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Short Communication

Population Dynamics of *Hymenia recurvalis* Fab., a Serious Pest of Crop *Amaranthus Caudatus* L. at Rani Chauri in Uttarakhand for One Season under Field Condition

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***Key words*:** *Hymenia recurvalis*, Larval and adult moth population, *Amaranthus caudatus* L., Light trap method, Population dynamics

Amaranth is a crop cultivated for both grains and greens. It is cosmopolitan in its origin [1]. Amaranth is originated from Central and South America [2]. Though it is the cultural crop grown in the hills and also known as a cash crop for the farmers of hills. Amaranth grains are good source of nutrients and its dry basses contains more than 15% of proteins [3]. It is also served to the children under malnutrition. It is the best way of fueling up on the season's best offering. Amaranth leaves come in a few varieties from purple and red to green or gold in colour and are found in the foothills of the Himalayas to the coasts of south India. Some time ago seeds of amaranths is enlisted under superfood segment because of its high health benefits [4]. One of the biggest challenges in raising the productivity of crop *Amaranthus caudatus* is its vulnerability towards insect-pest attack and incurred huge loss to the crop [5]. The larvae are more destructive than adult moths as they voraciously feed upon the green matter of the leaves leaving behind the vein and mid-rib. Continuous attack by the larvae impact the yield and did skeletonization of the plant [6]. The insect-pest population is mainly governed by the meteorological factors upon interaction with both biotic and abiotic factors [7]. The idea of insect-pest population helps in determining the destructive phase and index of loss to the crop.

Population dynamics of *Hymenia recurvalis* Fab. at the experimental site Rani chauri was found mainly on *Amaranthus caudatus* L., the host plant. The maximum population of *Hymenia recurvalis* Fab. larvae were found in the 34th standard week and maximum population of adult moth of *Hymenia recurvalis* Fab. was found in the 39th standard week of the year 2016. Correlation co-efficient between the population of adult moth and larvae of *Hymenia recurvalis* Fab. with abiotic factors like max.-min. temperature and relative humidity showed significant positive correlation and with abiotic factor like rainfall show negative correlation with the population of adult moth and larvae at Rani Chauri. *Amaranthus caudatus* L. is the local crop of Uttarakhand and one among the most important 36 crops with high nutritious value. The outcome of the research will help for the better management of *Hymenia recurvalis* fab. The *Amaranthus caudatus* L. is commonly known as *Chauli* in Uttarakhand. It is an annual herb cultivated in the warm and rainy season of the year. It is known common crop of the hills cultivated to eliminating the economic risk to the farmers but the quality and quantity production of the crop is the serious matter of concern. As it is affected by various insect-pest throughout the year during crop season and one among the various insect pest, *Hymenia recurvalis* Fab. have been reported to reduce the crop yield and regarded as the serious pest of the crop now a days.

Several visits were made at the experimental site Rani Chauri till the harvesting of the crop to record the infestation by insect pest for the study of population dynamics of larvae and adult moths of *Hymenia recurvalis* Fab. from the field under natural conditions. At the experimental site the larval population is observed by using two methods Ground cloth shake method and visual count method. The population of adult moths of *Hymenia recurvalis* Fab. was observed by following Light trap method that would be installed at the experimental site.

The appearance of the adult moth of *Hymenia recurvalis* Fab. was first of all recorded during 28th Standard week i.e., in the third week of July 2016 during crop season. Initial average population of adult moth to be recorded from 11 July- 17 July 2016 with mean value 6.98 adults per week thereafter, an increasing trend was recorded for adult moth population from the installed light trap reaching maximum average value 18.24 adult moths on the 39th standard week i.e., 26th September to 02th October 2016 and then gradually decreases for the subsequent dates of observations during collection and it has been found that the population of *Hymenia recurvalis* Fab. were completely disappeared from the field of *Amaranthus caudatus* L. on 44th Standard week i.e., in the month of November 2016 [8]. Maximum population of *Hymenia recurvalis* Fab. in the month of September to October [5]. Occurrence of 5 larval instar stages in the life cycle of *Hymenia recurvalis* Fab [9]. The newly hatched larvae start feeding upon the sap content of the leaves leaving behind the mid rib and veins, hence the photosynthetic machinery turned to be very low showing serious impacts

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upon crop quality [10]. The larval incidence was first of all recorded on the 28th standard week from 11- 17 July 2016 with average mean value of 5.99 larvae under maximum temperature 23.54°C, minimum temperature 16.14°C Relative humidity 88.24% and rainfall 4.62 mm [11]. The peak of maximum larval population was recorded on the 34th Standard week under maximum temperature 23.54°C, minimum temperature 16.14°C, Relative humidity 92.45%, and Rainfall 7.32 mm [12]. Correlation co-efficient of population of adult moths of *Hymenia recurvalis* Fab with maximum average temperature showed significant positive correlation (r= 0.42). Minimum temperature, relative humidity also showed positive correlation with adult moths of *Hymenia recurvalis* Fab. with average mean values (r= 0.37, r= 0.24) and show negative correlation with the rainfall (r= -0.15) [13].

Table 1 Population dynamics of *Hymenia recurvalis* Fab. larvae and adults in relation to temperature, relative humidity and rainfall

Standard week No.	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	No. of moths trapped /night	No. of larvae trapped /night
	Min.	Max.				
25	17.62	22.28	82.84	4.2	0	0
26	18.62	23.28	83.84	5.31	0	0
27	19.8	24.88	87.31	8.77	0	0
28	16.46	23.95	88.24	4.62	6.98	5.99
29	16.62	24.65	87.45	6.2	8.45	6.87
30	17.71	24.92	89.24	13.38	7.88	8.8
31	16.96	23.9	93.67	13.7	10.31	11.51
32	18.22	23.95	91.53	11.99	13.6	16.56
33	16.99	12.6	93.74	8.92	10.81	14.63
34	16.14	23.54	92.45	7.32	10.81	21.52
35	16.62	25.54	89.52	1.46	11.88	19.4
36	15.99	24.32	89.81	2.88	12.93	17.79
37	16.11	23.18	91.94	9.43	13.38	16.61
38	14.88	23.33	91.81	3.58	15.67	13.33
39	13.88	22.92	88.31	9.9	18.24	6.12
40	12.14	23.17	72.88	2.61	15.74	5.82
41	9.7	20.79	82.17	7.21	11.38	4.29
42	9.16	21.87	65.99	0	8.45	3.38
43	7.93	20.36	65.45	0.78	2.31	0
44	7.18	19.91	70.1	0	0	0
45	6.61	19.63	63.97	0	0	0
46	5.96	16.65	80.88	1.15	0	0
47	5.17	17.56	70.67	0.18	0	0

Correlation matrix	
Hymenia recurvalis Fab. adults and maximum average temperature	0.42198533
Hymenia recurvalis Fab. larvae and maximum average temperature	0.2762339
Hymenia recurvalis Fab. adults and minimum temperature	0.37397561
Hymenia recurvalis Fab. larvae and minimum temperature	0.41031875
Hymenia recurvalis Fab. adults and relative humidity	0.24828504
Hymenia recurvalis Fab. larvae and relative humidity	0.47301407
Hymenia recurvalis Fab. adults and rainfall	-0.15680442
Hymenia recurvalis Fab. larvae and rainfall	-0.41475845

SUMMARY

The intent of this paper is to put emphasis on the population dynamics of adult moths and larvae of *Hymenia recurvalis* Fab. pest of the crop *Amaranthus caudatus* L. as several attacks of pest *Hymenia recurvalis* Fab. on the crop damage the plant and incurred huge economic loss to the farmers. Severe attack results in drying up of crop within very short period of time leading to the failure of photosynthetic machinery hence poor yield of grains. Biotic potential is regarded as the qualitative expression of the insect-pest that help to maintain in an environment. The knowledge of insect-pest in their population build-up is very helpful in deciding the extent of damage to the crop. Insect-pest show variable pattern of incidence based upon Agro-climatic conditions. Variable climatic factors play an important role in determining the incidence of the pest. Hence the investigation on *Hymenia recurvalis* Fab. in particular area provides an idea regarding the spreading of insect-pest and their peak activity period which help in developing the effective management strategies particularly in Uttarakhand state.

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