texture of soil and the land Reform Acts, have facilitated the improvement in the recent status of land owners. The farmers now can take two or three crops in one year. It is now time to make maximum use of limited land, in very systematic way

**IRRIGATION IN GUJARAT**

There are two sources of irrigating water for development of agriculture sector in the state (1) From seasonal rainfall and (2) through irrigation from the reservoirs, canals or rivers.

The pattern of rain fall in the state is very irregular. It is therefore very essential to adopt very systematic and modern process of irrigation for crops, its protection and preservation of water to irrigation, the ground based check dams, farm tanks are to be created to store and preserve the water. Under irrigation project state government has implemented the water irrigation scheme, named Sardar Patel partnership water irrigation plan. Under this scheme in the year 2011-12 and year 2012-13 respectively about 2970 and 1430 check dams were constructed. Up till now, in all, 69433 check dams have been built up so far. Under the scheme SujalamSufalam, launched by the Government, 16000 hectors of land in the areas have been benefitted. Government is keen to prevent the effect of salty water, which is likely to enter in the Kutch district. Under the Vanbandhuyojana, maximum districts in the state have been benefitted through irrigation. Through the participatory system in water conservation and with the inter connecting of rivers, the problems for water in the state will be resolved. The government with its sincere efforts will succeed in providing water for agriculture & farming. In comparison to year 2015 the kharif cultivation of pulses crop has been increased by 2.84 lacks hectors in Gujarat.
In comparison to year 2015 the kharif cultivation of pulses crops in year 2016

<table>
<thead>
<tr>
<th>Crops</th>
<th>Average (of 3 years)</th>
<th>2016</th>
<th>2015</th>
<th>Increase</th>
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<tr>
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<td>234600</td>
<td>336500</td>
<td>227600</td>
<td>108900</td>
</tr>
<tr>
<td>Mug</td>
<td>1050200</td>
<td>127000</td>
<td>99600</td>
<td>27400</td>
</tr>
<tr>
<td>Math</td>
<td>17300</td>
<td>29700</td>
<td>14700</td>
<td>15000</td>
</tr>
<tr>
<td>Urad</td>
<td>74200</td>
<td>197500</td>
<td>67400</td>
<td>130100</td>
</tr>
<tr>
<td>Other</td>
<td>12600</td>
<td>8500</td>
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<tr>
<td>Total</td>
<td>443900</td>
<td>699200</td>
<td>414600</td>
<td>284600</td>
</tr>
</tbody>
</table>

(Note: Figures of cultivation are in hectares)

The kharif cultivation of pulses crops has been increased by 2.84 lacs hectares in Gujarat. In Gujarat, during this year the sowing of pulses crops has been increased by about in 2.84 lacs hectares. In the year 2015, the cultivation was made in 4,14,600 hectares, which has increased in this year to 6,99,200 hectares. During last three years, there has been increase in sowing of pulses crops and the average cultivation is estimated to 4,43,400 hectares. Looking to this estimation we can say that the crop sowing is increased by about 157.51%. As per the statistic declared as on 2nd August, 2016 the sowing for Tuar pulses is in 3,36,500 hectares for Mug it is in 12700 hectares for Muth it is in 29,700 while for Urad it is in 1,97,500 hectares for other pulses it is recorded to be made in 8,500 hectares. In Bharuch district the sowing of Tuar crop is maximum and crossed about in 9,800 hectares. Vadodara district stands at number two, with estimated sowing in 65,800 hectares, while ChotaUdepur district is at number three with sowing of Tuar crop in 20,600 hectares. In all the total sowing in Tuar crop is made in 3,36,500 hectares, which was done in previous year for 2,27,600 hectares. The sowing of Mug crop is done in 1,27,000 hectares, which was done last year in 99,600 hectares. The maximum sowing for Mug pluses crop is done in Kutch district for about 59,900 hectares. Urad crop which was cultivated last year in only 67,400 hectares, that has increased to in 1,97,500 hectares. This shows a big increase. In north Gujarat sowing of the Urad crop is maximum in about 38,300 hectares at district Patan. Looking to the good increase in pulses crops it is expected that the rates of pulses crop may go down in near future. However during this year the rates were at highest level in all pulses products.

**ECONOMIC-FINANCIAL POLICY OF GUJARAT**

For busting up the production of pulses, in the state, it is essential to concentrate on the following two points

(1) **Green revolution** (2) **Organic farming**.

Green Revolution is such an avenue which has its development impact on various aspects. Economics, social and political changes are encouraged by this revolution. The use of various types of new seeds and innovative fertilizers, with increased facilities of irrigation, our state has taken a big jump in the field of agriculture. By using latest technique at the various stages of farming and practicing the process with latest types of farming tools and equipments, the pattern of sowing cultivating harvesting and warehousing have totally taken qualitative change. Also the mindset of our
farmers and their views towards farming are reformed. Since the year 2005, our Government has come out with Krishi Mahotsav. Krishirath is reaching to every village and each farmer. From the lab to land concept, and the mission for more crop per drop has helped our peasants in increasing their crop production not only in quantity but also in qualitative aspect. A massive change in every village has been brought in, through media, magazine and methods of training to the farmers. Our agriculture scientist are actively keen to spread the benefits of their latest research. The soil health cards give the analyses of soil, the elements of minerals, phosphorous and other qualities, which the land possess, and accordingly the pattern of cropping and system of irrigation are advised.

Our state has taken a big leap in helping our farmers to adopt organic farming the inspiration, encouragement and the support by Government has resulted in adopting organic farming, with enthusiastic way and speed. The pulses produced through organic farming are very nutritious in value. The farmer can take the crop at his farm two or three times in a year; still the fertility of the soil is preserved. The cost of production remains at low level. For example, in Amdavad district at taluka Sanand, a farmer in Jivanpura village has successfully harvested wheat sprouts grass, under organic farming. It is very surprising that he earned Rs. 9 lakhs yearly from only a small piece of his farm by adopting organic farming it is therefore possible for our farmers to export qualitative pulses production and provide the best illustration of organic farming.

**ECONOMIC VALUE OF PULSES CROPS**

1) Use of pulses is a boon to increase immunity power among the malnurtriated and pregnant women.
2) It is essential to develop new system and advanced pattern of pulses production in the state.
3) Farmers should get timely and affordable rates of their production of pulses crops.
4) Farmers should compulsorily be diverted toward organic farming.
5) Volume of capital investment toward agricultural sector should be enhanced.
6) The scope for contact-system should be enlarged.
7) Pulses should be provided at fair and cheaper rate to poor people in villages.
8) With enough capital investment for crop of pulses the export volume should be increased.

On the outset we state that the year 2016 is being celebrated internationally as year of pulses industry and our Gujarat must come out with flying colours in production of pulses not in the nation but in the world.

The poverty, malnutrition and starvation may prevented and abolished with the increased production of pulses through the partnership with people, our Government can go ahead in its efforts of producing record crop of pulses and carve out a big success for its economy in real term as Gatisheel Gujarat.

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Tapping the Tannin Component in Pulses through domestic processing techniques

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ABSTRACT

Pulses are considered to be an important and essential component of vegetarian diet, as they provide body building proteins. Pulses are rich in bioactive substances which include proteins and others with tannins. These bioactive substances have positive and negative effects on the human body. Tannins are bitter poly phenolic compounds present in almost all plants, have property of binding to and cause precipitation of proteins, amino acids and alkaloids. Polyphenols and tannins impact the health and nutrition which have property of binding to and cause precipitation of proteins, amino acids and alkaloids. Tannins can form complex with iron in gastrointestinal lumen. Reducing the absorption, digestibility and bioavailability of these nutrients. Tannin concentration ranges for different pulses. Household strategies of soaking, germination and pressure cooking reduces the levels of polyphenols and tannins in pulse based foods, thereby enhancing the bio availability of pulse protein. The present communication aims at discussing the importance of domestic household processing techniques to improve the bioavailability of protein in pulses through reduction in tannin level.

Key Words: Pulses, bioavailability, Tannin, domestic processing

INTRODUCTION

Pulses are high in protein, carbohydrate and dietary fibre and are rich source of other nutritional components. Consumption and production of pulses extends world-wide. Frequent legume consumption reduces chances of coronary heart disease by 22% and cardiovascular disease by 11%. Major pulses consumed by humans include peas, beans, lentils and chickpeas. Pulses impart physiological beneficial effects in humans.

Pulses are a rich in bioactive substance which includes enzyme inhibitors, phytates, lectins oligosaccharides and phenolic compounds. These substances play a definitive role in the metabolism of humans and animals. They produce effects some of which are beneficial for humans where as some are negative effects to the extent that they are considered as anti nutritional factors because of the harmful impact produced by them on the nutritional quality of the food article. Sometimes this effect is mixed (1). Tannins, Oligosaccharides, phytic acid, Trypsin inhibitors and Chymotrypsin inhibitors are considered as antinutrients, as they hamper the bioavailability of proteins and carbohydrates present in pulses.

Conversely these same compounds have found to have protective effects against cancer, have antioxidant properties and have DNA protective effects.
ANTINUTRITIONAL COMPOUNDS

Antinutritional compounds can be divided in two categories

- Proteins and protease inhibitors such as lectins
- Others: This includes
  - Dietary polyphenols, which includes phytates, tannins and proanthocyanidins
  - Oligosaccharides
  - Alkaloids
  - Haemagglutinins
  - What are Tannins

Tannins are polymeric flavonoids, belonging to a small part of the broad and diverse group of phenolic compounds produced by plants as secondary metabolites (2,3). Tannins are present in almost all plants, they are bitter polyphenolic compounds which have the property of binding to and cause precipitation of proteins, amino acids and alkaloids. Tannins can form complex with iron in the gastrointestinal lumen. Reducing the absorption, digestibility and bioavailability of these nutrients. Tannin concentration ranges for different pulses. Certain quality of pulses is reported to show absence of Tannins.

Tannins are concentrated mainly in the hull portion of the pulses, decortication results in more than 80% reduction of tannin content. Tannins cause inactivation of enzymes trypsin and chymotrypsin and make protein insoluble decreasing it’s bioavailability. Tannins also decrease the bioavailability of vitamins.

Tannins in plants and grains can be classified as hydrolysable Tannins and Non hydrolysable Tannins. Hydrolysable Tannins are glucose esters of gallic acid structure 1, whereas Non hydrolysable tannins also known as condensed tannins structure 2 are polymers of flavone-3-ols and are the predominant phenolic compounds in pulses.

Tannins have an important role in the defense system of seeds and protect them against many environmental damages, they are found in the testa of seeds.

Structure 1

\[
\text{Gallic acid flavone-3-ols}
\]

Health Effects

Polyphenols and tannins impact the health and nutrition. Concentration of tannins varies in pulses and grains, there is limited information available about the content of tannins in different pulses. This concentration again varies as per cooking or processing status. The profiles and quantities of
polyphenols and Tannins in food are affected by processing. Shweta Khandelwal, Shobha A. Udipi and Padmini Ghugra[4] estimated the level of polyphenols and tannins in different cultivars of four pulses commonly consumed in India. It included Phaseolusaureus, Lens esculenta, Cajanuscajan and Cicerarretinum. Effects of domestic processing which included germination, pressure cooking and soaking were examined. Researchers analyzed the results by ANOVA after calculating means and standard deviation. Polyphenol and tannin contents of cultivars of the same pulse reported significant difference (P< 0.001), tannin content of the pressure cooked red gram cultivar (P= 0.3103) was an exception. It was concluded that processing reduced the concentrations of polyphenols by 19-59% and of tannins by 22-59%. Household strategies of soaking, germination and pressure cooking reduce the levels of polyphenols and tannins in pulse based foods, thereby enhancing the bioavailability of pulse protein.

P. Udaishekhara Rao [5] also emphasized on the traditional methods to remove the major part of tannin present in pulse. He estimated the tannin content of different varieties of pigeonpea, chickpea, black gram and green gram and reported significant varietal differences in Tannin content. Decortication of pulse was reported to have resulted in 83-97% loss of tannin. The major loss in tannin content is attributed to cooking of raw pulse it resulted in to 70% loss, overnight soaking caused 50% loss. Loss of tannin due to germination may be due to enzymatic degradation.

Different varieties of pulses have different tannin or polyphenolic content. Dark highly pigmented varieties such as Red Kidney beans (Phaseolus vulgaris) and black gram (Vignaungo) have very high polyphenolic content. Lentils are also very rich in phenolic content; they have highest phenolic, flavonoid and condensed tannin content

Phenolic content of pulses is directly associated with antioxidant activity(6,7). Pulses like Lentils, Red Kidney beans and black beans have higher total phenolic content, they have higher antioxidant capacity as assessed by 2,2-diphenyl-1-picrylhydrazyl(DPHH) free radical scavenging, ferric reducing antioxidant power and the oxygen radical absorbance capacity.

CONCLUSION

Pulses are essential component of vegetarian diet. Phenolic component present in pulses can be optimized through household food processing techniques, as phenolic content provides antioxidant properties to the pulses. Cooking results in significant reduction in phytic acid and tannins in pulses, but overcooking should be avoided as it decreases the nutritive value of pulses by reducing the levels of essential elements remarkably.

REFERENCES

Crops are attacked and damaged by innumerable insect pests and other diseases and a most important from of crop protection is to prevent or combat and keep them down, so as to save the crop entirely or minimize losses as much as possible. There is hardly a single crop which is not subject to these attacks. Crops are also attacked in all stages and nearly every part of the crop, roots, stems, leaves, flowers and fruits, and produce while on the crop or harvested and in storage, are subject to attacks and serious damage. Roots may rot or be cut or bored through, so may the stems; leaves may shed, be eaten off or the sap sucked off, flowers and fruits both young and ripe may be eaten off, may shed, be bored through or stained, or whole plants may be killed out in all stages, even when fully grown, by wilts, rusts and blights.

The preventive measures consist mainly in keeping out infection, maintaining cleanliness or plant sanitation in the farm, and proper attention to a certain particular methods of cultivation. Growers can themselves prevent infection by exercising care in the selection of the seeds of planting material they use. Infection can be avoided in some cases by strict attention to cleanliness on the farm, by cutting down weed growth and scrub vegetation and wild grasses, etc. from which diseases and pests are likely to spread. Many well-recognized agricultural practices secure a considerable measure of freedom from the incidence of pests and diseases; the sloughing of fields in the autumn brings up the grubs and pupae of insects to the surface where they are promptly eaten by birds; the burning of stubble destroys bores and scale insects on the stems; the transplanting of rice in preference to broadcasting prevents the appearance of certain fungus diseases; and the general rotation of crops prevents the carry-over or perpetuation of particular pests and diseases from year to year. Sometime the grafting of susceptible variety on to an immune root stock serves to secure freedom from pests. It is also necessary that crops should be sown at the recognized seasons, peculiar to the localities and not planting should be preferably of varieties of strains of the crop which have proved to be immune to particular diseases or pests, unless they are otherwise unsuitable.

Even with the best of efforts it is not always possible to Keep out pests and diseases and recourse must be had to remedial or control measures. But this is not a modern development. Field pests and storehouse pests of crops were evidently as familiar and dreaded enemies of the farmer even in the vedic times, as now. Large and visible pests like beetles, bugs and caterpillars, and invisible enemies like fungi and bacteria attacked crops on the field; and in the granaries, rats and sparrows, moths and destruction. Destruction of corn by locusts, mice, and borer and their protection are described in the Atharvveda. It seems the vedic seers had much faith in the efficacy of mantras and incantations, through which they invoked the help of gods like Asvins and others toward off these agenacies of crop destruction. Thus, the Atharvavedic seer Kanva says: Of like forms to two, of various form two, black two, red two, both the brown and the brown -eared, the vulture and the cuckoo-they are slain. The worms that are white-sided, that are black with white arms, and whatever ones are of all farms- those worms we grind up. Up in the east goes the sun, seen of all, slayer of the unseen, slaying both those seen and those unseen, and slaughtering all worms. The yeuasas, the kaskasas, the stirrers, the sipavitnukas- both let the seen worm be slain, and let the unsees be slain.

2. ibid, pp 398-400
The three-headed, the three-humped, the variegated, and the whitish worm – I crush the ribs of it; I hew at what is its head. Like Atri I slay you, O worms, like kanva, like Jamadgni, with the incantation of Agastya I mash together the worms.

सरूऩौ द्वौ ववरूऩौ द्वौ कृ ष्णौ द्वो रोहहतौ द्वौ।
बभ्रुश्च बभ्रुकणणश्च गृध्: कोकश्च ते हता:॥
ये क्रिमयः शितिक्षा ये कृ ष्णः शितिबाहवः:॥
ये के च विशवृपास्तात्निक्रिमीन् जम्भयामासि:॥
उत्पुस्तातसूर्यं एति विशवृष्टो अहृष्टा ।
एष्टेन्श्च धन्नूहार्णांश्च सर्ववृश्च प्रमृणाः क्रिमान् ॥
वापासः कष्टकशां एजत्कः: शिपवित्नुकः:
एष्टेन्श्च हन्यताः क्रिमिस्तातष्ठच हन्यताम् ॥
हतो योवापः क्रिमाण्य हतो नदिनिमोत ।
सर्ववृन्तिः मष्टिःकरकरं ध्दा खल्वाणव॥
त्रितीरीयुं क्रिकुदुं क्रिनिः सार्द्रगमरुणम् ।
शुणाम्यस्य पृष्टीरपि वृषचमि याच्छरः:॥
अत्रिद्वः: क्रिमयो हःलम कष्टवज्ञजमदग्नवः:॥
अगस्त्यस्य ब्राह्मण सं पिनश्यहं क्रिमीन् ॥3(Atharvaved.-5-23-4 to10)

Grind down (destroy) the worms as a physician grinds his medicinal mixtures in a mortar. I destroy those which are visible to the eye and which not visible …those which bore and which are in the jungle, in the herbs.4

इन्द्रस्य या मही रष्ट्रिक्ष्मविशवस्य तर्कपी।
तपया पिनश्यस्य सं क्रिमान्हस्तदा खल्वाणव॥
एष्टेन्श्च सम्मतिमयो कर्मस्मांगमुम् ।
अन्नपूमिन्द्रस्वर्तुतलुपानक्रिमीन् ।
ये क्रिमयः: पर्वतेऽऽ वनेऽष्टोषधीषु पशुवप्स्वनत्:॥
ये अस्मां तन्नमावविविशु: सर्व तद्दृशां जतिन क्रिमीणाम्॥ A.वे.2-31-1.2.5

The worm of all forms, h four eyed, the variegated, the whitish- I crush the ribs of it; I hew at what is its head.5

विशरूपं चतुःस्य क्रिमि सार्द्रगमरुणम् ।
शुणाम्यस्य पृष्टीरपि वृषचमि याच्छरः:॥
अत्रिद्वः क्रिमयो हःलम कष्टवज्ञजमदग्नवः:॥

3. Atharvaved.-5-23-4 to10
4. Atharvaved. 2-31-1.2.5
5. A. V. 2-32-2-3
Kesava and Sayana in their introduction to the ceremonies prescribed in connection to the Atharvavedic hymn (6.50) of the seer Atharva at the Kausika sutra 51,17-22 mention a long list of pestiferous insects. The performances are as follows: (17) While the hymn is being cited, the performer ploughs a furrow with an iron plough about the field; (18) he scatters stones upon the field; (19) he ties a hair through the mouth of a tarda (insect) and buries him head downward into the middle of the field; (20) he while walking offers thrice to the Asvins milk of a cow with a calf of the same colour as herself; (21) he offers a Bali offering to Asa (region), to Asapati, to the two Asvins and to Ksetrapati; (22) on the day he performs the ceremonies, he shall remain silent up to the time of sun-set.

Parasara gives the following incantations, in the Krs –parasara, for the cure of the diseases of paddy:

- Om (Let there be) success, salutation to the preceptor, (let there be) welfare. The paramount king, Lord Rama, the venerable and victorious one, from his shrine like the Nandana-vana on the slope of the hill, as white as conch, kunda flower and moon, commands Hanumat, the son of wind, speedy like wind, the destroyer of hosts of enemies, remaining on the seashore, with sharp nails and uplifted tall, among many hundred thousands of monkeys, as follows, and directs the welfare of other – If in the field, belonging to such person of such and such gotra, the destroyers of crops like insects, pests, such as Rata etc., do not leave, then disperse them with your adamantile tall-Om, am, gham, gdim, ghum, ghah.

According to another school, the pest-averting incantation is as follows: Om, Success. Salutation to the feet of the preceptor. Hail… If the demoness, Triputi along with her seven sons has visited the entire field of so-and-so, of such and such village, in the guise of pests like Bhombha, Bhomdhí, Pandara-mukhi, Gandhi, Dhulirsngi, etc. and is doing various kinds of harm to the crop, then thou should strike hernalong with her sons and relatives with thy staff-like tail, which is harder than adamant, and heving torn them all into pieces with thy hard nails, throw them into brine of the southern ocean. If thou tarriest even for a moment in this task, then mayse thou be cursed by (or sworn by the name of) thy father Kesarin wind and thy mother Anjana. Otherwise, I shall not be thy master, nor thou my servant. Om, ghrim, ghrati ! Having written this incantation on the Ketaki-leaf.

6. Raghavan, op.cit, p.84.
with the thorn of Eilva, one should on a Sunday, (go to his field) with the hair of his head let loose, tie it the blossoms of a plant in the midst of crops on the north east corner of his field.7

In regard to these incantations and the efficacy thereof, A>K> Yegna Narayan Aiyer, Director of Agriculture in Mysore (Retired) and Chairman of the Policy Committee for Agriculture and Mysore Economic Conference, relates a couple of facts from his experience which may be found interesting.8 As a boy he used to watch his grandmother who was credited with powers of curing by mantra, uttering incantraitions over a patient or medicine or simply vibhuti (holy ashes) for application, and was curious to know what these mantras were, he succeeded one day in persuading her to teach them to him. He found that they were merely threats addressed to the diseases to depart from the patient immediately, lest dire consequences befall them, such as the breaking of bones, cracking of skull, flaying of skin, plucking out of the eyes, tearing limb from limb and such inquisition devilry. And, when after the lapse of some sixty years as he read the above-quoted mantras from the Atharvaveda, his surprise may by imagined.9

Another instance relates to the successful control of an insect pest on a Government Farm, by means of incantations. A pest had broken out on the Farm (he omits the name of the place) and the poor manager was at his wit's end trying to control to it; he had tried all the remedies which had been taught to him in the college, in vain, He finally called in a mantravadi as a last resort and to his amazement, the pest disappeared after that person had recited his report, which when published aroused much skeptical comment, not unmingled with pity for the poor manager's credulity.10

As a tool of human intentionality, mantras are protean. They are used in an astonishing variety of contexts, for a plethora of purposes, with a multitude of informing emotions, and by the widest variety of individuals. Many scholars might feel with Conda that the term mantra has 'kept a definite else has really demonstrated exactly the limits and content of this semantic kernel. Lurking behind our sense of the commonality of mantras one can sense the instinctive conclusion of the rationalist.11

7. Raghavan, op. cit.,pp.87-88; the mantra is not reproduced in the KP.
9. ibid.
10. ibid
Human Friendly: Green Gram (Mug)
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In the Indian traditions, the pulse/bean holds its uncommon place. The Indians are used to have various pulses day-to-day in their food vividly. As per the demand of various local food varieties in various regional areas, pulse can be used either widespread or limited. But it’s doubled usage and growing demand is undeniable in the recent time.

In India, Green Gram (Mug) is sowed in Andra-Pradesh, Maharashtra, Gujarat, Orrissa and, Tamilnadu. It is minimally sowed in the areas like Punjab, Rajasthan, Uttar-Pradesh, Madhya-Pradesh, Bihar, West-Bengal and, Karnataka. In Gujarat, it is sowed in the areas like Kheda, Ahmedbad, Surat, Panchmahal and, Bharuch districts.

It is believed that India and middle Asia is a native of Green Gram (Mug). Though there are no clarifications regarding its origin but its species is very closer to Sublobata (Roxb.) Verdcourt syn. Phaseolus Sublobatus Roxb. It founds in Himalaya a woody condition and considered as an ancestors of ‘Green Gram’ and ‘Oodad’. It is added in dwidaliya classes of febesheiiredPepiliyoniedi species tree. Its scientific name is Vigna radiate (Linn.) Wilczek syn. Phaseolus radiates Linn. P. aureus Rob. It is called in Sanskrit as “Mudag”, in Marathi as “Mung”, in Gujarati as “Mug”, in Telgu as a “PachyaPeslu”, in Tamil as “PachyaPayru”, in Kannad as “Hesru”, in Malayalam as “CheruPayak”or “Golden Gram”.

Green Gram is a yearly erect or sub-erect and 45 C.M. to 120 C.M. higher vegetable trees. Its top branches are used to wrap with the base. Their leaves are Trifoliate. Each leaf is ultimate, round like an edge and sharper at top by nature. Its flowers are of raceme typed. At the very top of this tree, there can be visualized approximately 10 to 25 yellowcolored like green butterflies flowers. These leafs are both by gender masculine as well as feminine, which contains ten punkesar and one female Kesar. They do Self-Fertilization process altogether. There arrives a bean at the very top of these Green Gram plants, which is 5.5 c.m. to 10 c.m. longer, slim, round and likely glabrous. In every fruit, there are 10 to 12 Green Gram or sometimes black, green, yellow, badami or jambli-badami seeds available. On that seed, it can be seen a white coloured thin scaled hilum. The total weightage of 100 seeds is approximately 3.5 g.m. to 4.0 g.m.

In India, almost 90 various species of Green Gram has been selected. In Gujarat, D 2-15, D 45-6, T 5-7, T 6-8 and T 12-2 has been selected. Generally Green Gram is sowed as a ‘Kharif’ Crop. But in the religions like Gujarat and Maharashtra, it is sowed in the season of winter. A deserted land is not suitable for the Green Gram and much / heavy raining is tremendous for this crop. It is cropped in the dry places and un or half dry places because it needs less water for its growth and development. It can also be cropped mixed with juwar, bajro or cotton as well. It is researched well at Kanpur and Sardar Krishnagar in the India. There are also possibilities of various diseases with this plant of Green Gram. This Green Gram, which can be cured with various Agro-medicines.

Likewise other ‘daal, Green Gram related dietary continues less calcium. It actually contains a lot of potassium along with good quality of blood fitine. It has a less quantity of Mithionin named Amino Acid. A riped seed helps to increase ‘Loh’ quality and fitine lesser.
The main usage of Green Gram is as a protein food. It contains 25% of protein and is a main source of protein for the vegetarian people. In food, it is used as a whole or daal. As it is easy to digest, it can be given to the sick man in a food like Mug-Rice or Khichdi. Water dropped Green Gram’s ‘Ghugri’ or ‘Shabji’ is indeed much healthy food for the growing children. Though, Green Gram is truly ideal protein food for the every stage of a human.

According to Manubhai Gaudani, Maharshi Charaka had divided ten-ten trees in 50 classes in his Granth. Out of these 50 classes, the very first class is “Jivaniya Class”. It is life surviving one, and Green Gram is no exception.

Green Gram is a cool temperament and much healthy. It is the mitigation of mistakes, but the important thing is biliary diseases. The outer lap of Green Gram is meningitis. Green Gram is very imperative for eyes.

Its Alkali elements include traces of feces, urine and ways of carryings vedanum keeps clean. An osamana of Green Gram and Mug Soup to digest the short-lousy. Because water is the cradle of mug fasting is meant to be extremely short digestive function while feasting. To enable this function and the harmful effect of very small water purification is. A sweet ball of Green Gram is cool, sperm enhancer and anti-disease. A roasted Green Gram, lahi and honey by adding a sugar is given to the patient to cure vomiting, exaggeration, burning and fever etc.

Various Ayurvedic Experimentations has been described regarding Green Gram in the ancient Purana/Granth as under;

1. **Diarrhea / Loose Motion:** A deases like dearie / loose motion can be cured by having a roasted Green Gram and a Rice dhani/soup adding a honey as well as sugar.
2. **Fever:** Fever, dearie and, vomiting can be cured with the soup of roasted Green Gram by adding mamra, and water along with honey and sugar in it.
3. **Heat Fever:** By drinking a soup of Green Gram and Ghado or jethi honey or also dropped in water for 12 hours can cure heat fever.
4. **Milk Storage in Boobs:** Either boob cancer or milk storage in boobs can be dissolved by a mixture of anti-cooked Green Gram and hot rice lap.
5. **Huge Belly:** One should be depended only either on boiled Green Gram or Soup at the night instead Gehu, Ghee, Milk. If needed, anti-cooked cucumber can be eaten. Such experimentation for the period of six months can decrease / loose an expected weightage or huge bulk.
6. **Bite’s (Pitta’s) vomit:** A soup of Green Gram and dry amla by adding sugar and one spoon ghee in it can cure such vomiting.
7. **Raktapitta or Raktastrava:** A soup of Green Gram, Gado, mamra, pipdanichal, khaas, moth and red chandan’s small pieces usage two time of a day (morning-night) aids us to cure Raktastrava. Relying on Mung water and butter milk can cure old diarrreah. Green Gram is also refining the entric-purification.

There are thousands of instances recorded who are cured their dangerous ‘Vat - Rakhtu’ on depended on Green Gram. For blood-Raktapitta womens, Green Gram is an excellent diet. It must be remembered that, Mug suppository, power-watt is an excellent benefit for putting the blood via the vagina. Hemorrhoids (Piles), Green Gram, Butter Milk, Amorphousecompenulatus and cumin for a grouping of individuals with excellent food substances.
As early as the 17th century, the European sailors’ sea filling the sack with them while escaping sphere carrying Green Gram sprout and eat while travelling. The people of Britain and Germany had sprouted beans to eat breakfast. Sprouted pulses are also used extensively in China. In India, they takes it 2-2 inches sprouted.

The hospitals of Britain, America and also naturopathic centers of Meyoclonic usually carry out experimentation on an Indian Foods. Here, it is proved that the usage of Green Gram is un-optional. It is given sprout Green Gram, Math and Chana to the patients in their food. About 35 years before, foreign writer named Dr. Martha Oliver in her “Âeda Fyu Sprouts” emphasized to have a sprout Green Gram along with many other beans/pulse. In addition, she informs that the girls who have it, makes a hair blacked with a good growth and much more smoother.

The Americans are still unable to understand the proper benefits of sprout pulses. However, on the basis of whatever the former researches been carried out, the famous American Investigate food journalist Árik Slosar’, in his book Çhew on this’ explained to have a maximum benefits of chewed pulses.

Green Gram gained its unique place on account of healthy values and vaidik usages in public talk (speech) as well as proverbs as under’;

1) મગ કહે હું લીલી દાણો;મારા માથે ચાુંદ,
     વે.યાર માસ જો મને સેવે તો માછા કહો મંડ-
2) એ પાલીયે મગ નહીં પડે = અનેશા કાંધ વાંશે નહીંલાંશા કહી પડું ધારેલું કામ સિક ધરો નહીં /.
3) લખ માગને એ ખડ= સગા લાખાંણકું,
4) મગ ઓંચાલાંણા= ભોલવં ઘટે છતાં ન ભોલવં મીન ધારાજા કરવ/
5) મગ ચકા= કામ પાર પકાવ.
6) મગ યારા સરખા= ગામે તેમ ભોલવં કરવ= કાંધમારં વગરનં ભોલવ/.
7)ભેખ સેયા ધારા= કામ પૂં ધરા રહેલું કામ કરી લેવ/.
8) માગને અદક બેગા કરવા સરખા= ભીખો કરી નાંખોયો બંધ પોટી /.
9) ભેખ વેસવાનસરખા = મહાજા ો ભાગા ધપાવા હોય ક ભાગા નહીં /.
10) માગનું નામ મરી ન પકાવ = સાંરો એ ઓढાં જાં પાક કહો જ નહીં ઓડે ધરું હોય તો પાક જાં ભોલા /.
      આવા તબ વાદંક કોમાં પાણે હોવાથી તે ઉપરદ્રી વાઝિયા માગનું નામ મરી ન પાડે બેપી).બિના જ્ેલા કરવ /.
     (ખેડવા ઉપરાં દ્વારથે ૪: 11) માગને છાંંદને મગ કરવી = કાંધ પાક કાંધ તરી તેરી.માગનો ટોડ જમિન જાણં જ પદશાય છ.
       (દે ઉપરદ્રી કાંધ પાક લાખ માં તેમ ન હો તેને માટે જમ ભોલાય છ તેવા છ છ છ કાંધ ઉપયોગ થતી નથી
12) માગને લખે મરી = બં તોધા લખે.
13) ભેખમાંથી પગ નીકલાંણા= નાની ઉમરના યે પખદા આગા પકાવ કામ કરવાના માટે જાણુ ભોલવ/.
14) મગ ડેસલો= રસ્તા તારક મીટ માંખાવી ને આશા રામની બેરી હોવ.

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Importance of Pulses

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WHAT ARE PULSES AND WHY ARE THEY IMPORTANT?

Pulses, also known as grain legumes, are a group of 12 crops that includes dry beans, dry peas, chickpeas, and lentils. They are high in protein, fibre, and various vitamins, provide amino acids, and are hearty crops. They are most popular in developing countries, but are increasingly becoming recognized as an excellent part of a healthy diet throughout the world.

Pulse crops are one of the most sustainable crops a farmer can grow. It takes just 43 gallons of water to produce one pound of pulses, compared with 216 for soybeans and 368 for peanuts. They also contribute to soil quality by fixing nitrogen in the soil.

Though pulses are a very popular crop in the developing world, there is a massive gap in productivity between pulse crops inside and outside the developing world. With the introduction of improved varieties and promotion of better management techniques, pulse crops can continue to be an excellent choice for farmers in the developing world.

Up to 25% of pulses are used as feedstuff, particularly for pigs and poultry. As a steady source of nutrition, feed for animals, and soil sustainability, pulse crops play a major role in food security, a role which will only grow in the future.

THE FUTURE OF FOOD

Pulses are the food of the future. They are the future of better nutrition… the future of improved health… and the future of sustainable food.

Pulses are good for people – They are a low fat, high fibre source of protein that is full of vitamins and minerals.

Pulses are good for the planet – They have a low carbon footprint and enrich the soil.

PULSES AND NUTRITION

Pulses are a low fat source of protein with high levels of protein and fibre. Pulses also contain important vitamins and minerals like iron, potassium and folate.

Pulses provide important nutrients and are recommended as part of a healthy diet

Most national dietary guidelines recommend pulses as part of a healthy diet. Studies have shown that people who eat at least ½ cup of pulses per day have higher intakes of fibre, protein, calcium, potassium, folate, zinc, iron, and magnesium as well as lower intakes of total and saturated fat.
Pulses are an important plant-based source of protein

Many diets around the world rely on pulses as a source of protein. The amount of protein in beans, lentils, chickpeas and peas is 2-3 times the levels found in cereal grains like wheat, rice, quinoa, oats, barley, and corn. For example, eating just ½ cup of lentils provides the same amount of protein as 1 cup of quinoa or 2 cups of rice or corn. Compared to animal and many other plant-based sources of protein, pulses are a more affordable and sustainable protein source.

All proteins are created from twenty different amino acid building blocks. Nine of these amino acids cannot be produced by the body and are called “essential” because they must come from foods we eat. Most plant proteins lack at least one essential amino acid. However, when two or more plant-based sources of protein are combined, each food can provide the essential amino acid(s) that the complementary food(s) is missing. Eating protein from a variety of sources, from both plant and animal sources, ensures the body receives all of the essential amino acids necessary for good health.

Pulses are an excellent source of dietary fibre and other complex carbohydrates

One cup of cooked pulses gives you more than half the amount of fibre you need for the entire day. Pulses also contain both soluble and insoluble fibre. Soluble fibre can help manage body weight, blood sugar levels and lower cholesterol. Insoluble fibre on the other hand, assists with digestion and regularity. Pulses also contain resistant starch, a type of carbohydrate that behaves like fibre in the body; and has been shown have similar health benefits such as reduced circulating cholesterol and blood sugar levels as well as improved gut health.

PULSES AND HEALTH

Diets rich in pulses contribute to good health and can reduce the risk of certain diseases. Pulses are a key part of healthy vegetarian and Mediterranean diets and dietary recommendations from diabetes, heart health and cancer organizations all include pulses.

Eating Pulses can help maintain a healthy body weight

Pulses are rich in protein and fibre, and a low in fat, which can all help with body weight management. Protein and fibre help you to feel fuller longer. In addition to fibre, pulses also have other carbohydrates that are complex and take longer to break down compared with other carbohydrates (simple sugars). This means they provide energy for a longer time after you eat them compared with a quick energy source like sugars. The carbohydrates in pulses include oligosaccharides and resistant starch which can increase production of good bacteria for a healthy gut.

Pulses can help reduce the risk of Chronic Diseases

Pulses can help to manage blood sugar levels and diabetes because they do not cause blood sugar levels to rise as much as sugary or starchy foods that are low in fibre. Keeping blood sugar levels within the normal range reduces the risk of developing diabetes and also helps people who have diabetes to avoid having more health problems associated with levels that are not well controlled.

Pulses are a heart healthy food choice. Research has shown that eating pulses can lower blood cholesterol, reduce blood pressure and help with body weight management, which are all risk factors.
for heart disease. Pulses are low in saturated and trans fats and high in soluble fibre. These are all important for a heart healthy diet.

Studies have shown that people who eat diets containing pulses regularly have reduced risks of some cancers. The high levels of fibre, and low amounts of fat in pulses, and the antioxidant vitamins they contain are thought to contribute to this protective effect.

**PULSES AND SUSTAINABLE FOOD**

**Pulses are a low carbon footprint food**

Pulses utilize soil bacteria to draw nitrogen from the air. This natural process replaces the need to add nitrogen fertilizers in pulse crops, which means pulses use half the energy inputs of other crops.

When soil is fertilized with nitrogen in the form of manure, fertilizer, or crop residue, soil micro-organisms convert some of this nitrogen into nitrous oxide, which is a powerful greenhouse gas. Nitrous oxide is 300 times more potent than carbon dioxide (CO2) and represents around 46% of the greenhouse gas emissions from global agriculture1.

Since greenhouse gas emissions related to crop production are largely driven by nitrogen fertilizers, nitrogen-fixing pulse crops have a lower carbon footprint compared to other crops.

**Pulses are a Water Efficient Source of Protein**

When pulses are grown, they use 1/2 to 1/10 the water of other sources of protein 2. Many pulse crops are adapted to dry environments, making them well-suited for areas that are prone to drought.

Pulses like peas and lentils extract water from a shallower depth, leaving more water deep in the soil for the following year’s crop. This increases the water use efficiency of the entire crop rotation.

**Pulses Enrich the Soil Where They Are Grown**

Pulse crops produce a number of different compounds that feed soil microbes and benefit soil health. After pulse crops are harvested, they leave behind nitrogen-rich crop residues that provide extra nutrients for the next crop that is grown.

Growing pulse crops in rotation with other crops enables the soil to support larger, more diverse populations of soil organisms that help maintain and increase soil fertility.

- Pulse provided opportunities for microbial life to flourish
- Breaks disease, weed and insect cycles
- Increases microbial diversity, helping crops to access nutrients

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The Prayer of Atharva-Veda gives a deeper meaning of ‘why we should live’.

For a hundred autumns may we see,
For a hundred autumns may we live,
For a hundred autumns may we know,
For a hundred autumns may we rise and progress,
For a hundred autumns may we thrive,
For a hundred autumns may we be (our true self).
For a hundred may we become (perfect beings).

Atharva-Veda(19.67)

Atharva-Veda consists one famous harvest song also:

Full of sweetness are the plants,
and full of sweetness these my words,
and with things that are full of sweetness
I prosper in a thousand ways. (Atharva Veda 3.24.1)
I know the Lord who is full of sweetness,
He has made abundant corn,
We hereby invoke him with our songs. (Atharva Veda 3.24.2)

In German it is very famous ‘Health dwells with the peasant’. Thompson said ‘Health is the vital principal of bliss’. In the words of Hippocrates ‘Let food be thy medicine and medicine be thy food’. If we want to live life of a hundred years with good health we should use pulses in our daily food. With a history rooted in the Bible and the writings of Hippocrates, lentils have maintained prominence in Middle Eastern and Indian cuisine since their cultivation 8500 years ago.

For nothing, 'dal chawal' is the staple diet for most Indians. And rightly so. Do you remember all the dietary advice you got while growing up? 'Eat your pulses' or to put in simple way 'Have a bowl of dal every day.' Pulses include chickpeas, peas, lentils and beans. Pulses are members of the legume plant family which are grown for us to eat.

Traditionally, different communities of India prepare delicious recipes using pulses. If the Punjabis love their share of rajmachawal or chana-puri, the Bengali love their cholar dal. The Gujarati khattimithi dal is something to relish with plain rice. Not to talk about the South-Indians' love for a meal of rice and sambar. Odisha's signature dish dalma is basically dal cooked with vegetables like brinjal, potato and pumpkin.

Pulses occupy a very significant and crucial position in agriculture. In the context of Indian agriculture and daily life, the contribution of pulses is immense and tremendous. A member of the legume family, lentils is edible pulses dried seeds grown in enclosed pods. Lentils are high in protein
and fiber, one cup cooked contains 18 grams of protein and 16 grams of fiber. A one-cupserving is an excellent source of folate, as well as iron, potassium and phosphorus, and a good source of intake of pulses, such as lentils, lowers cholesterol and helps reduce risk of heart diseases, diabetes and certain cancers. They are a cheap, low fat source of protein, fiber, minerals and they count towards our recommended five daily portions of fruit and vegetables.

The history of pulses is as old as the history of agriculture. Cereals and pulses are the two essential components of daily diet of people in India and they in right proportion provide the basic needs of protein, food and energy for good health and life sustenance. Pulses are evidently being cultivated in India since time immemorial. The use of kalai (blackgram) and mung (green gram) has been traced to pure Vedic time.

Mind is surely made of food; vital force is made of water and speech is made of fire. Of curd when it is churned, that which is its subtle part rises upward. That becomes clarified butter. In this very way of food, when it is eaten, that which is the subtle part, that rise upward and that becomes mind. (Chhandogya Upnishad 5.6.1 and 2) When nourishment is pure, reflections and higher understanding are pure, memory becomes strong, there is release from all the knots of heart. (ChhandogyaUpnishad 1.7)

The term ‘pulse’ is derived from the Latin word ‘Puls’ of ancient Greek which means ‘porridge’. These are legume crops with one to twelve seeds of variable size, shape and color contained in a pod. India is the home to not only of vegetarian cooking but also science of healthful living. The scripture known as Ayurveda is the oldest known work on biology, hygiene, medicine and nutrition. The importance of healthful living in spiritual life is mentioned by Lord Krishna in the Bhagvad Gita. There is no possibility of becoming a Yogi, O Arjuna. If one eats too much or too little, sleeps too much or does not sleep enough. One who is temperate in his habits of eating, sleeping, working and recreation can mitigate all material pains by practicing the Yoga system (Bhagvad Gita 6-16,17). The Bhagvad Gita divides food in to three classes: those of the quality of goodness, those of the quality of passion and those of the quality of ignorance.

Sanskrit is an ancient and classical language of India in which ever first book of the world Rigveda was compiled. Let us look at the documented history of chickpea in India. The Vedas and Brahadaranyaka (c. 5500 BC), mentions a grain called khalva. There is a large gap in documentation since the time when the Brahmanas, Aranyakas, and Upanishads (c. 6000–1000 BC) were compiled. We should realize that even today chickpea in roasted form is consumed much more commonly than any other pulse. The word kalaya has a striking resemblance to khalva, and very similar words are used today for chickpea in Karnataka (kadale) and Kerala (kadala). In the Buddhist literature (c. 400 BC), the word chanaka for chickpea gained popularity, and today most Indian languages, except Marathi, have words for chickpea derived from chanaka. There existed another old Sanskrit word for chickpea. It was harimanth (hari= horse; manth= agitating/chewing); chickpea grain has been fed to horses since ancient times. Today, the word in Marathi for chickpea is harbhara, which closely resembles harimanth, and has a similar meaning.

Maharshi Ved Vyasa is that famous a personality who outstands as a representative of extreme human intelligence and vast ocean like knowledge.

For black gram, the ancient Sanskrit name is masha. Even today in Punjab, black gram is called mash and in West Bengal, it is called mashkalaya. In all other Indian languages, the name uradis used, which seems to have originated from the Tamil word ulundu. Masha (black gram) has been mentioned in the Brahadaranyaka (c. 5500 BC) and in the Mahabharata (c. 2000 BC).
Susruta (c. 400 BC) considered green gram to be better than other pulses in terms of food quality. The *Brahadaranyaka* (c. 5500 BC), a commentary on the *Rigveda* (c. 8000 BC) mentions *khatakula*, which is the original Sanskrit name for horse gram.

Moth bean too is indigenous to the Indian subcontinent. Its earliest mention is in the *TaitriyaBrahmana*, a commentary on the *Yajurveda* (c. 7000 BC). There are two Sanskrit names – *makushtaoor makushtaka*, and *vanamudga* (literally meaning ‘wild green gram’). Names in most Indian languages today are derived from these two Sanskrit names, except the distinct Tamil name, *narippayir*. The name “moth bean” is coined from the Hindi name *moth*. Kautilya (321–296 BC) mentions moth bean as a rainy season crop.

We find one of the earliest references to pea in the dictionary (*Amarkosa*) of Amarsimha (c. 200 BC), who names pea as *satina, khandika, or harenuin* Sanskrit. In the later literature, the word *kalaya* (chickpea) was also used for pea, possibly from the Arabic *khalaj* for pea, since medieval India borrowed many words from Persian and Arabic. In the *BhatSamhita* (6th century AD), Varahamihira used the name *vatala* (Bhat, 1981), which might connote the flatulence (*vata*) causing property of pea. The *Bhavaparakash* (16th century AD) used names such as *vartula, satina,* and *hareneku*.

By the time Charaka (c. 700 BC) wrote his Ayurvedic treatise, the word *shimbiin*Sanskrit was used for pods, and most of the pulses were classified as *shimbidhanya* (grain produced in pods). The Sanskrit names for lablab bean are *nishpava, shimbi, rajshimbi,* and *vallaka*. In the Jain literature (c. 200 BC–300 AD), we find names such as *nippavaand valla*, both of which originated from the Sanskrit words. Ayurveda, it is believed that all living beings are constituents of the five basic elements, i.e. earth, water, fire, air and sky. In order to keep life going, it is important to replenish these elements through natural foods, which are main source of rejuvenating these elements. Natural foods, which include vegetables, fruits, nuts, cereals and other food stuffs, are essential vegetarian sources. Grains like rice, wheat, and pulses have been given a very special place in Ayurvedic literature – as the staple food for mankind.

There are plentiful references to agriculture and its every aspect in the sources on the Gupta period. Kalidasa has been the poet of India and the brightest star in the firmament of Indian poetry for the last two thousand years.

We find in Kalidasa that even the hermits utilized lands for the purpose of agriculture and produced different kinds of food grains for their own maintenance. Since rainfall played a crucial role in agriculture in mise of the areas, Varahamihira deals elaborately with metrological observations providing guidelines to cultivators. There were according to Varahamihira, three harvests at least in some parts of India. – the summer, autumn and spring crops. Both Varahamihira and Amarsimha( author of a thesaurus of Sanskrit *Amarkosha*) frequently mention various crops cultivated during the period, such as rice, wheat barley, peas, lentils, pulses, sugarcane and oil seeds.

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Lentils History and Cooking Enjoy

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Lentils are believed to have originated in central Asia, having been consumed since prehistoric times. They are one of the first foods to have ever been cultivated. Lentil seeds dating back 8000 years have been found at archeological sites in the Middle East. Lentils were mentioned in the Bible both as the item that Jacob traded to Esau for his birthright and as a part of a bread that was made during the Babylonian captivity of the Jewish people.

For millennia, lentils have been traditionally been eaten with barley and wheat, three foodstuffs that originated in the same regions and spread throughout Africa and Europe during similar migrations and explorations of cultural tribes. Before the 1st century AD, they were introduced into India, a country whose traditional cuisine still bestows high regard for the spiced lentil dish known as dal. In many Catholic countries, lentils have long been used as a staple food during Lent. Currently, the leading commercial producers of lentils include India, Turkey, Canada, China and Syria.

HOW TO SELECT AND STORE

Lentils are generally available in prepackaged containers as well as bulk bins. Just as with any other food that you may purchase in the bulk section, make sure that the bins containing the lentils are covered and that the store has a good product turnover so as to ensure its maximal freshness. Whether purchasing lentils in bulk or in a packaged container, make sure there is no evidence of moisture or insect damage and that the lentils are whole and not cracked.

Canned lentils can be found in some grocery stores and most natural foods markets. Unlike canned vegetables, which have lost much of their nutritional value, there is little difference in the nutritional value of canned lentils and those you cook yourself. Canning lowers vegetables' nutritional value since they are best lightly cooked for a short period of time, while their canning process requires a long cooking time at high temperatures. On the other hand, beans require a long time to cook whether they are canned or you cook them yourself. Therefore, if enjoying lentils is more convenient for you, by all means go ahead and enjoy them. We would suggest looking for those that do not contain extra salt or additives. (One concern about canned foods is the potential for the can to include a liner made from bisphenol A/BPA. To learn more about reducing your exposure to this compound, please read our write-up on the subject).

Store lentils in an airtight container in a cool, dry and dark place. Stored this way, they will keep for up to 12 months. If you purchase lentils at different times, store them separately since they may feature varying stages of dryness and therefore will require different cooking times. Cooked lentils will keep fresh in the refrigerator for about three days if placed in a covered container.

TIPS FOR PREPARING AND COOKING

Tips for Preparing Lentils
Lentils can be prepared the day of serving since they do not need to be presoaked. Before washing lentils you should spread them out on a light colored plate or cooking surface to check for,
and remove, small stones or debris. After this process, place the lentils in a strainer, and rinse them thoroughly under cool running water.

The Healthiest Way of Cooking Lentils

To boil lentils, use three cups of liquid for each cup of lentils. Lentils placed in already boiling water will be easier to digest than those that were brought to a boil with the water. When the water returns to a boil, turn down the heat to simmer and cover. Green lentils usually take 30 minutes, while red ones require 20 minutes.

These cooking times can be slightly adjusted depending upon the final use. If you are going to be serving lentils in a salad or soup and desire a firmer texture, remove them from the stove top when they have achieved this consistency—typically 5-10 minutes earlier than their usual cooking time. If you are making dal or some preparation that requires a mushier consistency, achieving this texture may take an additional 10-15 minutes.

HOW TO ENJOY

A Few Quick Serving Ideas

- Combine cooked lentils, and chopped sweet peppers to make a delicious cold salad. Season with your favorite herbs and spices.
- Toss buckwheat soba noodles with cooked lentils, small broccoli florets and leeks. Dress with olive oil mixed with garlic and ginger.
- Moroccan lentil soup is easy to make. After cooking lentils, add diced vegetables of your choice and season with soy sauce, coriander, cumin, turmeric and cayenne.

INDIVIDUAL CONCERNS

Nutritional Profile

Lentils are an excellent source of molybdenum and folate. They are a very good source of dietary fiber, copper, phosphorus and manganese. Additionally they are a good source of iron, protein, vitamin B1, pantothenic acid, zinc, potassium and vitamin B6.
The Health Benefits of Lentils

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The health benefits of lentils include a high protein content, improved digestion, a healthy heart, diabetes control, control of cancer, weight loss, a solution for anemia, and better electrolytic activity due to potassium. It is good for pregnant women, the prevention of atherosclerosis, and it helps in maintaining a healthy nervous system.

Lentils are edible pulses or seeds that belong to the legume family. These lentils mostly consist of two halves covered in a husk. Both the seeds are lens-shaped, which is probably why they are named Lens culinaris in Latin. They are also one of the oldest known sources of food, dating back more than 9,000 years.

Lentils can be consumed with or without the husk. Prior to the invention of milling machines, they were eaten with the husk. The husk contains the highest amount of dietary fiber. After the milling process was invented, the husk or skin was removed and the dietary fiber in lentils disappeared. Some of the popular kinds of lentils include black lentils, red lentils, brown lentils, mung bean, yellow split peas, yellow lentils, macachiados lentils, French green lentils, black-eyed pea, kidney beans, soya beans, and many more varieties. Each country has its own native group of lentils, which are more or less similar and provide the same benefits.

Lentils with a high protein content are considered a cheap source of protein. They are a rich source of essential amino acids like isoleucine and lysine. They are also a good source of micronutrients such as vitamins and minerals.

Lentils are consumed much more often in Asian countries, particularly India. India has the largest number of vegetarians and lentils can be a substitute for meat in supplying the required protein. One very good way to have lentils is after they have sprouted because sprouted lentils contain methionine and cysteine. These two amino acids are very significant in muscle-building and strengthening of our body. Methionine is an essential amino acid that is supplied through the food and cysteine is a non-essential amino acid that can then be synthesized.

**Nutritional Value of Lentils**

Lentils contain the highest amount of protein originating from any plant. The amount of protein found in lentils is up to 35%, which is comparable to red meat, poultry, fish, and dairy products. Lentils contain carbohydrates (15-25 grams per 100 grams). They are a good source of dietary fiber and also have a low amount of calories. Other nutritious components found are molybdenum, folate, tryptophan, manganese, iron, phosphorous, copper, vitamin B1, and potassium.

Lentils are also another source of phytochemicals and phenols. Both of these organic chemicals are known to provide health benefits, but the mechanism behind their work is yet to be determined. Often, lentils and meat are compared for their effectiveness and many people vote for meat as the
best source of protein. It is true that lentils do not contain all the amino acids, but they do have less fat content when compared with meat.

**HEALTH BENEFITS OF LENTILS**

Lentils, as an ancient food source, have been known to mankind for a very long time. The cultivation of lentils is as old as early agriculture. It provides lot of health benefits, which include the following:

**Good for Muscle Generation:** Our organs and muscles need a constant supply of protein for repair and growth of the body. Lentils, especially sprouted lentils, contain all the essential amino acids that are needed by our body for good muscle-building and smooth functioning of the body.

**Controls Diabetes:** A study conducted by Anderson and Bridges showed that in the various categories of foods, dietary fiber was found to be high in the case of the legume family. Lentils, along with beans and peas, belong to the legume family. Dietary fiber found food such as lentils helps in controlling blood sugar levels. Dietary fiber slows down the rate at which food is absorbed by the blood and thus maintains the sugar level constantly.

**Improves Digestion:** As lentils contain high levels of dietary fiber, it improves digestion if consumed regularly. It also helps in easy bowel movement, resulting in decreased constipation.

**Heart Health:** Lentils, with their negligible amounts of fat, are an ideal source of protein without adding any extra fat to the body, thereby promoting a healthy heart. Lentils contain magnesium, which helps in relaxing cardiovascular muscles and helping to lower blood pressure.

**Prevents Atherosclerosis:** Research conducted by Xu, Yuan, and Chang at the Department of Cereal and Foods Sciences in North Dakota showed that the consumption of lentils provides a supply of antioxidants that decreased the chances of developing atherosclerosis. Also, these antioxidants play a role in neutralizing free radicals and thereby preventing cell and gene damage (aging).

**Counteracting Cancer:** Studies conducted by Elvira González De Mejía & Valentin I. Prisecaru at the University of Illinois have found that plant lectins, a separate type of plant protein originating from foods like lentils, wheat, peanuts, peas, and soybeans have a great influence on cancer cells. Research studies have shown that these lectins cause cytotoxicity and apoptosis, which means that they have a great potential to control cancer growth.

**Good Source of Folic Acid:** Lentils are a good source of Vitamin B-complex, such as folate or folic acid. The consumption of folic acid by pregnant woman helps in preventing birth defects. According to study by Susan J Duthie, at the Rowett Research Institute in Aberdeen, UK, a lack of folic acid often results in neural tube defects. Folate found in lentils helps in the formation of red blood cells, is good for pregnant women, and plays a key role in maintaining homocystine levels. It is also known to be effective against hypertension and DNA damage, which may result in cancer.

**Weight Management:** Research studies suggest that the regular consumption of lentils can help in weight control and increase satiety.

**Healthy Nervous System:** It was long believed that micronutrients such as vitamins and minerals did not have an effect on the functioning of the brain. However, further research suggested that for the proper functioning of the brain, vitamins and minerals are equally important. According to the
research conducted by J.M. Bourre at the Department of Neuro-pharmaco-nutrition at Fernand Widal Hospital in Paris, vitamins and minerals found in lentils are helpful in optimum brain functioning.

**High Iron Content:** Lentils contain high amounts of iron, which is needed by the body for optimum hemoglobin production. About 36% of the iron of the Daily Recommended value can comes from eating 1 cup (200 grams) of lentils every day.

**Improved Electrolytic Activity:** Potassium, one of the minerals found in lentils, is regarded as a better substitute for electrolytic activity than sodium. Many diseases have been associated with a high sodium content and a low potassium content in the body. Apart from acting as an electrolyte, potassium is also helpful for the functioning of a number of organs like the heart, brain, and kidney.

**Boosts Metabolism:** Lentils are a good source of many vitamins, including vitamin B3, which plays a significant role in boosting the digestive and nervous systems. Vitamin B3 offers many other benefits, including cholesterol control, a decreased risk of diseases like Alzheimer’s disease, cataracts, osteoarthritis, and diabetes.

**A Few Things to Consider**

Although lentils are good for your health and are the best alternative for meat, poultry, and fish, they also have few disadvantages, which include:

**Risk of Kidney Stones:** Research conducted by Massey et al. at the Washington State University’s Department of Food Science and Human Nutrition showed that that some lentils such as soy beans, soy foods, peanut butter, and re-fried beans, contain high concentrations of oxalate compounds. These oxalate compounds were responsible for the formation of kidney stones. Therefore, individuals who have kidney stones should stay away from legumes and lentils.

**Risk of Kidney Diseases:** Consumption of high levels of protein has other side effects as well. On an average, the amount of protein needed for our body stands at 0.8 grams per one kilogram of body weight. Excessive protein consumption can pressurize kidneys in flushing out those excess proteins in the body. In the long run, that elimination can damage overall kidney function.

**Formation of Gas Due to Fermentation:** After entering the digestive system, lentils start fermenting and subsequently release gas. These gases can make matters uncomfortable and therefore, too much lentil consumption should be avoided unless you don’t mind being a bit gassy!
Lentil Pulses
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Compared to other types of dried beans, lentils are relatively quick and easy to prepare. They readily absorb a variety of wonderful flavors from other foods and seasonings, are high in nutritional value and are available throughout the year.

Lentils are legumes along with other types of beans. They grow in pods that contain either one or two lentil seeds that are round, oval or heart-shaped disks and are oftentimes smaller than the tip of a pencil eraser. They may be sold whole or split into halves with the brown and green varieties being the best at retaining their shape after cooking.

**Health Benefits**

Lentils, a small but nutritionally mighty member of the legume family, are a very good source of cholesterol-lowering fiber. Not only do lentils help lower cholesterol, they are of special benefit in managing blood-sugar disorders since their high fiber content prevents blood sugar levels from rising rapidly after a meal. But this is far from all lentils have to offer. Lentils also provide good to excellent amounts of seven important minerals, our B-vitamins, and protein—all with virtually no fat. The calorie cost of all this nutrition? Just 230 calories for a whole cup of cooked lentils. This tiny nutritional giant fills you up—not out.

**Lentils—A Fiber All Star**

Check a chart of the fiber content in foods; you’ll see legumes leading the pack. Lentils, like other beans, are rich in dietary fiber, both the soluble and insoluble type. Soluble fiber forms a gel-like substance in the digestive tract that snares bile (which contains cholesterol) and ferries it out of the body. Research studies have shown that insoluble fiber not only helps to increase stool bulk and prevent constipation, but also helps prevent digestive disorders like irritable bowel syndrome and diverticulosis.

**Love Your Heart—Eat Lentils**

In a study that examined food intake patterns and risk of death from coronary heart disease, researchers followed more than 16,000 middle-aged men in the U.S., Finland, The Netherlands, Italy, former Yugoslavia, Greece and Japan for 25 years. Typical food patterns were: higher consumption of dairy products in Northern Europe; higher consumption of meat in the U.S.; higher consumption of vegetables, legumes, fish, and wine in Southern Europe; and higher consumption of cereals, soy products, and fish in Japan. When researchers analyzed this data in relation to the risk of death from heart disease, they found that legumes were associated with a whopping 82% reduction in risk!!

A study published in the Archives of Internal Medicine confirms that eating high fiber foods, such as lentils, helps prevent heart disease. Almost 10,000 American adults participated in this study and were followed for 19 years. People eating the most fiber, 21 grams per day, had 12% less coronary heart disease (CHD) and 11% less cardiovascular disease (CVD) compared to those eating
Lentils' contribution to heart health lies not just in their fiber, but in the significant amounts of folate and magnesium these little wonders supply. Folate helps lower levels of homocysteine, an amino acid that is an intermediate product in an important metabolic process called the methylation cycle. When folate (as well as vitamin B6) are around, homocysteine is immediately converted into cysteine or methionine, both of which are benign. When these B vitamins are not available, levels of homocysteine increase in the bloodstream—a bad idea since homocysteine damages artery walls and is considered a serious risk factor for heart disease.

Lentils' magnesium puts yet another plus in the column of its beneficial cardiovascular effects. Magnesium is Nature's own calcium channel blocker. When enough magnesium is around, veins and arteries breathe a sigh of relief and relax, which lessens resistance and improves the flow of blood, oxygen and nutrients throughout the body. Studies show that a deficiency of magnesium is not only associated with heart attack but that immediately following a heart attack, lack of sufficient magnesium promotes free radical injury to the heart. Want to literally keep your heart happy? Eat lentils.

**Lentils Give You Energy to Burn While Stabilizing Blood Sugar**

In addition to its beneficial effects on the digestive system and the heart, soluble fiber helps stabilize blood sugar levels. If you have insulin resistance, hypoglycemia or diabetes, legumes like lentils can really help you balance blood sugar levels while providing steady, slow-burning energy. Studies of high fiber diets and blood sugar levels have shown the dramatic benefits provided by these high fiber foods. Researchers compared two groups of people with type 2 diabetes who were fed different amounts of high fiber foods. One group ate the standard American Diabetic diet, which contains with 24 grams of fiber/day, while the other group ate a diet containing 50 grams of fiber/day. Those who ate the diet higher in fiber had lower levels of both plasma glucose (blood sugar) and insulin (the hormone that helps blood sugar get into cells). The high fiber group also reduced their total cholesterol by nearly 7%, their triglyceride levels by 10.2% and their VLDL (Very Low Density Lipoprotein—the most dangerous form of cholesterol) levels by 12.5%.

**Iron for Energy**

In addition to providing slow burning complex carbohydrates, lentils can increase your energy by replenishing your iron stores. Particularly for menstruating women, who are more at risk for iron deficiency, boosting iron stores with lentils is a good idea—especially because, unlike red meat, another source of iron, lentils are not rich in fat and calories. Iron is an integral component of hemoglobin, which transports oxygen from the lungs to all body cells, and is also part of key enzyme systems for energy production and metabolism. And remember: If you're pregnant or lactating, your needs for iron increase. Growing children and adolescents also have increased needs for iron.

**DESCRIPTION**

Lentils are legumes, seeds of a plant whose botanical name is Lens ensulenta. They grow in pods that contain either one or two lentil seeds.

Lentils are classified according to whether they are large or small in size with dozens of varieties of each being cultivated. While the most common types in the United States are either green or brown, lentils are also available in black, yellow, red and orange colors. These round, oval or heart-
shaped disks are small in size, oftentimes smaller than the tip of a pencil eraser. They are sold whole or split into halves.

The different types offer varying consistencies with the brown and green ones better retaining their shape after cooking, while the others generally become soft and mushy. While the flavor differs slightly among the varieties, they generally feature a hearty dense somewhat nutty flavor.

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**INTRODUCTION**

A variety of pulse crops are grown in India and world. Among the crops, the major ones are Gram, Pigeonpea, Lentil, Fieldpeas etc. According to history, origin of Gram is in South West Asia – probably Afghanistan and Persia, Pigeonpea in Africa, Lentil in Turkey to South Iran and Fieldpeas in Mediterranean Region of Southern Europe and Western Asia. Pulses are consumed as Dal, which is a cheap source of plant protein. These are consumed because of body building properties due to presence of various amino acids. These also have medicinal properties. By products of pulses like leaves, pod coats and bran are fed to animals in the form of dry fodder. Some pulse crops like Gram, Lobia, Urdbean & Moongbean are fed to animals as green fodder. Moong plants are also used as green manure which improve soil health and adds nutrient into the soil. Pulses are major source of plant protein and carbohydrates. Other nutrients like Phosphorus, Minerals, Vitamin C, Riboflavin and essential Amino acids are also major constituent.

India is the largest producer, largest consumer and the largest importer of pulses in the world. In India Pulses are grown in around 24-26 million hectares of area producing 17-19 million tonnes of pulses annually. India accounts for over one third of the total world area and over 20 per cent of total world production. India primarily produces Bengal gram (chickpeas), red gram (tur), lentil (masur), green gram (mung) and black gram (urad). For majority of vegetarian population in India, pulses are the major source of protein. Pulses and pulse crop residues are also major sources of high quality livestock feed in India.

In the world, pulses are grown by 171 countries. At triennium ending 2010-11, the total area under pulses was 723 lakh ha. This area provided about 644.08 lakh tonnes of pulses with a productivity of 890 kg / ha. The highest area was contributed by India (32.24 %) followed by Niger (7), Myanmar (5.33), Brazil (5.29) and Nigeria (4.44). Similarly, the contribution to total production by India was 23.46%, Canada 7.93, China 7.09, Myanmar 6.89 and Brazil 5.29. The highest productivity was of France (4219 kg / ha) followed by Canada (1936), USA (1882), Russian Federation (1643) and China (1596). At triennium ending 2010, Beansdry was cultivated by 120 countries, which contributed 37.63 % area to total world area, Chickpea by 52 contributed 15.95 %, Cowpeadry by 33 contributed 15.06 %, Peasdry by 96 contributed 8.45 %, Pigeonpea by 21 contributed 6.54 %, Lentil by 51 contributed 5.16 % & others 11.07 %. The share to World production of Beansdry was 33.48 % followed by Peasdry 15.91, Chickpea 15.51, Cowpeadry 8.45, Pigeonpea 5.88, Lentil 5.87 & others 14.9.

**PRODUCTION**

Different methods of sowing: Most of the pulse crops like Arhar, Moongbean, Urdbean, Mothbean, Kulthi, Gram, Lentil, Fieldpeas, Lathyrus, Rajmash and Cowpeas are sown by line sowing method and some farmers also undertake sowing by broadcasting method. Some states sow the seeds of Pigeonpea by drilling / dibbling. Pulses i.e. Moongbean, urdbean, fieldpeas, lentil, chickpea, cowpea, mothbean, khesari and horsegram are harvested manually using sickle. Pigeonpea...
crop is harvested by sickle as well as gadasa. At maturity of pigeonpea crop, the field is irrigated and after 3-4 days crop is uprooted by the farmers. This practice helps farmers to sow the seeds of succeeding crop in time. Most of the pulse crops are dried in the fields for 2-3 days and thereafter, threshed by normal thresher and this is also done by beating the dried plant by heavy sticks. Pigeonpea grains are separated by beating the plants on some hard objects like stone and heavy wood. To avoid storage losses in pulses, these should have 9-10% moisture at the time of placing in storage. Farmers, who have small quantity of pulses, store them in storage bins (Tin made) mixing them with Neem leaves. If the quantity is big, then it may be kept in scientific storage of Central Warehousing Corporation (CWC) and Food Corporation of India (FCI) to minimize the storage losses by pests. For the triennium ending 2010-11, the domestic consumption of pulses in India was 186.5 lakh tonnes. Against this, India produced an average quantity of 158 lakh tonnes. During this period, there was a gap of 28.5 lakh tonnes of pulses in demand and supply. This gap was due to higher growth of population as compared to pulse production. On an average, pulses are sown in an area of 239 lakh ha. To sow this area, about 101 lakh quintals of seeds are required including 63 lakh quintals of Gram, 4 lakh quintals of Lentil, 7 lakh quintals of fieldpeas, 5.5 lakh quintals of Urdbean, 6 lakh quintals of Moongean and 7 lakh quintals of pigeonpea. Against this requirement, on an average, 20.83 lakh quintals of certified/quality seeds were supplied, including 12.5 lakh quintals of Gram, 0.74 of Lentil, 1.47 of Fieldpeas, 1.96 of Urdbean, 1.76 of Moongbean and 1.52 of Arhar. As such, it may be concluded that, at 100% SRR, about 80.17 lakh quintals of certified/quality seed more is required.

In India pulses are cultivated on marginal lands under rain fed conditions. Only 15% of the area under pulses has assured irrigation. Because of the high level of fluctuations in pulse production (due to biotic and abiotic stress) and prices (in the absence of an effective government price support mechanism) farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. Farmers are getting attracted towards cash crops like Bt cotton, maize and oilseeds (mainly soybeans) because of better return and lower risk. Consequently area under these crops has increased over the years to the detriment of pulses (Table 1).

In order to give the much needed fillip to pulse production, the government has included pulses in the NFSM (along with wheat and rice) since the launch of NFSM in October 2007 and has been

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (million hectares)</th>
<th>Production (million tonnes)</th>
<th>Yield (kg./ hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-81</td>
<td>22.46</td>
<td>10.63</td>
<td>473</td>
</tr>
<tr>
<td>1990-91</td>
<td>24.66</td>
<td>14.26</td>
<td>578</td>
</tr>
<tr>
<td>2000-2001</td>
<td>20.35</td>
<td>11.08</td>
<td>544</td>
</tr>
<tr>
<td>2010-11</td>
<td>26.40</td>
<td>18.24</td>
<td>691</td>
</tr>
<tr>
<td>2011-12</td>
<td>24.66</td>
<td>17.09</td>
<td>699</td>
</tr>
<tr>
<td>2012-13</td>
<td>23.47</td>
<td>18.34</td>
<td>781</td>
</tr>
</tbody>
</table>

Nevertheless, improvement in yields, albeit modest, has contributed to higher pulse production in recent years. Most of the increase in pulse production in recent years has been in gram. Low pulse yield in India compared to other counties is attributed to poor spread of improved varieties and technologies, abrupt climatic changes, vulnerability to pests and diseases, and generally declining growth rate of total factor productivity

In order to give the much needed fillip to pulse production, the government has included pulses in the NFSM (along with wheat and rice) since the launch of NFSM in October 2007 and has been

significantly increasing the MSP for most pulses. Over the past four years, the increase in MSP was a massive 87 percent for tur, 71 percent for urd, and 63 percent for mung. Among rabi pulses MSP for gram for MY 2014-15 was fixed at Rs. 3,100 per quintal and masur at Rs. 2,950 per quintal, although a modest increase over the MY 2013-14 level of Rs. 3,000 and Rs. 2,900 per quintal, nevertheless a massive increase of 76 percent and 58 percent, respectively, since 2010-11.

**CONSUMPTION AND PRICES**

Pulse production has recorded less than one percent annual growth during the past 40 years, which is less than half of the growth rate in Indian human population. Consequently per capita production and availability of pulses in the country has witnessed sharp decline. Per capita net pulse availability has declined from around 60 grams per day in the 1950s to 40 grams in the 1980s and further to around 35 grams per day in 2000s. However, in the past four years, there has been significant increase in consumption averaging around 50 grams due to somewhat higher production, thanks to the National Food Security Mission (NFSM) focus on pulses, and larger imports, mostly of dry peas from Canada and Australia.

Higher production combined with larger imports has resulted in a marginal increase in pulse consumption estimated at around 50 grams per day in 2012-13 compared to less than 40 grams prior to 2012-13. This level of consumption is estimated to have been maintained in 2013-14. Larger imports of dry peas in recent years due its lower international prices have resulted in its increased share in the domestic pulse consumption.

The increasing mismatch between production and consumption of pulses has resulted in larger imports of pulses in recent years. Imports of pulses in 2012-13 (Apr-Mar) were a record 4.0 million tonnes an increase of 500,000 tonnes over 2011-12. 2012-13 imports included 1.37 million tonnes of dry peas and dun peas (mattar), 506,000 tonnes of pigeon pea (tur), 642,000 tonnes of green pea (mung), 698,000 tonnes of chick peas, 506,000 tonnes of lentil (masur), 84,000 tonnes of kidney beans (rajma), 180,000 tonnes of other beans and 24,000 tonnes of other pulses. Imports in 2013-14 through November 2013 at 2 million tonnes were about 500,000 tonnes behind imports during the corresponding period of 2012-13 reflecting larger domestic production and higher cost of imported pulses due to the depreciation of Indian rupee against US$. Total imports in 2013-14 are projected at 3.5 million tonnes.

Domestic price inflation for pulses as a group measured by Wholesale Price Index remained in the negative territory since June 2013, largely due a significant decline in gram prices, the major pulse in India. Price inflation in other pulses, mainly mung and masur, although showing some declining trend, remained high in 2013 (see Figure 5). Due to expected higher production of gram in 2014, price inflation of pulses as a group is likely to remain subdued in 2014-15, unless the 2014 kharif season pulse crop declines significantly.

**TRADE**

India imported about 4 million tonnes of pulses during 2012-13. Although based on current assessment kharif pulses production in 2013-14 has remained nearly the same as in 2012-13, due to a likely increase in rabi season pulse production, imports are expected to decline marginally during 2014-15.
Despite being world’s largest producer of pulses, only small exports of pulses are taking place from India, both because of restrictions on exports and the high domestic demand. The supply-demand balance sheet for pulses is provided in Table 2.

| Table 2: Demand and Supply Balance Sheet for Pulses (000 tonnes) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                | 2010-11         | 2011-12         | 2012-13         | 2013-14         |
| Production                      | 18,240          | 17,090          | 18,340          | 19,770          |
| Imports                         | 2,780           | 3,500           | 4,010           | 3,500           |
| Total supply                    | 21,020          | 20,590          | 22,350          | 23,270          |
| Total Export                    | 209             | 175             | 200             | 200             |
| Domestic Use                    | 20,811          | 20,415          | 22,150          | 23,070          |
| Total utilization               | 21,020          | 20,590          | 22,350          | 23,270          |
| % imports to production         | 15.2            | 20.5            | 21.7            | 17.8            |

**SUMMARY AND CONCLUSION**

Because of the high level of fluctuations in pulse production (due to biotic and abiotic stress) and prices (in the absence of an effective government price support mechanism) farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. Nevertheless, improvement in yields, albeit modest, has contributed to higher pulse production in recent years, with most of the increase in pulse production in recent years in gram. Low pulse yield in India compared to other counties is attributed to poor spread of improved varieties and technologies, abrupt climatic changes, vulnerability to pests and diseases, and generally declining growth rate of total factor productivity.

In order to give the much needed fillip to pulse production, the government has included pulses in the NFSM (along with wheat and rice) since the launch of NFSM in October 2007 and has been significantly increasing the MSP for most pulses. This has resulted in an above normal growth in pulse production in recent years.

In the past four years, there has been significant increase in pulse consumption averaging around 50 grams due to somewhat higher production and larger imports, mostly of dry peas from Canada and Australia.

The increasing mismatch between production and consumption of pulses has resulted in larger imports of pulses in recent year with imports in 2012-13 (Apr-Mar) reaching a record 4.0 million tonnes an increase of 500,000 tonnes over 2011-12.

Despite being world’s largest producer of pulses, only small exports of pulses are taking place from India, both because of restrictions on exports and the high domestic demand.

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Prospects for Export of Processed fruits and Pulses

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Lecturer Sheth C.L Commerce College, Ahmedabad Gujarat (India)

ABSTRACT

Agreements for conformity of standards, standards equivalence and agriculture market access for agriculture products in the focus countries should be encouraged. There are 5200 processing units of fruits, pulses and vegetables in India. exports have acquired added significance in the wake of liberalization wave sweeping across the world. during the period 2000-2001 to 2013-14. India’s export of processed fruits and vegetable’s increased by more than fourteen times. Food processing and value addition will be crucial for any strategy to boost export of agriculture products.

INTRODUCTION

Any international trade in agriculture and processed food products depends on the international demand and supply situation, availability of the concerned product in the domestic market at reasonable price; health safety and quality standards as may be applicable in the importing countries and price competitiveness. For the reasons, it is important to disseminate information about the quality requirement of major markets, created a network of certifying agencies baked with laboratories manned by trained technicians. People with less physical strain are easily victimized by this disease. no physical activities and the consumption of oily 'fatty food and to the probability of this disease because they result in the dump of fats on the walls of blood vessels. Though people have started getting aware of this alarming situation now, this disease has been spreading very fast causing the complications in the functioning of heart which often result into death. This disease is not appearing only in India. Any international

OBJECTIVE

1. To study the attitude of the people about the food and nutrition and to survey the people complaining high cholesterol
2. There has been a noticeable compositional changes in India’s export basket between 2000-01 and 2014.

Table-1

<table>
<thead>
<tr>
<th>Place</th>
<th>Number of respondents</th>
<th>Know anything about cholesterol</th>
<th>What contained item is used more?</th>
<th>Which oil do you use? Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>ghee</td>
</tr>
<tr>
<td>Rakiyal</td>
<td>50</td>
<td>20</td>
<td>30</td>
<td>38</td>
</tr>
<tr>
<td>Gomtipur</td>
<td>50</td>
<td>35</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Maninagar</td>
<td>50</td>
<td>5</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A survey was made of 150 people from area Rakiyal, Gomtipur and Maninager and city Ahmedabad was made which provided some interesting result. In maninager area people wear illiterate but they were doing more physical work and hence were not experiencing the problem of high cholesterol much. But in rakhbyal, gomtipur people had less physical work and were taking diet with more fats, and hence had more problems of high cholesterol.

Table-2
India's Export of processed fruits and vegetables since 2000-01
(Value in crore)

<table>
<thead>
<tr>
<th>Year</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>9212.88</td>
</tr>
<tr>
<td>2001-02</td>
<td>10169.43</td>
</tr>
<tr>
<td>2002-03</td>
<td>13827.95</td>
</tr>
<tr>
<td>2003-04</td>
<td>14184.17</td>
</tr>
<tr>
<td>2004-05</td>
<td>16828.17</td>
</tr>
<tr>
<td>2005-06</td>
<td>23197.05</td>
</tr>
<tr>
<td>2006-07</td>
<td>30282.70</td>
</tr>
<tr>
<td>2007-08</td>
<td>35779.70</td>
</tr>
<tr>
<td>2008-09</td>
<td>36294.42</td>
</tr>
<tr>
<td>2009-10</td>
<td>34825.25</td>
</tr>
<tr>
<td>2010-11</td>
<td>43626.88</td>
</tr>
<tr>
<td>2011-12</td>
<td>83485.42</td>
</tr>
<tr>
<td>2012-13</td>
<td>11825.94</td>
</tr>
<tr>
<td>2013-14</td>
<td>136920.07</td>
</tr>
</tbody>
</table>

Source; APEDA New Delhi

It is clear from the above table that during the period 2000-01 to 2013-14 India’s export of fruits and vegetables increased by more than fourteen times.

Table-3
India's Export of Agricultural and processed foods and pulse (During 2013-14)

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Product</th>
<th>Qty(2013-14)</th>
<th>Value (2013-14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jaggery and Confectionery</td>
<td>14,332.58</td>
<td>5,081.68</td>
</tr>
<tr>
<td>2</td>
<td>Cereal preparations</td>
<td>6692.66</td>
<td>3905.71</td>
</tr>
<tr>
<td>3</td>
<td>Basmati Rice</td>
<td>3706.18</td>
<td>2984.09</td>
</tr>
<tr>
<td>4</td>
<td>Dairy product</td>
<td>716.48</td>
<td>2097.69</td>
</tr>
<tr>
<td>5</td>
<td>Alcoholic Beverages</td>
<td>2962.67</td>
<td>2082.26</td>
</tr>
<tr>
<td>6</td>
<td>Miscellaneous preparations</td>
<td>2143.60</td>
<td>814.72</td>
</tr>
<tr>
<td>7</td>
<td>Other processed Fruits and vegetables</td>
<td>1673.53</td>
<td>1127.24</td>
</tr>
<tr>
<td>8</td>
<td>Non-Basmati Rice</td>
<td>6918.78</td>
<td>1927.56</td>
</tr>
<tr>
<td>9</td>
<td>Wheat</td>
<td>25.50</td>
<td>4.97</td>
</tr>
<tr>
<td>10</td>
<td>Floriculture</td>
<td>2.08</td>
<td>5.41</td>
</tr>
<tr>
<td>11</td>
<td>Cucumber and Gherkins</td>
<td>21.00</td>
<td>6.12</td>
</tr>
<tr>
<td>12</td>
<td>Other Cereals</td>
<td>45.96</td>
<td>8.99</td>
</tr>
<tr>
<td>13</td>
<td>Cocoa Product</td>
<td>9.34</td>
<td>18.50</td>
</tr>
<tr>
<td>14</td>
<td>Pluses</td>
<td>45.69</td>
<td>24.58</td>
</tr>
<tr>
<td></td>
<td>Item</td>
<td>Unit 1</td>
<td>Unit 2</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>15</td>
<td>Guargum</td>
<td>13.70</td>
<td>33.75</td>
</tr>
<tr>
<td>16</td>
<td>Fruits and Vegetable Seeds</td>
<td>2.87</td>
<td>34.65</td>
</tr>
<tr>
<td>17</td>
<td>Fresh Onions</td>
<td>289.00</td>
<td>39.03</td>
</tr>
<tr>
<td>18</td>
<td>Natural Honey</td>
<td>26.57</td>
<td>40.62</td>
</tr>
<tr>
<td>19</td>
<td>Casein</td>
<td>26.57</td>
<td>40.62</td>
</tr>
<tr>
<td>20</td>
<td>Milled product</td>
<td>528.49</td>
<td>131.42</td>
</tr>
<tr>
<td>21</td>
<td>Mango pulp</td>
<td>564.67</td>
<td>352.52</td>
</tr>
<tr>
<td>22</td>
<td>Groundnuts</td>
<td>0.12</td>
<td>0.07</td>
</tr>
<tr>
<td>23</td>
<td>Walnuts</td>
<td>0.04</td>
<td>0.26</td>
</tr>
<tr>
<td>24</td>
<td>Dried and preserved Vegetable</td>
<td>0.57</td>
<td>0.46</td>
</tr>
<tr>
<td>25</td>
<td>Fresh Grabes</td>
<td>2.13</td>
<td>1.84</td>
</tr>
<tr>
<td>26</td>
<td>Fresh mangoes</td>
<td>2.00</td>
<td>1.99</td>
</tr>
<tr>
<td>27</td>
<td>Other fresh vegetables</td>
<td>6.22</td>
<td>2.96</td>
</tr>
<tr>
<td>28</td>
<td>Maize</td>
<td>2.12</td>
<td>3.01</td>
</tr>
<tr>
<td>29</td>
<td>Other fresh fruits</td>
<td>4.51</td>
<td>3.56</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40765.63</td>
<td>20681.28</td>
</tr>
</tbody>
</table>

Source: DGCIS Annual Export

**CONCLUSION**

1. Competitive prices of Indian processed fruits and pulses and vegetables.
2. Poor crop husbandry practise and limited extension services and incidences of pests and diseases leading to low yields and lower incomes for farmers.
3. Small holder farmers lack modern business and farming knowledge for export markets, hence India can easily enter in this market.
4. High costs of certain imports hybrid seeds, fertilizer and pesticides make it hard for small scale farmers to shift to high management practices.
5. Farmers lack sufficient technical and innovative knowledge pest and disease control, soil fertility, harvesting and post-harvest techniques resulting in low production efficiency, crop losses, non –sustainable production system etc. while India has sufficient technical and innovative knowledge.
6. Lack of access to appropriate financial services for farmer and trading, resulting in lack of working capital to invest in farming.
7. Lack of irrigation facilities and knowledge about high value and volume vegetables, causing farmers to be unable to produce off –season and improve market access.

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Cowpeas Facts and Health Benefits

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Cowpeas also known as Vigna unguiculata is a legume of the family Fabaceae/Leguminosae. It is also known as Bachapin Bean, Southern Pea Black Eyed Cowpea, Black Eyed Dolichos, Poona Pea Black-Eyed Pea, Rope Bean Black-Eyed Bean, Red Pea China Bean, Marble Pea, Common Cowpea, Macassar Bean, Cowgram, Cowpea, Kafir Bean, Cultivated African Cowpea, Crowder Bean, Field Pea and Crowder Pea. The names of cowpea in various languages are: (German) Augenbohne, Langbohne; (Hindu) Chauli, Kulath; (Japanese) Sasage; (Korean) Tongpu etc. There are 7 varieties of cowpea which are named as Blackeye or purple eye peas, Browneye peas, Crowder peas, Cream, White acre type, Clay types and Forage cultivars.

HISTORY

It was found in Africa but nowadays it is also cultivated in Southeast Asia, Africa, Southern United States and Latin America. Around 200 BC and 300 BC, it was introduced to India and Europe respectively.

PLANT

Cowpea is an herbaceous legume which grows annually in a warm climate with adequate rainfall. It is the crop which grows well in the warm season, temperate zones and humid tropic. It prefers well drained, sandy soils or sandy loams. The plant grows up to 24 inches in height. The flower has got the shape of bell in the color of white, pink, dirty yellow, purple or blue. The leaves are dark green and 10 cm long with smooth, rhomboid, pubescent and shiny to dull appearance. The leaves are dark green with smooth, rhomboid, pubescent and shiny to dull appearance. The stem is 3 m long with smooth, straite, slender hairy and some shades of purple. The plant has got no branches at all. The plant has the taproot with an expansion of lateral roots in the soil. The parts of the plant which are edible are roots, green leaves, immature pods, seeds and green seeds.

SEED

The pod is yellow, green or purple, slightly curved and cylindrical with 6-10 inch long. Each pod possesses 6-13 seeds. The seeds are white, green, cream, buff, brown, red and black. It has got the shape of kidney with 6-12 mm in length. It has got the flavor of nuts. The seed has got the lifespan of 5 year

Cowpea is loaded with various types of nutrients. It is rich in fiber, protein, iron, potassium, low in fat and calories. The cup of cowpea possesses 11.1 g fiber, 13.22 g protein, 4.29 mg iron, 475 mg potassium, 0.91 g fat and 198 calories. Along with that, various amino acids such as 0.612 g of tryptophan, 0.41 g of histidine, 0.188 g of Methionine and 0.894 g of lysine is contained in this seed.

HEALTH BENEFITS OF COWPEA

1. Prevent Cancer
Cowpea possesses folate (Vitamin B9) which assists in lowering the chances of neural tube defects like anencephaly or spina bifida. The deficiency of folate leads to the birth defects such as malformations of limb and heart. Folate is also essential for the replication of DNA because the fetus cells could not grow without the presence of folate. This is an essential vitamin that is necessary for having a healthy pregnancy. The pregnant women should consume the prenatal vitamin so that they would consume the adequate amount of folate. Cowpea possesses Vitamin B9 by 356 µg which provides the eighty nine percentage of the daily recommended value.

2. Prevents Anemia
Cowpeas possess the mineral (Iron) in high amount which eliminates the anemia. Iron assist in the protein metabolism which is essential for the RBCs and hemoglobin production and also inhibits anemia. Anemia is the result of the low hemoglobin and red blood cells. Anemia affects the body parts and also reduces the energy levels. It leads to the poor functioning of the brain and reduction in immunity. World Health Organization surveys that the half of the anemia cases are caused due to the deficiency of iron and other are caused due to the genetic factors.

3. Supports a Healthy Metabolism
Potassium, copper, various antioxidants and folate assist to maintain the metabolism health in the people who intake the cowpeas daily. Copper acts as an essential part in functioning 50 different reactions of metabolic enzymes in the body. The reactions of enzymes are vital to maintain the smooth functioning of metabolism. 0.458 mg of copper is present in the cowpeas.

4. Helps Maintain Strong Bones
Cowpeas possess the calcium and phosphorus which is a vital mineral to maintain the strength and structure of bones. Manganese assists in the formation of bones by regulating the enzymes and hormones which is involved in the process of bone metabolism. Phosphorus assists in the mineral density of bones that forbs the bone break, fracture and osteoporosis. To have the healthy bones, it is a must to balance the calcium and phosphorus levels. Cowpeas contains 4% calcium, 38% phosphorus and 35% manganese. The osteoporosis in women is helped with the presence of vitamin D, zinc, magnesium, calcium, copper and boron in cowpea.

5. Encourages Mental Well-being
Cowpea possesses tryptophan which is effective for treating disorders of social anxiety, insomnia and provides a sound sleep. It assists the neurotransmitters which maintain the level of energy, control mood and appetite. The cowpeas can enhance the level of histidine as it possesses histidine in 0.41 mg which provides thirty three percent of the daily recommended value.

6. Helps heal and repair muscle tissue
Cowpeas contain isoleucine which assist to raise the endurance and also fixes the tissue in the muscles and promotes the clotting of the injury. The presences of amino acids enhance the energy. Valine, isoleucine and leucine are three chain of amino acid which enhances the recovery of muscles. It also stabilizes the blood sugar. 0.53 grams Isoleucine, 1.01 grams leucine and 0.63 grams Valine is obtained in one cup of cooked cowpeas.

7. Helps maintain bowel health
The cowpeas possess dietary fibers which promote and softens the stool. It reduces the constipation with the easy flow of bulky stool. The bulk is added to the stool because the fiber helps to absorb the water. The diet rich in fiber reduces the chances of small pouches in the colon and hemorrhoids.
8. Supports a Healthy Cardiovascular System
   The presence of Vitamin B1 is a must for the production of neurotransmitter which is also known to be acetylcholine which passes messages between the muscles and nerves. The recent studies summarizes that thiamine counteracts with the heart diseases and maintains the healthy function of ventricles which cures the heart failure. Adding vitamin B1 rich food Cowpeas to your diet may help to prevent cardiovascular diseases.

9. Supports Immune system
   Cowpeas possess threonine which may assists the immune system by promoting the antibodies production. The threonine produces the serine and glycine which is essential for the collagen, muscle tissue and elastin production. It maintains the healthy and strong connective muscles and tissues. Cowpeas which are rich in threonine may help to boost your Immune system.

10. Prevent Cold Sores
    The lysine in the cowpea reduces the genital herpes or cold sores and also speeds up the healing process. The daily intake of the cowpeas reduces the chances of recurrence of cold sores. One cup of cowpea provides 0.90 g of lysine which means 27% of DV.

11. Prevent Depression
    The amino acid phenylalanine in Cowpeas may help to prevent depression. The studies have shown that the phenylalanine is effective for the therapy of depression. The mood of the people was improved as they took phenylalanine because the raise in the production of chemicals such as norepinephrine and dopamine. Hence depression and other health conditions such as migraines and insomnia may prevent by adding phenylalanine rich food Cowpeas to your diet.

12. Prevent Diabetes
    Cowpea possess high amount of magnesium which is essential for the metabolism of glucose and carbohydrate. The research summarizes that the intake of the food rich in magnesium reduces the chances of the type 2 diabetes by 15% in approx. The clinical studies show that the intake of magnesium improves the insulin sensitivity. The researchers have shown that the low presence in the level of magnesium leads to the defect in the secretion of insulin and also reduces the sensitivity of insulin. It inhibits diabetes but does not cure it. As it possess the carbohydrate by 27%, it stimulates the level of glucose so the patients of chronic diabetes must consult with medical professional before consume it.

**Traditional Usage**

1. **Leaf**
   Leaves and seeds are used as a bandage in order to treat skin swellings and infections. It is also applied to treat burns. Leaves are chewed to treat tooth disorders.

2. **Root**
   The root acts as an antidote for snakebites. The infusion of seeds treats amenorrhea and the use of crushed roots with porridge cure the chest pain, epilepsy, painful menstruation and dysmenorrhea.

3. **Seed**
   The powder made from the seeds is used to treat insect stings. The liquor of cowpea which is cooked with spices is effective for common cold. The worms in the stomach could be eliminated with the boiled cowpea. The roots of other plant if cooked with the seeds, is effective in treating the bilharzias and blood in urine.
4. Plant
The plant is used to make emetics which treats fever and heals urinary schistosomiasis caused due to Schistosoma haematobium.

5. How to Eat
Cowpeas could be cooked or either steamed after soaking in the water whole night. It is added to the various recipes as well. Along with the pea, chilies, tomatoes and onions could also be added.
Health Benefits of Pulses: A Review

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ABSTRACT
According to the World Health Organization, non-communicable chronic diseases, such as heart disease, stroke, cancer, chronic respiratory diseases, and diabetes, are by far the leading cause of mortality in the world, representing 60% of all deaths. Nutrition has moved from being viewed only as a preventive modality to being recognized as a disease management tool. Health professionals are promoting dietary changes, including the increased consumption of plant foods like “pulses.” Pulses (dried beans, peas, and lentils) have been consumed extensively in the world. According to FAO, pulses are more than cheap and delicious and are nutritional powerhouses packed with protein, B vitamins, iron, potassium and low in fat. In this review, the focus is on the role of pulses in maintaining good health to protect from several life-threatening chronic conditions by highlighting the work that has been published as a result of numerous clinical trials in the past few years. Observational studies consistently show an inverse relationship between pulse consumption and risk for obesity. Due to higher content of fibre pulses have a low glycaemic index, making them particularly beneficial to people with diabetes by assisting in maintaining healthy blood glucose and insulin levels. Moreover pulses may have significant anticancer effects as the phytochemicals, saponins, and tannins found in them possess antioxidant. Pulse’s consumption also improves serum lipid profiles and positively affects several other cardiovascular disease risk factors. In conclusion, consuming at least half a cup of pulses per day can enhance diet quality by increasing intakes of nutrients and can be benefited for living healthy with reduced risk of several chronic diseases. The review suggests promoting “Pulses as nutritious seeds for a sustainable future”.

Keywords: Pulses, beans, peas, chickpeas, lentils, Diet, Nutrition, Health Benefits, Chronic Diseases

INTRODUCTION
According to the World Health Organization (WHO), non-communicable chronic diseases, such as heart disease, stroke, cancer, chronic respiratory diseases, and diabetes, are by far the leading cause of mortality in the world, representing 60% of all deaths. Viable and sustainable solutions are straight away needed. Nutrition has moved from being viewed only as a preventive modality to being recognized as a disease management tool. Health professionals are promoting dietary changes, including the increased consumption of plant foods like “pulses.”

Pulses (beans, peas, and lentils) have been consumed extensively in the world. Numerous clinical trials have been examining how whole pulses, and the individual components produce protective and therapeutic effects to such chronic health conditions.

METHODOLOGY
The main objective of this review study is to evaluate the impact of pulses in maintaining good health and several life-threatening chronic conditions like obesity, cardiovascular disease, diabetes and cancer as well as highlighting the work that has been revealed by a systematic review and meta-
analysis of all available clinical trials in the past few years and provide evidence and recommendations about health implications of pulses for better living.

**Review of Literature**

Pulses, a subgroup of legumes, are plant species members of the Leguminosae family (commonly known as the pea family) that produce edible seeds which are used for human and animal consumption. Pulses are a type of legume that is exclusively harvested for the dry grain and therefore excludes peanuts and soybeans, which are harvested for their oil. – FAO

The name - Pulses comes from the Latin “puls” meaning “thick gruel, porridge, mush.” Pulses include mainly dried beans, lentils, chickpeas, and dry peas. (Figure 1).

According to FAO, pulses, including all kinds of dried beans and peas, are not merely cheap and delicious; they are also highly nutritious source of protein and vital micronutrients that can greatly benefit people's health and livelihoods, particularly in developing countries.

Nutrition Benefits of Pulses - Pulses are nutritional powerhouses packed with protein, B vitamins, iron, potassium and low in fat as well as have various therapeutic effects (Figure-2). Not only are pulses easy to prepare, but they also can serve as a meat alternative. Pulses, by their virtue of being wholesome, nutritious and healthy, are really the "Super-Foods" and make perfect ingredients waiting to be taken full benefit of. The protein power of pulses makes them an important food for maintaining a healthy diet with an average of 15 grams of protein per cup. In fact, the protein content of pulses ranges from 17–30% of dry weight which is typically twice the amount found in cereal.

![Figure-1 The classification of Pulses](image1)

![Figure-2 Nutrition of Pulses](image2)

Pulses contribute about 10% of protein intake and 5 percent of energy intake in low-income countries and are extremely beneficial for women and children because folate is a key nutrient during periods of rapid growth, such as pregnancy and infancy. While pulses are low in calories (260-360 kcal/100 g dried pulses), they are high in complex carbohydrates and fibre, which means they are slowly digested and give a feeling of satiety. Pulses promote a steady, slow-burning energy while their iron content helps transporting oxygen throughout the body, which boosts energy production and metabolism. Pulses are gluten free and can be eaten by people with celiac disease. Pulses are a great alternative to wheat-based products. They add starch, fibre, protein, and many vitamins and minerals that may be lacking from a gluten-free diet. The 2005 Dietary Guidelines for Americans,
developed by the USDA, recommend eating three cups of dry beans a week who consume 2000 kcal/day57.

A healthy vegetarian diet should include a variety of peas, beans, lentils and chickpeas in place of beef, pork, chicken and fish. Eating pulses combined with grains, such as wheat, rice, or oats, ensures a high quality protein.

Pulses also contain enzyme inhibitors, lectins, oligosaccharides, polyphenols, phytates, and saponins also known as anti-nutritional factors (ANFs), that affect the digestibility and bioavailability of nutrients in humans59. Interestingly, sprouted pulses can significantly diminish polyphenols and tannins, and the protein, carbohydrates and fats begin to break down into a pre-digested form, leading to an easier and better digestion and making for better overall digestion. Sprouts have large amounts of body essentials especially Vitamin A, B, C. Hence weight loss is one of the greatest benefits of eating sprouts. Sprouts help in removing excessive Sodium out of the body and also help in better circulation of blood in the body. Sprouts contain antioxidants and nutrients that help in averting Skin wrinkles and Acne. Sprouts contain an abundant amount of fibres or roughage that help in bringing out the toxic waste in the body which might also help lead to loss of weight and also act as a medicine if you are suffering from Constipation problem57.

RESULT

THE HEALTH BENEFITS OF PULSES

Including Pulses-dry beans- in a health-promoting diet is especially important in meeting the major dietary recommendations to reduce risk for chronic diseases such as coronary heart disease, diabetes mellitus, obesity and cancer5.

Pulses and Satiety and Weight Management - Observational studies have consistently shown an inverse relationship between pulse consumption and BMI or risk for obesity25. Peter Jones32 found that consuming Pea fibre significantly decreases insulin resistance by up to 20% compared to control and help to reduce obesity. Dr. G. Harvey Anderson’s6 research demonstrates that regular consumption of pulses (5 cups per week for 8 weeks) without further dietary advice improved long-term blood sugar control, reduced the amount of food and calories eaten and decreased the waist line and blood pressure of overweight and obese individuals (n=40). Sylvie Dodin44, from Laval University investigated how eating 3 cups of pulses weekly for 16 weeks affected components of metabolic syndrome, percentage of body fat and food habits in women (n=134) and found a favourable effect on anthropometric variables. A systematic review and meta-analysis of all available clinical trials found that people felt 31 % fuller after eating on average 160 grams of dietary pulses compared with a control diet and feel fuller was true across various age categories and Body Mass Indexes45. The meta-analysis in 2016 looked at 21 clinical trials involving 940 adult men and women, who lost an average of 0.34 kilogrammes over six weeks with the addition of a single serving -130 grams of pulses to the diet - and without making a particular effort to reduce other foods58.

Pulses And Type 2 Diabetes Mellitus- Pulses are a low-glycemic food with GI values ranging from 28 to 52 (using glucose as the reference)7. A meta-analysis of 11 studies revealed that low-GI diets resulted in a decrease in mean blood glucose levels, a decrease in Hb A1c, and improved plasma lipid parameters compared with high-GI diets13. Low-GI diets that include pulses have been found to be effective metabolic stabilizers in type 1 and type 2 diabetic patients. Inclusion of pulses in a healthy diet can benefit those with diabetes and help prevent healthy people from becoming
Adding dry beans, dried peas, or chickpeas to diets improved the glycemic and insulin response compared with the ingestion of liquid glucose, brown rice, or potatoes. The intake of vegetables and pulses was associated with a significantly reduced risk of all-cause mortality associated with diabetes. In addition to consumption of whole pulses, the bioactive alpha-amylase inhibitor, derived from Phaseolus vulgaris species, is used as a starch blocker to control postprandial glucose release in diabetes.

**Pulses and Cardiovascular disease** - Epidemiological data suggest that pulse consumption could reduce the risk of cardiovascular disease. In numerous clinical trials, consumption of pulses has shown to significantly reduce serum lipid levels. Total serum cholesterol was reduced by 7%, LDL-cholesterol by 6%, and serum triacylglycerol by more than 17% with no significant changes in HDL-cholesterol in a recent meta-analysis of 11 clinical trials investigating the effects of pulse intake on serum lipids. While this effect was primarily attributed to the content of soluble dietary fiber, the cardioprotective effect of pulses could also be due to the synergistic action of the pulse protein, resistant starch, oligosaccharides, vitamins, minerals, and phytochemicals. For instance, the B-vitamin folate has been shown to reduce homocysteine concentrations, where elevated homocysteine levels have been identified as a significant risk factor for increased cardiovascular disease risk. Food form also appears to affect the ability of pulses to act as cholesterol-lowering agents.

Consuming a diet with whole pulses, compared with a diet containing ground pulses, significantly reduces total cholesterol and LDL-cholesterol. Peter Zahradka found that daily pulse consumption leads to major improvements in blood vessel function in participants with peripheral arterial disease. Another recently published systematic review and meta-analysis by Dr. Sievenpiper’s research group found that eating on average one serving a day of beans, peas, chickpeas or lentils can also reduce “bad cholesterol” by five per cent and therefore lower the risk of cardiovascular disease. A very recent study by Dr. Russell de Souza had found that eating on average one serving a day of beans, peas, chickpeas or lentils can also reduce “bad cholesterol” by five per cent and therefore lower the risk of cardiovascular disease.

**Pulses and Cancer** - Significant evidence links diets rich in plant foods, including pulses, with a reduced risk of numerous types of cancer. Pulses possess many of the nutrients and bioactive factors associated with anti-carcinogenic activity: dietary fiber, oligosaccharides, folate, selenium, protease inhibitors, phytic acid, lignans, phenolic acids, saponins, and isoflavones. Epidemiological studies have shown the protective effects of dietary fiber against the development of colorectal cancer. The relatively high concentrations of dietary fiber (15–30% DF) in pulses, as well as other non-nutritive factors, could contribute to its protective effect. The non-digestible carbohydrates in pulses (insoluble DF, oligosaccharides, resistant starch) are potential prebiotics, stimulating growth and/or activity of “good” bacteria, such as bifidobacteria and lactobacilli in the colon, resulting in the increased formation of butyrate, a short-chain fatty acid, with demonstrated anti-tumour and anti-inflammatory activity. In addition, pulses, particularly beans, contain a myriad of polyphenols with antioxidant and anti-mutagenic activities that could inhibit the formation of tumors.

Inverse correlations between pulse consumption and colon cancer mortality and risks of prostate cancer, gastric cancer, and pancreatic cancer have been found in various epidemiological studies. A report from the Nurses Health Study indicated that bean or lentil intake is associated with a lower risk for breast cancer. Potential anti-carcinogenic properties have been noted for some vitamins, protease inhibitors, phytic acid, phytoestrogens, and saponins present in pulses. Pulses are an excellent source of the B-vitamin folate with values ranging from 247 μg/100 g in split.
peas to 557 μg/100 g for chickpeas47,48. While still under investigation, folate may play a protective role against colorectal, cervical, breast, and pharyngeal cancers21,31,36,53. Recently, a new study provided insight into how severe folate deficiencies are associated with changes in DNA in human colonocytes, thus increasing the risk for colon cancer15. Pulses grown on selenium-rich soils of the western United States and Canada are good sources of selenium43.

Pulses And Gut Health - Dr. Peter Jones32 et al. found that eating pea hulls fibre or whole peas regularly results in an increase in Lactobacillus and Bifidobacteria bacterial species, both of which are considered important in gut health. Amanda Wright2, Researchers from the University of Guelph found that regular pulse consumption (½ cup per day for 4 weeks) is well tolerated and may improve gut health in healthy males with a mean age of 28.1 years (n=21). This research shows promising effects on gastrointestinal bacterial populations that have been linked in other studies with improved health and suggest that pulses have prebiotic activity in humans. Wendy Dahl49 from the University of Saskatchewan and the University of Florida found that eating canned chickpeas daily beneficially modulates gut bacteria of subjects in healthy individuals (n=12 with a mean age of 25.6 years). Individuals consuming chickpeas (200 grams/day for 3 weeks) had reduced levels of harmful bacteria (putrefactive and pathogenic bacteria), whereas individuals consuming raffinose (5 grams), a common oligosaccharide in pulses, every day had elevated levels of putatively beneficial gut bacteria.

CONCLUSIONS

Nutrition has moved from being viewed only as a preventive modality to being recognized as a disease management tool. Overall, the available evidence indicates that regular consumption of half a cup pulses provides endless health benefits. Observational studies consistently show an inverse relationship between pulse consumption and BMI or risk for obesity. Pulses are high in fibre and have a low glycaemic index, making them particularly beneficial to people with diabetes by assisting in maintaining healthy blood glucose and insulin levels. Moreover, pulses may have significant anticancer effects as the phytochemicals, saponins, and tannins found in them possess antioxidant. Pulses could be considered a heart-healthy food. Pulses consumption also improves serum lipid profiles and positively affects several other cardiovascular disease risk factors as well as considered important in gut health. Pulses are an affordable alternative to more expensive animal-based protein, which makes them ideal for enhancing diets in poorer parts of the world. “Much work needs to be done to end hunger and provide food security and nutrition for all. One concrete, promising opportunity lies with pulses. Let us join forces to raise awareness of the benefits of pulses,” said U N Secretary-General Ban Ki-moon61. Hence, this review suggests that promoting and incorporating pulses as part of a regular diet of people could lead to reduced risks of many “lifestyle” diseases, resulting in safe, healthier and more active human life.

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Value addition and acceptability of selected Indian recipes with germinated cowpea flour

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INTRODUCTION

In the global scenario, India as a prime position in pulse production. In the context of widespread protein calorie malnutrition and undernutrition, pulses will continue to be the major source of dietary protein. On account of the balanced amino acid composition of cereal and pulse protein blend, which matches with milk protein, the importance of pulse in vegetarian diet for nutritional food security cannot be emphasised. Further, pulse crops are also known for the unique role in restoring and building up of soil fertility.

Cowpea, is occupies a prominent role in Indian dietaries and is considered as one of the major sources of protein of high nutritional and therapeutic value. Cowpea contains 24.8% of protein and reasonable amounts of minerals and vitamins and is an excellent healthy food, at the most economical price when compared to other animal protein, which is far beyond the purchasing power of poor people. Very recently attempts have been made to incorporate soya flour at various levels in several indigenous traditional preparations of India.

Previous studies on soya flour incorporation in recipes have aimed at substituting only upto 40% level. But many research study shows controversy on consumption of soya bean. This study is an attempt to incorporate whole and germinated cowpea flour at 50% level for the pulse fraction present in five selected Indian recipes.

The study was planned with the objectives of evaluating the effect of substituting whole and germinated cowpea flour at 50% level for the pulse fraction present in the selected recipes, to compare the sensory evaluation and nutritive value of the traditional recipes with cowpea incorporated recipes and also to determine the preference of the developed recipes among the panel member.

MATERIALS AND MATERIALS

Cowpea flour, is soaked, germinated and powdered. The cowpea was procured from the market in bulk and were used throughout the study in order to reduce the influence of confounding variables. Vegetables, required for the preparation of recipes were purchased at the time of need.

Five common indices were selected to study the effect of incorporation of cowpea flour in recipes like pan cake, pakoda, dal, dhokla. The dishes were selected on the basis of various functional properties of legume. To name few, spreading property, binding property, thickening agent, texture respectively.
The recipes were prepared in the traditional way. In all the recipes, both whole germinated flour were incorporated at 50% level for the pulse fraction present in the recipe. Traditional recipes with no substitution of cowpea flour served as control.

SENSORY EVALUATION

Five faculty members from Food science and Nutrition department were selected as panel members based on results of a sensitivity threshold test conducted to analyse their taste acuity and consistency in detecting differences of the type expected in the product being studied. The sensory qualities, namely colour, flavour, texture, taste and overall total score were graded in the descending order on a five point scale, so that the most desired character owing to that particular quality carried the maximum mark of five and the least desired character carried the mark of one. Apart from using scorecards, a multiple sample difference test was used to assess how the taste and flavour of the experimental samples differed from the traditional samples. A hedonic rating scale was also used to measure the degree of pleasurable and unpleasurable experience of tasting the recipes on a scale of nine points ranging from “like extremely to dislike extremely.”

OBJECTIVE EVALUATION

The parameters used to evaluate the objective characteristics of products included water uptake, volume, oil absorption capacity, increase in volume after fermentation and the time taken for cooking one serving of the recipe.

RESULTS AND DISCUSSION

Nutritive value of the reference and experimental samples all the experimental samples possessed the highest protein content than the experimental samples and reference sample. As far the fat content of the recipes were concerned, the experimental sample of all the recipes had a lower fat content than the other two samples.

SENSORY EVALUATION

The results of the sensory evaluation conducted to find out the acceptability of the experimental samples. As far as the degree of difference for taste between the cowpea flour incorporated sample in relation to the reference sample is concerned. There was no significant difference the taste between the cowpea flour incorporated recipes and the traditional recipes.

Analysing the mean scores for the degree of liking of the traditional and cowpea flour incorporated recipes it was found that scores obtained by cowpea germinated flour incorporated recipes were almost closer to the scores of the traditional recipes.

OBJECTIVE EVALUATION

The objective evaluation exhibited that the cowpea germinated flour incorporated recipes required a higher amount of water to prepare, absorbed lesser amount of oil and the time taken for cooking was higher than the traditional recipes.

PREFERENCE TEST

The results of the preference tests conducted among the faculty member indicated that germinated cowpea flour incorporated recipes were liked very much by them than the traditional
one. So, it can be concluded that dietary supplementation of traditional foods with protein rich germinated cowpea flour substitute would improve the health status of individuals. Also, dietary intervention coupled with education on inclusion of germinated cowpea flour in their diets is definitely an ideal strategy to reduce effect of malnutrition on a sustainable basis among individuals.

SUMMARY AND CONCLUSION

Analysis of the nutritive value of both the traditional and germinated cowpea flour incorporated recipes possessed a high nutritive value than the traditional recipes, which speaks of its dietetic benefits.

Overall analysis of the sensory evaluation data revealed the fact that germinated cowpea flour incorporated recipes were almost same as traditional recipes. So, it may be concluded that, germinated cowpea flour can be successfully included in daily diet pattern by incorporating in recipes at 50% levels.

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Pulses – A Healthy Diet
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Pulses are a general name given to plants that provide dried edible seeds. Split pulses in India are known as Dal. Dried peas and beans have about the same composition as Pulses. In tropics, pulses are second only to cereals as important sources of calories and proteins. Bengal gram (chana dal), red gram (tuver dal), green gram (mung dal), black gram (urad dal) and lentils (masur dal) are the most widely consumed pulses in India.

Composition Pulses supply the same amount of calories as cereals i.e. 350 kcal per 100 gm dry weight.

The protein content of pulses is about 20% to 25% about twice as much as that of cereal's, making them the most economical source of proteins.

PULSES PROVIDE IMPORTANT NUTRIENTS AND ARE RECOMMENDED AS PART OF A HEALTHY DIET

Most national dietary guidelines recommend pulses as part of a healthy diet. Studies have shown that people who eat at least ½ cup of pulses per day have higher intakes of fibre, protein, calcium, potassium, folate, zinc, iron, and magnesium as well as lower intakes of total and saturated fat.

PULSES ARE AN IMPORTANT PLANT-BASED SOURCE OF PROTEIN

Many diets around the world rely on pulses as a source of protein. The amount of protein in beans, lentils, chickpeas and peas is 2-3 times the levels found in cereal grains like wheat, rice, quinoa, oats, barley, and corn. For example, eating just ½ cup of lentils provides the same amount of protein as 1 cup of quinoa or 2 cups of rice or corn. Compared to animal and many other plant-based sources of protein, pulses are a more affordable and sustainable protein source.

All proteins are created from twenty different amino acid building blocks. Nine of these amino acids cannot be produced by the body and are called “essential” because they must come from foods we eat. Most plant proteins lack at least one essential amino acid. However, when two or more plant-based sources of protein are combined, each food can provide the essential amino acid(s) that the complementary food(s) is missing. Eating protein from a variety of sources, from both plant and animal sources ensures the body receives all of the essential amino acids necessary for good health.

PULSES ARE AN EXCELLENT SOURCE OF DIETARY FIBRE AND OTHER COMPLEX CARBOHYDRATES

One cup of cooked pulses gives you more than half the amount of fibre you need for the entire day. Pulses also contain both soluble and insoluble fibre. Soluble fibre can help manage body weight, blood sugar levels and lower cholesterol. Insoluble fibre on the other hand, assists with digestion and regularity. Pulses also contain resistant starch, a type of carbohydrate that behaves like fibre in the body; and has been shown have similar health benefits such as reduced circulating cholesterol and blood sugar levels as well as improved gut health.
SPROUTING VEGETABLES FROM SEEDS

Sprouting vegetables are obtained by germinating seeds. The germination process takes place in a dark, humid and warm atmosphere. Included in this group of vegetables are alfalfa, taugé, mustard cress or seed, bio cress, shish purple or shiso green. They are most commonly used in salads and as garnishes for sandwiches and cold dishes. Apart from alfalfa and taugé, they are all sold in the containers they are grown in. They are usually cut for use, half way down the stems. Germinated sprouting vegetables are richer in vitamin C and contain fewer calories than most seeds. They have higher protein content and contain more vitamin B and iron than most vegetables. They can be stored for a few days at a temperature of 0 - 1º C in a humid atmosphere.

BENEFITS OF SPROUTED PULSES

When 100 grams of whole green pulse is sprouted, the sprouts provide 0.06 mg thiamine, 0.66 mg riboflavin, 1.5 mg niacin and 82 mg ascorbic acid.

Other key nutrients provided by the pulse exchange are iron, vitamins of B group and dietary fiber which mainly comes from whole pulses.

Pulses and beans are reputed to lower blood cholesterol. Dried beans and canned beans lower serum lipids. Ex: Bengal gram ( chana dal ) consumed for several weeks may reduce serum cholesterol levels by increasing faecal excretion of total vile acids.

Pulses and beans help diabetics by reducing post meal rise in blood sugar. The ability of carbohydrates depends on their speed of absorption.

Liguminous seeds and beans provide high fibre and antinutrients (phytaes, tanin, saponins and enzyme inhibitors). Their gradual absorption results in a lower rise of blood sugar than with equal amounts of carbohydrates from other sources. Hence recommended for diabetes.
Name of the event: **Pulses increase your Pulse**

**Event dates:** June 24<sup>th</sup> 2016 to Oct 2016

**Address:** Psgr Krishnammal Nursery and Primary School, Peelamedu, Avinashi Road, Coimbatore, Tamil Nadu, India – 641004

**Brief Description of the Event**

Inauguration of International year of pulses was celebrated on 15th June 2016. Now a days the children are interested to intake the fast food like noodles, burger, pizza etc. they lost the interest towards healthy food. Children motivated to have healthy food habits like including pulses along with their lunch. Children were get aware through songs, skit, speech etc. Through this project children came to know about the importance of pulses in day to day life.
ACTIVITY-1

Aim: To introduce the idea of pulses and edible parts of a plant.

Description: ✓ A power point has shown to the children about the edible parts of plant. ✓ Flash cards had been shown about the nutritional facts of a variety of food derived from plants. ✓ Parts of a plant and examples shown through power point presentation and drawing

Outcome: Children enjoyed all activities and learnt edible parts of a plant.
The pamphlets were distributed to the children about the healthy food habits. They were requested to site these pamphlets in their hand book so that the parents also get aware of it.

**Outcome:**
Children got aware of healthy food and junk food. They started to eat healthy food.

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### Activity-3

**Aim:**
To prepare the nutrition balanced fruit salad and pulse based vegetable salad. To make the children to know the importance of salad and its nutritive value.

**Description:**

**Fruit salad:**
Children were prepared the fruit salad using fruits like apple, guava, mango and grapes and mixed the chopped fruits with honey. They enjoyed by having and doing it. They understood the nutritive value present in the fruits. They enjoyed preparing the salad.

**Vegetable salad:**
Children were prepared the salad using sprouted pulses, grams, salt, pepper and chopped onions. They participated eagerly and started to take vegetable salad with their breakfast and lunch. They knew to cook without fire.

**Outcome:**
Children loved this activity and started to have it along with their food.
ACTIVITY-4

Aim:  
To introduce agriculture as a managed system that has environments impacts.

Description:  
✓ Inculcating the habit of growing plants.  
✓ From this activity the children learned the germination of seeds.  
✓ An animation had shown to the children about the germination of seeds.  
✓ They get the habit of gardening.

Outcome:  
Children got aware about growing plants.
ACTIVITY-5

Aim:
To make them to understand about the concept of nitrogen fixation with rhizobia and to know the importance of crop rotation and the ways to improve the fertility of the soil.

Description:
Children were motivated to know the concept of nitrogen fixation and the importance of crop rotation and the ways to improve the fertility of the soil, variety of crops used in the crop rotation through power point presentation and animation.

Outcome:
Children got aware of crop rotation and its uses and learn the concept of nitrogen fixation.
ACTIVITY-6

Aim:
To explore cultural contexts of pulses throughout history and in modern times.

Description:
- The children come to know about the import and export of pulses through graph and using map. They came to know the major pulses cultivated in each country.
- Major production of pulses in each and every state of our country through the graphical representation.
- Children learnt the major pulses cultivated in that particular country and its uses.

Outcome:
Children enjoyed and learnt the major production of pulses in all countries.

ACTIVITY-7

Aim:
To know the food item in different countries and understand the role of pulses in the food.

Description:
- The food of different countries and its nutritious value, different types of pulses conveyed through power point presentation and album preparation. Role of pulses in the food conveyed through nation lunch week, food carnival, fruit day and vegetable day celebrations.
- Children brought pulses along with their lunch for food carnival, their parents prepared different dishes using pulses, grams and grains. Children were insisted to avoid junk food.
- Children were requested to start to avoid the wastage of food from their house. During function time remaining foods were distributed to the orphanage and old age home. From the childhood they were inculcating the habit of avoid the wastage.

Outcome:
Children loved those activities and also understood the importance of role of pulses in food.
**OVERALL DESCRIPTION:**

**Aim:**
To inculcate the children to lead a healthy and happy life.

**Description:**
Children were motivated to have healthy life germination of seeds edible parts of plants, nutritional facts of variety of food derived from plants, imports and exports of plants, crop rotation, different types of pulses in different countries and its nutritious value import and export of pulses around the world through the activities like, power point, fruits and vegetable day celebrations, National lunch week celebrations, food carnival, competitions, album preparations.

Dr. Neminathan MBBS, DCH, MD, Address nearly 200 parents aware about the balance diet, art of parenting. Children got aware of zero food waste, avoid junk food and follow the balanced diet.

Kamba is an equipment to make natural manure. The food splits by the children in our school are collected and put in the kamba with earth worm, cow dung, Soil and mixed all these substance. After some days it will converted in to manure.
SUMMARY OF THE EVENT

Children were motivated to know the importance of pulses. Children loved all the activities and got aware and started to live a healthy and happy life.

Number of the participants: 735
International Year of Pulses-2016

Celebration Event for,

Food and Agriculture Organization Of The United Nations  Viale delle Terme di Caracalla – 00153, Rome, Italy

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