



# Yava (Barley): A Potential Dietary Component for Management of Metabolic Disorders W.S.R. To Diabetes Mellitus-A Multi Case Report

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**ABSTRACT:** *Yava* or Barley (*Hordeum vulgare* L.) of Triticaceae is one of the most celebrated cereals of Ayurveda. *Yava* is a *nityasevaneeya dravya* meaning, that which can be consumed on a regular basis and is conducive to health. Classically, *Yava* has been mentioned as a potent dietary component in many conditions which can now be placed under the umbrella term of metabolic disorders. Understanding the holistic potential of *yava* in addressing the pathogenesis of *prameha* is a key to develop newer dietary supplements out of it. This article explores the utility of *Yava* as a dietetic product in metabolic disorders with special reference to Diabetes mellitus. *Yava* was included in the daily diet of Diabetic patients for a period of 1 month and their blood glucose levels were assessed. It was noted that there was significant improvement in the glycemic control in selected patients of Diabetes mellitus.

**KEY WORDS:** *Yava*, Barley, *Prameha*, Diabetes mellitus, Ayurveda, Diet

## INTRODUCTION

Barley, in Sanskrit, is called *Yava*. *Yava* is one of the oldest cereals known to and cultivated by mankind. *Yava* belongs to *Dhanya varga* and is revered in Ayurveda as one among the best *dhanyas*<sup>1</sup>. *Yava* is classified under *Shukadhanya varga*, a group which deals with cereals<sup>2</sup> and *Madhura gana* owing to its sweet taste<sup>3</sup>. *Yava* is enumerated by Acharya Sushruta among the *Sarva prani pathya ahara varga* which are a group of food articles which are considered as compatible dietary articles to all animals<sup>4</sup>. The drug is included in *Svedopaga dashemani*—the drugs helpful in Sudation therapy<sup>5</sup>, *Shramaharani dashemani*<sup>6</sup>— drugs which are helpful to mitigate fatigue and *Chardinigrahana dashemani*<sup>7</sup>—the drugs which can control emesis. Sushruta considers *Yava* under *Vatasamshamana varga*<sup>8</sup>—a drug which can alleviate Vata. and Vagbhata emphasises its usage in *Asthapana Basti-Enema* therapy<sup>9</sup>.

## Antiquity of Yava:

*Yava* is one cereal which has been vastly talked about in ancient literature of India since the Vedic era. Almost all the *puranas* mention about *Yava* and its various uses such as in rituals of *Yajna*, *Homa*, as a food and medicine—both internal and external. It is considered as nectar or Amruta and is counted as one among the five best oshadhis (annual plants)<sup>10</sup>.

The earliest known literary work the Rigveda mentions *Yava* as the *samanya dhanyavachaka* (*Yava* is mentioned synonymous to Cereal)<sup>10</sup>. A number of puranas mention the therapeutic utility of *Yava*. In Brahma purana<sup>11</sup> and Narada purana<sup>12</sup>, *Yava* is considered as a measurement unit as well. Markandeya purana mentions *Yava* among the 17 *Oshadhis* (Annuals) which are used by population for food<sup>13</sup>. Similarly, Vayupurana counts *Yava* among the 14 plants cultivated for food and also among the 8 plants used in Yajnas<sup>14</sup>. *Yava* is said to be useful in all the *shodhashasamskaras* except *Garbhadana* in *Shatapata brahmana*. Vishnu dharma sutra speaks of therapeutic utility of *Yava*. The Arthashastra of Kautilya has mentioned the utility of *Yava* in various ways such as food for horses, bullocks, in rituals like yajnas done before harvest season and for processing of metals to manufacture weapons<sup>15</sup>.

An outlook into its cultivation shows that, barley is one of the first domesticated grains in the Fertile Crescent, an area of relatively abundant water in Western Asia and near the Nile River of northeast Africa<sup>16</sup>.

## **METABOLIC DISORDERS AND DIABETES**

The term metabolic disorder is an umbrella term encompassing different types of disorders and diseases occurring due to disturbed metabolism. They come under the head of Non-communicable diseases and account to nearly 53% of deaths per annum in India. Cardiovascular diseases stand at the top of the list followed by Diabetes mellitus in the second place<sup>17</sup>.

Diabetes Mellitus has been one of the most prevalent health conditions of the new age lifestyle disorders. It poses a grave problem in global health index almost of pandemic proportions. According to a report published by International Diabetic federation in November 2017, it is estimated that 463 million adults between age group 20-79 years have diabetes worldwide. About 79% live in low and middle income countries. If these trends continue, by 2045, 700 million people between age group 20-79 years will have diabetes. Globally diabetes results in a burden of USD 760 billion spent yearly diabetes patients on healthcare, which corresponds to 10% of total geriatric healthcare. It is projected that healthcare expenditure on diabetes will reach USD 776 billion by 2045. Among the Diabetics, 72% belong to working age of between 20-64 years. 27.8% of diabetics are over 65 years and 0.2% are children and adolescents. The largest numbers of diabetes patients from age 20-79 years are in China (116.4 million), India (77 million) and the United States (31 million). India is placed 2nd in top ten countries having diabetes patients with 72.9 million diabetic subjects. This number is expected to increase to about 101 million by 2030 and 134.2 million in 2045.

The treatment of Diabetes in the present day has been largely dependent on different classes of anti-diabetic drugs such as alpha-glucosidase inhibitors, biguanides, dopamine antagonists, DPP-4 inhibitors, GLP-1 receptor antagonists, Meglitinides, SGLT-2 inhibitors, Sulfonylureas, Thiazolidinediones etc. However, diet forms a major part of Diabetic management protocol.

In Ayurveda Diabetes Mellitus (DM) is analogous to a spectrum of conditions mentioned under the terminologies Prameha and Madhumeha which are sometimes used synonymously. Generally Prameha is a spectrum and Madhumeha is a condition included under Prameha. The very etymology of the word Prameha indicates Polyuria to be the primary symptom of the disease. Madhumeha is a type of vataja prameha which is characterised by madhura mehana meaning sweet urine or in other words, indicating presence of glucose in urine. The Ayurvedic pathophysiology of the disease describes the involvement of deranged tissue metabolism. Ayurvedic principle of treatment during initial stages of prameha is to regulate diet and life style and in advanced stages use of pharmacological approaches. The Ayurveda management of Diabetes lays special emphasis on diet regulation and *Yava* is one of the primarily accentuated dietary components.

## **MATERIALS AND METHODS**

4 patients at different stages of Diabetes and presenting with different symptoms and laboratory results attending the Diabetic OPD of Centre of excellence in Research and Clinical services in Madhumeha (Diabetes mellitus), Central Ayurveda Research Institute, Bengaluru were advised a similar inclusion of Yava in their diet for a duration of one month. The laboratory investigations were carried out before and after this one month duration. The medication was not altered during this period.

The patients were explained the following methods of food preparation using barley. The grains were to be roasted and powdered into coarse powder and fine flour. Coarse powder can be used to prepare Barley water, porridge, or saktu. Flour can be used to prepare chapathi, roti, mixed with ragi flour while preparing ragi balls, mixed with butter milk and water to prepare dosa etc. The patient is supposed to include barley as a major part of calorie intake in atleast two major meals in a day.

The selected patients belonged to different stages of diabetes and their disease, diet and medication history was noted in detail.

### **Patient- 1**

A 52 year old female who is a known case of Diabetes since 18 yrs is on regular treatment. The patient is on Biphasic Isophane 70/30 Insulin injections since 3 years presently dosed at 16 U-0-12 U. She is also taking oral hypoglycaemic agents- Metformin 500mg+Sitagliptin 50 mg twice a day. Additionally, she is on Chandraprabha vati 1 tablet BD and Katakakhadiradi Kashaya 10 ml BD since past 6 months. She was advised inclusion of Yava in diet. The investigations were done before and after 1 month of Yava diet. The medicines were continued during diet intervention.

### **Patient- 2**

Patient 2 is a 48 year old male is a newly diagnosed drug naive case of Diabetes. He was diagnosed with Diabetes during annual health check up. The patient was not advised any oral anti-diabetic drug and was advised inclusion of Yava in diet. The investigations were done before and after 1 month of Yava diet. No medicine was taken during this one month period.

### **Patient -3**

A 55 year old male is a known case of Diabetes since 4 yrs. He was on oral Metformin 1000mg/day for a period of 1year 6 months after which the Diabetician had discontinued the medicine through taper down method. The glycemic control was later achieved through diet and exercise and the patient was not on any medication for the next 3 years. The patient would undergo investigations every 3 months once regularly to confirm whether the sugar levels are at check. The previous test showed a raise in the blood sugar levels and hence approached Ayurveda treatment. He was advised to continue with the same diet and lifestyle he has been following for the past 3 years and was introduced with Yava in Diet. No oral anti-diabetic agents were introduced during this one month period.

### **Patient -4**

Patient 4, a 32 year old male, is a newly diagnosed drug naive case of pre-diabetes. He was diagnosed with slightly higher FBS level during a free diabetes camp and was advised by the attending physician to undergo detailed check. His Glycosylated Haemoglobin level was 5.9% indicating Pre-diabetic stage. The patient had positive bi-parental family history and hence patient was keen on glycemic control and prevention of progression of the condition into Diabetes. The patient was advised inclusion of Yava in diet. The investigations were done after 1 month of Yava diet. No medicine was prescribed during this one month period.

## OBSERVATIONS AND RESULTS

The laboratory reports of all the patients showed significant improvement in their glycemetic control (Table 1). It was observed that along with lowering the Blood sugar levels, it also showed prominent lipid balancing action as well.

## DISCUSSION

Yava is said to have pramehahara activity as per most nighantus. Table 2 shows the pharmacodynamics of the drug yava. Charaka indicates regular intake of Yava in Prameha<sup>19</sup>. The madhura rasa of yava makes it Ojavardhana, balya, dhatu poshana, preenana- which nourishes the body<sup>20</sup>. The dhatu kshaya and Ojo kshaya avastha that is caused in pravruddha prameha and Madhumeha wherein there is weight loss and emaciation, tissue protection is achieved by the nourishing property of Madhura rasa. The kashaya rasa of yava is said to have shareerakleda achushana karma <sup>21</sup> meaning it can dry up the kledata or the fluid factor of the metabolism thus regulating fluid mechanism of the body. Prameha mainly occurs due to involvement of kapha, meda and kleda and kashaya rasa acts against all these.

The gunas of yava are ruksha and laghu. The action of these gunas are that which dries up and that which helps in bringing about lightness in the body. The action of both the gunas are mainly against snigdhatata which is the prime guna affecting a pramehi due to involvement of snigdha dhatus such as meda, kleda and kapha dosha.

Barley is said to reduce serum glucose level. Consuming diets containing either barley, or its combinations with drugs like cinnamon regulates blood glucose, lipid profile, and adipose tissue hormones in type 2 diabetes<sup>22</sup>.

Carbohydrates rich in fibers may delay absorption of glucose resulting in a better coincidence between the timing of insulin release and peak blood glucose concentration<sup>23</sup>.

β-glucan from barley reduces the risk of coronary heart disease; may modestly decrease serum triacylglycerols; may improve glycemetic control. Individuals with low barley fiber intake should increase their intake of whole grains in order to receive the benefits of whole grains in addition to fiber<sup>24</sup>.

Inclusion of whole grain barley in diet has shown significantly reduced plasma interleukin-6 (IL-6) and peak postprandial glucose. intake of whole grains induced compositional alterations of the gut microbiota that coincided with improvements in host physiological measures related to metabolic dysfunctions<sup>25</sup>.

The addition of barley to a healthy diet may be also can be effective in lowering total and LDL cholesterol, without altering HDL levels<sup>26</sup>.

Some food recipes which can be potential dietary supplements for diabetic patients as mentioned in our classical texts are below which can help us advise the patients as dietary supplements.

### Yavaja Saktu

Yava grains are fried in a pan and then pounded. It is said to be cold, imparts taste, is light, laxative, dry, and clarifying. It alleviates kapha and pitta. When consumed as a drink, it is strengthening, aphrodisiac, growth promoting, breaks the stools, satiating, sweet, imparts taste and is strengthening. This can be considered as a potent anti-diabetic food preparation<sup>27</sup>.

### Yava saktu

It alleviates *Kapha* and *pitta*, removes fatigue, hunger, thirst, and treats wounds and diseases of the eyes. It is specially suited for diabetics who are physically active and need more energy<sup>27</sup>.

### Chanaka Yava saktu

Saktu prepared from Barley grains mixed with de-husked and fried Bengal gram along with sugar and ghee are suitable for summer. Along with being a nourishing drink option for diabetics, it is considered

*Shukrala* (Aphrodisiac), *balya* (Strength promoting), *laghu* (Light for digestion), *sheeta* (Cold in potency), *truptikara* (Satiating) and imparts taste<sup>28</sup>.

### **Yavaka**

Cooked *Yava* is *ati guru* (Very heavy for digestion), *Svadu* (Sweet), *Vrushya* (Aphrodisiac), *Snigdha* (Unctuous), and helps alleviate *Meha* (Diabetes) along with other conditions such as *Gulma* (Abdominal Tumours), *Jvara* (Fever), *Pratishyaya* (Rhinitis), *Kantaroga* (Diseases Of Throat), *Kasa* (Cough)<sup>29</sup>.

### **CONCLUSION**

Barley is a key component of diet in diabetes. The Ayurveda classics hail the benefits of Barley in correcting metabolism thus making it a potential dietary supplement in life style related metabolic disorders especially Diabetes mellitus. The patients who were given Barley diet have shown that Barley has the potential to be a great nutrient inclusion in diet for Diabetes. Further research to ponder over specific benefits of Barley in Diabetic therapy is required.

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**Table 1:** showing the Laboratory investigations in Patients who were on Yava diet

Parameter	Presenting Symptoms	FBS (mg/dl)	PPBS (mg/dl)	TC (mg/dl)	TGL (mg/dl)	HDL (mg/dl)	LDL (mg/dl)	BUN (mg/dl)	Cr	FUS	
Pt 1	BT	Polyuria, Fatigue, Visual disturbances, Delayed wound healing	248	339	238	176	32	205	19.3	0.82	2+
	AT	Polyuria, Visual disturbances, Delayed wound healing	186	263	201	145	35	184	18.9	0.84	1+
Pt 2	BT	Fatigue Weight loss	221	268	169	162	44	164	16.8	1.1	0
	AT	Decreased fatigue, Weight stable	153	176	155	168	48	169	15.4	1.0	0
Pt 3	BT	Polyuria, Polydipsia	178	209	142	134	51	189	12.5	0.9	0
	AT	Polyuria, Polydipsia	126	154	158	129	49	196	13.6	0.7	0
Pt 4	BT	Weight gain	116	135	198	279	31	219	18.6	1.0	0
	AT	No change in weight	105	128	203	254	34	225	14.9	1.2	0

FBS: Fasting blood sugar; PPBS: Postprandial blood sugar; TC: Total Cholesterol; TGL: Triglycerides; HDL: High density lipoprotein; LDL: Low density Lipoprotein; BUN: Blood urkeia nitrogen; Cr: Creatinine, FUS: Fasting Urine sugar

**Table 2:** Pharmacodynamics of Yava in Ayurveda according to different authors

<b>Reference</b>	<b>Rasa</b>	<b>Guna</b>	<b>Veerya</b>	<b>Vipaka</b>	<b>Doshakarma</b>
Charaka Samhita <sup>20</sup>	<i>Madhura</i> <i>Kashaya</i>	<i>Ruksha</i> <i>Laghu</i>	<i>Sheeta</i>		<i>Kaphahara</i>
Sushruta Samhita <sup>8</sup>	<i>Kashaya</i> <i>Madhura</i>		<i>Sheeta</i>	<i>Katu</i>	<i>Kaphapittahara</i>
Ashtanga Hrudaya <sup>9</sup>	<i>Madhura</i>	<i>Ruksha</i> <i>Guru</i> <i>Sara</i>	<i>Sheeta</i>		<i>Vatakrut</i> <i>Pittakaphahara</i>
Bhava Prakasha <sup>30</sup>	<i>Kashaya</i> <i>Madhura</i>	<i>Mrudu</i> <i>Ruksha</i> <i>Guru</i>	<i>Sheeta</i>	<i>Katu</i>	<i>Kaphapittahara</i>
Raja Nighantu <sup>31</sup>	<i>Madhura</i> <i>Kashaya</i>	<i>Ruksha</i> <i>Laghu</i> <i>Mrudu</i>	<i>Sheeta</i>	<i>Katu</i>	<i>KaphaVatahara</i>
Kaiyadeva nighantu <sup>32</sup>	<i>Madhura</i>	<i>Laghu</i> <i>Mrudu</i>	<i>Sheeta</i>		
Madanapala nighantu <sup>33</sup>	<i>Kashaya</i> <i>Madhura</i>		<i>Sheeta</i>		<i>Kaphapittahara</i>
Dhanvantari Nighantu <sup>34</sup>	<i>Madhura</i>	<i>Ruksha</i> <i>Guru</i> <i>Sara</i>	<i>Sheeta</i>		<i>Vatakrut</i> <i>Pittakaphahara</i>
Ayurvediya oushadhi nighantu <sup>35</sup>					<i>Pittarakthahara</i> <i>Vatala</i>
Dravyaguna samgraha <sup>36</sup>	<i>Madhura</i> <i>Kashaya</i>		<i>Sheeta</i>	<i>Katu</i>	<i>Kaphapittahara</i>
Rajavallabha nighantu <sup>37</sup>	<i>Kashaya</i> <i>Madhura</i>	<i>Guru</i> <i>Ruksha</i>	<i>Sheeta</i>		<i>Vataraktahara</i>
Shodhala Nighantu <sup>38</sup>	<i>Kashaya</i> <i>Madhura</i>		<i>Sheeta</i>	<i>Katu</i>	<i>Kaphapittahara</i>