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Diseases of Barley and their management

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Barley (*Hordeum vulgare*) belongs to the Poaceae family and is cultivated during the Rabi season, specifically in the states of Uttar Pradesh, Rajasthan, Madhya Pradesh, Bihar, Punjab, Haryana, Himachal Pradesh, and Jammu & Kashmir. Barley holds the position of the fourth largest cereal crop globally, following maize, rice, and wheat. Referred to as the "poor man's crop," due to its minimal input requirements and superior adaptability to challenging conditions such as drought, salinity, alkalinity, and marginal lands. In India, barley primarily serves as feed for cattle and poultry, and it is further utilized in the production of malting and beverages. In rural areas of India, barley grains are used for preparing sattu and missi roti especially in the tribal areas of hills and plains.

Like other cereals, barley is also exposed to various diseases, which are ultimately responsible for significant yield reduction and poor grain quality. The chemical controls for diseases are available, however, inbuilt resistance mechanism is eco-friendly and best tactics for sustainable agriculture coupled with high benefit ratio. The pathogens may be disseminated through seed, soil and air. The seed borne pathogens can be controlled using seed treating chemicals.

Barley is exposed to several biotic stresses, however, some major diseases are discussed below

1. **Yellow rust (stripe rust) *Puccinia striiformis hordei***

Yellow rust is the disease of cool temperature (10 – 15°C) and the availability of free moisture is further congenial to spread infection. The narrow stripes containing yellow to orange yellow colour pustules on leaf sheaths, necks and glumes appears in the stripe rust.

2. Leaf rust (brown rust) *Puccinia hordei*

In case of leaf rust, the symptom appears randomly on upper surface of leaf and leaf sheaths and occasionally on neck and awns as small orange/ orange brown pustules, primarily. In severe, sheathes can be affected and leaves can die. The temperature requirement is between 20-25°C.

3. Stem rust (black rust) *Puccinia graminis*

It requires warmer temperature for infection and dark reddish brown pustules on both sides of leaves, stems, leaf sheaths and on spikes are generally appeared.

4. Leaf blight/ Spot blotch: *Bipolaris sorokinina*

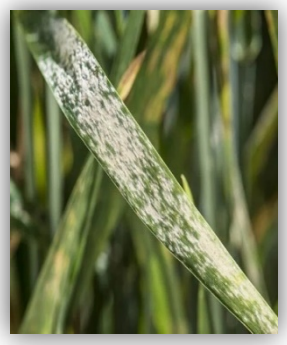
The disease spreads as small light brown spindle spots distributed on leaf blade increasing in size along the leaf veins. The spots are irregular and vary from oval to oblong or elliptical. Fully developed lesions become dark brown colour and cover entire leaf by merging together. If severe, brown spots can occur on glumes.

5. Net Blotch: *Drechslera teres*

In general, net blotch is not prevalent as leaf blight but is an emerging disease in north eastern plains zone. It appears as small circular brown spots that develop into a chocolate brown net-like pattern on leaves, leaf sheaths and glumes with yellowing of the areas surrounding the net pattern. In its early stages, the condition exhibits elongated lesions that run parallel to each other. As the disease progresses, these lesions fuse together, forming a more extensive and interconnected pattern.

6. Powdery mildew: *Erysiphe graminis* f. sp. *hordei*

Disease appears sporadically and prevalent in northern hills zone. The disease is favoured by cool, cloudy and humid weather conditions. The symptoms appear as small white grey dots on leaf surface and change to grey or greyish brown at later stages. Susceptible varieties exhibit the merging of these spots, forming extensive necrotic blotches. In severe instances, affected leaves undergo premature drying.



7. Loose smut: *Ustilago nuda*

The entire inflorescence gets turned to smutted head containing black powdery masses. The disease is caused by the internally seed borne pathogen and expresses only at the time of flowering. Smutted heads often emerge earlier than healthy heads. Spores are dislodged and scattered by wind when the delicate membranes surrounding them break. The fungus infects open flowers and becomes established in the embryo of the developing seed. The losses in infected spikes are hundred per cent.

8. Covered Smut: *Ustilago hordei*

Masses of dark brown smut spores, completely replacing the plant's entire head. These spores are enclosed in a membrane until the plant reaches maturity. During threshing, when the spores are dislodged, they proceed to infect the seeds. The resilient spore balls of covered smut are frequently found in the soil of untreated plots during harvest.

Diseases Management:

1. Farmers are advised to opt for newly released high-yielding cultivars that come equipped with in-built disease resistance. It is recommended to follow the suggested sowing time and consider the specific agro-ecological conditions for optimal results.
2. For effective disease management, consider seed treatment options such as using Vitavax at a rate of 2-3g/kg of seed or Tebuconazole @ 1g/ kg of seed at the time of sowing.
3. Foliar sprays of Propiconazole (25 EC) @ 0.1% (200 ml in 200 litres of water/acre) at the appearance of rusts and foliar blights and repeat at 15-day intervals until physiological maturity, if necessary.
4. crop rotation with non-host crops and removing crop debris can be beneficial in combating barley diseases. This practice helps disrupt the life cycle of pathogens and reduces the risk of disease recurrence.