



## Research Note

### Community structure of insectivorous birds of cabbage fields

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**ABSTRACT:** Community structure of insectivorous birds on insects infesting cabbage, (*Brassica oleracea*) was studied at Anand, Gujarat during January – March 2012. Bird activity in the field was observed through binoculars during 07:00 to 10:00 hrs and evening 16:00 to 18:00 hrs. Standard field guides were used to identify the birds. Birds recorded from cabbage fields represented three foraging guilds: ground feeder (4 spp.), aerial feeder (2 spp.) and canopy feeder (8 spp.). The canopy feeding species (n=8) were more compared to ground (n=4) and aerial feeding (n=2) species. Nine species were insectivorous whereas five species were omnivorous. A Total 14 bird species were recorded feeding mainly on upon cabbage aphids, (*Lipaphis erysimi*) from field. Red-wattled Lapwing was the most dominant and frequently observed species. Abundance of aphids as well as birds species activity was significantly high in pesticide free plot ( $27.22 \pm 46.44$  aphids/plant and  $9.75 \pm 11.63$  bird numbers, respectively) compared to treated plots ( $9.15 \pm 7.76$  aphids/plant and  $4 \pm 2.17$  bird numbers, respectively). Birds can act as bio-control agent for management of insect pests of cabbage crop and can be encouraged for their abilities to regulate the insect pests of crop pests.

**KEY WORDS:** *Brassica oleracea*, bird community structure, predatory bird, biocontrol agent, cabbage aphid, *Lipaphis erysimi*, red-wattled lapwing, *Vanellus indicus*

(Article chronicle: Received: 29-01-2013; Revised: 15-04-2013; Accepted: 25-04-2013)

The avifauna of India is rich and diversified with 2,060 species and subspecies (Ali and Ripley, 1983) of which nearly 85 per cent are either insectivorous or omnivorous. Mason and Lefroy (1911) established that insectivorous and omnivorous birds feed on insect pests of important agricultural crops. However, bird predation on insect pests of agricultural crops remained restricted to field observations on bird predation on lepidopteran and coleopteran insects. Mason and Lefroy (1911) reviewed food habits of the birds using gut content analysis and concluded that in agricultural tracts, the birds play an indispensable role in crop protection. Indian roller, crows, myna, hoopoe, spotted owl, kites, black partridge and cattle egret were reported as beneficial birds to agriculture.

However, Toor and Ramzan (1975) recorded wagtails as good predator of mustard aphids. Chakravarthy and Lingappa (1978) recorded that field bean aphid, *Aphis craccivora* was efficiently predated by Yellow Wagtail and grey wagtail. Gupta and Yadava (1989) observed common myna feeding on cumin aphid, *Myzus persicae*. Verghese and Sriharan (1993) recorded wagtails actively preying on the aphids, *A. craccivora* in field bean

and *Brevicoryne brassicae* in cabbage. Wagtails were also reported as a predator of diamond back moth larvae, *Plutella xylostella* Linn. in cabbage (Jayarathnam, 1978).

Presence of insects pests in the gut content of the birds and predation of some avian species on insect pests have been well documented. However, community structure of the birds exclusively feeding on insects of agricultural crops is least studied (Dhindsa *et al.*, 1984; Parasharya *et al.*, 1992) Hence, the study on community structure of birds feeding on insects in cabbage (*Brassica oleracea*) crop was taken up.

Cabbage crop is an important vegetable crop grown in central Gujarat during winter. Total area, production and productivity of cabbage in India during 2010-11 was 369 thousand hectares, 7949 MT and 21.5 MT/ha, respectively, whereas in Gujarat, it occupied 23 thousand hectares, 404.6 MT and 17.6 MT/ha, respectively. Mehsana, Kheda, Vadodara and Gandhinagar are the major districts known for cabbage cultivation (Anon., 2011). Cabbage crop is attacked and devastated by an array of insect pests, amongst which *P. xylostella*, aphid (*Lipaphis erysimi* Kalt.), semilooper (*Thysanoplosia orichalcea*

Fabricius), head borer (*Helicoverpa armigera* (Hubner), whitefly (*Bemisia tabaci* Gennadius), cabbage borer (*Hellula undalis* Fabricius) and cabbage maggots (*Hylemya brassicae* Linnaeus) are important (Mini and Krishnakumary, 2005). Amongst all insect pests, aphids (Aphididae: Hemiptera) are the most destructive and predominant pest reported from entire cabbage growing area. Three different species of aphids are known to attack cabbage of which, *L. erysimi*, is the most abundant species in the study area. In a field where no plant protection measure had been taken, damage and yield loss could reach up to 70–80 per cent. Therefore, present investigation was aimed to identify bird community structure feeding on insects from cabbage fields to assess their biotic potential in the management of cabbage pests.

Avian community structure and their diversity in cabbage field was studied during January – March 2012 in cabbage fields of Anand, (22° 32' N, 72° 55' E), Gujarat. Activity of birds and their number were recorded by observing each field with the help of binoculars (10 × 12) for half an hour during morning (07:00 to 10:00 hrs) and evening hours (16:00 to 18:00 hrs) for the assessment of bird community. Birds were identified using standard field guides (Grimmett *et al.*, 1999; Kazmierczak, 2000). Amongst insect pests, aphid numbers were higher. Observation on abundance of aphids was carried out by dividing experimental plot into four equal sectors. From each sector, three plants were randomly picked up and number of aphids (nymphs + adults) was recorded from outer three leaves. Record on spraying intensity of pesticides was also maintained. Total seven cabbage plots were monitored starting from head development stage to the maturity stage of the crop to record pest infestation and associated bird community feeding on insect pest. Amongst seven cabbage fields, two were organic plots and remaining five fields were treated with various pesticides *viz.*, malathion 50 EC, chlorpyrifos 20 EC, dichlorvos 76 EC, novaluron 10 EC and quinalphos 20 EC for control of sucking and lepidopterous pests.

A total of 14 bird species were recorded from cabbage field feeding on insects from the crop. Amongst them, red-wattled lapwing (25.2%) was most abundant followed by yellow wagtail (23%), common swallow (12.8%) and common myna (10.6%) whereas the most frequently observed species was red-wattled lapwing (26.1%) followed by common myna (14.5%) and common swallow (10.1%) Foraging guild structure showed occurrence of four ground feeder, two aerial feeder and eight canopy feeder species (Table 1), The ground and canopy feeding birds largely

consumed immature forms of aphids whereas aerial feeders consumed winged adults flying above the crop.

Count of *L. erysimi* was significantly higher in unsprayed fields (organic plot) ( $27.22 \pm 46.44$  aphids/plant,  $n = 114$ ) compared to pesticide sprayed fields ( $9.15 \pm 7.76$  aphids/plant,  $n = 60$ ) ( $t = 2.99$ ,  $df = 172$ ,  $P < 0.05$ ). Due to higher infestation of cabbage aphids, average bird number was also higher in unsprayed fields ( $9.75 \pm 11.63$ ,  $n = 21$ ) compared to sprayed fields ( $4 \pm 2.17$ ,  $n = 53$ ) ( $t = 2.61$ ,  $df = 72$ ,  $P < 0.05$ ) (Table 2).

Amongst fourteen bird species, 9 (64.29%) were insectivorous and 5 (35.71%) were omnivorous. All the birds were confirmed feeding on cabbage aphids (through binoculars). Nine species were resident whereas only three were migratory. Relative abundance of migratory species was much higher than resident species.

Avian community structure was studied for the first time in the cabbage crop. Total 14 bird species were recorded feeding upon insect from the cabbage fields. These birds act as biological control agent of insect pests in organic farming of crops. Lower numbers of bird species were recorded in cabbage were probably due to following factors: Cabbage crop is a ground crop and do not have much canopy cover over soil, hence weeding and inter-culturing operations are carried out frequently. Human intervention was also higher in cabbage field due to frequent pickings of the crop. Amongst the whole bird community, red-wattled lapwing was most frequent and abundant bird species recorded feeding upon insects from cabbage field. Frequently sprayed fields had lower abundance of insect-pest population and also lower number of birds. On the other hand, unsprayed organic cabbage field had higher insect population and bird number. The numerical response of birds to insect pest density was recorded earlier by Parasharya *et al.* (1988) and Monsrud and Toft (1999).

Varghese and Sriharan (1993) have reported green bee-eater, black drongo and wagtails as good predators of aphids in various crops. Wagtails had been considered important predator of aphids (Toor and Ramzan 1975; Chakravarthy and Lingappa, 1978) which was also a case in present study. Wagtails are winter migrant and their relative abundance was as high as 25 per cent in this study. Bird species feeding on mustard aphid in present study are all known to feed on aphids on some occasion (Mason and Lefroy 1911; Chakravarthy and Lingappa 1978; Shivayogeshwara *et al.* 1993; Varghese and Sriharan 1993). However, purple sunbird was not recorded earlier feeding

**Table 1: Community structure of birds in cabbage crop**

Sl. No.	Common Name	Scientific Name	f	R. F. %	No.	R. A. %	Foraging guild	Food Type	Residential status
1	Cattle Egret	<i>Bubulcus ibis</i>	1	1.4	6	2.2	G	I	R
2	Grey Francolin	<i>Francolinus pondicerianus</i>	3	4.3	4	1.5	G	O	R
3	Red-wattled Lapwing	<i>Vanellus indicus</i>	18	26.1	69	25.2	G	I	R
4	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	4	5.8	13	4.7	G	I	R
5	Small Bee-eater	<i>Merops orientalis</i>	3	4.3	5	1.8	A	I	R
6	Common Swallow	<i>Hirundo rustica</i>	7	10.1	35	12.8	A	I	M
7	Black Drongo	<i>Dicrurus macrocercus</i>	4	5.8	6	2.2	C	I	R
8	Common Myna	<i>Acridotheres tristis</i>	10	14.5	29	10.6	C	O	R
9	Red-vented Bulbul	<i>Pycnonotus cafer</i>	2	2.9	4	1.5	C	O	R
10	Common Babbler	<i>Turdoides caudatus</i>	4	5.8	13	4.7	C	O	R
11	Jungle Babbler	<i>Turdoides striatus</i>	4	5.8	16	5.8	C	O	R
12	Yellow Wagtail	<i>Motacilla flava</i>	5	7.2	63	23.0	C	I	M
13	Grey Wagtail	<i>Motacilla cinerea</i>	2	2.9	6	2.2	C	I	M
14	Purple Sunbird	<i>Nectarinia asiatica</i>	2	2.9	5	1.8	C	I/N	R
	Grand Total		69	100	274	100			

**Note:** f = frequency; R. F. = Relative Frequency; R. A. = Relative Abundance; Type of foraging guilds: G = Ground feeder; A = Aerial feeder; C = Canopy feeder; Birds classified as per their food type: I = Insectivorous; O = Omnivorous; I/N = Insect & Nectar as food

**Table 2: Mean number of aphids and birds in pesticide sprayed and unsprayed cabbage fields at Anand, Gujarat**

Observations	Unsprayed Fields	Sprayed Field	Comparison 't' test	Significance Level
No. of aphids/plant	27.22 ± 46.44 (114)	9.15 ± 7.76 (60)	t = 8.67 df = 172	P < 0.01 S
No. of birds/field	9.75 ± 11.63 (21)	4.0 ± 2.17 (53)	t = 2.61 df = 72	P < 0.05 S

on aphids. In our present observation, the purple sunbird was observed feeding on aphids as well as honeydew excreted by them. Bird community recorded to serve as biological control agents of insect-pest of cabbage crop, particularly of cabbage aphid. As birds are generalized predators of insects, they are not given importance as biological control agent of crop pests (Buckner, 1966). Our findings suggest that the birds can serve as biocontrol agents at significantly and their assessment as agents needs critical evaluation. All avian species recorded here have been recorded feeding on aphids by Mason and Leroy (1911). Presence of common swallows above the crop field acts as an indicator of presence of winged aphids (Henderson *et al.*, 2007).

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