

## A REVIEW

# The production and effect of nitrogen nutrition on *Cicer arietinum* L.

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*Cicer arietinum* L. is a most significant crop which grown and consumed over the entire world, mostly in Asian countries. Chickpea is also trendy in the Ethiopian high ground and South America. The production of chickpea throughout the last three decades has been static in most countries and in some it has even decreased. The two types of chickpea *i.e.* desi and the kabuli are botanically parallel, but there are strong user preferences for one or the other. Chickpea is a rich source of some vitamins such as riboflavin, thiamin, folate and niacin. This crop may contain anti-nutritional compounds that can spoil consumption of the nutrients by people. The plan of this review is to summarize the nutritional value of chickpea and effect of nitrogen nutrition on chickpea which can be supplemented to plants as nitrate (NO<sub>3</sub>), ammonium (NH<sub>4</sub>) or combination of both (NH<sub>4</sub>NO<sub>3</sub>).

**Key words :** Chickpea, Nutritional composition, Anti-nutritional compounds, Nitrogen effect

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## INTRODUCTION

*Cicer arietinum* L. or chickpea, also called as garbanzo bean, Bengal gram, *Chana*, chickpea gram and Chole in various part of India. *Cicer arietinum* or chickpea, a diploid (2n=2x = 16) and self-pollinated and this is an important annual cool period legume crop and this species belonging to the Fabaceae family and the sub-family of chickpea is most closely linked to crops such as clover (*Trifolium* spp.), alfalfa (*Medicago sativa*), lentil (*Lens culinaris*), pea (*Pisum sativum*) and the model legumes barrel medic (*Medicago truncatula*) and *Lotus japonicas* (Varshney *et al.*, 2013). Chickpea is the third most important legume crop in a production and the second is the field peas and dry beans (Jukanti *et al.*, 2012). Chickpeas are separated into two main

groups *i.e.* desi and the Kabuli groups. Desi seeds have small and brown coloured seed and smooth or wrinkled. The Kabuli variety has large seeds but a lesser germination rate. This may be due to its bigger size and different in respiratory metabolism and the color of Kabuli chickpeas are pale yellow (Pandey *et al.*, 2019). The Kabuli type is grown in temperate regions whereas the desi type is grown in the half-dry tropics (Malhotra and Singh, 1991). Kabuli and desi both type of chickpea seeds can be powdered for use as flour, known as Besan. Preparing demonstration of desi chickpea is a significant expectation of overall chickpea engendering programs (Gaur *et al.*, 2016 and Rubio *et al.*, 2011). Chickpea (*Cicer arietinum* L.) is a cool season yearly vegetable yield having a place with the family Leguminosae, otherwise called Fabaceae, the

subfamily Faboideae and the class Magnoliopsida. The Chickpea is regularly gotten from the variety *Cicer*. There are some Monocicer with the sub-variety *C. bijugum*, *C. cuneatum*, *C. echinospermum*, *C. judaicum*, *C. pinnatifidum*, *C. reticulatum* and *C. yamashitae*. *Cicer anatolicum* is firmly identified with the species in the chickpea essential quality assortment (Croser *et al.*, 2003).

Chickpea plants were full grown for 24 days in water culture under two systems of nitrogen nourishment for example nitrate ( $\text{NO}_3^-$ ) and ammonium ( $\text{NH}_4^+$ ) existence or lack of iron (Ecoport, 2013). Chickpea, also a cross-pollinated but is a rare occurrence approx 0-1% is reported (Smithson *et al.*, 1985 and Singh *et al.*, 1987). Chickpeas can be utilized as a high vitality and protein feed in creature diets to help milk and veggie lover creation. Regularly with different grains of vegetable, Chickpeas contain hostile to wholesome factor, for example, trypsin and chymotrypsin inhibitors (Bampidis and Christodoulou, 2011).

Chickpea is a decent wellspring of sugars and proteins and the protein quality is viewed as superior to different heartbeats in chickpea. Chickpea gives a few potential medical advantages and chickpea in blend with different heartbeats and grains could effectsly affect a portion of the significant human ailments, for example, CVD, type 2 diabetes, stomach related sicknesses and a few malignant growths. Chickpea seeds are utilized for blood improvement, rewarding skin diseases, ear contaminations, liver and spleen issue.

#### Global production scenario of *Cicer arietinum*:

*Cicer arietinum* chickpea, which rank is third in

food vegetable creation in the all over world, this is the most significant vegetable in the Indian subcontinent and 96-97 per cent of chickpea developed in creating nations.

Chickpea is cultivated in about 58 countries of the world over an area of about 21,132,370 ha, producing 17,207,840 tones of chickpea with an average productivity of 1,315,511 hg/ha (FAOSTAT, 2018). India is the major chickpea producing with respect area (11,899,185 ha), yield (9,564 hg/ha) and the production (11,380,000 tones) and the second country is Australia in which, the area (1,075,136 ha), yield (9,285 hg/ha) and the production of chickpea (998,231 tones) followed by Turkey, Russian Federation, United states of America, Ethiopia, Myanmar, Mexico, Pakistan and Canada. These are the top the countries for producing the chickpea (FAOSTAT, 2018). West and South Asia indicated a solid upward pattern in the region under creation. In India the creating states are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Andhra Pradesh. Madhya Pradesh creates a significant portion of 43 per cent of all out 6 million tones creation. Andhra Pradesh, Uttar Pradesh, Maharashtra and Rajasthan represented 7 per cent, 9 per cent, 10 per cent and 14 per cent individually.

#### Nutritional value of chickpea:

Chickpea is an awesome wellspring of protein and starch (Singh, 1985) and it is generally contain the about 57 per cent carbs and approx 9 per cent of fibres. This is also a rich source of vitamins and minerals. Chickpea seeds contain 20-30 per cent crude protein, about 40 per cent carbohydrate and approx 3-6 per cent oil (Gil *et al.*, 1996). Starch is the most copious sugar and shifted from 31.5 to 53.6 per cent. Among the sugars, oligosaccharides

Table 1: Top ten countries for the harvested area, yield and production of chickpea				
Sr. No.	Countries	Area harvested of chickpea (ha)	Yield of chickpea (hg/ha)	Production of chickpea (tones)
1.	India	11,899,185	9,564	11,380,000
2.	Australia	1,075,136	9,285	998,231
3.	Turkey	514,102	12,254	630,000
4.	Russian federation	819,330	7,572	620,400
5.	United states of America	341,070	16,946	577,970
6.	Ethiopia	241,212	21,377	515,642
7.	Myanmar	368,390	13,840	509,856
8.	Mexico	194,370	18,099	351,796
9.	Pakistan	976,580	3,311	323,364
10.	Canada	176,000	17,688	311,300

Source: FAOSTAT (2018).

of the raffinose family prevailed in many pulses and record for a huge worth (31.1 to 76.0%) of the complete solvent sugars. Cellulose is the significant segment of rough fibre in chickpea. Pulses contain considerable measure of rough fibre (1.2 to 13.5%). Unrefined fibre was moderately higher in green seeded chickpea followed by desi and Kabuli types (Muehlbauer and Tullu, 1997). Pulses give a significant portion of protein and calories in Afro Asian diet. Among the various heartbeats, chickpea is accounted for to have higher protein bio accessibility. Chickpea protein quality is better than some pulses harvests, for example, dark gram (*Vigna mungo* L.), green gram (*Vigna radiata* L.) and red gram (*Cajanus cajan* L.) (Muir and O'Dea, 1992).

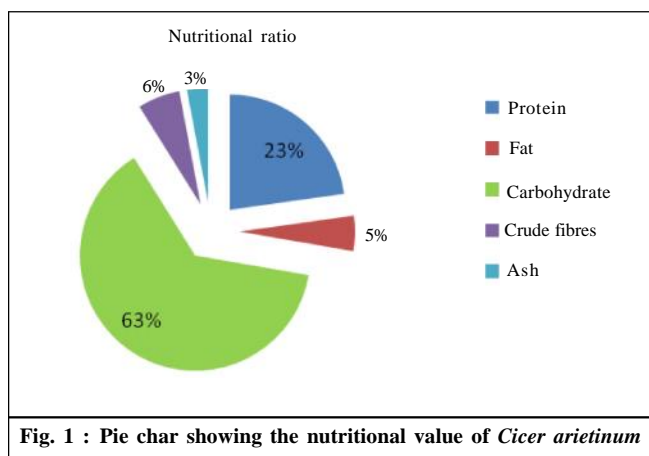


Fig. 1 : Pie char showing the nutritional value of *Cicer arietinum*

It is also a good source of calcium, magnesium, potassium, phosphorus, iron, zinc and manganese (Ibrikci *et al.*, 2003). Approx 100g of chickpea seed can meet day by day dietary requirements of iron (1.05 mg/day in males and 1.46 mg/day in females) and zinc (4.2mg/day and 3.0 mg/day) and 200g can meet that of magnesium (260 mg/day and 220 mg/day) (Osorio-Díaz *et al.*, 2008). There were no huge contrasts between the Kabuli and desi genotypes aside from calcium, with desi types having a higher substance than Kabuli types (Pandey and Enumeratio, 1993).

### Nitrogen nutritions on chickpea:

Legume family is the largest flowering plants family, including more than 18000 species. The family members of legume some are annual herbs, some are vines, some are bushes and trees (Vavilov, 1951). This family contains the vitamins such as vitamin B1, vitamin B3, vitamin B5 and vitamin B6. Legume shows the symbiotic relationship

with some type of types of bacteria recognized Rhizobia that work in nitrogen-fixing and rhizobia bacteria able to take nitrogen from the environment and “fix” it (Gopalakrishnan *et al.*, 2015).

Chickpea fixes atmospheric nitrogen like further legume crops through its co-operative relationship with Rhizobium species; thus, it helps to enhance the soil fertility (Melchinger *et al.*, 1990 and Winter and Kahl, 1995). Nitrogen (N) is a important and desirable for plant development. Absence of nitrogen appears as general yellowing (chlorosis) of the plant, since nitrogen can move around in the plant, more established development regularly yellows more than the novel development. Nitrogen can be utilize by plants forms in anion (nitrate,  $\text{NO}_3^-$ ), cation (ammonium,  $\text{NH}_4^+$ ) or combination of both. Albeit most species can develop on either structure, providing plants with blends of  $\text{NO}_3^-$  and  $\text{NH}_4^+$  regularly brings about better vegetative development and upgraded supplement aggregation than either structure alone (Hageman and Flesher, 1960 and Haynes and Goh, 1978). Plant development and advancement have long been known to beneficial from the presence of  $\text{NO}_3^-$  (Marschner, 1995).

Nitrogen can be fixed by lightning that convert into nitrogen and oxygen *i.e.* nitrogen oxides (NO). Nitrogen oxides (NO) may act in response with water ( $\text{H}_2\text{O}$ ) to make Nitrous acid ( $\text{HNO}_2$ ) or Nitric acid ( $\text{HNO}_3$ ), which soak the soil, where it makes nitrate ( $\text{NO}_3^-$ ), which is use to plants (Tuck, 1976).  $\text{NO}_2$  molecule in turn reacts with water ( $\text{H}_2\text{O}$ ) to produce nitric acid ( $\text{HNO}_3$ ), or nitrate ion ( $\text{NO}_3^-$ ), which is used by plants (Joel *et al.*, 1984).

### Ammonium and nitrate content:

Ammonium ( $\text{NH}_4^+$ ) is an essential wellspring of nitrogen for plants. This is usually not utilized for significant distance transport of nitrogen inside the plant. It tends to be created all over again from sub-atomic nitrogen ( $\text{N}_2$ ) by nitrogen-fixing microbes in some plant cells, for example, rhizobia in vegetable root knob cells (Howitt and Udvardi, 2000). Nitrate ( $\text{NO}_3^-$ ) is also an important nitrogen source for each plant because of its multipurpose functions in both physiological regulations and plant nutrition (Raven, 2003 and Wang *et al.*, 2012). Without nitrates ( $\text{NO}_3^-$ ), the amount of chlorophyll in leaves reduces. This means leaves turn a yellow colour or pale green (Dechorgnat *et al.*, 2010). High centralizations of nitrate in soils can harm the nodulation and discourage  $\text{N}_2$  obsession (Harper and Gibson, 1984; Beccana and

Sprent 1987 and Macduff *et al.*, 1996) yet there is additionally genotypic variety among vegetables in affectability to nitrate (Harper and Gibson, 1984 and Chalifour and Nelson, 1988). Both Ammonium (NH<sub>4</sub><sup>+</sup>) and nitrate (NO<sub>3</sub><sup>-</sup>) are accepted to be the essential wellsprings of nitrogen for plant advancement in cultivating and most regular habitats. They are required in bigger sums than some other mineral supplement.

### Conclusion:

Chickpea is a beneficial crop for humans, normally two type of chickpea such as desi and the Kabuli (edible part is seed). The data introduced here shows the potential nutritional significance of chickpea and its job in improved sustenance. It is nominal source of carbohydrates, protein, diatary fibres, minerals, vitamins and folate. This review focus on the producing countries and the nutritional value of chickpea.

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