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Coccinella sptumpumctata (Coccinellidae: Coleoptera) as a predator of cecidozoan, hymenopteran and dipteran in Garhwal Himalaya, India.

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Abstract

The gall forming insects (cecidozoan), *Allirhytis semicarpifoliae, Rhopalomyia baijali Labopteromyia bivalve and Amaradiplosis amaermyia, Andricus sp.* are widely distributed in Garhwal Himalaya causing galls on different economically important plants. In this regard, out of theses Coccinellids oftenly crawl on gall bearing portions in search of their prey, but it is frequently seen in case of grubs. Maximum numbers of grubs prefer to feed upon the larvae of *R. baijali.* The abundance of predators synchronized with peak population of prey insects. The relative abundance of predators always higher in tropical region than those of other geographical zones. The grubs of Coccinellids find their way by cutting the gallicolous tissues with help of their serrated mandibles so as to secure their prey inside the gall. Experiments on feeding propensity of grubs of *Coccinella saptempunctata* show that this insect devour 15.2 to 22.8 larvae of *R. baijali* per 24 hrs. in laboratory condition *(Table-1).* It was also noticed that the predatory activity was recorded high in the lower altitude in comparision to the higher one.

Keywords: *Galls, cecidozoan, predator, larva*

Introduction

In the Garhwal Himalayan region (situated between north latitude 29° 26' 15" and 31° 5' 31" and between east longitudes 70° 18' 45" and 80° 8' 0") due to high and low mountain ranges and valleys climatic conditions vary from one place to another. This region is very rich for florastic and faunastic population. The population of galls is also very high in comparision to the other parts of the country. In the natural condition variation enemies of gall and gall insects

(i. e. parasites and predators) are found. They not only feed upon the gall producing insects, but also play a significant role in controlling the population of these cancer causing agents of the plnats. The predatory nature of Coccinelids on various groups of insects, (aphids and other soft body insects) has been recognized for a long time (Atwal and Sethi 1963), but studies on feeding upon gall insect is magre and far from complete. Very few published work on predatory related study is available e.g., Barnes 1929, 1930 and 1933). Harris, (1967) recorded cecidomyiid (Diptera) as predators upon some coccids. Yukawa (1983) observed that the worker ant *Monomorium nipponenset* to feed upon gall insect Pseudasphondylia neolitseae (Diptera : Cecidomyiidae) from Kagoshima., Japan. Smith (1939), Atwal and Sethi (1963) and Kaczmerek (1973) done work on predatory nature of Coccinellids upon aphids. But published work on Coccinelidsas the predators of the gall insects exists. Therefore, the present study on the predatory insects was undertaken in the Garhwal Himalayas during 1988-1990.

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Materials and Method

To study feeding nature of grubs and adults of Coccinelids in natural conditons the daily visits were conducted during seasons of abundance of galls and predators. Some galls were also carefully cut, opened and calculated for damage done by the predators.

Feeding experiments were done upon the 2nd instar larvae of R. Baijali, for that ten sets of experiments were kept. In each set of experiment one grub and 100 larvae were kept on tender bud of *A. vulgaris*

inside the glass chimeny or beaker and covered with thin cloth net (for proper ventilation and prevent to escape the predator and prey from the beaker). Some experiments of the same type also conducted inside the insect raring cage. After every 24 hours of intervals remaining larvae inside the beaker were counted. This experiment was continued for 10 days. The time of complete exploitation of larvae is also calculated during different field visits of the sites.

Results and Disscussion

However, the predatory nature of Coccinella is well known Kaczmareh (1973) used nine species of Coccinella as a predator of aphids. In majority of cases (e.g. grubs and adults of *Coccinella septumpunctata)* was observed that maximum abundance of these predatory insects coincides with the most favorable period (higher population) of the gallicolous insects such as *Andricus sp., Amaradiplosis amraemyi.,* We observed as many as seven species of Coccinella crawling on the gall bearing portion of the host plant in many localities of Garhwal Himalaya. Out of the seven species of this predatory insects (immature stage and adults), the most common and widely disturbed species was *Coccinella septumpunctata*. The grubs of this species were feed upon by the larvae of *Rhopalomyia baijali* under laboratory conditions (temp. 9.0°C to 28.2°C) Maximum 39 larvae were ate by *Coccinella septumpunctata* in 24 hours *(Table.1),* Sethi and Atwal (1963) observed in their experiments that the Coccinella can eat on an average 62 aphids of cabbage plant.

Table-1: Feeding propensity experiments on grubs of *Coccinella septempunctata*. On mature 2nd larval stages of *R. baijali* in laboratory conditions (for 24 hours).

Days	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1.	13	25	14	13	16	35	14	23	14	16
2.	15	18	23	17	24	15	17	19	16	25
3.	23	24	17	15	18	17	34	18	23	16
4.	14	17	15	13	25	26	19	23	35	18
5.	19	18	19	18	26	27	27	15	24	27
6.	15	17	23	died	20	25	18	10	19	19
7.	8	17	11	-	27	38	26	9	27	38
8.	27	10	18	-	28	21	20	22	24	17
9.	12	19	17	-	25	12	29	11	29	18
10.	19	10	39	-	11	12	17	10	8	16
Mean	16.50	17.50	19.60	7.60	22.00	22.80	22.10	16.00	21.50	21.00
S.D.	±2.85	±2.67	±2.11	±1.43	±2.63	±2.64	±2.91	±2.85	±2.56	±2.69

When we correlate the distribution and rate of feeding of predatory Coccinelids on the basis of abiotic factors, we found that the predators were much active and higher in number in the low altitudinal zones (up to 1800 meters), where the temperature was high and humidity was low as compared to the higher altitudes (more than 1800 meter), where the average annual temperature was low and humidity was high. In the present study, out of a total of 11 prey for these coccinelids, 7 were gall producing insects from lower altitudes and 4 species were from the higher altitudes Coccinelids *(Table-2).*Although the grubs and adults of this species were observed frequently on the gall bearing areas of many host plants in the field *(Table-2),* but occasionally the adults were noticed to utilize the gallicolous insects. On the contrary grubs were frequently noticed to prey upon the cecidozan insects. This was more so in case of larvae of R. baijali (on *Artemisis vulgaris* as their food, but frequently of abundance of grubs on these galls radically differs (i.e. a few in *Andricus sp*. and *Callirhytis semicarpifoliae* both on *(Q. incana).* In general it is also noticed that the relative abundance of the predators remain higher in lower altitudes than in higher altitudes mostly during the month from February to May *(Table-2).* The grubs of Coccinella find their way by cutting the gallicolous tissues with the help of their sharp mandibles, so as to secure their prey inside the gall. The anterior half body portion of grubs was inserted the gall cavity by making peristetitic movements. The grubs captures its prey with the help of its serrated mandibles which act like a forecep.

Table-2: Showing the food spectrum of predatory insects with their distribution at various localities in Garhwal.

SN	Predator	Food spectrum (Cecidozoan)	Host plant	Abundance of predator on a gall twigs	Period of maximum occurrence of the predators	Localities of occurence	Altitudinal distribution (m. asl)
1.	*Coccinella septumpuntata* (grubs)	*Andricus sp.* (larvae)	*Quercus incana*	++	May-June	CHM,BTH,CHO, RAN,PAU,ADW, KAN,CBU,KAD	1400-2610
		Callirhytis semicarpifoliae (larvae and adult)	*Quercus incana*	++	May-June	CBU,CHM,BTH, KAD	1650-2610
		Rhopalomyia baijali	*Artemisia vulgaris*	+++	Jan.-Feb.	KTW,MAT,TIP, KAN	350-1800
2.	*Coccinella Septumpunctata* (adult)	*Andricus* (larvae and adults)	*Quercus incana*	++	Feb.-May	CHM,BTH,CBU, KNK	1400-2610
		Labopteromyia bivalvae(larvae)	*Acacia catechu*	++	Feb.-May	GHN,GAD,UPH, SIM	550-1500
		Amaradiplosis amraemyia (larvae)	*Magnifera indica*	+	March-April	SRI,THE,DEB,K TW,SAT	350-1500
		Rhopalomyia baijali (larvae and adults)	*Artemisia vulgaris*	++	Jan.-April	PAU,DHU,KNK, UK,KAN, KTW	350-1800
3.	*Coccinella sp.* (Adult and grub)	*Andricus sp.* (larva)	*Quercus incana*	+++	Feb.April	CHM,BTH,CHO, RAN,PAU,ADW, KAN	1400-2610
		Rhopalomyia baijali	*Artemisia vulgaris*	++	Jan.-April	PAU,DHU,KNK, UK,KAN, KTW	350-1800
		Labopteromyia bivalvae (larvae)	*Acacia catechu*	++	Feb.-April	GHN,GAD,UPH, SIM,TAK	550-1500
		Amaradiplosis Amraemyia (larvae and adult)	*Magnifera indica*	++	Feb.-April	SRI,DEB,KTW,S IR,TEH	350-1500

Fore-legs also assist the larve during feeding. The duration taken by this predatory insects from the time of captivity of an insect (such as *Rhopalomyia baijali)* upto the complete exploitation of its body contents was observed to be 7 to 12 minutes (average 9.1 minutes) under laboratory experiments. As feeding is over the larvae was pushed back and out by making peristelitic movement of its body. The effect of predation by the above mentioned insect is quite embracing. The death of cecidozoan causes early drying of gall.Occasionally adults of *Coccinella septumpunctata* and Coccinella sp. were found predatory on larvae of *Andricus sp*. *Labopteromyia bivalvae, Amaradiplosis amraemyia* and *Rhopalomyia baijali* on their host plants *Quercus incana, Acacia catechu, Mangifera indica* and *Artemisis vulgaris* respectively. These predotory insects are noticed to cut the interlocular tissue of the oak galls so as to expose the larval chambers to secure the prey.The considerable frequency of predation by the predotors on a gall insect (larvae/adults) thus definitely seem to play a prime role in decreasing the biotic potential of gall insect in Garhwal Himalayas.

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