P. Manikandan *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.6 Issue.7, July-2019, pg. 1-13 **ISSN: 2348-1358**
Impact Factor: 6.057
NAAS Rating: 3.77

Incidence and Host Preference of Brinjal Hadda Beetle *Epilachna vigintioctopunctata* (Fabricius) (Coccinellidae: Coleoptera) on Different Solanaceous Weed Hosts

P. Manikandan[1]; M. Saravanaraman[2]; V. Selvanarayanan[3]; K.Suguna[4]
[1]Department of Entomology, Faculty of Agriculture, Annamalai University, Tamil Nadu, India
rudhran323@gmail.com
[2]Department of Entomology, Faculty of Agriculture, Annamalai University, Tamil Nadu, India
saravana.raman01@gmail.com
[3]Department of Entomology, Faculty of Agriculture, Annamalai University, Tamil Nadu, India
selvaento@gmail.com
[4]Department of Entomology, Faculty of Agriculture, Annamalai University, Tamil Nadu, India
agrisuguna@gmail.com

ABSTRACT: ***Spotted beetle, Epilachna vigintioctopunctata (Fabricius) (Coccinellidae: Coleoptera) is one of the major defoliators of eggplant leading to heavy economic yield loss. Due to its multiple host range pests occurred throughout the year. In order to know the alternate hosts of hadda beetle field survey, field susceptibility evaluation and laboratory host preference of studies conducted to find out preference on different solanaceous hosts during the year 2017-2018. During survey E. vigintioctipunctata recorded on different solanaceous weed hosts viz., Datura metal, Solanum xanthocarpum, Physalis angulata, Solanum nigrum, Solanum torvum and Solanum trilobatum. Survey resulted that high population occurred on weed host during off-season than the crop seasons. The feeding damage and highest population of hadda beetles were recorded in the field was P. angulata (7.94) followed by S. nigrum (2.86), D. metal (1.03), S.trilobatum (1.00) and the lowest population recorded on S. xanthocarpum (0.27) under field condition. The higher laboratory feeding preference of hadda beetle in free choice test recorded on P. angulata (0.45) followed by S. nigrum (0.25), D. metal (0.21), S.trilobatum (0.16) and the lowest leaf area consumption recorded on S. xanthocarpum (0.27). In oviposition and orientation assay also P. angulata recorded as most preferred crop and least preferred was S. xanthocarpum.***
Keywords: Spotted beetle, weed hosts, host preference, brinjal

1. Introduction:

Eggplant, *Solanum melongena* Linnaeus is one of the major vegetable crops grown in India and subtropical and tropical countries (Sarker *et al*., 2006). India holds the second rank in total world production. (Saravaiya *et al*., 2010). Brinjal is known for its high nutritive value such as phosphorus, iron and vitamins especially the B complex (Dhaliwal, 2014). Many insect pests that infest eggplant includes among them, spotted beetle, *Epilachna vigintioctopunctata* (Fabricius) (Coccinellidae: Coleoptera) is one of the most destructive pests leading to heavy

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

economic yield loss (Ali *et al*., 2017; Sharma *et al*.,2017). Apart from eggplant the Hadda beetle is reported as the key pest of many cultivated and weed plants of Solanaceae and Cucurbitaceae such as potato, tomato, *S. bonariense*, *Datura stramonium* L., *D. metel* L., *D. innoxia* Mill., *S.nigrum* L., *S. torvum* L., *Withania somnifera* L., *Momordica charantia* L., *Benincasa cerifera* Savi, *Cucumis sativus* L., *Luffa cylindrica* Roem., *Coccinia grandis* (Shirai and Katakura 1999; Islam *et al*., 2011;Mathur and Srivastava 1964;Chandra 2004; Dhamdhere *et al.*1990; Folcia *et al.*, 1996) . Due to its polyphagous nature survivability of hadda beetle is more in both on and off seasons. Management practices during cropping season may reduce the beetle population in the field but again the population rebuild in a certain period from the alternate hosts to the main crop. For effective management of pests, alternate hosts and its interaction should be known. Keeping in this view, the present experiment conducted to know the alternate hosts of hadda beetle and level of preference among the alternate hosts.

2. Materials and Methods

2.1. Survey for the alternate host of hadda beetle:

A field survey conducted on alternate hosts of *Epilachna vigintioctipunctata* in the major eggplant growing villages of Cuddalore district, Tamil Nadu were selected for survey *viz.*, Sivapuri, Varagurpettai, Vallambadugai, Perambattu, Thittukaatur, Velakudi, Therkumangudi, Mutlur, Vadakkumangudi, Madathanthoppu, B. Mutlur. Five spots for each village which includes cropping and non-cropping area were pre-located. The weekly survey made in selected villages and data recorded based on damage symptoms and presence of insect stages on different weed hosts. The survey done for two brinjal seasons (January-April, July-October), one off-season (May-June) data pooled and major alternate hosts seeds were collected for further study.

2.2. Field evaluation of weed hosts for hadda beetle

The field experiment was conducted to evaluate the preference of *E. vigintioctopunctata* on five solanaceous weed hosts *viz.*, *D. metal, S. xanthocarpum, P. angulata, S. nigrum* and *Solanum trilobatum.* Nursery raised and 30 days old plants of each host were transplanted into the main field. Three plots were maintained, all the six hosts planted in four rows/ host/ plot. Data collected at morning 6 am to 8 am when the feeding activity is grub and adults more. Visual observations were made on all the three replications of six hosts. A number of eggs, grubs

and adults of hadda beetles on leaves, flowers, and stems were counted at 15, 30, 45 and 60 DAT (Days after transplanting) and the data pooled together.

2.3. Laboratory experiment:

Selected solanaceous weed hosts were maintained in the pot culture were used for the laboratory experiments.

2.3.1. Host plant culture:

The pot culture has maintained at Department of Entomology, Faculty of Agriculture, Annamalai University, Tamil Nadu. Soil mixture was prepared using soil and FYM in 3:1 ratio filled in mud pots. 30 days old seedlings of alternate hosts such as *D. metal*, *S. xanthocarpum*, *P. angulata*, *S. nigrum* and *S. trilobatum* were planted in pots. Ten pots for each host were maintained. The laboratory experiment was carried out using potted plants.

2.3.2. Laboratory rearing of *Epilachna vigintioctopunctata*

In order to get accuracy in preference among solanaceous weed hosts beetles does not multiply on selected weed hosts. Brinjal was used as the host for insect rearing. Adults of *E. vigintioctopunctata* were collected from the unsprayed brinjal fields in Annamalai University, Chidambaram, Tamil Nadu,India. Released into potted brinjal plant (Variety: Annamalai brinjal) in the cage. Once the egg laying was completed adults were removed and plant kept undisturbed laboratory conditions at 27±2˚C, 85% RH. Immediately after hatching, the grubs were transferred on to a fresh and healthy host plant leaves by using a soft brush. The cut end of each leaf petiole was wrapped with wet cotton to prevent water loss from the leaves and kept plastic trays covered with a fine cotton cloth. Leaves were replenished once in two days. The grubs were reared up to adult emergence and the above process was repeated throughout the study period.

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

2.4. Feeding preference test:

2.4.1. Free choice test:

Laboratory maintained freshly third instar grubs were used for the experiment under laboratory conditions of 28±2^{0}C and 90 per cent relative humidity. Fresh and insect damage free leaves of six solanaceous hosts collected from the pot culture. Leaf discs were made in the size of 3.7cm^2. Twenty cm diameter plastic Petri plates were used for the experiment. The filter paper was placed inside the Petri plates and leaf discs of selected hosts were place in the equal distance. Four hours pre-starved test insect released in the Petri plate and kept in undisturbed condition. Above setup were replicated thrice under completely randomized design. Leaf area fed calculated using graph sheets. Observations were taken on leaf consumption in square cm at 12, 24, and 48 hrs after grub release.

2.4.2. No choice test:

Laboratory maintained freshly emerged adults were used for the experiment under laboratory conditions of 28±2^{0}C and 90 per cent relative humidity. Fresh and insect damage free leaves of six solanaceous hosts collected from the pot culture. Leaf discs were made in the size of 3.7cm^2. Nine cm diameter plastic Petri plates were used for the experiment. The filter paper was placed inside the Petri plates and single leaf disc of selected hosts was placed in each Petri plates. Four hours pre-starved test insect released in the Petri plate and kept in undisturbed condition. Three replications were maintained for each host. Leaf area fed calculated using graph sheets. Observations were taken on leaf consumption at 12, 24, and 48 hrs after grub release.

2.5. Oviposition preference test:

2.5.1. Free choice test:

Oviposition preference study was conducted in caged potted plants. One plant for each host was placed in the equal distance within the cage. Five pairs of freshly emerged adults were released into the cage. Data observed at

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

3, 5, 7 and 10 days after the release of adults number eggs laid on the plant were counted. Three replications were maintained data collected and pooled together.

2.5.2. No choice test:

Each test hosts of potted plants were kept individually in the cage and a pair of a freshly emerged adult was released. Data observed at 3, 5, 7 and 10 days after the release of adults number eggs laid on the plant were counted. Three replications were maintained each host and the data pooled together.

2.6. Orientation assay:

Each host leaves were chopped and kept in different jars of olfactometer adapted to determine the attraction of different hosts to *E. vigintioctopunctata*. Twenty numbers of 4 hours prestarved adult beetles placed on the centre platform at a time. The number of insects that had moved in to each jar was recorded. The experiment replicated thrice. The environment was kept clean with extractor fans to remove odours not related to the experiment.

2.7. Statistical analysis

The data obtained from the field survey and field evaluation were analysed statistically using randomized block design (RBD) and all the laboratory experiment data analysed using completely randomized block design (CRD) as per the methods described by Panse and Sukhatme (1978).

3. Results and Discussion:

3.1. Survey for the alternate host of hadda beetle:

Survey results showed the population fluctuations of *E. vigintioctipunctata* on solanaceous weed hosts during two crop seasons and one off-season during 2018. Mean population of hadda beetle during first crop season (January - April) viz., *P.angulata* (19.81), *S.nigrum* (3.49), *S. trilobatum* (3.21), *D. metal* (1.83) and *S. xanthocarpum* (1.68). Due to the availability of major crop less incidence recorded on weed hosts. Result supported by the findings of Muthukumar and Kalyanasundaram, 2003 they reported that incidence of hadda beetle on brinjal was peak during March and April in brinjal. The population increased on weed hosts during off-season (May-June)

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

P.angulata (20.08), *S. trilobatum* (7.12), *D. metal* (6.12), *S.nigrum* (5.64) and *S. xanthocarpum* (4.69). In May to June young vegetative stage of brinjal plant availability is less that makes hadda beetle population move towards alternate weed hosts. Veeravel and Bhaskaran (1994) concluded their findings that is the young vegetative stage of the brinjal is infested by maximum hadda beetle than the matured stage. Again the population declined on weed hosts during second crop season (July-October) (Table-1). Mall *et al*., (2002) recorded the incidence of hadda beetle on brinjal crop and he concluded that infestation started from August and peak up to October. This population fluctuation on weed hosts during crop and non-crop seasons showed that availability of brinjal is attracted the pest. Incidence on *P.angulata* on throughout the study was not varied that indicated brinjal is not able attracts the population on *P.angulata* this result were supported by Nagia *et al*, 1992 who reported that larval, pupal weight and number eggs laid was more in *Physalis minima* Linn, (wild gooseberry) than brinjal.

3.2. Field evaluation of weed hosts for hadda beetle:

Studies conducted with different solonaceous weed hosts to find out a most preferred host under field condition. Infestation started at 10 DAT. During the whole study period, the peak insect population recorded on *P.angulata*. Mean population data at 10 DAT revealed that maximum population infested on *P. angulata* (6.60) and infestation on other hosts viz., *S. trilobatum* (1.40), *S.nigrum* (1.00), *D. metal* (0.40) and *S. xanthocarpum* (0.20) was statistically on par. The data on hadda beetle population at 20 DAT showed that a high number of infestation recorded on *P. angulata* (3.20) followed by *S. nigrum* (2.20) and the least population recorded on *D. metal* (0.20) it was non-significantly differ from *S. trilobatum* (0.80) and *S. xanthocarpum* (0.40). Similar trend found at 30 DAT. At 40 DAT *P. angulata* (11.20) infested with more hadda beetles followed by *S. nigrum* (4.60) least population recorded in *S. xanthocarpum* (0.40) that was statistically similar with *D. metal* (1.00) and *S. trilobatum* (0.80) (Table-2). Many authors reported hadda beetle infestation on various solonaceos plants includes weed hosts (Rajagopal and Trivedi, 1989, Katakura *et al.* (1988). Number of eggs on host plants were counted during the entire study period at 10 DAT more number of eggs observed on *P.angulata* (7.80) followed by *S. nigrum* (2.20), *D. metal* (1.40), *S. trilobatum* (1.00) and no eggs were found on *S. xanthocarpum.* During whole study period

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

maximum eggs observed on *P.angulata* and regarding other hosts eggs counted vary in pattern. During 40 and 50 DAT eggs observed in all host was statistically similar (Table-2).

3.3. Leaf consumption of *E. vigintioctipunctata* on different solanaceous weed hosts

Data of leaf area consumption of *E. vigintioctipunctata* in free choice test on different hosts were recorded at 12, 24, 36 and 48 hours after treatment. At 48 HAR data showed that highest leaf area consumption recorded on *P.angulata* (0.89 cm^2) followed by *S. nigrum* (0.44 cm^2), *D. metal* (0.21 cm^2), *S. trilobatum* (0.16 cm^2) and (0.13 cm^2) and *S. xanthocarpum* (0.07). In the no-choice test, leaf area consumption at 48 hrs data revealed that highest leaf area consumption recorded on *P.angulata* (3.24 cm^2) followed by *S. nigrum* (2.91 cm^2), *S. trilobatum* (2.31 cm^2), *D. metal* (1.65 cm^2) and *S. xanthocarpum* (0.52). Nagia *et al*, 1992 who recorded higher larval, pupal weight of hadda beetle on *Physalis minima* Linn, by comparatively higher consumption than brinjal. (Table-3)

3.4. Oviposition of *E.vigintiopunctata* on different solanaceous weed hosts vegetables under free and no choice test:

A number of eggs counted laid on different hosts in free choice and no-choice test at 3 DAR, 5 DAR and 7 DAR were recorded. The cumulative egg numbers at 7 DAR data showed that maximum eggs counted on *P.angulata* (112.00) followed by *D. metal* (76.33), *S. nigrum* (69.33), *S. trilobatum* (56.33) and *S. xanthocarpum* (42.33). In another hand, no choice test resulted in that number of an egg laid vary from host to host the highest number of eggs counted on *P.angulata* (63.67) followed by *D. metal* (28.22), *S. nigrum* (31.33), *S. xanthocarpum* (26.00) and *S. trilobatum* (19.33). Finding of Nagia *et al*, 1992 supports the result that was a maximum number of hadda beetle eggs laid on *Physalis minima* Linn.(Table-4)

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

3.5. The orientation of *E.vigintiopunctata* on different solanaceous weed hosts (Olfactometer study):

Orientation percentage towards different host has recorded a maximum number of insects moved towards *P.angulata* (48.00) followed by *S. nigrum* (25.33), *S. trilobatum* (14.67), *D. metal* (9.33) and *S. xanthocarpum* (42.33). (Table-5)

Conclusion:

Alternate weed hosts have a major impact on hadda beetle survivability by providing food and shelter during the off-season. We can reduce or delay the population build up by removing alternate hosts around the field. In another way, we can use the most attractive alternate host as a trap crop.

Table-1. Survey for *E. vigintioctumpunctata* on different weed hosts

Month		Mean population of *E.vigintiopunctata* on				
		S.xanthocarpum	***S. trilobatum***	***D. metal***	***S. nigrum***	***P. angulata***
January	**1st day**	**1.93** (1.71)	**3.26** (2.06)	**2.06** (1.75)	**2.26** (1.79)	**20.73** (4.66)
	16th day	**1.86** (1.69)	**3.06** (2.01)	**1.80** (1.67)	**4.60** (2.35)	**18.86** (4.44)
February	**1st day**	**1.33** (1.52)	**3.33** (2.08)	**1.86** (1.68)	**3.20** (2.01)	**22.13** (4.81)
	16th day	**1.40** (1.55)	**3.06** (2.01)	**1.80** (1.67)	**2.06** (1.73)	**18.73** (4.43)
March	**1st day**	**1.53** (1.59)	**3.40** (2.09)	**1.66** (1.63)	**3.26** (2.04)	**17.93** (4.34)
	16th day	**1.46** (1.57)	**3.33** (2.07)	**1.60** (1.60)	**4.93** (2.43)	**22.45** (4.84)
April	**1st day**	**2.00** (1.73)	**3.13** (2.03)	**1.86** (1.69)	**3.07** (1.96)	**18.53** (4.40)
	16th day	**1.93** (1.71)	**2.93** (1.98)	**2.06** (1.74)	**4.60** (2.36)	**21.12** (4.70)
May	**1st day**	**4.80** (2.41)	**6.99** (2.82)	**6.33** (2.71)	**5.20** (2.49)	**20.60** (4.65)
	16th day	**4.60** (2.36)	**7.46** (2.90)	**6.06** (2.65)	**5.53** (2.55)	**21.46** (4.74)
June	**1st day**	**4.53** (2.35)	**7.20** (2.86)	**5.86** (2.62)	**6.20** (2.68)	**20.26** (4.60)
	16th day	**4.86** (2.42)	**6.86** (2.79)	**6.26** (2.68)	**5.66** (2.58)	**18.00** (4.28)

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

July	**1st day**	**1.93** (1.71)	**2.80** (1.94)	**1.60** (1.59)	**0.46** (1.19)	**15.13** (3.94)
	16th day	**2.20** (1.79)	**2.60** (1.89)	**1.80** (1.67)	**2.86** (1.95)	**20.00** (4.58)
August	**1st day**	**1.66** (1.63)	**2.40** (1.84)	**1.33** (1.52)	**2.00** (1.72)	**18.73** (4.41)
	16th day	**1.80** (1.67)	**2.73** (1.92	**1.53** (1.58)	**2.26** (1.80)	**18.46** (4.40)
September	**1st day**	**1.80** (1.67)	**2.13** (1.75)	**1.66** (1.63)	**2.53** (1.87)	**21.39** (4.73)
	16th day	**1.93** (1.71)	**2.06** (1.74)	**1.46** (1.57)	**2.33** (1.81)	**19.86** (4.56)
October	**1st day**	**1.80** (1.67)	**2.00** (1.81)	**1.80** (1.67)	**1.86** (1.68)	**18.33** (4.38)
	16th day	**2.13** (1.77)	**2.40** (1.84)	**2.00** (1.73)	**1.93** (1.71)	**20.06** (4.59)
SE(d)		**0.07**	**0.11**	**0.11**	**0.16**	**0.27**
C.D.		**0.14**	**0.22**	**0.21**	**0.33**	**N/A**

*****Mean of five replications.Values in parenthesis are square root transformed.

Value with different alphabets differs significantly.

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Table-2. Field incidence of *E.vigintioctumpunctata* on different solanaceous weed hosts

Host	Mean number grub/adult on weed hosts at						Mean	Mean number of eggs on weed hosts at						Mean
	10 DAT	20 DAT	30 DAT	40 DAT	50 DAT	60 DAT		10 DAT	20 DAT	30 DAT	40 DAT	50 DAT	60 DAT	
S.xanthocarpum	0.20 (1.08) [a]	0.40 (1.15) [a]	0.40 (1.15) [a]	0.40 (1.15) [a]	0.40 (1.15) [a]	0.60 (1.20) [a]	0.27	0.00 (1.00)[a]	1.40 (1.37)[a]	0.00 (1.00)[a]	0.00 (1.00)[a]	2.20 (1.58)	2.20 (1.33)	0.97
S. trilobatum.	1.40 (1.47) [a]	0.80 (1.28) [a]	1.00 (1.35) [a]	0.80 (1.29) [ab]	1.60 (1.45) [ab]	0.40 (1.15) [a]	1.00	1.00 (1.29)[a]	0.40 (1.15)[a]	1.00 (1.29)[ab]	1.60 (1.49)[a]	5.00 (2.19)	4.20 (2.17)	2.2
D. metal	0.40 (1.15) [a]	0.20 (1.08) [a]	0.20 (1.08) [a]	1.00 (1.35) [b]	3.00 (1.74) [b]	1.40 (1.47) [a]	1.03	1.40 (1.37)[a]	0.80 (1.25)[a]	0.00 (1.00)[a]	1.40 (1.36)[a]	2.40 (1.63)	2.40 (1.39)	1.4
S. nigrum	1.00 (1.40) [a]	2.20 (1.65) [ab]	4.40 (2.11) [ab]	4.60 (2.25) [bc]	1.80 (1.54) [b]	3.20 (1.94) [a]	2.86	2.20 (1.62)[a]	0.60 (1.20)[a]	7.00 (2.52)[bc]	1.20 (1.33)[a]	8.20 (2.84)	5.00 (2.21)	4.03
P. angulata	6.60 (2.73) [b]	3.20 (2.03) [b]	9.80 (3.09) [b]	11.20 (3.28) [c]	12.20 (3.38) [c]	11.00 (3.24) [b]	7.94	7.80 (2.94)[b]	10.40 (2.87)[b]	10.40 (3.13)[c]	8.60 (2.88)[b]	8.60 (2.88)	6.40 (2.48)	8.70
SE(d)	0.25	0.32	0.50	0.49	0.63	0.50		0.38	0.59	0.65	0.49	0.70	0.61	
C.D.	0.53	0.68	1.05	1.04	1.36	1.04		0.82	1.27	1.40	1.05	N/A	N/A	

*****Mean of five replications.

Values in parenthesis are arc sin transformed.

Value with different alphabets differs significantly.

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Table-3. Feeding preference of *E.vigintioctumpunctata* on the different host under laboratory condition

Host	Leaf area consumption (Sq.cm) by *Epilachna vigintioctumpuntata*									
	Free- choice					No- choice				
	12 HRS	24 HRS	36 HRS	48 HRS	Mean	12 HRS	24 HRS	36 HRS	48 HRS	Mean
S.xanthocarpum	0.03 (1.02)^{a}	0.06 (1.03)^{a}	0.10 (1.05)^{a}	0.10 (1.05)^{a}	0.07	0.08 (1.04)^{a}	0.27 (1.13)^{a}	0.76 (1.33)^{a}	0.97 (1.40)^{a}	0.52
S. trilobatum.	0.07 (1.03)^{ab}	0.14 (1.07)^{ab}	0.18 (1.08)^{ab}	0.26 (1.12)^{ab}	0.16	1.41 (1.55)^{bc}	1.88 (1.69)^{b}	2.66 (1.91)^{bc}	3.30 (2.07)^{c}	2.31
D. metal	0.09 (1.04)^{ab}	0.18 (1.08)^{b}	0.23 (1.11)^{ab}	0.34 (1.16)^{b}	0.21	0.86 (1.36)^{b}	1.39 (1.54)^{b}	1.95 (1.72)^{b}	2.41 (1.85)^{b}	1.65
S. nigrum,	0.11 (1.05)^{b}	0.18 (1.09)^{b}	0.28 (1.13)^{bc}	0.44 (1.20)^{b}	0.25	1.69 (1.63)^{c}	2.75 (1.93)^{c}	3.41 (2.09)^{cd}	3.78 (2.18)^{cd}	2.91
P. angulata	0.17 (1.08)^{c}	0.30 (1.14)^{c}	0.45 (1.20)^{c}	0.89 (1.37)^{c}	0.45	1.71 (1.64)^{c}	2.94 (1.98)^{c}	3.70 (2.16)^{d}	4.59 (2.36)^{d}	3.24
SE(d)	0.01	0.02	0.03	0.04		0.12	0.10	0.10	0.09	
C.D.	0.02	0.04	0.07	0.08		0.26	0.23	0.22	0.20	

*****Mean of three replications.

Values in parenthesis are square root transformed.

Value with different alphabets differs significantly.

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Table-4. Oviposition preference of *E.vigintioctumpunctata* on the different host under laboratory condition

Host	Eggs laid (in numbers) by *Epilachna vigintioctumpuntata*							
	Free- choice			Mean	No- choice			Mean
	3 DAR	5 DAR	7 DAR		3 DAR	5 DAR	7 DAR	
S.xanthocarpum	**0.00 (1.00) [a]**	19.00 **(3.95) [a]**	42.33 **(6.48) [a]**	**20.44**	0.00 (1.00)	11.00 (3.11)	26.00 (4.55)	**12.33**
S. trilobatum	**10.67 (3.08) [b]**	43.33 **(6.62) [b]**	56.33 **(7.55) [ab]**	**36.77**	5.33 (2.04)	12.67 (3.30)	19.33 (4.50)	**12.44**
D. metal	**16.33 (4.12) [bc]**	48.00 **(6.98) [b]**	76.33 **(8.76) [b]**	**46.88**	13.67 (3.49)	28.00 (5.30)	43.00 (6.45)	**28.22**
S. nigrum,	**23.67 (4.93) [c]**	45.00 **(6.76) [b]**	69.33 **(8.36) [b]**	**46.00**	5.33 (2.04)	18.67 (4.42)	31.33 (5.66)	**18.44**
P. angulata	**30.00 (5.55) [c]**	72.33 **(8.56) [b]**	112.00 **(10.63) [c]**	**71.44**	14.33 (3.47)	41.00 (6.47)	63.67 (8.03)	**39.66**
SE(d)	**0.77**	**1.06**	**0.75**		**1.45**	**1.10**	**1.35**	
C.D.	**1.74**	**2.39**	**1.69**		**N/A**	**N/A**	**N/A**	

*****Mean of three replications.
Values in parenthesis are square root transformed.
Value with different alphabets differs significantly.

Table-5. Orientation of *E.vigintioctumpunctata* on different hosts

Host	Percent orientation
S.xanthocarpum	**2.67 (5.47) [a]**
S. trilobatum.	**14.67 (22.46) [bc]**
D. metal	**9.33 (17.70) [b]**
S. nigrum,	**25.33 (30.19) [c]**
P. angulata	**48.00 (43.82) [d]**
SE(d)	**4.03**
C.D.	**9.10**

*****Mean of three replications.

Values in parenthesis are arc sin transformed.

Value with different alphabets differ significantly

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

References:

1. Dhamdhere, S.V., Koshta, V.K. & Rawat, R.R. 1990, Effect of food plants on the biology of *Epilachna vigintioctopunctata* Fabr. (Coleoptera : Coccinellidae). *Journal of Entomological Research*, 14(2) pp.142-145.
2. Folicia, A.M., Rodriguez, S.M. & Russo, S. 1996, Aspects of morphology, biology and preferences of *Epilachna vigintioctopunctata* Fabr. (Coleoptera :Coccinellidae). *Boletin de Sanidad Vegetal Plagas* 22(4) pp. 773-780.
3. Islam,K., Islam, M.S. & Ferdousi, Z. 2011, Control of *Epilachna vigintioctopuntata* Fab. (Coleoptera: Coccinellidae) using some indigenous plant extracts. *Journal of Life Earth Science* 6, pp.75-80.
4. Jamwal,V.V.S., Ahmad, H. & Sharma, D. 2013, Host biology interactions of *Epilachna vigintioctopunctata* Fab. *The bioscan*.8(2), pp. 513-517.
5. Katakura, H., Abbas, I., Nakamura, K. & Saraji, H. 1988, Records of epilachnie crop pests (Coleoptera, Coccinellidae) in Sumatra Barat, Sumatra, Indonesia. Kontyu 56(2) pp. 281-287.
6. Mall, N.P., Pandey, R.S., Singh, S.V. & Singh, S.K. 1992, Seasonal incidence of insect pests and estimation of the losses caused by shoot and fruit borer on brinjal. *Indian Journal of Entomology* 63, pp.137-143.
7. Mathur, A.C. & Srivastava, J.B. 1964, *Epilachna vigintioctopunctata* F. (Coccinellidae: Coleoptera) as a defoliator of some Solanaceous medicinal plants. *Indian Journal of Entomology*, 26, pp.246-246.
8. Muthukumar, M. & Kalyansundram. 2003, Influnce of abiotic factors on the incidence of major insect pests in brinjal (*Solanum melogena* L.). *South Indian Horticulture* 51 pp. 214-218.
9. Nagia, D.K., Kumar, S., Sharma, P., Meena, R.P. & Saini, M.L. 1992, Mass multiplication of *Henosepilachna vigintioctopunctata* (Fabricius) (Coleoptera : Coccinellidae) on *Physalis minima* L. *Plant Protection Bulletin Faridabad* 44(3) pp.24-25.
10. Naz, F., Inayatullah, M., Rafi, M.A., Ashfaque,M. & Ali, A. 2012, *Henosepilachna vigintioctopunctata* FAB; Its taxonomy, distribution and host plants in Pakistan. *Sarhad Journal of Agriculture* 28(3) pp.421-427
11. Rajagopal, D. & Trivedi, P. 1989, Status, bioecology and management of epilachna beetle, *Epilachna vigintioctopunctata* (Fab.) (Coleoptera : Coccinellidae) on potato in India : a review. *Tropical Pest Management* 35(4) pp. 410-413.
12. Sarker, R.H., S. Yesmin & M.I. Hoque, 2006, Multiple shoot formation in eggplant (*Solanum melongena* L.). *Plant Tissue Culture Biotechnology* 16 pp. 53-61.
13. Shirai, Y. & Katakura, H. 1999, Host plants of the phytophagous ladybird beetle, *Epilachna vigintioctopunctata* (Coleoptera : Coccinellidae), in Southeast Asia and Japan. *Applied Entomology and Zoology* 34(1) pp. 75-83.
14. Singh, G. & Mukherjee, A. 1987, On the oligophagous nature of *Henosepilachna dodecastigma* (Wiedemann) and *Henosepilachna vigintioctopunctata* (Fabricius) (Coleoptera : Coccinellidae). *Indian Journal of Entomology* 49(1) pp.118-126.
15. Singh, Y.P. & Singh, P.P. 2002, Pest complex of egg plant *(Solanum melongena)* and their succession at medium high altitude hills. *Indian Journal of Entomology* 64(3) pp.335-342.
16. Veeravel, R. & Bhaskaran, P. 1994, Relationship between various growth stages and pest occurrence in brinjal *(Solanum melongena* L). *Pest Management and Economic Zoology* 2(2) pp.171-173.

