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Host preference of *Epilachna ocellata* Redt. (Coccinellidae : Coleoptera) among different vegetable crops

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ABSTRACT: The host plant preference of *Epilachna ocellata* Redt. was studied under field conditions. The beetles showed a wide range of host plants in Kulu Valley. The order of preference of beetles in the descending order was : potato, tomato, brinjal, okra, cucumber, radish, capsicum, French bean, green gram and black gram. The adults always prefer the host plants on which they live as larvae. The adult females, though fed on various hosts, deposited the eggs on most preferred host plants. Potato, tomato and brinjal harboured maximum beetles. Some of the heavily infested potato plants harboured 25–30 larvae on a single plant, whereas brinjal and tomato revealed maximum of 15–20 larvae per plant. The population of beetles was always higher than larvae. Radish, capsicum, green gram and black gram harboured many beetles but were least preferred by the larvae.

Amongst different insect pests of vegetables, *Epilachna* sp. is an important pest, being polyphagous in nature and infests almost all the vegetables grown in Kulu Valley of Himachal Pradesh during rainy season (Lal, 1975).

Both the adults and larvae are voracious feeders and cause almost the same type of damage to different food plants. They preferably attack the leaves but some times the flowers and fruits as well. Usually they feed on the lower surface of leaves and the epidermis of the upper surface remains untouched. Heavily attacked leaves are skeletonized, shrivelled and ultimately get dried up.

During 1983–84 rainy season, the beetles as also the larvae attacked numerous host plants but caused economic injury only to certain crops. A survey work was, therefore, undertaken and the present contribution reports the host preference of *Epilachna ocellata* Redt. under field conditions.

MATERIALS AND METHODS

Different localities were surveyed from July to October in 1983 and 1984 to determine the host range of *Epilachna ocellata* Redt. beetles and larvae. Thirty plants of each crop under report were randomly selected and critically examined for the population of beetles and larvae. Such observations were taken five times at an interval of 10–12 days in the fields. The population pattern of beetles and larvae on different crops formed the basis of host preference.

RESULTS AND DISCUSSION

It is evident from Table 1 that the beetles were always fond of potato plants. In the beginning of July, the number of beetles on other host plants was very rare and slowly increased

Table 1. Field population of *E. ocellata* adults and larvae recorded on different host plants during five observations in 1983

Host Plant	Population of beetles (B) and larvae (L) per 10 plants									
	12.7.83		22.7.83		1.8.83		13.8.83		25.8.83	
	B	L	B	L	B	L	B	L	B	L
Potato	580	54	530	66	430	40	478	31	483	13
Tomato	24	14	31	15	186	23	255	20	138	12
Brinjal	39	10	45	10	175	12	240	15	195	10
Okra	0	1	2	2	32	4	60	3	67	1
Radish	0	0	1	0	9	1	15	0	31	1
Capsicum	0	0	1	0	8	0	7	2	12	1
Cucumber	8	2	21	4	25	6	25	12	15	8
French bean	5	0	8	1	10	3	10	2	8	2
Green Gram	3	0	5	0	6	1	10	1	9	0
Black gram	1	0	0	0	1	1	2	0	1	1

by middle of August. But, potato plants were always preferred by the beetles in comparison to any other crop (Table 1).

In some cases a single plant of potato harboured 120 to 150 beetles and a single leaf was infested with 15-20 or even more beetles.The infestation already started on potato in May but at that time no brinjal or tomato plants were transplanted in the fields. The beetles, thus, developed and increased on potato plants. During July, the potato crop was heavily infested in several localities and the beetles also spread to other crops, particularly tomato and brinjal. From the counts of beetles on different host plants in August it was evident that brinjal and tomato were also much preferred as compared to other crops. The preference of tomato was more than brinjal plants. It was observed that when some potato plant was found in between rows of radish, capsicum or okra, the beetles covered the potato plants. The beetles were also recorded on French bean, green gram or black gram. But, the population on these crops was very low. Cucumber crop was also attacked and preferred than capsicum, French bean, green gram or black gram. The beetles feed mostly on the under surface of leaves giving them a characteristic skeletonized appearance.

The larvae of *E. ocellata* also preferred potato plants vis-a-vis other host plants. Although radish, capsicum, green gram and black gram harboured quite a good number of beetles yet these were the least preferred host plants by the larvae (Table 1). Some of the potato plants were heavily infested and harboured up to 25-30 larvae on a single plant, whereas brinjal and tomato were maximum infested with 15-20 larvae per plant. Okra and cucumber were less preferred than tomato and brinjal plants. In most of the cases, the food plant is primarily chosen by the adult female and the offsprings are placed on the plant during the act of oviposition (Thorsteinson, 1960). The ovipositing beetles normally deposit the egg masses on the leaves of the plants they themselves feed upon, and the taste of the larvae is generally in agreement

Table 2. Field population of *E. ocellata* adults and larvae recorded on different host plants during five observations in 1984

Host Plant	Population of beetles (B) and larvae (L) per 10 plants									
	26.6.84		8.7.84		20.7.84		4.8.84		19.8.84	
	B	L	B	L	B	L	B	L	B	L
Potato	30	9	37	17	97	47	103	26	68	12
Tomato	4	1	5	4	18	35	56	15	55	9
Brinjal	1	0	5	1	13	29	49	18	50	9
Okra	0	0	0	0	2	0	15	5	13	4
Radish	0	0	1	0	1	0	6	2	7	1
Capsicum	0	0	0	0	1	0	3	1	6	1
Cucumber	1	0	1	0	5	7	24	7	25	3
French bean	0	0	0	0	2	2	9	2	15	1
Green gram	0	0	0	0	0	0	3	1	6	1
Black gram	0	0	0	0	0	0	1	1	3	0

with that of their parents (Bonjers, 1970). Though differences may be found in food preference between adults and larvae (Trouvelot *et al.*, 1933), but the present studies reveal that the food chosen by adults of *E. ocellata* was in agreement with the larvae. The population of beetles as observed during July was more on brinjal than tomato plants but the larvae were always more on tomato than brinjal plants (Tables 1, 2).

The findings indicate that the beetles and larvae prefer certain solanaceous plants than others within the food plant range, except cucumber which was more infested than several other hosts (Tables 1, 2). The females deposit eggs on the preferred food plants as the population of both the beetles and larvae was always higher on potato, tomato and brinjal than any other host plant. The adult beetles always preferred the plants on which they lived as larvae and later on when their population increased to a great extent they also spread on other host plants. Another factor of suitability of potato as the most preferred host plant may be the coincidence of its growing season with activity of feeding stages of larvae and adults of *E. ocellata*. The activity and feeding already starts in May when they find only potato crop in the fields to feed upon, while other crops generally attain growth in July.

A number of workers reported that the behaviour involved in host plant selection of a phytophagous insect depends upon properly co-ordinated interaction between the insect and the plant (Thrope *et al.*, 1957; Dethier, 1947; De Wilde, 1958; Beck, 1965). A high population of larvae and adults on potato, tomato and brinjal plants may be due to the development of *E. ocellata* on these crops taking less time which may be prolonged on other host plants. Furthermore, capsicum, radish, green gram or black gram may not be readily eaten and accepted by the larvae and in some cases mortality of larvae on these host plants may also result though no dead larvae in the fields on these host plants were observed. Although, the adult beetles

feed on different host plants (Tables 1, 2), they probably fly or walk to the suitable host plant for egg laying. Because once the eggs are laid on an unsuitable plant, it is beyond the power of young larvae to seek food elsewhere in most of the cases. The beetles oviposit only on most preferred host plants, as the population of larvae was always confined only on them (Tables 1, 2). According to De Wilde and coworkers (1969), plant odours play an important role in finding a suitable host plant by the beetles. Grison (1950) reported that the smell of cut potato foliage can be perceived by Colorado beetles at a distance of 4 m. Bongers (1970) stated that Colorado beetles searching for food or sites to deposit eggs, keep moving in a constant direction guided by a light compass orientation. Besides optical or olfactory stimuli, some other mechanism may be also functioning in long-range attraction to the *Epilachna* beetles in the fields. Also, the factors working at close range and operating in the final recognition of the preferred plant are largely chemical (Dethier, 1947; Jermy, 1961). Solanine, the active matter of potato, may be a factor for the attraction of *Epilachna* beetles, but it proved to be inert for Colorado beetles (Chauvin, 1952; Schreiber, 1957). Favonoid glucoside isolated from potato leaves by Thorsteinson (1960) proved chemotactically inert for Colorado beetles. Hesse and Meier (1950) found acetaldehyde playing an important role in the host plant selection of Colorado beetles which prefer potato plants. Perhaps, the chemical aspects of host preference in *Epilachna* beetles may be more or less the same. Beck (1965) and Thorsteinson (1960) cited several cases in which sugars served as feeding stimulants for phytophagous insects. Probably, high contents of different sugars in potato plants play an important role in its preference by *Epilachna* beetles over other host plants.

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