



## SEASONAL INCIDENCE OF CUT WORM, *AGROTIS IPSILON* (HFN.) IN POTATO (*SOLANUM TUBEROSUM*) (L.) RAISED FROM TRUE POTATO SEED

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### ABSTRACT

The seasonal incidence of cutworm, *Agrotis ipsilon* (Hfn) in potato crop raised from TPS was investigated at Assam Agricultural University (A.A.U.), Jorhat during 2005-06 and 2006-07. The study revealed that the TPS nursery beds were completely free from cutworm infestation during the period of experimentation. Incidence of larvae of cutworm initiated from last week of November to 2<sup>nd</sup> week of December and reached its peak (2.2 and 2.6 larvae per/pit during 2005-06 and 2006-07, respectively) in between 2<sup>nd</sup> week of December to 2<sup>nd</sup> week of January. The larval activity continued for more than seventy-five days. The pupal stages were recorded from mid January till the second week of March with a peak population (1.2 pupae per pit) in the second week of February. The first appearance of moths was observed in November and the activity of the moths continued up to December reaching its peak population (11 and 13 nos. of moths/catches during 2005-06 and 2006-07 respectively) in the last week of November. The reemergence of the moths was observed from the 2<sup>nd</sup> week 2005 and 3<sup>rd</sup> week of February 2006 and continued their activity till the end of 2<sup>nd</sup> week of March.

**Key words:** Seasonal incidence, *Agrotis ipsilon*, potato

Potato (*Solanum tuberosum* L.) is an important crop both in developed as well as developing countries. India is the third largest producer of potato in the world but the productivity is very less. Among various factors responsible for low yield, infestation by insect pest is the most important. Cut worm alone is causing 12-40 per cent loss in tuber yield in different parts of India (Saxena and Misra, 1990). This insect also has been reported from almost all potato growing regions of Assam and other states of North East. Therefore, it is essential to develop effective management strategies to manage this insect pest. In view of this, the present investigation on seasonal incidence of cut worm was conducted during 2005-06 and 2006-07.

### MATERIALS AND METHODS

To investigate the seasonal incidence of *A. ipsilon*, field experiments were conducted in the Instructional Cum Research (ICR) Farm of Assam Agricultural University (A.A.U.), Jorhat during 2005-06 and 2006-07. For the estimation of larvae and pupal population, weekly sampling was carried out in the nursery beds of true potato seed (TPS) from the 1<sup>st</sup> week of October till transplanting of the seedlings by digging randomly 5 pits of 20 cm × 20 cm × 20 cm. After transplantation of the seedlings, this population was recorded in the main field of potato crop raised from

TPS (variety HPS 1/13). Adult population was recorded weekly from the first week of October till disappearance from the light trap (Pest-O-flesh) installed at ICR Farm.

### RESULTS AND DISCUSSION

The incidence of cutworm in nursery beds raised for TPS seedlings was studied in both the years from the 1<sup>st</sup> week of October till the transplanting of the seedlings in the main field. The light trap study did not divulge the presence of any moths during the period of investigation. Likewise, the soil sampling conducted in the nursery beds did not reveal the presence of any larvae or pupae of this pest.

**Larval population :** Perusal of data presented in Table 1 and 2 revealed that the larval population was observed in between last week of November to 1<sup>st</sup> week of February. The larval population was continuously present for 75 days in the investigation due to over lapping generation. The population increased gradually and reached its peak 2.2 and 2.6 larvae per/pit during 2<sup>nd</sup> to 3<sup>rd</sup> week of December 2005 to 2<sup>nd</sup> week of January 2006 respectively. These findings corroborate the findings of Parihar and Singh (1992), according to whom, the appearance of *A. ipsilon* occurred during November and the populations increased gradually during the

Table 1. Seasonal incidence of the cutworm on potato during 2005-06

Weeks	No. of larvae/ pit	No. of Pupae/ pit	No. of moths trapped	Temperature (°C)			Relative Humidity (%)		Total Rainfall (mm)	B.S.S.H (hr.)	Evapo-ration (mm)	Wind speed (kmph)	Soil Temperature (°C)		Soil moisture (%)
				Max.	Min.	Ave.	Mor.	Eve.					Mor.	Eve.	
Nov., 05-11	0	0	2	28.7	16.7	22.7	94.0	70.0	0.0	7.5	2.0	1.4	23.9	28.1	18.70
Nov., 12-18	0	0	8	30.8	15.2	23.0	95.0	74.0	0.4	8.1	2.0	1.2	23.3	27.5	19.91
Nov., 19-25	0.2	0	11	25.4	15.4	20.4	96.0	70.0	5.1	5.7	1.7	2.0	21.6	25.5	19.47
Nov., 26 – Dec., 02	0.6	0	9	25.2	12.8	19.0	97.0	63.0	0.0	7.1	1.3	1.2	20.3	26.0	20.78
Dec., 03-09	1.2	0	7	25.4	10.6	18.0	93.0	61.0	0.0	8.2	1.3	1.4	19.5	25.5	18.03
Dec., 10-16	2.2	0	4	25.0	8.9	17.0	95.0	69.0	0.0	8.7	1.6	1.7	17.9	20.5	18.00
Dec., 17-23	1.8	0	4	24.7	9.9	17.3	95.0	72.0	0.0	7.1	1.1	1.6	17.1	19.3	16.57
Dec., 24-31	1.6	0	1	23.9	10.5	17.2	97.0	65.0	0.0	6.7	1.1	1.7	17.2	19.8	16.44
Jan., 01-07	1.0	0	0	24.0	7.7	15.9	91.0	76.0	2.0	7.5	1.2	2.1	16.2	18.9	16.33
Jan., 08-14	0.8	0	0	21.9	9.6	15.8	93.0	76.0	0.0	4.9	1.0	1.6	16.1	17.8	16.53
Jan., 15-21	0.6	0.2	0	20.6	11.6	16.1	96.0	81.0	2.5	2.2	0.9	1.3	16.6	18.5	18.23
Jan., 22-28	0.6	0.8	0	23.6	10.6	17.1	93.0	74.0	0.0	5.1	1.1	1.7	17.4	19.4	17.22
Jan., 29 – Feb., 04	0.2	0.8	0	27.0	10.2	18.6	92.0	60.0	0.0	8.9	1.8	1.2	17.2	19.5	17.67
Feb., 05-11	0	1.0	0	27.0	12.1	19.6	93.0	66.0	3.7	8.4	1.7	2.1	16.6	19.9	20.15
Feb., 12-18	0	1.2	2	23.5	15.2	19.4	89.0	76.0	28.4	4.7	1.5	3.1	18.9	18.9	16.65
Feb., 19-25	0	0.8	4	23.0	18.3	20.7	93.0	83.0	24.2	1.4	1.2	3.1	20.0	21.3	20.25
Feb., 26 – Mar., 04	0	0.2	9	27.0	16.4	21.7	94.0	74.0	0.0	6.3	1.7	3.3	21.2	17.9	19.12
Mar., 05-11	0	0.2	8	24.8	11.7	18.3	90.0	79.0	0.0	6.7	2.2	1.8	27.2	22.8	21.21
Mar., 12-18	0	0.0	3	27.0	17.4	22.7	92.0	81.0	20.5	8.0	2.2	1.2	24.2	22.0	19.16

Max. = Maximum, Min. = Minimum, Ave. = Average, Mor. = Morning, Eve. = Evening, B.S.S.H. = Bright sunshine hours

Table 2. Seasonal incidence of the cutworm on potato during 2006-07

Weeks	No. of larvae/ pit	No. of Pupae/ pit	No. of moths trapped	Temperature (°C)			Relative Humidity (%)		Total Rainfall (mm)	B.S.S.H (hr.)	Evapo-ration (mm)	Wind speed (kmph)	Soil Temperature (°C)		Soil moisture (%)
				Max.	Min.	Ave.	Mor.	Eve.					Mor.	Eve.	
Nov., 12-18	0	0	3	28.4	16.9	22.7	94	72	2.8	7.7	1.5	1.8	23.3	24.8	17.7
Nov., 19-25	0	0	8	23.1	17.1	20.1	95	86	11.7	1.6	1.1	2.1	22.1	22.8	17.7
Nov., 26 - Dec., 02	0	0	13	22.9	11.3	17.1	97	77	0	4.7	1.0	1.6	19.5	21.2	18.9
Dec., 03-09	0	0	10	25.1	11.1	18.1	97	70	0	7.3	1.2	1.1	18.4	20.9	19.5
Dec., 10-16	0.8	0	7	24.5	12.1	18.3	99	76	3.1	4.2	1.1	1.5	17.8	20.0	19.1
Dec., 17-23	1.2	0	3	25.6	11.5	18.6	97	69	0	8.0	1.2	1.5	17.9	20.7	16.6
Dec., 24-31	1.8	0	0	23.8	13.4	18.6	97	71	8.3	4.9	1.2	1.5	18.0	19.5	17.1
Jan., 01-07	2.2	0	0	21.4	11.9	16.7	98	77	0	1.9	0.9	1.9	17.4	18.5	16.6
Jan., 08-14	2.6	0	0	23.7	10.8	17.3	98	75	0.1	6.1	1.1	1.3	17.3	18.7	16.4
Jan., 15-21	1.6	0	0	18.6	7.5	13.1	99	75	0	5.5	1.0	1.5	16.7	17.2	17.0
Jan., 22-28	1.2	0.2	0	22.9	8.5	15.7	83	69	0	6.6	1.3	1.3	15.5	18.1	17.1
Jan., 29 - Feb., 04	1.0	0.8	0	23.7	12.0	17.9	97	75	2.9	5.3	1.3	1.6	17.0	19.2	15.9
Feb., 05-11	0.8	1.0	0	21.0	12.7	16.9	97	75	21.2	3.8	1.3	2.7	17.5	19.1	20.3
Feb., 12-18	0.6	1.2	0	21.5	12.5	17.0	97	81	3.9	3.3	1.7	3.3	17.7	18.9	19.4
Feb., 19-25	0.4	0.8	2	25.5	10.6	18.1	93	63	0	8.1	2.3	1.2	17.5	21.0	20.2
Feb., 26 - Mar., 04	0	0.4	5	24.5	14.2	19.4	96	72	40.1	4.7	2.1	2.6	19	20.9	22.2
Mar., 05-11	0	0.2	11	25.7	15.1	20.4	95	70	1.1	7.1	2.1	2.1	20.1	22.3	18.7
Mar., 12-18	0	0	2	28.7	15.6	22.2	91	66	0	8.2	2.9	3.1	21.0	23.0	17.7

Max. = Maximum, Min. = Minimum, Ave. = Average, Mor. = Morning, Eve. = Evening, B.S.S.H. = Bright sunshine hours

subsequent weeks. The present findings are in line of conformity with the findings of Zaz (1999), who observed that the activity of the larvae of *Agrotis* spp. was high from July to December and peaked during November to December. A decreasing trend of the mean larval population of *A. ipsilon* after reaching the peak as well as the complete disappearance of the larval population of the pest from the field from March onwards was also observed in the present investigation. It may be due to the decrease in availability of hosts in seedling stage as reported by Giraddi *et al.* (1997). Ogaard and Esbjerg (1993) reported that the decreasing trend of larval population of *A. segetum* was due to its tendency of hibernation in cold as well as in mild winters.

**Pupal population :** The data indicated (Table 1 & 2) that the pupal population was recorded from mid January onwards to 2<sup>nd</sup> week of March in 2005 and from 3<sup>rd</sup> week of January to 2<sup>nd</sup> week of March 2006 (Table 1 & 2). The pupal population increased steadily and reached its peak (1.2 pupae/pit) in the 3<sup>rd</sup> week of February 2005 and 2006. Minimum population (0.2 pupa/pit) was recorded in the 2<sup>nd</sup> week of March. The present finding is in conformity with Zidan *et al.* (1998), according to whom, the density of the larvae and pupae of this pest peaked during winter and were lowest during summer.

**Moth population :** The data recorded on the trapped number of adults (Table 1 & 2) showed that adult emergence started from first week of November 2005 and

2006 and observed till 4<sup>th</sup> week of December 2005 and 3<sup>rd</sup> week of December 2006 respectively. It is also evident from the table that no adult emergence was observed from 1<sup>st</sup> week of January to 2<sup>nd</sup> week of February 2005 and 4<sup>th</sup> week of December to 3<sup>rd</sup> week of February 2006. Adult population was again recorded from 3<sup>rd</sup> week of February to 3<sup>rd</sup> week of March during the investigation. First peak population (11 and 13 adults/trap) was recorded during 4<sup>th</sup> week of November 2005 and 2006 respectively, whereas 2<sup>nd</sup> peak (9 and 11 adults/trap) was monitored during 1<sup>st</sup> week of March 2005 and 2<sup>nd</sup> week of March 2006, respectively. The present findings are in conformity with the findings of Vaishampayan and Vaishampayan (1995), who reported that the activity of *A. ipsilon* remained high during December to February and part of March in Uttar Pradesh, which was the main active period of this pest in central and southern parts of India.

**Correlation study :** In the present study an attempt was also made to see the effect of various weather parameters *viz.*, temperature (maximum, minimum and average), relative humidity (morning and evening), total rainfall, wind speed, bright sunshine hours, evaporation, soil temperature (morning and evening) and soil moisture on the population of different stages of *A. ipsilon*. In case of incidence of larvae of *A. ipsilon*, it was observed that among all the weather parameters, ambient temperature, evaporation, soil temperature and soil moisture showed negatively significant correlation (at P=0.05) with the mean

**Table 3. Correlation study of larval, pupal and adult population of *A. ipsilon* with different meteorological parameters Jorhat during 2005-06 & 2006-07**

Meteorological parameters	Correlation coefficients (r)					
	Larval Population		Pupal Population		Moth Population	
	2005-06	2006-07	2005-06	2006-07	2005-06	2006-07
Maximum temperature (°C)	-0.4027**	-0.6059**	-0.2409 <sup>NS</sup>	-0.3955 <sup>NS</sup>	-0.0158 <sup>NS</sup>	-0.1762 <sup>NS</sup>
Minimum temperature (°C)	-0.6771**	-0.5992**	-0.1530 <sup>NS</sup>	-0.2947 <sup>NS</sup>	-0.1370 <sup>NS</sup>	-0.1968 <sup>NS</sup>
Average temperature (°C)	-0.6670**	-0.6241**	-0.0234 <sup>NS</sup>	-0.3532 <sup>NS</sup>	0.3212 <sup>NS</sup>	-0.1940 <sup>NS</sup>
Morning Relative Humidity (%)	0.3170 <sup>NS</sup>	0.3023 <sup>NS</sup>	0.3913 <sup>NS</sup>	0.0813 <sup>NS</sup>	0.2172 <sup>NS</sup>	0.2118 <sup>NS</sup>
Evening Relative Humidity (%)	-0.3453 <sup>NS</sup>	-0.1164 <sup>NS</sup>	-0.0447 <sup>NS</sup>	-0.0933 <sup>NS</sup>	-0.1915 <sup>NS</sup>	-0.0915 <sup>NS</sup>
Total rainfall (mm)	-0.3655 <sup>NS</sup>	-0.2543 <sup>NS</sup>	0.2929 <sup>NS</sup>	0.0135 <sup>NS</sup>	-0.1643 <sup>NS</sup>	-0.1333 <sup>NS</sup>
Bright sunshine hour (hours)	-0.2347 <sup>NS</sup>	-0.2454 <sup>NS</sup>	-0.1778 <sup>NS</sup>	-0.1875 <sup>NS</sup>	-0.1685 <sup>NS</sup>	-0.0463 <sup>NS</sup>
Evaporation (mm)	-0.5687**	-0.5647**	0.1620 <sup>NS</sup>	0.0801 <sup>NS</sup>	-0.0687 <sup>NS</sup>	-0.1658 <sup>NS</sup>
Wind speed (kmph)	-0.3215 <sup>NS</sup>	-0.2108 <sup>NS</sup>	0.3446 <sup>NS</sup>	0.3556 <sup>NS</sup>	-0.0322 <sup>NS</sup>	-0.0503 <sup>NS</sup>
Morning soil temperature (°C)	-0.5870**	-0.6250**	-0.410**	-0.3980**	-0.0546 <sup>NS</sup>	-0.1610 <sup>NS</sup>
Evening Soil temperature (°C)	-0.4100**	-0.6670**	-0.3780 <sup>NS</sup>	-0.3720 <sup>NS</sup>	-0.0368 <sup>NS</sup>	-0.1380 <sup>NS</sup>
Soil moisture (%)	-0.5800**	-0.4840**	-0.1590 <sup>NS</sup>	-0.1340 <sup>NS</sup>	0.1694 <sup>NS</sup>	0.0780 <sup>NS</sup>

\*\* Significant at 5 per cent probability level  
NS = Non significant

larval population during three period of investigation whereas the rest of the parameters were non significant (Table 3). These findings are in general agreement with the findings of Giraddi *et al.* (1997) who reported that the evening relative humidity, minimum temperature and wind velocity significantly affected the activity of *Agrotis* spp. The sensitivity of early instar larvae of *A. segetum* to soil moisture was also reported by Esbjerg (1989).

Correlation of different weather parameters with the pupal population of *A. ipsilon* showed that none of the parameters except morning soil temperature gave significant correlation with the incidence of pupae (Table 3). Parihar and Singh (1992), also reported similar results that soil temperature influenced population of *A. ipsilon*. The correlation study worked out between the weekly light trap catches of moths of *A. ipsilon* and the different weather parameters did not exhibit any significant relationship in the present investigation (Table 3).

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