Mangrove litter production in a tidal creek of Lothian island of Sundarbans, India

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Average annual litter fall beneath *Avicennia marina* in a tidal creek of Sundarbans mangrove forest was 1603 g m⁻² y⁻¹ (dry wt). In this litter content, leaves contributed 72.3%, twigs 12.1%, flowers 4.1%, fruits 5.3% and miscellaneous 5.9%. Seasonality of litter production was observed with maximum (av. 553 g m⁻²) in postmonsoon season and minimum (av. 354 g m⁻²) during premonsoon season. Nutrient content in the leaves was generally higher than that of other components of the litter.

Mangrove forests, being an important component of the estuarine ecosystem, have been implicated as producers and exporters of organic matter. The ground litter on the substratum produced by trees, shrubs and herbaceous plants, contributes substantial amount of organic matter to the complex estuarine food webs and energy transfer. Consequently, litter production in the mangrove ecosystem has been used as a measure of productivity in view of the importance of litter to detritivores. The present study deals with the litter production beneath the dominant mangrove species *Avicennia marina* in a tidal creek of Lothian island in Sundarbans.

A few number of discrete islands constitute Sundarbans. The study area is restricted to Lothian island (88°18′10″ to 88°21′30″E and 21°32′50″ to 21°42′30″N) in the Septamukhi river complex of the Ganga delta. Seasons are well recognised in this mangrove ecosystem - premonsoon (March to June) is characterised by high temperature and little precipitation; SW monsoon (July to October) gives heavy rainfall; and postmonsoon (November to February) comprising part of winter season, has comparatively lower temperature and lesser precipitation. The mean maximum and minimum temperatures are 32.2°C and 21.2°C respectively. The mean annual rainfall is 1900 mm. The tidal influence is diurnal with tide range 2.5 to 5.5 m. Among the macrophytes, *Avicennia marina* is most dominant followed by *Acanthus ilicifolius* and *Avicennia alba*. Besides, *Aegiceras majus*, *Ceriops mucronata*, *Excoecaria agallocha*, *Bruguiera gymnorrhiza* and *Sonneratia apetala* are also present.

Litter fall beneath *A. marina* only was collected in traps for 1 y (November 1988 to October 1989). Litter traps were made of nylon screen on conical metal frame (area 2826 cm² and depth of 60-70 cm). They were suspended below the canopy from branches of *A. marina* (6-7 m tall) at a height above that of the highest tide to avoid waterlogging. Two traps were placed in each of 2 locations at 20 m apart along a straight line and litter was collected at monthly intervals. The litter was oven dried at 90°C for 24 h, sorted into leaves, twigs, flowers, fruits and miscellaneous and weighed. The mean and standard deviation of production was determined from 4 traps. Nutrient contents of the litter, collected in a month, were estimated from 3 replicate samples. Litter was ground and digested in concentrated H₂SO₄ and H₂O₂ (30%). Phosphorus was estimated by adjusting pH and Ca and Mg by versenate titration. Na and K were estimated by flame photometer (AIMIL, C150). N was determined by modified Kjeldahl method.

The mean total dry weight of litter fall was 1603 g m⁻²y⁻¹. Leaf fall was the most important component of litter comprising 72.3% of the total. Twigs and miscellaneous components constituted 12.1 and 5.9% respectively. Fruits accounted for 5.2% of the total litter collected during June-August. Flowers accounted for 4.1% and decreased during April-June (Fig. 1). Higher temperature, longer duration of light and reduced salt content of the plant tissue and its immediate environment are probably the factors responsible for extensive fall of fruits and flowers during these months. The amount of litter fall varied with the change of seasons, higher (av. 553 g m⁻²) in postmonsoon and lower (av. 354 g m⁻²) during premonsoon season. The maximum and minimum rates of leaf fall were 6.21 and 1.8 g m⁻² d⁻¹ respectively in November and June (Fig. 1). These are similar to the leaf fall of the mangrove.
Table 1—Litter fall and nutrient content of different components of *A. marina* [Values are mean ± S.D.]

<table>
<thead>
<tr>
<th>Component</th>
<th>Litter fall (g.m⁻².y⁻¹)</th>
<th>Nutrient (% of dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Leaves</td>
<td>1158.7 ± 157.4</td>
<td>1.20 ± 0.42</td>
</tr>
<tr>
<td>Twigs</td>
<td>194.1 ± 89.3</td>
<td>0.88 ± 0.16</td>
</tr>
<tr>
<td>Flowers</td>
<td>66.9 ± 22.5</td>
<td>0.47 ± 0.19</td>
</tr>
<tr>
<td>Fruits</td>
<td>84.4 ± 31.9</td>
<td>0.63 ± 0.14</td>
</tr>
<tr>
<td>Misc.</td>
<td>95.9 ± 26.2</td>
<td>0.76 ± 0.25</td>
</tr>
</tbody>
</table>

The nutrient contents of various components of the litter fall are given in Table 1. The mean annual contribution of P, N, Ca, Mg, K and Na by the litter components of *A. marina* to the mangrove forest substratum are estimated to be of the order 70, 631, 328, 351, 718 and 2048 kg.ha⁻¹ respectively. However the concentrations of various elements represent the concentrations of the litter recovered from traps after a month and some loss of nutrients due to leaching and translocation prior to abscission might have occurred. Hence, the estimated average annual inputs of the nutrients are to some extent lesser in amount than the total input of nutrients to the mangrove forest floor. Nevertheless, it does reveal that the mangrove litter contributes significant amount of nutrients within the open mangrove ecosystem.

References