Floristic seed bank in forest plantations in the Eastern Amazon, Pará, Brazil

Cecília Hernandez Ochoa Coutinho¹; Sílvio Brienza Júnior²; Ana Paula Bastos³; Julie Andrews de França e Silva⁴; Vanessa Gomes de Sousa⁵

¹ Scholarship INCT/CNPq/ Museum Paraense Emílio Goeldi/Embrapa Eastern Amazon. cecilia.ochoa@gmail.com
² Researcher, Embrapa Eastern Amazon, Belém, PA, Brasil. brienza@cpatu.com.br
³ Researcher, Center for Advanced Amazonian Studies at the Federal University of Pará - NAEA/UFPA. pbastos@ufpa.br
⁴ Scholarship/Federal Rural University of Amazonia. julie.franca@yahoo.com.br
⁵ Scholarship Embrapa/FAPESPA. vanessousa@gmail.com

Introduction

The major causative agents of changing on Amazon forest ecosystems are predatory exploitation of timber and non-timber products, implantation of pastures, the slash-and-burn and mechanized farming of grains (ALMEIDA et al., 2006).

In Brazil, the new Forest Code (Law nº 12.727/2012 and Decree 7.830/2012) was created with the purpose of supporting the activities with different land uses in order to guarantee the recovery of legal reserve and permanent preservation areas in rural properties.

The introduction of forest plantations in degraded areas in the eastern Brazilian Amazon region is considered a way to recover degraded areas and is nowadays a widely used process in the restoration of legal reserve areas. Besides bringing economic benefits, these plantings fasten the natural regeneration in the understory, contributing to biodiversity conservation.

The study of natural regeneration and seed bank in successional forests of different ages and land use, when developed in the same area, allows to know its performance based of the seed stock in the soil and possible differences in the results may be related to the stage of succession or the type of change that occurred in this forest (ARAÚJO, 1998).

The seed bank in the soil can be considered as an indicator of the forest regeneration potential in degraded areas, since it is a deposit with high density of seeds of several species in latent state storing mainly pioneer species and early secondary (ARAÚJO et al., 2001). They are life forms kept in the soil, able to germinate for a long time, in response to changes in forest (BAZZAZ and PICKETT, 1980).

The objective of this study is to characterize the floristic composition of the seed bank present in the understory of forest plantations aiming to support environmental legislation regarding the maintenance of biodiversity in legal reserve areas in Eastern brazilian Amazon region.
Material and Methods

The research is developed in four farms: Arizona Farms (ARZ-DE), Chapadão (CPD-DE) and Incomaf (INC-DE), located in Dom Eliseu-Pará, under the geographic coordinates S 04°04'51,4" and W 47°33'00,2" and Itabaiana Farm (ITB-MA), in the state of Maranhão, coordinate 05 ° 04'05 S, 6 ° and W 47 ° 37'13, 1". The seed bank was collected in the understory of forest plantations with *Schizolobium amazonicum* Huber ex Ducke and *Eucalyptus urograndis* at different ages. The age of the understory vegetation of such plantings ranged from 6 months to 4 years. These areas have distinct historical land use before the planting. In each property, composite samples of the seed bank were collected with a wood guide of 0.25 m². The experiment was held for 6 months in a green-house at Embrapa Eastern Amazon.

After germination, seedlings were counted and identified with the aid of a parabotanist. The species were sorted into families and distributed according to its life habit (tree, shrub, woody liana, herbaceous and herbaceous liana), following the rating system Angiosperm Phylogeny Group III (APG III, 2009), site www.tropicos.org; classified into successional stages (pioneer, early secondary, late secondary and climax) and in different syndromes of seed dispersal (zoochory, anemochory and barochory). The heterogeneity and floristic similarity were calculated by the Shannon-Wiener (H’) Diversity Index and by the Sorensen Similarity Index, respectively.

Results and Discussion

Out of the total number of emerging seedlings, more than 60% germinated in the first month of evaluation and less than 10% at the end of the experiment. The floristic richness of the seed bank was composed by 2,750 individuals, represented by species 79, distributed in 34 botanical families. The Shannon-Weaner heterogeneity index was considered high and ranged from 2,75 to 3,02, indicating high diversity of floristic composition of the seed bank in the four areas (Table 1). The Sorensen index, ranging from 0,619 to 0,778, indicated the existence of high floristic similarity in the pairs formed by the four areas studied.

ARAÚJO, (2001) observed in a six-year successional forest a floristic richness composed of 72 species and diversity index of 2.23.

Table 1: Diversity and floristic composition of the seed bank understory of forest plantations.

<table>
<thead>
<tr>
<th>Areas studied</th>
<th>Nº of individuals</th>
<th>Nº of families</th>
<th>Nº of species</th>
<th>Diversity Shannon (H’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARZ-DE</td>
<td>1.160</td>
<td>27</td>
<td>55</td>
<td>2,99</td>
</tr>
<tr>
<td>CPD-DE</td>
<td>997</td>
<td>25</td>
<td>53</td>
<td>2,77</td>
</tr>
<tr>
<td>INC-DE</td>
<td>350</td>
<td>24</td>
<td>42</td>
<td>2,75</td>
</tr>
<tr>
<td>ITB-MA</td>
<td>243</td>
<td>20</td>
<td>42</td>
<td>3,02</td>
</tr>
</tbody>
</table>

Table 2: Floristic similarity existing in pairs formed by the four areas studied.

<table>
<thead>
<tr>
<th>Areas studied</th>
<th>Sorensen Similarity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARZ-DE x CPD-DE</td>
<td>0,778</td>
</tr>
<tr>
<td>ARZ-DE x INC-DE</td>
<td>0,680</td>
</tr>
<tr>
<td>ARZ-DE x ITB-MA</td>
<td>0,639</td>
</tr>
<tr>
<td>CPD-DE x INC-DE</td>
<td>0,695</td>
</tr>
<tr>
<td>CPD-DE x ITB-MA</td>
<td>0,653</td>
</tr>
<tr>
<td>INC-DE x ITB-MA</td>
<td>0,619</td>
</tr>
</tbody>
</table>
The shrub-tree biomass, formed by trees, shrubs and woody lianas, ranged from 36% to 49%, but in all areas studied there was a predominance of herbaceous biomass (above 50%) (Figure 1). In the herbaceous percentage, graminoid plants had an average of 46% (Figure 2). The ecological succession was mainly characterized by pioneer species (66%) and early secondary (23%) (Figure 3). The main types of seed dispersal was zoochory (38%), barochory and anemocory (both 29%) (Figure 4).

![Figure 1: Distribution of woody biomass and herbaceous biomass in the seed bank.](image1)

![Figure 2: Distribution of individuals with herbaceous and graminoid in the four areas studied.](image2)

![Figure 3: Distribution of species seed bank by successional stages.](image3)

![Figure 4: Major dispersal syndromes seed bank understory of the studied areas.](image4)

SANTOS (2010) found a 96% prevalence of herbaceous plants in the seed bank under eucalyptus plantation in the city of Paragominas-Pará. But on the seed bank of a six-year secondary forest in the city of Benevides-Pará, the tree was the predominant form of life. VIEIRA (1996) states that the predominant way of life in a particular site depends on the kind of
land use, considering that in areas where there was forest degradation for pastures implantation, there is generally the dominance of herbs, grasses and shrubs invasive species.

Conclusions and Outlook

The areas studied may be considered a source of biodiversity as long as they show similar results to the richness of secondary forests with historical of land use similar to the areas studied and whose growing native vegetation are close to 3.5 and 5 years.

References


