Pertanika J. Trop. Agric. Sci. 22(1): 69-72 (1999)

ISSN: 1511-3701

Communication

Effect of Moon Light and Lunar Periodicity on the Attraction of Black Cutworm Moth *Agrotis flammatara* (Schiffer – Mueller) on Light Trap

MISHRA, P.N., M.P SINGH and M.C. NAUTIYAL
Entomology Section, Hill Campus,
G.B. Pant University of Agric. & Tech.,
Ranichauri – 249 199, (Tehri Garhwal), U.P, India

Keywords: ***Agrotis flammatra*** **(Schiffer – Mueller), moon light, lunar periodicity, moon phase**

ABSTRAK

Kajian telah dijalankan terhadap kesan cahaya bulan dan keberkalaan bulan pada ulat pangkas, Agrotis flammatra (Schiffer – Mueller) semasa tempoh aktif (musim hujan) dalam tahun 1997 dan 1998 di Blok Penyelidikan Hortikultur Kampus Hill, Ranichauri (1600m ASL). Dalam perangkap cahaya, mentol elektrik cecair merkuri (160 Watt) telah diguna sebagai sumber cahaya. Ulat pangkas yang tertarik kepada perangkap cahaya semasa tempoh aktif dikumpul dan direkodkan setiap hari. Bilangan ulat pangkas yang terperangkap pada cahaya dikaitkan dengan darjah fasa bulan pada hari-hari yang berlainan mengikut pusingan bulan. Kesimpulan menunjukkan bahawa bilangan ulat pangkas yang tertarik kepada perangkap cahaya sentiasa sangat rendah semasa bulan bersinar penuh. Cerapan telah dibuat terhadap korelasi linear songsang yang sangat signifikan antara darjah fasa bulan dan perangkap cahaya. Secara hitung panjang, respon tarikan ulat pangkas lebih kuat pada fasa menurun berbanding fasa menaik.

ABSTRACT

The effect of moon light and lunar periodicty on the attraction of cutworm moth, Agrotis flammatra (Schiffer – Mueller) was studied during active periods (rainy season) in 1997 and 1998 at Horticulture Research Block of Hill Campus, Ranichauri (1600m ASL). In the light trap, a mercury vapour electric bulb (160 Watt) was used as the source of light. The moths attracted to the light trap during the active period were collected and recorded daily. Number of moths trapped on the light trap was correlated with the degree of moon phase of different days of a lunar cycle. The results indicated thet the number of moths attracted to light trap was consistently very low during moonlit nights around full moon. A highly significant inverse linear correlation between the degree of moon phase and light trap catches was observed. On the average, the attraction response of cutworm moths was stronger in descending phase as compared to ascending phase.

INTRODUCTION

The black cutworm, *Agrotis Flammatra* (Schiffer – Mueller) (Lepidoptera : Noctuidae) is a serious polyphagous insect pest feeding voracioulsy on many cultivated crops in northern states named Hisar and Punjab in India (Arya *et al.* 1995; Bakhetia *et al.* 1995). Kushwaha and Noor (1983) listed six species of genus Agrotis prevalent in India which are polyphagous in nature. Larvae of *Agrotis* sp. cut the tender stem at soil surface in the early growth stage of crop while in the later stage they feed on the foliage (Archer and Musick 1977). *A flammatra* is a predominant specie of black cutworm in the hills of Meghalaya and Himachal Pradesh damaging soybean and potato (Sachan and Gangwar 1980; Mirshra and Agrawal 1989).

In the recent years, with the adoption of non-chemical methods of insect control and more emphasis on the ecological consideration in the Integrated Pest Management (IPM) programme, the use of light trap is becoming more and more popular (Vaishampayan 1982). It is well known that moths of balck cutworms

are photophilic in nature and attracted towards artificial light sources in sizeable number. The size of light catch is not influenced only by the actual population of adults present in environment of insect and their responsiveness (Southwood 1978). The intensity of moon light associated with daily changes in the degree of moon phase in a lunar cycle also affects the attraction of phototactic insects day to day (Vaishampayan and Verma 1982).

No information is available on the impact of moon phase on the attraction of *A. flammatra* moths to light trap. Hence, the present investigation was carried out to know the effect of moon light and lunar periodicity on the light trap catches of *A. flammatra* during the active periods (rainy season) of 1997 and 1998.

MATERIALS AND METHODS

A widely used light trap designed by Yoshimeki (1964) with 160 Watt mercury vapour electric bulb was installed as a source light at Horticulture Research Block, Hill Campus, Ranichauri (1600m ASL). The light trap was installed about one metre above the ground level and operated daily during the active period (rainy season) in 1997 and 1998. The cutworm moths of *A. flammatra* trapped on light trap were collected daily in the morning hours and their numbers were counted. To assess the influence of moon light and lunar periodicity, the position of moon phase for each calender day of observation was worked out form Indian Almanac. The period of lunar cycle of 29.53 days constant was corrected to 30 days cycle for practical purpose. The slight adjustment for these corrections was made as per the suggestion of Vaishampayan and Verma (1982).

The brightness of moon light for each lunar day was measured in terms of degree of moon phase or the relative illuminated area of moon disc. The 360° moon phase was considered full moon and 0° moon phase as no moon with the division of 360° by 15, each day represented a change of 24° increase in ascending phase (24° – 360°) and of lunar cycle. The correlation between the moths trapped and degree of moon phase of four lunar cycles during peak emergence period for two different years was studied by fitting the data to correlation coeffiicnet and regression analysis following Gomez and Gomez (1976).

RESULTS AND DISCUSSION

The brightness of moon light associated with daily change in the degree of moon phase in a lunar cycle affected the phototactic response of mohts of *A. flammatra.* The analysis of the data of light trap catches in both the years showed a highly significant difference in the attraction response of moths between moonlit nights (24° – 360° moon phase) and dark nights (336° – 0° moon phase) (*Fig. 1*). In all the lunar cycles, the attraction response of the mohts was consistently very low during moonlit nights around full moon where only a fraction of the natural population was attracted to the light trap. It is evident from the *Fig. 1* that there was a gradual decrease and increase in the attraction response of moths on various nights in the first half (no moon to full moon) and in the second half (full moon to no moon) of lunar cycles, respectively. The response was clearly associated with the change in the degree of moon phase.

Regression analysis revealed a highly significant inverse linear correlation between the degree of moon phase and light trap catches (*Fig. 1*). The high correlation coefficient (r) indicated a very strong relationship between the two variables i.e. mean per night catch per lunar day and degree of moon phase. The steeper slope in the figure seemed to indicate stronger response in descending moon phase (336° to 0°), as compared to ascending moon phase (24° to 360°) during both the years.

Bowden and Church (1973), Bowden and Morris (1975) and Vaishampayan and Verma (1982) also reported such a lunar effect and deduced that the reduction in the attraction of photophilic insects at around full moon is purely a physical phenomenon. Nag & Nath (1991) recorded the same trend of attraction response in *Agrotis ipsilon* (Hufn.) where more number of moths were trapped during descending moon phase. The results of the present study are in agreement with that of Vaishampayan and Srivastava (1978) who studied the attraction response of *Spodiptera litura* on light trap during 12 lunar cycles in a year and also observed a highly significant inverse correlation between the light trap catches and the degree of moon phase.

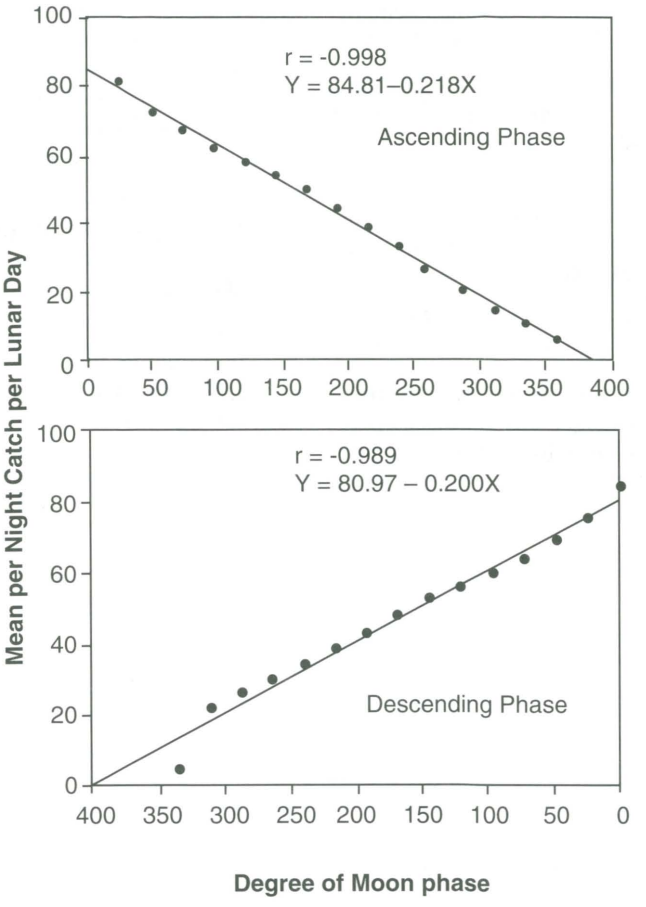

Fig 1. Fresh weights of long bean seedlings (% control 7 days after sowing) grown in soils with varying peat content and treated with varying concentrations of picloram

ACKNOWLEDGEMENTS

The authors are grateful to the Indian Council of Agricultural Research, New Delhi for funding the project. Thanks are also due to the Dean, College of Forestry, Hill Campus, Ranichauri for the facilities.

REFERENCES

ARCHER, T.L. and J.G. MUSICK. 1977. Cutting potential of the black cutworm on field corn. *J. Econ. Entomol.* **70**: 745-746.

ARYA, D.R., P.R. YADAV and H.V. SINGH. 1995. Insect pest complex of sunflower in relation to crop phenology. *Indian J. Ent.* **57(2)**: 141-145.

BAKHETIA, D.R.C., R. ARORA and R. ARORA. 1995. Control of cutworms, Agrotis sp. in sunflower crop in punjab. *J. Oilseeds Res.* **12(2)**: 264-265.

BOWDEN, J. and M. MORRIES. 1973. Influence of moon light on catches of insects in light traps in Africa Part II. The effect on moon phase on light trap catch. *Bull. Ent, Res.* **63**: 129.

BOWDEN, J. and M. MORRIES. 1975. Influence of moon light on catches of insects in light traps in Africa Part III. The effective radius of mercury vapour light traps and the analysis of catches using effective radius. *Bull. Ent. Res.* **65**: 303-308.

GOMEZ, K.A. and A.A. GOMEZ. 1976. *Statistical procedure for agricultural research with emphasis on rice.* p. 123-130. Los Banos, Philippines: The Int. Rice Rex. Institute.

KUSHWAHA, K.S. and A. NOOR. 1983. Soil insects infesting agricultural crops. In *Agricultural Entomology.* P. 36-66. New Delhi: All India Scientific Writers' Society.

MISHRA, S.S. and H.O. AGRAWAL. 1989. Management of potato cutworms. *Seeds and Farms* **15**: 9-10

NAG, A. and P. NATH. 1991. Effect of moon light and lunar cycle on the light trap catches of cutworm, *Agrotis* ipsilon (Hufn) moths. *J. appl. Ent.* **111**: 358-360.

SACHAN, J.N. and S.K. GANGWAR. 1980. Insect pest of soybean in Khasi hills of Meghalya and their control. *Bull. Ent.* **21**:105-112.

SOUTHWOOD, T.R.E. 1978. *Ecological Methods.* P.1-223. London: Methuen.

VAISHAMPAYAN, S.M. 1982. New design of light trap for survey and management of insect pest population in agro and forestry ecosystems. *Indian J. Ent.* **44**: 201-205.

VAISHAMPAYAN, S.M. and S.K. SRIVASTAVA. 1978. Effect of moonphase and lunar cycle on the activity of light trap catch of tobacco caterpillar, *Spodoptera litura* (F). *J. bambay Natl. Hist. Soc.* **75(1)**: 83-97

VAISHAMPAYAN, S.M and R. VERMA. 1982. Influence of moon light and lunar periodicity on the light trap catches of gram pod borer, Heliothis armigera (Hub.) moths. *Indian J. Ent.* **44(3)**: 206-212.

YOSHIMEKI, M. 1964. A summary of the forecasting programme for rice stem borer control in Japan. In *Proc. Symp. Int. Rice Inst.* p. 181-193. Philippines.

(Received 6 August 1997)
(Accepted 1 September 1999)