Journal of Entomology

ISSN 1812-5670

Academic Journals Inc.

www.academicjournals.com

Journal of Entomology 5 (5): 328-333, 2008
ISSN 1812-5670

Temporal Occurrence of *Spodoptera exigua* (Lepidoptera: Noctuidae) in Cameron Highlands, Pahang

A.A. Azidah
Institute of Biological Sciences, Faculty of Science,
University of Malaya, 50603 Kuala Lumpur, Malaysia

Abstract: Adult of *Spodoptera exigua* populations were monitored in Cameron Highlands using pheromone traps between 24 January 2003 and 27 February 2004 in the vegetables farm and between 24 March 2003 and 27 February 2004 in the carnation farm at Kampong Raja. They were captured all the time in the studied areas, although the numbers fluctuated. The highest number of adult catches per trap per day was 5.75 individuals between 6 to 13 June 2003, followed by 5.14 individuals between 23 to 30 May 2003 at the vegetables farm. The lowest number of adult catches per trap per day was 0.25 individuals between 3 to 10 October 2003. Whereas, at the carnation farm, the highest number of adult catches per trap per day was 1.22 individuals between 25 July to 8 August 2003. The lowest number of adult catches per trap per day was 0.06 individuals between 31 October to 7 November 2003 and 30 January to 6 February 2004. In general, capture increased towards the middle part of the year with four capture peaks occurring between April and June 2003 at the vegetables farm. Whilst, at the carnation farm, there were several capture peaks occurred between April and October 2003. Thus, this date could be used as a benchmark to determine when and if population levels are high enough to have the potential to cause economic damage to crops in Cameron Highlands, Pahang.

Key words: *S. exigua*, adult population, pheromone trap

INTRODUCTION

A vast study on adults' population of the beet armyworm, *Spodoptera exigua* (Hübner) has been done in the United States of America (Adamczyk *et al*., 2002; Hendricks *et al*., 1995; Raulston *et al*., 1997), since it has become a serious pest especially on cotton (Hendricks *et al*., 1995; Ruberson *et al*., 1994a,b). However, in Malaysia, such study was scanty (Azidah, 2006; Palasubramaniam *et al*., 2000; Sivapragasam and Syed, 2001). The beet armyworm has been considered an occasional pest associated with hot and dry conditions (Stewart *et al*., 1996). They have found severe beet armyworms outbreaks occur following early seasons with multiple insecticide applications or when it is unusually dry. Eveleen *et al*. (1973) suggested that *S. exigua* abundance is favored by frequent insecticide use; otherwise it is considered a secondary or induced pest in some crops. However, the adults' population was found throughout the whole year in Sekinchan, Selangor as Malaysia is not a seasonal country (Azidah, 2006). Thus, this study was conducted to determine the presence of adult *S. exigua*, particularly the male species and to monitor their population in the studied areas.

MATERIALS AND METHODS

Study Site

Field study was carried out in Kampong Raja, Cameron Highlands, Pahang. Two sites were chosen i.e., a vegetables and a carnation farms. Size of the study area is 3 acres each. Crop which has

been planted in the vegetables farm during the study was English cabbage, French beans, spinach and celery, while in the carnation farm was pink, purple and red variety of carnation flower.

Adult's Trapping

Adult population was monitored by using DELTA trap baited with synthetic beet armyworm sex pheromone impregnated into rubber septa that lured males to the traps. Twelve traps were allocated in the vegetables farm from 24 January 2003 to 18 April 2003, eight traps from 18 April 2003 to 22 August 2003 and nine traps from 22 August 2003 to 27 February 2004. Whilst in the carnation farm, three traps were allocated from 24 March 2003 to 18 April 2003 and seven traps from 18 April 2003 to 27 February 2004. The traps were arranged randomly. They were suspended about 1 m above ground from a 1 reinforcement stick formed in an inverted L shape anchored in the soil. Each trap was separated by about 10 m. Traps were serviced between 6 to 8 days in the vegetables farm and between 6 to 11 days in the carnation farm, but usually every 7 days in both places. During the trap servicing, the adult catches were counted and recorded on site and also the pheromone and plastic layer with sticky glue sprayed on it was changed. Trapping was made from 24 January 2003 until 27 February 2004 in the vegetables farm and from 24 March 2003 until 27 February 2004 in the carnation farm.

Weather records on temperature, relative humidity and rainfall were obtained from the Meteorological Department at Petaling Jaya. They actually gathered the data from a meteorological station at the Cameron Highlands.

Data Analysis

Number of moths caught per trap per day was used as the basic unit for purposes of analyses and graphic illustrations. The data were handled this way because the number of days for trapping the adults was quite varied. This is due to the weather condition. Correlation analyses were performed to determine the relationship between the moth populations and abiotic factors.

RESULTS

Adults of *S. exigua* were captured all the time in the studied areas, although the numbers fluctuated (Fig. 1, 2). A total number of 6105 and 1019 male moths were caught at the vegetables

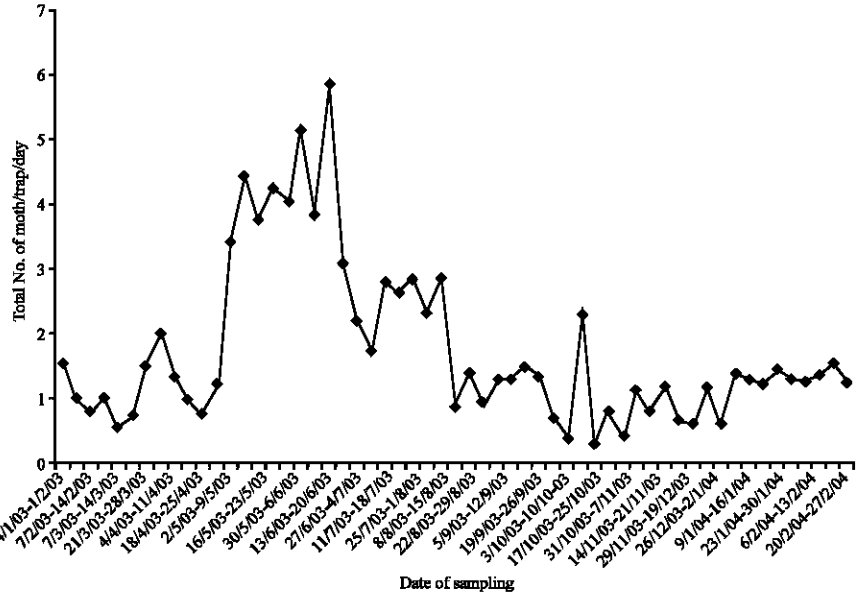

Fig. 1: Adult catches in vegetables farm, Kampong Raja, Cameron Highlands, Pahang

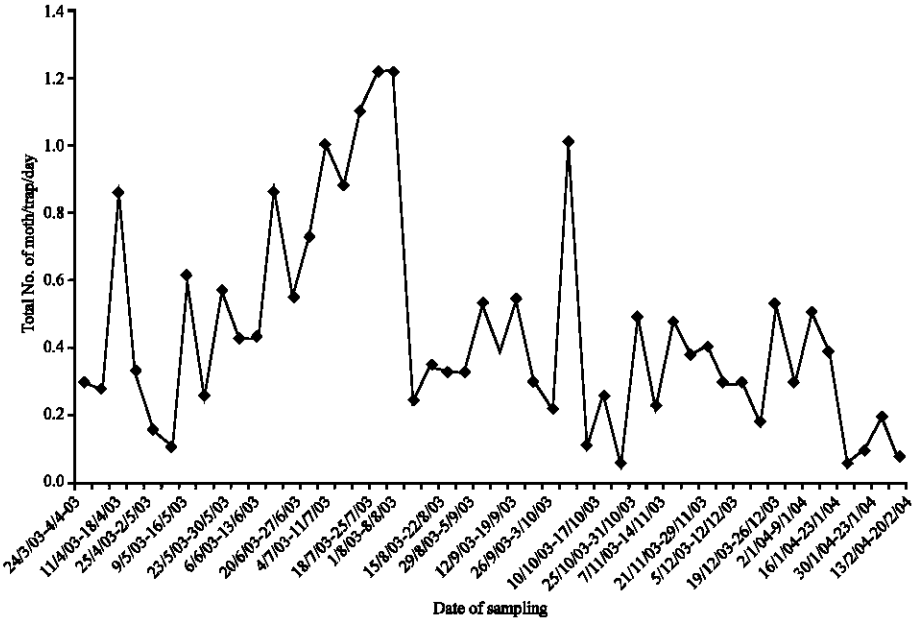

Fig. 2: Adult catches in carnation farm, Kampong Raja, Cameron Highlands, Pahang

and carnation farms throughout the study, respectively. The highest number of adult catches per trap per day was 5.75 individuals between 6 to 13 June 2003, followed by 5.14 individuals between 23 to 30 May 2003 at the vegetables farm. The lowest number of adult catches per trap per day was 0.25 individuals between 3 to 10 October 2003. Whereas, at the carnation farm, the highest number of adult catches per trap per day was 1.22 individuals between 25 July to 8 August 2003. The lowest number of adult catches per trap per day was 0.06 individuals between 31 October to 7 November 2003 and 30 January to 6 February 2004. In general, capture increased towards the middle part of the year with four capture peaks occurring between April and June 2003 at the vegetables farm. Whilst, at the carnation farm, there were several capture peaks occurred between April and October 2003 (Fig. 1, 2). Relatively, the total number of moth caught at the vegetables farm was higher compared to the carnation farm.

The averaged temperature ranges from 16.58 to 19.14°C, relative humidity 84.00 to 97.74% and rainfall 0.00 to 21.25 mm. Generally, the climatic factors were mostly did not influence the moth populations, although there was a moderate correlation between the adult catches with the means of temperature ($r = 0.5097$) at the vegetables farm. However, there were no correlation with the means of relative humidity ($r = 0.2725$) and rainfall ($r = 0.0678$) at the vegetables farm. Whereas, there were no correlation between the adult catches with the means of temperature ($r = 0.0509$), relative humidity ($r = 0.0921$) and rainfall ($r = 0.0616$) at the carnation farm.

DISCUSSION

This study has found that the *S. exigua* adults were present throughout the study, i.e., from the 24 January 2003 until 27 February 2004 in Kampong Raja, Cameron Highlands, Pahang, although the number was lower compared to Sivapragasam and Syed (2001). Their maximum number of male caught in Cameron Highlands was 10.57 per trap per day. While result of this study also was fairly low compared to Azidah (2006), where the highest number of male caught in Sekinchan, Selangor was

6.63 per trap per day. Further, Palasubramaniam *et al.* (2000) caught a higher number of male compared to this study. Their short period survey (i.e., one week in October, 1998) in Batang Kali, Selangor at the onion plantation caught 21.43 individuals of moth per trap per day. Besides Selangor, they also have done some survey in several places in Johor such as in Johor Bahru, Batu Pahat, Kluang and Kota Tinggi for six months (i.e., from July until December, 1997) and in Air Hitam for one week (i.e., in February, 1998), using the pheromone trap. However, the number of catches per trap was not as high as in Batang Kali, i.e., 24.0, 1.0, 5.1, 2.0 and 37.0, respectively. Meanwhile, in Mississippi, USA, Hendricks *et al.* (1995) reported that during the growing season, captures ranged from 2.1 moths to 399.8 per trap per night.

Since Malaysia is not a seasonal country, the abiotic factors were generally found not influencing the moth populations in this study, although the temperature at the vegetables farm was moderately correlated to the number of the adults' moth. This is somewhat similar to Jaipet's (1998) finding. He stated that climatic factors did not have much influence on the moth accept they showed highest negative correlation with maximum humidity. Nevertheless, it was observed that the availability of the host plant is the factor that attracting the moths to the study plot. The same phenomenon was encountered by Raulston *et al.* (1997) in northeastern Mexico. They reported that the increases in trap capture in the fall could have resulted from increased of host availability associated with the onset of the high rainfall season. Thus, the fluctuation in the number of adult catches in this study could be due to the larval host range and their abundance within or between the study areas, where there were other vegetables cultivated area. Similar occurrence was also reported by Adamcyzk *et al.* (2002) in Mississippi. However, during the field study very few larvae were existed or collected, although the pheromone traps catches a considerable number of the adult's moth. This phenomenon is contradicted with the normal situation, where the number of larvae should more or less reflect the number of adult's moth or vice versa. The larvae also were not found at the vicinity of the studied areas. This shows that the adults came from other places. This occurrence is supported by and Feng *et al.* (2003) who stated that the beet armyworm is capable of long distance dispersal of hundreds of miles in relation to weather patterns. Thus, the migration and dispersion of this moth at the Cameron Highlands need further investigation.

On contrary, Smith (1989) has often observed that beet armyworms outbreaks are more serious in the dry years than in wet ones. There are several possible explanations for this phenomenon. The availability of moisture and free water can greatly enhanced the induction and spread of entomopathogen epizootics. Beet armyworms are attacked by various fungal and viral pathogens. The beet armyworms are fairly easily dislodged from plants and heavy rains may knock larvae from plants and drown them (Ruberson *et al.*, 1994b). However, during this study the weather in Kampong Raja, Cameron Highlands was considered moderate i.e., not really dry, in order to cause outbreak of the *S. exigua*. Perhaps, a more prolonged duration of study should be made in the future, in order to determine the relationship between the weather and their population in much detail.

Stewart *et al.* (1996) found that there were relationship between the number of early season insecticide applications and rainfall, but not temperature to percent yield loss caused by beet armyworm. They indicate that the more early season insecticide applications are made and the drier the weather, the greater the risk of beet armyworm outbreaks. Further, Eveleen *et al.* (1973) stated that *S. exigua* on cotton in California is typically a secondary pest, likely to become abundant after insecticide applications against *Lygus hesperus*. While, in this study, the farmers were observed to spray insecticides at least once a week and were more frequent during the raining days. Perhaps, this could be another reason of the moth existence year around in the study plot due to the elimination of its natural enemies by the insecticides. However, their relationship was not certain and further studies are needed to document these patterns more extensively.

This study has shown that the pheromone trap is useful for monitoring and to determine the entry of the *S. exigua* into the studied areas at the Kampong Raja since the existence of its larvae were very low in order to determine their infestation. The used of this trap for these purposes is also complemented with Parker *et al.* (1995) who stated that the pheromone is useful for monitoring and to determine the entry of the pest into the field.

ACKNOWLEDGMENTS

I would like to thank Dr. Lim Guan Soon for his suggestion and initiative of this project. I am grateful to the Institute's support staffs who have been kindly helping me during this project. I also would like to thank the owner of the vegetables and carnation farms for letting me using their farms and the Meteorological Department for the weather records. This work is supported by the Malaysian government research grant, IRPA No. 01-02-03-0695.

REFERENCES

Adamczyk, Jr. J.J., M.R. Williams, J.T. Reed, D.W. Hubbard and D.D. Hardee, 2002. Spatial and temporal occurrence of beet armyworm (Lepidoptera: Noctuidae) moths in Mississippi. Florida Entomol., 86 (3): 229-232.

Azidah, A.A., 2006. Temporal occurrence of *Spodoptera exigua* (Lepidoptera: Noctuidae) in Sekinchan, Selangor. J. Entomol., 3 (4): 336-340.

Eveleen, K.G., R. Van Den Bosch and L.E. Ehler, 1973. Secondary outbreak induction of beet armyworm by experimental insecticide applications in cotton in California. Environ. Entomol., 2 (4): 497-503.

Feng, H.Q., K.M. Wu, D.F. Cheng and Y.Y. Guo, 2003. Radar observations of the autumn migration of the beet armyworm *Spodoptera exigua* (Lepidoptera: Noctuidae) and other moths in Northern China. Bull. Entomol. Res., 93 (2): 115-124.

Hendricks, D.E., D.W. Hubbard and D.D. Hardee, 1995. Occurrence of beet armyworm moths in cotton-growing areas of the lower Mississippi river delta as indicated by numbers caught in pheromone traps from April to November 1994. Proceedings 1995 Beltwide Cotton Production Conference, 2: 802-804.

Jaipet, A., 1998. Population dynamics of vegetable insect pests. AVRDC-ARC Research report 1998, pp: 4. http://www.arc-avrdc.org/html_files/AreewunJaipet.html.

Palasubramaniam, K., R. Thiagarajan and A.B. Othman, 2000. Status of Beet armyworm (*Spodoptera exigua*) in Peninsular Malaysia. In: Proceedings of the Plant Health Seminar, Zakaria, S. (Ed.). Malaysian Plant Protect. Soc., pp: 123-126.

Parker, B.L., N.S. Talekar and M. Skinner, 1995. Field guide: Insets pests of selected vegetables in tropical and subtropical Asia. Publication 94-427. pp: 2. http://www.avrdc.org/LC/tomato/armyworm.html.

Raulston, J.R., D.W. Spurgeon and O. Zamora, 1997. Spatial and temporal patterns of beet armyworm trap captures in Northestern Mexico. Proceedings 1997 Beltwide Cotton Production Conference 2: 1229-1232.

Ruberson, J.R., G.A. Herzog, W.R. Lambert and W.J. Lewis, 1994a. Management of the beet armyworm (Lepidoptera: Noctuidae) in cotton: Role of natural enemies. Florida Entomol., 77(4): 440-453.

Ruberson, J.R., Herzog, G.A., Lambert, W.R. and W.J. Lewis, 1994b. Management of the beet armyworm: Integration of control approaches. Proceedings 1994 Beltwide Cotton Production. Conference, pp: 857-859.

Sivapragasam, A. and A.R. Syed, 2001. The genus *Spodoptera* with emphasis on the ecology and natural enemies of the beet armyworm, *Spodoptera exigua* Hubner in Malaysia. Malaysian Plant Protect. Soc. Newslett., pp: 6-7.

Smith, R.H., 1989. Experiences with beet armyworm control in cotton in 1988. Proceedings Beltwide Cotton Prod. Conference, pp: 273-275.

Stewart, S.D., M.B. Jr. Layton and M.R. Williams, 1996. Occurrence and control of beet armyworm outbreaks in the cotton belt. Proceedings 1996 Beltwide Cotton Prod. Conference, pp: 846-848.