RELATION BETWEEN ABOVE GROUND BIOMASS, GIRTH AND NUMBER OF GROWTH RINGS IN THREE SPECIES OF THE DECIDUOUS FOREST OF UDAIPUR, RAJASTHAN

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Synopsis

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Estimation of the above-ground biomass in three important tree species of dry deciduous forests of Udaipur (Rajasthan) is presented. The tree species selected for the investigation are Annona squamosa Linn., Diospyros cordifolia Roxb. and Wrightia tinctoria R. Br. The area of study is the Chirva forest, situated 10 km north of Udaipur town. From the study it is concluded that in all the three species, the height of tree, girth at breast height and net above-ground biomass increases with an increase in the number of growth rings. The accumulation of the biomass is the highest in D. cordifolia and the lowest in A. squamosa. The trend of the biomass accumulation is correlated with the amount of photosynthetic area.

Introduction

The International Biological Programme has drawn attention to the basic need of estimating the plant biomass. The extent of information available in the productivities of different woodlands of the temperate and Western Pacific regions has been reviewed by Ovington (1962), Bray and Gorham (1964) and Kira and Shidei (1967). In India very few studies on the estimates of tree biomass (Misra et al., 1967, Pandeya et al., 1967, 1968) have been made. No attempt seems to have been made so far on the productivity of forest communities in the semiarid parts of Rajasthan. The present study was aimed to find the biomass of three common tree species (A. squamosa Linn., D. cordifolia Roxb. and W. tinctoria R. Br.) of this area.

Materials and Methods

The values of the net above-ground biomass were estimated by clear cutting and dimension analysis technique. Fifteen trees of good form of each species, varying in their dimensions were selected within a small area of 200 acres in the Chirva forests, Udaipur. The trees were cut down at the bases. Branches and leaves were cut off and measurements on height of bole, girth at breast height, the number of branches, circumference of branches at the cut ends, height of branches, and fresh weights of bole, branches and leaves were recorded. For measuring the dry weight, the samples of bole, branches and leaves were oven dried at 80°C. Due to the nonavailability of any forest history observations on the growth rings were made. All the tree species studied fall in the range of 20–40 growth rings. The operations were made in early December, when in every one of these trees each organ attained its annual maximum biomass.

The Study Area

The area of study in the Chirva forest is situated 10 km north of Udaipur (24° 35′ N latitude and 75° 49′ E longitude). The hills of this area geologically belong to the Aravalli system and range in height from 587 m to 864 m above mean sea level. The red and yellow coloured soils derived from these metamorphosed rocks are sandy loam in texture. The area receives about 500 mm rainfall, which is distributed in monsoonic pattern. Vegetation is of dry deciduous type and has two stories. Boswellia serrata, Lannea coromandelica and Sterculia urens constitute the top story while the second story
includes *D. cordifolia*, *W. tinctoria*, *A. squamosa* etc.

**Results and Discussion**

Fig. 1 represents the (allometric) variation of (growth parameters such as) height, girth and total photosynthetic area with the number of growth rings. The variation types in all the three species are similar to some part of the sigmoid curve which is generally obtained by plotting the growth parameters against time in years. From this it becomes clear that the number of growth rings represent the time in years and hence they can be taken to be roughly equivalent to tree age. Misra (1967) has pointed out that the growth rings in tropical regions do not conform with the calander year. The very presence of the growth rings indicates the presence of alternate dry and wet phases. In case we can count not only the number of the rings but also the alternate dry and wet phases from the meteorological data, comparison between these numbers would lend aid to estimating the correct tree age.

A further study of Fig. 1 will reveal that in this forest *A. squamosa* has a tendency to attain more height while *D. cordifolia* has a tendency to increase in girth and total photosynthetic area. In all the cases *W. tinctoria* is intermediate between the two.

Since the number of growth rings is only roughly equivalent to tree age in tropical countries, it is thought desirable to correlate the pattern of biomass production with the girth of bole at breast height. For this purpose the total dry weight and dry weights of bole, branches and leaves have been considered. It is observed in Fig. 2 that these measurements increase with an increase in girth at breast height (Fig. 2). It is further observed that *D. cordifolia* has the largest biomass and *A. squamosa* the smallest. These observations when read with those of Fig. 1, clearly demonstrate that the order of biomass accumulation is the same as that of total photosynthetic area. This is in conformity with the observations of Misra et al., (1967) for *Shorea robusta*.

Average increment of non-photosynthetic above-ground biomass (calculated by dividing the total weight of bole and branches by the number of growth rings) in the plants studied is presented in Fig. 3. From this figure it is clear that in all the three species (studied), the average increment of non-photosynthetic above-ground biomass increases gradually till 20–23 growth rings, after which there is a steep rise. *D. cordifolia* and *W. tinctoria* show a steep fall of the average increment in a later stage (28 or 29)

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**Fig. 1.** Tree height, girth and total photosynthetic area in relation to the number of growth rings, in the plants studied.

**Fig. 2.** Relation of dry weights of bole, branches and leaves to girth, in the plants studied.

**Fig. 3.** Average increment of non-photosynthetic above-ground biomass in the plants studied.
growth rings). Such a steep fall in *D. cordifolia* is followed by a rise.

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**References**


**グッピーにおける摂食行動の社会的促進**

**II 社会的促進の機構**

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SOCIAL FACILITATION IN FEEDING BEHAVIOR OF THE GUPPY

II. EXPERIMENTAL ANALYSIS OF MECHANISMS

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**Synopsis**


In this part, the experimental analyses of the mechanisms of the social facilitation in feeding behavior of the guppy, *Poecilia reticulata* Peters, are reported. The feeding rate was shown by the numbers of *Daphnia pulex* LEYDIG eaten during 2 hrs.

The results obtained are as follows:

1. The social facilitation in the feeding behavior of the guppy was mainly evoked by visual stimuli.
2. The social facilitation of the feeding behavior in the guppy is likely to be the process by 'the presence recognition effect', rather than that induced by 'the learning effect' or 'the feeding behavior recognition effect'.
3. The size, number of individuals and movement of companions were effective as stimuli, and an increase in quantity of stimulus facilitated the feeding behavior. But, sex, body form, coloration and position of the companion had no or, if any, a very limited value as a stimulus.
4. The fact that an increase of the feeding behavior resulted from the size and number of companions suggests the facilitation by 'the presence recognition effect' caused by the sensophysiological process.
5. The feeding rate increased as the number of stimulators increased up to 3, but never increased with more than 3 stimulators. Referring to literatures, the discrimination among the companion's numbers of 1, 2 and more than 3, observed here, may be