

**Research Note** 

## Spatial distribution of *Cheilomenes sexmaculata* (Fabricius), an important predator of bean aphid, *Aphis craccivora* Koch in green gram

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**ABSTRACT**: Field studies were conducted to study the spatial distribution of *Cheilomenes sexmaculata* (Fabricius) during summer and *kharif* seasons, 2009 at instructional cum research farm of Assam Agricultural University, Jorhat, Assam. Various indices of dispersion were used to study the distribution pattern. In both seasons, the variance to mean ratios were found to be less than unity, dispersion parameter 'k' was less than 8 and David and Moore's indices of clumping were negative. Also, Lloyd's indices of mean crowding were less than mean and indices of patchiness were less than unity, indicating positive binomial (regular) distribution of *C. sexmaculata* at both larval and adult stages.

KEY WORDS: Spatial distribution, green gram, Aphis craccivora, Cheilomenes sexmaculata

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The cowpea aphid, *Aphis craccivora* Koch, is an important pest causing serious damage and considerable losses to green gram crop. The nymphs and adults suck the plant sap from young parts of the plant and their feeding induces wilting. The aphids were found predated by a coccinellid beetle, *Cheilomenes sexmaculata* (Fab.) in the field. Spatial distribution of the predator was studied for development of population models, for better understanding of predator–prey interactions for the management of *A. craccivora*.

Green gram variety SG–1 was grown in an area of 50m<sup>2</sup> at instructional cum research farm of Assam Agricultural University, Jorhat, Assam. Three methods of sampling, *viz.*, plant inspection method (PIM), measured row method (MRM) and quadrat method (QM) were adopted to study the spatial distribution of *C. sexmaculata*. The number of larvae and adults of the coccinellid predator were recorded. Samples were drawn at weekly intervals during summer (mid–March to mid–June, 2009) and *kharif* (mid–September to mid–December, 2009). In PIM, ten plants were randomly selected from the plot, in MRM, two samples of ½ m row length (ten plants) were randomly selected and two quadrats of size 0.35×0.35m (twelve plants) were selected at random in QM.

Various indices of dispersion were used to analyse the distribution pattern. The mean number of

*C. sexmaculata*  $(\overline{\mathbf{x}})$  and the variance  $(s^2)$  were calculated for each date of observation in all the sampling methods. The simplest approach used was variance to mean ratio (VMR). The value of VMR is one for Poisson distribution and less than one for regular or positive binomial and more than one for aggregated or negative binomial distribution. The index of clumping of David and Moore (1954) was calculated by  $I_{DM} = s^2 / \overline{\mathbf{x}} - 1$  whose value is zero for random, positive for negative binomial and negative for positive binomial. The parameter k which is the measure of the amount of clumping was calculated by the formula given by Southwood (1978), *viz.*,

 $k = \frac{x^2}{s^2 - x}$ . If k value is greater than eight (k>8),

clumping is low and there is a tendency towards randomness. If k value is smaller than eight (k<8), it indicates high amount of aggregation. The concept of mean crowding is used to indicate the possible effect of mutual interference or competition among individuals, which is expected when they encounter one another.

The sample estimate of mean crowding (x\*) was calculated by  $x^* = \frac{-x}{x} + \left[\frac{s^2}{x} - 1\right]$  given by Lloyd, 1967. The ratio of mean crowding to mean density (x\*/ x) is called patchiness index (Lloyd, 1967) whose value is less

	Sampling date (DAS)	Crop growth stage	Sampling method	Variance to mean ratio $S^2/\overline{X}$	ce to ratio $\overline{X}$	Dispersion parameter k	ion er k	Index of clumping IDM IDM	of IDM	Index of mean crowding X*	mean ing	Lloyd's index of patchiness $X^* / \overline{X}$	index tiness $\overline{X}$	Mean colony size C*	lony **
3.06         Seedling stage         PM $-$ 0.89 $-$ 0.80 $-$ 0.01 $-$ 0.08 $-$ 0.44 $-$ 3.06         Eaching stage         MRM $-$ 0.89 $-$ 2.00 $-$ 0.01 $-$ 0.44 $-$ 3.06         Early vegetative growth         PMM         0.25         0.76 $-1.03$ $-1.28$ $-0.34$ $-0.11$ $-$ 0.08 $-$ 0.44 $-$ <				Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult
	08.03.09	Seedling stage	PIM	I	0.89	I	-2.00	I	-0.11	I	0.08	I	0.44	I	1.08
	(12)		MRM	I	0.89	I	-2.00	I	-0.11	I	0.08	I	0.44	I	1.08
3.09         Early vegetative growth MRM         PM         0.25         0.76         -1.03         -0.78         -0.24         0.02         0.06         0.02         0.04         1.05           3.09         Raydivegrative growth MRM         0.65         0.89         -2.04         -0.03         -0.11         0.55         0.06         0.29         0.17         0.14         1.05           3.09         Rapid kaf formation         PM         0.67         0.89         -1.14         -0.19         0.05         0.06         0.11         0.20         0.11         1.16           3.09         Rapid kaf formation         PM         0.67         0.89         -1.14         -0.12         0.01         0.05         0.11         0.20         0.11         1.16           3.09         Flowering         PM         0.66         0.56         0.11         0.25         0.14         0.14         0.14         0.11         0.14         1.14           3.09         Flowering         PM         0.56         0.12         0.14         0.14         0.14         0.14         1.14         0.14         0.14         0.14         1.14         1.14         1.14         0.19         0.16         0.11			QM	I	0.89	I	-2.00		-0.11	I	0.08	I	0.44	I	1.08
3.0         MRM         0.65         0.89 $-2.04$ $-2.06$ $-0.31$ 0.08         0.50         0.44         1.35           3.0         Rapid laaf formation         PM         0.56         0.75 $-1.14$ $-0.64$ $-0.33$ 0.06         0.17         1.26           3.0         Rapid laaf formation         PM         0.56         0.78 $-1.21$ $-1.14$ $-0.64$ 0.07         0.06         0.11         0.11         1.14           3.0         Flowering         PM         0.09         0.56 $-1.21$ $-1.14$ $-0.94$ 0.07         0.06         0.11         0.14         1.14           3.0         Flowering         PM         0.09         0.56 $-1.21$ $-1.14$ $-0.94$ 0.05         0.11         1.14           3.0         Flowering         PM         0.09         0.56 $-1.21$ $-1.14$ $-0.55$ 0.44         0.05         0.11 $1.14$ 4.0         Mid pod formation         PM         0.56 $-1.44$ 0.55         0.56         0.57         0.56         0.56         0.57         0.56<	15.03.09	Early vegetative growth	PIM	0.22	0.76	-1.03	-1.28	-0.78	-0.24	0.02	0.06	0.02	0.20	1.02	1.06
Map $0M$ $0.56$ $0.67$ $0.23$ $-1.14$ $-0.64$ $-0.33$ $0.26$ $0.29$ $0.17$ $1.26$ Rapid larf formation         PIM $0.67$ $0.89$ $-1.23$ $-2.00$ $-0.33$ $-0.11$ $0.07$ $0.08$ $0.17$ $0.44$ $1.07$ Rapid larf formation         PIM $0.67$ $0.36$ $-1.27$ $-1.14$ $-0.04$ $0.07$ $0.08$ $0.11$ $1.41$ Plowering         PIM $0.03$ $0.56$ $-1.23$ $-2.16$ $-0.34$ $0.01$ $0.05$ $0.11$ $1.41$ Plowering         PIM $0.06$ $0.56$ $-2.15$ $-3.27$ $-1.14$ $-0.91$ $0.07$ $0.07$ $0.11$ $1.41$ Plowering         PIM $0.66$ $0.56$ $-2.25$ $-2.24$ $0.04$ $0.07$ $0.01$ $1.07$ $1.06$ $1.11$ $1.44$ Plowering         PIM $0.66$ $0.11$ $0.26$ $0.24$ <td>(19)</td> <td></td> <td>MRM</td> <td>0.65</td> <td>0.89</td> <td>-2.04</td> <td>-2.00</td> <td>-0.34</td> <td>-0.11</td> <td>0.35</td> <td>0.08</td> <td>0.50</td> <td>0.44</td> <td>1.35</td> <td>1.08</td>	(19)		MRM	0.65	0.89	-2.04	-2.00	-0.34	-0.11	0.35	0.08	0.50	0.44	1.35	1.08
Rapid leaf formation         PM         0.67         0.89         -1.23         -2.00         -0.33         -0.11         0.07         0.08         0.11         0.20         1.01           MRM         0.56         0.76         -1.14         -1.28         -0.24         0.05         0.06         0.11         0.20         0.11         0.20         0.11         0.20         0.11         1.44           PM         0.05         0.56         -1.14         -0.24         0.05         0.044         0.01         0.26         0.11         0.10         0.01         1.44           PM         0.04         0.55         -1.21         -1.14         -0.56         0.044         0.05         0.11         1.14           PM         0.05         0.55         -1.24         0.56         0.044         0.55         0.41         0.75         0.11         1.14           Flowering         MRM         0.66         0.15         -2.25         -2.04         -0.04         0.75         0.69         0.11         1.14           Flowering         MRM         0.66         0.15         0.25         0.26         0.26         0.26         0.26         0.26         0.26         0.26<			QM	0.36	0.67	-0.23	-1.14	-0.64	-0.33	0.26	0.06	0.29	0.17	1.26	1.06
MRM         0.56         0.76         -1.14         -1.28         -0.44         -0.24         0.05         0.11         0.20         1.05           Plowening         PM         0.81         0.56         -3.27         -1.14         -0.19         -0.04         0.05         0.11         0.11         1.19           Flowening         MRM         0.81         0.56         -1.79         -1.14         -0.91         -0.44         0.05         0.017         0.11         1.19           Flowening         MRM         0.35         0.81         0.56         -1.79         -1.14         -0.91         0.75         0.44         0.11         1.19           MRM         0.35         0.81         0.35         0.81         -2.25         -2.04         -0.93         0.35         0.75         0.79         0.75         0.79         0.75         0.79         0.75<	22.03.09	Rapid leaf formation	PIM	0.67	0.89	-1.23	-2.00	-0.33	-0.11	0.07	0.08	0.17	0.44	1.07	1.08
(M)         (0.81)         (0.56) $-3.27$ $-1.14$ $-0.19$ $-0.44$ (0.11)         (0.11) $1.41$ Flowering         PIM         (0.09)         (0.56) $-1.21$ $-1.14$ $-0.91$ $-0.44$ (0.19)         (0.05)         (0.11) $1.44$ Flowering         MRM         (0.94)         (0.56) $-1.27$ $-1.14$ $-0.55$ $-0.19$ (0.75)         (0.11) $1.44$ Mid         PIM         (0.60)         (0.55) $-2.25$ $-2.04$ $-0.94$ (0.75)         (0.77)         (0.11) $1.44$ Mid         PIM         (0.56)         (0.15) $-2.25$ $-2.04$ $-0.44$ (0.56)         (0.57) $1.75$ (0.75)         (0.75) <th< td=""><td>(26)</td><td></td><td>MRM</td><td>0.56</td><td>0.76</td><td>-1.14</td><td>-1.28</td><td>-0.44</td><td>-0.24</td><td>0.05</td><td>0.06</td><td>0.11</td><td>0.20</td><td>1.05</td><td>1.06</td></th<>	(26)		MRM	0.56	0.76	-1.14	-1.28	-0.44	-0.24	0.05	0.06	0.11	0.20	1.05	1.06
FloweringPIM0.090.56-1.21-1.14-0.91-0.440.050.170.111.19MRM0.440.55-1.79-1.14-0.56-0.190.750.410.050.440.011.141.14QM0.350.350.350.350.350.350.560.500.501.141.14PMN0.660.65-2.15-2.15-2.04-0.400.350.350.560.500.501.501.35Mid pod formationPIM0.660.65-1.211.14-0.25-0.190.750.730.750.071.58Mid pod formationPIM0.560.15-2.25-2.14-1.03-0.25-0.290.750.750.750.750.75Mid pod formationPIM0.560.15-2.70-2.15-0.25-0.290.750.750.790.752.56Mid pod formationPIM0.560.15-0.25-0.21-0.21-0.240.750.750.722.563.75Mid pod formationPIM0.650.11-4.25-2.12-0.22-0.290.750.790.770.752.56Mid pod formationPIM0.160.11-1.21-0.25-0.290.750.790.770.732.56Mid pod formationPIM0.110.100.020.290.710.760.740.742			QM	0.81	0.56	-3.27	-1.14	-0.19	-0.44	0.41	0.05	0.69	0.11	1.41	1.05
MRM         0.44         0.56         -1.79         -1.14         -0.56         -0.44         0.44         0.05         0.44         0.11         1.44           QM         0.35         0.81         -2.15         -3.27         -0.65         -0.19         0.75         0.41         0.69         1.50         1.50           Early pod formation         PIM         0.60         0.65         -2.25         -2.04         -0.40         -0.34         0.56         0.56         0.50         0.56         0.50         1.50           Mid pod formation         PIM         0.66         0.55         -1.09         -0.22         -0.56         0.56         0.56         0.50         0.56         0.56         1.50           Mid pod formation         PIM         0.56         0.15         -5.53         -1.41         -0.44         0.85         0.02         0.29         0.36         0.35         0.37         1.35           Mid pod formation         PIM         0.56         0.15         -5.53         -1.41         -0.44         0.85         0.79         0.77         0.69         1.75         2.51           Mid pod formation         PIM         0.78         0.35         -2.55         -0	29.03.09	Flowering	PIM	0.09	0.56	-1.21	-1.14	-0.91	-0.44	0.19	0.05	0.17	0.11	1.19	1.05
QM         0.35         0.81         -2.15         -3.27         -0.65         -0.19         0.75         0.41         0.54         0.69         1.75           Early pod formation         PIM         0.60         0.65         -2.25         -2.04         -0.40         -0.34         0.56         0.56         0.50         1.50           MRM         0.78         0.44         -3.56         -1.09         -0.22         -0.78         0.35         0.02         0.35         0.56         0.70         1.58           Mid pod formation         PIM         0.56         0.15         -5.63         -1.41         -0.44         v0.85         2.06         0.35         0.75         0.79         0.77         0.07         1.58           Mid pod formation         PIM         0.56         0.15         -2.53         -1.41         -0.05         2.05         0.75         0.77         0.79         0.77         2.05         0.75         0	(33)		MRM	0.44	0.56	-1.79	-1.14	-0.56	-0.44	0.44	0.05	0.44	0.11	1.44	1.05
Early pod formationPIM0.600.65-2.25-2.04-0.40-0.340.500.350.560.501.50MRM0.780.44-3.56-1.09-0.22-0.560.580.040.720.071.58QM0.150.22-1.41-1.03-0.85-0.780.350.020.290.031.55Mid pod formationPIM0.560.15-5.5.3-1.41-0.44v0.852.060.350.293.06MRM0.440.35-1.21-0.35-0.552.050.750.720.720.753.05Mid pod formationPIM0.560.11-2.70-1.21-0.38-0.911.510.790.543.05MRM0.110.09-2.70-1.21-0.89-0.911.510.790.770.603.91Jate pod formationPIM0.080.11-4.25-2.24-0.92-0.920.740.770.603.91MRM0.110.100.10-1.24-1.28-0.92-0.920.740.770.803.913.95MaturityPIM0.780.78-1.04-2.20-0.26-0.911.690.740.803.913.95MaturityPIM0.330.76-1.04-1.28-0.02-0.240.090.740.700.761.04MaturityPIM0.330.76-1.04 <td< td=""><td></td><td></td><td>QM</td><td>0.35</td><td>0.81</td><td>-2.15</td><td>-3.27</td><td>-0.65</td><td>-0.19</td><td>0.75</td><td>0.41</td><td>0.54</td><td>0.69</td><td>1.75</td><td>1.41</td></td<>			QM	0.35	0.81	-2.15	-3.27	-0.65	-0.19	0.75	0.41	0.54	0.69	1.75	1.41
MRM         0.78         0.44         -3.56         -1.09         -0.22         -0.56         0.58         0.04         0.72         0.07         1.58           QM         0.15         0.22         -1.41         -1.03         -0.85         -0.78         0.35         0.02         0.29         0.03         1.55           Mid pod formation         PIM         0.56         0.15         -5.63         -1.41         -0.44         v0.85         2.06         0.35         0.03         0.03         1.55           Mid pod formation         PIM         0.56         0.15         -5.63         -1.41         -0.44         v0.85         2.06         0.35	05.04.09	Early pod formation	PIM	0.60	0.65	-2.25	-2.04	-0.40	-0.34	0.50	0.35	0.56	0.50	1.50	1.35
QM $0.15$ $0.22$ $-1.41$ $-1.03$ $-0.85$ $-0.78$ $0.35$ $0.02$ $0.29$ $0.03$ $1.35$ $Mid$ pod formation $PIM$ $0.56$ $0.15$ $-5.63$ $-1.41$ $-0.44$ $v0.85$ $2.06$ $0.35$ $0.82$ $0.29$ $0.03$ $0.32$ $3.06$ $MRM$ $0.44$ $0.35$ $-4.70$ $-2.15$ $-0.55$ $-0.65$ $2.06$ $0.35$ $0.82$ $0.29$ $0.36$ $3.06$ $QM$ $0.11$ $0.09$ $-2.70$ $-1.21$ $-0.89$ $-0.91$ $1.51$ $0.19$ $0.63$ $0.17$ $2.51$ $3.05$ $QM$ $0.11$ $0.09$ $-2.70$ $-1.21$ $-0.89$ $-0.91$ $1.51$ $0.19$ $0.63$ $0.17$ $2.51$ $3.05$ $MRM$ $0.11$ $0.09$ $-2.70$ $-1.21$ $-0.89$ $-0.90$ $2.98$ $1.11$ $0.76$ $0.53$ $3.06$ $MRM$ $0.11$ $0.01$ $-4.25$ $-2.24$ $-0.89$ $-0.91$ $2.58$ $1.140$ $0.77$ $0.60$ $3.91$ $MRM$ $0.11$ $0.01$ $-4.25$ $-2.26$ $-0.24$ $-0.89$ $0.74$ $0.80$ $3.58$ $3.05$ $Maturity$ $PIM$ $0.33$ $0.76$ $-1.04$ $-1.28$ $-0.24$ $0.02$ $0.06$ $0.74$ $0.80$ $3.01$ $Maturity$ $PIM$ $0.33$ $0.76$ $-1.04$ $-1.28$ $-0.24$ $-0.24$ $0.02$ $0.04$ $0.20$ $1.04$ $MRM$ $0$	(40)		MRM	0.78	0.44	-3.56	-1.09	-0.22	-0.56	0.58	0.04	0.72	0.07	1.58	1.04
Mid pod formationPIM0.560.15-5.63-1.41-0.44v0.852.060.350.720.293.06MRM0.440.35-4.70-2.15-0.55-0.652.050.750.790.543.05QM0.110.09-2.70-1.21-0.89-0.911.510.190.630.172.51Late pod formationPIM0.080.110.09-2.70-1.21-0.89-0.911.510.790.633.91MRM0.110.10-4.25-2.24-0.92-0.892.981.110.760.563.91MaturityPIM0.080.110.10-4.25-2.240-0.92-0.911.400.770.603.91MaturityPIM0.080.76-1.04-1.28-0.92-0.412.581.690.740.803.91MaturityPIM0.330.76-1.04-1.28-0.64-0.240.060.740.803.91MaturityPIM0.600.76-2.20-0.2110.920.740.700.603.91MaturityPIM0.760.790.760.740.760.740.700.741.04MaturityPIM0.89-1.09-2.00-2.00-0.240.740.760.700.741.04MaturityPIM0.890.89-1.09-2.00-2.00-0.24 <td< td=""><td></td><td></td><td>QM</td><td>0.15</td><td>0.22</td><td>-1.41</td><td>-1.03</td><td>-0.85</td><td>-0.78</td><td>0.35</td><td>0.02</td><td>0.29</td><td>0.03</td><td>1.35</td><td>1.02</td></td<>			QM	0.15	0.22	-1.41	-1.03	-0.85	-0.78	0.35	0.02	0.29	0.03	1.35	1.02
MRM $0.44$ $0.35$ $-4.70$ $-2.15$ $-0.55$ $-0.65$ $2.05$ $0.75$ $0.79$ $0.54$ $3.05$ QM $0.11$ $0.09$ $-2.70$ $-1.21$ $-0.89$ $-0.91$ $1.51$ $0.19$ $0.63$ $0.17$ $2.51$ Late pod formationPIM $0.01$ $0.08$ $0.11$ $-4.25$ $-2.240$ $-0.89$ $-0.91$ $1.11$ $0.76$ $0.56$ $3.98$ MRM $0.11$ $0.10$ $-4.25$ $-2.240$ $-0.89$ $-0.90$ $2.91$ $1.140$ $0.77$ $0.60$ $3.91$ MRM $0.11$ $0.10$ $-4.25$ $-2.240$ $-0.89$ $-0.90$ $2.91$ $1.40$ $0.77$ $0.60$ $3.91$ MRM $0.11$ $0.10$ $-4.25$ $-2.20$ $-0.26$ $-0.11$ $0.76$ $0.74$ $0.80$ $3.78$ MaturityPIM $0.33$ $0.76$ $-1.04$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.76$ $0.74$ $0.80$ MaturityPIM $0.60$ $0.76$ $-1.04$ $-1.28$ $-0.64$ $-0.24$ $0.06$ $0.74$ $1.04$ MaturityPIM $0.76$ $0.76$ $-1.28$ $-0.20$ $-0.24$ $0.03$ $0.76$ $0.74$ $1.04$ MaturityPIM $0.76$ $0.89$ $-1.28$ $-0.20$ $-0.24$ $0.06$ $0.74$ $1.04$ MaturityPIM $0.76$ $0.89$ $-1.28$ $-0.20$ $-0.24$ $0.06$ $0.74$ $0.74$ $1.04$	12.04.09	Mid pod formation	PIM	0.56	0.15	-5.63	-1.41	-0.44	v0.85	2.06	0.35	0.82	0.29	3.06	1.35
Late pod formationQM0.110.09 $-2.70$ $-1.21$ $-0.89$ $-0.91$ $1.51$ $0.19$ $0.63$ $0.17$ $2.51$ $2.51$ Late pod formationPIM0.080.11 $-4.25$ $-2.25$ $-0.92$ $-0.89$ $2.98$ $1.11$ $0.76$ $0.56$ $3.98$ $3.91$ MRM0.110.10 $-4.25$ $-2.240$ $-0.89$ $-0.90$ $2.91$ $1.40$ $0.77$ $0.60$ $3.91$ MRM0.110.01 $-4.25$ $-2.40$ $-0.89$ $-0.90$ $2.91$ $1.40$ $0.77$ $0.60$ $3.91$ MaturityPIM0.33 $0.76$ $-1.04$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.74$ $0.80$ $3.58$ MaturityPIM $0.33$ $0.76$ $-1.04$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.76$ $0.74$ $0.80$ MaturityPIM $0.60$ $0.76$ $-1.04$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.76$ $0.74$ $1.04$ MaturityPIM $0.60$ $0.76$ $-1.28$ $-0.20$ $-0.24$ $0.03$ $0.06$ $0.74$ $1.04$ MaturityPIM $0.89$ $0.76$ $-1.28$ $-0.20$ $-0.24$ $0.03$ $0.06$ $0.74$ $1.04$ MaturityPIM $0.89$ $0.89$ $-1.28$ $-2.00$ $-0.24$ $-0.24$ $0.03$ $0.06$ $0.74$ $1.04$ MaturityPIM $0.89$ $0.89$ $-1.28$ $-2.00$ <	(47)		MRM	0.44	0.35	-4.70	-2.15	-0.55	-0.65	2.05	0.75	0.79	0.54	3.05	1.75
Late pod formationPIM0.080.11-4.25-2.25-0.92-0.892.981.110.760.563.91MRM0.110.10-4.25-2.40-0.89-0.902.911.400.770.603.91MaturityQM0.080.59-3.80-5.07-0.92-0.912.581.690.740.803.91MaturityPIM0.330.76-1.04-1.28-0.67-0.240.030.060.740.803.58MaturityPIM0.330.76-1.09-2.00-0.56-0.110.030.060.740.803.58MaturityPIM0.600.76-1.09-2.00-0.56-0.110.030.060.741.03MaturityPIM0.600.76-1.28-0.40-0.240.030.060.741.03MaturityPIM0.600.76-1.28-0.40-0.240.060.760.701.03MaturityPIM0.89-1.09-2.00-0.240.010.060.760.741.04MaturityPIM0.890.89-1.28-2.00-0.240.010.741.04MaturityPIM0.890.89-1.28-2.00-0.240.010.760.741.04MaturityPIM0.890.89-2.00-2.00-0.240.010.741.04MaturityPI			QM	0.11	0.09	-2.70	-1.21	-0.89	-0.91	1.51	0.19	0.63	0.17	2.51	1.19
MRM         0.11         0.10         -4.25         -2.40         -0.89         -0.90         2.91         1.40         0.77         0.60         3.91           QM         0.08         0.59         -3.80         -5.07         -0.92         -0.41         2.58         1.69         0.74         0.80         3.91         3.91           Maturity         PIM         0.33         0.76         -1.04         -1.28         -0.67         -0.24         0.03         0.74         0.80         3.58         3.91           Maturity         PIM         0.33         0.76         -1.04         -1.28         -0.67         -0.24         0.03         0.74         0.80         3.58         3.58           Maturity         DMR         0.44         0.89         -1.09         -2.00         -0.24         0.03         0.06         0.04         0.20         1.04           Maturity         QM         0.60         0.76         -2.255         -1.28         -0.40         -0.24         0.06         0.06         0.20         1.04           Harvesting (2-3         PIM         0.89         -1.28         -2.00         -0.24         0.06         0.06         0.20         1.06 </td <td>19.04.09</td> <td>Late pod formation</td> <td>PIM</td> <td>0.08</td> <td>0.11</td> <td>-4.25</td> <td>-2.25</td> <td>-0.92</td> <td>-0.89</td> <td>2.98</td> <td>1.11</td> <td>0.76</td> <td>0.56</td> <td>3.98</td> <td>2.11</td>	19.04.09	Late pod formation	PIM	0.08	0.11	-4.25	-2.25	-0.92	-0.89	2.98	1.11	0.76	0.56	3.98	2.11
MaturityQM $0.08$ $0.59$ $-3.80$ $-5.07$ $-0.92$ $-0.41$ $2.58$ $1.69$ $0.74$ $0.80$ $3.58$ $2$ MaturityPIM $0.33$ $0.76$ $-1.04$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.06$ $0.04$ $0.20$ $1.03$ MaturityMRM $0.44$ $0.89$ $-1.09$ $-1.28$ $-0.67$ $-0.24$ $0.03$ $0.06$ $0.04$ $0.20$ $1.03$ MRM $0.44$ $0.89$ $-1.09$ $-2.00$ $-0.56$ $-0.11$ $0.04$ $0.08$ $0.07$ $0.44$ $1.04$ days before harvesting (2-3)PIM $0.89$ $-2.25$ $-1.28$ $-0.40$ $-0.24$ $0.08$ $0.76$ $0.20$ $1.50$ days before harvesting (2-3)PIM $0.89$ $-2.00$ $-2.00$ $-0.24$ $-0.11$ $0.08$ $0.74$ $1.04$ days before harvesting (2-3)PIM $0.89$ $-1.28$ $-2.00$ $-0.24$ $-0.11$ $0.06$ $0.08$ $0.44$ $1.06$ days before harvesting (2-3)PIM $0.89$ $-1.28$ $-2.00$ $-0.24$ $-0.11$ $0.06$ $0.08$ $0.44$ $1.06$ days before harvesting (2-3)QM $0.89$ $-2.00$ $-2.00$ $-0.24$ $-0.11$ $0.08$ $0.44$ $1.08$ days before harvesting (2-3)PIM $0.89$ $-2.00$ $-2.00$ $-0.11$ $-0.11$ $0.08$ $0.44$ $1.06$	(54)		MRM	0.11	0.10	-4.25	-2.40	-0.89	-0.90	2.91	1.40	0.77	0.60	3.91	2.40
			QM	0.08	0.59	-3.80	-5.07	-0.92	-0.41	2.58	1.69	0.74	0.80	3.58	2.69
	26.04.09	Maturity	PIM	0.33	0.76	-1.04	-1.28	-0.67	-0.24	0.03	0.06	0.04	0.20	1.03	1.06
5.09         Harvesting (2-3)         QM         0.60         0.76         -2.25         -1.28         -0.40         -0.24         0.50         0.06         0.56         0.20         1.50           5.09         Harvesting (2-3)         PIM         0.89         0.89         -2.00         -2.00         -0.11         -0.11         0.08         0.44         1.08         1.08           days before harvest         MRM         0.76         0.89         -1.28         -2.00         -0.24         -0.11         0.08         0.44         1.08           QM         0.89         0.89         -1.28         -2.00         -0.24         -0.11         0.06         0.08         0.44         1.06	(61)		MRM	0.44	0.89	-1.09	-2.00	-0.56	-0.11	0.04	0.08	0.07	0.44	1.04	1.08
5.09         Harvesting (2-3)         PIM         0.89         -2.00         -2.00         -0.11         -0.11         0.08         0.44         0.44         1.08           days before harvest)         MRM         0.76         0.89         -1.28         -2.00         -0.24         -0.11         0.06         0.08         0.20         0.44         1.06           days before harvest)         MRM         0.76         0.89         -1.28         -2.00         -0.24         -0.11         0.06         0.08         0.20         0.44         1.06           QM         0.89         0.89         -2.00         -0.01         -0.11         0.08         0.44         0.44         1.06			QM	09.0	0.76	-2.25	-1.28	-0.40	-0.24	0.50	0.06	0.56	0.20	1.50	1.06
days before harvest)         MRM $0.76$ $0.89$ $-1.28$ $-2.00$ $-0.11$ $0.06$ $0.08$ $0.20$ $0.44$ $1.06$ QM $0.89$ $0.89$ $-2.00$ $-0.11$ $0.08$ $0.20$ $0.44$ $1.06$	03.05.09	Harvesting (2-3	PIM	0.89	0.89	-2.00	-2.00	-0.11	-0.11	0.08	0.08	0.44	0.44	1.08	1.08
0.89 0.89 -2.00 -2.00 -0.11 -0.11 0.08 0.04 0.44 1.08	(68)	days before harvest)	MRM	0.76	0.89	-1.28	-2.00	-0.24	-0.11	0.06	0.08	0.20	0.44	1.06	1.08
			QM	0.89	0.89	-2.00	-2.00	-0.11	-0.11	0.08	0.08	0.44	0.44	1.08	1.08

Table 1. Parameters of spatial distribution of C. sexmaculata in summer green gram

Ing stage     Larva       Ing stage     PIM     -       MRM     -     -       vegetative growth     PIM     0.81       vegetative growth     PIM     0.81       with the indext of the ind	Sampling date (DAS)	Crop growth stage	Sampling method	Variance to mean ratio $S^2/\overline{X}$	ce to ratio <u>X</u>	Dispersion parameter k	sion er k	Index of clumping IDM IDM	of ; IDM I	Index of mean crowding X*	ing	Lloyd's index of patchiness $X^* / \overline{X}$	index niness X	Mean colony size C*	lony *
9.09Seedling stagePIM-0.09Early vegetative growthMRM0.810.09Early vegetative growthMRM0.810.09Rapid leaf formationPIM0.890.09FloweringPIM0.600.09FloweringPIM0.600.09Early pod formationPIM0.600.09Early pod formationPIM0.600.09Early pod formationPIM0.330.09Lare pod formationPIM0.330.09Late pod formationPIM0.051.09Mid pod formationPIM0.051.09Mid pod formationPIM0.331.09Mid pod formationPIM0.331.09Mid pod formationPIM0.331.09Mid pod formationPIM0.331.09Mid pod formationPIM0.331.09Mid pod formationPIM0.341.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MaturityPIM0.331.09MitPIM0.331.09MitPIM0.331.09MitPIM0.33 <trr>1.09Mit</trr>				Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult	Larva	Adult
MRM         -           0.09         Early vegetative growth         PIM         0.81           0.09         Early vegetative growth         PIM         0.81           0.09         Rapid leaf formation         PIM         0.81           0.09         Rapid leaf formation         PIM         0.65           0.09         Flowering         PIM         0.67           0.09         Farly pod formation         PIM         0.67           0.09         MRM         0.33         0.17           1.09         Mid pod formation         PIM         0.24           1.09         Late pod formation         PIM         0.24           1.09         Maturity         QM         0.17           1.09         Maturity         QM         0.17           1.09	27.09.09	Seedling stage	PIM	I	0.89	I	-2.00	I	-0.11	I	0.08	I	0.44	I	1.08
0.09       Early vegetative growth $PIM$ $0.81$ $0.09$ Early vegetative growth $NIKM$ $0.81$ $0.09$ Rapid leaf formation $PIM$ $0.81$ $0.09$ Rapid leaf formation $PIM$ $0.65$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Farly pod formation $PIM$ $0.33$ $0.09$ Early pod formation $PIM$ $0.21$ $0.10$ Mid pod formation $PIM$ $0.22$ $1.09$ Late pod formation $PIM$ $0.24$ $1.09$ Maturity $PIM$ $0.17$ $0.10$ $PIM$ $0.20$ $PIM$ $0.17$ $0.109$ Maturity $PIM$ $0.20$ $PIM$ $0.17$ $1.09$	(13)		MRM	I	0.89	I	-2.00	I	-0.11	I	0.08	I	0.44	I	1.08
0.09       Early vegetative growth       PIM $0.81$ $0.00$ Rapid leaf formation $0.81$ $0.81$ $0.00$ Rapid leaf formation $PIM$ $0.89$ $0.09$ Rapid leaf formation $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Early pod formation $PIM$ $0.17$ $0.09$ Early pod formation $PIM$ $0.33$ $0.09$ Late pod formation $PIM$ $0.20$ $1.09$ Mid pod formation $PIM$ $0.20$ $1.09$ Late pod formation $PIM$ $0.24$ $1.09$ Late pod formation $PIM$ $0.17$ $1.09$ Maturity $0.17$ $0.17$ $0.100$ PIM $0.24$ $0.17$ $0.100$ PIM $0.17$ $0.17$ $0.100$ PIM $0.17$ $0.1$			QM	I	0.89	Ι	-2.00	Ι	-0.11	Ι	0.08	I	0.44	I	1.08
0.09     Rapid leaf formation     MRM     0.81       0.09     Rapid leaf formation     PIM     0.65       0.09     Flowering     PIM     0.67       0.09     Farly pod formation     PIM     0.60       1.09     Mid pod formation     PIM     0.33       1.09     Late pod formation     PIM     0.21       1.09     Late pod formation     PIM     0.24       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.50	04.10.09	Early vegetative growth	PIM	0.81	0.67	-3.27	-1.23	-0.19	-0.33	0.41	0.07	0.69	0.17	1.41	1.07
0.09     Rapid leaf formation     PIM     0.65       0.09     Rapid leaf formation     PIM     0.89       0.09     Flowering     PIM     0.67       0.09     Flowering     PIM     0.67       0.09     Early pod formation     PIM     0.67       0.09     Early pod formation     PIM     0.17       0.09     Early pod formation     PIM     0.33       1.09     Mid pod formation     PIM     0.38       1.09     Late pod formation     PIM     0.21       0.09     Late pod formation     PIM     0.22       1.09     Mid pod formation     PIM     0.24       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.50	(20)		MRM	0.81	0.76	-3.27	-1.28	-0.19	-0.24	0.41	0.06	0.69	0.20	1.41	1.06
0.09       Rapid leaf formation       PIM $0.89$ $0.00$ $0.067$ $0.67$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.67$ $0.09$ Flowering $PIM$ $0.60$ $0.09$ Early pod formation $PIM$ $0.17$ $0.09$ Early pod formation $PIM$ $0.33$ $0.10$ $MRM$ $0.10$ $0.38$ $0.10$ $MRM$ $0.21$ $0.06$ $1.09$ Mid pod formation $PIM$ $0.21$ $1.09$ Late pod formation $PIM$ $0.22$ $1.09$ Late pod formation $PIM$ $0.24$ $1.09$ Maturity $PIM$ $0.33$ $0.10$ $MRM$ $0.17$ $0.17$ $0.00$ $MRM$ $0.24$ $0.17$ $0.01$ $0.01$ $0.01$ $0.17$ $0.01$ $0.01$ $0.01$ $0.01$ $0.01$ $0.01$ $0.01$ $0.01$ $0.01$			МØ	0.65	0.89	-2.04	-2.00	-0.34	-0.11	0.35	0.08	0.50	0.44	1.35	1.08
0.09     Flowering     MRM     0.76       0.09     Flowering     PIM     0.67       0.09     Flowering     MRM     0.17       0.09     Early pod formation     MRM     0.17       0.09     Early pod formation     PIM     0.33       0.09     Latry pod formation     PIM     0.33       1.09     Mid pod formation     PIM     0.38       1.09     Late pod formation     PIM     0.21       1.09     Late pod formation     PIM     0.24       1.09     Late pod formation     PIM     0.24       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.33	11.10.09	Rapid leaf formation	PIM	0.89	0.67	-2.00	-1.23	-0.11	-0.33	0.08	0.07	0.44	0.17	1.08	1.07
0.09     Flowering     QM     0.67       0.09     Flowering     PIM     0.60       0.09     Early pod formation     PIM     0.17       0.09     Early pod formation     PIM     0.53       0.09     Early pod formation     PIM     0.38       1.09     Mid pod formation     PIM     0.06       1.09     Mid pod formation     PIM     0.21       1.09     Late pod formation     PIM     0.22       1.09     Late pod formation     PIM     0.24       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.31       1.09     Maturity     PIM     0.33	(27)		MRM	0.76	0.89	-1.28	-2.00	-0.24	-0.11	0.06	0.08	0.20	0.44	1.06	1.08
0.09       Flowering       PIM       0.60         0.017       MRM       0.17         0.09       Early pod formation       PIM       0.53         0.09       Early pod formation       PIM       0.33         0.09       Mid pod formation       PIM       0.10         1.09       Mid pod formation       PIM       0.06         1.09       Late pod formation       PIM       0.21         1.09       Late pod formation       PIM       0.21         1.09       Maturity       PIM       0.24         1.09       Maturity       PIM       0.24         0.017       QM       0.33       0.17         1.09       Maturity       PIM       0.24         1.09       Maturity       PIM       0.33			QM	0.67	0.89	-1.23	-2.00	-0.33	-0.11	0.07	0.08	0.17	0.44	1.07	1.08
0.09     Early pod formation     MRM     0.17       0.09     Early pod formation     PIM     0.53       0.10     MRM     0.10     0.38       1.09     Mid pod formation     PIM     0.38       1.09     Late pod formation     PIM     0.21       1.09     Late pod formation     PIM     0.22       1.09     Late pod formation     PIM     0.24       1.09     Maturity     PIM     0.17       1.09     Maturity     PIM     0.50       1.09     Maturity     PIM     0.50	18.10.09	Flowering	PIM	0.60	0.36	-4.44	-0.23	-0.40	-0.64	1.40	0.26	0.78	0.29	2.40	1.26
0.09     Early pod formation     PIM     0.53       0.09     Early pod formation     PIM     0.33       0.10     MRM     0.10       1.09     Mid pod formation     PIM     0.38       1.09     Mid pod formation     PIM     0.21       1.09     Late pod formation     PIM     0.22       1.09     Late pod formation     PIM     0.24       1.09     MRM     0.17     0.17       1.09     Maturity     PIM     0.50       1.09     Maturity     PIM     0.50       1.09     Maturity     PIM     0.33	(34)		MRM	0.17	0.22	-2.28	-1.03	-0.83	-0.78	1.07	0.02	0.56	0.03	2.07	1.02
0.09     Early pod formation     PIM     0.33       0.10     MRM     0.10       1.09     Mid pod formation     PIM     0.06       1.09     Late pod formation     PIM     0.21       1.09     Late pod formation     MRM     0.21       1.09     Maturity     PIM     0.17       1.09     Maturity     PIM     0.17       1.09     MRM     0.17     0.17       0.01     OM     0.17     0.11			QM	0.53	0.33	-3.61	-1.04	-0.47	-0.66	0.28	0.03	0.16	0.05	1.28	1.03
I.09     Mid pod formation     MRM     0.10       I.09     Mid pod formation     PIM     0.38       I.09     Mid pod formation     PIM     0.06       I.09     Late pod formation     PIM     0.21       I.09     Late pod formation     PIM     0.24       I.09     MRM     0.17     0.17       I.09     Maturity     PIM     0.50       I.09     Maturity     PIM     0.33       OM     OM     0.31	25.10.09	Early pod formation	PIM	0.33	0.44	-3.00	-1.79	-0.67	-0.56	1.33	0.44	0.67	0.44	2.33	1.44
1.09     Mid pod formation     PIM     0.38       1.09     Mid pod formation     PIM     0.06       1.09     Late pod formation     PIM     0.24       1.09     Late pod formation     PIM     0.17       1.09     Maturity     PIM     0.17       1.09     Maturity     PIM     0.33       1.09     Maturity     PIM     0.50	(41)		MRM	0.10	0.33	-2.40	-3.60	-0.90	-0.67	1.40	0.53	0.60	0.44	2.40	1.53
1.09     Mid pod formation     PIM     0.06       MRM     0.21     0.21       MRM     0.21     0.22       1.09     Late pod formation     PIM     0.24       1.09     MRM     0.17     0.17       1.09     Maturity     PIM     0.50       1.09     Maturity     PIM     0.50       0.01     OM     0.31     0.81			QM	0.38	0.29	-3.59	-1.55	-0.62	-0.71	1.58	0.39	0.72	0.35	2.58	1.39
MRM         0.21           1.09         Late pod formation         PIM         0.24           1.09         Late pod formation         PIM         0.17           MRM         0.17         QM         0.11           1.09         Maturity         PIM         0.50           0.01         OM         0.33         0.81	01.11.09	Mid pod formation	PIM	0.06	0.11	-3.39	-2.25	-0.94	-0.89	2.26	1.11	0.71	0.56	3.36	2.11
1.09         Late pod formation         PIM         0.22           1.09         Late pod formation         PIM         0.17           MRM         0.17         QM         0.11           1.09         Maturity         PIM         0.50           0.04         0.33         0.081	(48)		MRM	0.21	0.17	-4.16	-2.28	-0.79	-0.83	2.51	1.07	0.76	0.56	3.51	2.07
1.09Late pod formationPIM0.24MRM0.170.17QMQM0.111.09MaturityPIM0.50MRM0.33OM0.81			QM	0.22	0.40	-3.86	-2.83	-0.78	-0.60	2.22	1.10	0.74	0.65	3.22	2.10
MRM         0.17           QM         0.11           QM         0.11           1.09         Maturity         PIM         0.50           MRM         0.33         OM         0.81	08.11.09	Late pod formation	PIM	0.24	0.29	-5.41	-3.27	-0.76	-0.71	3.34	1.59	0.81	0.69	4.34	2.59
QM         0.11           1.09         Maturity         PIM         0.50           MRM         0.33         OM         0.81	(55)		MRM	0.17	0.11	-4.80	-2.70	-0.83	-0.89	3.17	1.51	0.79	0.63	4.17	2.51
1.09 Maturity PIM 0.50 MRM 0.33 OM 0.81			QM	0.11	0.47	-4.25	-4.70	-0.89	-0.53	2.91	1.97	0.77	0.79	3.91	2.97
MRM 0.33 OM 0.81	15.11.09	Maturity	PIM	0.50	0.76	-1.60	-1.28	-0.50	-0.24	0:30	0.06	0.38	0.20	1.30	1.06
0.81	(62)		MRM	0.33	0.67	-1.04	-1.23	-0.66	-0.33	0.03	0.07	0.05	0.17	1.03	1.07
			QM	0.81	0.76	-3.27	-1.28	-0.19	-0.24	0.41	0.06	0.69	0.20	1.41	1.06
	22.11.09	Harvesting	PIM	0.89	0.89	-2.00	-2.00	-0.11	-0.11	0.08	0.08	0.44	0.44	1.08	1.08
$(69) \qquad (2-3 \text{ days before harvest}) \text{ MRM} \qquad 0.76 \qquad 0.89$	(69)	(2-3 days before harvest)		0.76	0.89	-1.28	-2.00	-0.24	-0.11	0.06	0.08	0.20	0.44	1.06	1.08
QM 0.89 0.89			QM	0.89	0.89	-2.00	-2.00	-0.11	-0.11	0.08	0.08	0.44	0.44	1.08	1.08

DAS = days after sowing; PIM = plant inspection method; MRM = measured row method; QM = quadrat method

Table 2. Parameters of spatial distribution of C. sexmaculata in kharif green gram

than one, equal to or larger than one in regular, random and clumped distribution, respectively. The mean colony size (C\*) was also calculated as given by Tanigoshi et al. (1975). Iwao's patchiness regression-index  $x^* = \hat{a} + \hat{a}_{\mathbf{x}}$ was calculated over a range of densities (Iwao, 1972). The constant á is the intercept on the ordinate or index of basic contagion and â is the slope of the regression line when x\* is regressed on the or density contagiousness co-efficient. If  $a \ge 0$  and  $a \ge 1$ , then distribution is contagious and for regular distribution  $a \le 0$  and  $a \le 1$ . Cheilomenes sexmaculata larva appeared in the early vegetative growth of the crops in both the seasons till harvest. The statistical parameters used to describe dispersion behaviour of C. sexmaculata larva are summarized in Tables 1 and 2 for summer green gram and kharif green gram, respectively.

The variance to mean ratio was less than unity in all the sampling occasions indicating regular distribution. The value of dispersion parameter 'k' was less than eight. Similarly, the other statistical parameters, *i.e.*, David and Moore's index of clumping (negative value), Lloyd's index of mean crowding (<) and Lloyd's index of patchiness (<1) also revealed regular distribution. The more confirmed approach for deciding the distribution of C. sexmaculata larva was found with Iwao's patchiness regression. In summer, the Iwao's patchiness regressions in PIM, MRM and QM were x\*=0.8821-0.4166, x = 0.8600 - 0.2972 and x = 0.7641 - 0.2551, respectively. In kharif, the Iwao's patchiness regressions were x\*=0.8092 - 0.1548 in PIM, x\*=0.8299 - 0.3013 in MRM and  $x^*=0.7889 - 0.2550$  in OM. In all the cases the values of a were negative and a was less than unity which confirmed the regular distribution of C. sexmaculata larva. The negative values of a signified that the larva had a tendency to repel each other, *i.e.*, presence of one coccinellid beetle repel the other to occupy the same area. Shukla and Pathak (1987) reported similar findings with Coccinella septempunctata L. feeding on corn leaf aphid, Rhopalosiphum maidis (Fitch). Rao et al. (2002) also reported similar findings with Coccinella transversalis feeding on green pea aphid, Acyrthosiphon pisum Harris. Pandey (2004) studied the spatial distribution of A. craccivora and its predator *Coccinella* spp. on alfalfa and recorded negative binomial distribution of aphids and positive binomial distribution of the predators.

*Cheilomenes sexmaculata* adults were recorded in the field when the crops were in seedling stage. Observing the statistical parameters for dispersion behaviour of *C. sexmaculata* adult it could be clearly concluded that it was distributed regularly in both the seasons (Tables 1

and 2). All the statistical parameters, *viz.*, variance to mean ratios, dispersion parameter 'k', David and Moore's index of clumping, Lloyd's index of mean crowding and Lloyd's index of patchiness indicated regular distribution.

Further confirmation of regular distribution of *C. sexmaculata* adults was obtained from Iwao's patchiness regression (x\*=0.5384-0.0883 in PIM, x\*=0.6203-0.2033 in MRM and x\*=0.7854-0.2477 in QM in summer season). In *kharif*, the Iwao's patchiness regressions were x\*=0.6877-0.1706 in PIM, x\*=0.6382-0.1500 in MRM and x\*=0.7787-0.1843 in QM.

Thus, the present studies conclude that the larva and adult of *C. sexmaculata* followed positive binomial (regular) distribution suggesting uniform regulatory pressure in all parts of the field and accommodating minimum inter- and intra-specific competition. These studies are more useful in designing population models and for understanding the predator-prey interaction for successful management of *A. craccivora*.

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