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Crop Protection to Outsmart Climate Change for Food Security & Environmental Conservation

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Contents

S. No	Symposia/Session Title	Page
1	Spread, monitoring and management of fall armyworm (FAW)	1
2	Herbicide-resistant weeds – a global perspective	6
3	Integrated pest management (2)	10
4	Pest, host plant, and environmental interactions: Effect of climate change in managing insect pests	16
5	Pest and disease resistance gene mapping and cloning	20
6	The challenge of coconut rhinoceros beetle (<i>Oryctes rhinoceros</i>) to palm production and prospects for control in a changing world	26
7	Phytiatry (plant medicine) as a distinct university science for modern world agriculture	31
8	Fall armyworm-control technologies and management advocacy for Asia	34
9	The impact of climate change on weeds	41
10	Outsmarting the red palm weevil: A global challenge	46
11	Pollination management under protected cultivation	52
12	Biotechnology and integrated pest management	60
13	Biological control – prospects and associated challenges	64
14	Crop protection in horticulture	71
15	Predicting population dynamics of insect pests under climate warming	78
16	Pesticide resistance management	83
17	Plant-pest/pathogen interactions in the context of chemical ecology	88
18	A greener IPM: Development of ecologically-based management of pests, weeds and diseases in cereal grain crops	93
19	Beneficial microbes for plant protection – current performance and future expectations	98
20	Integrated management of the cactus cochineal, <i>Dactylopius opuntiae</i> (Hemiptera: Dactylopiidae)	103
21	Molecular pathology and entomology	107
22	Conventional and omic approaches to integrate host plant resistance in IPM	114
23	Breeding for disease/pest resistance (HPR 1)	119
24	Spread, monitoring and management of <i>Tuta absoluta</i>	128
25	Biosystematics for effective crop protection under changing climatic scenario	134
26	Endophytes for plant protection	139
27	Detection and diagnosis of plant pathogens: DNA barcoding	144

28	Artificial intelligence (AI) based smart plant protection – futuristic scenario	152
29	Taxonomy and diversity of pest populations	158
30	Germplasm health: Facing future challenges	165
31	Emerging pathogens and their management: phytoplasmas, viruses and viroids	171
32	An overview of frameworks used for predicting, monitoring and responding to new pests	177
33	Emerging pests and their management: Nematodes	182
34	Integrated pest management (3)	188
35	Remote sensing and machine learning for determination of spatio-temporal distribution of invasive species	195
36	Host plant × pest interaction (HPR 2)	201
37	Integrated pest management (1)	207
38	Climate change effects on pests and pest management	213
39	Extension education and technology transfer	218
40	Post-harvest pests and their management	224
41	Integrated pest management (4)	229
42	Food safety: Mycotoxins and pesticide residues	235
Poster Session	Thematic Area	
I	Integrated pest management (IPM 1)	240
II	Mitigating climate change	272
III	Integrated pest management (IPM 2)	284
IV	Host plant resistance	307
V	Detection and diagnosis: DNA barcoding	329
VI	Food and nutritional security	339
VII	ICT in crop protection	343

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