

OBSERVATIONS ON THE SEASONAL VARIATIONS IN POPULATION OF THREE SPECIES OF GRASSHOPPERS (ORTHOPTERA: ACRIDIDAE) OF KASHMIR HIMALAYA

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Abstract: Observations on the seasonal variations in population of nymphs and adults of three species of grasshoppers viz., *Sphingonotus longipennis* Saussure, *Oedaleus abruptus* (Thunberg) and *Acrida exaltata* (Walker) were carried out in the field during the different months of the year 2005-2006. During the field observations it was found that the population of hoppers and adults was abundant during the months of April-August and September – October respectively in the Kashmir Valley. The mating was found during the months of September and October soon after mating eggs were laid, which remained under diapause during winter months, they hatched on the onset of spring season. The hoppers of *Acrida exaltata* appeared first after the winter months followed by *Sphingonotus longipennis* and *Oedaleus abruptus* respectively.

Keywords: Seasonal Population variations, *Acrida exaltata*, *Sphingonotus longipennis*, *Oedaleus abruptus*, Kashmir Himalaya.

INTRODUCTION

Grasshopper populations are greatly influenced by the climate. A long, warm autumn favours egg laying by the females. In many areas which had high population in the previous year may face local outbreaks. The damage caused by the grasshopper species is directly proportional to their population, essential for farm managers to keep watch on the population of grasshopper species. It also acts as biological indicator of environmental changes in the area. Keeping in view its significance, the present study was undertaken to observe the effect of

temperature and humidity on population of three species of grasshoppers in the Kashmir valley.

MATERIALS AND METHODS

To observe the population dynamics of three species of grasshoppers viz. *Sphingonotus longipennis*, *Acrida exaltata* and *Oedaleus abruptus*, field observations were taken from January to December fortnightly. The samples of hoppers and adults were obtained by net sweeping method. The collections were made for an hour from the specific areas selected in the districts of Kupwara (Handwara) and Srinagar (Mirgund). The collection was always made in the afternoon. Meteorological records were obtained from the Meteorological department of India for Kupwara and Srinagar stations. The number of individuals collected fortnightly in each month (January to December) are shown in the tables I, II and III for *Sphingonotus longipennis*, *Oedaleus abruptus* and *Acrida exaltata* respectively.

RESULTS AND DISCUSSION

During the field observations, it was found the hoppers and adults were almost abundant during summer and autumn season. Hoppers were found in abundant during mid summer and adults during late summer and early autumn. Their abundance is due to Availability of optimum ecological conditions particularly temperature, relative humidity and food for their development and other biological activities. As is evident from the tables I, II and III, the populations of both hoppers and adults were recorded zero during the months of January, February and March for all the three species studied. This is due to non-availability of favorable climatic conditions like temperature and due to lack of food. Copulation was mostly observed in September and October in all the three species. Soon after copulation, egg laying occurs which due to the low temperature during winter months, undergo diapause, so there is no movement of these grasshoppers during winter months. With gradual increase in temperature, hatching takes place during spring season. The first hopper of *Acrida*

exaltata was collected during the first fortnight of April, *Sphingonotus longipennis* during second fortnight of April and *Oedaleus abruptus* during second fortnight of May. These results are in contrary to the results of Khan and Aziz (1973) and Susanta and Halder (1998) who recorded the occurrence of hoppers throughout the year for *Oedaleus abruptus* and *Acrida exaltata* respectively. The number of hoppers gradually increased with increase in temperature and were most abundant during the summer months. The maximum number of hoppers viz., 118, 89 and 105 of *Sphingonotus longipennis*, *Oedaleus abruptus* and *Acrida exaltata* respectively were collected during months of July, when the maximum temperature of Kupwara study site and Srinagar study site was 34.5 and 35.5 respectively. These results are not in conformity with the results of Khan and Aziz (1973) for *Oedaleus abruptus*, who collect the record number of hoppers during the month of August, 1970 and 1971. But for *Acrida exaltata* are in conformity with the results of Susanta and Halder (1998) who recorded the maximum population of hoppers in the months of May and July, 1991 and April and July, 1992. After the month of August no hopper of any species was collected. This can be correlated with the metamorphosis of hoppers into adults and lack of second generation hoppers as there is single generation of these grasshopper species in Kashmir. Susanta and Halder (1998) did not collect nymph of *Acrida exaltata* in the months of November and February, 1992. Khan and Aziz (1973), however recorded the availability of nymphs in the field throughout the year 1970, but could not collect any nymph during the second fortnight of December, 1971.

The first adult of *Sphingonotus longipennis* was collected during first fortnight of June, *Oedaleus abruptus* and *Acrida exaltata* during the second fortnight of July. These results are again not in conformity with the observations of Khan and Aziz (1973) *Oedaleus abruptus* who adults were found in the field throughout the year in 1971-1972. Susanta and Halder (1998) on the basis their observation for *Acrida exaltata* recorded the first appearance of adults in the month of April, 1991. With the gradual increase in temperature, relative humidity and availability of food material their population increased gradually and reached to the maximum level in September, when record number of individuals 127 of *Sphingonotus longipennis*, 139 *Oedaleus abruptus* and 119 of *Acrida exaltata* were

collected. Khan and Aziz (1973) however recorded maximum number of adults in October of *Oedaleus abruptus* in the year 1970-1971.

Table I: Seasonal abundance of hoppers and adults of *Sphingonotus longipennis* collected fortnightly at a site in district Kupwara.

Year	Temperature (°C)			Relative Humidity (% age)						Collected Fortnightly			
				At 0830 hrs. (IST)			At 1730 hrs. (IST)						
	Max.	Mini.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Hoppers	Total	Adults	Total
Jan	9.6	-4.0	2.8	097	090	93.5	097	074	85.5	-		-	
	11.5	-4.5	3.5	097	089	93	097	066	81.5	-	-	-	-
Feb	10.4	-3.5	3.45	097	090	93.5	097	073	85	-		-	
	11.3	-2.6	4.35	097	093	95	097	069	83	-	-	-	-
Mar	20.8	1.0	10.9	094	079	86.5	094	055	74.5	-		-	
	20.6	1.6	11.1	097	075	86	097	057	77	-	-	-	-
Apr	23.2	1.5	12.35	095	069	82	095	050	72.5	-		-	
	27.6	4.4	16	095	070	82.5	095	050	72.5	5	05	-	-
May	26.6	6.3	16.45	087	073	80	079	052	65.5	8		-	
	25.0	7.0	16	095	073	84	098	056	77	11	19	-	-
Jun	29.6	8.5	19	089	074	81.5	086	047	66.5	17		03	
	36.9	12.6	24.75	086	073	79.5	061	035	48	51	68	03	06
Jul	34.5	13.0	23.75	090	074	82	083	046	64.5	51		05	
	34.0	15.4	24.7	082	073	77.5	075	049	62	67	118	10	15
Aug	34.8	14.2	24.5	094	077	85.5	073	047	60	23		13	
	34.0	12.9	23.45	088	077	82.5	057	049	53	08	31	18	31
Sep	34.4	11.1	22.75	092	079	85.5	081	050	65.5	-		55	
	31.7	9.6	20.65	088	084	86	073	051	62	-		72	127
Oct	29.9	6.2	18.05	089	083	86	080	062	71	-		68	
	23.0	-0.4	11.3	093	082	87.5	095	060	77.5	-		29	97
Nov	20.6	-1.8	9.4	092	083	87.5	088	064	76	-		23	
	17.6	-2.7	7.45	097	084	90.5	097	066	81.5	-		14	37
Dec	11.8	-5.2	3.3	096	093	94.5	081	049	65	-		05	
	10.5	-5.7	2.4	096	092	94	083	070	76.5	-		03	08

Table II: Seasonal abundance of hoppers and adults of *Acrida exaltata* collected fortnightly in different months at a site in district Kupwara (Kashmir).

Year	Temperature (°C)			Relative Humidity (% age)						Collected Fortnightly			
				At 0830 hrs. (IST)			At 1730 hrs. (IST)						
	Max.	Mini.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Hoppers	Total	Adults	Total
Jan	9.6	-4.0	2.8	097	090	93.5	097	074	85.5	-		-	
	11.5	-4.5	3.5	097	089	93	097	066	81.5	-	-	-	-
Feb	10.4	-3.5	3.45	097	090	93.5	097	073	85	-		-	
	11.3	-2.6	4.35	097	093	95	097	069	83	-	-	-	-
Mar	20.8	1.0	10.9	094	079	86.5	094	055	74.5	-		-	
	20.6	1.6	11.1	097	075	86	097	057	77	-	-	-	-
Apr	23.2	1.5	12.35	095	069	82	095	050	72.5	05		-	
	27.6	4.4	16	095	070	82.5	095	050	72.5	09	14	-	-
May	26.6	6.3	16.45	087	073	80	079	052	65.5	11		-	
	25.0	7.0	16	095	073	84	098	056	77	17	28	-	-
Jun	29.6	8.5	19	089	074	81.5	086	047	66.5	26		-	-
	36.9	12.6	24.75	086	073	79.5	061	035	48	27	53	-	-
Jul	34.5	13.0	23.75	090	074	82	083	046	64.5	46		-	-
	34.0	15.4	24.7	082	073	77.5	075	049	62	59	105	17	17
Aug	34.8	14.2	24.5	094	077	85.5	073	047	60	61		43	
	34.0	12.9	23.45	088	077	82.5	057	049	53	32	93	69	112
Sep	34.4	11.1	22.75	092	079	85.5	081	050	65.5	-		61	
	31.7	9.6	20.65	088	084	86	073	051	62	-		58	119
Oct	29.9	6.2	18.05	089	083	86	080	062	71	-		42	
	23.0	-0.4	11.3	093	082	87.5	095	060	77.5	-		23	65
Nov	20.6	-1.8	9.4	092	083	87.5	088	064	76	-		14	
	17.6	-2.7	7.45	097	084	90.5	097	066	81.5	-		10	24
Dec	11.8	-5.2	3.3	096	093	94.5	081	049	65	-		06	
	10.5	-5.7	2.4	096	092	94	083	070	76.5	-		05	11

Table III: Seasonal abundance of hoppers and adults of *Oedalues* abruptly collected fortnightly in different months at a site in district Kupwara (Kashmir).

Year	Temperature (°C)			Relative Humidity (% age)						Collected Fortnightly			
				At 0830 hrs. (IST)			At 1730 hrs. (IST)						
	Max.	Mini.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Hoppers	Total	Ad ults	Total
Jan	11.5	-3.6	3.95	100	76	89.2	94	53	68.34	-		-	
	11.2	-3.8	3.7	97	77	94.8	93	41	70.2	-	-	-	-
Feb	12.7	-0.4	6.15	97	81	91.94	94	50	79.54	-		-	
	10.7	-0.7	5.0	97	82	89.93	97	51	76.47	-	-	-	-
Mar	21.2	2.0	11.6	95	68	82.74	83	42	60.47	-		-	
	19.1	2.7	10.9	93	48	79.25	91	27	62.13	-	-	-	-
Apr	23.1	2.2	12.65	79	30	58.74	68	20	34.94	-		-	
	26.2	4.6	15.4	93	43	66.14	69	22	46.07	-	-	-	-
May	25.8	7.4	16.6	84	62	70.14	75	37	53.54	-	-	-	
	24.9	7.6	16.25	89	64	78.75	83	41	62.38	13	13	-	-
Jun	29.7	8.9	19.3	93	54	65.34	65	27	46.87	17		-	-
	36.5	14.0	25.25	79	47	61.87	60	28	41.54	20	30	-	-
Jul	35.5	14.0	24.75	92	56	78.2	91	52	63.14	40		-	-
	32.0	16.4	24.2	88	66	75.13	77	45	57.5	49	89	08	08
Aug	33.6	15.2	24.4	86	63	73.87	75	42	54	25		11	
	32.9	10.5	21.7	90	59	70.38	60	39	46.32	11	36	37	48
Sep	33.4	11.1	22.25	82	63	74.74	78	38	50.07	-		62	
	30.8	8.8	19.8	90	65	73.94	57	43	49.87	-	-	79	139
Oct	29.1	6.2	17.65	91	68	76.8	79	39	53.8	-		60	
	22.6	0.0	11.3	94	71	82.38	90	47	58.57	-	-	35	95
Nov	20.4	-1.8	9.3	93	73	82.34	81	41	55.47	-		26	
	16.9	-4.3	6.3	94	69	81.00	89	38	55.67	-	-	11	37
Dec	12.3	-6.3	3.0	96	80	91.47	76	56	66.07	-		09	
	13.6	-5.8	3.9	96	48	87.50	70	53	62.88	-	-	00	09

Susanta and Halder (1998) recorded maximum number in July, 1991. After the month of September population of all these species showed the declining trend in response to the temperature as shown in the tables. Khan and Aziz (1973) reported declining trend in population for *Oedaleus abruptus* from October onwards and their total absence during the II fortnight of December, 1970-1971. However, Susanta and Halder (1998) recorded declining trend in population for *Acrida exaltata* from July onwards and their total absence during December and February.

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REFERENCES

- KHAN, H.R. AND AZIZ, S.A., 1973. Observations on seasonal variations in populations of hoppers and adults of *Oedaleus abruptus* (Thunberg) (Orthoptera: Acrididae). *Indian J. ent.*, **35**(4): 300-305.
- KHAN, H.R. AND AZIZ, S.A., 1973. Influence of different levels of temperature and moisture on the development and hatching of eggs of *Oedaleus abruptus* (Thunberg) (Orthoptera: Acrididae). *Indian J. ent.*, **35**(1): 29-31.
- KHAN, H.R., 1974. Bionomics and life history of *Oedaleus abruptus* (Thunberg) and *Eyprepocnemis alacris* Serville (Orthoptera: Acrididae) with observation on their antennal sense organs. Doctoral thesis. Aligarh Muslim University, Aligarh.
- SUSANT, N. AND HALDER, P., 1998. Population dynamics of the grasshopper *Acrida exaltata* (Walker) in the arid zone of West Bengal, *Indian J. Interacademia*, **2**: 1-2, 51-53.

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