

## A preliminary study on flood tolerant trees in Sonitpur district of Assam, India

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[Received revised 13.12.2012; Accepted 14.12.2012]

### Abstract

Many parts of Assam have been experiencing flood during summer that caused tremendous losses in terms of human life & livelihood and ecosystem. Many studies have been conducted to understand the impact of flooding on trees; often these are area specific. Gohpur subdivision of Sonitpur district is one of the flood prone areas in Assam where local trees were observed for their tolerance to flood. On the basis of the observations made during 1998- 2010 trees are categorized as Tolerant (most individuals survived  $\geq 100$  consecutive days of flooding), Somewhat Tolerant (most individuals survived  $\geq 100$  but  $< 60$  consecutive days of flooding), Slightly Tolerant (most individuals survived  $\geq 30$  but  $< 60$  days of flooding) and Intolerant (severe effects within 30 days) considering the longevity of flood and survivability of trees during growing season. So far six species have been enlisted as Tolerant, 12 as Somewhat Tolerant and 15 as Slightly Tolerant dicotyledonous tree species occurring in the area. Utilization of such trees for human welfare as well environment is also noted.

**Key words:** Flood Tolerant Trees, Gohpur, Assam

### INTRODUCTION

Assam (24°09' to 27°58' N & 89°42' to 96°01' E) covers an area of 78,523 sq km after recognition of the states of North -East Region. It is a humid tropical area with its heterogenic physiography coupled with varied climate (rainfall 1000 mm to 2500 mm per annum, temperature ranging from 5° C to 38° C and relative humidity 73 % to 95 % annually) favours the luxuriant growth of diverse plant species.

Assam is one of the states of India prone to natural disasters like earthquake, floods, landslides, cyclone and occasional draught. Disasters cause sudden disruption to the normal life and cause enormous damage to property and lives leading to socio-economic setback to a great extent. The most frequently occurring disaster in Assam is flood. Almost all districts on the north bank of the mighty river Brahmaputra have the experiences of perennial and flash floods especially the Dhemaji, Lakhimpur, Sonitpur, Barpeta and Bongaigaon districts. The area has been recording high flood during 1897, 1910, 1911, 1915, 1916 and 1931 prior to the great earthquake in 1950 and after that in 1954, 1962, 1966, 1972, 1974, 1977, 1978, 1984, 1986 to 2000, 2004 and 2010. (Gogoi 2000; Bora 2010)

During the 10<sup>th</sup> plan period, on an average, 674148 hectare of land inundated in Assam causing serious damage to crop production, forests, roads & bridges, homesteads, domestic and wild animals (CNDM 2000).

Usually almost all terrestrial herbs and shrubs of flood inundated areas die after prolonged flood; some shrubs and trees can survive or regain their growth after receding

flood water. The ability of trees to survive flooding depends mainly upon soil, tree type and flood characteristics. (Pezeshki 1991; Hershey *et al* 1993). These include soil aeration, soil pH, Organic matter in the soil, sedimentation and scouring; tree height, crown class, age of the tree, vigor of the tree, roots and species variations; season of flood, flood duration, water level, temperature and oxygen, mechanical injuries caused to tree, and chemicals carried by flood (*Missouri Department of Conservation* 1993)

Flood tolerant trees of different categories can be used in preventing soil erosion, controlling water current, as food and shelter for animals and economic use for peoples of flood prone area. Many investigations have been conducted in different parts of the world in searching and developing flood resistant varieties of crops and other useful plants but these studies are mostly area specific and have not developed sufficiently to warrant a precise statement on the adaptability of a species to a specific flooding situation.

### Study Area:

A study on locally available flood tolerant trees have been conducted in the Gohpur subdivision (26°88' N to 93°63' E) of Sonitpur district, one of the flood prone areas in Assam. Ten villages viz. *Rajabari, Dhandi, Khetriyati, Rawnmukh, Belguri, Majikuchi, Mikirborachuk, Bordop, Borbheti* and *Nabil* were considered for the study. The villages are inundated by flood carried by the rivers Mornoi, Kharoi, Solengi, Kharonijan and Brahmaputra during monsoon. Traditional agriculture is the main occupation of the villagers with cultivation practice of areca nut, banana, bamboo, edible fruit yielding trees and some vegetable crops in their homestead gardens (*Bari*)

### METHODOLOGY

Direct observation of trees during and post flood season as well as enlisting the species which were died during/ and immediately after flood in the selected villages during 1998 to 2010. Duration of flooding, depth of water, acidity and turbidity of flood water were recorded from the inundated localities. Trees were observed for their tolerance to flood and also interaction to local citizens made mainly regarding traditional utilization of the trees in the study area. On the basis of the observations of survivability of trees in different flooding period and post flood period, the trees are categorized as below-

Tolerant = most individuals survived 100 consecutive days of flooding,

Semi-tolerant = most individuals survived  $\geq 100$  but  $< 60$  consecutive days of flooding,

Slightly Tolerant = most individuals survived  $\geq 30$  but  $< 60$  days of flooding; and

Intolerant = severe effects within 30 days

Trees were enlisted alphabetically in different categories. Information of flood, local Assamese names and traditional utilization of the plants are mentioned on the basis of direct observation and experience in the field.

### RESULTS AND DISCUSSION

As a result of the observation, six species have been enlisted as Tolerant (Table 1), 12 as Semi-tolerant (Table 2), and 15 as Slightly Tolerant (Table 3), dicotyledonous tree species occurring in the area.

**Table 1.** Flood Tolerant trees recorded from the Sonitpur District of Assam

Botanical name	Assamese name	Traditional Utilization
<i>Barringtonia acutangula</i> (Linnaeus) Gaertner [Barringtoniaceae]	<i>Hijol</i>	Stem as underwater post of bridges, barks feed to fishes, usually planted along river sides to prevent soil erosion.
<i>Dillenia indica</i> Linnaeus [Dilleniaceae]	<i>Ouw-tenga</i>	Fleshy calyx are eaten fresh and cooked, as pickles, dried ones are grinded and the powders are preserved for future use.
<i>Lagerstroemia reginae</i> Roxburgh [Lythraceae]	<i>Ajar</i>	Timber is considered good for making boat.
<i>Salix tetrasperma</i> Roxburgh [Salicaceae]	<i>Bhe</i>	As fire wood
<i>Trewia nodiflora</i> Linnaeus [Euphorbiaceae]	<i>Bheleu</i>	As fire wood, low quality plywood.
<i>Zizyphus mauritiana</i> Lamarck [Rhamnaceae]	<i>Bogori</i>	Ripe fruits are eaten fresh, as prickles, dried fruits are grinded & preserved and eat during summer, a kind of sour juice is prepared from dried fruits and drink.

**Table 2.** Flood Semi-tolerant trees recorded from the Sonitpur District of Assam

Botanical name	Assamese name	Traditional Utilization
<i>Antidesma acuminatum</i> Wallich [Euphorbiaceae]	<i>Heloch</i>	Matured fruits are eaten fresh, sour in taste.
<i>Bischofia javanica</i> Blume [Bischofiaceae]	<i>Urium</i>	Timber for low cost furniture; Leaves for cattle feed during flood
<i>Bombax ceiba</i> Linnaeus [Bombacaceae]	<i>Simolu</i>	Ply from the tree are used in housing, making boat; Aril fibers for cushioning.
<i>Cassia fistula</i> Linnaeus [Caesalpiniaceae]	<i>Sonaru</i>	Timber for house posts, pulp of ripe fruits is eaten, medicinal for mouth ulcer.
<i>Ficus religiosa</i> Linnaeus [Moraceae]	<i>Aahot</i>	Planted as shade tree due its gigantic canopy, fruits are eaten by many birds.
<i>Ficus rumphii</i> Blume [Moraceae]	<i>Jori</i>	-do-, usually planted along road side and river banks to prevent soil erosion
<i>Garcinia morella</i> (Gaertner) Desrousseaux [Clusiaceae]	<i>Kuji-thekera</i>	Ripe fruits are sliced and dried under the sun, used as pickle and used as medicine for dysentery.
<i>Garcinia pedunculata</i> Roxburgh ex Buchanon-Hamilton [Clusiaceae]	<i>Bor-thekera</i>	-do-, used in worshipping cows & bulls in "Garu-Bihu"
<i>Lannea coromandelica</i> (Houttuyn) Merrill [Anacardiaceae]	<i>Jia</i>	As fire wood
<i>Mangifera indica</i> Linnaeus [Anacardiaceae]	<i>Aam</i>	Fruits are eaten fresh, as pickles; used as fire wood in "Jogya"; leaves as fodder for cattle during flood.
<i>Streblus asper</i> Loureiro [Moraceae]	<i>Soura</i>	Leaves as cattle fodder during flood.
<i>Syzygium fruticosum</i> DC. [Myrtaceae]	<i>Kathiya jamu</i>	Fire wood; ripe fruits are eaten fresh

**Table 3:** Slightly flood tolerant trees recorded from the Sonitpur District of Assam

Botanical name	Assamese name	Traditional Utilization
<i>Albizia lebbek</i> (Linnaeus) Bentham [Mimosaceae]	<i>Koroi</i>	Timber for housing purposes
<i>Alstonia scholaris</i> (Linnaeus) R.Brown [Apocynaceae]	<i>Sotiyana</i>	Bark as medicine for skin disease
<i>Anthocephalus chinensis</i> (Lamarck) A. Richard ex Walpers [Rubiaceae]	<i>Kodom</i>	Timber for furniture, ply.
<i>Artocarpus lacucha</i> Buchanon-Hamilton [Moraceae]	<i>Bohot</i>	Ripe fruits eaten fresh, leaves as cattle fodder during flood
<i>Averrhoa carambola</i> Linnaeus [Averrhoaceae]	<i>Kordoi</i>	Ripe fruits are eaten fresh, as pickles etc.
<i>Bridelia retusa</i> (Linnaeus) Sprengel [Euphorbiaceae]	<i>Kuhir</i>	Timber for housing purpose
<i>Duabanga grandiflora</i> (Roxburgh ex DC.) Walpers [Sonneratiaceae]	<i>Khokon</i>	-do-
<i>Cordia fragrantissima</i> Kurz [Cordiaceae]	<i>Poroza, Mahidol</i>	-do-, leaves as cattle feed during flood
<i>Ficus hispida</i> Vahl [Moraceae]	<i>Dimoru</i>	Leaves as cattle feed during flood
<i>Flacourtia jangomas</i> (Loureiro) Raeuschel [Flacourtiaceae]	<i>Poniyol</i>	Ripe fruits are eaten fresh
<i>Meyna spinosa</i> Roxburgh ex Link [Rubiaceae]	<i>Kotkora</i>	Ripe fruits are first dried and then eaten with salt
<i>Persea bombyciana</i> (King ex Hooker f.) Kostelezky [Lauraceae]	<i>Som</i>	Muga silk worm rear on this tree
<i>Premna benghalensis</i> Clarke [Verbenaceae]	<i>Gohora</i>	Timber for housing, as fire wood.
<i>Samanea saman</i> (Jacquin) Merrill [Mimosaceae]	<i>Sirish</i>	As shade tree, timber for making ply
<i>Terminalia chebula</i> Retzius [Combretaceae]	<i>Shilikha</i>	Fruits are eaten fresh, dried etc ad medicinal for stomach diseases; timber for housing and furniture.

It should be noted that conclusions from different studies on flood tolerant trees in different areas are different, sometimes it may be contradictory, caused in part by the physiological responses of the tree as it interacts with environmental conditions. Since these environmental conditions are not well understood, as well as the difficulty in categorizing tree species over their entire range, flood tolerance predictions must be carefully evaluated in general terms.

In the list of flood-tolerant trees presented in Table 1 there are some plants like *Barringtonia acutangula*, *Lagerstroemia reginae* and *Salix tetrasperma* are known to grow well in marshy areas. So, naturally these plants will tolerate flood-water easily for a longer period. Again, a quick scan in all the three tables shows that the lists are dominated by resin and latex bearing plants from the families like Euphorbiaceae, Moraceae and Anacardiaceae. So, the presence of these substances in plants can improve the food tolerance capacity of plants.

The trees enumerated as Tolerant, Semi-tolerant and Slightly Tolerant to flood can be planted in the flood prone areas with reference to similarity of climatic conditions as well as nature of flood for protection of soil erosion, prevention of water current, food and shelter for wild animals, food for some domestic animals, and human beings and other economic and ecological uses. These are easily available, can be grown either from seeds or cuttings and planted in road sides, river banks, embankments, near public institutes, homesteads and forests & fringes.

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