Plant Archives Vol. 17 No. 1, 2017 pp. 666-671 *ISSN 0972-5210*

SCREENING OF DIFFERENT VARIETIES /ACCESSIONS OF MUSTARD *(BRASSICA JUNCEA)* AGAINST *LIPAPHIS ERYSIMI* (KALT.) UNDER NATURAL CONDITIONS

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Abstract

Cultivation of resistant or tolerant varieties is the easiest way to protect mustard crop from insect pests. Varietal screening for aphid resistance and stability of seed yield under aphid-infested and protected environment would help in identifying the tolerant varieties for aphid attack. The present investigations were therefore carried out with the objectives to study the evaluation of 240 *B. juncea* accessions for resistance/tolerance against mustard aphid. Under field conditions, experiment was conducted with 240 accessions (germplasm) of *Brassica juncea* at Norman E. Borlaug Crop Research Centre (CRC), Pantnagar, during 2010-2011 to evaluate their differential response on the infestation of *Lipaphis erysimi* (Kalt.). The different categories of resistance of mustard plants against aphid based on its population 16 out of 240 has been recorded as resistant, 83 accessions falling under moderately resistant category, 102 accessions as susceptible accessions whereas 39 accessions were found highly susceptible.

***Key Word**:* Field assessment, accessions/varieties, mustard*, Lipaphis erysimi.*

Introduction

Oilseed crop is an important group of crops in India. *Brassica* is an important oilseed crop of India. *Brassica* species comprise of Indian mustard [*Brassica juncea* (L.) Czern. & Coss.], *toria* (*B. rapa* L. var. *toria)*, yellow sarson (*B. rapa* L. var. *yellow sarson)*, brown *sarson* (*B. rapa* L.var. *brown sarson)*, swedes/ gobhi *sarson* (*B. napus* L.*),*Abyssinian mustard/ karan rai (*B. carinata* Braun.) and rocket/ taramira (*Eruca sativa* Mill.*)* related genera,which are found in India, are black mustard/ banarsi rai (*B.nigra* Koch), white mustard (*Sinapis alba* L.), wild mustard (*B. tournefortii* Gouan) and candrasura (*Lepidium sativum*L.) a close relative. *Brassica* the main source of edible oil next only to groundnut in both area and production (Ali *et al.,* 2010). .Oilseed crops include groundnut, sesame, rapeseed-mustard, sunflower, safflower and soybean. Among various constraints in the productivity of rapeseed-mustard, such as abiotic and biotic factor, abiotic factor in which rain fall, temperature, light humidity and biotic factors of insect-pests is one of the most important limiting factor for its low yield. More than 43 species of insect pests have been recorded to infest rapeseed-mustard crops in India under biotic stress. Out of these about a dozen species are considered as major pests (Purwar *et al.,* 2004). However, the maximum damage to the crop is done at flowering stage. The mustard aphid, *Lipaphis erysimi* (Kalt.) is the key pests of rapeseed-mustard and damage to the crop ranged from 9 to 96% in different agro-climatic conditions of India (Gupta *et al*., 2003). Both the adults and nymphs cause damage to mustard plant at vegetative, flowering and pod formation stages by sucking sap from the plant. In case of severe infestation leaves become curled, plant fails to develop pods, the young pods when developed do not mature and cannot

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produce healthy seeds. As a result, plant loses their vigour and their growth is stopped (Husain and Begum, 2009) Cultivation of resistant or tolerant varieties is the easiest way to protect mustard crop from insect pests. Varietal screening for aphid resistance and stability of seed yield under aphid-infested and protected environment would help in identifying the tolerant varieties for aphid attack (Dey *et al*., 2005). The yield loss in rapeseed mustard also varies with their germplasms and agro-ecological practices (Ansari, *et al.* 2007). Field assessment against aphid resistance and stability of seed yield under aphid-infested and protected environment would help in identifying the resistant varieties against aphid attack. Regular and indiscriminate usage of insecticides to manage this pest has resulted into adverse effect on environment and their non-target organism. Under these conditions develop a resistant variety/ accession and to identify the source of resistance and better approach. Therefore, the present investigation was under taken to find out the promising tolerant/resistant accession/variety of *Brassica* spp. against *Lipaphis erysimi* Kalt.

Materials and methods

A field trial was carried out to study the aphid infestation on 240 accessions of *B. juncea* germplasm at Norman E. Borlaug Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar during the *Rabi* season of year 2010- 2011 in Augmented Block Design (ABD).

Total 240 accessions of *Brassica juncea* were used for determining their reaction against mustard aphid under natural conditions. Sowing was done in second week of November during *Rabi* season of 2010-2011. Each entry was sown in two rows of 3m length with a line to line and plant to plant distance of 30 cm and 10-15 cm, respectively was maintained. Five checks were shown each after ten tested accessions for comparison under augmented design in 6 blocks.

The population of mustard aphid was counted on 5 plants. The aphid population on each plant was observed from 10 cm terminal shoot. The first count of mustard aphid population was taken at 50 days after sowing and subsequent observations were taken at a week interval for *Rabi* season. The population of mustard was counted visually.

Scoring pattern based on aphid population:

Degree of damage by aphid population in each germplasm

Group	Percentage of infestation	Rating index
I	0	Immune **(I)**
II	0-50	Resistant **(R)**
III	51-100	Moderately resistant **(MR)**
IV	101-150	Susceptible **(S)**
V	>151-200	Highly susceptible **(HS)**

To find out mean of aphid infestation, the number of plants following in each grade was multiplied by the respective grade number and the total was divided by number of plants observed. Five plants of each germplasm were randomly selected for observation on aphid infestation index '0-5' scale and population count of mustard aphid. The infestation rating of mustard aphid was observed on mustard germplasm and sampling of mustard aphid population was done by counting @ of 5 aphid/ plant.

Results and Discussion

Aphid population on mustard germplasm in *Rabi* season:

In the *Rabi* season 2010-11, it was observed that accession no. 491128 (13.64) showed minimum population

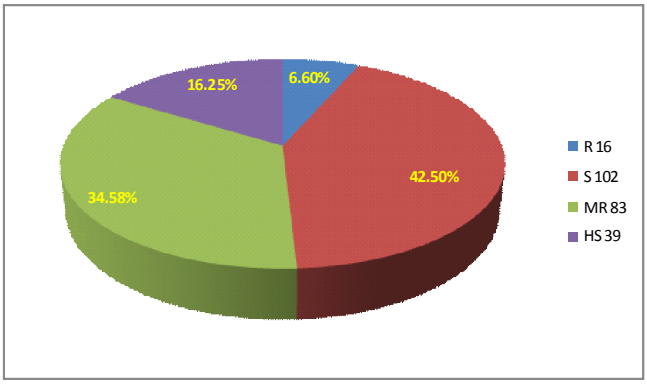

Fig.1 : Distribution pattern of categories for resistance among 240 mustard accessions Over the season

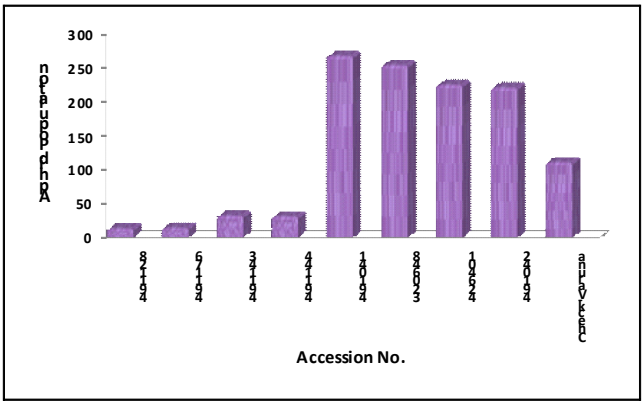

Fig.2: Most resistant and susceptible accessions of mustard against mustard aphid in *Rabi* season

Table 1: Aphid population on mustard accession *Rabi* season, during 2010-2011

S. No.	Accession (IC No.)	Adjusted mean	S. No.	Accession (IC No.)	Adjusted mean	S. No.	Accession (IC No.)	Adjusted Mean
1	248993	109.42	41	399803	114.80	81	491044	151.72
2	255498	92.42	42	399808	120.60	82	491046	46.12
3	257765	114.70	43	399814	64.40	83	491047	135.72
4	291158	65.93	44	399815	68.00	84	491048	46.52
5	296685	127.02	45	399816	73.20	85	491049	217.32
6	296690	255.62	46	399824	65.80	86	491052	165.52
7	296703	228.22	47	399826	148.80	87	491053	120.32
8	296705	154.42	48	399840	87.40	88	491056	137.92
9	310758	84.020	49	399853	104.20	89	491057	176.24
10	320641	196.62	50	399878	52.00	90	491058	111.72
11	**320648**	**253.62**	51	**401570**	**219.40**	91	491060	138.32
12	320701	92.02	52	401574	118.80	92	491061	111.56
13	324000	83.660	53	417020	163.40	93	491063	63.720
14	326253	103.66	54	422165	103.40	94	491067	99.71
15	329705	119.42	55	422195	154.20	95	491073	138.92
16	328316	132.82	56	426220	141.0	96	491074	202.12
17	335847	49.42	57	426221	115.2	97	491080	93.71
18	335854	32.42	58	426346	164.40	98	491081	165.68
19	338523	56.020	59	426351	118.60	99	491082	204.32
20	339589	46.820	60	426354	167.20	100	491084	116.72
21	339597	108.42	61	426357	131.60	101	491085	102.92
22	**339625**	**202.62**	62	426358	64.400	102	491086	114.92
23	341457	113.82	63	426379	217.0	103	491093	140.72
24	347947	61.420	64	426395	209.40	104	491100	172.92
25	347994	71.21	65	**426401**	**224.40**	105	491101	111.96
26	360723	120.42	66	490996	128.20	106	491104	150.72
27	360770	83.620	67	491004	86.40	107	491105	118.64
28	363606	100.42	68	491011	91.20	108	491106	121.12
29	363737	110.42	69	491016	78.40	109	491108	106.52
30	366460	71.820	70	491024	124.0	110	491111	145.32
31	334698	95.420	71	491028	157.24	111	491112	141.12
32	**375924**	**203.62**	72	491029	122.20	112	491114	76.03
33	375925	66.21	73	491031	145.20	113	491116	65.16
34	397277	50.220	74	491036	84.80	114	491117	124.72
35	397537	184.62	75	491038	142.20	115	491118	116.12
36	**399678**	**28.819**	76	491039	180.84	116	491119	122.32
37	399784	69.42	77	491040	136.80	117	491120	78.02
38	399788	75.42	78	**491041**	**267.00**	118	491123	164.32
39	399795	116.30	79	**491042**	**220.60**	119	491124	135.72
40	399802	76.020	80	491043	161.20	120	491125	133.92

on plant which was significantly different as compared to the check Varuna (111.05) followed by accession number 491176 (14.64), 491143 (32.24), 491144 (31.04). On the other hand, accession no. 491041 (267.00), followed by accession no. 320648 (253.62), 426401 (224.40), 491042 (220.60) was significantly higher than the check table 1. and Fig. 2.

The remaining germplasm showed the aphid population per plant from 491175 (39.24) to 401570 (219.40). No germplasm was found to belong immune against mustard aphid. The different categories of resistance of mustard plants against aphid based on its population 16 out of 240 has been recorded as resistant, 83 accessions falling under moderately resistant category. 102 accessions as susceptible accessions. Whereas 39 accessions were found highly susceptible Table 2. and Fig. 1.

Subhash *et al.,* (2013) reported that the differential behaviour of germplasm/ accessions ranged from highly susceptible to highly tolerant. The percentage of highly resistant and tolerant germplasms in different species of Brassica ranged from 5% to 100% in closely related species, (Jenson *et al*. 2002)**.** The high level of antibiosis resistance in *B. fruticulosa* has also been reported against cabbage root fly, *Delia radicum* Higher amount of protein (Pusa Gold and DIRA 313), total soluble sugars (Pusa Gold) and oil content (Pusa Bold and RLM 619) were positively associated with average peak aphid population, while phenol (B85 Glossy and RWH 1) and glucosinolate (B 85 and T 6342) were related with low incidence

S. No.	Accession (IC No.)	Adjusted mean	S. No.	Accession (IC No.)	Adjusted mean	S. No.	Accession (IC No.)	Adjusted Mean
121	491127	63.04	161	491187	111.28	201	491245	51.74
122	**491128**	**13.64**	162	491188	170.08	202	491246	78.34
123	491129	40.44	163	491189	65.279	203	491248	123.74
124	491130	78.04	164	491190	125.88	204	491249	82.34
125	491131	104.24	165	491192	126.68	205	491251	113.94
126	491133	43.44	166	491195	137.08	206	491253	109.74
127	491136	118.04	167	491198	111.88	207	491254	75.54
128	491137	81.44	168	491200	117.28	208	491255	72.74
129	491138	86.04	**169**	491201	113.48	209	491256	165.14
130	491139	115.64	170	491202	91.67	210	491257	58.740
131	491141	99.84	171	491203	116.08	211	491262	143.34
132	491142	106.84	172	491205	69.67	212	491264	103.54
133	**491143**	**32.24**	173	491206	89.27	213	491265	90.54
134	**491144**	**31.04**	174	491210	75.48	214	491266	86.38
135	491145	108.04	175	491211	73.67	215	491267	106.94
136	491149	58.64	176	491213	79.27	216	491268	91.94
137	491150	78.24	177	491214	103.08	217	491269	81.54
138	491151	121.24	178	491215	112.08	218	491271	48.34
139	491152	97.04	179	491217	123.88	219	491274	73.34
140	491156	93.64	180	491219	102.88	220	491276	131.14
141	491157	81.84	181	491220	146.8	221	491280	163.34
142	491158	63.84	182	491221	98.55	222	491281	148.54
143	491162	49.12	183	491222	92.87	223	491283	171.14
144	491163	89.04	184	491224	126.08	224	491284	62.74
145	491165	63.44	185	491225	165.08	225	491285	121.14
146	491166	64.64	186	491227	93.48	226	491286	137.74
147	491167	116.64	187	491229	99.48	227	491287	136.94
148	491170	87.44	188	491230	98.67	228	491288	122.34
149	491171	60.44	189	491231	94.07	229	491290	39.34
150	491173	132.84	190	491232	120.08	230	491292	120.94
151	491175	39.24	191	491233	101.88	231	491294	60.34
152	491176	**14.64**	192	491234	101.08	232	491296	112.94
153	491177	130.44	193	491235	176.28	233	491298	106.14
154	491180	173.44	194	491237	87.27	234	491299	116.94
155	491181	101.08	195	491238	129.68	235	491301	113.94
156	491182	132.40	196	491240	96.27	236	491304	85.340
157	491183	58.44	197	491241	139.88	237	491307	144.14
158	491184	92.64	198	491242	152.08	238	491309	132.34
159	491185	59.24	199	491243	138.68	239	491310	88.54
160	491186	55.64	200	491244	65.27	240	491312	49.54
					Checks	CH-1	PJ Kisan	117.18
						CH-2	Rajat	139.15
						CH-3	RH- 30	145.30
						CH-4	Varuna	111.05
						CH-5	Laxmi	113.61

CMLSD= 46.98110 AVSBLS= 115.0797 AVDBLS= 126.0635 AVACLS= 96.28261
CMLSD=Least significant difference between the means of two ckeck varieties
AVSBLS=Least significant difference between adjusted values of two selection in the same block
AVDBLS= Least significant difference between adjusted values of two selection in the different block
AVACLS=Least significant difference between an adjusted selection value and a check mean

of mustard aphid. Mamun *et al.,* 2010 reported that the infestation variation among the genotypes were concluded that among the different genotypes of Brassica, incidence of aphid showed variability as in the same group of cultivars. The level of aphid infestation and population on different Brassica accessions seem to be the ability of plant characteristics of different germplasm (Patel *et al.,* 2004). The lowest plant infestation was recorded in the variety MM014-02wf (1.79%) followed by the variety MM012-02ys (2.23%) and the variety Binasarisha-4. Pink *et al.,* 2003 were reported genetic control of resistance to the aphid *Brevicoryne brassicae* in the wild species *Brassic fruticulosa.*

References

Ali, A., P.Q. Rizvi and F.R. Khan (2010). Bio-efficacy of some plant leaf extracts against mustard aphid, *Lipaphis eysimi* Kalt. on Indian mustard, *Brassica juncea*. *Journal of Plant Protection Research,* **50** : 130-132.

Ansari, M.S., B. Hussain and N.A. Qazi (2007). Influence of abiotic environment on the population dynamics of mustard aphid, lipaphis erysimi (Kalt.) on *Brassica* Germplasm. *J. Boil. Sci*., **7** : 993-996.

Dey, Prasad, S.K. and Trimohan (2005). field evaluation of mustard cultivars for resistance to *Lipaphis erysimi* (Kalt.) *Shashpa*, **12** : 134-136.

Gupta, M.P., M.L. Verma, S.K. Chaurasia and H.S. Rai (2003). Assesment of avoidable yield losses in *Brassica carinata* varieties due to mustard aphid. *Ann. Pl. Protec. Sci.* **11** : 11-15.

Husain, M. and M.A. Begum (2009). number of insect pests attack mustard. *J. Agric. Res.* Vol.46.

Jenson E.B., G. Felkl, K. Kristiansen and S.B. Andersen (2002). Resistance

Table 2: Category of mustard accessions against mustard aphid during the *Rabi* season,2010-2011.

Resistant	Moderately resistant	Susceptible	Highly susceptible
335847, 339589, 335854 399678, 491046, 491046 491046, 491128, 491133, 491143, 491144, 491162, 491175, 491176, 491271, 491312.	255498, 291158, 310758, 320701, 324000, 338523, 347947, 347994, 360770, 366460, 334698, 375925, 397277, 399784, 399788, 399802, 399814, 399815, 399816, 399824, 399840, 399878, 426358, 491004, 491011, 491016, 491036, 491063, 491067, 491080, 491114, 491116, 491120, 491127, 491130, 491137, 491138, 491141, 491149, 491150, 491152, 491156, 491157, 491158, 491163, 491165, 491166, 491170, 491171, 491184, 491185, 491186, 491189, 491202, 491205, 491206, 491210, 491211, 491213, 491221, 491222, 491227, 491229, 491230, 491231, 491237, 491240, 491244, 491245, 491246, 491249, 491254, 491255, 491257, 491265, 491266, 491268, 491269, 491274, 491284, 491294, 491304, 491310.	248993, 257765, 296685, 326253, 329705 328316, 339597, 341457, 360723, 363606 363737, 399795, 399803, 399808, 399826, 399853, 401574, 422165, 426220, 426221 426351, 426357, 490996, 491024, 491029 491031, 491038, 491040, 491047, 491053, 491056, 491058, 491060, 491061, 491073, 491084, 491085, 491086, 491093, 491101, 491105, 491106, 491108, 491111, 491112 491117, 491118, 491119, 491124, 491125 491131, 491136, 491139, 491142, 491145 491151, 491167, 491173, 491177, 491181 491182, 491187, 491190, 491192, 491195 491198, 491200, 491201, 491203, 491214 491215, 491217, 491219, 491220, 491224 491232, 491233, 491234, 491238, 491241 491243, 491248, 491251, 491253, 491262 491264, 491267, 491276, 491281, 491285 491286, 491287, 491288, 491290, 491292 491296, 491298, 491299, 491301, 491307 491309	296690, 296703, 296705, 320641, 320648, 339625, 375924, 397537, 401570, 417020, 422195, 426346 426354, 426379, 426395, 426401, 491028, 491039, 491041, 491042, 491043, 491044, 491049, 491052 491057, 491074, 491081, 491082, 491100, 491104, 491123, 491180, 491188, 491225, 491235, 491242 491256, 491280, 491283

to the cabbage root fly, *Delia radicum* within *Brassica fruticulosa*. *Euphytica*, **124** : 379–386.

Mamun, M.S.A, M.H. Ali, M.M. Ferdous, M.A. Rahman and M.A. Hossain (2010). Assessment of Several Mustard Varieties Resistance to Mustard Aphid, *Lipaphis erysimi* (Kalt.) *J Soil Nature*, **4(1)** : 34-38.

Patel, S.R., A.K. Awasthi and R.K.S. Tomar (2004). Assessment of yield losses in mustard (*Brassica juncea* L.) due to mustard aphid *Lipaphis erysimi* (Kalt.) under different thermal environment in Eastern Central India. *App. Eco. And Env. Res* ., **2** :1-5.

Pink, D..A..C., Kift,, N.B., Ellis, P.R., McClement,, S.J., Lynn J & G.M.. Tatchell (2003). Genetic control of resistance to the aphid *Brevicoryne brassicae* in the wild species *Brassica fruticulosa*. *Plant Breeding*, 122 : 24–29.

Purwar JP, Singh RK & P.Mall (2004). Ecofriendly management of insect pests in rapeseed- mustard. *Indian Farmers Digests*, 37 : 34-35.

Subhash, C., Prasad, T.V., Ranbir, S., Subadas, S., Gautam R.D. and B. Shashi (2013) Evaluation of Different Brassica Species against Mustard Aphid, *Lipaphis erysimi*. *Indian J Plant Prot.* 41(1) :38-44.