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23. Breeding for disease/pest resistance (HPR 1)

Organizers: P M Gaur and N Gangarao

Lead

O23-1. Breeding for resistance to diseases and insect pests in grain legumes

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Grain legumes are source of high-quality food and feed and their integration in the cropping systems provide multiple benefits for agriculture sustainability. They are being considered important to ensure food and nutritional security in the face of climate change. Diseases and insect pests are the main constraints in the quantity and quality of yield. This presentation focuses on chickpea (*Cicer arietinum* L.) and pigeonpea (*Cajanus cajan* L.), which are mandate crops of ICRISAT and globally grown on 21.6 million ha, largely in the developing countries of Asia and Africa. The production and productivity of chickpea is severely constrained by diseases such as Fusarium wilt (FW, *Fusarium oxysporum* f sp *ciceris*), dry root rot (DRR, *Rhizoctonia bataticola*), Ascochyta blight (AB, *Ascochyta rabiei*) and Botrytis gray mold (BGM, *Botrytis cinerea*). In pigeonpea, Fusarium wilt (FW, *Fusarium udum*) and sterility mosaic disease (SMD) caused by pigeonpea sterility mosaic virus (PPSMV) are the most important diseases, while Phytophthora blight (PB, *Phytophthora cajani*) is an emerging important disease. Pod borer [*Helicoverpa armigera* (Hubner)] is the most important insect-pest of both the legumes. In addition, spotted pod borer [(*Maruca vitrata* (Geyer))] is also important in pigeonpea. Several varieties with high resistance to FW and AB have been developed in chickpea and FW and SMD in pigeonpea. Only moderate level of resistance is available for resistance to the remaining diseases and pod borers in the germplasm of cultivated species. Comparatively, higher levels of resistance have been observed for some of these diseases and pod borers in wild species and are being exploited in breeding programs. Transgenic resistance using insecticidal genes has been developed to achieve high level of resistance to pod borer in both the legumes. Numerous genes/quantitative trait loci (QTL) conferring resistance to key diseases have been mapped and markers linked to some of these have been validated. Use of novel sources of resistance and novel breeding techniques (marker-assisted selection, speed breeding) are being used to accelerate development of improved varieties with enhanced resistance to diseases and insect pests. Availability of such varieties will improve yield stability and production of these grain legumes and contribute to food and nutritional security and sustainable food production.

O23-2. Utilizing crop wild relatives (CWR) for improving biotic stress tolerance in ICRISAT mandate crops

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Biotic stresses such as diseases and insect-pests cause huge yield losses to most of the crops worldwide. Under changing climatic conditions, new insect-pests and diseases are emerging as serious threats to crop production and productivity. High levels of resistance for these stresses is not available in cultivated genepool, which necessitates the exploitation of new and diverse sources of variations. Crop Wild Relatives (CWR) possess many useful and novel genes including high levels