

# The Incredible Impact Of Horsegram: A Review

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## ABSTRACT-

Legume crops are grown extensively over the world and are a major source of protein in many least developed nations. Legumes have a very rich nutrient profile, with a higher than average concentration of protein, fiber, and bioactive substances and comparatively fewer carbs than cereal crops. Despite the fact that food beans are a staple in more than 70 countries, particularly in the Asian, African, and South American regions, the per capita intake in western nations remains low. Horsegram (*Macrotyloma uniflorum*), a member of the Fabaceae family and a potential grain legume, has superior therapeutic and nutritive qualities as well as greater climate resistance to withstand harsh environmental circumstances. Horsegram has historically been used to treat bronchial issues, cold and cough, asthma, and the degeneration of urinary calculi. Horsegram (*Macrotyloma uniflorum*) seed parts are dried, decoction-extracted, and used as drugs. Alkaloids, flavonoids, steroids, tannins, and glycosides are all present. Due to its wide range of applications, it has become a phytotherapeutic agent. In this paper, we discuss the potential use of horsegram (*Macrotyloma uniflorum*) in the pharmaceutical and food industries.

**Keywords:** horsegram , legume , nutraceutical properties, phytotherapeutic, bronchial.

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## I. INTRODUCTION-

In the world, there are more than 50,000 recognized edible plants (Aditya et al., 2019). The history of legume crops in relation to the advancement of agricultural techniques and the satisfaction of human nutritional needs is both lengthy and diversified (Afrifah et al., n.d.). There are many untapped agricultural resources in the world. An orphan and/or underutilized crop, horse gram (*Macrotyloma uniflorum*) is mostly grown locally by communities as a cultural heritage in specific niches in underdeveloped countries. Despite the fact that this orphan legume is an essential part of the diets of resource-poor populations, providing balanced nutrition, feed for animals in drought-prone regions, as well as potential health and environmental benefits, it has typically been overlooked in terms of resources for their promotion and is not traded internationally because of the limited economic importance in the global market (Aditya et al., 2019).

India is the original home of the horsegram, which is a tropical old world plant. Archaeological research has shown that horsegram was first used as food approximately 2000 BC, notably in India. The genus *Macrotyloma*, which includes the horsegram, has 25 species that are native to Asia and Africa (Bhartiya et al., 2015). A prospective grain legume from the Fabaceae family, horsegram has superior healing and nutritional qualities as well as greater climate resistance to withstand harsh environmental circumstances (Bhartiya et al., 2015). Horse gram is also known as "Gahhat" in the native language of Uttarakhand, "Kulthi" in Gujarati, and "Hulga" in Marathi. Kulthi dal is primarily consumed in the southern region of India as a staple cuisine (Chauhan, 2012).

Horsegram has a gray, bushy, slender stem that is 30 to 45 cm high and has numerous branches coming from the root. It has triplets of pale green leaves with tall stems that resemble bilvae. Its seeds have the same look as urad seeds: they are light red, black-pied, sticky, and shiny. It is a dark brown tint and resembles lentils. Some important south Indian recipes, including Rasam, are made with it. This pulse is grown in Chhattisgarh, West Bengal, Madhya Pradesh, Bihar, Uttarakhand, and Himachal Pradesh in addition to Karnataka, Andhra Pradesh, Odisha, and Tamil Nadu 1. (Chauhan, 2012.).

The following is a taxonomic classification of horse gram:

Kingdom – Plantae

Class – Magnoliopsida (Dicotyledons)

Subclass – Rosidae

Order – fabales

Family – Fabaceae

Subfamily – Faboideae

Tribe – Phaseoleae

Subtribe – Phaseolinae

Genus – *Macrotyloma* (Wight & Arn) Verd

Horsegram (*Macrotyloma uniflorum*) is a healthy food that is high in protein, fiber, ash, and low in fat. The detected moisture content ranges from 6.50% to 10.80%. While the amounts of protein, ash, and fiber are to range from 20.66% to 31.57%, 3.08% to 4.26%, and 4.45% to 7.38%, respectively. It is a pulse crop that is underutilized and may be cultivated in a variety of unfavorable environmental conditions. With a wealth of protein, minerals, and vitamins, it plays a significant role in human nutrition. Due to the presence of non-nutritive bioactive compounds, it has been associated with a lower risk of developing a number of diseases in addition to its nutritional value. These bioactive compounds, such as fiber, enzymatic/proteinase inhibitors, phytic acid, and phenolic acid, have important physiological and/or metabolic impacts.

Following cereals, which have been a staple of a healthy diet for humans for millennia, food legumes are the second most significant group of crops in terms of their contribution to human and animal nutrition. Some of the underutilized native legumes, like horse gram, have great significance in the nutritional security of rural, tribal, and underprivileged masses. In developing countries, a small number of conventional legumes dominate the production and market chains and play a crucial role in eradicating protein malnutrition. One of the most nutrient-dense vegetable pulse crops with ethno-medical benefits in India is horse gram, which is widely grown in the South Indian States of Karnataka, Andhra Pradesh, and Maharashtra. Additionally, it is grown in several areas of Bengal, Bihar, Himachal Pradesh, and Orissa.

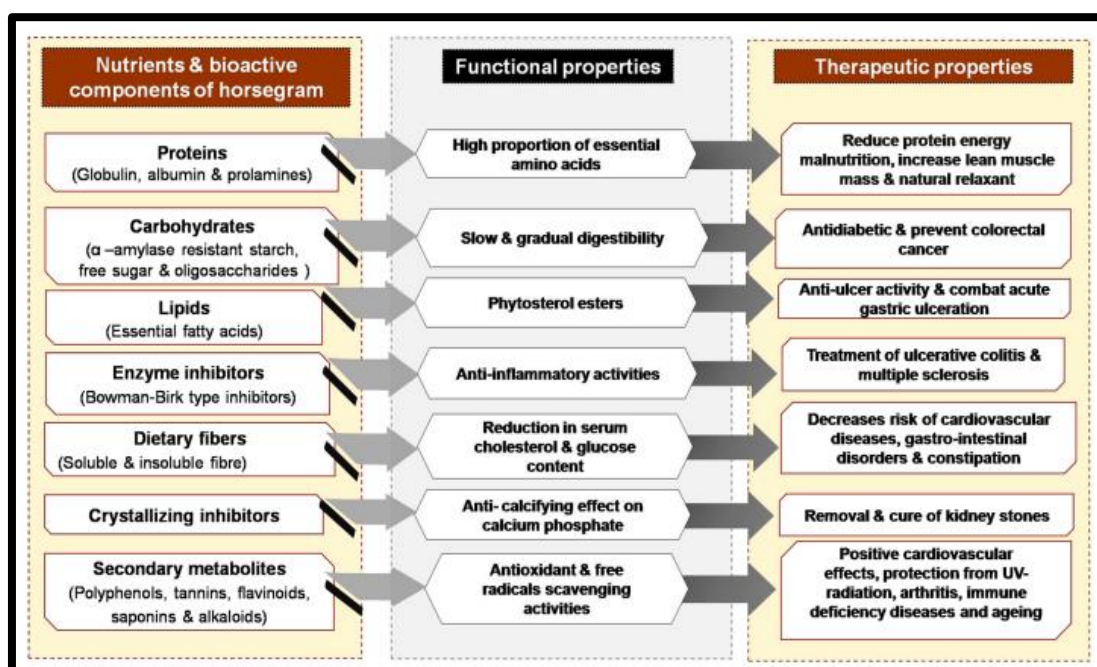
S. No.	Constituents	Value (% on DM bases)
<b>Proximate principle analysis</b>		
1.	Moisture	10.80%
2.	Crude Protein	31.57%
3.	Crude fibre	7.38%
4.	Ether Extract	0.82%
5.	Total Ash	4.26%
6.	Acid Insoluble ash	0.34%
<b>Digestibility analysis</b>		
7.	True protein	14.91%
8.	<i>In vitro</i> digestibility (Dry Matter)	77.95%
9.	Silage analysis (pH)	6.44
10.	NDF	13.14%
11.	ADF	7.35%
12.	Lignin	3.11%
<b>Micro and macro nutrients</b>		
13.	Calcium	1.36 %
14.	Phosphorus	0.48 %
15.	Magnesium	0.05 %
16.	Copper	14.0 ppm
17.	Cobalt	Not detected
18.	Iron	75.4 ppm
19.	Manganese	31.8 ppm
20.	Zinc	21.2 ppm

Source - Sharma, N., Bisht, S. S., Gupta, S., Rana, M., & Kumar, A. (2019). Nutraceutical Evaluation of Horse Gram (*Macrotyloma uniflorum*) Cultivated in High Altitudes of Uttarakhand Himalaya, India. *Ind. J. Pure App. Biosci*, 7(4), 190-202.

## II. MAIN BODY-

In many different cultures around the world, legumes have been utilized in traditional medicine (Ahmed & Hasan, 2014). The relevance of traditional medicinal plants and herbs in addressing the projected growth in global health care demands is significant (Sharma et al. 2016). Horse gram is a legume with ethnomedical benefits that is well-known in India. Rural residents use a significant amount of it during the dry and drought seasons. The seeds of *M. uniflorum* are mentioned in ancient Indian literature like Charak Samhita and Sushruta Samhita regarding the traditional Indian medical system as a means of curing abdominal lumps, bronchial asthma, hiccups, piles, and regulating/stopping excessive sweating. (Kaundal et al., 2019).

Its medicinally significant properties include anti-hypercholesterolemic, anti-microbial, anti-obesity, anti-helminthic, analgesic, anti-inflammatory, anti-diabetic, anti-cholelithiasis, antihistamine, anti-peptic ulcer, anti-oxidant, diuretic, hemolytic, hepatoprotective, anti-diabetic, and antihypertensive properties (Kaundal et al., 2019).



Aditya, J. P., Bhartiya, A., Chahota, R. K., Joshi, D., Chandra, N., Kant, L., & Pattanayak, A. (2019). Ancient orphan legume horse gram: a potential food and forage crop of future. *Planta*, 250, 891-909.

## III. HEALTH BENEFITS OF HORSEGRAM -

In the southern regions of India, horse gram is a common staple meal that is regarded as a wonder superfood. It is loaded with vitamins and minerals, including phosphorus, calcium, protein, and iron. As a result, it is well known to be particularly advantageous for both human and animal health. Let's now carefully examine and discover more about the advantages of horse gram for our general health.

### 1. Diarrhea -

Horse gram contains a sizable quantity of fiber, which aids in digestion and absorbs extra liquid from the stomach and intestines. This makes normal bowel motions possible and lessens the likelihood of diarrhea and loose motion. The digestive tract functions better when a handful of pre-soaked horse gram beans are consumed in the early morning.

### 2. Weight loss -

Weight reduction According to Ayurveda, if one consumes horse gram on a daily basis, weight reduction will undoubtedly occur. This only occurs when you ingest horse gram in powder form, to which a dash of cumin seeds should be added. Two times a day, on an empty stomach, the two should be combined in a glass of water and consumed as desired. It's fine if some people don't want to consume horse gram in this form for weight loss. In these circumstances, the bean can be consumed raw and soaking, or combined with Bengal gram and pepper to make a crisp salad that can be eaten.

3. Menstrual Disturbances -

Menstrual issues are incredibly upsetting, and unless you experience them, you won't understand how painful and draining they may be. You can either consume horse gram soup or salads containing horse gram to assist you get through this unpleasant condition. Both of these foods reduce the irritability caused by menstruation irregularities. The high iron content of horse gram will assist maintain the levels of hemoglobin in the body when you have irregular menstruation cycles or severe bleeding. For this reason, holistic specialists advise ladies with menstrual problems to take horse gram.

4. Cholesterol -

According to research, horse gram aids in lowering blood levels of LDL, or bad cholesterol. When horse gram is ingested, the bad cholesterol that has become lodged in the veins is eliminated.

5. Constipation -

Constipation is brought on by a diet low in fiber, a lack of water intake, a deficiency in minerals, as well as by an unhealthy lifestyle, stress, and a number of other factors. This occurs when the intestines and the lining of the stomach above the duodenum are unable to expand and contract appropriately, preventing the waste from being expelled. Horse gram can aid in the fight against constipation because it contains potent minerals and a lot of fiber. In these situations, horse gram should be pre-soaked and eaten raw as a salad.

6. Piles -

When the veins in the rectum enlarge and become irritated or painful, piles develop. Holistic specialists advise using horse gram as opposed to running to the pharmacy for drugs and treatment. Eat a cup of horse gram uncooked as a salad garnish as well as soak a cup in water overnight and drink it the next day. Its combination of roughage and fiber aids in the treatment of piles.

7. Common Cold and Fever -

We experience the common cold and fever when our bodies' immune systems are compromised and viruses take up residence in our bodies. For this, ancient Ayurvedic academics suggested consuming horse gram when you have a fever, cough, or cold, as well as bronchial issues and asthma. Consuming horse gram in soup form helps to clear congestion and opens up the nasal passages by causing the mucus membranes to soften and melt. This facilitates breathing because the body's metabolism and immunity are both increased by the necessary nutrients.

8. Urinary Discharge -

The humiliation that comes with urine discharge in women is real. This is particularly true when the urine is heavy, inconsistent, occasionally foul-smelling, and occasionally continuous. Around the cervix and the vagina, there may be aches, infections, and inflammation. This occurs when the membrane's lining becomes irritated, and the discharge may smell bad or be thick. When puberty begins or when sexual excitement is at its highest, the amount of discharge increases. According to Ayurveda, one should boil some horse gram the following day after soaking it in a basin of water for the previous night. To treat the symptoms of this condition, this water should be drunk three times each day.

9. Diabetes -

Researchers from the Indian Institute of Chemical Technology have discovered that raw, unprocessed horse gram seeds have characteristics that lower insulin resistance in addition to anti-hyperglycemic effects. Horse gram has the ability to provide strategies for preventing the development of hyperglycemic qualities in the body, making this possible. Horse gram in turn aids in reducing the body's insulin resistance. Blood glucose levels are reduced and managed, and it may also help slow down the rate of carbohydrate digestion, which further lowers blood glucose levels. Because of this, it is frequently used as a superfood to treat type 2 diabetes.

10. Digestion -

After a substantial meal, if your stomach doesn't feel comfortable or feels acidic for minutes to an hour or longer, you probably have indigestion. This might cause problems like GERD and acid reflux, which can be uncomfortable for you as well. For this reason, it is advised to take horse gram on an empty stomach first thing in the morning. This facilitates the digestive process and makes digestion simple.

11. Leucorrhoea -

Leucorrhoea patients struggle to meet their needs for personal hygiene. Leucorrhoea is recognized as a typical vaginal discharge that is both common and commonplace. It can fluctuate in consistency or color, and it

frequently goes along with cervix and vaginal discomfort, infections, and inflammation. This occurs when the membrane's lining becomes irritated, and the discharge may smell bad or be thick. When puberty begins or when sexual excitement is at its highest, the amount of discharge increases. According to Ayurveda, one should boil some horse gram the following day after soaking it in a basin of water for the previous night. To treat the symptoms of leucorrhoea, this water should be drunk three times each day.

12. Kidney Stones -

Horse gram can help prevent kidney stones from forming or even help remove them from the body when consumed regularly. The main component of kidney stones is a substance called calcium oxalate. Additionally, kidney stones in horses can be removed the same day. This is due to the fact that horse gram is high in polyphenols and rich in iron. Additionally, kidney stones have high antioxidant levels. The next morning, eat a cup of horse gram that has been soaked in a basin of water. This seems to have positive outcomes after a week of use.

13. Ulcers -

Horse gram, but not stomach ulcers, can be highly helpful in healing different types of ulcers. Horse gram contains lipids that are particularly beneficial for people who have oral and stomach ulcers when they eat the legume. Rats have been the subject of research and studies on the subject, and the animals have recovered. The same research and studies have also been conducted on humans, with encouraging results. Even in Ayurveda, it has been demonstrated that eating mashed horse gram twice a day produces the lipids the body needs to heal itself of ulcers. (Aditya et al.,2019).

IV. APPLICATION OF HORSEGRAM IN FOOD INDUSTRIES -

Sr. No.	Researcher	Product profile	Research conducted
1	Nanjaiah Lalitha & Sridevi Annapurna Singh, 2020	Protein concentrate	Horsegram protein concentrate (HGPC) was prepared, which had $80.4 \pm 3.5\%$ protein and $94.2 \pm 1.4\%$ in vitro protein digestibility compared to dehulled horsegram flour ( $22.8 \pm 0.8\%$ and $82.3 \pm 1.2\%$ , respectively). Available lysine content in concentrate was increased by 64% compared to dehulled horsegram flour. The trypsin inhibitory activity in the protein concentrate decreased by 51% from $36.6 \pm 3.5$ TIU/mg in horsegram flour to $17.6 \pm 2.5$ TIU/mg in HGPC
2	Haripriya A, & Lidiya Mercy, 2017	Instant dosa mix	Good nutritional profile mix had carbohydrate content in the range of 31.44 - 39.11 g/100g, 24% increase in the carbohydrate content, 26.48% increase in protein content, 9.75 % - 18.69% increase in calcium content, 28 % decrease in iron and phytic acid was observed in germinated Horsegram mix.
3	Joshi Shruti, & Dubey Ritu, 2018	Horsegram dal ladoo	Highly acceptable product was manufactures in context to colour and appearance, body and texture, taste and flavour and overall acceptability
4	Chavan U.D. et.al. (2010).	Isolation and Characterization of Starch	Hot water extraction gave maximum of 28.4 %, 31.1 % and 29.0 % starch from seeds of white, red and black cultivars of horsegram.
5	Patil et.al, 2017	Development of antioxidant rich extrudates	Product had total phenolic content (465.23 mg GAE/100g dw) and antioxidant activity (17.98 $\mu$ mol TE/g dw)
6	Shalini et.al., 2015	Enhancement of antioxidant property of extrudate	HTLM increased appreciably by 25-40% and 16-52% High temperature low moisture extruded products had increased phenolics and anti-oxidant activity 25-40% and 16-52% respectively
7	Basediya et.al., 2017	Model development for extrusion cooking	Model development for extrusion cooking Model development for extrusion cooking based on textural properties was done where Second order quadratic regression model was fitted in the variation. The significance was established at $p \leq 0.05$ . The hardness observed varied from 1.1 to 10.4 kg whereas the cutting strength varied from 1.3 to 10.1 kg.
8	Karishma Moktan and Pravin Ojha. (2016).	Fortified bread	Gakjadscsgerminated horsegram Germinated horse gram was used for the fortification of dough which enhanced the antioxidant property of bread
9	Mathangi S. Sudarsan and S. Geethanjali Santhanam. (2017)	horse gram idly mix powder	shelf life of the horse gram idly mix was one month and microbial load was within the safer limit Shelf life of the horse gram idly mix was found to be one month and microbial load was within the safer limit

Source : Ingle, K. P., Al-Khayri, J. M., Chakraborty, P., Narkhede, G. W., & Suprasanna, P. (2020). Bioactive compounds of horse gram (*macrotyloma uniflorum lam.[Verdc.]*). *Bioactive Compounds in Underutilized Vegetables and Legumes*, 1-39.

## V. CONCLUSION-

Horsegram is a significant food and feed crop that has historically been farmed in dry areas of impoverished countries. It is frequently referred to as the "poor man's pulse and is overlooked or underutilized. After a thorough analysis of horse gram's nutritional value and positive effects, we can conclude that those who understand its significance find it to be well-liked. It is relatively simple to digest and one of the key substances used to treat kidney stones, but it also contributes to a number of other aspects of human health. It is one of the foods with almost no negative effects and is excellent for all age groups. It is a reliable, nutritious, and therapeutic food crop that has long been despised by cynics. Its current level of use cannot minimize the many positive bioactivities it possesses. There are natural chemicals in our possession that can heal us, despite our busy lifestyles where we favor all medications and spend our money on therapies. "Eat healthy, live healthy" is the quotation that applies to this situation. Consequently, depending on its nutritional content, we can employ horsegram in the food sectors and in the pharma industry.

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