



Fig. 1. *Tilletia* species that are found in wheat grain after harvest. (a) *T. indica* (b) *T. walkeri* and (c) *T. ehrhartae*

Name: *Tilletia indica*

Disease: Karnal bunt

Classification: K: Fungi, D: Basidiomycota, C: Ustilaginomycetes, O: Tilletiales, F: Tilletiaceae

Tilletia indica Mitra. causes Karnal bunt of wheat. This disease does not occur in Australia, and it would cause severe disruption to trade if it was introduced. *T. indica* is one of five bunt and smut pathogens that affect wheat throughout the world. None of these is toxic to humans or livestock, but some can affect the appearance and smell of grain products. Three occur in Australia and most other wheat growing countries: these are common bunt (caused by *Tilletia caries* and *T. laevis*), loose smut (*Ustilago tritici*) and flag smut (*Urocystis agropyri*). The other two which do not occur in Australia are Karnal bunt (*T. indica*) and dwarf bunt (*T. controversa*), which have more restricted distributions worldwide and are subject to quarantine regulations in many countries.

Host Range:

Wheat (*Triticum aestivum*), Durum (*Triticum durum*), Triticale (*X Triticosecale*).

Impact:

Tilletia indica causing Karnal bunt of wheat is a serious pathogen for international trade because it reduces grain quality and has a restricted distribution, being limited to areas within the Indian subcontinent, neighbouring Middle East, Mexico, the south-western United States of America and South Africa.

There are other species of *Tilletia* that can be found in grain samples and are morphologically similar to *T. indica*. *T. walkeri* causes a partial bunt of ryegrass. *T. ehrhartae* causes a bunt of veldt grass. If not correctly identified, these pathogens could be mis-identified as *T. indica* and cause severe disruption to the export industry.

Symptoms:

Symptoms of the bunts are not readily seen in crops. When severe, they are readily seen and smelt in the harvested grain. *Tilletia indica* replaces part of the wheat seed with a black powder consisting of millions of ustilospores. Bunted grain smells foul like rotting fish due to the presence of the volatile chemical triethylamine.

Morphology of the ustilospores:

All of these spores are tuberculate. They differ in spore size, colour and spine ornamentation. However, there are considerable overlaps in these characteristics making it difficult to confirm diagnosis morphologically. The following guidelines can be used for a presumptive identification:

- Samples with ustilospores all < 36 µm, with curved spines, are most likely to be *T. horrida*
- Samples with ustilospores >36 µm are most likely to be *T. indica*.
- Samples with ustilospores mostly (28-35 µm), translucent brown, never black/opaque, very spherical, with blunt spines with distinct gaps between are most likely to be *T. walkeri*.
- Samples with mature, dark ustilospores less than 25 µm are most likely to be *T. horrida* not *T. indica* or *T. walkeri*.
- Samples with some black, opaque ustilospores are most likely *T. indica*. This is because *T. walkeri* ustilospores are never opaque, or black; *T. horrida* ustilospores can be dark, but are semi-opaque.

Identification by PCR:

The most reliable method currently is to identify ustilospores, is through PCR. Currently there are a number of different methods available throughout the literature.

Further Reading:

Pascoe, G., Priest, M.J., Shivas, R.G. and Cunnington, J.H. (2005). Ustilospores of *Tilletia ehrhartae*, a smut of *Ehrharta calycina*, are common contaminants of Australian wheat grain, and a potential source of confusion with *Tilletia indica*, the cause of Karnal bunt of wheat. *Plant Pathology* 54: 161–168.

Wright, D.G., Murray, G., & Tan, M.K. (2003). A National Diagnostic Protocol for the identification of *Tilletia indica* – the cause of Karnal bunt.

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