



## The Bioavailability Balance: A Critical Review of Millet's (*Kshudra Dhanya*) Nutritional Ascent and Anti-Nutrient Caveats

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### ABSTRACT

**Introduction:** Ayurveda establishes *Ahara* as the "greatest medicine", essential for life's pillars *Traya Upastambha* and vitality. In the modern context, millets *Kshudra Dhanya* are championed as sustainable, nutrient-dense 'Nutri-Cereals.' This study addresses the critical need to analyze the dual effect of millets: their celebrated physiological benefits versus the risks posed by their inherent properties and anti-nutrient content, often overlooked in contemporary health narratives.

**Materials and Methods:** This research analyzed classical Ayurvedic texts alongside scientific literature to elaborate the properties of millets (*Kshudra Dhanya*) and validate their physiological merits and demerits based on qualities like *Ruksha* and *Vatakrita*.

**Results and Discussion:** Classical texts establish millets as *Ruksha, laghu and lekhana*. This combination yields therapeutic benefits: excellent management of obesity and diabetes by reducing Kapha and absorbing excess fat, and aiding digestion. Specific millets also promote bone repair and gut restoration.

However, the primary flaw is their highly vata -Aggravating nature, which is the root of many chronic diseases. This severe *Rukshata* creates systemic pathology:

- Cardiovascular: *Vata* causes vasoconstriction, accelerating atherosclerosis and leading to myocardial ischemia.
- Musculoskeletal: Dryness depletes joint lubrication, causing increased friction and accelerating osteoarthritis.
- Pediatric: High fiber causes nutrient displacement in children, hindering crucial development.

**KEYWORDS:** Millets, Ayurveda, *Kshudra Dhanya*, bioavailability, anti-nutrients, Vata aggravation

### INTRODUCTION

Ayurveda, through texts like *Charaka Samhita* and *Astanga Hridaya*, establishes *Ahara* as the primary of the *Traya Upastambha*<sup>1,2</sup> (Three Pillars of Life), reinforced by *Acharyas Kashyap* and *Bhel* who deemed it the "greatest medicine" (*Mahabhaishajyam*). *Sushruta* emphasized *Ahara* as the root of *Bala, Varna, and Oja*<sup>3</sup>, while *Charaka* called it the life force (*Praninam Pransangnakanam*<sup>4</sup>). Transitioning to modern context, millets, revered for their resilience and high fiber, align with this classical emphasis on wholesome food, offering significant physiological merits like improved gut health. However, their inclusion of anti-nutrient compounds

creates a critical trade-off, potentially limiting the bioavailability of the very minerals that define their nutritional value.

### Need of study:

*Aahar* as the root of vitality mentioned by ancient scholars like *Charaka* and *Sushruta*, the focus naturally shifts to what constitutes the most health-supportive *Ahara* today. In a world increasingly conscious of sustainable and nutrient-dense options, millets—which have been staples for millennia—have emerged as one of the hottest topics in nutrition. Often championed as 'Nutri-Cereals' for their high fibre, protein, and mineral content, they are widely used by health enthusiasts and are the subject of global attention. Therefore, to truly understand their role in modern dietary health, it is crucial to analyse the dual effect they have on our bodies: the profound physiological benefits versus the challenge of their anti-nutrient compounds

### MATERIAL AND METHODS

Concepts related to millets (*Kshudra Dhanya*) are analyzed with their relation to physiological and clinical application from Ayurvedic texts, internet source, and various journals.

### Aims and objectives:

To elaborate Properties of Millets (*Kshudra Dhanya*) in the Ayurvedic *Samhitas*

To scientifically validate the physiological merits and demerits of millets by its properties

### LITERATURE REVIEW

In the classical Ayurvedic classification, *Acharya Charaka* includes millets within the broader category of *Shuka Dhanya* Varga, while *Acharya Sushruta* and later texts like *Bhavaprakasha* (*Bhavamishra*) established millets as a distinct and separate group known as *Kudhanya Varga*<sup>5</sup> or *Kshudra Dhanya Varga*<sup>6</sup>.

क्षुद्रधान्यं कुधान्यं च तृणधान्यमिति स्मृतम् | क्षुद्रधान्यमनुष्णं स्यात्कषायं लघु लेखनम् |

मधुरं कटुकं पाके रूक्षं च क्लेशशोषकम् | वातकृद् बद्धवित्कं च पित्तक्तकफापहम् ||६३||(*Bh.Ni.Dhanyavarga*)

उष्णाः कषायमधुरा रूक्षाः कटुविपाकिनः | श्लेष्मघ्ना बद्धनिःस्यन्दा वातपित्तप्रकोपणाः ||२२||(*Su.Su.46/22*)

*Kangu* (*setaria italica*/foxtail millet) Gramineae:

स्त्रियां कङ्गुप्रियंगू द्वे कृष्णा रक्ता सिता तथा | पीता चतुर्विधा कङ्गुस्ताम्रा पीता वरा स्मृता ||६४||

कङ्गुस्तु भग्नसन्धानवातकृद् बृंहणी गुरुः | रूक्षा श्लेष्महराऽतीव वाजिनां गुणकृद् भृशम् ||६५||

कृष्णा रक्ताश्च पीताश्च श्वेताश्चैव प्रियङ्गवः | यथोत्तरं प्रधानाः स्यू रूक्षाः कफहराः स्मृताः ||२४||(*Su.Su.46/24*)

<i>Bhagna sandhankrut</i>	Calcium (Ca), Phosphorus (P): Essential minerals for bone matrix formation (hydroxyapatite). Protein: Amino acids for collagen synthesis in bone.
<i>guru</i>	high Fiber (Insoluble & Soluble): Resists digestion, increasing transit time.
<i>brumhana</i>	High Carbohydrate Content (Complex Starches): Primary energy source. Protein: Essential for muscle and tissue synthesis
<i>shleshmahara</i>	Low Glycemic Index (GI): Prevents sharp blood sugar rise. High Fiber: Aids in the removal of metabolic waste and fat.

*Shyamak*: (*echinochloa frumentacea*/barnyard millet) Gramineae

श्यामाकः श्यामकः श्यामस्त्रिबीजः स्यादविप्रियः | सुकुमारो राजधान्यं तृणबीजोत्तमश्च सः |

श्यामाकः शोषणो रूक्षो वातलः कफपित्तहृत् ||६७||(*Bh.Ni.Dhanyavarga*)

कषायमधुरस्तेषां शीतः पित्तापहः स्मृतः | कोद्रवश्च सनीवारः श्यामाकश्च सशान्तनुः ||२३||(*Su.Su.46/23*)

सकोरदूषः श्यामाकः कषायमधुरो लघुः | वातलः कफपित्तघ्नः शीतः सङ्ग्राहिशोषणः ||१६||(*Ch.Su.27/16*)

<i>laghu</i>	Suggests Low Fat content and/or High Digestible Fiber. It means the food has a low metabolic load and potentially a low caloric density
<i>Sangrahi, Shoshana</i>	These properties strongly suggest a High Dietary Fiber content, particularly insoluble fiber. The fiber adds bulk and absorbs excess water from the intestine, making it beneficial for conditions like diarrhea and malabsorption. This may also indicate Prebiotic benefits.

*Kodrava*: (paspalum scrobiculatum/kodo millet) Gramineae

कोद्रवः कोरदूषः स्यादुद्दालो वनकोद्रवः |कोद्रवो वातलो ग्राही हिमपित्तकफापहः |

उद्दालस्तु भवेदुष्णो ग्राही वातकरो भृशम् ||६८||(*Bh.Ni.Dhanyavarga*)

<i>Vatala</i>	This is a common property of most dry and light millets, which are high in Insoluble Fiber. The relative lack of Lipids and Moisture contributes to the dry, rough, and light qualities that increase the Vata Dosha in the body, potentially leading to dryness.
<i>Grahi</i>	Indicates High Dietary Fiber content, this fiber absorbs water in the gut, binding and solidifying the stool, which is beneficial in diarrhea/loose motions.

*Chinaka* (panicum miliaceum/ Indian millet) Gramineae

चीनाकः काककङ्गुश्च सुश्लक्ष्णः श्लक्ष्णकः स्मृतः |चीनाकः कङ्गुभेदोऽस्ति स ज्ञेयः कङ्गुवद् गुणैः ||६६||(*Bh.Ni.Dhanyavarga*)

<i>Shlakshna</i>	This can relate to its low Crude Fiber content, which makes its texture softer upon cooking. It also suggests that the Starch component is easily gelatinized
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## DISCUSSION

Merits of *kangu*

Weight Loss & Cravings: High Fiber and Complex Starches ensure lasting fullness and stable blood sugar, naturally reducing calorie intake and controlling cravings.

Muscle Support: Quality Protein provides the Amino Acids and steady Glucose provides the energy needed for efficient muscle and tissue synthesis.

Constipation Relief: Insoluble Fiber significantly increases fecal bulk, promoting healthy gut motility and easing chronic constipation.

Bone Health: Essential Minerals (Ca, P) are the foundational co-factors required for forming the bone matrix (Hydroxyapatite), supporting strength and repair

Demerits of *kangu*:

High fiber content in bulky foods causes rapid stomach fullness in children. Due to their small stomach capacity, this leads to "nutrient displacement," meaning they feel full before they can consume sufficient calories and essential nutrients required for their fast development.

Merits of *Shyamaka*:

Gut Restoration: Fiber solidifies stools and restores intestinal balance, acting similarly to a BRAT diet for loose motions.

Easy Digestion: Low Fat and simple, digestible Starch provide energy without straining a weak digestive system.

Metabolic Relief: Delivers nutrients with a minimal metabolic load.

Weight Management: High Fiber provides strong satiety, making it an excellent low-calorie grain replacement.

Nutrient Source: Supplies essential energy and nutrients even during recovery or restricted eating.

Demerits of *Shyamaka*:

Excessive dryness/absorption hinders growth. By absorbing too much moisture and fat, the diet promotes catabolism (breaking down) over the necessary anabolism (building up) for child development.

Merits of *Kodrava*:

Indigestion: It helps to maintain intestinal sluggishness, promotes better nutrient absorption, and manage symptoms like excess mucus and lack of appetite.

Diarrhoea: It reduces hypermotility and helps to repair the lining of the colon, providing relief from acute diarrhoea.

Demerits of *Kodrava*:

Severe Constipation: Excessive absorption of water hardens stools, causing abdominal pain and hindering the absorption of nutrients needed for growth.

## CONCLUSION

Millets are *Ruksha*, *Laghu*, and *Lekhana*. This powerful combination makes them excellent for managing obesity and diabetes by reducing *Kapha* and absorbing excess body moisture.

Their Pungent post-digestive taste (*Katu Vipaka*) helps to stimulate and strengthen *Agni*.

Their inherent flaw is being highly *Vata* -Aggravating, primarily due to the ensuing dryness and instability it creates.

The dryness depletes the essential moisture in the body, including the walls of the blood vessels, Causes Vasoconstriction and Spasm, Accelerates Atherosclerosis, myocardial ischemia

Aggravated *Vata* damages the blood vessels and muscle tissues in the skin, leading to skin diseases characterized by dryness, cracking, intense itching, and scaling.

The drying quality aggressively depletes the *Shleshaka Kapha* (the lubricating fluid, like synovial fluid) in the joints. This depletion results in reduced cushioning and a critical increase in friction between the joint surfaces.

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