Ethnobotanical Leaflets 13: 59-64. 2009.

Resprouting in Tropical Rainforest of Highwavy Mountains, Western Ghats, Tamil Nadu, India

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Issued 04 January 2009

ABSTRACT

Six hectares of evergreen forest of Highwavy Mountains, Western Ghats, Theni District, Tamil Nadu, India, was censused for the damaged trees (≥ 30cm girth at breast height). Among 57 damaged trees 28.07% was uprooted and 71.93% was standing broken stems. Among standing broken stems only 39.02% was resprouted. The percentage of resprouting of our study site was slightly higher than other forests. The resprouting and the production of multishoots from the stumps were mainly seen in the pioneer species and resprouting was rare in the climax species. This was contrast to other forests.
Key words: resprouting, stumps, tree damage, rainforest, Western Ghats.

INTRODUCTION

The death of the whole tree affects nutrient cycling, regeneration, and species richness in the particular area. Tree falls are determined by local climatic factors, physical characteristics of the substrate, and biological attributes of trees (Brokaw 1982, Putz & Milton 1982, Putz et al. 1983, Denslow 1987, Putz & Brokaw 1989). When a whole tree falls to the forest floor, it; cause pulses of organic material and nutrients that can subsequently become available to terrestrially rooted plants (Denslow 1987); increase the biomass of the forest floor, thus creating additional habitats for terrestrial organisms. Crush seedlings, saplings and understory plants (Aide 1987; Gartner 1989; Kinsman 1990); and affect microclimate of the ensuing gap that may daunt or smooth the progress of seed germination of some species (Putz & Milton 1982, Brandani et al. 1988, Swaine et al. 1990).

While many damaged trees die, some continue to live by producing new shoots from above or below ground parts. Most of the research has centered on regeneration from seeds, seedlings, or clonal

growth (Clark & Clark 1989, Eriksson & Ehrlen 1992). Resprouting from standing broken stems might replace the lost canopy and affect the form and duration of gap regeneration faster than regeneration from seedlings. The ability to resprout might allow a species to maintain its frequency in the population (Knight 1975, Putz & Brokaw 1989, Whigham et al. 1991).

The rates and frequency of tree damage expected to be greater in higher elevation forests because of steeper slopes, less stable soil and exposure to more wind. Plant adaptations to these environmental characteristics might also be expected in wet evergreen forest.

In this paper, we describe the damage of the trees and report the frequency of resprouting of snapped trees of evergreen forest of Highwavy Mountains, Western Ghats, Theni District, Tamil Nadu, India.

METHODS

Study Site

Our study site is situated in the Pachakumachi hill (9° 35’ to 9° 45’ N latitude and 77º 15’ to 77º 27’E longitude) of Western Ghats, South India. The Pachakumachi hill is surrounded by Palani Hills in the North, Sethur and Sivagiri hills in the South, Cardamom hills and Kerala state in the West, the Varushanadu hills in the Northeast and Thekkadi hills in the Southwest. Vaigai and Surliyaru are the main rivers originating from Pachakumachi hill ranges.

Climate and Soil

Climatological data of the study site are collected from Pachakumachi estate Climatological station. Pachakumachi hill receives 2726 mm rainfall annually. June is recorded as the hottest month with maximum temperature of 31°C and January is the coldest month with the minimum temperature of 17° C. Humidity is high (95%) during the months of June, July and August; and low humidity is noted only in the month of March (85%). Climatological data of Pachakumachi hill is given in Fig 1. Pachakumachi hill has red, sandy clayey and loamy type of soil. Physio- chemical characteristics of soil of the study site are given in table 1.

Vegetation

In the 10,000 Acres of total area of Pachakumachi hill, 2,000 acres are under the cultivation of cash crops such as cardamom, coffee and tea. These plantations are intermingled with the patches of Evergreen forests. The altitude of the hill ranges from 600 m to 2,000 m. The vegetation ranges from scrub jungles in the foothill to evergreen and sholas at hill tops. Our study site is situated at an altitude of 1,700 m. Our study site is defined as the tropical evergreen forest.

Field Work

Between June 2006 and February 2007, we censused the entire site (6 hectares) for snapped or fallen trees and resprouting of the standing broken stems during study period. We made frequent visits to the study site. The damaged trees with GBH ≥ 30 cm were noted. Tree damage was divided into three categories; a: uproot- fallen trees with exposed root balls; b: knockdown- a broken or uprooted, tree falling as a result of a neighboring tree hitting it; c: standing dead- tree dead, but stem not broken or uprooted;.

During study period, all standing broken stems were checked for the evidence of resprouting of leaves anywhere on the stem. Standing broken stem with newly sprouted leaves were recorded as living ones and those with no sprouting of leaves were recorded as dead ones.

The resprouted stumps were classified into two groups; by the formation of new shoots; 1: Multishooted stumps- The stump producing more than one new shoots; 2: Monoshooted stumps- The stump producing only one new shoots; for this the standing broken stumps with DBH ≥ 30 cm were tagged.

The stumps which were produced the shoots more than two in numbers, also noted. The stumps with DBH ≥ 30 cm were noted.

RESULTS

In 6 ha study plot, 57 trees were severely damaged. The number of damaged trees per hectare was 9.5 trees. Among these, 28.07% were uprooted, 7.01% were standing dead, and remaining was knocked down (Fig 1.).

All the trees that were damaged or died during our study period (57) were identified up to species level. They were belonging to ten families, represented by ten genera, and ten species. The percentage of damage was seen in both cases i.e., in climax and in pioneer species.

The uprooting of whole trees mainly occurred in the climax species (20). All the members' of pioneer species were standing broken stems. The standing dead trees were the climax species.

Resprouting of damaged trees:

The resprouting mechanism is mainly seen in the pioneer species. Among the climax species only 4 species were resprouted. The percent of resprouted and not resprouted standing stems was shown in the Fig 2. Other 5 species didn't resprouted. They were considered as the standing dead trees.

The resprouting mechanism is mainly seen in the pioneer species. Among the climax species only 4 species were resprouted. The percent of resprouted and not resprouted standing stems was shown in the Fig 2. Other 5 species didn't resprouted. They were considered as the standing dead trees.

Euphorbiaceae family showed 50% of resprouting among total percentage of resprouting. Resprouting percentage for other families were 6.25, 12.5, 12.5, and 18.75 of Guttiferae, Anacardiaceae, Elaeocarpaceae and Rutaceae respectively. Polypetalae and Monochlymadeae shared the percentage of resprouting (Fig 3).

The production of multi shoots was seen only in the pioneer species. It was not seen in the climax species. Among 8 of the resprouting pioneer species, 2 only producing more than 2 new shoots from the standing broken stem.

DISCUSSION

The rate of resprouting in our study site was coinciding with other forests. There was a trend that, in the mature forests, gap-colonizing species suffer higher nonresprouting rates than other taxa. But our result was controversy to the above trend, i.e., in our study site the pioneer species showed the higher resprouting rate. Among the climax species only 4 species showed the resprouting.

Likewise the resprouting, the production of multishoots was seen only in the gap-colonizing species. No other standing broken stems belonging to the climax species was producing the multishoots.

ACKNOWLEDGEMENTS

We thank UGC for their financial support of this project. We also thank Selvam for his help during the field study. Our sincere thank to Tamil Nadu Forest Department for their permission.

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Table 1: Physio- chemical characteristics of soil of the study site.

S.No.	**Parameters**	
1.	Texture	Sandy clay loamy
2.	pH	5.35
3.	Nitrogen (ppm)	142.84
4.	Phosphorus (ppm)	5.23
5.	Potassium (ppm)	80.15
6.	Iron (ppm)	21.21
7.	Manganese (ppm)	3.99
8.	Zinc (ppm)	0.41
9.	Copper (ppm)	0.35

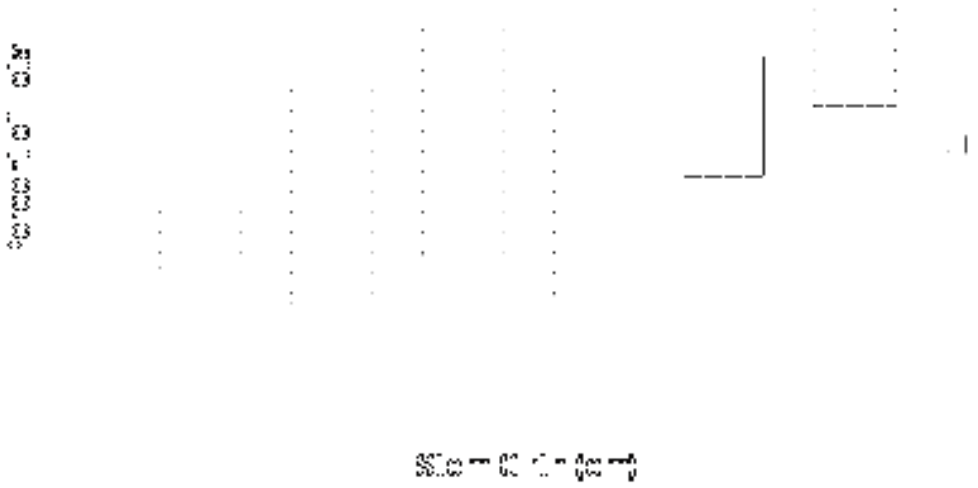

Figure 1: Size class distribution (percent of total stems) of the damager stems.

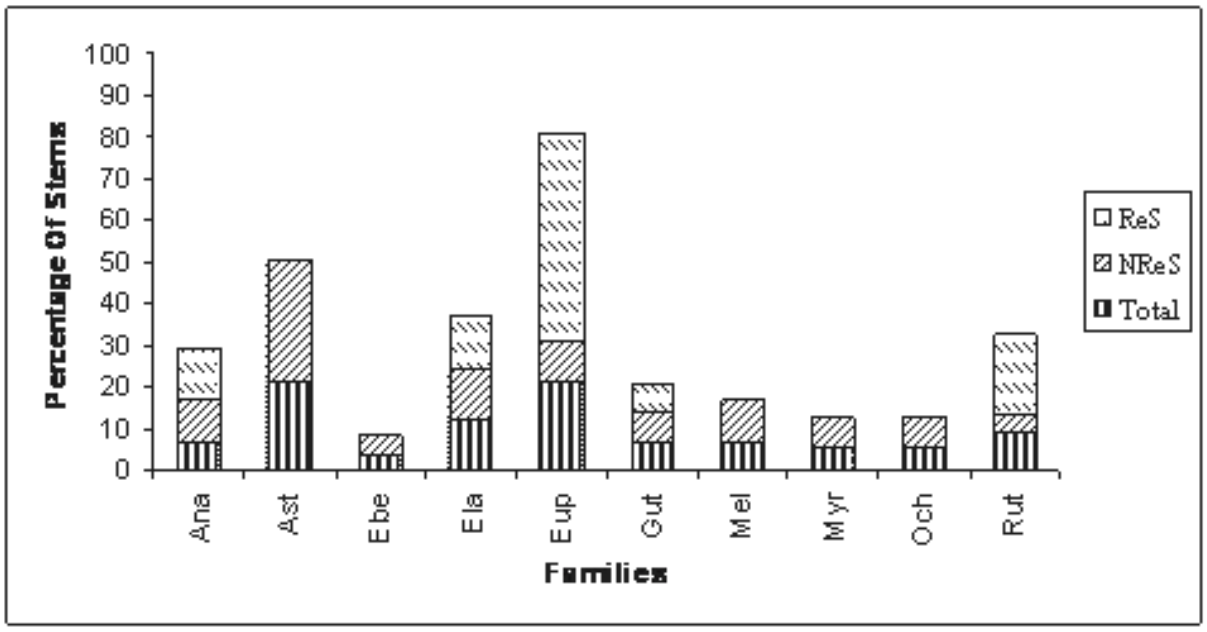

Figure 2: The composition of damaged trees by family. The percent of total trees damaged, not resprouted and resprouted. (ReS- Resprouted, NReS- Not resprouted).

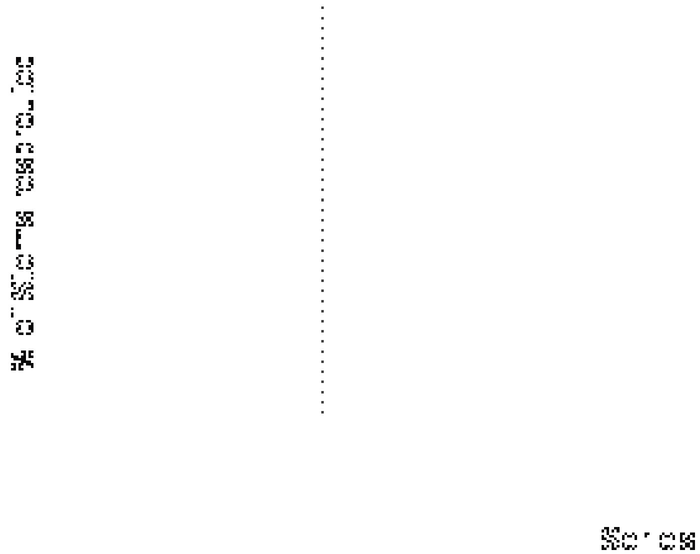

Figure 3: Resprouting of standing stems regarded with Series.