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Revalidation of Tolerant and Susceptible genotypes of *Brassica juncea* (L.) Czern. & Coss.

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ABSTRACT
To re-confirm the tolerance and susceptibility of tolerant genotypes of Brassica juncea, IC-385686, IC-491089, IC-312545, IC-312553 and susceptible genotypes IC-399802, IC-264131, IC-426392, Laxmi were grown in Randomized Block Design (RBD) with three replications in the field conditions and the observations was recorded for days to 50% flowering, first incidence of aphid population, number of aphids at 15 days interval and then aphid infestation index was calculated. Days to 50% flowering for tolerant and susceptible did not show much significant differences and ranged from 63 days to 65 days. On first observation recorded for aphid population, it was lowest for tolerant genotypes, IC 491089 while highest for susceptible genotypes, IC 426392. On second observation, aphid Population was lowest in tolerant genotypes, IC 491089, while highest in susceptible in Laxmi. Finally, on the basis of aphid infestation index, tolerant genotypes were IC 491089, IC 312545, IC 385686 and IC 312553. The above observations reconfirm these genotypes to be tolerant and can be used as putative sources of aphid tolerant genotypes in future breeding programmes.
Keywords: *Brassica juncea, Mustard aphid.*

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INTRODUCTION

Mustard aphid (*Lipaphis erysimi* K.), is one of the major biotic constraints of rapeseed-mustard. As reported 83% yield loss in rapeseed-mustard due to this pest in India [1]. It belongs to order Homoptera and family aphididae. Its population reaches its zenith in the month of December to February in India. Both adults and nymph cause maximum damage to the crop, by sucking the saps of the leaf, inflorescence and pods of the plant, resulting in pale, curled leaves and adversely affecting the plant's growth and development. Furthermore, these aphids also transmit plant viral diseases (turnip mosaic virus, cauliflower mosaic virus, cucumber mosaic virus etc.), which can only be managed by effective control of aphids. Although, mustard aphid can be controlled satisfactorily by insecticides, but the use of resistant varieties is the best approach to tackle the menace of aphid. Development of reliable screening techniques for insect resistance is quite difficult because such techniques are based on the size of insect population or assessment of insect damage to plants under field condition. In *B. juncea*, some of the morphological and

biochemical traits like small and hardy inflorescence with loosely packed buds, darker leaves, more branches with wider angle of orientation, less amount of total sugar and sulphur contents, higher glucosinolates particularly sinigrin traits were observed to be related to aphid tolerance [2-4].

MATERIAL AND METHODS

The present investigation was carried out during 2017-18 in *Rabi* season at an area specified to Oil seed section of Department of Plant Breeding and Genetics (PBG), Bihar Agricultural College (BAC), Sabour, Bihar, India, which lies in the Middle Gangetic plain region of Agro-climatic Zone III A of Bihar (25°50' N latitude; 87°19' E longitude; altitude 52.73 meters above mean sea-level). The plant materials included tolerant and susceptible genotypes of *B. juncea* identified on the basis of earlier field trials conducted at Oilseed section of Plant Breeding and Genetics, Department, Bihar Agricultural College, Sabour. These were classified as per the scale given in (Table 1)[5] and were as follows: tolerant genotypes: IC-385686, IC-491089, IC-312545, IC-312553 and susceptible genotypes: IC-399802, IC-264131, IC-426392, Laxmi. To re-confirm the tolerance and susceptibility of these genotypes, these were grown in Randomized Block Design (RBD) with three replications. The layout was as follows: spacing, 30cm x 10cm; no of rows per entry, 2; Plot size, 8 x 5 = 40m^2; row length, 1 m; no. of genotypes, 8; no. of tolerant genotypes, 4; no. of susceptible genotypes, 4. Observations were recorded for (1) days to 50% flowering, the numbers of days were counted from the date of sowing to appearance of flower on almost 50% plants for each genotype, (2) first incidence of aphid population, the numbers of days were counted from date of sowing to initial appearance of aphid in the inflorescence of the central branch of the shoot, (3) no. of aphids at 15 days interval (two observations). The number of aphid was counted after two weeks of first aphid incidence and two observations were recorded at two weeks interval on the top ten cm central branch of the shoot.

Table 1: Aphid tolerance scale [5]

Sl.No.	Scale	Aphid reaction	Aphid Population
1.	0	Immune	0 mean aphid population/ 10 cm inflorescence
2.	0.1-1.0	Highly tolerant	≤20 mean aphid population/ 10 cm inflorescence
3.	1.1-2.0	**Tolerant**	21-50 mean aphid population/ 10 cm inflorescence
4.	2.1-3.0	Moderately tolerant	51-100mean aphid population/ 10 cm inflorescence
5.	3.1-4.0	**Susceptible**	101-150 mean aphid population/ 10 cm inflorescence
6.	4.1-5.0	Highly susceptible	>150 mean aphid population/ 10 cm inflorescence

RESULTS

To test the tolerance and susceptibility of the eight genotypes used in the present study, these genotypes were evaluated as detailed in Material and Method section. The evaluation of susceptible and tolerant genotypes was carried out in the field condition and the observations was recorded for days to 50% flowering, first incidence of aphid population, number of aphids at 15 days interval and then aphid infestation index was calculated. ANOVA was done and the result is shown below (Table 2). The results re-confirmed the susceptibility and tolerance level of these geotypes. Table of mean values of eight genotypes (Table 3) showed that days to 50% flowering of eight genotypes differ for 1-2 days for 50% flowering, while earliest flowering (63 days) was observed in two susceptible genotypes, IC 399802 and IC 385686 and late (65 days) in one susceptible genotypes, IC 264131. In case of days to first incidence of aphid population, an early attack of aphid was observed in susceptible genotypes, IC 399802 and IC 264131, and late in susceptible genotypes, Laxmi and IC 426392 and tolerant genotypes, IC 491089, IC 312545. There was 2-3 days of difference observed among all genotypes for first incidence of aphid population. On first observation recorded for aphid population, it was lowest for tolerant genotypes, IC 491089 while highest for susceptible genotypes, IC 426392. On second observation, aphid population was lowest in tolerant genotypes, IC 491089, while highest in susceptible in Laxmi. On the basis of aphid infestation index, tolerant genotypes were IC 491089, IC 312545, IC 385686 and IC 312553. These finding re-confirmed the tolerance and susceptibility level of above genotypes reported earlier after evaluation for three years in Oilseed section, PBG, BAC, Sabour.

Table 2: Analysis of Variance for observation

Sl. No.	Characters	Mean sum of squares		
		Replication	Treatments	Error
		d.f. (2)	d.f. (7)	d.f. (14)
1.	Days to 50% flowering	0.125	1.518	3.839
2.	First Incidence of Aphid Population after sowing	4.667	4.565	3.762
3.	1st observation on 20/2/2018 for Aphid Population	1.625	1248.315*	2.233
4.	2nd observation on 6/3/2018 for Aphid Population	3.717	12796.255*	16.945
5.	Aphid Infestation Index	0.0037	3.278*	0.009

*At 5% level of significance

Table 3 Mean values of eight genotypes used in the present study

Treatment	Days to 50% Flowering	Days of First Incidence	Aphid population (I observation)	Aphid population (II observation)	Aphid infestation index (AII)
LAXMI	64	68	46.667	172.567	3.640
IC 426392	64	68	70.444	161.667	3.740
IC 399802	63	65	50.889	163.000	3.687
IC 264131	65	65	62.000	161.667	4.070
IC 385686	63	67	27.111	36.778	2.007
IC 312553	64	67	20.889	58.333	2.067
IC 491089	64	68	18.000	34.000	1.560
IC 312545	64	68	22.000	44.667	1.820
C.D	N/A	N/A	2.642	7.279	0.173
SE(m)	1.131	1.120	0.863	2.377	0.057
C.V	3.068	2.904	3.760	3.955	3.473

C.D. – Critical Difference; S.E.(m)-Standard Error of mean; C.V –Coefficient of Variance

DISCUSSION

Eight different genotypes of *B. juncea* comprising tolerant (IC-399802, IC-491089, IC-312545, IC-312553) and susceptible (IC-385686, IC-264131, IC-426392, Laxmi) were selected for the present study. From the ANOVA table (Table 2), it was concluded that at 5% level of significance days to 50% flowering and first incidence of aphid population after sowing were non-significant indicates that all susceptible and tolerant genotypes had nearly equal days to 50% flowering and first incidence of aphid population while for first observation for aphid population, second observation after 15 days for aphid population and aphid infestation index were found to be highly significant which indicates that all the susceptible and tolerant genotypes showed variations for first observation for aphid population, second observation for aphid population and aphid infestation index. The tolerance and susceptibility level of these genotypes is in accordance with the result of three years consecutive trials reported by Oil seed section, PBG, BAC, Sabour (2013-16).

It was reported that generally, *B. juncea* strains show moderate resistance mustard aphid infestation as compared to brown and yellow sarson [6,7,8].The strain of *B. juncea* has tough inflorescence twigs with loosely packed flowers buds, which offer a less suitable site for colonization of aphid [2]. As reported that another close relative, *Eruca sativa* to be least susceptible to *L. erysimi* infestation and it suffered the least loss in seed yield and harboured the minimum population of mustard aphid [9,10].

CONCLUSION

The above observations reconfirm these genotypes IC-385686, IC-491089, IC-312545 and IC-312553 to be tolerant and can be used as putative sources of aphid tolerant genotypes in future breeding programmes.

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REFERENCES

1. Mandal, S.M.A., Mishra, R.K., Patra, A. (1994). Yield loss in rapeseed and mustard due to aphid infestation in respect of different cultivars and dates of sowing. Orissa Journal of Agriculture Research, 7:58-62.
2. Rai, B. and Sehgal, V.K. (1975). Field resistance of *Brassica* germplasm to mustard aphid *Lipaphis erysimi* (Kalt) Science and Culture, 41:444-445.
3. Ahuja, I., Rohloff, J., Bones, A.M. (2010). Defence Mechanisms of Brassicaceae: implications for plant-insect interactions and potential for integrated pest management. Agronomy for Sustainable Development, 30:311-348.
4. Martínez-Ballesta, M.del-., Moreno, D.A., Carvajal, M. (2013). The Physiological Importance of Glucosinolates on Plant Response to Abiotic Stress in *Brassica*. International Journal of Molecular Sciences, 14:11607-11625.
5. Bakhetia, D.R.C. and Sandhu, R.S. (1973). Differential response of *Brassica* species / varieties to the aphid, *Lipaphis erysimi* (kalt.) infestation. Journal of research, Punjab Agricultural University, 10(3): 272-279.
6. Singh, R.N., Dass, R., Saran, G., Singh, K.K. (1982). Differential response of mustard varieties to *Lipaphis erysimi* (Kalt.). Indian Journal of Entomology, 44:408.
7. Rohilla, H.R., Singh, H., Kumar, P.R. (1993). Strategies for the identification of the sources of resistance in oilseeds *Brassica* against *Lipaphis erysimi* (Kalt.). Annals of Biology, 9: 174-183.
8. Bakhetia, D.R.C., Singh, H., and Chander . (2002). IPM for sustainable production of oilseeds. In: M. Rai, Harvir Singh and D.M. Hegde (eds). Oilseeds and Oils – Research and Development Needs. Indian Society of Oilseeds Reseach, Hyderabad, pp. 184-218.
9. Dilawari, V.K. and Dhaliwal, G.S. (1988). Population build-up of mustard aphid, *Lipaphis erysimi* (Kalt.) on cruciferous cultivars. Journal of Insect Science, 1: 149-153.
10. Singh, J.K. and Kumar, S. (2011). Quantification of avoidable yield losses in oilseed *Brassica* caused by insect pests. Journal of Plant Protection Research, 51:1