Table 3. Age specific fecundity life table (for females) of *Deudorix isocrates*

Pivotal age (days) x	Survival of females at age x lx	Age schedule for female births at age m mx	lx.mx	x.lx.mx
38	1.0	- Immature stages -		
39	1.0	- Preoviposition period -		
40	1.0	- Preoviposition period -		
41	1.0	- Preoviposition period -		
42	1.0	0.1	0.10	4.20
43	1.0	0.9	0.90	38.70
44	1.0	5.6	5.60	246.40
45	0.8	6.8	5.44	244.80
46	0.6	3.3	1.98	91.08
47	0.4	1.2	0.48	22.56
48	0.3	0.4	0.12	5.76
49	0.2	0.3	0.06	2.94
50	0.1	0.0	0.00	0.00
51	0.1	0.0	0.00	0.00
			Σ 14.68	656.44

October-November. The innate capacity for increase (rm) was 0.062311 while the finite rate of increase () was 1.0643 female/day. The doubling time (DT) of the population was 11.89 days. The population could multiply 1.547 times per week (Table 4) which necessitate an effective monitoring and management in order to contain the pest effectively.

Table 4. Generation time, innate capacity for increase and finite rate of increase in numbers of *D. isocrates* on pomegranate

Parameter	Values
Mean length of generation Tc (day) Σ x.lx.mx/Ro	44.72
Innate capacity for increase in numbers (calculated) rm $= \frac{\log_e Ro}{TC}$	0.06
Corrected rm	0.06231
Corrected generation time (days) $= \frac{\log_e Ro}{TC}$	43.11
Finite rate of increase λ = antilog e^{rm} / female / day	1.0643
Weekly multiplication of population = $(e^{rm})^7$	1.547
Doubling time (DT) days = Log 2 / Log λ	11.89

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INFLUENCE OF WEATHER FACTORS ON RETAINABILITY AND EGG LAYING OF *Chrysoperla carnea* ADULTS UNDER COTTON ECOSYSTEM

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ABSTRACT

Retainability and egg laying of *Chrysoperla carnea* adults were observed over a period of 5 weeks under cotton ecosystem. Using weather factors, correlations and multiple regression analysis were worked out to identify the factors influencing the retainability and egg laying. Multiple correlation studies revealed that a significant positive association exist between the retainability and egg laying of the adults *C. carnea* under maximum relative humidity with aphid population and significant negative association was also observed with maximum temperature and wind speed. Hence, multiple regression analysis led to the conclusion that a decrease in maximum temperature increases the per cent retainability of *C. carnea* adults.

KEY WORDS : *Chrysoperla carnea*, cotton, weather parameters, correlations.

Chrysoperla carnea Stephens is an efficient predator of sucking pests and mites and tolerates some broad spectrum pesticides. This species is found on all crop ecosystem, forming 40 per cent of the total chrysopid population. The retention of this predator in crop ecosystem is influenced by weather parameters and prey population. The influence of weather factors *viz.*, maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity, wind speed, sunshine hrs and prey population on retainability and fecundity of *C. carnea* was assessed and the results are presented in this paper.

MATERIALS AND METHODS

A field experiment with cotton was laid out in a randomised block design with a plot size of 5x4m^2. All agronomical practices were followed as per the crop production manual of Tamil Nadu Agricultural University. The treatments were replicated seven times. Laboratory cultured *C. carnea* adults were released during the flowering stage of the cotton crop @ 20 pairs per plot during the morning hours. Observations were recorded on number of adults retained on 20 sampled plants at random by tapping the sampled plants gently. The number of eggs laid by *C. carnea* adults on the same 20 sampled plants was also recorded. Data on important weather parameters were collected from the Metereology Department. Prey population like aphid and leafhopper were also recorded on the sampled plants. Observations were continued daily for a period of 5 weeks. Correlation and multiple regression analysis were carried out. using the variables as indicated in Table 1.

RESULTS AND DISCUSSION

Retainability of *C. carnea* on cotton

The multiple correlations worked out between retainability of *C. carnea* adults and weather factors and pest populations showed a significant positive association with maximum relative humidity (r=0.615) and aphid population (r=0.894) and significant negative association with maximum temperature (r=0.564) and wind speed (r=0.833). The other factors were non-significant (Table 1).

The partial regression co-efficient of maximum temperature had significant negative association and aphid population had significant positive association. The partial regression co- efficient of other factors was not significant (Table 2). The multiple regression analyses made between eight independent variables and retainability of *C. carnea* adults showed the prediction of $y_1 = 1654.17 - 65.089\ X_1 - 3.391\ X_2 - 0.000000001\ X_3 - 0.986\ X_4 + 0.000000001\ X_5 - 0.171\ X_6 + 24.449\ X_7 + 0.152\ X_8$.

The variation expressed by the equation was 92.30 per cent (r^2 = 0.9230). The regression equation fitted had a r^2 value of 0.923, explained

Table 1. Correlation matrix between retainability and egg laying by *C. carnea* adults and weather factors and prey population

	VARIABLES	Y1	Y2	X1	X2	X3	X4	X5	X6	X7	X8
Y1	Retainability (%)	1.000	-	-0.564**	- 0.072 NS	0.615**	0.008 NS	-0.833**	-0.245 NS	0.894**	0.129 NS
Y2	Egg laying (NO)		1.000	-0.839**	0.293 NS	0.490**	-0.254 NS	-0.432**	-0.139 NS	0.541**	0.330*
X1	Max. Temp. (°C)			1.000	0.181 NA	0.491**	-0.259 NS	-0.623**	-0.164 NS	0.598**	0.541**
X2	Min. Temp. (°C)				1.000	-0.128 NS	0.800**	0.255 NS	-0.910**	-0.181 NS	0.061 NS
X3	Max. Relative humidity (%)					1.000	- 0.279 NS	-0.912**	-0.018 NS	0.658**	0.223 NS
X4	Min. Relative humidity (%)						1.000	0.324 NS	-0.902**	-0.164 NS	-0.253 NS
X5	Wind speed (Km/h)							1.000	-0.019 NS	-0.856**	-0.258 NS
X6	Sunshine (hours)								1.000	-0.091 NS	0.024 NS
X7	Aphid population (No./20 plants)									1.000	-0.070 NS
X8	Leafhopper Population (No./20 Plants)										1.000

* Significant at 5 per cent level 0.325 ; ** Significant at 1 per cent level 0.418 ; NS Non significant

Table 2. Regression coefficient of weather factors, prey population and retainability of *C. carnea* adults (n=35)

Variables	Mean	Partial Regression Coefficient	Standard Error	t
X1 Maximum temperature	32.260	-65.089	11.604	-5.609**
X2 Minimum temperature	24.900	-3.391	1.917	-1.769 NS
X3 Maximum Relative Humidity	77.370	-0.000000001	0.0002	-0.000005 NS
X4 Minimum Relative Humidity	46.890	-0.986	1.292	- 0.763 NS
X5 Wind speed	14.180	-0.000000001	0.0002	-0.000006 NS
X6 Sunshine hours	6.320	-0.171	0.133	-1.290 NS
X7 Aphid population	37.000	24.449	7.448	3.283**
X8 Leaf hopper population	3.900	0.152	0.590	0.258 NS

Constant term $a_2 = 1654.17$

$r^2 = 0.923$; P (0.05) = 2.030 ; P (0.01) = 2.724 ; NS = Non Significant

that 92 per cent variation which existed in retainability of *C. carnea* could be attributed to 8 variables.

Egg laying by *C. carnea*

Multiple correlation worked out between egg laying by *C. carnea* and weather factors and pest populations showed a significant positive association with maximum relative humidity (r=0.490) and aphid population (r=0.541) and significant negative correlation with maximum temperature (r=0.839) and wind speed (0.432) (Table - 1).

The partial regression co-efficient of maximum temperature, maximum relative humidity and wind speed had significant positive association with egg laying by *C. carnea* adults. The other factors were not significant. The multiple regression equation with eight independent variable to predict the egg laying of *C. carnea* on cotton was,

$$Y_2 = -440.62 + 6166\ X_1 - 3.137\ X_2 + 3.586\ X_3 + 0.0000000002\ X_4 + 2.814\ X_5 - 0.00000000003\ X_6 + 0.145\ X_7 + 0.522\ X_8$$

with a r^2 value of 0.90, explained the variation by the equation was 90 per cent. (Table 3).

The temperature played an important role in retainability and egg laying of *C. carnea* adults. The maximum temperature at the time of experiment was 32°C which may not be favourable for the adults might be the reason for the poor retainability, eventhough the females might not have wasted their progeny and laid eggs on cotton plants. Beglyarov and Ushchekou (1977) also reported that the high temperature was not favourable for *C. carnea*. Zhoa- Jingchao (1981) proved that the temperature between 28-30oC was the most favourable to chrysopa for its oviposition. Very low temperature decreased the oviposition rate of chrysopa adults (Samson and Blood, 1979).

Table 3. Regression coefficient of weather factors, prey population on the egg laying of *C. carnea* adult (n=35)

Variables	Mean	Partial Regression Coefficient	Standard Error	t
X1 Maximum temperature	32.26	6.166	0.644	9.579**
X2 Minimum temperature	24.90	-3.137	2.048	-1.532 NS
X3 Maximum Relative Humidity	77.37	3.586	0.594	6.037**
X4 Minimum Relative Humidity	46.89	0.0000000002	0.000015	0.000015 NS
X5 Wind speed	14.18	2.814	0.568	4.951**
X6 Sunshine hours	6.32	0.00000000003	0.0000059	0.0000054 NS
X7 Aphid population	37.00	0.145	0.090	1.609 NS
X8 Leaf hopper population	3.90	0.522	0.400	1.303 NS

Constant term $a_2 = 440.62$

$r^2 = 0.90$; P (0.05) = 2.030 ; P (0.01) = 2.724 ; NS = Non Significant

This study further revealed that aphid and leafhopper population positively correlated with retainability and egg laying of *C. carnea* adults. Similar correlation was obtained by Medina (1987) between chrysopid and whitefly population. Thakur *et al.*, (1988) found that *C. scelestes* population increased along with increasing population of woolly aphid, *Eriosoma lanigera* longevity.

The negative correlation existed between the retainability and egg laying of *C. carnea* adults with wind speed might be due to the soft bodied and lighter weight nature of *C. carnea* adults, which might be driven away by the wind from the target area.

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INTERCROPPING SYSTEM CAN ENHANCE THE YIELD OF POTATO AND GROUNDNUT

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ABSTRACT

Field experiments were carried out during the winter seasons of 1989-91 at the Unviersity research farm, Mohanpur (W.B.) to find out the suitable cropping system of potato and groundnut in the Gangetic plains of upland alluvial soil. It revealed that the sole crop yields of potato and gorundnut were superior to the respective intercrop yield of the systems. Intercrops of potato and groundnut having 3 : 3 row arrangements maintained row to row 40 cm apart recorded moderate potato tuber equivalence (24.09 t/ha), highest land equivalent ratio (1.49) and maximum monetary advantage (Rs. 4,971/-) preseumably due to the highest potato yield (12 t/ha) in the system. However, potato + groundnut intercrops having 2 : 2 row arrangements maintained 30 cm apart exhibited less advantage.

KEY WORDS : Cropping system, intercrops, potato tuber equivalence, Land exquivalent ratio and monetary advantage

With the introduction of high yielding and short duration genotypes of field crops, the possibilities and opportunities of growing best compatible crops in mixed stand/intercropping has also increased. Growing of crop mixture is an age-old farm practice. It is undoubtedly a successful and profitable method which maintains the fertility of the soil (Bains, 1968). Practice of growing two or more crops together has been considered as a safeguard against total failure of any particular crop. The cropping systems like potato + groundnut as intercrops may be popularised as both the crops are valuable and needed to earthing up of the soil during growth period and harvesting time and can enrich the fertility status of the soil. Hence, an attempt was undertaken to find out a profitable crop mixture of potato and groundnut suitable for growing in the