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SCREENING OF PIGEONPEA FOR RESISTANCE AGAINST *MELANAGROMYZA OBTUSA* (MALLOCH)

R.K. MOUDGAL, R.K. LAKRA, AND B. DAHIYA

Department of Entomology, CCS HAU, Hisar – 125004, Haryana

ABSTRACT

Preliminary evaluation of 260 determinate and non-determinate type pigeonpea accessions belonging to early and extra early maturity groups revealed no accession free from pod fly damage. The per cent, respectively. Based on Pest Susceptibility Rating (PSR), 78 accessions with less than 10 per cent pod damage were selected for revaluation and revealed consistent reaction of the tested material during the two crop seasons with a few exceptions. Only 4 pigeonpea accessions of different plant types and maturity periods, *viz.*, GP75, GPI18, GP233 and GP253 proved least susceptible with lowest mean pod and grain damage ranging from 3.76-5.24 and 1.60-2.32 per cent, respectively. Hence, they could be useful for breeding programs against pod fly. Further, the determinate (5.48 and 2.85%) and extra early maturing accessions (6.18 and 2.98%) were less susceptible to pod fly in comparison to non-determinate (7.75 and 3.35%) and early maturing ones (6.55 and 3.21%) in terms of pod and grain damage, respectively.

KEY WORDS: *Melanagromyza obtusa,* Screening, Pigeonpea

INTRODUCTION

Pigeonpea [*Cajanus cajan* (L) Millsp.] is an important pulse crop which is known to harbor more than 200 insect species, although only a few of these cause significant and consistent damage. Of these, the pigeonpea pod fly, *Melanagromyza obtusa* (Maloch) [Agromyzidae; Diptera] has gained the status of major pest causing moderate to heavy crop losses in India (Dias *et al.*, 1981). Thus, exploitation of resistant variety against this pest is a prime tactic in Integrated Pest Management (IPM), being environment friendly, flexible, economical and practical. Hence, search for pod fly resistant/or tolerant sources to evolve economically viable and ecologically sustainable pest management option is indispensable. Therefore, various pigeonpea accessions belonging to early and extra early maturity groups of determinate and non-determinate type were evaluated against pod fly under natural field conditions for generating information related with resistant/ tolerant source against the pest.

MATERIALS AND METHODS

A total of 260 pigeonpea accessions of different plant types and maturity groups selected for the study were sown on 13th June in 4 m row length, 60 cm apart adopting line sowing method in augmented design. The recommended varieties of the region, *Manak* (non-determinate type) and *Prabhat* (determinate type) were grown as standard check after every ten entries for comparison with the test material. To raise a healthy crop of pigeonpea, all the recommended cultural practices (except plant protection) were followed. The per cent pod and grain damage due to pod fly were recorded by examining 350 pods randomly collected from 5 plants of each test entry at harvest and the data collected were subjected to arc-sin transformation for statistical analysis. Response of each test entry was finally compared with standard check through Pest Susceptibility Rating (PSR) based on 1 to 9 rating scale as suggested by Lal and Rathore (2001).

Based on first year screening, 78 accessions of different plant types and maturity groups with less than 10 per cent pod infestation were selected for re-evaluation during Kharif 2002 along with standard checks. They were sown at Research Farm, Pulses Section, Department of Plant Breeding, CCS HAU, Hisar on 15th June in RBD with 3 replications. Each cultivar was sown in paired row of 4 m length with a spacing of 60 × 30 cm. Similar observations on pod and grain damage were recorded at harvest as mentioned earlier.

RESULTS AND DISCUSSION

Preliminary screening

Pigeonpea material consisting of 110 non-determinate extra early, 120 non-determinate early, 15 determinate extra early and 15 determinate early maturing accessions were evaluated in preliminary screening trial during 2001 cropping season. Out of the 260 accessions screened, none was found free from pod fly incidence. Only 1.9%

accessions showed pod damage below 5%, rest of 30% exhibited damage between 5-10% and majority of other accessions (68.1%) showed pod fly damage above 10%. The pod and grain damage in different pigeonpea accessions ranged from 4.00 to 21.43 and 1.62 to 10.57%, respectively (Table-1). However, from other locations higher damage of pod (12.00-69.2%) and grain (2.94-38.95%) was reported by Sheriff and Rajagopalan (1971) from Tamil Nadu; Kooner *et al.* (1972) from Punjab and Veda *et al.* (1975) from Madhya Pradesh by this pest. This might be due to the differences in the genotypes as well as the agro-climatic conditions. Under north-west plane zone, Hisar is considered to be the 'Hot Spot' for *Helicoverpa armigera* (Hubner), probably the higher incidence of pod borer lead to the moderate incidence of the pod fly. The trial further revealed that, the accessions with higher rates of pod infestation by *M. obtusa* also showed higher rates of grain infestation. These findings are in consonance with those reported by Kumar *et al.* (1998).

Re-evaluation

A total of 78 pigeonpea accessions with less than 10% pod damage comprising of 32 non-determinate extra early, 33 non-determinate early, 6 determinate extra early and 7 determinate early maturing accessions were re-evaluated against pod fly during 2002 crop season. Pod and grain damage in different promising pigeonpea accessions of distinct plant types and maturity periods ranged from 3.52-9.81% and 1.77-5.00%, respectively (Table-1). Data based on PSR, revealed that out of the 78 accessions screened, none could qualify for grades 1 & 2, however, 35 accessions were grouped in grade 3 and remaining 43 fell in grade 4. But there was no accession for grades 5-9, confirmed the results of preliminary screening (Table-2).

Table 1: Performance of promising pigeonpea accessions against pod fly damage (2001 and 2002)

Accessions	2001			2002			Mean		
	Pod damage (%)*	Grain damage (%)*	PSR**	Pod damage (%)*	Grain damage (%)*	PSR**	Pod damage (%)*	Grain damage (%)*	PSR**
Non-determinate extra early maturing accessions									
GP13	5.14	1.71	3	4.85	1.65	3	5.00	1.68	3
GP24	5.14	1.71	3	4.76	1.62	3	4.95	1.67	3
GP36	6.28	2.29	3	4.57	1.87	3	5.42	2.08	3
GP37	5.71	2.00	3	4.19	2.38	3	4.95	2.19	3
GP75	4.86	1.62	3	4.09	1.59	3	4.48	1.60	3
Manak (CH)	13.47	5.57		13.91	5.71		13.69	5.64	
Non-determinate early maturing accessions									
GP118	5.14	2.29	3	5.33	1.84	3	5.24	2.06	3
GP180	5.71	2.86	3	6.67	2.29	3	6.19	2.58	3
GP181	5.43	2.29	3	7.62	2.10	4	6.52	2.20	3
GP191	6.86	2.84	4	5.90	2.57	3	6.38	2.72	3
Manak (CH)	13.82	5.83		13.91	5.71		13.87	5.75	
Determinate extra early maturing accessions									
GP233	4.00	2.86	3	3.52	1.77	3	3.76	2.32	3
GP240	6.00	3.90	3	4.76	2.38	3	5.38	3.14	3
Determinate early maturing accessions									
GP253	4.28	2.86	3	3.90	1.56	3	4.09	2.21	3
GP254	5.14	3.43	3	4.57	2.48	3	4.86	2.96	3
GP260	4.89	2.86	3	4.89	2.03	3	4.89	2.44	3
Prabhat (CH)	13.02	5.38		12.38	5.65		12.70	5.52	
Range	4.00-21.43	1.62-10.57		3.52-9.81	1.77-5.00		3.76-15.62	1.60-7.78	

**PSR = Pest susceptibility rating; based on pod damage basis; 1-9 scale; 1=Resistant; 9=Susceptible; CH=Standard check

Screening data of pigeonpea accessions from two crop seasons showed consistent reaction against pod fly. However, some accessions, *viz*. GP9, GP34, GP35, GP59, GP72, GP96, GP101, GP114, GP117, GP140, GP141, GP144, GP160, GP162, GP174, GP182, GP191, GP252 and GP259 showed increased resistance, while, GP119, GP159, GP181 and GP236 showed reduced resistance during the second

Table 2: Categorization of promising pigeonpea accessions screened during 2002

Pest susceptibility rating (PSR)*	No. of Accessions in each class			
	Non-determinate		Determinate	
	Extra early maturing	Early maturing	Extra early maturing	Early maturing
1 & 2	Nil	Nil	Nil	Nil
3	(14) GP9, GP11, GP13, GP23, GP24, GP34, GP35, GP36, GP37, GP59, GP72, GP75, GP96, GP101	(12) GP114, GP117, GP118, GP140, GP141, GP144, GP160, GP162, GP174, GP180, GP182, GP191	(4) GP233, GP240, GP241,GP243	(5) GP252, GP253, GP254, GP259, GP260
4	(18) GP6, GP7, GP12, GP22, GP32, GP33, GP39, GP40, GP58, GP60, GP61, GP64, GP65, GP71,GP73, GP80, GP81, GP85	(21) GP115, GP116, GP119, GP121, GP130, GP142, GP143, GP145, GP159, GP161, GP164, GP175, GP181, GP193, GP196, GP201, GP202, GP219, GP220, GP221, GP224	(2) GP235, GP236	(2) GP256, GP257
Total	32	33	6	7

*Based on pod damage basis; 1-9 scale; 1=Resistant; 9=Susceptible; Extra early=110 days; Early maturing=130 days

year. Out of the total 78, only 4 pigeonpea accessions, *viz.*, GP75 (4.48 and 1.60%), GP118 (5.24 and 2.06%), GP233 (3.76 and 2.32%) and GP253 (4.09 and 2.21%), each belonging to non-determinate type extra early and maturing, determinate type extra early and early maturing group, respectively were found to be highly promising as they recorded lowest mean pod and grain damage (Table-1), respectively, during the two crop seasons, and on the basis of PSR those are grouped in grade 3 (Table-1 & 2). Hence, the above accessions may be exploited for breeding pod fly resistant cultivars.

Present studies further revealed that determinate type pigeonpea accessions showed less pod (5.48%) and grain damage (2.85%) due to pod fly as compared to non-determinate type, which showed comparatively higher (7.75 and 3.35%) pod and grain damage, respectively (Fig. 1). This may be attributed due to the continuous availability of immature pods in non-determinate type pigeonpea

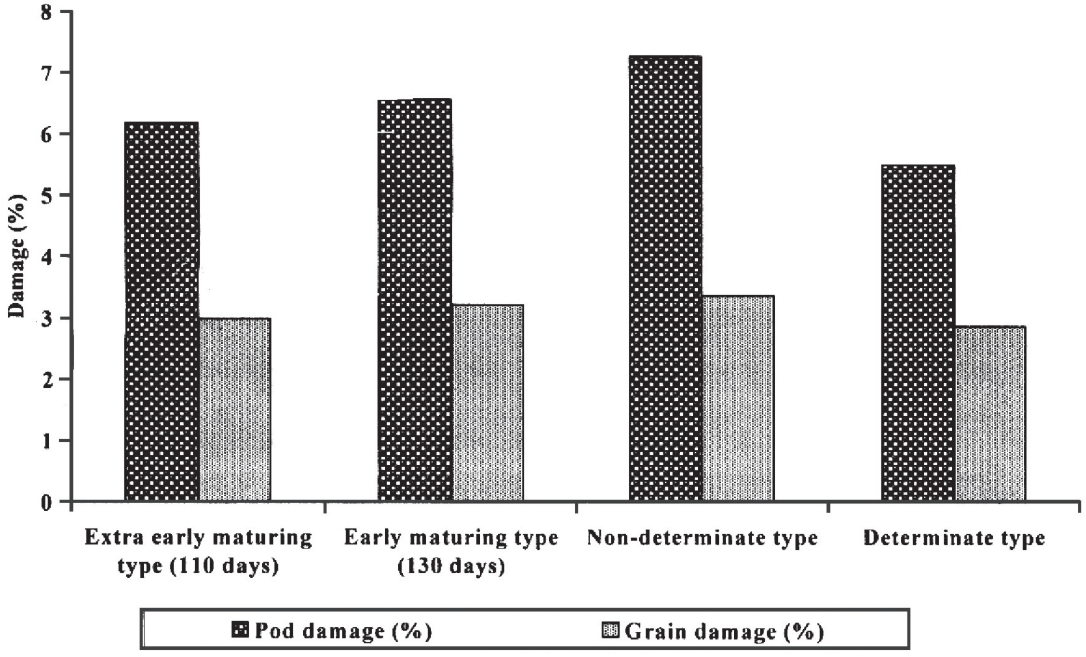

Fig. 1: Response of plant type and maturity period of pigeonpea on pod fly damage

accessions, the most preferred stage for pod fly infestation. Similarly in terms of maturity period, extra early maturing accessions (110 days) showed low pod damage (6.18%) and grain damage (2.98%) as compared to early maturing ones (130 days), the corresponding figures for which were 6.55 and 3.21%, respectively (Fig. 1).

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