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ORIGINAL ARTICLE

Analysis of Control of Insect Pest Methods with Special Emphasis on Trap Design in the Field of Cucurbitaceae

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ABSTRACT

Continuous damaging of any annual, biannual as well as perennial species of plants if continuously effected by saliva of insect pest, may also loss its specific genetic components. Regwada in it hymns, mentioned several insect pests. The bible reported at last eleven pests, continuous use of pesticides are responsible for loss of specific plant's productivity as well as various metabolic activities of herbivores and carnivores disturb if continuously any pesticide intake in their body and may cause serious problem like tumor, cancer, hepatitis problems. It is obvious therefore that man must faced the problem of insect pest quite early in the history of his existence. The insect pests are much harmful to the crops like wheat, pulses and vegetables than rodents. Not only food plant damage by pest but also ornamental plants as well as medicinal plants damaged by various insect pest. Pesticides are also responsible for environmental hazardous problem, some insect pest like Lepidoptera, Coleoptera as well as Diptera attract towards moon light as well as electrical light being might, so it is one of the most successful tactics for protection of different important plants being cropping become by this practice, we can save environment as well as money and health of producers as well as consumers. By light trapping we can also identify various migratory insect pest, which will light various hidden reserved problems. Present study highlights comparison of insect trapping in light and shade in field conditions.

***Key words**: Insect Pest Management, Trap Design, Cucurbitaceae*

INTRODUCTION

Conventional crop protection with pesticides has limitations such as resistance of pests to pesticides and faunal imbalance. Agroecological crop protection is an attractive alternative based on the principles of agroecology. We present here this strategy using the case of Cucurbitaceae flies. Research has been carried out on the bioecology of these insects and on the effectiveness of agroecological techniques. Light trapping is very common among developing countries. However, the success depends on trap design. Present study highlights influence of trap design on insect trapping in field conditions. Insects have existed on this planet (earth) for over two hundred million years ago, while men, on the scene only half a million years ago. It is obvious therefore that man must faced the problem of insect pest quite early in the history of his existence. The insect pests are much harmful to the crops like wheat, pulses and vegetables than rodents. Not only food plant damage by pest but also ornamental plants as well as medicinal plants damaged by various insect pest.

Continuous damaging of any annual, biannual as well as perennial species of plants if continuously effected by saliva of insect pest, may also loss its specific genetic components. Regwada in it hymns, mentioned several insect pests. The bible reported at last eleven pests, continuous use of pesticides are responsible for loss of specific plant's productivity as well as various metabolic activities of herbivores and carnivores disturb if continuously any pesticide intake in their body and may cause serious problem like tumor, cancer, hepatitis problems. In tropical countries like India productivity of cucurbits play a very important role as nutrients. This is a fairly large family, well represented in India by plants which are mostly climbing, annual, which grow rapidly and climb by aid of tendrils. The fruits of cucurbits are generally fleshy, of the type exhibited in pumpkin or the cucumber which some time called pepo.

Pesticides are also responsible for environmental hazardous problem, some insect pest like Lepidoptera, Coleoptera as well as Diptera attract towards moon light as well as electrical light being might, so it is one of the most successful tactics for protection of different important plants being cropping become by this practice, we can save environment as well as money and health of producers as well as consumers. The use of light traps as an entomological survey device has been in vague for long time than the other sampling devices like sweetness, sticky traps, pheromone trap etc. light traps are specially suited to nocturnal flying insects over a large area. The pheromone of insect attraction to artificial light was recorded by man as early as 525-456 B.C. However, progress was slow due to use of oil lamp, which were less efficient. With the introduction of electric lamps, research on this direction developed faster and the invention of mercury lamps led to a new way of investigation. Consequently the old trapping method replaced by new method with mercury vapour lamps, as light source resulting in higher attraction of insect pest. Since then the use of light traps have gained much importance and being utilized for pest survey. By light trapping we can also identify various migratory insect pests, which will light various hidden reserved problems. It is clear that use of synthetic pesticides always leave their harmful effect. So it is most important to apply some mechanical or non chemical process for protection of food crops against pests. With the help of light trapping of insect pest, we can also relate environmental aspects with population of different insect pest and their light span related to environment.

MATERIALS AND METHODS

During experiments, investigation carried out together abiotic components which influenced the light traps with reference to trend of insect catch during experiments. Light trapping of insect population noted relative catches (RC) that is collection of different orders with relation to abiotic factors. The relative catches (RC) defined as a quotient of the number of individual caught during the sampling time (night).

In this work relation between temperature, humidity as well as velocity of air studied with insect population of different orders, which compose with the non trapped field productivity.

Studies were conduced is selected three crop field stations in Etah, which are crop field of Ganjdundwara village for crops of *Luffa cylindrical* (Ghia), *Luffa aegyptica* (Torai) and *Citrullus vulgaris* (Tinda).

Following instruments have used for light trapping

Jermy – type light trap
The killing jars, filled with ethanol (C_2H_5OH)
Humidity meter
Thermometer

The insect which caught by light trapping, have not get in contact with the chloroform for killing because of its strong fat dissolving action.

The trapping used during the first and second crop season respectively as per crop season from October 2010 to March 2011 for *Luffa cylindrical* and *Luffa aegyptica*. March 2010 to August 2011 *Citrullus vulgaris.*

Studies were conducted to fix the peak period of activity of different group of insects.

The period were-

6.00 PM to 8.00 PM
8.00 PM to 10.00 PM
10.00 PM to 12.00 PM
12.00 PM to 6.00 PM

Data were gathered separately for each crop when there was peak population on insects.

Again a correlation was worked out between the light trap catches and the corresponding week average number of insect to know the effect of light trap catch of different insect population in the field.

During trapping temperature, humidity and velocity of air as well as pH of soil also noted to find out the correlation between light trapping and abiotic factors.

The log values of the total catch of each crop field in relation to physical factors have represented by respective histograms. To avoid swamping of result, the catch values for experimental orders are divided separately.

The light trap used for the purpose in the present observation has done at a height of 1.5 meter with Jermy type light trap. It is placed in a corner of the crop field of selected station. A regular operation of the light trap was conducted during night. Entire catch of the night was then shorted out with morning. Daily record of the individual of different orders attracted to light was regularly maintained the temperature recorded by centigrade thermometer, where as relative humidity was determined by the standard values of humidity meter.

The three traps referred in each crop field and compared for their relative efficiency, sufficient distance were provided among the three different traps of each experimental field.

Table 1: Influence of trap design in the attraction of *Raphidopalpa foveicollis* (Coleoptera) insect pest in the field of *Luffa cylindrical*

Standard Week No.	*Raphidopalpa foveicollis*	
	MJLT	SMLT
40	376 (2.58)	136 (2.14)
41	111 (2.05)	59 (1.76)
42	521 (2.72)	192 (2.28)
43	367 (2.56)	124 (2.09)
44	521 (2.72)	188 (2.27)
45	312 (2.49)	276 (2.44)
46	699 (2.84)	423 (2.63)
47	324 (2.51)	218 (2.34)
48	947 (2.99)	291 (2.46)
49	125 (2.10)	79 (1.89)
Total	4303 (25.56)	1986 (22.03)
Mean	2.56	2.23
% decrease over MJLT	-	12.89

RESULTS AND DISCUSSION

Crop protection has long relied on agrochemicals but is now at a defining moment. Although pesticides have been condemned for many years (Carson 1962), the problems encountered with this type of crop protection are becoming more frequent and acute: inefficiency in many situations; resistance to pesticides; soil, water, and air pollution; hazards to human health; and loss of biodiversity (Pimentel 2002). The challenge is now to move from this chemical-based approach to one of pest prevention with more balanced and sustainable agroecosystems. This approach is based on agroecological management of plant and animal communities at extended scale, spatiotemporal management (Deguine *et al.* 2008).

The results are given in Tabel-1 and 2. The *Raphidopalpa foveicollis* population increased steadily from December 2010 and reached its peak during the month of February 2011. Low temperature and high humidity, prevailed during this month, might be the cause for its peek. This is confirmed with the finding of Natrajan (1975) and Sharma *et al.* (2002) who reported that the insect pest was found to increase. The experimental findings related to light trapping for agricultural insect pest of *Luffa aegyptica*, *Citrullus vulgaris* and *Luffa cylindrical* clearly indicate that abiotic factors during light trapping should not have meant such variation in the catch of *Raphidopalpa foveicollis*,

Bactsocera strumata of *Luffa cylindrical*; *Raphidopalpa foveicollis*, *Pieris brassicae* and *Dacus cucurbitae* of *Citrullus vulgaris* and *Raphidopalpa foveicollis* of *Luffa cylindrical* field crops (Costantini *et al.* 1998, Conrad *et al.* 2006).

Table 2: Influence of trap design in the attraction of insect pests in the field of *Luffa aegyptica*

Standard Week No.	*Raphidopalpa foveicollis* (coleoptera)		*Bactosocera strumeta* (Diptera)	
	MJL-T	SML-T	MJT-T	SML-T
40	218 (2.34)	193 (2.29)	62 (1.79)	55 (1.74)
41	324 (2.51)	276 (2.44)	520 (2.72)	468 (2.67)
42	245 (2.39)	201 (2.30)	82 (1.910)	67 (1.83)
43	364 (2.56)	291 (2.46)	224 (2.35)	192 (2.28)
44	946 (2.98)	860 (2.93)	48 (1.68)	42 (1.620)
45	642 (2.81)	571 (2.76)	42 (1.62)	38 (1.58)
46	424 (2.63)	364 (2.56)	53 (1.72)	47 (1.67)
47	210 (2.32)	176 (2.25)	12 (1.08)	10 (1.00)
48	312 (2.49)	277 (2.44)	34 (1.53)	31 (1.49)
49	165 (2.22)	83 (1.91)	24 (1.38)	18 (1.26)
Total	3850 (25.25)	3292 (21.31)	1101 (17.78)	968 (17.14)
Mean	(2.53)	(2.43)	(1.78)	(1.71)
% decrease over MJL-T	-	14.49	-	12.08

The significant findings further suggestive that the abiotic parameters have direct influence over the light trap catch of light attracting insect pest, as effect due to decreasing of temperature (Arnyas *et al.* 2005, Carolin Ulbrich *et al.* 2008). The earliest catch of *Bactsocera strumeta* noticed from the last week of October 2010 with the peak accordingly during February 2011 which is in consonance with the report of Velusamy and Subramanium (1974) and Natrajan (1975), the higher catches in February 2011 due to the fact that both biotic and abiotic environment were conductive for the development of *Bactsocera strumata*. Being rainy months the temperature and relative humidity were favourable for its rapid development. The *Bactsocera strumeta* increased from October 2010 and caught in highest number in the month of February 2011. Cloudy and continuous drizzling weather with moderate temperature prevailing during these months favoured the pest. This is an agreement with the finding of Natarajan (1975) and Dhaliwal *et al.* (2000).

The *Raphidopalpa foevicollis*, *Pieris brassicae* and *Dacus cucurbitae* reached during the month of October 2010. This was due to the hot humid climate with intermittent showers in evening hours prevailing during month of September and October 2011. Narayanasamy (1975) and Debolt *et al.* (1975) stated that hot humid environment was conductive for the development of insect pest. The *Raphidopalpa foveicollis* might gradually increase from August 2010 and caught highest member during the week of March 2011. The population of *Raphidopalpa foveicollis* increased 469 on 43rd standard week of 2010 and another numbering on 3rd standard week of 2011 became 16850. Low temperature and high humidity that prevailed during these months might be cause for its peak. This is supported with the finding of Natrajan (1975).

Another insect pest *Bactsocera strumeta* was trap from February 2010. A peak catch was observed during 37th standard week with 88 adults and another numbers during 41st standard week, it was 167 beyond this population decline gradually with no catch after December. The earliest catch of consonance with the reports of Velusami and Subramaniam (1974) and Eric *et al.* (2007). The

highest catch was due to the fact that both biotic and abiotic environment, were conductive for the development of *Bactsocera strumeta*. The light trap catch from 32nd standard week for *Raphidopalpa foveicollis* started and increased gradually up to 41st standard week (9935 numbers) and become maximum in 44th standard week (1973 in numbers) after that the number decline and after second standard week become zero. Cloudy and continuous drizzling wet weather with moderate temperature prevailing during these months favour the pest. This is agreement with the findings of Natrajan (1975).

Table 3: Comparison of MJL-T and SML-T on the Relative efficiency in attraction of insect pests in the field of *Citrullus vulgaris*

Standard Week No.	*Raphidopalpa foveicollis* (coleoptera)		*Pieris brassica* (Lepidoptera)		*Dacus cucurbitae*	
	MJL-T	SML-T	MJL-T	SML-T	MJL-T	SML-T
40	1145 (3.06)	902 (2.96)	372 (2.57)	192 (2.28)	3466 (3.54)	2270 (3.36)
41	9935 (4.00)	6637 (3.82)	1437 (3.160)	814 (2.91)	5112 (3.71)	3244 (3.51)
42	8530 (3.93)	4528 (3.66)	332 (2.52)	191 (2.28)	9248 (3.97)	4758 (3.68)
43	9319 (3.97)	5279 (3.72)	600 (2.780)	384 (2.58)	27723 (4.44)	15790 (4.20)
44	19774 (4.30)	15150 (4.18)	124 (2.09)	73 (1.86)	30982 (4.49)	23834 (4.38)
45	4695 (3.67)	3453 (3.54)	49 (1.69)	41 (1.61)	18152 (4.26)	14096 (4.15)
46	453 (2.66)	314 (2.50)	33 (1.52)	25 (1.40)	3307 (3.52)	2471 (3.39)
47	124 (2.09)	78 (1.89)	46 (1.66)	23 (1.36)	4382 (3.64)	2678 (3.43)
48	77 (1.89)	36 (1.56)	23 (1.36)	14 (1.15)	243 (2.39)	218 (2.34)
49	188 (2.27)	92 (1.96)	63 (1.80)	29 (1.46)	699 (2.84)	423 (2.63)
50	366 (2.56)	198 (2.30)	83 (1.92)	61 (1.79)	2554 (3.41)	1678 (3.22)
51	56 (1.75)	21 (1.32)	92 (1.96)	340 (2.53)	340 (2.53)	164 (2.21)
52	82 (1.91)	46 (1.66)	22 (1.34)	1501 (3.18)	1501 (3.18)	656 (2.82)
01	22 (1.34)	18 (1.26)	36 (1.56)	21 (1.32)	2552 (3.41)	1671 (3.22)
02	-	-	23 (1.36)	16 (1.20)	1253 (3.10)	764 (2.88)
03	-	-	31 (1.49)	24 (1.38)	1827 (3.26)	1041 (3.02)
04	-	-	32 (1.51)	18 (1.26)	459 (2.66)	298 (2.47)
TOTAL	54766 (39.40)	36752 (36.33)	3395 (32.29)	2001 (28.69)	113800 (58.35)	76054 (54.91)
Mean	(2.31)	(2.13)	(1.90)	(1.69)	(3.43)	(3.23)
	-	32.89	-	41.06	-	33.17

Pieris brassicae a lepidopteron insect pest trapped from 32nd standard week to 52nd standard week. The maximum number 765 recorded in 40th standard week after words trapping numbers are decline gradually. It indicates that the low temperature and high humidity are suitable for their life span. *Dacus cucurbitae* is very serious pest as recorded from 29th standard week and maximum number recorded in 44th standard week as 30982; this was due to hot humid climate with intermittent in evening hours prevailing. Narayanasamy (1975) supported as hot humid

environment supported the development of the pest. In the field of *Luffa aegyptica*, among the three colour tested, that in green, yellow and red, which lie in the ascending order of wavelength in the visible electromagnetic spectrum, *Raphidopalpa foveicollis* attracted more in yellow colour. *Bactsocera strumeta* attracted more in green colour spectrum in general followed by red and yellow. The finding of Lam and Stewart (1969) with reference to insect pest was in a similar trend as stated above. Hence in general as the wavelength increased attraction of *Bactsocera strumeta* decreased.

Research & Development activities conducted in Réunion have given us more effective, cheaper, environmentally friendly, healthy, and sustainable agroecological crop protection. It is fully compatible with the national plan of pesticide reduction in agriculture. The discontinuation of insecticides, such as pyrethroids and organophosphates, on crops has given a healthy new image to agriculture.

REFERENCES

1. Arnyas E., Szabo S., Tothmeresz B. and Varga Z.S. (2005): Light-trap surveys of the Lepidoptera fauna at the Aggtelek National Park. Folia Entomologica Hungarica, 66: 196-206.
2. Carolin Ulbrich, Thomas Kirchartz and Uwe Rau (2008): Enhanced Light-trapping in Solar Cells by Directional Selective Optical Filters. Presented at MRS 2008 Spring Meeting, March 26. pp- 6.
3. Carson R. (1962) Silent spring. The Riverside Press, Cambridge
4. Conrad K.J., Warren M. S., Fox R., Parsons M. and Woiwod I.P. (2006): Rapid declines in common moths underscore a biodiversity crisis. Biological Conservation, 132: 279-291.
5. Costantini C., N.J. Sagnon, E. Sanogo, L. Merzagora and M. Colozzi (1998): Relationship to human biting collections and influence of light and bednet in CDC light-trap catches of West African malaria vectors. Bull. of Entomological Research, 88: 503-511.
6. Debolt J.W., D.L. Tay and R.L. Ost (1975): Light traps effect of modification on catches of several species of Noctuidae and Arctiidae. J. Econ. Entomol., 68: 186-188.
7. Deguine J.P., Ferron P. and Russell D. (2008) Sustainable pest management for cotton production. A review. Agron Sustain Dev 28:113–137.
8. Dhaliwal C.S., Rarnesh Arora, A.K. Dhawan and Balwindar Singh (2000): Intensive agriculture and pest problems: A case study of Punjab. Indian J. Ecol., 27(2): 109-130.
9. Eric L. Blinka, Jack S. Bachelor, J.R. Bradley, and J.W. Van Duvn (2007): Stink bug distribution based on black light trap captures Across North Carolina in relation' to Surrounding agricultural host plant ratios. Beltwide Cotton Conferences, New Orleans, Louisiana, pp. 1711-1712.
10. Lam J.J., Jr. and P.A. Stewart. (1969): Modified traps using black light lamps to capture nocturnal tobacco insects. J. Econ.Entomol., 62: 1379-1382.
11. Narayanasamy P. (1975): Ecology and control of sap feeding insects of the rice crop (Oryza sativa L.). Rice Ent. Newal., 2: 42.
12. Natrajan K. (1975): Studies on the effect of time of sowing and weather factors on the incidence of major insect pest of rice. Unpubl. M.Sc. (Ag.) Dissert, Tamil Nadu Agric. Univ., Coimbatore. 80pp.
13. Pimentel D. (2002) Encyclopedia of pest management. Marcel Dekker, New York
14. Sharma H.C., Sullivan, D.J. and Bhatnagar V.S. (2002): Population dynamics and natural mortality factors of the oriental armyworm, Mythinzna separata. (Lepidoptera: Nociuidae), in south-central India. Crop Protection. 34: 223-229.
15. Velusamy R. and Subramaniam T.R. (1974): Bionomics of the rice leaf roller, *Cnaphalocrocis medinolis* G. (Pyralidae:-Lepidoptera). Indian J. Entomol., 36: 185-189.