

Fusarium Head blight (FHB) affecting Wheat

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Introduction

Wheat (*Triticum aestivum* L.) is, member of *Poaceae* family widely cultivated for its grain is a staple food of global importance. In 2023, the global wheat production was 785 million metric tonnes with production led by China, India, Russia, US and France. In 2022, the wheat area, production and productivity in India was 30.45 lakh ha, 104.983 million tonnes and 3.5 t ha⁻¹ respectively. It is a major source of energy, starch, protein, vitamins, dietary fibers, phytochemicals, etc. Yield loss up to 23% is reported by various biotic factors affecting wheat. Those biotic factors include fungi, viruses, insects, nematodes, etc. Among the various biotic factors, fungi pose a significant threat to the global wheat production. One of the important fungal diseases of wheat is *Fusarium* Head Blight caused by *Fusarium graminearum* (Teleomorph: *Giberella zeae*). It is also known as *Fusarium* Ear Blight (FEB), head scab or tombstone disease. It has been reported as the worst plant disease to have hit US since 1950 by the USDA. The mycotoxins produced by the pathogenic fungi pose a serious threat to human and animal health.

Systemic position of pathogenic fungi

Kingdom : *Fungi*
Phylum : *Ascomycota*
Subphylum : *Pezizomycotina*
Class : *Soradariomycetes*
Order : *Hypocreales*
Family : *Nectriaceae*
Genus : *Fusarium*
Species : *F. graminearum*
Botanical Name : *Fusarium graminearum*



Figure 1: FHB affected ear heads

Fungi Biology

It is an ascomycete, producing sexual spores in a sac like ascus. The asexual spores are called macroconidia and the sexual spore are known as ascospores. The asexual spores are derived from phialides, conidium producing cells. The phialides are clustered in sporodochia. The macroconidia are hyaline, septate & canoe shaped. These spores are produced in the overwintering hosts. The sexual spores are in ascus and are forcibly discharged from perithecium. Ascospores are hyaline to light-brown in color, slightly curved with round ends. This is characterised by presence of dark-blue perithecia at maturity. The fungus produces many mycotoxins. The most significant mycotoxin is the DON toxin (Deoxynilavenol). The wheat with FHB infection has toxin >20 ppm while the recommended level is less than 1ppm for humans.

Epidemiology

- Extended periods of high moisture or relative humidity (>90%).
- Warm temperatures of 30°C.
- Flowering period particularly anthesis is the most sensitive stage for the infection.

Symptoms

- Premature bleaching of the spikelets either in top, middle or down of the head shortly after flowering.
- Bleaching progresses to the entire ear head.
- Appearance of pinkish spores in the glumes and rachis of spikelets under warm and moist environment.
- Appearance of bluish-black spherical spores on the surface of the spikelets.
- Shrunken, shrivelled and pink to light-brown-colored grains.



Figure 2: A FHB affected & fully bleached ear head

Management

- Crop rotation and proper tillage have been known to reduce the FHB incidence.
- Cultivation of resistant varieties could mitigate the effects of FHB.
- Demethylation inhibitors such as metaconazole, prothioconazole, tebuconazole, prothioconazole + tebuconazole sprays before and during anthesis were shown to be effective against FHB.
- Biological control includes utilisation of *Bacillus* sps., *Pseudomonas* sps. & *Trichoderma* sps.

References

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