Barley Crop Details for Exam

Grass-family member barley (Hordeum vulgare) is a common cereal grain cultivated all over the world in temperate areas. It was one of the first grains to be grown, especially in Eurasia 10,000 years ago. Globally, 30% of barley production is utilised as a source of fermentable material for beer and some distilled drinks as well as a component of several diets, while 70% is used as animal feed. It is a component of many cultures' barley bread as well as soups and stews. Commonly, barley grains are processed into malt using an old fashioned technique. In terms of quantity produced (149 million tonnes or 330 billion pounds), barley came in fourth place among grains in 2017 after maize, rice, and wheat. Barley belongs to the grass family. It has 14 chromosomes and is a self-pollinating diploid species. Hordeum vulgare subsp. spontaneum, the wild parent of domesticated barley, is widely distributed in grasslands and forests throughout the Fertile Crescent region of Western Asia and northeast Africa. It is also widely distributed in disturbed habitats, roadside ditches, and orchards.

About Barley

After rice, wheat, and maize, barley, often known as "jau", or Hordeum vulgare L., is one of the world's most significant cereal crops. The grass family Poaceae produces the Rabi cereal crop known as barley. Most of the world's barley crops are grown in colder, semiarid climates. It is said that the Middle East is where barley first appeared. Historically, barley was primarily planted for human consumption, but today it is also produced for animal feed, malt products, and human food.

History of Barley

One of the earliest domesticated grains was barley, which was originally grown in the Fertile Crescent, a region of Western Asia with a lot of water that is also close to the Nile River in northeastern Africa. It emerged in the same period as emmer and einkorn wheat. The geographic distribution of wild barley (H. vulgare ssp. spontaneum) extends from Tibet in the east to North Africa and Crete in the west. At Ohalo II, near the southern tip of the Sea of Galilee, grinding stones with residues of starch were discovered, providing the oldest archaeological evidence of the consumption of wild barley. The remains were estimated to date to around 23,000 BCE. Around 9,000 - 7,000 BCE, in the Jarmo region of present-day Iraq, there is the earliest evidence of barley being domesticated, in the form of cultivars that cannot reproduce on their own. Barley was domesticated in the Near East around 11,000 years ago and is one of the most significant crops in the world today (circa 9,000 BCE). By 2,000 BCE, barley had expanded throughout Eurasia, according to archaeobotanical data. The sole crop that has been repeatedly referenced in the Rigveda and other Indian texts as one of the main grains in ancient India is barley, known as Yava in both Vedic and Classical Sanskrit. Barley farming was also practised in the Harappan culture, which flourished between 5700 and 3300 years ago, during the post-Neolithic Bronze Age.

Barley Climate Requirements

Barley can be cultivated as both a summer crop or a winter crop. Both tropical and subtropical climates are suitable for growing it. The crop needs temperatures of 12 to 15 °C for growth and 30 to 32 °C for maturity. At any stage of growth, the crop is particularly sensitive to frost. Any occurrence of frost during the blossoming period might significantly reduce productivity. Drought- and heat-tolerant barley crops can endure harsh conditions.

Barley Soil Requirements

Barley is mostly cultivated in sandy to moderately heavy loam soils. Therefore, the soil of Indo-Gangetic plains having neutral to saline reaction and medium fertility are the most suitable soil types for barley cultivation. Barley crops can be cultivated in saline, sodic and lighter soils too. Soil acidity impairs the root growth of barley crops hence acidic soils are not suitable for barley cultivation.

Barley Farming Techniques

Barley requires two to three cultivator ploughings, with each ploughing being followed by planking. Row spacing should be 22.5 cm for irrigation dependent lands and 22.5 to 25 cm for rain-fed lands. In an irrigation setting, the required sowing depth is 5 cm; in a rainfed situation, it is 6 to 8 cm. The main techniques for sowing seeds are drilling, broadcasting, and dropping. Barley can tolerate droughts quite effectively because it is a rabi crop. As a result, barley crops need less irrigation and have less access to water.

Barley Physiology

The stems are upright, thick, tufted, and reach a height of 60 to 120 centimetres. It has few alternately arranged leaves. Near the spike is the upper leaf. Smooth and striated describe the sheath. Large auricles that frequently clasp or overlap are present in barley. The ligules are thin, membrane-like structures.

Barley Crop Development

The rate of development of barley is largely guided by variety selection and sowing date. Developmental stages differ in their impact on harvestable yield. The harvestable yield is more impacted by some growth phases than others. Management should promote growth in the stages that have the greatest impact on yield, particularly ear number. Compared to winter barley crops, spring barley crops go through the growth phases far more quickly. Ten developmental phases can be used to explain the life cycle of a barley plant. With the following key growth stages in mind, management decisions can be made more effectively:

1. Germination
2. Seedling growth
3. Tillering
4. Stem elongation
5. Booting
6. Ear emergence
7. Flowering
8. Milk development
9. Dough development
10. Ripening

Barley Crop Diseases

- Yellow rust/Stripe rust (Puccinia striiformis hordei): The stripe rust is characterised by narrow stripes with yellow to orange yellow coloured pustules on leaf sheaths, necks, and glumes.
- Leaf rust/Brown rust (Puccinia hordei): Small orange or orange-brown pustules are the primary sign of leaf rust, which can also occasionally be seen on the neck and awns of plants.
- Stem rust/Black rust (Puccinia graminis): Warmer temperatures are necessary for infection, and dark reddish brown pustules commonly occur on the undersides of leaves, stems, and spikes.

- Leaf blight/Spot blotch (Bipolaris sorokiniana): Bipolaris sorokinina causes leaf blight in barley. Small light brown spindle dots that grow in size along the leaf veins are the disease's primary sign of dissemination on a leaf blade. The dots are erratic and might be oval, oblong, or elliptical in shape. When lesions are fully grown, they are dark brown in colour and completely cover the leaf.
- Net Blotch (Drechslera teres): On leaves, leaf sheaths, and glumes, it first manifests as tiny circular brown spots that grow into a chocolate brown net-like pattern with yellowing in the areas around the pattern. Early on, the lesions are long and parallel to one another; later on, they fuse together.
- Powdery mildew (Erysiphe graminis . f. sp. hordei): On the surface of the leaf, the symptoms first emerge as tiny white grey spots that gradually turn grey or greyish brown. For kinds that are vulnerable, the spots congregate to create sizable necrotic blotches, and in extreme cases, the leaves prematurely dry.
- Loose smut (Ustilago nuda): The entire inflorescence turns into a smutted head with piles of black powder. The illness only manifests during flowering and is brought on by an internally transmitted infection found in seeds. Losses among afflicted people spiked.
- Covered Smut (Ustilago hordei): The entire head of plants is replaced by masses of dark brown smut spores, which are kept in a membrane until the plant reaches maturity. By being knocked loose by threshing, spores infect the seed. In the soils of untreated plots harvested, the firm spore balls of coated smut are highly prevalent.

Barley Growing Environments

Barley can be cultivated in a subtropical climate. The crop needs temperatures of 12 to 15 degrees Celsius while it is growing and 30 degrees Celsius when it is fully mature. Frost cannot be tolerated at any stage of growth, and when it occurs during flowering, the yield is severely harmed. The crop has a wide range of high levels of drought and sodic condition tolerance. Uttar Pradesh, Rajasthan, Punjab, Madhya Pradesh, Haryana, Bihar, Himachal Pradesh, West Bengal, and Jammu & Kashmir are the principal barley-growing states.

Barley Economy

Russia is the largest producer of Barley. The global barley production volume was approximately 147.05 million metric tonnes in the 2021/2022 crop year, down from approximately 160.53 million metric tonnes in the previous crop year.

Top 10 Barley Producing Countries

1. Russia
2. Spain
3. Germany
4. Canada
5. France
6. Australia
7. Turkey
8. United Kingdom
9. Ukraine
10. Argentina

Top Barley Producing States in India

While Rajasthan has historically been the largest barley-producing state in India, other states are catching up.

- Rajasthan
- Uttar Pradesh
- Punjab
- Madhya Pradesh
- Haryana
- Bihar
- Himachal Pradesh
- West Bengal
- Jammu Kashmir

Indian Barley Growing Zones

Region Name	States or Regions Covered
Eastern Region	This region comprises Bihar, Uttar Pradesh and West Bengal. In this region, barley is grown in the basins of the Ganga and Mahanadi rivers. Barley is grown here primarily for feeding cattles.
Northern Region	This region comprises Haryana, Punjab, Himachal Pradesh and Jammu & Kashmir. The region experiences low winter temperature and a single crop of barley is grown here.
Western Region	This region comprises mainly Rajasthan and some parts of Madhya Pradesh. Barley is largely grown in Rajasthan contributes to over 40% of total Barley production in India.

Barley as a Food

Barley is a very adaptable ingredient in the kitchen. Any recipe calling for white rice can be substituted with cooked whole grains. When prepared like risotto, its more pronounced flavour and texture can add a complimentary nuance, and its chewy texture makes it a pleasant alternative to pasta. It is frequently used in stews and soups. It can serve as the foundation of a hearty casserole that contains meat or dairy. It can also be served cold in a salad with chopped vegetables and herbs or warm in a pilaf. Naturally, it can also take the lead in a soup like the popular Persian dish jo, or barley chicken soup. The most popular way to prepare barley is, of course, to make beer after it has been malted. Instead of using refined sugar, malt syrups can be utilised as a natural sweetener. Using it in place of sugar gives any dessert a richer, more complex flavour. Additionally, malt powder has a long history of use as a unique sweetener. Although it can be challenging for the average consumer to obtain this ingredient, its delightfully sweet flavour has been used in both sweets and milkshakes (referred to as "malts" when malt powder is added).

When consumed as a whole grain, barley is a good source of fibre and protein. Due to its lower glycemic index, whole barley outperforms processed grains like refined flours by maintaining bodily energy more steadily and delivering a sensation of fulfilment over a longer duration of time. Mineral elements like phosphorus, manganese, selenium, copper, and B vitamins are also abundant in barley. It is linked to heart health and is highly advised for lowering the risk of heart disease and Type 2 diabetes, along with other whole grains.

Barley Nutritional Information

Nutritional value per 100 g		**Quantity**
Energy		123 kcal (515 kJ)
Carbohydrates		28.2 g
	Sugars	0.3 g
	Fiber	3.8 g
Fat		0.4 g
Protein		2.3 g
Vitamins	Vitamin A	0 µg
	beta-Carotene	5 µg
	lutein zeaxanthin	56 µg
	Thiamine (B1)	0.083 mg
	Riboflavin (B2)	0.062 mg
	Niacin (B3)	2.063 mg
	Pantothenic acid (B5)	0.135 mg
	Vitamin B6	0.115 mg
	Folic acid (B9)	16 µg

	Vitamin B12	0 µg
	Choline	13.4 mg
	Vitamin C	0 mg
	Vitamin D	0 IU
	Vitamin E	0.01 mg
	Vitamin K	0.8 µg
Minerals	Calcium	11 mg
	Iron	1.3 mg
	Magnesium	22 mg
	Manganese	0.259 mg
	Phosphorus	54 mg
	Potassium	93 mg
	Sodium	3 mg
	Zinc	0.82 mg
	Copper	0.105 mg
	Selenium	37.7 µg

Barley Health Effects

Consuming 0.75 grammes of soluble fibre per meal or at least 3 grammes of barley beta-glucan per day helps lower blood cholesterol levels, a risk factor for cardiovascular illnesses, according to Health Canada and the US Food and Drug Administration. Consuming whole-grain barley and other high-fiber grains enhances blood sugar control (i.e., reduces blood glucose response to a meal). Over several weeks or months, eating breakfast cereals with barley reduced cholesterol levels and glycemic control. Barley contains gluten, making it an undesirable grain for eating by those with gluten-related illnesses, including celiac disease, non-celiac gluten sensitivity, and wheat allergy sufferers, among others. This

is true of wheat, rye, and their hybrids and derivatives. However, some people with wheat allergies can manage barley or rye.