



## Pharmacognostic studies on *Hordeum vulgare* L.

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### Abstract

Barley has been cultivated since long in northern India. The important producers of barley are U.S.S.R., China, U.S.A., Canada, India and countries bordering the Mediterranean, which together contribute more than 50% of the total world production. In India it is found in Uttar Pradesh, Rajasthan, Bihar, Punjab and Madhya Pradesh, West Bengal, Himachal Pradesh, Jammu and Kashmir. The shoots are diuretic. The seed sprouts are demulcent, expectorant, galactofuge, lenitive and stomachic. The seed is digestive, emollient, nutritive, febrifuge and stomachic. It is taken internally as a nutritious food or as barley water (an infusion of the germinated seed in water) and is of special use for babies and invalids. Its use is said to reduce excessive lactation. Barley is also used as a poultice for burns and wounds. Recent research has shown that barley may be of aid in the treatment of hepatitis, whilst other trials have shown that it may help to control diabetes. Barley bran may have the effect of lowering blood cholesterol levels and preventing bowel cancer. Hence an attempt is made to study its detailed pharmacognosy.

**Keywords:** hordeum vulgare, barley, TLC, physicochemical, anatomical, microbial limits

### Introduction

Barley belongs to Poaceae, is a wonderfully versatile cereal grain with a rich nutlike flavor and an appealing chewy, pasta-like consistency. Barley is a very resourceful plant; it has had its uses since antiquity to treat various disorders among different countries. A decoction of the dried seed and fruit are used to medicate diabetes, urinary tract infection, respiratory infection, applied on hemorrhoids, dysentery, jaundice, etc. It exerts excellent cardio protective effect by reducing total and low-density lipoprotein (LDL) and improving high-density lipoprotein (HDL) this is due to the presence of higher soluble fiber. Significant reductions in blood pressure have previously been reported in this high-fiber grain diet studies. Plant is an annual, erect, 50–100 cm tall, smooth, glabrous. Leaf sheath are usually glabrous; auricles present, membranous; leaf blade 9–25 × 0.6–2 cm. Roots are fibrous, 0.5 to 0.1 cm thick. Spike hexastichous, dense; rachis flexible. Spikelets all sessile, fertile, and similar. Glumes linear-lanceolate at base, puberulent; awn 8–14 mm. Lemma apex with long awn 8–15 cm or 3-forked appendage. Palea equaling lemma. Caryopsis adherent to or free from lemma and palea. Flowering and fruiting is during February–April<sup>[1]</sup>.

A study was conducted on four varieties of dehusked highland barley to evaluate its antioxidant, antiproliferative activities towards HepG2 human liver cancer cells. Anti-oxidant activity was determined by oxygen radical absorbance capacity (ORAC) and cellular antioxidant activity (CAA) assays showed excellent antioxidant activity, as well as effective antiproliferative activity owing its properties to the presence of phenolic group<sup>[2]</sup>. Various test results comply with barley as a potent anti-cancerous agent, in a study pertaining to breast and prostate cancer, barley showed apoptosis of cells by increasing the intracellular ROS level<sup>[3]</sup>.

Further, Green barley extract exhibited inhibition of leukemia/lymphoma cells showing no significant effect on non-cancerous cells<sup>[4]</sup>. Similar effect was seen when young green barley were tested for colon cancer exerted, inhibited proliferation of colon cancer cells in a dose-dependent manner with no consequence on colon epithelial cells<sup>[5]</sup>.

Methanolic extract of barley was subjected to LPS induced inflammatory response, portrayed positive result thus suggesting it as a viable treatment for inflammatory diseases<sup>[6]</sup>. In a study to find a natural alternative to prevent thrombosis, peptides derived from oat, buckwheat, and barley were subjected to *in vitro* gastrointestinal digestion, trypsin and alcalase digestions, barley exhibited decent anti-platelet activity<sup>[7]</sup>. In a study 13 barley cultivars were subjected to cold water and ethanol (12%) extraction and were investigated for their  $\alpha$ -amylase and  $\alpha$ -glucosidase inhibitory activities showed moderate to high  $\alpha$ -amylase inhibitory activity and moderate  $\alpha$ -glucosidase inhibitory activity acting as a non-food nutraceuticals in management of type 2 diabetes and its complications<sup>[8]</sup>. The presence of Barley grass powder encourages sleep due to the presence of GABA and calcium, magnesium and B vitamins<sup>[9]</sup>. In light of the aforementioned studies it could be suggested as a promising candidate for the further studies.

### Materials and Methods

**Voucher specimen:** The plant materials were collected and identity was confirmed with the voucher specimen using<sup>[10]</sup>. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, and water and alcohol-soluble extractives were calculated as per the Ayurvedic Pharmacopoeia of India,<sup>[11]</sup>. TLC fingerprinting profile carried as per<sup>[12]</sup>. For the Anatomical

studies, transverse sections (TS) and powder microscopy studies were prepared and stained [13, 14]. A standard guideline for total microbial Limit count was provided by WHO [15].

**Results and Discussions**

**Table 1:** Pharmacognosy features

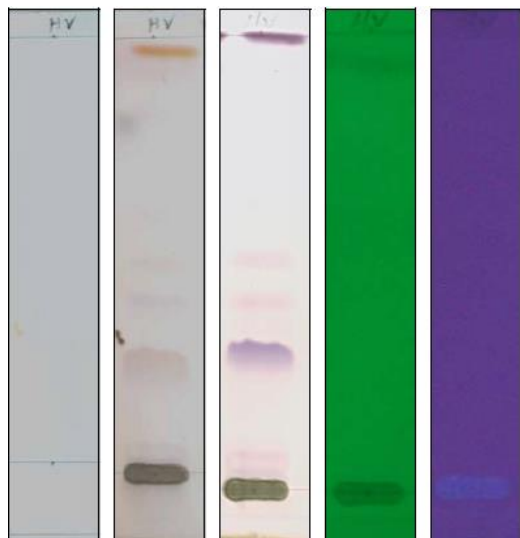
Physicochemical Constants			Organoleptic Characters	
Parametrs	Values	Limit	Parametrs	Values
TA	0.8%	NMT 8.5	Taste	Starchy
AIA	0.05%	NMT 4	Color	White
ASE	1.4%	NLT 7	Odour	Mild
WSE	5.3%	NLT 8	Texture	Smooth

TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble Extractive; NMT- Not More Than, NLT- Not Less Than Limit as prescribed by Ayurvedic Pharmacopeia of India

The physiochemical criteria did not comply with the specified value of the Ayurvedic Pharmacopeia of India. Perhaps, this is due to the presence of adulterants such as salts, silica or inappropriate handling of raw materials. The organoleptic characteristics described above are special for a particular plant.

**Table 2:** TLC Profile

TLC Finger Printing Profile						
Under Visible Light						
Rf Values	-	-	-	-	-	-
Sprayed with 10% H <sub>2</sub> SO <sub>4</sub>						
Rf Values	0.27	0.31	0.4	-	0.98	-
Sprayed with Anisaldehyde						
Rf Values	0.04	0.31	0.42	0.51	0.99	-
Under Short UV (254 nm)						
Rf Values	-	-	-	-	-	-
Under Long UV (366 nm)						
Rf Values	-	-	-	-	-	-

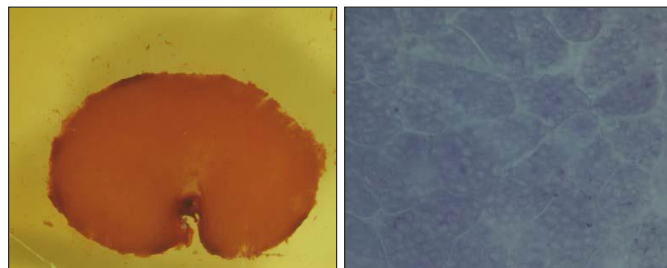


**Fig 1:** TLC Chromatograms

*Hordeum vulgare* showed 0 bands under visible light, 4 bands when sprayed with 10% H<sub>2</sub>SO<sub>4</sub> and 5 bands when sprayed with Anisaldehyde. Further, no bands were observed under short and

long UV light respectively. The results are qualitative TLC finger print profile of plant under study (table 2, fig 1)

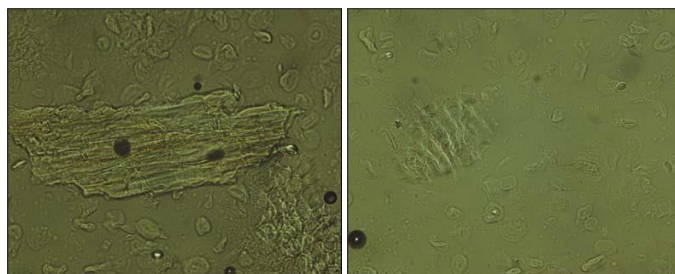
**Anatomical Characters**



**Fig 2:** Anatomical Characters of *Hordeum vulgare*

T.S of seed looks like kidney shape with thin epicarp, after epicarp region abundant parenchyma cells filled with starch grains, Section shows the notch this is the radical region (fig 2).

**Powder Characters:** Powder Colour: White:



**Fig 3:** Powder characteristics of *Hordeum vulgare*

1. Fragment of epidermal cells parenchyma,
2. Groups of tubular, elongated lignified cells, polygonal thin walled parenchymatous epidermal cells with intercellular spaces,
3. Trichomes with large lumen, Sclerenchymatous fibers, vessels,
4. Abundant round to oval, simple starch grains having concentric striations.

Powder microscopy allows to find the various broken bits of the sample that are specific and play a key role in the identification of the raw sample (fig 3).

**Microbial Limit Test**

**Total Aerobic Bacterial Count (TABC):** 2.5 x 10<sup>3</sup>  
**Total Yeast and Mould Count (TYMC):** 0.5 x 10<sup>3</sup>  
 (Microbial contamination limit for raw herbs - TABC: <10<sup>7</sup>, TYMC: <10<sup>5</sup>)

All criteria were within the limits specified by the WHO Guidelines and Indian Herbal Pharmacopeia.

**Conclusion**

In the present research, Pharmacognostic parameters of *Hordeum*, a therapeutically essential plant has been studied in order to standardize and authenticate plant material. Physicochemical values did not reach the limits prescribed by

Ayurvedic Pharmacopeia of India, which may indicate the existence of adulterants. The TLC profile will serve as a fingerprint profile for the plant. Organoleptic, anatomical and powder microscopic studies are specific to the plant. The microbial limit of the raw herb was well within the guidelines.

## References

1. Rajesh K, Manju S, Mita K. Yava (*Hordeum vulgare* Linn.): A review. *International Research Journal of Pharmacy*. 2016; 7(3):5-9.
2. Zhu Y, Li T, Fu X, Abbasi AM, Zheng B, Liu RH, *et al.* Phenolics content, antioxidant and antiproliferative activities of dehulled highland barley (*Hordeum vulgare* L.). *Journal of Functional Foods*. 2015; 19:439-450.
3. Woo SM, Kwon SC, Ko SG, Cho SG. Barley grass extract causes apoptosis of cancer cells by increasing intracellular reactive oxygen species production. *Biomedical reports*, 2017; 6(6):681-685.
4. Robles-Escajeda E, Lerma D, Nyakeriga AM, Ross JA, Kirken RA, *et al.* Searching in mother nature for anti-cancer activity: anti-proliferative and pro-apoptotic effect elicited by green barley on leukemia/lymphoma cells. *PloS one*. 2013; 8(9):e73508.
5. Kawka K, Lemieszek MK, Rzeski W. Chemopreventive properties of young green barley extracts in *in vitro* model of colon cancer. *Annals of Agricultural and Environmental Medicine*. 2019; 26(1):174-181.
6. Choi KC, Hwang JM, Bang SJ, Son YO, Kim BT, Kim D, *et al.* Methanol extract of the aerial parts of barley (*Hordeum vulgare*) suppresses lipopolysaccharide-induced inflammatory responses *in vitro* and *in vivo*. *Pharmaceutical Biology*. 2013; 51(8):1066-1076.
7. Yu G, Wang F, Zhang B, Fan J. *In vitro* inhibition of platelet aggregation by peptides derived from oat (*Avena sativa* L.), highland barley (*Hordeum vulgare* Linn. var. nudum Hook. f.), and buckwheat (*Fagopyrum esculentum* Moench) proteins. *Food chemistry*. 2016; 194:577-586.
8. Ramakrishna R, Sarkar D, Schwarz P, Shetty K. Phenolic linked anti-hyperglycemic bioactives of barley (*Hordeum vulgare* L.) cultivars as nutraceuticals targeting type 2 diabetes. *Industrial Crops and Products*. 2017; 107:509-517.
9. Zeng Y, Yang J, Du J, Pu X, Yang X, Yang S, *et al.* Strategies of functional foods promote sleep in human being. *Current signal transduction therapy*. 2014; 9(3):148-155.
10. Gamble JS. *Flora of The Presidency of Madras*. Newmann and Adlard London West, 1935, 1-3.
11. The Ayurvedic Pharmacopoeia of India, Ministry of Health and Family welfare, Govt. of India, 2001, 1-4.
12. Stahl E *Thin layer chromatography*, Springer International Student Edition New York, 1965.
13. Wallis TE. *Text Book of Pharmacognosy*, Fifth Edition, CBS Publication and Distributors, 1957, 389-396.
14. Johansen DA. *Plant Microtechnique*. McGraw-Hill, New York, 1940, 523.
15. WHO. *Quality Control methods for Medicinal Plant materials*, WHO, Geneva, 1998, 22.