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# Field screening of blackgram accessions for resistance against spotted pod borer *Maruca vitrata* (Geyer)

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**Abstract**
Blackgram (*Vigna mungo* L.) is an important pulse crop in the semi-arid tropics and subtropical farming systems, providing high quality vegetable protein. Spotted pod borer, *Maruca vitrata* (Geyer) is the devastating pest on blackgram. For varietal screening studies**,** 100 accessions were screened against *Maruca*. Population of *Maruca* larvae as well as Pod damage due to its feeding was recorded during two consequent Rabi seasons, 2020 & 2021. Among the accessions, six accessions were categorized under Resistant with no pod damage in both the seasons, thirteen accessions were grouped under moderately resistant, twenty five accessions were categorized under Tolerant, fifty four accessions were classified as moderately susceptible and two were grouped under highly susceptible in first season. In second season six accessions were categorized under moderately resistant and twenty two accessions were tolerant. Sixty four accessions were comes under moderately susceptible and two were identified as highly susceptible. Among the accessions, Sivanmalai local recorded significantly highest pod damage (46.17%) with mean larval population of 3.02.

**Keywords:** field screening, blackgram, resistance and *M. vitrata*

## Introduction

Black gram, [*Vigna mungo* (L.) Hepper] is a legume crop, which is grown for its pod and it is extensively utilized as protein source for human consumption. In India, the total area under Blac kgram is 35.53 L.ha with the production of 19.64 L.ton and the average productivity is 553 kg/ha.[(1)] Mostly black gram is growing under paddy fallows and its can be included as filler crop and provide additional income to the farming community. The production and productivity of the crop is greatly hampered by the insect pests damage and disease. [(2)] In India, 60 insect species were known to attack black gram at different stages of crop growth. The Spotted pod borer which is also known as legume pod borer, *Maruca vitrata* Geyer. (Lepidoptera; Pyralidae) is a serious pest of grain legumes in the tropics and subtropics. Adults prefer to lay eggs on flower buds, flowers, terminal shoots and tender pods. After hatching, the young larvae especially injure the terminal shoots and the flower buds, whereas the older larvae particularly damage the open flowers and the pods. The larvae feed from inside a webbed mass of leaves, flowers, flower buds and pods. In general, the incidence is higher on flowers (52.3%) than on pods (37.8%) and leaves (9.9%).[(3)] The yield loss due to this pod borer range from 20 to 88%.[(4)]Because of its damage nature it holds the economic importance state, where management practices need to be taken. Host plant resistance is the main basic component of IPM, and the utilization of resistant plants has long been considered as one of the most effective components of insect control. Host plant resistance play a crucial role in insect pest management of grain legumes and resistance to insect pest has been a major criterion in the development and release of new varieties [(5)]. Keeping this in mind, the present study was conducted with an objective, to evaluate the resistance potentials of the black gram accessions against spotted pod borer *M. vitrata*.

## Materials and Methods

The accessions of the blac kgram were collected from various sources and the following accessions were used for studies.

**Table 1**

| S. no. | Accessions | Place of collection | S.no. | Accessions | Place of collection |
|---|---|---|---|---|---|
| 1 | IC 261172 | NBPGR, New Delhi | 26 | IC 436560 | NBPGR, New Delhi |
| 2 | IC 261179 | | 27 | IC 436597 | |
| 3 | IC 261182 | | 28 | IC 436626 | |
| 4 | IC 281975 | | 29 | IC 436628 | |
| 5 | IC 281981 | | 30 | IC 436647 | |
| 6 | IC 281989 | | 31 | IC 436667 | |
| 7 | IC 281992 | | 32 | IC 436675 | |
| 8 | IC 281993 | | 33 | IC 436676 | |
| 9 | IC 281994 | | 34 | IC 436717 | |
| 10 | IC 282001 | | 35 | IC 436718 | |
| 11 | IC 335331 | | 36 | IC 436724 | |
| 12 | IC 343812 | | 37 | IC 436727 | |
| 13 | IC 343856 | | 38 | IC 436736 | |
| 14 | IC 343936 | | 39 | IC 436753 | |
| 15 | IC 343939 | | 40 | IC 436758 | |
| 16 | IC 343967 | | 41 | IC 436765 | |
| 17 | IC 382807 | | 42 | IC 436784 | |
| 18 | IC 382811 | | 43 | IC 436817 | |
| 19 | IC 398983 | | 44 | IC 436852 | |
| 20 | IC 398989 | | 45 | IC 436882 | |
| 21 | IC 398998 | | 46 | IC 436910 | |
| 22 | IC 426769 | | 47 | IC 519620 | |
| 23 | IC 436508 | | 48 | IC 436922 | |
| 24 | IC 436518 | | 49 | IC 519678 | |
| 25 | IC 436524 | | 50 | IC 519835 | |

**Table 2**

| S.no. | Accessions | Place of collection | S.no. | Accessions | Place of collection |
|---|---|---|---|---|---|
| 51 | $CO_6$ | TNAU, Coimbatore | 76 | Odanilai local | Tiruppur District |
| 52 | KKM1 | Tuticorin | 77 | Nadupalayam local | |
| 53 | ADT3 | TRRI, Aduthurai. | 78 | Kundadam local | |
| 54 | ADT4 | | 79 | Kangeyam local | |
| 55 | ADT5 | | 80 | Kulampalayam local | |
| 56 | ADT6 | | 81 | Sivanmalai local | |
| 57 | VBN3 | NPRC, Vamban | 82 | Parayakatuvalasu local | |
| 58 | VBN4 | | 83 | Sonai ulunthu | |
| 59 | VBN5 | | 84 | Kuthirai saanthal | Dindigul District |
| 60 | VBN6 | | 85 | Dindigul local | |
| 61 | VBN8 | | 86 | Thiruvaarur local | Tiruvarur District |
| 62 | MDU1 | Madurai District | 87 | Valangaiman local | |
| 63 | T9 | | 88 | Alangudi local | |
| 64 | Aathur local | Salem District | 89 | Vedharanyam local | Nagapatinam District |
| 65 | Covai local | Coimbatore District | 90 | Kuthalam local | |
| 66 | Kinathukadavu local | | 91 | Viruthachalam local | Cuddalore District |
| 67 | Dharmapuri local | Dharmapuri District | 92 | Kothu ulunthu | |
| 68 | Ottavalasu local | Erode District | 93 | Kodi ulunthu | |
| 69 | Mettur local | | 94 | Sivapuri local | |
| 70 | Nul-7 | | 95 | Cuddalore local | |
| 71 | Komarapalayam local | | 96 | VBN12039 | Department of Plant Breeding and Genetics, Annamalai University |
| 72 | Kalivalasu local | | 97 | VBN 12062 | |
| 73 | Thitampalayam local | | 98 | VBG 10010 | |
| 74 | Murugampalayam local | | 99 | VBG 11011 | |
| 75 | Muthur local | Karur District | 100 | VBG11035 | |

Hundred accessions of blac kgram were sown in row system with spacing of 30X10 cm in Sivapuri village situated 4 km away from Department of Entomology, Faculty of Agriculture, Annamalai University. Twenty five plants were maintained per accession. Field screening was conducted in two consequent Rabi seasons (2020 & 2021). All agronomic practices were carried during the crop period, except pest management measures. The larval population was recorded at five randomly selected plants from flower bud stage to pod maturation stage at weekly intervals. Pod damage was calculated at the time of harvest by counting total number of pods and infested pods of five randomly selected plants. [6] Based on the per cent pod damage, the damage score for each genotype was calculated and were given the resistance rating 1-9 as suggested by Rani *et al*., 2008 [7].

Per cent Pod damage = (Number of damaged pods/ Total Number of Pods) ×100

Based on the per cent pod damage, the accessions were classified as detailed below,

**Table 3**

| Pod damage (%) | Score | Resistance rating |
|---|---|---|
| No damage | 1 | Resistant |
| <10 | 3 | Moderately resistant |
| 11-20 | 5 | Tolerant |
| 21-40 | 7 | Moderately susceptible |
| >40 | 9 | Highly Susceptible |

**Result and Discussion**

The performance of accessions was calculated based on the pod damage in field condition. The results revealed that the incidence of Pod borer was peek in accession Sivanmalai local with the larvae of 3.02 numbers. All other accessions were recorded with mean population of *M. vitrata* range from 0.37 to 2.41 numbers (Plate.1). Based on the pod damage, the accessions were categorized in to five groups. The accessions recorded with no damage categorized as resistant. Six accessions were considered to be resistant in both seasons with no pod damage. They were Dindigul local, Kuthirai saanthal, Thiruvarur local, Sivapuri local, Kuthalam local and Sonai ulunthu. Similar to the present findings, high level of resistance was observed in cultivated and local land races of blackgram compare to hybrids [8, 9]. In first season, Thirteen accessions categorized as moderately resistant with <10 per cent pod damage(Dharmapuri local(4.64), Vedharanyam local(1.19), Valangaiman loca(l.15), Alangudi local(1.99), Viruthachalam local(9.60), Cuddalore local(2.07), VBN12039(3.61), VBN12062(5.74), VBG 10010(5.21), VBG 11011(7.40), VBG 11035(5.20), Kothu ulunthu(6.04), Kodi ulunthu(6.07)) Twenty five accessions with score of 5 categorized as tolerant(IC 398998(19.51), IC 436508(19.59), IC 436518(20.0), IC 436597(19.66), IC 436626(19.93), IC 436628(19.94), IC 436647(18.37), IC 436724(19.37), IC 436727(19.38), IC 436736(19.85), IC 436758(18.79), IC 436817(19.72), IC 436110(17.40), IC 436922(19.53), IC 519678(19.77), IC 519835(18.71), KKM1(15.41), ADT6(16.01), VBN5(11.15), VBN6(11.87), VBN8(16.36), Ottavalasu local(16.70), Kinathukadavu local(15.67), Odanilai local(19.58), Aathur local(18.92)), Fifty four accessions (IC 261172(21.87), IC 261179(21.66), IC 261182(22.14), IC 281975(23.60), IC 281981(22.22), IC 281989(22.03), IC 281992(20.94), IC 281993(22.30), IC 281994(22.03), IC 282001(25.41), IC 335331(23.88), IC 343812(36.97), IC 343856(32.46), IC 343936(22.25), IC 343939(22.42), IC 343967(22.75), IC 382807(21.37), IC 382811(22.12), IC 398983(21.85), IC 398989(20.13), IC 426769(21.18), IC 436524(21.60), IC 436560(21.71), IC 436667(21.19), IC 436675(20.42), IC 436676(20.43), IC 436717(20.23), IC 436718(20.41), IC 436753(20.36), IC 436765(20.94), IC 436784(22.42), IC 436852(21.75), IC 436882(22.95), IC 519620(20.56), $CO_6$(28.63), ADT3(23.04), ADT4(22.57), ADT5(20.59), VBN3(24.19), VBN4(20.89), MDU1(24.48), T9(26.47), Nul-7(26.62), Covai local(22.76), Kundadam local(25.90), Mettur local(24.85), Komarapalayam local (20.88), Muthur local(26.69), Thitampalayam local(20.27), Murugampalayam local (20.67), Parayakatuvalasu local(20.03), Nadupalayam local (22.46), Kangeyam loca(21.32) and Kulampalayam local(20.15)) recorded as moderately susceptible with score of 7 and two accessions(Kalivalasu local (44.14), Sivanmalai local (45.53))

were recorded as highly susceptible.

Whereas in second season, six accessions (Dharmapuri local (4.44), Vedharanyam local (9.61), Valangaiman local (3.17), Alangudi local (3.56), Cuddalore local(2.07) and Kodi ulunthu (5.12) recorded moderately resistant. Likewise twenty two accessions (IC 436765(18.10), ADT5(18.72), KKM1(16.98),VBN5(13.46), VBN6(13.13), MDU1(13.06), Nul-7(19.89), Parayakatuvalasu local(18.31), Nadupalayam local(19.58), Kangeyam local(19.71), Kulampalayam local(18.94), Kalivalasu local(18.38), Covai local(10.88), Ottavalasu local(17.01), Kinathukadavu local(17.08), Odanilai local(18.77), Viruthachalam local(14.36), VBN12039(18.81), VBN12062(16.72), VBG 10010(17.49), VBG 11011(18.91) and Kothu ulunthu(16.75) were categorized as tolerant and sixty four accessions (IC 261172(22.98), IC 261179(30.09), IC 261182(26.39), IC 281975(25.91), IC 281981(27.61), IC 281989(21.85), IC 281992(22.86), IC 281993(22.19), IC 281994(24.54), IC 282001(23.99), IC 335331(26.79), IC 343812(38.80), IC 343856(33.93), IC 343936(22.54), IC 343939(24.72), IC 343967(26.49), IC 382807(24.03), IC 382811(22.01), IC 398983(23.58), IC 398989(23.21), IC 426769(27.95), IC 436508(24.59), IC 436524(23.72), IC 436560(24.33), IC 436667(23.88), IC 436675(22.25), IC 436676(25.32), IC 436717(27.14), IC 436718(26.39), IC 436753(25.86), IC 436784(22.30), IC 436852(23.71), IC 436882(23.92), IC 519620(29.78), IC 398998(26.65), IC 436518(25.25), IC 436597(23.35), IC 436626(25.92), IC 436628(25.55), IC 436647(25.72), IC 436724(24.69), IC 436727(24.63), IC 436736(24.07), IC 436758(23.36), IC 436817(24.57), IC 436110(23.0), IC 436922(23.15), IC 519678(25.31), IC 519835(26.08), VBG 11035(20.94), $CO_6$(23.12), ADT3(21.88), ADT4(20.81), VBN3(22.59), VBN4(23.86), T9(20.75), ADT6(22.19), VBN8(21.35), Aathur local(21.63), Kundadam local(24.85), Mettur local(22.29), Komarapalayam local(20.38), Muthur local(22.23) and Thitampalayam local(21.12))recorded as moderately susceptible. Two accessions (Sivanmalai local (46.81), Murugampalayam local (40.84)) were recorded as highly susceptible in second season with the damage scale of >40 per cent.

The varieties like MDU 1, ADT 5 and VBN 8 were grouped under tolerant. From the previous findings we came to know that these accessions were comparatively less preferred by *Maruca* as they posses dense trichomes and wider angled pods [10]. Similarly they also opined that VBN 6, KKM 1, and ADT 6 were moderately resistant to *Maruca.*

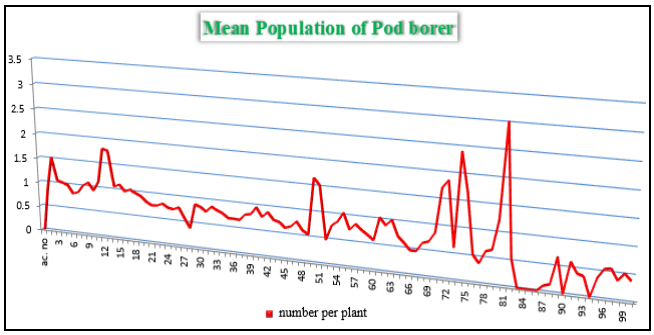


**Fig 1:** Mean Population of *M. vitrata* (Both Season)

## Conclusion

Several management practices for spotted pod borer have been reported. But the information regarding the host plant resistance to blackgram spotted pod borer was very much scanty which need to be studied intensively. Based on the above findings, it is observed that, six accessions Dindigul local, Kuthirai saanthal, Thiruvarur local, Sivapuri local, Kuthalam local and Sonai ulunthu were identified as resistant accessions. These accessions might be utilized in resistance breeding programmes against *M. vitrata* pod damage. Only after ascertaining the resistance potentials by repeated evaluation, a promising accession could be recommended for large scale cultivation.

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