

A Review- Nutritional Quality and Production of Chickpea

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Introduction

Main source of protein for the vegetarian population of our society are pulses. Seed is the main edible part of the plant and is a rich source of protein, carbohydrates and minerals. Pulses play important roles on farms, in human diets and for the sustainability of agriculture. Smallholder farm households both consume and sell grain legume crop products. This flexibility enables farmers to manage their crops according to needs, and thereby their livelihood strategies (Shiferaw 2007; Lowenberg-DeBoer and Ibro 2008)

The dual role of pulses helps meet household needs and generate income by yielding valuable and diverse products, such as grains, oil, pods, peas, leaves, haulm, and press-cake. As a human food and livestock fodder and feed, grain legumes are in demand locally, and in urban and export markets. A wide range of processed products from these raw materials can add value and generate income-earning opportunities for poor people, especially women. (CGIAR, 2012).

Production of chickpea in India and the world:

Pulse production in India is facing a multitude of constraints. It has been recorded that about 92% of pulses in India are grown in rain fed areas. Erratic and uncertain behavior of monsoon affect timely sowing of these crops, which are normally opted out for marginal and sub marginal lands. (Upadhyay, *et al.*, 1998).

Currently, chickpea is grown in over 50 countries across the Indian subcontinent, North Africa, the Middle East, southern Europe, the Americas and Australia. Globally, chickpea is the third most important pulse crop in production, next to dry beans and field pea. (FAOSTAT (2011) <http://faostat.fao.org/site/567/DesktopDefault.aspx>. (Accessed 12th December 2011).

Chickpea (*Cicer arietinum*L.) is a major winter pulse crop in India and accounts for more than 43% of the world's chickpea production. Among the pulses, chick occupies 30%

of area with 38% of annual production in India. It is grown largely on residual soil moisture in the post rainy season as a sole crop or mixed crop with wheat, mustard and sorghum. The chickpea seed provides a necessary protein supplement to the largely cereals-based vegetarian diets in the Indian subcontinent. (Ali and Sharma, 2002).

Four states viz., Madhya Pradesh, Rajasthan, Uttar Pradesh and Maharashtra together contribute 87% of the total area (Table 1). The area under chickpea has shown steady uptrend in Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Orissa, Maharashtra, Rajasthan and Tamil Nadu. Except Rajasthan, all other states in this category are located in Southern and Central zones. As far as the productivity rate is concerned, chickpea has observed considerable improvement from 611 kg/h in 1971-75 to 761 kg/h in 2007-08 (FAOSTAT, 2009).

Table 1: Area and Production of chickpea in different states of India

State	Production (Lakh tonnes)	Area (Lakh hectares)	Yield (Kg per h)
Andhra Pradesh	96.4	142.5	679
Bihar	110.0	107.0	1028
Haryana	58.0	100.0	580
Gujrat	41.8	81.9	512
Karnataka	181.0	319.0	567
Maharashtra	580.0	932.0	622
Madhya Pradesh	2493.3	2748.1	908
Orissa	16.0	32.0	500
Rajasthan	677.9	975.3	695
Punjab	6.1	6.3	968
West Bengal	30.0	27.0	1111
Tamil Nadu	5.3	8.0	663
Uttar Pradesh	779.3	822.3	948

Source: Chickpea Research in India: Edited by Masood Ali, Shiv Kumar, N.B. Singh, IIPR, Kanpur, India.

Types of chickpea

There are two distinct types of cultivated chickpea, Desi and Kabuli. Desi (microsperma) types have pink flowers, anthocyanin pigmentation on stems, and a colored and thick seed coat. The kabuli (macrosperma) types have white flowers, lack anthocyanin pigmentation on stem, white or beige-colored seeds with a ram's head shape, thin seed coat and smooth seed surface (Moreno M & Cubero JI (1978). The seed weight generally ranges from 0.1 to 0.3g and 0.2 to 0.6g in desi and kabuli types respectively (Frimpong A, Sinha A, Tar'an B, *et al.* (2009). The desi types account for about 80-85% of the total chickpea area and are mostly grown in Asia and Africa (Pande S; Siddique K.H.M.; Kishore, G.K., *et al.* (2005). The kabuli types are largely grown in West Asia, North Africa, North America and Europe.

Origin and domestication:

Chickpea (*Cicer arietinum* L.) is thought to have originated in Anatolia (Turkey), where three closely related wild species *C. bijugum*, *C. echinospermum*, and *C. reticulatum* are commonly found in nature (van der Maesen, 1984). Chickpea seeds had been occasionally recovered in pre-historic sites in the Near East (Renfrew, 1973). However, Ramanujam (1976) reported that remnants of chickpea radiocarbon are dated at 5450 BC and there is evidence of its cultivation in the Mediterranean basin in 3000-4000 BC. The earliest record of chickpea in Northern India (Uttar Pradesh) dated at 2000 BC, and from the Southern India much later (Chowdhury *et al.*, 1971; Vishnu-Mittre, 1974).

Taxonomy of chickpea:

Chickpea has been classified as follows:

Classification of chickpea	
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae
Subfamily	Faboideae
Genus	Cicer
Species	<i>C. arietinum</i>

Uses of chickpea:

Chickpea is a rich source of protein, its protein quality is limited by sulphur containing amino acids, methionine and cystine. Chickpea generally meets adult human requirement for all essential amino acids with trace amount of methionine and cystine and rich in fiber, minerals (phosphorus, calcium, magnesium, iron and zinc) and β -carotene (Table 2). Nutritional value of chickpea per 100 gram of edible portion showed in (Table 2) like amino acids, proximates, minerals, vitamins and lipids. Total amino acid composition of seed protein fractions of chickpea shown in (Table 3).

The levels of different protein fractions primarily control the essential amino acid composition of chickpea seed proteins, nutritional composition of whole seed and dhal component of

chickpea showed in table (Table 4), percentage of starch 47.3, protein 22, fat 5.3, sugar 5.8, ash 3.2, crude fiber 6.3 and dietary fiber 19 in whole seed and percentage of starch 56, protein 24.5, fat 5.7, sugar 4.9, ash 2.8, crude fiber 1.1 and dietary fiber 11.3 in dhal of chickpea.

Table 2: Nutritional value of chickpea per 100 gram of edible portion

Nutrient	Unit	Value per 100 grams
Amino acids		
Tryptophan	g	0.185
Threonine	g	0.716
Isoleucine	g	0.828
Leucine	g	1.374
Lysine	g	1.291
Tyrosine	g	0.479
Cystine	g	0.259
Valine	g	0.809
Methionine	g	0.253
Arginine	g	1.819
Phenylalanine	g	1.034
Tyrosine	g	0.479
Alanine	g	0.828
Histidine	g	0.531
Glutamic acid	g	3.375
Aspartic acid	g	2.270
Serine	g	0.973
Glycine	g	0.803
Proximates		
Water	g	11.53
Energy	kJ	1525
Energy	kcal	364
Protein	g	19.3
Ash	g	2.48
Fiber, total dietary	g	17.4
Total lipid (fat)	g	6.04
Carbohydrate, by difference	g	60.65
Sugars, total	g	10.7
Minerals		
Calcium, Ca	mg	105
Magnesium, Mg	mg	115
Manganese, Mn	mg	2.204
Iron, Fe	mg	6.24
Sodium, Na	mg	24
Potassium, K	mg	875
Phosphorus, P	mg	366
Zinc, Zn	mg	3.43
Copper, Cu	mg	0.847
Selenium, Se	μ g	8.2
Vitamins		
Vitamin C, total ascorbic acid	mg	4
Riboflavin	mg	0.212
Thiamin	mg	0.477
Pantothenic acid	mg	1.588
Niacin	mg	1.541
Folate, food	μ g	557
Folate, total	μ g	557
Vitamin B-6	mg	0.535

Choline, total	µg	95.2
Folate, DFE	µg DFE	557
Vitamin A, RAE	µg RAE	3
Vitamin B-12	µg	0
Carotene, beta	µg	40
Retinol	µg	0
Lycopene	µg	0
Vitamin A, IU	IU	67
Vitamin K (phylloquinone)	µg	9
Vitamin E (alpha tocopherol)	mg	0.82
Lipids		
Fatty acids, total saturated	g	0.626
14:00	g	0.009
16:00	g	0.501
18:00	g	0.085
Fatty acids, total monounsaturated	g	1.358
16:1 undifferentiated	g	0.012
18:1 undifferentiated	g	1.346
Fatty acids, total polyunsaturated	g	2.694
18:2 undifferentiated	g	2.593
18:3 undifferentiated	g	0.101
Phytosterols	mg	35

IU: One International Unit of Vit-A = 0.3 mg of Vit A alcohol; * Rao and Rao (2007).

Source: USDA National Nutrient Database for Standard Reference, Release 22 (2009)

Table 3: Essential amino acid composition of seed protein fractions of chickpea.

Amino acid	Protein fraction (g/100 g protein)			
	Albumin	Globulin	Glutelin	Prolamin
Lysine	10.8	6.4	6.8	2.3
Methionine+Cystine	5.3	1.8	2.6	1.5
Phe + Try	9.3	9.0	8.1	5.7
Valine	4.5	4.2	5.7	2.1
Threonine	5.4	3.5	5.7	2.2
Leucine	9.8	7.5	9.1	1.6
Isoleucine	5.1	4.4	5.4	2.3

Table 4: Nutritional composition of whole seed and Dhal component of chickpea.

Constituent (%)	Whole seed	Dhal
Value (Kcal)	347.6	360.8
Starch	47.3	56.0
Protein	22.0	24.5
Fat	5.3	5.7
Sugar	5.8	4.9
Ash	3.2	2.8
Crude fiber	6.3	1.1
Dietary fiber	19.0	11.3

Source (Table 5-6): Chickpea Research in India: Edited by Masood Ali, Shiv Kumar, N.B. Singh, IIPR, Kanpur, India.

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add value and generate income-earning opportunities for poor people, especially women. (CGIAR, 2012).

Medicinal uses

- Among the food legumes, chickpea is the most hypocholesteremic agent; germinated seeds are reported to be effective in controlling cholesterol level in rats (Geervani, 1991)
- Glandular secretions of the leaves, stems and pods consist of malic and oxalic acids giving a sour taste. In India these acids are used to be harvested by spreading thin muslin over the crop during the night. In the morning the soaked cloth is wrung out and the acids are collected in bottles. Medicinal applications include use for aphrodisiac, bronchitis, catarrh, cutamenia, cholera, constipation, diarrhea, dyspepsia, flatulence, snakebite, sunstroke and warts. Acids are supposed to lower the blood cholesterol levels. Seeds are considered antibilious (Duke, 1981).

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