

## References

- deWet MJM (1977) Domestication of African Cereals. *Afr. Econ. Hist.* 3: 15.
- IBPGR/ ICRISAT (1980) *Sorghum Descriptors*. Rome, Italy.
- IBPGR/ ICRISAT (1993) *Descriptors for Sorghum (Sorghum bicolor (L.) Moench)*. IBPGR, Rome, Italy.
- Kimber CT (2003) Origin of domesticated sorghum and its early diffusion to India and China. p. 3-98. In: CW Smith, and RA Frederiksen (Eds.) *Sorghum Origin, History, Technology and Production*, John Wiley and Sons, Inc., New York.
- Mahajan RK, RL Sapra, Umesh Srivastava, Mahendra Singh and GD Sharma (2000) Minimal Descriptors (for Characterization and Evaluation) of Agri-Horticultural Crops (Part I). National Bureau of Plant Genetic Resources, New Delhi, 230p.

---

## Potential Quarantine Pests of Cereals for India

**Usha Dev, Kavita Gupta, VC Chalam, Shashi Bhalla, DB Parakh, Baleshwar Singh, Rajan, BM Pandey<sup>1</sup>, Manju Lata Kapur, PC Agarwal, Shamsheer Singh, Arjun Lal and RK Khetarpal**

*Division of Plant Quarantine, National Bureau of Plant Genetic Resources, New Delhi-110 012*

<sup>1</sup> *G.B. Pant University of Agriculture and Technology, Pantnagar-263 145, Uttaranchal*

**Key Words: Quarantine Pest, Pathway, Pest Risk Analysis, Cereals**

The international exchange of seed in agricultural trade is more extensive now than ever before. But this has also increased the probability of introducing new and dangerous pests or their virulent races along with the movement of plant genetic resources. Internationally there are several examples of spread of important pests, causing havoc with profound political and social impacts. These include: introduction of flag smut (*Urocystis agropyri*) from Australia to Mexico with wheat intended for milling and used for sowing, loose smut of wheat (*Ustilago tritici*) detected for the first time in Laos on wheat imported from Israel and in all probability, bunt of wheat (*Tilletia caries*) introduced into USA from Australia and the Karnal bunt (*Neovossia indica*) first reported in USA in 1996. India also had more than its share of pests introductions causing huge economic losses. The introduction of exotic weeds such as *Lantana camara* from Central America in the 19<sup>th</sup> century, *Parthenium hysterophorus* from Central and South America and *Phalaris minor* from Mexico in mid 20<sup>th</sup> century have become a threat to the crop production, environment and the human health.

The National Bureau of Plant Genetic Resources (NBPGR), New Delhi, India is a nodal institution, which has a mandate of germplasm exchange for research and its quarantine processing. When measured in terms of total weight, germplasm material is relatively much

smaller compared with commercial shipments. However, the diversity of germplasm poses special problems. For example, different lines are expected to have different levels of resistance to pests and pathogens. Ever since its inception a large number of pests viz., insects, nematodes, fungi, bacteria, viruses and weeds have been intercepted during quarantine processing of introduced material.

Phytosanitary measures are extremely important to facilitate safe import of plants and plant products while protecting them from the ravages of destructive pests. These are also essential as part of risk management strategies adopted during pest risk analysis (PRA), preparation as per the Sanitary and Phytosanitary Agreement of WTO. The International Plant Protection Convention (IPPC) which develops standards has divided PRA preparation in 3 stages viz., initiation, risk assessment and risk management, the compilation of which should be fully documented in the event of a review or dispute arises.

The Division of Plant Quarantine has planned to bring out a series of publications on the potential quarantine pests in various crop groups. In this context, the present publication is an attempt on potential quarantine pests of cereals comprising the species and wild relatives of *Avena*, *Hordeum*, *Oryza*, *Triticum*, *Zea* and *Triticale*. The various parameters taken into account were pest/

synonym(s), disease/ common name, host range, pathway of introduction, geographical distribution, economic impact and phytosanitary risk involved. While compiling the information emphasis is laid more on the identification of pathway in imported commodity that may allow the introduction and/ or spread of quarantine pests.

The information is primarily collected from the Crop Protection Compendium of CAB International (2003), supplemented with the other available CAB literature and also included the pests under the Schedules V And VI of Plant Quarantine (Regulation of Import into India) Order, 2003 dealing with the lists of plant and plant materials for restricted import only by authorized institutions with additional declarations and special conditions. A brief summary of the number of Plant Quarantine Pests (PQPs) in six genera of cereals and their wild relatives is given in Table 1. Some of the major PQPs for India include: *Acarus siro*, *Barley stripe*

*mosaic virus*, *Clavibacter michiganensis* sub sp. *nebraskensis*, *Ditylenchus africanus*, *Striga hermontheca* and *Tilletia controversa*. Some of the pests which are known to cause significant damage worldwide include: *Acidovorax avenae*, *Aphelenchoides besseyi*, *Claviceps purpurea*, *Maize chlorotic mottle virus*, *Rumex crispum*, *Sitophilus granarius* and *S. zeamais*.

However, the pest risk from South-Asian countries include: *Drechslera maydis* (Race 'T'), *Pseudomonas fuscovaginae*, *P. viridiflava* and *Veronica persica* from Nepal; *Ahasverus advena*, *Burkholderia glumae*, *Cryptolestes ferruineus*, *D. maydis* (Race 'T'), and *Richardia brasiliensis* from Sri Lanka; *Thalapsi arvense* and *V. persica* from Bhutan; *C. ferruineus* and *D. maydis* Race 'T' from Bangladesh.

The present publication would be of great significance and use by quarantine personnel and researchers and would serve as a ready reckoner while issuing permits stating

Table 1. Number of potential quarantine pests for India in cereals

Crop	Insects	Nematodes	Fungi	Bacteria	Viruses	Weeds
<i>Avena</i>	34 (17)	4 (-)	4 (4)	5 (4)	2 (2)	12 (9)
<i>Hordeum</i>	36 (18)	2 (-)	4 (2)	5 (4)	3 (3)	16 (10)
<i>Oryza</i>	68 (26)	5 (1)	5 (4)	4 (3)	-	13 (8)
<i>Triticum</i>	33 (11)	5 (1)	6 (4)	6 (4)	2 (2)	18 (11)
Triticale	5 (2)	-	3 (1)	4 (4)	-	-
<i>Zea</i>	59 (28)	5 (2)	7 (5)	7 (5)	2 (2)	919 (12)

Figures in parentheses denotes the number of pests not known to occur in India

additional declarations required for import in addition to supplementing information for analyzing pest risk(s).

## References

Anonymous (2003) Plant Quarantine (Regulation of Import into India) Order, 2003. In *The Gazette of India Part-II-Section 3-Sub-section (ii)* published by Ministry of Agriculture (Department of Agriculture and Cooperation) Notification, New Delhi, dated 18<sup>th</sup> November, 2003, 104.

CAB International (2003) *Crop Protection Compendium*, CAB International, Wellingford, UK.

Khetarpal RK, KS Varaprasad, A Lal, PC Agarwal and B Lal (2001) Plant quarantine of germplasm under exchange. In: BS Dhillon, KS Varaprasad, K Srinivasan, M Singh, S Archak, U Srivastava and GD Sharma (Eds). *National Bureau of Plant Genetic Resources: A Compendium of Achievements*, National Bureau of Plant Genetic Resources, New Delhi, pp 90-115.