

FOOD OF THE ROSE-RINGED PARAKEET *PSITTACULA KRAMERI*: A QUANTITATIVE STUDY¹

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(With two text-figures)

Key words: feeding ecology, *Psittacula krameri*, diet diversity, food-niche breadth

Gut contents of the Rose-ringed Parakeet *Psittacula krameri* (Scopoli) were analysed gravimetrically during August 1988 to July 1989 in an intensively cultivated area of Punjab. Cereals (45% of total contents) and tree seeds (38%) were the predominant food of the species. Among cereals, sorghum (21%) was the most abundant. Guava ranked first among tree seeds forming 24% of the diet followed by mulberry (about 10%). Oilseeds formed about 9% and weed seeds nearly 3 % of the contents. Pearl millet, sorghum and maize were consumed in significant proportions during August to December. Guava seeds were recorded in large proportions from January to March and July to August. Mulberry seeds formed the main bulk of the food in April and May. Weed seeds belonging to five taxa were recorded from April to June, August, October and February. Food of the Rose-ringed Parakeet was more diverse from August to October and January to March than during rest of the year. Shannon-Wiener index, equitability and Levins' index of the food-niche breadth were calculated to be 1.02, 0.80 and 0.33, respectively.

INTRODUCTION

The Rose-ringed Parakeet *Psittacula krameri* (Scopoli) is the most widespread species among the parrots of the world (Grzimek 1972). Distributed in Africa, Afghanistan, Pakistan, India, Nepal, Myanmar and Sri Lanka, this species has invaded Mauritius, Zanzibar Island, England, U.S.A., Saudi Arabia, Israel and Germany through man-made and/or natural introductions (Long 1981, Dvir 1988, Lantermann 1989, Stagg 1989). In India, Rose-ringed Parakeet has been rated as the number one bird pest of agriculture and horticulture (Ali and Ripley 1983, Babu and Muthukrishnan 1987). In Punjab, the most intensively cultivated state of India, it inflicts heavy damage to maize, sunflower, mustard, guava, almonds, peach and so on (Ramzan and Toor 1972, 1973, Simwat and Sidhu 1973, Toor and Ramzan 1974, Toor and Sandhu 1981, Sandhu and Dhindsa 1982, Dhindsa *et al.* 1992), and thus warrants control. In Bangladesh also, this species is considered to be the major pest of maize and sunflower (Sultana and Brooks 1986). In Africa, it has been

reported to damage sorghum (Cunningham-Van Someren 1969) and in Mauritius it is stated to be a destructive bird pest (Benedict 1957).

Despite the widespread distribution and pest status of the Rose-ringed Parakeet, little information is available on its food and feeding behaviour. Ali and Ripley (1983) have mentioned fruits, cereals and seeds of all kinds of wild and cultivated plants as the food of this species. Although qualitative information on its food is available from Punjab (Simwat and Sidhu 1973, Toor and Ramzan 1974) and Andhra Pradesh (Shivanarayan 1982), there has been no serious study providing quantitative data from any part of India. This paper presents a detailed quantitative description of the diet, seasonal variation in the relative proportion of various food types and the food-niche breadth of this species.

MATERIAL AND METHODS

The study was conducted in the field area of the Punjab Agricultural University, Ludhiana (30° 56' N, 75° 52' E, c. 247 m above the m.s.l.) from August 1988 to July 1989. The study area is intensively cultivated with two main crop seasons: *rabi* (October-November to April-May) and *kharif* (June-August to September-October). The major *kharif*

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crops are rice, maize and pearl millet, and *rabi* crops are wheat and mustard. The climate of the study area is of semi-arid monsoon type. Generally, four seasons are experienced in a year: summer or pre-monsoon season (April to June), monsoon (July to September), post-monsoon (October to November) and winter (December to March).

In total, 88 birds were collected using a 0.22 airgun. Monthly sample sizes ranged from 5 to 11 except in December when only two parakeets could be collected. Soon after collection, the birds were dissected and the guts (esophagus and gizzard) opened to extract contents. The contents were washed through a nylon sieve and dried on blotting papers at room temperature. They were then sorted and weighed on an electric balance to the nearest of 0.001 g. Monthly summaries of the relative proportions by weight of various food types were prepared.

Three indices were used to study the food-niche breadth (Krebs 1989): Shannon-Wiener index (H'), equitability (J') and Levins' index (B). These indices were calculated as follows:

$$H' = - \sum p_i \log p_i,$$

where, p_i is the proportion of the i th food type in the diet;

$$J' = H'/H'_{\max},$$

where, $H'_{\max}$ is the log of total number of food types recorded in the guts; and

$$B = 1/\sum p_i^2.$$

Levins' index was standardized to express it on a scale of 0 to 1.0 following Hurlbert (1978) as:

$$B_A = (B - 1)/(n - 1)$$

where, B_A is Levins' standardized niche breadth, and n is the number of food types recorded.

RESULTS

Diet Composition: Gravimetric analysis of gut contents of 88 Rose-ringed Parakeets revealed cereals and tree seeds as their predominant food comprising 45% and 38% of the total contents,

respectively (Table 1). Oilseeds (mustard, sunflower and groundnut) accounted for about 9% and weed seeds nearly 3% of the total diet. Gram, recorded in only three of 88 guts dissected, made only 2% of the total contents. Unidentified vegetative matter, consisting of crushed leaves and seed husks, formed about 2% of the diet. Grit was recorded in 14% of the guts analysed and formed 1 % of the total intake.

Among cereals, sorghum was the predominant food making about 21% of the diet and was recorded in 15% of the guts analysed (Table 1). Pearl millet, maize and wheat each constituted 6-7% of the diet and was recorded in 7-15% of the guts analysed. Rice was consumed in very low proportions and formed only 4% of the total diet.

Among tree seeds, those of guava were predominant as they alone accounted for nearly 24% of the diet. Following guava were seeds of mulberry (10%) and sissoo (4%). Seeds of siris and dek were recorded in relatively very small proportions. Weed seeds of five taxa formed only 2.8% of the diet, of which *Crotalaria medicaginea* accounted for more than 2%.

The values of three indices of food-niche breadth viz., Shannon-Wiener index, equitability and Levins' standardized index were calculated to be 1.02, 0.80 and 0.33, respectively.

Seasonal changes in the diet: Sorghum was recorded in significant amounts in the guts of the Rose-ringed Parakeet from August to January. Its proportion in the diet increased steadily from less than 10% in August to 76% in December and declined rapidly to 18% in January (Fig.1). Relative proportion of pearl millet exceeded that of any other cereal in August (22%) and September (40%), whereas in two other months when recorded, it only supplemented the diet. Maize constituted considerable proportion (16-23%) of the diet from September to November. It was also recorded in four other months but only in small proportions (<5%). Among the other cereals recorded in the guts of parakeets, rice in January (25%) and wheat in March (20%) and July (51%) were predominant (Fig.1). Among oilseeds, groundnut in February

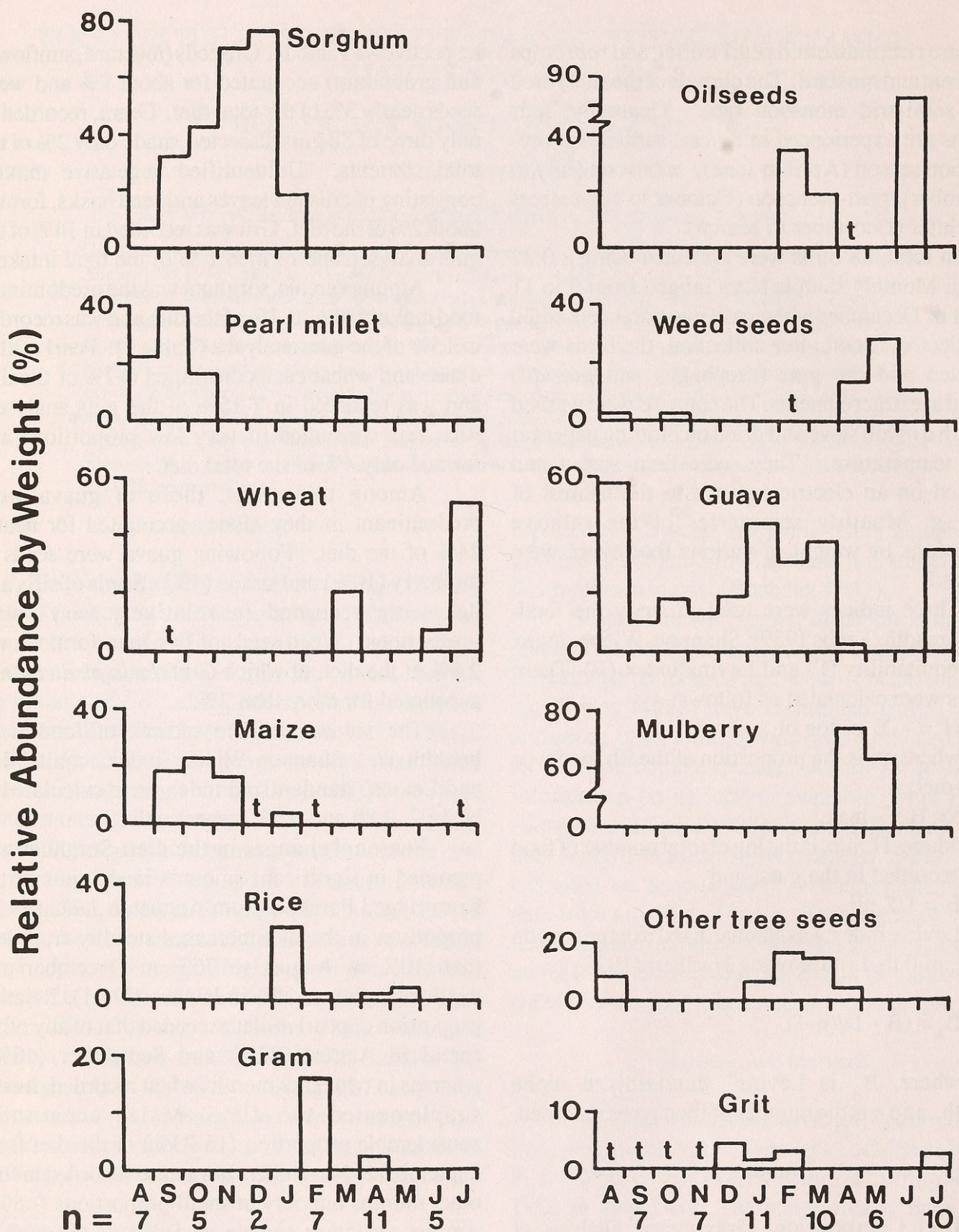


Fig. 1. Seasonal variations in the food of the Rose-ringed Parakeet during August 1988 to July 1989 (t = traces, i.e. <1%).
Figures below months along X-axis indicate sample sizes.

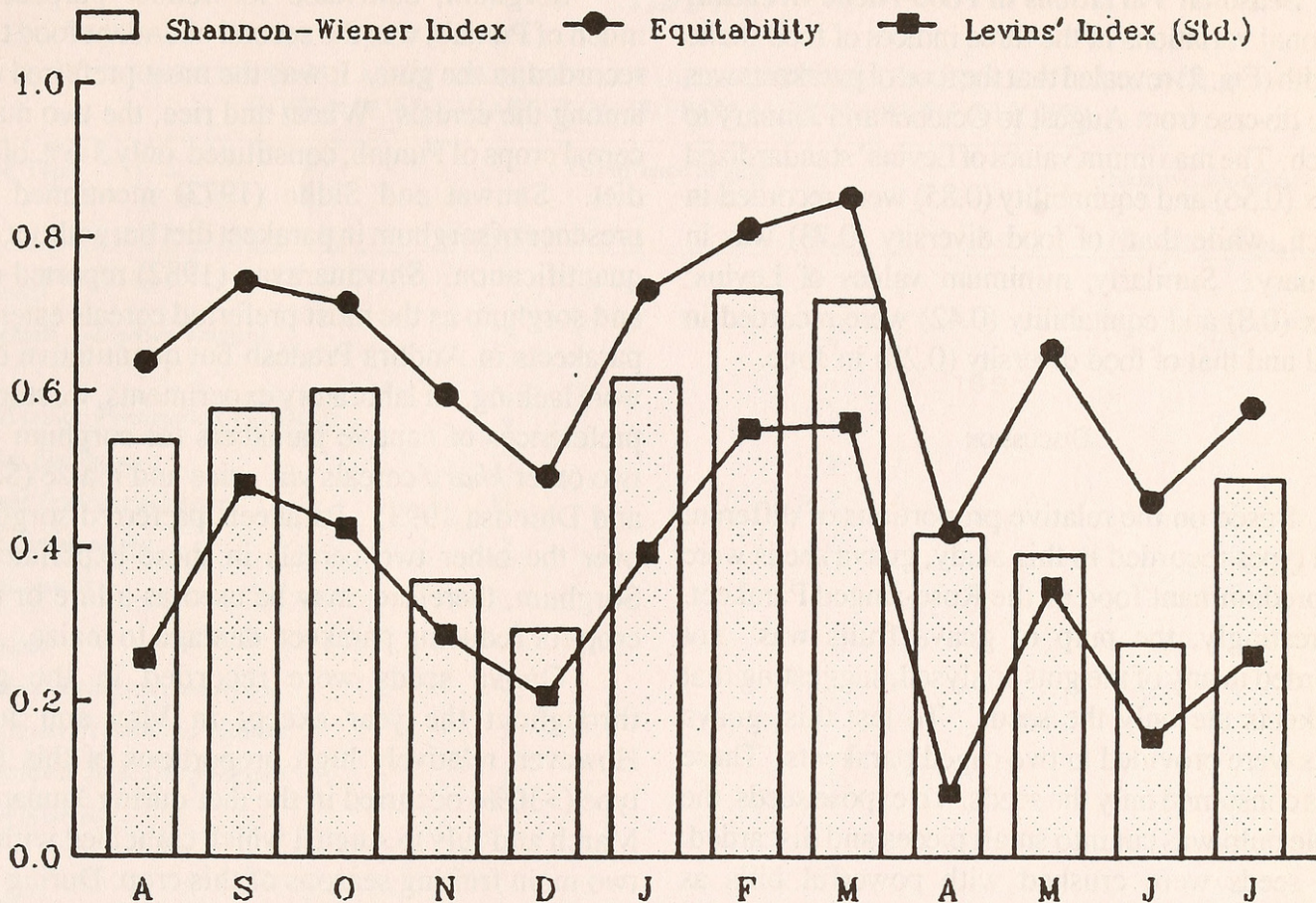


Fig.2. Seasonal variations in three indices of food-niche breadth of the Rose-ringed Parakeet during August 1988 to July 1989.

(17%), mustard both in February (17%) and March (18%), and sunflower in June (82%) formed a significant proportion of the diet.

The occurrence of guava seeds was more prevalent in the diet than any other tree seed as these were recorded in the guts in variable proportions throughout the year except in May and June (Fig.1). Guava seeds dominated the diet in August (58%) and also from January to March (30-45%). In July, this food type ranked second in abundance after wheat. From September to December, guava seeds accounted for 10-20% of the total food. Mulberry seeds formed the major food of parakeets in April and May, constituting 64-75% of the total food. Among other tree seeds, those of sissoo formed about 16% of the diet in February, whereas, in four other months they formed less than

10% of the food. Siris seeds were recorded in the diet only in March (12%) and dek seeds only in April (<1%).

Weed seeds formed considerable proportion (9-28%) of the diet only from April to June. Seeds of *Crotalaria medicaginea* were abundant in the diet in April and May and those of *Rumex* spp. in August and June. Other weed seed, recorded in very small proportions (<1%), were of *Trigonella polycerata*, *T. foenum-graecum* and *Melilotus alba*. Vegetative matter that could not be identified ranged from <1 to 4% of the diet in six months of the study. The proportion of this matter, however, was about 10% in July. Grit was recorded in eight months of the study constituting <1% of the total intake in August to November and 2-5% in December, January, March and June.

Seasonal Variations in Food-Niche Breadth:

Seasonal variations in the three indices of food-niche breadth (Fig. 2) revealed that the food of parakeets was more diverse from August to October and January to March. The maximum values of Levins' standardized index (0.56) and equitability (0.85) were recorded in March, while that of food diversity (0.73) was in February. Similarly, minimum values of Levins' index (0.8) and equitability (0.42) were recorded in April and that of food diversity (0.28) in June.

DISCUSSION

Based on the relative proportions of different food types recorded in this study, guava seeds were the predominant food of the Rose-ringed Parakeet. Interestingly, the pulp of guava fruits was not recorded in any of the guts analysed, suggesting that parakeets ate only the seeds. To test this, guava fruits were provided to two caged parakeets. These birds consumed only the seeds. To expose seeds, the whole pulp was cut into small pieces and discarded. The seeds were crushed with powerful bills as evidenced by the sound of cracking seeds that could be heard at a distance of 3 m. Guava seeds recovered from the guts were very well masticated. In Punjab and Uttar Pradesh, Rose-ringed Parakeet is reported to cause 20-30% damage to guava (Ramzan and Toor 1972, Singh and Kumar 1982). The Rose-ringed Parakeet has often been termed a frugivorous bird but our study suggests that this species does not feed on guava fruits but on their seeds. In case of almonds also, parakeets have been reported to break the fruit to extract and eat their kernels, leaving the hull and stone portions attached to the plants (Sandhu and Dhindsa 1982). The fruits of peach, however, are damaged differently. Parakeets eat the pulp of ripening peach fruits but do not break the seeds (Toor and Sandhu 1981), probably because they are very hard. For other fruits, it remains to be seen whether parakeets eat the succulent parts (as in peach) or damage them to expose and eat their seeds (as in guava). Nevertheless, the fruits are damaged.

Sorghum, cultivated for fodder purpose in much of Punjab, was the second abundant food type recorded in the guts. It was the most preferred one among the cereals. Wheat and rice, the two major cereal crops of Punjab, constituted only 3-6% of the diet. Simwat and Sidhu (1973) mentioned the presence of sorghum in parakeet diet but without any quantification. Shivanarayan (1982) reported rice and sorghum as the most preferred cereals eaten by parakeets in Andhra Pradesh but quantitative data were lacking. In laboratory experiments, we studied preferences of captive parakeets for sorghum and two other *kharif* cereals viz. , rice and maize (Saini and Dhindsa 1993) . Parakeets preferred sorghum over the other two cereals in these experiments. Sorghum, therefore, may be used as a lure or trap crop for reducing parakeet damage to maize.

Guava seeds were recorded in the guts throughout the year except in May and June. However, relatively high proportions of this food type (>30%) occurred in the diet during January to March and July to August which coincided with the two main fruiting seasons of this crop. During this period ripe guava fruits are abundant and probably it is easier for parakeets to extract seeds from ripe fruits. In May and June, however, parakeets preferred to feed on mulberry, sunflower and *Crotalaria medicaginea* rather than on guava seeds. This may be because of energy requirement reasons; apparently less energy is needed to collect mulberry and sunflower as compared to extracting seeds from unripe guava fruits. From August to December pearl millet, sorghum and maize formed significant proportion of the diet. Pearl millet and sorghum are raised as fodder crops in the study area, hence the damage to their earheads is of little concern. Maize, however, suffers heavy damage (12-21%) from parakeets (Ramzan and Toor 1973, Simwat and Sidhu 1973). From January to June, cereals formed only small proportions of the diet except for rice in January and wheat in March. Wheat and rice were not recorded in the guts of parakeets during April-May and October-November, respectively, the

TABLE 1

OCCURRENCE AND RELATIVE ABUNDANCE OF DIFFERENT FOOD TYPES IN THE GUT CONTENTS OF THE ROSE-RINGED PARAKEET (N=88) FROM AUGUST 1988 TO JULY 1989

Food Type	Occurrence in guts		Relative abundance
	Frequency	%	(% by dry weight)
CEREALS			
Sorghum <i>Sorghum vulgare</i>	13	14.8	20.8
Pearl millet <i>Pennisetum typhoides</i>	6	6.8	7.4
Maize <i>Zea mays</i>	13	14.8	6.5
Wheat <i>Triticum aestivum</i>	11	12.5	6.4
Rice <i>Oryza sativa</i>	7	8.0	3.6
Total cereals			44.7
OILSEEDS			
Mustard <i>Brassica campestris</i>	9	10.2	3.8
Sunflower <i>Helianthus annuus</i>	2	2.3	2.9
Groundnut <i>Arachis hypogaea</i>	1	1.1	2.4
Total oilseeds			9.1
PULSE			
Gram <i>Cicer arietinum</i>	3	3.4	2.4
TREE SEEDS			
Guava <i>Psidium guajava</i>	58	65.9	23.6
Mulberry <i>Morus alba</i>	17	19.3	9.9
Sissoo <i>Dalbergia sissoo</i>	10	11.4	3.8
Siris <i>Albizia lebbek</i>	2	2.3	0.9
Dek <i>Melia azedarach</i>	1	1.1	<0.1
Total trees seeds			38.2
WEED SEEDS			
<i>Crotalaria medicaginea</i>	5	5.7	2.3
<i>Rumex</i> spp.	2	2.3	0.4
<i>Trigonella polycerata</i>	1	1.1	0.1
<i>Melilotus alba</i>	1	1.1	<0.1
<i>Trigonella foenum-graecum</i>	1	1.1	<0.1
Total weed seeds			2.8
UNIDENTIFIED VEGETATIVE MATTER			
Grit	21	23.9	1.7
	12	13.6	1.0

periods during which these crops in maturing stage are abundantly available in the fields. This indicated that wheat and rice are not the preferred foods of parakeets. In January, rice was most probably consumed from grain stores because it is not available in the fields during this month. Parakeets, along with sparrows, doves, pigeons, mynas, etc. congregate at grain stores and rice-shelling yards during December-March and feed on stored paddy (Sandhu and Toor 1984).

Oilseeds (mustard, sunflower and groundnut) formed a considerable proportion of the diet in February, March and June. Parakeets have been reported to cause extensive damage (63%) to mustard (Simwat and Sidhu 1973) during this period. From April to June parakeets subsisted on seeds of native trees (mainly mulberry) and weed seeds of *Crotalaria medicaginea* despite the presence of maturing wheat in the fields. Sunflower crop, which has recently been introduced for oilseed production, matures during May-June and provides a feast for parakeets. In spite of intensive manual scaring, this crop suffers heavy damage from this species (Toor and Ramzan 1974). In small unattended crops damage may range from 90 to 100% (unpublished data). The maturity of this crop and the lean-food period of parakeets are so well matched that its protection has become very difficult. Sunflower seeds, however,

were recorded in only two guts of parakeets analysed in this study and formed 3% of the total contents. This may be because of the small sample sizes in May and June.

The food of parakeets was more diverse during August-October and January-March than during rest of the year. The low diet diversity, equitability and food-niche breadth during November-December were probably because of the overdominance of sorghum in the gut contents. The low values of these indices in April-June resulted from the preponderance of tree seeds. In another study, low diet diversity of the House Sparrow *Passer domesticus* was recorded in September-October and January-February owing to the predominance of pearl millet in the former and wheat in the latter period (Saini and Dhindsa 1991).

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