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DECOMPOSITION AND NUTRIENT RELEASE OF *SAL* LEAF LITTER AS INFLUENCED BY LEGUME LEAF LITTER OF THE *SAL* FORESTS

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Decomposition of litter is an important function that determines nutrient and carbon cycling in the forest ecosystems. Litter quality largely influences the rate of decomposition; high levels of nutrients such as nitrogen (N) and phosphorus (P) enhance the rate of microbial decomposition and mineralization and those of defense chemicals such as phenolic compounds and tannins slow down the rate of that processes[1,2,3]. Plant species differ greatly in decomposability of litter[4,5]. Leguminous plants produce high quality litter having increased N and P in their plant tissues because of the capability to fix atmospheric N and also of the ability to uptake increased P through mycorrhizal association[6,7,8]. In *Sal* forests, dominated by *Sal* (*Shorea robusta* Gaert. *ex* f.), of Bangladesh about 70 - 75% of the trees are *Sal* and among the total of 54 families recorded, Leguminosae is the largest with 24 species under 15 genera[9]. Although leguminous plants are naturally associated with *Sal* plants[10], the role of these plants on decomposition and nutrient mineralization of the litter of *Sal* plants has not been well studied, although such information is relevant for the management and conservation of the *Sal* forests. The main objective of the present study was to examine the effects of legume leaf litter on mass loss and the release of N and P of the *Sal* leaf litter in *Sal* forests.

Leaf litter was collected from four legume species, namely *Butea monosperma*, *Acacia auriculiformis*, *Albizia procera* and *Desmodium heterophyllum* along with *S. robusta* growing naturally in the *Sal* forest under the districts of Gazipur, Tangail and Mymensingh. Soil was collected from nine different sites at 0 - 10 cm depth and then mixed together and kept in a plastic bag. Dried leaves of legume plants were then added separately to 200 g soil already taken into a plastic pot. The dried leaf litter of *Sal* plants was cut into pieces of 2cm x 2cm in size. Then, 1 g *Sal* leaf was added to each pot containing legume leaf litter mixed with soil. In addition to litter treatments, control (soil without legume leaf litter) was also used. Each treatment was replicated three times. Autoclaved distilled

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water was added time to time in order to maintain moisture content similar to all treatments. Pots were kept for incubation at room temperature. Samples were collected after three to six months for the analysis of mass loss rate and N and P contents in *SaI* leaf litter. Leaf N, P, phenolics and tannins were determined by following standard protocols as described by Hossain *et al.*[11].

As shown in Table 1, the highest total N content was recorded in *A. auriculiformis* (1.46%) and the lowest of that was recorded in *S. robusta* (1.09%), although no significant difference appeared. Leaf P content showed significant difference among the litter species. Phosphorus content was highest in *A. procera* (0.29%) and that was lowest in *S. robusta* (0.09%). Leaf phenol content also showed significant difference among the five plant species. Concentration of phenol was highest in *D. heterophyllum* (2.88%) and lowest in *S. robusta* (1.31%). Tannin content was also highest in *D. heterophyllum* (0.05%) but lowest in *A. procera (*0.003%) with marginal significance (p = 0.06).

Table 1. Chemical properties of leaf litter of the different plant species used in the study.

	Acacia auriculiformis	*Albizia procera*	*Butea monosperma*	*Desmodium heterophyllum*	*Shorea robusta*	p
Nitrogen (%)	1.46 ± 0.08	1.13 ± 0.08	1.23 ± 0.08	1.19 ± 0.08	1.09 ± 0.08	0.08
Phosphorus (%)	0.10 ± 0.04	0.29 ± 0.04	0.19 ± 0. 04	0.11 ± 0.04	0.09 ± 0.04	0.04
Phenol (%)	1.47 ± 0.35	1.52 ± 0.35	2.39 ± 0.35	2.88 ± 0.35	1.31 ± 0.35	0.04
Tannin (%)	0.01 ± 0.01	0.003 ± 0.01	0.03 ± 0.01	0.05 ± 0.01	0.03 ± 0.01	0.06

Two-way ANOVA revealed that mass loss and N content in *SaI* leaf litter was significantly ($p < 0.0001$) affected by time of incubation but not by litter species. Species effect was significant ($p = 0.03$) for leaf P (%) content during decomposition (Fig. 1). There was no significant interaction between litter species and time on the variables studied in the present study.

Mass remaining and N content of the leaf litter gradually declined from initial through three months to six months. After six months, about 50% mass remained in *SaI* leaf litter incubated with *A. auriculiformis* and *B. monosperma*. Although there was no significant effect of litter species on leaf N content there was a tendency of lower leaf N content in *SaI* leaf litter treated with the leaf litter of the four legume species compared to control. Leaf P content of *SaI* leaf litter gradually decreased from initial to six months while incubated with leaf litter of *A. procera* and increased when incubated with that of *D. heterophyllum*.

Significant effect of legume litter species on the release of P content in *SaI* leaf litter could be explained by the differences in the litter chemistry of the plant species used in the experiment. The lowest and the highest amount of P were reported in *SaI* leaf when it

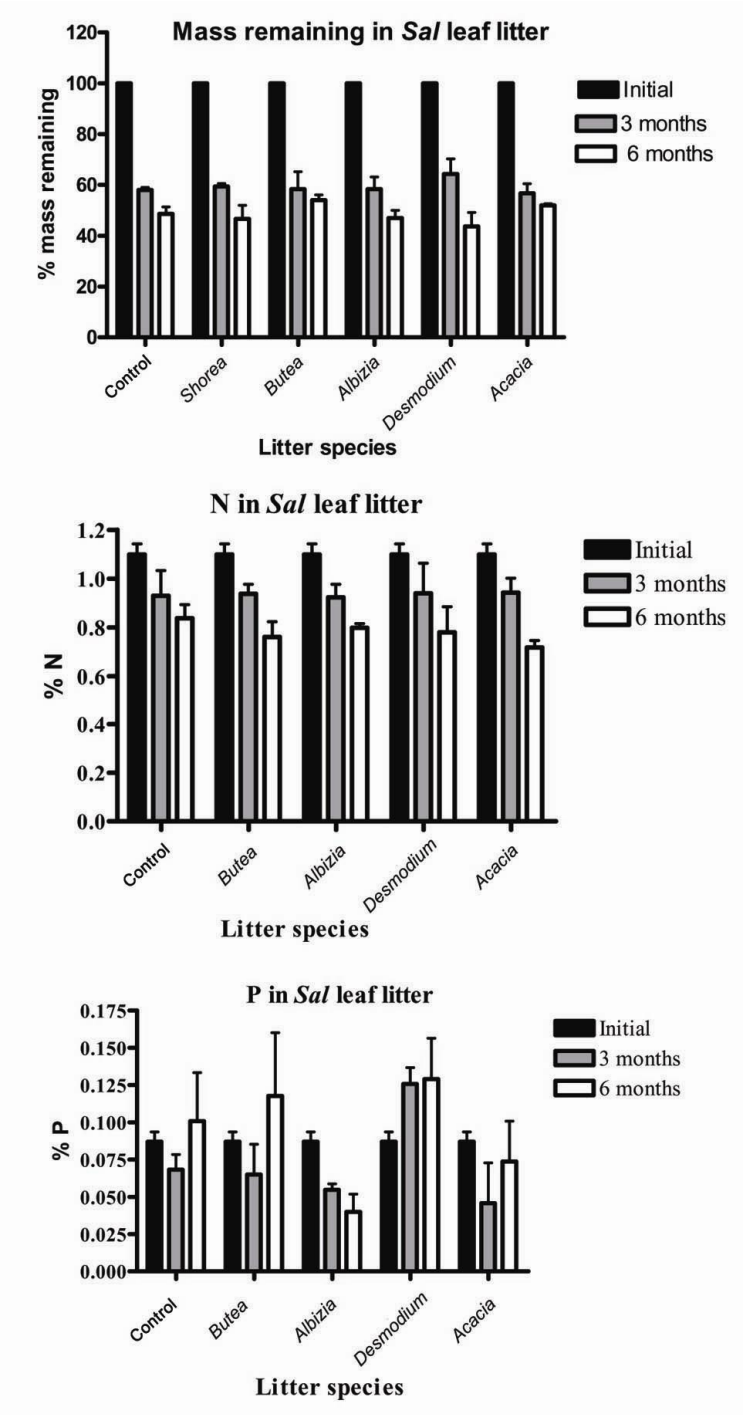

Fig. 1. Effects of leaf litter of various plant species on the mass loss rate and N and P remaining in the *Sal* leaf litter.

was incubated with *A. procera* and *D. heterophyllum,* respectively. Further, *A. procera* contained the lowest amount of tannin while *D. heterophyllum* contained the highest amount of phenolic substances. It is reported that phenolic substances inhibit microbial activities[2]. The inconsistent pattern of P release in *Sal* leaf litter incubated with litter of different legume species observed in the present study is consistent with other studies those reported accumulation of P in the decomposing leaf litter[12]. All these results of the present study are thus relevant for the management and conservation of the deciduous *Sal* forest ecosystems.

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