



Carefully to Carry

Karnal bunt

Karnal bunt is a fungal disease which can affect certain types of cereal grains such as wheat. The disease develops during the growth phase of the plant. It does not develop during post-harvest storage or transportation. Nonetheless, it can cause potentially serious problems for shipowners and charterers. Many countries prohibit the importation of wheat which is known or, in some instances, is even suspected to be affected by Karnal bunt. This can cause lengthy delays to ships while a solution is found for the disposal of the cargo. Definitive identification of the spores of the specific fungus causative of Karnal bunt in any consignment of grain, requires specialised and time-consuming test procedures which can take up to two weeks to perform.

Karnal bunt was first described in Karnal, India in 1931, hence the name of the disease. It has now been identified in all of the major wheat producing regions of India, Pakistan, Iraq and Afghanistan. It is also now well-established in north-western Mexico, probably having been introduced into Mexico on imported seed in the late 1960s. More recently it has also been found in durum wheat from Arizona. Following this discovery a flurry of surveys and inspections were carried out which resulted in quarantine measures being imposed in the state of Arizona and in counties in New Mexico, Texas and California.



While the disease is not particularly damaging in terms of yield loss, it can cause significant reductions in grain quality and is strictly regulated in international wheat markets. The spores of the infecting fungus are believed to present no health risks to consumers through infected grain or grain products, but wheat containing more than 3% of so-called bunted kernels is commonly considered to be unfit for human consumption. The reason for this is that flour produced from wheat containing a significant number of bunted kernels may have a distinctive foreign odour. The potential for loss in grain quality and for market loss has caused great concern in the US wheat industry. In 1997 the USDA Animal and Plant Health Inspection Service was investigating methods to control spread of the disease in order to protect the current crop.



"The carrier shall properly and carefully load, handle, stow, carry, keep, care for and discharge the goods carried."

Hague Rules,
Articles iii, Rule 2

Carefully to Carry Advisory Committee

This report was produced by the Carefully to Carry Committee – the UK P&I Club's advisory committee on cargo matters. The aim of the Carefully to Carry Committee is to reduce claims through contemporaneous advice to the Club's Members through the most efficient means available.

The committee was established in 1961 and has produced many articles on cargoes that cause claims and other cargo related issues such as hold washing, cargo securing, and ventilation.

The quality of advice given has established Carefully to Carry as a key source of guidance for shipowners and ships' officers. In addition, the articles have frequently been the source of expertise in negotiations over the settlement of claims and have also been relied on in court hearings.

In 2002 all articles were revised and published in book form as well as on disk. All articles are also available to Members on the Club website. Visit the Carefully to Carry section in the Loss Prevention area of the Club website www.ukpandi.com for more information, or contact the Loss Prevention Department.

Karnal bunt is alternatively known as Partial bunt. The fungal organism responsible for the disease is *Tilletia indica*. Spread of the disease occurs by the microscopically small spores of the fungus being distributed by wind and then infecting the host plant during flowering and heading. Symptoms become visible only as the grain matures. Bunted kernels can be very difficult to detect in the field, especially in cases of mild infection, because normally not all plants in the crop are affected. Moreover, on any individual plant, not all kernels are affected. Hence the alternative name of Partial bunt. Bunted kernels, however, each contain millions of daughter spores of the fungus causative of the disease which become available to continue the further potential spread of the disease.

There are various other types of bunt besides Karnal bunt such as the Common bunt (sometimes known as 'stinking smut') prevalent in parts of Europe and caused by the related fungal organism *Tilletia caries*. However, these other types of bunt differ from Partial bunt in a number of respects. The main difference is that rather than infection occurring by wind-borne distribution of the spores, it is spores present in the soil which invade the germinating seed and then systemically infect the growing plant so that all kernels on an infected plant become diseased or bunted. These other types of bunt can be controlled relatively easily by pre-treatment of the seed with suitable anti-fungal dressings. In EU countries, however, a ban has been imposed in recent years on the application of hitherto traditionally used seed dressings of proven effectiveness. This has been held responsible for some resurgence in the incidence of Common bunt in certain parts of Europe.

In contrast to Common bunt, Karnal bunt is much more difficult to control and, as far as is presently known, no effective solution to control this disease has yet been found. This is because the infection of growing plants with the fungal spores responsible for causing Karnal bunt occurs not via the soil but by windborne distribution of the spores.

For these reasons, a number of countries, more especially those in which wheat is a crop of major importance, look extremely critically upon the importation of wheat which is known or suspected to contain kernels affected by Karnal bunt and regard this disease as a quarantine pest. By early 1997, some 50 countries had adopted phytosanitary measures to prevent the import of Karnal bunt-affected wheat and it is anticipated that other countries may adopt the same policy with the passage of time. US officials have been, and still are, negotiating regarding the terms of import of US-grown wheat into these countries. Most of these countries accept wheat if the following additional declaration is stated on the phytosanitary certificate:

*"The wheat in this shipment originated in areas of the United States where *Tilletia indica* (Karnal bunt) is not known to occur".*

Some countries accept US wheat from quarantined areas if it is certified that the wheat has tested negative for *Tilletia indica* by laboratory analysis on both pre-harvest

and pre-shipment samples. Other countries, for example Mexico, require methyl bromide fumigation prior to discharge of the cargo.

It is impossible for ships' representatives to detect by visual inspection at loading whether a cereal grain cargo is contaminated with diseased kernels specifically affected by Karnal bunt. However if, during loading of a grain cargo, any unusual odour is detected which may or may not be due to the presence of substantial amounts of grain severely infected with Karnal bunt, the bill of lading should be claused. Other than that, the only realistic course of action open to shipowners wishing to protect their interests as far as possible, is to insist on the provision of a certificate from an authoritative source in the country of exportation, which unequivocally confirms that the cargo is free from Karnal bunt. Even though a particular cargo may not be affected, it may be advisable for shipowners to avoid carrying cargoes of wheat originating from countries where Karnal bunt is known to be prevalent. This particularly applies to cargoes destined for countries known to adopt a particularly severe approach to the importation of wheat from such countries.

When a ship has discharged a cargo known to be affected by Karnal bunt then, depending on future trading patterns, it may be necessary to carry out sterilisation treatment of the relevant holds in order to destroy the viability of any residual spores from the disease-causing fungus. The following are individual treatments for sterilisation of storage installations generally which have reportedly been applied and are claimed to be effective:

- Wetting all surfaces to the point of run-off with a solution of 1.5% of sodium hypochlorite and water and letting stand for 15 minutes. Thereafter the surface should be thoroughly washed down to minimise corrosion.
- Applying steam to all surfaces until the point of run-off so that a critical temperature of about 80°C is reached at the point of contact.
- Cleaning with a solution of hot water and detergent under a pressure of at least 2kg per sq cm. (30 pounds per square inch) at a minimum temperature of 80°C.
- Fumigating with methyl bromide at a dosage of 240kg per 1,000m³.