

Horse gram; A legume-crop delivering nutritional and economic importance: A review

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Abstract

Horsegram being a conventional indigenous crop can hence be utilized on a large-scale processing to develop value-added products. The nutraceutical and medicinal properties of horsegram has proven it to be a super-food. Horsegram, the nutrient power-house certainly would figure out the issue of nutritional security and thus exhibit as a superfood for better tomorrow. Food production specialists are continuously developing new value-added and innovative food products by completely utilizing and incorporating it in prior developed products as fortification. The legume as rich source of protein has a luminous future in creation of plant-based diets, healthy weight-losing diet and vegan foods.

Keywords: conventional, security, superfood, fortification

Introduction

Food legumes, a chief source of major nutrients i.e., carbohydrates, proteins, lipids, fiber, and minor nutrients as vitamins and minerals is considered to have good-time to predict the depiction of utilization and consumption of legumes in human nutrition with proper approach. The leguminous crops are crops for global security having a Major influence on agroecosystems. The locally available legume food crops play a major role in providing the nutritive food sources as well to solve the issue of food security. Hence, there is a need to increase the reliance on these underutilized food crops, pulses and legumes for feeding the growing population. Horsegram, an underutilized and obscured food pulse crop is found to be abundant in major nutrients.

Horsegram *Macrotyloma uniflorum* (Lam.) Verdc., belongs to family Fabaceae, a leguminous major crop of ancient India, native to Southeast Asia and tropical Africa (Chahota *et al.*, 2013) [3], grown in arid and semi-arid regions, usually hardy in raw form and soften on soaking, boiling, soaking operation. The genus name *Macrotyloma* is derived from the Greek words *makros* which denotes large, *tylos* means knob and *loma* denotes margin, apropos knobby-like structures on the legume pods. Horsegram, familiar as Kulith (marathi), kollu (southern part of India), and Madras bean or madras gram, is a legume with higher nutritional profile and value components. Along, also remarked to be great-powered source, hence used to fed race horses.



Fig 1: Horsegram seeds

Nutritional importance of horsegram

Food legumes are a major source of nutrients and have high potential for the nutritional quality improvement of foods. Horsegram is recognised to have nutritional profile equivalent to other commonly grown legumes in all aspects. Horsegram seeds contains carbohydrates (57.2%), protein (22%), dietary fibre (5.3%), fat (0.50%), calcium (287mg), phosphorous (311mg), iron (6.77mg) and calories (321 Kcal) and vitamins like thiamine (0.4mg), riboflavin (0.2mg) and niacin (1.5mg) per 100g of dry matter (Bhartiya *et al.*, 2015).

The whole and dehulled horsegram seeds showed variations in proximate constituent as carbohydrate (51.9-60.9% and 56.8-66.4%), protein (17.9-25.3%, 18.4-25.5%), fat (0.70-2.06%, 0.81-2.11%), moisture (11.55% and 9.73%), ash (3.0%-3.8%, 2.7-3.4 %) (Sudha *et al.*, 1995) [19]. The Horsegram seed consists of 28.8% total

dietary fibres, primarily insoluble dietary fibre is 27.82% and soluble dietary fibre 1.13% (Khatoon and Prakash, 2004).

The Carbohydrate content of raw horsegram seeds depicts the amount of starch as 36 ± 1.17 g starch per 100g dry matter (Bravo *et al.*, 1999). Similarly, the protein content is distributed as globulin 50-90%, and glutenin 10-20%, albumin 10-20% of total protein content.

The mineral content of horsegram is potassium (762 mg/100 mg), phosphorus (311 mg/100 mg), calcium (287 mg/100 mg), magnesium (172 g/100 mg), iron (6.77 mg/100 mg), zinc (3.4 mg/100 mg). Though a rich source of minerals, they are not readily available due to formation of complex with phenols or phytic acid. In addition, horsegram contains three major water-soluble vitamins in quantitative amount as thiamine (B1) - 0.38 mg/100 mg, riboflavin (B2) 0.19 mg/100 mg and niacin (B3) - 1.42 mg/100 mg (Ryan, 1981). Horsegram contains generous level of flavonoids such as quercetin, kaempferol, myricetin (major flavonoids); daidzen and genistein (isoflavonoids). Horsegram seeds contains free tannins and phenolics as 763.7 mg/100 g (Subbulakshmi and Kumar, 1967) and 1.67 g/100 g respectively (Sudha *et al.*, 1995) ^[19].

Bioactive compounds in Horsegram

The bioactive compounds present in horsegram are reported to be of two major types, nutritional bioactive components and antinutritional bioactive components. The antioxidant activity of Horsegram is due to its abundance natural source of flavonoids. The major flavonoids and isoflavonoids existing in horsegram are quercetin, kaempferol, myricetin and daidzein, genistein respectively (Ingle *et al.*, 2020) ^[7].

The presence of numerous anti-nutritional compounds is found to be present in horsegram as protease inhibitor, haemagglutinins, phytates, tannins, polyphenols, trypsin inhibitors, and small levels of oligosaccharides (Pagar *et al.*, 2021) ^[13]. The levels of anti-nutrients in raw horsegram, variety ANK Brown was found to be Phytic acid 4.55 ± 0.55 (mg/g), saponins 10.06 ± 0.73 (mg/g), trypsin Inhibitors 0.65 ± 0.02 (mg/g) (Herath *et al.*, 2020).

The pre-treatment steps prior to processing, i.e., dehulling, soaking, germination, fermentation, roasting, dehydration, and partially hydrolysing of the proteolytic enzymes is found to lower the anti-nutritional value, enhancing the rise in nutritional value (Oloyo, 2004 and Deshpande *et al.*, 2002) ^[12, 4].

Medicinal properties of Horsegram

Horsegram, also known as 'Tamrabeeja' due to the metallic brown (iron-copper) colour of the leguminous seeds. The ayurveda describes horsegram as spicy taste (*katu rasa*) and after digested it gets astringent (*kashaya rasa*). Being of hot-natured (*ushna veerya*), easy to assimilate (*laghu*), increases pitta dosha and Rakta (blood).

The presence of bioactive compounds in horsegram exhibits wide range of medicinal properties such as anti-hypercholesterolemic, anti-helminthic, analgesic and anti-inflammatory, as well as anti-diabetic activity. The studies also revealed that anti-histaminic properties of horsegram such as anti-peptic ulcer, anti-oxidant, free-radical scavenging, anti-urolithiatic, diuretic activity etc. have effect on human body (Ranasinghe and Ediriweera, 2017) ^[15]. Conventionally, horsegram is considered to be a medicinal herb for treatment of common diseases such as amenorrhoea, piles, bile and kidney stone, diabetes mellitus, and some complicated diseases such as leucorrhoea (Kaundal and Kumar, 2020) ^[9].

Horsegram, considered as a positive pranic food, is a food that serves as an instant source of energy to the body, energizes you throughout the day to carry all activities, without being fatigue.

Horse gram Processing

Wide range of processing methodologies have been developed for processing of horse gram to formulated different value-added products. These techniques not only add taste, texture and overall acceptability to the final product, but also lead to removal or disruption of anti-nutritional factors. Soaking, sprouting and germination, drying, fermentation, malting, etc. are the well-known methods applied prior to preparation. Horsegram in its raw form contains numerous anti-nutritional factors which interrupts the mineral absorption, protein digestibility and along causes difficulty in cooking as of legumes (Pagar *et al.*, 2021) ^[13]. Hence, processing of horsegram by application of pre-treatments as roasting, soaking, germination, dehydration, malting etc., helps in reduction of the anti-nutrients and increasing the nutritive quality and bio-availability. Single or combination of methods, thereof can be applied for the desired product. Extrusion cooking, 3-D printing and extraction of bioactive compounds from horse gram can be performed by use of advanced technologies.

Traditionally, the horsegram was processed to number of items such as soups, Shengule, murukku, pithla, etc. The research studies shown the utilization of horsegram flour in chapatis, bhakris, pancakes, bakery items like bread, cookies, savory items like chips, khakra, bhakarwadi, namkeens, nachos, etc. (Gaikwad and Ghatge, 2022) ^[5]. The re-formulation and innovations thus created a demand of healthy and value-added products for the youth, adult and geriatric population.

Future prospectus of Horsegram processing

Horsegram, a superfood, is considered as a potential food source of future, due to its nutrient-rich and medicinal, pharmacological properties. The concept of plant-based diet, plant-based milks, vegan foods has recently evolved and horsegram as a power-packed source of protein and other nutrients will play a substantial role in development of such foods. Along with it, horsegram in its processed form can be used in fortification of

different range of food items. Incorporating horsegram in diet will lead to ayurvedic and scientific approach of consumption.

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