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Role of *Cicer arietinum (Bengal gram)* as a Neutraceutical in *Sthaulya*

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Abstract

Easy availability of health injurious, processed food, increased capacity of expenditure and bad food habits have caused an outburst in Obesity, resulted in more than 30 million obese patients in India. As obesity causes increased risk of heart diseases, and Diabetes Mellitus, 2 most fatal diseases in India, this is the right time to search for an alternative to overcome the changed food habits of young India. Therefore, making changes in life - style along with alterations in the diet, play a key role in the management of obesity. We are proposing *Cicer arietinum* or Bengal Gram, which reduces the deranged *Meda* and *Kapha dosha* found in *Medoroga*. As low energy food with huge amount of fibers are effective in the treatment of *Medoroga*, Bengal Gram is an ideal food supplement, since it has a low glycemic index and is rich in dietary fibers. It also lowers the LDL & total cholesterol. Here, we have established that though *Cicer arietinum* is a rich source of proteins, more than 38% amino acids are *vaayaviya* and *aakashiya* in their *paanchabhautic* constitution and are in possession of *ruksha*, *laghu*, *vishad* qualities. According to *Acharya Hemadri*, *laghu* and *ruksha* qualities are responsible for *Langhana* and *Rukshana* respectively causing weight loss. We have concluded that Bengal gram has a potential to work as a nutraceutical in the management of *Sthaulya*(Obesity).

Keywords- *Cicer arietinum* Neutraceutical, *Sthaulya.*

INTRODUCTION

Obesity is accumulation of excess fat in body which leads to negative effects on health, reduced life longevity or increased health problems. resulted in more than 30 million obese in India. It leads to diabetes, ischemic heart diseases, hypertension, stroke etc. *Ayurvedic* classics described obesity under headings of *Atisthoulyam* and *Medoroga*, The word *Atisthoulya* is a combination of *'Ati'* and *Sthoola* . *Ati* means excessive and *Sthoola* means large. The meaning of *Atisthoulya* is to become excessively fat, leading to flabbiness of hips, abdomen and breast

[1]. The body metabolism is get decreased, the persons having these quality termed as *Atisthoola* (obese)The basic principles of treatment of *Sthouly*) as described in *Ayurveda Nidanaparivarjana, Apatarpanachikitsa* and *Samana* and *Shodhan chikitsa* are used to treat obesity. We must to know *pathya Apathya* is important for proper management of disease and maintenance of health. In *Ayuveda* the management of obesity are aimed to pacify *kapha dosha* and *medodhatu* and *vataanuloman* are rich in dietary fiber and low glycemic index . *Pathya* is described as *Ahara* and *Vihara*, which causes pacification of the disease. [2] *Ayurveda* emphasizes that the successful treatment of any disease is not only depends upon the proper medication but proper diet and proper lifestyle is equally important. By following *Ahara Vihara* as described in *Ayurveda* one can prevent himself from Obesity and reduces its risks of various complications. Management of *Guru* and *Apatarpana*[4]

***Nidana* of *Sthaulya* :** *sthaulya* causes may be of two types-

1. **Exogenious** -*medas* containing diet.
2. **Endogenious** - *dosha, dhatu, mala, strotas*, etc.

- *Acharya charka*[5] has mentioned the *nidana* of *sthaulya* analytically. exogenious types .*Charak* has also defined *bijadosh* is another causes.
- *Aharya sushrut* [6]and *vagbhat* have made mention of the endogenous type..

In *ayurvedic* classics can be classified into 4 groups.

1. *Aharaj nidan* (dietary causes)
2. *Viharaj nidan* (life style factors)
3. *Manas nidan* (psychological factors)
4. Other causes-*Bijasvabhava* (genetic factor)

Pathogenesis of *Sthaulya*: - [6,7] manifestation of sthoulya, imbalance of few basic components of the body required are *dosha, dushua, strotas, agni, and ama.*

Dosha

a. *Kapha*- It is the main effective dosha in sthaulya, comes under the category of *kaphaprakopa* symptoms like *alasya, gatrasad, , nidradhikya, angagurav* etc. Due to extreme intake of *guru, snigdha, shit, picchila guna madhur rasa ahar ,and divaswap avyayam, achinta, vihara* lead to vitiation of kapha. so kapha is the main cause of *sthaulya* and *kapha prakriti* persons are more prone to become *sthula*

b. *Pitta – Mainly pachak pitta* is involved in the pathogenesis of shaulya.
symptoms like *adhiksudha, atipipasa, svedadhikya, daurgandhya,* have mentioned in *pittavriddhi* .

c. *Vayu* - the process of digesion , and proper circulation of *dhatus* like *medas* is controlled by saman *vayu* and *vyan vayu*. Improper circulation of fat in the body proves the involvement of *vyanvayu*.

***Dushya*:**

Sushrutacharya has mentioned *sthauly as dushya* prevailing disease (Su. Su.24/9) and extreme and abnormal production of *medodhatu* is clearly seen in *sthaulya*, due to intake of *guru, snigdha, shit, picchila guna madhuradi rasa* as seen above dominant diet, increase accumulation of *medodhatu* (su. su. 15/38) .

Strotas :

According to *acharya charak* specific *nidan* of *medovahasrotasdushti*, *avyayam*, *diwaswapn*, excessive intake of *madhuradravya*, *varuni* have been mentioned which, indicates involvement of *medovahasrotas* along with *rasavahasrotas*.

Agni

In the *sthaulya* formation of *ama* is more due to the diminish of *medodhatwagni* than *jatharagni* (su. Su. 15/38)

Sampraptighatak - Dosha

kapha	*kledak kapha,*
Pitta	*pachak pitta,*
Vayu	*vyan vayu*

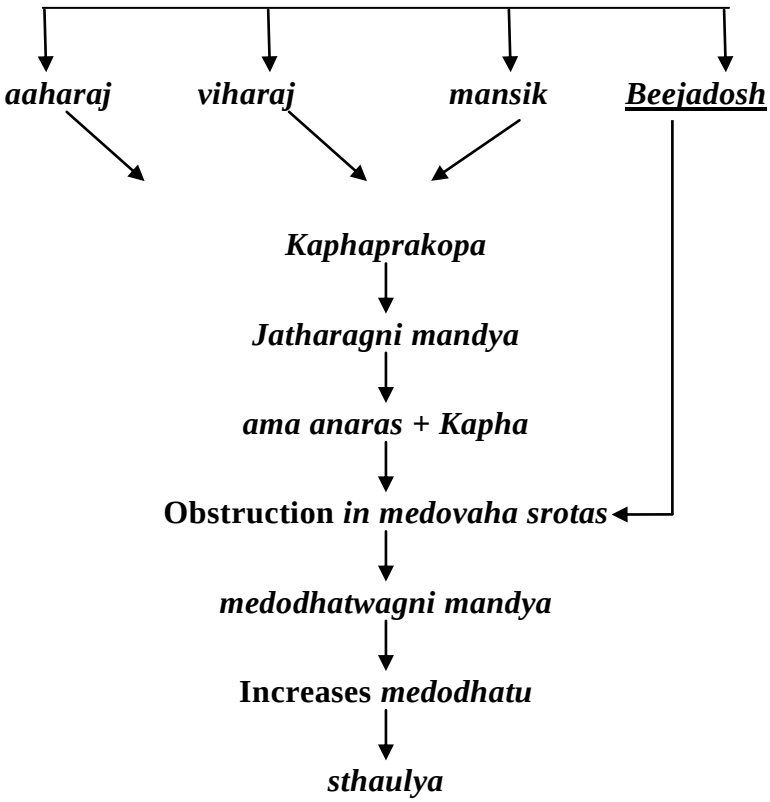
Dushya: *Meda* and *Rasa,*

Agni : *Jatharagni* and *medodhatwagni*

Strotas*: Medovaha strotas, rasavaha stotasa*

Udbhavsthan : *Amashaya*

Sthana : *Sarvang particular in udara, stana, sphik and gala pradesha.*



Pathogenesis of obesity: There are 3 main factors of obesity

1. Excessive lipid deposition
2. Diminished lipid metabolism
3. Diminished lipid utilization

1. Excessive lipid deposition : is due to Hypothalamic lesions, Adipose cell hyperplasia or hyperlipogenesis. Increased food intake in the form of carbohydrates, proteins and fats by metabolic process at end gets converted into fats.

2. Diminished lipid metabolism : is due to abnormality of autonomous innervations or decreased lypolytic hormones like adrenaline and thyroxin stimulate mobilization of unsaturated fatty acids from adipose tissue.
3. Diminished lipid utilization : in old age , imperfect of lipid oxidation and defective thermo-genesis or inactivity.

In *Ayurveda* various food articles are mentioned *medohar*, *apatarpaneeya*, *karshaneeye* and *Lekhneeya* one of them *is Cicer arietinum* belongs to family fabaceae.

Literature review[8]

"चणको हरिमंथ: स्यात्सकलप्रिय इत्यपि॥

चणक: शीतलो रुक्ष: पित्तरक्तकफापह:।

लघु: कषायो विष्टांम्भी वातलो ज्वरनाशन:॥"

भा.प्र.

Synonym: chanaka, harimantha, sakalpriya
Hindi: Chane, chole
Marathi: Harbara
Gujrati: Chanya
Bangali: Chola
Telgu: Sangulu
English: Bengal Gram, Chick pea
Taxonomic classification:
Kingdom: Plantae;
Division: Magnoliophyta;
Class: Magnoliopsida;
Order: Fabales;
Family: Fabaceae;
Subfamily: Faboideae;
Genus: *Cicer;*
Species: *Cicer arietinum*(9-10).
Part use: Leaves, seeds and seedpod(11,12,13).

CHEMICAL CONSTITUENTS

Phytochemical showing of *Cicer arietinum* seeds revealed the presence of carbohydrates, proteins, amino acids, fixed oils, phytosterols, alkaloids, Phenolic compounds and tannins, flavonoids, glycosides, saponins, amino acids, iron, phosphate, sulphate, and chloride [14-17]. It is excellent source of carbohydrates and proteins, which constitute about 80% of the total dry seed weight. The seeds were relatively rich in lecithin, potassium, phosphorus, calcium, folate and vitamin C, and also have small quantities of vitamins A and B. [9,18-19]. The amino acid composition (%) of seed proteins were: 7.2 glysine, 1.4 g methionine, 8.8 g arginine, 4.0 g glycine, 2.3 g histidine, 4.4 g isoleucine, 7.6 g leucine, 6.6 g phenylalanine, 3.3 g tyrosine, 3.5 g threonine, 4.6 g valine, 4.1 g alanine, 11.7 g aspartic acid, 16.0 g glutamic acid, 0.0 g hydroxyproline, 4.3 g proline, and 5.2 g serine [11,18,20]. Fatty acid like oleic

52.1, linoleic 38.0, myristic 2.74, pactic 5.11, and steatic 2. diphenyl-1-picrylhydrazyl (DPPH) radical scavengers followed by embryonic axe and cotyledon fractions. Hydrogen peroxide (H2O2) scavenging capacities of cotyledons and seed coats of chickpea were 12.3, 34.1 and 78.6% [21].

PHARMACOLOGICAL ACTIVITY

Weight Loss / Obesity

Howarth NC at el stated that Intake of foods which are high in dietary fibre is associated with lower body mass index [BMI][22,23]. Eating of foods with rich in fibre content helps in reaching satiety faster and this satiating effect lasts longer since fibre rich foods require more time to chew and diges[24,25]. Consumption of low GI foods results in increase of cholecystokinin (a gastrointestinal peptide and hunger suppressant) and increased satisfaction [26-28]. Diets with low GI foods resulted in reduced insulin levels and higher weight loss compared to those with higher GI[29]. *chana* is a low GI food, it may helps to reduces weight. *Chana* supplementation in the diet prevented increased body weight and weight of epididymal adipose tissues in rats[30]. At the end of eight month experimental period the rats fed on high fat diet (HFD) weighed 654 g versus those fed with HFD plus *chana* (HFD+CP; 562 g) The epididymal fat pad weight to total body weight ratio was higher in rats fed on HFD (0·032 g/g) compared to those fed on HFD+CP (0·023 g/g; details of this experiment are explained under CVD)[30]. Therefore, *chana* being a low GI food can be an effective good choice in weight loss. *Chana* is reported to reduced fat accretion in obese person. It is getting better fat metabolism and can be helpful in correcting obesity and related disorders[30]. *chana* supplementation in the diet resulted in increased satiation and fullness[31].

Antioxidant effects: Tom B and Thiruselyi M reported that the free radicals scavenging, antioxidant properties and intestinal α-glucosidase inhibitory activity of methanol extract of two varieties of *Cicer arietinum* were evaluated. Compared with raw seeds raise in total flavonoids and polyphenol concentration in green gram sprouts and Kabuli Chana sprouts (KCs) were recorded. Total protein concentrations in sprouts same as non-sprouted grains. 2,2'- Azinobis (3-ethyl benzthiazoline-6-sulphonic acid) cation scavenging activity was more than twice in *chana* sprouts of (BGs) and KtCs than their raw seeds.DPPH scavenging, nitro blue tetrazolium dropping and glucose induced Hb glycation inhibitory activity same as non-sprouted raw grains. enhance in rat intestinal α-glucosidase inhibitory activity was observed in Bengal gram and kaboli chana. Bengal gram significantly mitigated first 30 min starch-induced postprandial glycemic excursions and reduced 2 hr postprandial glycemic load[32]. The extent of free radical scavenging properties and antioxidant effects of crude extracts of sprouted *Cicer arietinum* seeds were evaluated. main varieties of *Cicer arietinum chana* and Kabuli Chana are examined and compared for their free radical scavenging properties and antioxidant effects. Free radical scavenging properties are evaluat against stable hydrogen peroxide and DPPH radical. The results observe that the two varieties *Cicer arietinum* out of these Brown colored *Cicer arietinum* sprouts

showed the greatest activity against DPPH radicals, hydrogen peroxide radicals and lipid peroxide compared to the cream variety[33].

Antidiabetic effect: *Madhumeha* and *hrudroga* are the most common complication *sthaulya.* PullaihT and Naidu KC has reported that the seeds reduced postprandial plasma glucose and were useful in the treatment of diabetes[34-35]. *Cicer arietinum* in petroleum ether extract of shows anti-hyperglycaemic activity, seeds at three different doses i.e. first is 100 second 200 and third 400 mg per kg in alloxan (70 mg/kg iv) induced diabetic rats. In both acute and subacute studies serum glucose level (SGL) was measured. The change in body weight was noted during subacute study. Oral glucose tolerance test (OGTT) was performed in both diabetic and non-diabetic mice previously loaded with (2.5 g/kg po) glucose. Glyburide (10 mg/kg) was used as a standard drug. The maximum reduction in SGL was observed in PEECA (400 mg/kg) group at 6h (137.17 mg/dl) in acute study and on 21st day (217.79 mg/dl) in subacute study respectively. In glyburide treated mice the maximum reduction in SGL was observed at 6h (194.97 mg/dl) and on 21st day (267.40mg/dl) respectively. Petroleum ether extract of *chana* (400 mg/kg) and glyburide (10 mg/kg) nullify loss of body weight in diabetic mice. OGTT rises glucose threshold in diabetic and non-diabetic mice. Accordingly, PEECA showed antihyperglycaemic activity comparable with glyburide[36].

Hypocholesterolaemic effect: Yust Mdel M et al stated that the hypocholesterolaemic and antioxidant activities of chickpea protein were studied. All hydrolysates tested exhibited better hypocholesterolaemic activity when compared with *chana* protein isolate. The maximum cholesterol micellar solubility inhibition (50%) had seen after 60 min of treatment with alcalase after that 30 min of hydrolysis with flavourzyme. To test antioxidant activity of *chana* proteins three methods were used: β-carotene bleaching method, reducing power and DPPH radical-scavenging effect. *Chana* hydrolysates showed better antioxidant activity in all assays, especially reducing power and DPPH scavenging effect than chickpea protein isolate[37].

Discussion

From the pathophysiology of *Sthaulya*, it can be clearly noticed that obesity is caused by several factors; it results from a common pathological mechanism. *Chana* causes *rukshta* (dryness) *laghavta* in the body because of its *ruksha* and *laghu guna*, and predominance of *kashsya rasa*, it break the *samprapti* of *sthaulya* (obesity). It is high in fibre and helps to lower cholesterol. It also has a very low glycemic index, high fiber which is important for Obesity patients.

Panchabhautika constitution	*Kashaya rasa*	*Laghu guna*	*Ruksha guna*
Prithvi	+	-	-
Aapa	-	-	-
Tej	-	+	+
Vayu	+	+	+
Akash	-	+	-

According to *Ayurveda*, *Chana* posses *Kashaya rasa* with predominance of *Prithvi* and *Vaayu mahabhutas* it also shows *laghu* and *ruksha guna*. *Acharya Hemadri* said that *Langhane Laghu* and

Shoshane ruksha that means the both *gunas* shows the *Medo- Kapha shamaka karma*.

Chana has rich source of protein in legumes and hence it help fuel the body methionine a type of amino acid present in it is beneficial for proper functioning of the cells and muscles and also protein helpful in obesity. Protein is the single most essential nutrient for weight loss and better looking body, high protein intake boosts metabolism, reduces appetite and changes several weight regulating hormones. Proteins are made up of chain of amino acid. A complete protein contains all essential amino acid, one cup of Bengal gram contains 38.6 grams of proteins.

Essential amino acid	Amount	RDI%
Histidine	1.062 gm	152%
Isoleucine	1.062 gm	118%
Leucine	2.748 gm	101%
Lysine	2.582 gm	123%
Methionine	0.506 gm	-
Phenylalanine	2.068 gm	-
Threonine	1.432 gm	136%
Tryptophan	0.37 gm	132%
Valine	1.618 gm	89%

Above table shows the balance of essential amino acids in 200gm i.e. One cup of *chana*. Out of 9 amino acid isoleucine, leucine, methionine, phenylalanine, valine have possesses *vaayu* and *aakash mahabhutas* both *laghu* and *ruksha gunas* also shows *vishad guna*. Aakash *vaayu mahabhutas* are hydrophobic action that means *medo* and *kapha nashana karma*, which decreased fats or *meda* of body, *chana* have high fiber content and thus have high volume along with high nutrient density. Intake of foods rich in dietary fiber often lead to lower body mass index as dietary fibers function as bulking agents in digestive system. These compounds increase satiety (a feeling of fullness) and reduce appetites making people feel fuller for longer and thereby reducing overall calorie intake.

Conclusion

Excessive accumulation of *kapha* and *meda* with other factors eventually leads to *Sthoulya roga*, so specific diet management should be followed to conflict *Sthoulya roga*. The weight loss expected to be gradual and long-lasting.

Chana have high fiber content with high nutrient density. *Chana* is considered as low GI food which increase cholecystokinin (hunger suppressant) thus help in obesity reduction and weight loss. *Chana* is a medicinal plant used as a medicine to treat traditionally a wide range of health complications. The analysis of phytochemistry, proteins, amino acids and other minerals present in chickpea are proved beneficial for treating many health disorders and thus have high significant value in therapeutical and pharmacological uses.

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