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# FORAGE QUALITY OF *CENCHRUS SETIGERUS* VAHL. AT DIFFERENT GROWTH STAGES

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ABSTRACT

Dry matter yield, neutral detergent fibre (NDF), acid detergent fibre (ADF), lignin and cellulose content of *Moda Dhaman (Cenchrus setigerus* Vahl.) increased with plant growth whereas crude protein and dry matter digestibility decreased, with the ageing of the grass, dry matter yield decreased appreciably, but the *in vitro* dry matter digestibility (IVDMD) remained unaffected. The NDF, ADF, lignin and cellulose were positively and significantly inter-correlated. These attributes, however, showed significant negative correlation with crude protein and IVDMD.

## INTRODUCTION

The nutritive value of forage grasses and legumes decreases with plant growth and development (Grant and Campbell, 1978; Willms *et. al.*, 1980; Gupta 1983, 1984). Thus, it becomes necessary to have information about the proper stage of harvesting of various forages so that these could be preserved as hay or silage to meet the fodder reqirements of animals during the lean period and to have maximum livestock production by providing good quality fodder.

The paper presents studies undertaken to assess changes in the qualitative attributes at different growth stages of *Cenchrus setigerus*, which is an important perennial grass of the arid areas of Rajasthan.

## MATERIAL AND METHODS

The experiment on growth rhythm of *C. setigerus* var. CAZRI-296 was laid out at the Central Research Farm, CAZRI, Jodhpur during 1977. The 0.5 ha area was divided into four blocks each having plots of $10 \times 5$ m size. Samples were taken in four replications from each block for 120 days at intervals of 15 days during the growing season of three consecutive years (1978-80). The grass was uniformly cut prior to the commencement of growing season each year.

Samples were dried in an oven at 60°C, ground and analysed for chemical composition. Crude protein content was estimated by micro-Kjeldahl method. *In vitro* dry matter digestibility (IVDMD) was done following Van Soest *et. al.* (1966). Neutral detergent fibre (NDF) was analysed by the modified method of Van Soest and Wine (1967) and acid detergent fibre (ADF) by the method of Van Soest (1963) and cellulose and silica after Van Soest and Wine (1968). The

pooled data of 3 years were analysed for variance and correlation coefficients as per Snedecor and Cochran (1967).

## RESULTS AND DISCUSSION

### Dry matter yield

With advanced growth, dry matter yield of *Moda Dhaman* increased significantly. The maximum yield was obtained at 90 days growth followed by that at 60 and 45 days (Table 1.) Gradual decrease in the maximum dry matter yield was noticed in the three years (22.8 q/ha in 1978, 17.9 q/ha in 1979 and 10.8 q/ha in 1980). The decrease in dry matter yield may be attributed to the gradual loss in plant vigour with passage of time as observed by Holt (1967) in Blue panic grass.

### Crude protein

Crude protein content which was maximum (10.9 to 12.60% at 15 days of plant growth in all the three years, declined rapidly and significantly at and beyond 60 days' growth. After 45 days' growth, the protein content in the forage is inadequate to maintain animal body weight as it falls short of the minimum (6 to 7%) requirement (Minson and Milford 1967).

### *In vitro* dry matter digestibility (IVDMD)

The first cut of the forage was highly digestible (72.9 to 74.6%) in all the three years (Table 1). It declined rapidly and gradually with growth and maturity upto 90 days' and thereafter slowly. Decrease in digestibility could possibly be due to decrease in the cell content and digestibility of the cell wall contents (Wilman *et. al.* 1977). Yearly variations in digestibility at the same harvesting intervals were not appreciable.

### Neutral detergent fibre (NDF)

Increase in the fibre content with plant growth was significant ($P<0.01$) upto 45 days' growth and beyond it there was no appreciable change. In general, the fibre content ranged from 56.3 to 74.2 per cent during 120 days' growth in all the three years. Yearly variations in the fibre content at the same harvesting intervals were appreciable but no definite trend was observed. In earlier findings (Gupta, 1983, 1984) no appreciable variations in the fibre content was observed in *C. ciliaris* while in *Lasiurus sindicus* it varied appreciably at the same harvesting intervals.

### Acid detergent fibre (ADF)

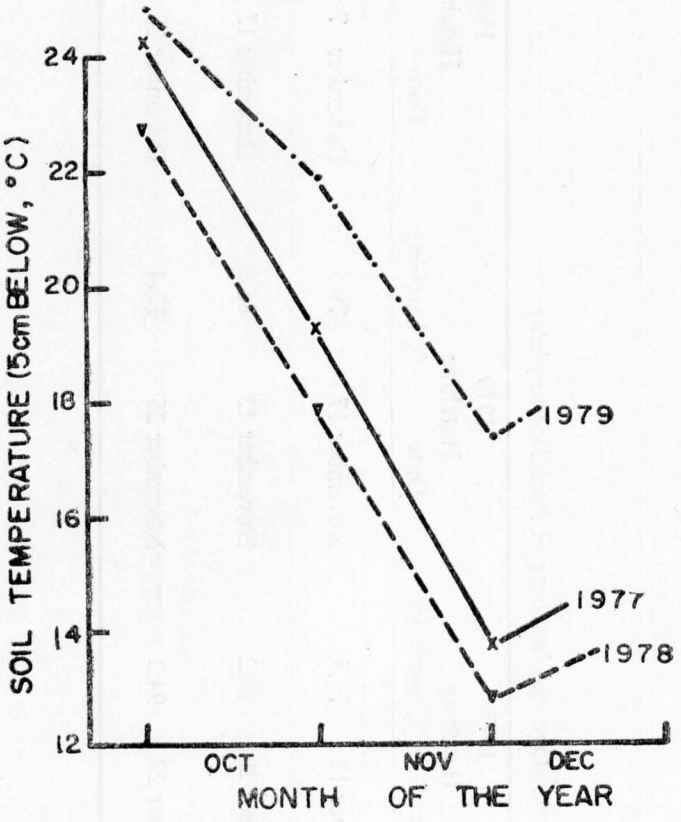
The ADF contents were maximum at 75, 90 and 60 days of plant growth during the three years. With the increase in the NDF, the ADF also increased significantly till 45 to 60 days of plant growth (Table 2). Yearly variations in the ADF content at the same harvesting period were not appreciable. The results are in line with the findings on *C. ciliaris* (Gupta, 1983).

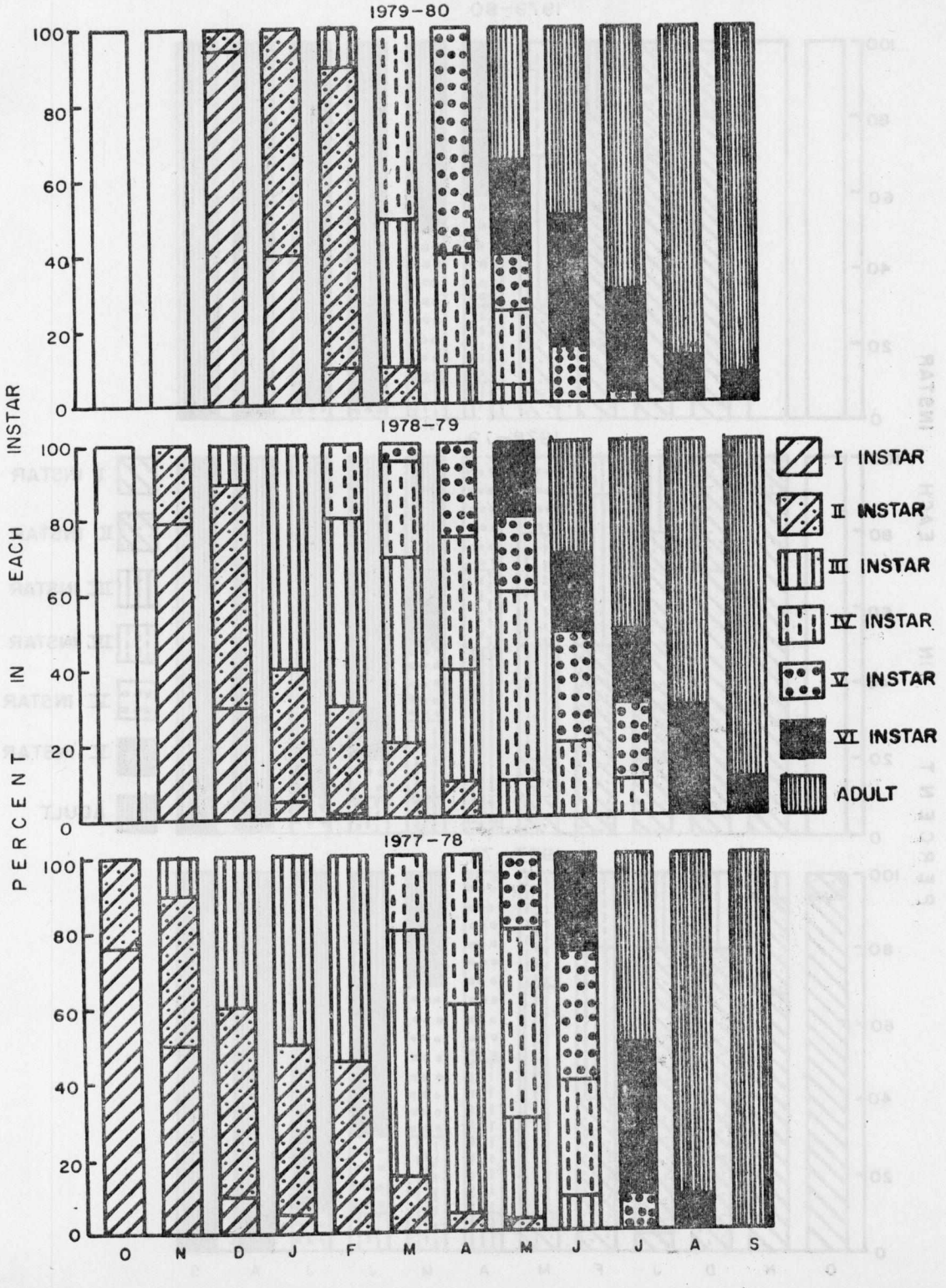
### Cellulose and Hemicellulose

Cellulose, a major constituent of plant cell wall, progressively increased with the plant growth. It was maximum at 75 days of growth during 1978 while in 1979 and 1980, it was maximum at 60 days (Table 3). However, significant increase

Table 2. Date and mean percentage egg hatching of *Poekilocerus pictus*

| Localities | 1978 Hatching | | 1979 Hatching | | 1980 Hatching | |
|---|---|---|---|---|---|---|
| | Date | % hatching | Date | % hatching | Date | % hatching |
| Mandore | October 12 | 76.5 | November 17 | 79.5 | December 7 | 72.1 |
| Ghanchi colony | October 20 | 88.2 | November 13 | 86.6 | December 15 | 64.0 |
| Khema-ka-Kuwa | October 22 | 94.2 | November 25 | 77.4 | December 28 | 62.4 |


SOIL TEMPERATURE (5cm BELOW, °C)
24
22
20
18
16
14
12
1979
1977
1978
OCT
NOV
DEC
MONTH OF THE YEAR


1979–80
1978–79
1977–78
PERCENT IN EACH INSTAR
100
80
60
40
20
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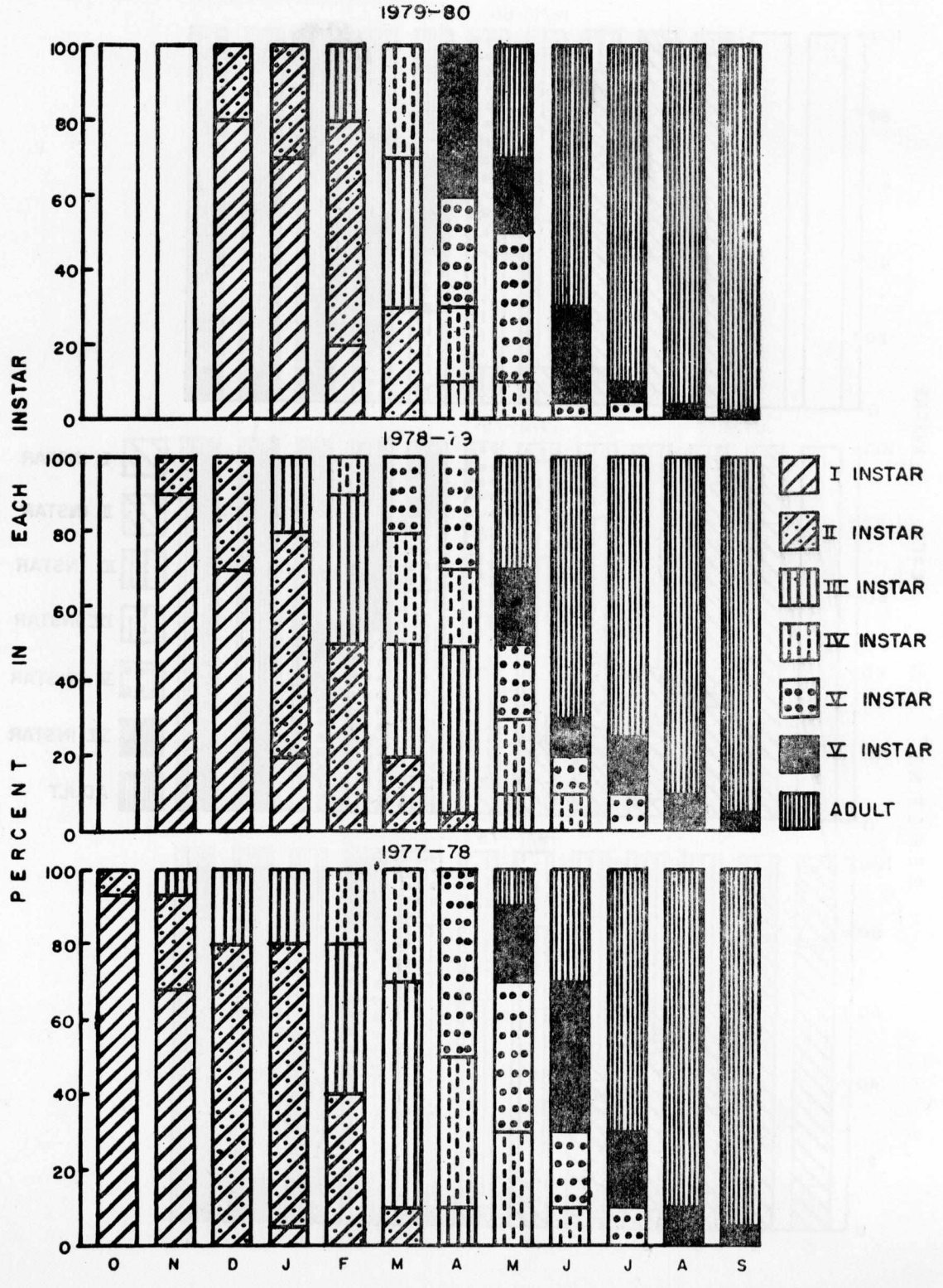
O N D J F M A M J J A S
I INSTAR
II INSTAR
III INSTAR
IV INSTAR
V INSTAR
VI INSTAR
ADULT


1979–80
1978–79
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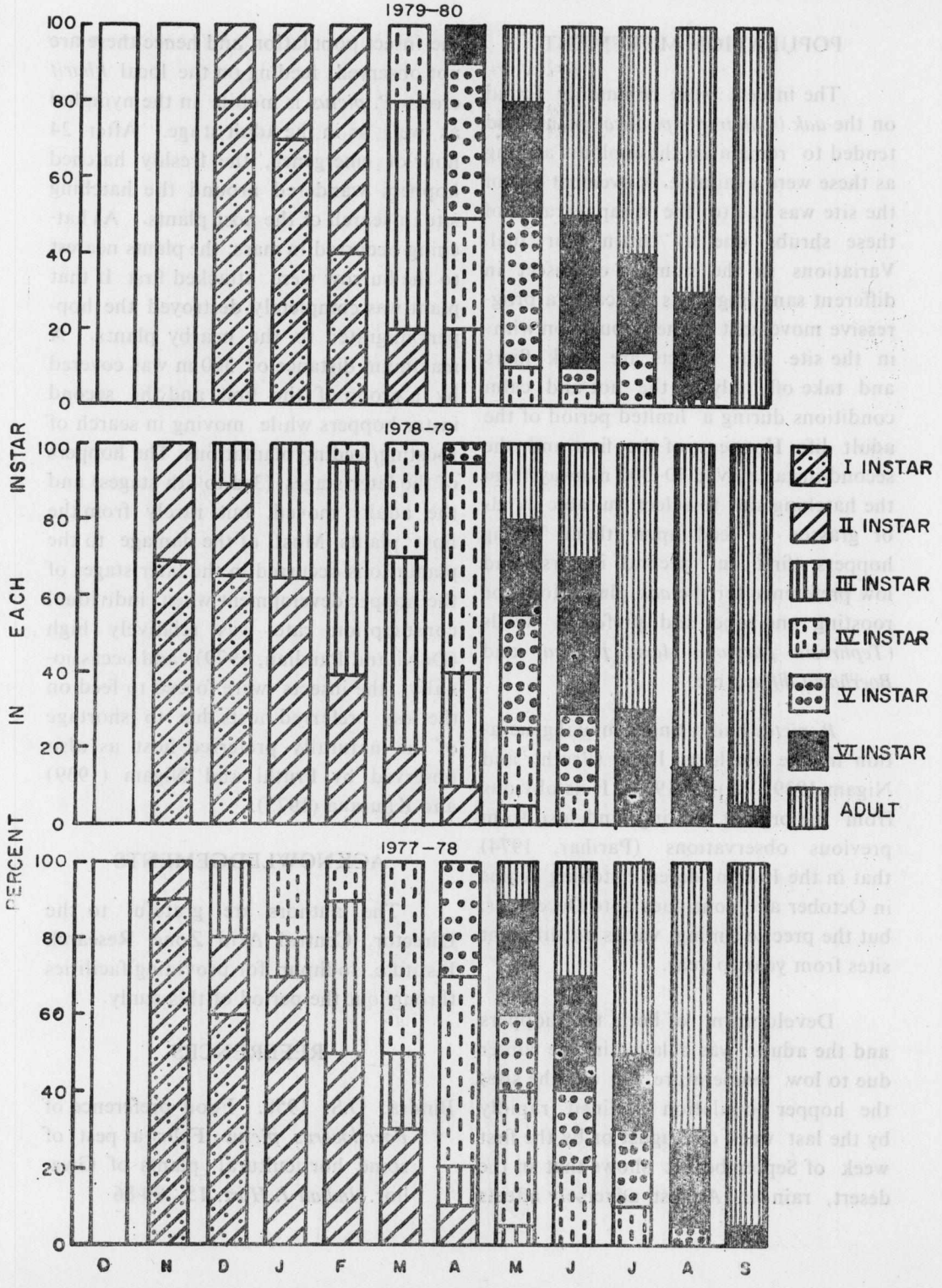
ADULT


1979–80
1978–79
1977–78
PERCENT IN EACH INSTAR
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V INSTAR
VI INSTAR
ADULT

## POPULATION MOVEMENT

The insects were commonly found on the *aak (Calotropis procera)* plants and tended to remain on these plants as long as these were available. Movement out of the site was due to the disappearance of these shrubs due to cutting for fuel. Variations in the number of insect in different sampling plots indicated a progressive movement of the population within the site. The insects are weak fliers and take off only in the hot and calm conditions during a limited period of the adult life. Hoppers of the first and the second instar moved 10–300 m away from the hatching site to select suitable weeds or grasses to feed upon them. Young hoppers (first and second instars) had low preference for the *aak* plantations for roosting and food; and preferred weeds (*Tephrosia purpurea Aerva persica* and *Boerhavia diffusa* etc.).

*P. pictus* had a single annual generation in the northern India (Pruthi and Nigam 1939, Parihar 1974). It is obvious from the present findings and also from previous observations (Parihar, 1974) that in the Indian desert hatching begins in October and continues upto December, but the precise timing varies on different sites from year to year.

Development of both the hoppers and the adults was delayed in the winter due to low temperature. On all the sites the hopper population declined rapidly by the last week of August or by the first week of September. It shows that in the desert, rain in August adversely affects the insect population and hence these are not observed feeding on the local *kharif* crops. *P. pictus* is mobile in the nymphal as well as in the adult stage. After 24 hour of emergence, the freshly hatched hoppers wandered around the hatching site in search of the host plants. As hatching occurred in mass, the plants nearest to the burrow were attacked first. If that plant was completely destroyed the hoppers migrated to the nearby plants. A maximum distance of 300 m was covered by a group of the first and the second instar hoppers while moving in search of roosting/feeding plantations. The hoppers of the later stages (3rd to 5th stages) and the adults moved, but rarely from the host plants. Most of the damage to the plantations occurred in the later stages of the hopper development when individual consumption rate was relatively high (Delvi and Pandian, 1979), and occassionally, the insects were forced to feed on the less preferred hosts due to shortage of the naturally preferred host as also observed by Pruthi and Nigam (1939) and Khurana (1975).

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## *EXPLANATION OF FIGURES*

Fig. 1 Rainfall during 1977-80 (averages of monthly totals) at Jodhpur

Fig. 2 Average monthly soil temperatures beolw 5 cm from October to December during 1977–79

Fig. 3 Age structure of *P. pictus* population at Ghanchi Colony site

Fig. 4 Age structure of *P. pictus* population at Khema-ka-kuwa site

Fig. 5 Age structure of *P. pictus* population at Mandore site