

# COMMUNITY STRUCTURE OF BIRD PESTS AND THEIR DIURNAL RHYTHM IN RIPENING SORGHUM<sup>1</sup>

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(With a text-figure)

**Key words:** bird pest, community, damage, diurnal rhythm, sorghum, species diversity

The species of birds and the maximum number that fed on isolated fields of standing sorghum, *Sorghum vulgare* were recorded from 0700 to 1800 hr and their community characters were determined. A total 12 species of birds fed on standing sorghum. The Baya *Ploceus philippinus*, Rose Finch *Carpodacus erythrinus* and Spotted Munia *Lonchura punctulata* constituted 75.22% of the total bird species. The feeding pattern was bimodal with morning and evening peaks. The density of birds, species richness, their diversity and evenness were greater during the morning peak as compared to that of the evening. The bird density and the species richness were extremely low during the noon hours. Therefore it is suggested that morning is the best time to study the bird community and morning as well as the evening foraging periods are the times a ripening field requires maximum protection. The estimated percent damage inflicted by birds ranged from 38.54 to 73.93.

## INTRODUCTION

Sorghum *Sorghum vulgare* and pearl millet *Pennisetum typhoides* are the two important cereals heavily depredated by birds. Seeds of these crops are exposed and so attract several bird species during the entire period of seed setting to harvesting stage and so suffer heavy losses.

Bird pests of sorghum have been identified and the extent of damage to this crop has been reported in India (Rao and Rao 1953, Perumal *et al.* 1971, Mehrotra and Bhatnagar 1979, Santhaiah *et al.* 1983, Dhindsa *et al.* 1984, Dodia *et al.* 1989) and elsewhere (Manikowski and Da Camara-Smeets 1979, Brugger 1980). Dhindsa *et al.* (1984) reported on the bird community structure of sorghum and pearl millet at Ludhiana and estimated the damage inflicted by them. However, there exists no information

on the diurnal rhythm of the feeding activity of pest birds on any of the crops. This paper deals with the diurnal feeding rhythm of pest birds on sorghum grown in isolation and the extent of damage caused by the pests. It is necessary to know the diurnal rhythm of bird communities associated with cereal crops at their ripening stage since it would be useful in evolving and employing different control strategies and methods. Such knowledge on the timing of bird activities in crop fields would be helpful in designing studies on the population dynamics of birds in ripening cereal fields too.

## MATERIALS AND METHODS

This study of the diurnal rhythm on the feeding activity of birds damaging sorghum *Sorghum vulgare* was carried out at the college farms of Gujarat Agricultural University, Anand (22° 32' N, 73° 00' E) from 20 November to 10 December 1984. The observations were recorded from 1330 to 1800 hr on a day and were followed up on the next day from 0700 to 1330 hr to complete one day cycle. During the study

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period, sunrise was at 0705 hr and 0720 hr on 20 November and 10 December whereas sunset was at 1800 hr and 1802 hr respectively. The maximum temperature ranged between 29.5° and 33.6°C and minimum temperature ranged between 8.5° and 17.5°C. The maximum

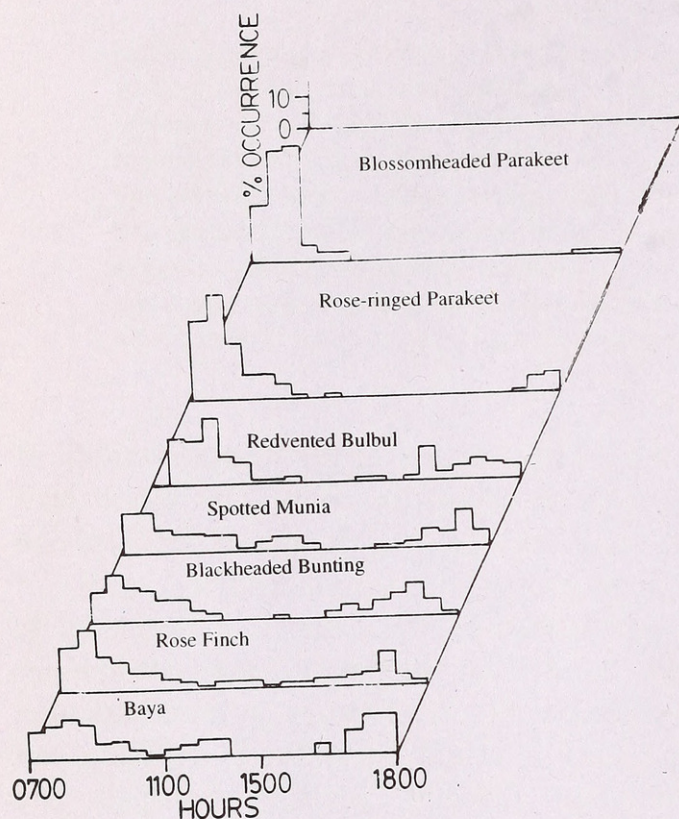


Fig. 1. Diurnal rhythm in the feeding activity of granivorous birds in sorghum fields.

number of birds feeding on grains were recorded during every 30 minutes block. The results are based on seven days observations recorded on 3 different fields (0.10-0.55 ha area). The birds were identified and counted using 7 x 30 binoculars from at least 2.0 m height above ground. The species diversity ( $H'$ ) and evenness of the species ( $J$ ) were determined using Zar's (1974) method. Sorghum was the only cereal crop grown, mainly as fodder. During the study period, other cultivated crops were Tobacco *Nicotiana tabacum*, Sugarcane *Saccharum officinarum*, Pigeon-pea *Cajanus cajan* and

Cotton *Gossypium hirsutum*.

The damage caused by birds was estimated by moving across the field from one end to the other in a zigzag fashion. After an equal distance of walking, the earheads touching the 1 m stick raised at breast height were considered for estimating the damage. All the earheads were cut and brought to the laboratory. Besides working out the percentage of earheads damaged, overall damage was also calculated by counting the total number of seeds present and those missing in the earheads damaged by the birds. Parakeets cut the earheads, the number of seeds missing were extrapolated from the average number of seeds per earhead.

#### RESULTS AND DISCUSSION

A total of 12 species of birds were identified feeding on sorghum grains during the study. Only 7 species occurred in fairly large numbers and showed definite feeding pattern (Fig. 1 and Table 1), whereas the remaining

TABLE 1  
RELATIVE ABUNDANCE OF BIRDS FEEDING ON SORGHUM AND THEIR COMMUNITY CHARACTERISTICS

| Species                | Relative Abundance (%) |
|------------------------|------------------------|
| Baya                   | 29.33                  |
| Rose Finch             | 22.76                  |
| Blackheaded Bunting    | 8.37                   |
| Redheaded Bunting      | 1.10                   |
| Spotted Munia          | 23.13                  |
| Whitethroated Munia    | 0.06                   |
| Redvented Bulbul       | 4.34                   |
| Common Babbler         | 0.73                   |
| Jungle Babbler         | 1.10                   |
| Large Grey Babbler     | 1.50                   |
| Roseringed Parakeet    | 5.38                   |
| Blossomheaded Parakeet | 2.20                   |

species were only few in number. The three major species, the Baya *Ploceus philippinus*,



Rose Finch *Carpodacus erythrurus* and Spotted Munia *Lonchura punctulata* constituted 75.22% of the total birds counted. Species diversity ( $H'$ ) of the birds encountered in the field and its evenness ( $J$ ) were 0.791 and 0.739 respectively. All the birds started feeding soon after sunrise and stopped completely after sunset.

The Baya fed mainly from 0700-0900 hr and from 1630-1800 hr. There was absolutely no activity between 1300 and 1530 hr. They roosted in nearby sugarcane field and a few individuals intermittently fed between 0900 and 1300 hr. The feeding activity of the Rose Finch was recorded throughout the day but the peak activity was from 0700-1030 hr and 1630-1700 hr. The Spotted Munia and Blackheaded Bunting *Emberiza melanocephala* also showed a similar pattern of foraging as that of the Rose Finch. The finches and buntings took shelter in the adjoining Pigeon pea field during hours of the day and from there, a few birds visited the field occasionally. Feeding hours of the Roseringed Parakeet *Psittacula krameri* and Blossomheaded Parakeet *P. cyanocephala* were restricted in the morning between 0700 and 0930 or 1000 hr; it was much shorter in the evening. The Redvented Bulbul *Pycnonotus cafer* also showed bimodal feeding pattern.

The results incorporated in Table 2 show that the feeding pattern of birds associated with the sorghum field is bimodal with high activities during the morning and evening hours. However, when the species richness, diversity ( $H'$ ) and evenness ( $J$ ) were compared, it was maximum between 0700 and 1000 hr (morning peak) as compared to that of 1600 to 1800 hr (evening peak). When the species richness was considered it was poor between 1030 to 1530 hr. But as the species richness, diversity and evenness were taken into account, it is obvious that the avian activities in the field were at a minimum from 1230 to 1430 hr. Since the highest number of

species was 5 and the evenness of species was nearer to 1 during the noon hours, it was concluded that only a few species were present in the field during that time of the day and their numbers were almost even. But the bird density was the least (Fig.1). Therefore the field did not require much protection against birds at this time and also this was not the right time to study and conduct bird census. On the contrary, the number of species observed was the maximum during the morning peak with greater values of diversity and evenness even to that of the evening peak. Thus it could be considered that the morning hours between 0700 to 1000 hr as the best time to study the bird community in a ripening sorghum field. Moreover, this is the period of the day together with the evening peak period during which a field requires maximum protection against bird pests to make the scaring more effective and economical.

Peak feeding hours of the birds may change with the season and changing day length period. The birds are seasonal breeders and hence higher food requirement during such periods may influence their feeding rhythm. Therefore, it is essential that the diurnal feeding pattern of birds is determined in all the seasons so that right scaring time could be determined. Several behavioural and physiological functions follow circadian rhythms. Consequently the feeding activity of many of the birds exhibits a bimodal pattern with peaks in the morning and evening. The morning peak may be for making up the deficiencies built up during the previous night of starvation whereas the evening peak for enabling the bird to store energy in surplus for the coming night (Gwinner 1975).

Among the 12 species recorded damaging sorghum in the present study, a few have already been reported from other parts of the country (Bhatnagar *et al.* 1982, Santhaiah *et al.* 1983, Dhindsa *et al.* 1984) the Redvented Bulbul and



TABLE 2

## DIURNAL VARIATIONS IN THE COMMUNITY CHARACTERS OF BIRDS FEEDING ON SORGHUM

| Time (hr) | Average no/obs. | Species richness | Diversity (H') | Evenness (J) |
|-----------|-----------------|------------------|----------------|--------------|
| 0700-0730 | 48.57           | 7                | 0.720          | 0.852        |
| 0730-0800 | 65.00           | 9                | 0.809          | 0.848        |
| 0800-0830 | 54.14           | 10               | 0.836          | 0.836        |
| 0830-0900 | 41.28           | 9                | 0.792          | 0.830        |
| 0900-0930 | 24.57           | 9                | 0.840          | 0.880        |
| 0930-1000 | 24.42           | 10               | 0.776          | 0.776        |
| 1000-1030 | 13.57           | 7                | 0.626          | 0.741        |
| 1030-1100 | 04.28           | 4                | 0.508          | 0.843        |
| 1100-1130 | 07.57           | 6                | 0.590          | 0.758        |
| 1130-1200 | 11.28           | 6                | 0.574          | 0.738        |
| 1200-1230 | 15.14           | 5                | 0.569          | 0.815        |
| 1230-1300 | 12.28           | 4                | 0.470          | 0.781        |
| 1300-1330 | 01.57           | 4                | 0.562          | 0.934        |
| 1330-1400 | 02.28           | 5                | 0.614          | 0.878        |
| 1400-1430 | 03.00           | 4                | 0.584          | 0.969        |
| 1430-1500 | 06.14           | 5                | 0.609          | 0.871        |
| 1500-1530 | 06.00           | 5                | 0.623          | 0.891        |
| 1530-1600 | 13.71           | 7                | 0.713          | 0.844        |
| 1600-1630 | 18.57           | 7                | 0.693          | 0.820        |
| 1630-1700 | 32.00           | 8                | 0.664          | 0.786        |
| 1700-1730 | 35.85           | 8                | 0.604          | 0.664        |
| 1730-1800 | 28.28           | 7                | 0.487          | 0.576        |

three species of babblers namely Large Grey Babbler *Turdoides malcolmi*, Jungle Babbler *T. striatus* and Common Babbler *T. caudatus* are being reported for the first time. Earlier Toor and Saini (1986) had analysed the gut of Large Grey Babbler at Ludhiana and reported grains of wheat *Triticum aestivum* and paddy *Oryza sativa*, however, the grains of sorghum were not recovered from the gut and its status as a pest of standing crop was not established. As in the present study, the Whitethroated Munia *Lonchura malabarica* has already been observed damaging sorghum from Andhra Pradesh (Perumal *et al.* 1971, Santhaiah *et al.* 1983) and Punjab (Dhindsa *et al.* 1984). The Rose Finch and Blackheaded Bunting as well as Redheaded Bunting *Emberiza brunniceps* are winter migrants whereas the remaining species are

residents.

The present report of damage estimation was only on crops grown under isolated condition. Though the extent of damage varied from 38.54% to 73.93% with variation in the extent of damage depending on certain environmental factors (Mathew *et al.* 1991). Such high degree of damage was mainly attributed either to the isolated condition or leaving the fields unwatched. The identification of bird pests and the extent of damage due to them to sorghum have been done in other parts of the country (Rao and Rao 1953, Perumal *et al.* 1971, Santhaiah *et al.* 1983, Dhindsa *et al.* 1984, Mehrotra and Bhatnagar 1979, Dodia *et al.* 1989). Most of these studies including the present one deal with the estimation of damage in a small area under isolated condition if not



mentioned otherwise, and hence do not represent the nature or extent of damage caused by birds to sorghum in general.

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