CRP on Agrobiodiversity-Component II (Detailed evaluation)

Wheat

A total of 1,483 accessions during *rabi* 2014-15 and 1,485 accessions during *rabi* 2015-16 were evaluated for agronomic traits (3 locations), biotic stress traits (foliar blight- 2 locations; brown and black rust (2 locations), yellow and brown rust (3 locations), Karnal bunt (2 locations), powdery mildew and smut (1 location).

Based on evaluation during year 2014-15 at different location promising germplasm were selected and validated during second year for example, agronomic (28 acc.), foliar blight (24 acc.), brown and black rust (58 acc.), yellow and brown rust (87 acc.), yellow rust, brown rust and Karnal bunt (65 acc.) and Karnal bunt (21 acc.). Thus based on observations recorded at multi-locations and multi-year data, eight accessions such as IC177785, IC128153, IC530072, IC443736, IC543400, IC529292, IC542127 and IC539162 were found resistant to Karnal bunt both at Karnal and Ludhiana; thirteen accessions such as IC443639, IC542104, IC553914, IC543448, IC549338, IC445489, IC547699, IC539535, IC541996, IC543335, IC543404, IC498431 and EC177734 were found resistant to both yellow and brown rust in multilocation testing. At ARI Pune accessions such as IC240797, IC296469, IC415870, IC443640, IC529216, IC529338, IC529334, IC542114, IC549396, IC549456, IC544662, IC557720, IC609559, IC609560, IC75427, IC190919 were found resistant to leaf and stem rust continuously for two years. For loose smut screening, four ear head each of 1,417 accessions were inoculated during year 2014-15 and tolerance/susceptible data were recorded during 2015-16. A total of 173 accessions were found tolerant against powdery mildew and loose smut disease. In addition, Twenty four accessions such as IC524292, IC530025, IC558801, IC547668, IC539312, IC372646, IC529193, IC529171, IC543392, IC75222, IC549358, IC262740, IC529332, IC529348, IC528877, IC402035, IC539549, IC529243, IC529192, IC539275, IC539564, IC542087, IC498433 and IC443761 were found resistant to spot blotch at Coochbehar and Varanasi.

Among agronomic traits, promising accessions for 1000 seed weight at PAU, Ludhiana were IC582710, IC253012, IC539321, IC401979, IC252705, IC531927, IC116276, IC539531, IC539314 and IC547675 with (>46 g); at ARI, Pune were IC415939, IC566635, EC576887, IC310584 (>50 g); at BHU, Varanasi were EC14107, EC576557, IC111968, IC535704 (>48 g). Biochemical analysis of grain samples from two locations were carried out at IIWBR, Karnal for protein content, sedimentation value and hectolitre weight. Three accessions

IC177770, IC445359 and EC177825 were found promising for higher protein content (>15% grain protein at Pune and > 13% at Varanasi location).



Monitoring at BHU, Varanasi (Agronomic and foliar blight screening)

Monitoring at CCSHAU, Hissar (Drought stress)



Monitoring at GBPUAT, Pantnagar (Yellow and brown rust screening)

Monitoring at ARI, Pune (Agronomic and brown and black rust screening)

Rice

Agronomic and trait specific evaluation was carried out at 14 hot spot locations. About 1,000 accessions have been evaluated during *kharif* 2015. The evaluation data will be used for selecting stable as well as location specific genotype and for developing core/minicore/reference collections.

A total of 1,015 germplasm accessions along with checks were screened during *kharif* 2015 for resistance against major diseases like blast, sheath blight, bacterial blight and rice tungro at Indian Institute of Rice Research (IIRR). The accessions were evaluated against blast with LSI 7.2. The entries that scored less blast disease were IC No's75859, 75966, 455376, 458484X, 540644, 540661, 210768, 210780, 210796, 210798, 17044X, 17119X, 460473, 460457, 460474, 460472, 460495, 461141, 17117X, 462040, 211166, 211168, 217105,

217217, 217275, 217437, 217571, 217585, 217599, 218094, 218146, 218150, 218183, 218190, 218588, 218615 and 218811.

None of the accessions were found resistant against sheath blight (with LSI 7.8) but few were recorded low disease that included IC No. 75874, 75896, 76000A, 76007, 76034, 76040, 76050, 540644, 216507, 216525, 216570, 216599, 216636, 216638, 216640 and 216674. Similarly the nursery was evaluated against bacterial leaf blight under high disease pressure (LSI 7.2) and found that IC217473 was resistant. Six accessions such as IC75960, IC76033, IC461079, IC216596, IC216856 and IC218438 were recorded with low disease score against rice tungro disease.

A total of 1,010 germplasm lines were mass screened for their reaction to brown planthopper (BPH). Out of the total germplasm lines, IC216750 was highly resistant to BPH with a damage score of 0.77. Total 47 germplasm lines showed resistance to BPH viz., IC216788, IC216737, IC75961, IC75990, IC76013, IC76000A, IC76010, IC76033, IC215054, PTB 33, IC216944, IC216650, IC216735, IC75975, IC216553, IC217309, IC216636, IC540644, IC216651, IC76057, IC216759, IC75797, IC75966, IC218062, IC218166, IC217610,IC218085, IC217492, IC216841, IC216822, IC218011, IC75786, IC217107, IC216974, IC216585, IC216602, IC216618, IC218053, IC217750, IC216605, IC217452, IC216678, IC216680 and IC218658.

Similarly, 1010 accessions were screened for gall midge biotype 1 at IIRR. Of which 29 accessions such as IC75756, IC75772, IC75843, C75844, IC75877, IC75855, IC75859,IC75849, IC75861, IC75974, IC75975, IC75984, IC76013, IC76014, IC76018, IC75990, IC75991, IC76017,IC76028, IC76040, IC76051, IC76054, IC76057, IC17118X, IC211201, IC217073, IC218186, IC218199 and IC218338 showed resistant reaction.



Visit of Monitoring Team at IIRR, Hyderabad

Chickpea

A total of 736 accessions and of chickpea in *rabi* 2014-15 and 250 in 2015-2016 were sent to seven different locations for evaluation against pod borer, wilt, collar rot, Botrytris grey mould, Ascochyta blight, dry root rot and abiotic stress particularly drought. Agronomic evaluation was done only at JNKVV, Jabalpur.

Based on agronomic performance studied at JNKVV, Jabalpur promising accessions have been identified for different traits. For days to 50% flowering total 30 accessions identified having less than 55 days to flowering. IC83830 matured only in 102 days. Six accessions (IC83512, IC83486, IC83818, IC83874, IC116329 and IC83517) found promising for number of pods/plant (>145 pods/plant). Eleven accessions recorded more than 25 g/100 seed weight (EC490039, IC116626, IC117727, IC83997, IC83943, IC84119, EC498827, IC83438, IC83344, IC83990, and EC490014). IC83346, IC116325, IC73118, IC83486, IC83327, IC83587, IC116337 and IC83592 were found promising for yield/plant (>20 g/plant). At IIPR, Bhopal centre, based on field evaluation EC198580, EC198583, EC198707, EC219928 and EC220006 found to be tolerant for pod borer and only two accessions (IC83409 and IC116287) found tolerant using 3rd instar and 4th instar larvae bioassay. Accessions IC83519 and IC84053 (B) (score 2) found promising for pod borer at GBPUA&T, Pantanagar. At JNKV, Jabalpur 13 accessions for collar rot and seven accessions for wilt had shown zero per cent mortality. Three accessions (IC83330, IC116347 and IC267443) scored zero per cent mortality for both the diseases. Under BGM screening six accessions (IC83522, IC83523, IC83524, IC83525, IC83536 and IC83720) scored less than 4 and three accessions for Ascochyta blight which scored less than 5 at PAU, Ludhiana. At RARI, Durgapura dry root rot was screened and five accessions (IC95082, IC83703, IC83854, IC83819 and IC116347) found resistant for it. Ten accessions such as IC84023, EC442228, IC116341, IC116453, IC84019, IC116336, IC83536, EC442300, IC83870 and IC83545 were identified superior based on their agronomic performance under drought treatment.



Monitoring of field trials at ARS, Durgapura

Rapeseed-mustard

A detailed evaluation of 1,000 accessions and validation of 112 accessions of Indian mustard was carried out at five different hotspot locations for different agro-morphological traits, biotic and abiotic stresses under CRP programme. Promising genotypes were identified for different agro-morphological traits over the location. About 20 accessions i.e. IC20167, IC58388, IC122414, IC267691, IC541052, EC199744, EC204233, EC206714, EC206724, EC322093, EC766084, EC766087, EC766134, EC766304, EC766306, EC766311, EC766312, IC491469, IC520747, IC426383 were found superior for day to 50% flowering in <65 days, 11accessions i.e. IC121667, IC58388, IC122300, IC122346, IC122431, IC122442, IC253077, IC310804, IC520375, EC322093, EC620075 were superior for plant height (< 130 cm), about 20 accessions namely IC20167, IC58388, IC122414, IC267691, IC541052, EC199744. EC204233, EC206714, EC206724, EC322093, EC766051, EC766084, EC766087, EC766134, EC-766304, EC766306, EC766311, EC766312, IC491469, IC520747, IC426383 were matured in <130 days; 20 accessions i.e. IC12209, IC122235, IC122319, IC249624, IC253063, IC253066, IC296684, IC482968, IC589689, EC414319, EC620088, EC698998, EC699030, EC766325, EC766330, EC766444, EC766600, IC491200, IC491342, IC491461were superior for number of siliqua on main branch (>80); twenty accessions i.e. IC121700, IC121715, IC121718, IC122197, IC122231, EC400082, EC766033, EC766205, EC766214, EC766234, EC766412, IC491294, IC491454, IC491580, IC426383, IC491457, IC491007, IC491211, IC121700, IC121715 were promising for siliqua length (>5.0 cm) and accessions namely IC482968, EC620075, EC699055, EC766198, EC766234, EC766336, IC491114, IC491506, IC426383, IC570302, IC571646, IC571672, IC589669, IC589674, IC253063, IC296507, IC398765, EC720967, EC766037, IC491294 were having >17 seeds/siliqua over the location. Some genotypes were superior for multiple traits *viz*; IC58388, EC322093 for plant height, days to maturity; IC426383 for days to maturity, siliqua length (>5.0 cm), seeds/ siliqua (>17); EC766325 for siliqua on main shoot (>80), seed yield/Plant; EC766198 for seeds/ siliqua (>17) and seed yield/plant over the location.

Under abiotic stress experiment, mustard germplasm was also evaluated for white rust, *Alternaria* blight and aphid resistance. A total of 21 accessions i.e. IC020167, EC657030, EC699003, EC766091, EC766133, EC766134, EC766136, EC766140, EC766142, EC766143, EC766144, EC766145, EC766148, EC766152, EC766164, EC766191, EC766192, EC766193, EC766230, EC766232, EC766402 were found resistant to white rust over the locations. None of germplasm line was found completely free from *Alternaria* blight at all the locations. Sixty three germplasm lines showed moderately resistant reaction (<10% disease severity) against *Alternaria* leaf blight under artificial inoculation conditions.

Under quality analysis for oil content, 8 mustard accessions viz. EC766064, EC766067, EC766070, EC766071, EC766097, EC766203, EC766286, EC766440 were found rich in oil content ranging from 43.2 to 44.2% over the location.

Some of the unique traits like smooth stem (IC491410), broom type silique arrangement (IC355410), erect plant type (IC571661), creamish flower colour (IC337391, IC491648, IC399840), pigmented silique (IC401578), non-waxy type (EC720977), bold seeded (IC570324) and appressed type silique (IC312541, IC385632) in *Brassica* germplasm were observed under CRP programme during 2014-15 at different locations and grown for second year validation also.



Finger millet

During 2015-16 total of 966 accessions were evaluated for traits of agronomic importance and biotic stress. At Mandya, Jagdalpur and Almora centers evaluation was done for agronomically important traits such as early flowering, early maturity, tillers per plant, plant height, finger length, fingers per ear and grain weight. Whereas, at Vizianagaram and Almora centers evaluation was done for leaf blast, neck blast and finger blast and at Ranichauri center accessions were evaluated for Cercospora leaf spot.

Accessions with early flowering were identified at Almora (< 55 days) IC53764, IC477871, IC478288, IC478600, IC478189, IC478486, IC477994, IC477808; at Jagdalpur (<55 days) IC478980, IC479088, IC473459, IC474649, IC474942, IC473154, EC130935 and at Mandya (<50 days) IC478503, IC478297, IC478631, IC478794, IC478843, IC478071, IC478266 and IC478505. Early maturing accessions were identified on the basis of maturity at < 90 days. At Almora IC475126, IC473322, IC478977, IC479038, IC473411, IC473380, IC473460, IC479132, IC473231; at Jagdalpur IC478980, IC479088, IC474684, IC474622, EC130935, IC479161, IC479207, IC479197, IC473461 and at Mandya IC478297, IC478631, IC478794, IC478843, IC478071, IC478266, IC478505, IC478754, IC478048, IC478463 were identified.

Accessions with high tillering were identified on the basis of productive tillers more than five. At almora IC-478067, IC-477589, IC-477566, IC-477511, IC-474285, IC-478505, IC-41806, IC-477724, IC-587936, IC-53716; at Jagdalpur IC-41806, IC-53764, IC-478478, IC-477611, IC-478302, IC-478772, IC-478338, IC-478450, IC-478486 and at Mandya IC0477261, IC0477025, IC0476728, IC0476782, IC0476816, IC0477193, IC0477216, IC0477246, IC0477380 were identified for high tillering.

Accessions with fingers more than or equal to 10 were identified, Almora center identified IC-478062, IC-478496, IC-478048, IC-477832, IC-478354, IC-478736, IC-477374, IC-477991, IC-478057, IC-478217 ; Jagdalpur center identified IC-478492, IC-478331, NC-58235, IC-477448, IC-477579, IC-478400, IC-477358, IC-478254, IC-478668, IC-477749 and Mandya center identified IC0477006, IC0477095, IC0476873, IC0477260, IC0476724, IC0477259, IC0476975, IC0477658, IC0587969 were identified.

Accessions with grain test weight of more than or equal to 4 were identified, Almora center identified IC477834, IC478326, IC478560, IC41813, IC478125, IC478165, IC53749,

IC477358, IC478320, IC478353; Jagdalpur center identified IC478344, IC78151, IC478612, IC-41806, IC587937, IC478546, IC478002, IC478436, IC478008, IC478663 and Mandya center identified IC0476740, IC0476969, IC0476760, IC0476809, IC0477644, IC0477522, IC0477617, IC0477152, IC0477905 and IC0477629 accessions.

In evaluation for biotic stresses accessions with less than 10% infestation for finger blast and neck blast were identified. Almora centre identified resistant accessions such as IC477803, IC477716, IC477872, IC478179, IC477899, IC478404, IC477434, IC478058, IC477348, IC477986 for finger blast and IC478794, IC587932, IC477256, IC478956, IC477248, IC477758, IC477785, IC479008, IC478079, IC477849 for neck blast. Vizianagaram center identified IC477600, IC478615, IC478755, IC478452, IC477813, IC478194, IC478241, IC477791, IC53728, IC478333 for finger blast and IC478187, IC41807, IC477133, IC478900, IC477375, IC478365, IC477595, IC478755, IC477653, IC478615 for neck blast. Ranichauri center identified resistant accessions for *Cercospora* leaf spot having zero incidence on infection and the resistant accessions are IC478759, IC473258, IC473260, IC473279, IC473283, IC473284, IC473292, IC473293, IC478900, IC478925, IC478926, IC478932, IC478953, IC478960, IC478963, IC478527, IC478566, IC478754.



Monitoring of field trials at ARS, Vizianagaram

Okra

A total of 725 accessions of okra germplasm were evaluated in Augmented Block Design along with five checks (Arka Anamika, Parbhani Kranti, VRO-6, Pusa Sawani and local check) at 7 centres viz. GBPUAT, Pantnagar (Agronomic evaluation and characterization); PAU, Ludhiana (Jassid, whitefly and fruit borer); MPKV, Rahuri (Jassid, whitefly and fruit borer);

BCKV, Kalyani (Yellow Vein Mosaic Disease: YVMD); IIVR, Varanasi (YVMD, Okra Enation Leaf Curl Disease: OELCD); IIHR Reg Stn. Bhubaneswar (YVMD, OELCD) and NBPGR, New Delhi (YVMD) during *kharif* 2015.

In agronomic evaluation at GBPUAT, Pantnagar; 5 accessions (IC117025, IC117066, IC588163, IC282265 and IC282275) were observed superior for fruit length and EC305616 was superior for marketable yield /plant. A total of 68 accessions comprising 65 accessions from CHES, Bhubaneswar and 3 accessions from GBPUAT, Pantnagar were found resistant to YVMD up to 95 DAS. Not a single accession was found resistant against YVMD at BCKV, Kalyani and NBPGR, New Delhi. At MPKV, Rahuri; multiple resistances to biotic stresses was shown by EC016974 (leaf hopper and whitefly) and IC116993, IC117328 (whitefly & fruit borer). for evaluation in *Kharif* 2016, a total of 560 accessions of okra germplasm were sent to 5 locations namely, PAU, Ludhiana (Jassid, whitefly, fruit borer); MPKV, Rahuri (Jassid, whitefly and fruit borer); BCKV, Kalyani (YVMD); IIVR, Varanasi (YVMD, OELCD); IIHR Regional Station Bhubaneswar (YVMD, OELCD) for evaluation in augmented block design. Besides this, the superior accessions identified during *kharif* 2015 were sent for validation to different locations.



Monitoring of okra germplasm evaluation at BCKV, Kalyani