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Research Article

Phenology of some medicinal plant species of Goalpara District, Assam (India)

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Abstract: The study of various periodic behaviours of plant species or the phenology has great significance because it not only provides knowledge about the plant growth pattern but also provides the inferences on the effect of environment and selective pressure on flowering and fruiting behaviour. In this paper an attempt has been made to record such data regarding periods of leaf fall, leaf flushing, flowering, fruiting and all. This was done for a period of three years for forty species of course which were some how having medicinal properties and it was carried out in the district of Goalpara, Assam. In the study the leaf fall peak period was found in last part of January, leaf flushing peak period in the month of march where as flowering and fruiting activity peak period was found during the month of March—April and May—June respectively. So, this type of study will be helpful to give inferences in future whether the of climate change are giving pressure on the periodic behaviour of plant species. Changed phenological behaviour of plant species indicates the losing of plant diversity of the district in a critical level..
Keywords: Phenology, leaf fall, leaf flush, flowering, fruiting

INTRODUCTION

In nature it is often seen that each species has a definite period, month, season in a year during which its seeds germinate, seedlings grow or show maximum vegetative growth, leaves fall (if it is deciduous) , flushing of new leaves, flowering and then fruiting. The study of all these periodic behaviour of a species is called its phenology. In the life cycle of a plant each and every stage is greatly influenced by a number of environmental factors. The different stages of the plant species remain completely embedded in an environmental complex. It is very interesting to note that being fixed at a particular place, the requirement of germination, growth, flowering, fruiting, leaf fall etc of the species are met with at the same place but of course in different times of the year. There is a synchronization of phenological behaviour of the species and the various factors of the environment that plants are spoken of biological clocks. This is mostly regulated by external signals from the environment. But the interactions of each and every species are different at different stages of their life cycle. Thus plant phenological study has great significance because it not only provides knowledge about the plant growth pattern but it also provides the idea on the effect of environment and selective pressure on flowering and fruiting behavior [1].. Phenological events are used variously for characterization of vegetation type [2]. Climate change forced deviations in the length of growing period [3]. The phenology of subtropical forest of North—East median region was studied by several authors[4].. Considering the significance of phenological studies of plant species of a locality the present work was undertaken over a period three years (2009—2011). This was carried out to understand the response of some medicinal plant species to climatic factors and the periodicity of seasons of the district Goalpara (Assam).

MATERIALS AND METHODS

Study Area

Goalpara district with an area of 1,958 sq. km lies between 25˚ 33́ -- 26˚12́ N latitude and 90˚7́ E—91˚ 5́ E longitude and it is located in the extreme South-Western part of Assam [5-6]. Topographically the district exhibits a remarkable diversity as the hills of Meghalaya form its southern boundary and the greater part of the district constitutes by the Brahamaputra plains which is flowing in the Nothern side, in the eastern side it is the district of Kamrup and in the West Dhubri district along with the foreign country Bangladesh is attached.

OBSERVATION

The phenological study was carried out for forty species of medicinal plants of the district Goalpara, Assam. Observation was made on leaf fall, leaf flushing, flowering, and fruiting at one month of interval from January 2009 to December 2011. For each

species individual record of different phenophases were taken into consideration. Observations were made on leaf initiation, leaf fall, flowering, fruiting at an interval of one month and recorded in a tabular form.

Table 1: Period of leaf fall, leaf flush, flowering and fruiting of forty plant species studied

Name of plant	Leaf fall	Leaf flush	Flowering	Fruiting
Annona squamosa	Jan--Feb	Mar-- Apr	Mar--May	Aug-- Nov
Averrhoea carambola	Feb—Mar.	Mar--Apr	Aug-- Sep	Nov-- Jan
Aegle marmelos	Dec--Jan	Feb-- Mar	Mar-- May	May—Jun(Rippen next yr. Mar—Jun)
Azadirachta indica	*Feb--Mar*	*Apr-May*	*Mar--Apr*	*Jul--Aug*
Alstonia scholaris	*Nov--Dec*	*Jan--Mar*	*Feb--Apr*	*May--July*
Adhatoda vasica	*Dec--Jan*	*Feb--Mar*	*Dec--Apr*	*Apr—May*
Andographis paniculata	*Jan--Feb*	*Mar--Apr*	*May--Jul*	*Aug—Sep*
Bixa orillana	*Han--Feb*	*Mar--Apr*	*Jul--Oct*	*Oct--Dec*
Bacopa monnierie	*Remain green*	*Mar--Apr*	*Round the year*	*Oct--Dec*
Cissampelos pareira	*Oct*	*Nov*	*Nov--Jan*	*Jan--Feb*
Cassia alata	*Dec--Jan*	*Feb--Apr*	*Sep--Dec*	*Jan--Mar*
Cassia fistula	*Feb--Mar*	*Apr--May*	*Mar--Jan*	*Cold season*
Calotropes gigantea	*Nov--Dec*	*Jan--Feb*	*Feb--May*	*May—Aug*
Clarodendrum colebrookianum	*Nov--Jan*	*Feb--Mar*	*Cold season*	*Cold season*
Clarodendrum viscosum	*Nov--Dec*	*Jan--Feb*	*Feb--May*	*May--Jul*
Costus specious	*Dry of in Jan--Feb*	*Srrouting from rhizome in Feb--Mar*	*Apr--Jun*	*July--Aug*
Dillenia indica	*Jan--Feb*	*May--Jun*	*Jun--Aug*	*Sep--Oct*
Euphorbia nerifolia	*Dec--Jan*	*Feb*	*Feb--Mar*	*Apr--May*
Glycosmis arborea	*Dec--Jan*	*Jan--Mar*	*Mar--Apr*	*Jan-Aug*
Homalomena aromatica	*Dry of in Nov--Dec*	*Sprouting in Feb--Mar*	*Apr--May*	*Jun--July*
Houthuynia cordata	*Dec--Jan*	*Feb--Mar*	*May--Jun*	*Jun--Aug*
Justicea gendurossa	*Nov--Jan*	*Jan--Feb*	*Mar--May*	*Jan--Jul*
Melia azadirach	*Dec--Feb*	*Mar*	*Mar--May*	*Cold season*
Murraya koenigii	*Dec--Jan*	*Feb--Mar*	*Feb--Apr*	*May--Jun*
Nyctanthes arbortristis	*Feb--Mar*	*Apr--May*	*Aug--Nov*	*Dec--Feb*
Oroxylum indicum	*Dec--Feb*	*Mar--Apr*	*Jun--Aug*	*Cold season*
Phlogacanthus thyrsiflorus	*Aug--Sep*	*Oct--Nov*	*Dec--Mar*	*Mar--Apr*
Phylanthus embelica	*Oct--Nov*	*Jan--Feb*	*Mar--May*	*Cold season*
Paederia foetida	*Dec--Jan*	*Feb--Apr*	*Sep--Oct*	*Nov--Jan*
Rauvolfia serpentina	*Jan--Feb*	*Feb--Mar*	*Apr--Oct*	*Nov--Jan*
Spondias pinnata	*Nov--Dec*	*Jan--Mar*	*Mar--May*	*Nov--Dec*
Saraca indica	*Nov--Dec*	*Jan--Feb*	*Feb--Apr*	*Sep--Oct*
Syzygium cumini	*Dec--Jan*	*Feb--Mar*	*Apr--May*	*Jan--July*
Tinospora cordifolia	*Nov--Dec*	*Jan--Feb*	*Mar--Apr*	*Apr--May*
Terminalia arjuna	*Jan--Feb*	*Feb--Mar*	*Mar--Apr*	*Jun--Jul*
Terminalia bellerica	*Dec--Feb*	*Mar--Apr*	*Apr--Jun*	*Jul--Oct*
Terminalia chebula	*Nov--Jan*	*Feb--Mar*	*Hot season*	*Feb—Mar(Next year)*
Tabernaemontana divericata	*Oct--Nov*	*Dec--Jan*	*Feb--May*	*Cold season*
Vinca rosea	*Nov--Dec*	*Jan--Feb*	*Round the year*	*Round the year*
Vitex negundo	*Nov--Jan*	*Feb--Mar*	*Apr--Jul*	*Cold season*

RESULTS AND DISCUSSION

After observation a record of time period of leaf fall, leaf flushing, flowering and fruiting were done for all the forty species of medicinal plants in a tabular form for a period of three years. Then the data were analyzed from which some important inferences were made.

Leaf fall and leaf flushing activity:

After the data analysis it was found that leaf fall initiation was a periodic activity for most of the species. In majority of the species leaf fall started in the month of November/December with a peak in the last part of January (30%) to first part of February (50%).After shedding of older leaves new leaf initiation starts in the species , the time period of this activity seen to be different in different species. But it can be said that new leaf formation started in majority of species in the month of February (25%) continued upto May (30%) with a peak in the month of March (50%) that is before the outset of monsoon. Among forty species 75% showed brief leaf flushing activity where as only about 25% exhibited extended leaf activation.

Flowering activity:

Flowering continued in different species throughout the year. However, peak period of flowering can be distinguished for most of the species in the month of March—April where plants like *Alstonia scholaris, Cassia fistula, Cassia alata, Saraca indica, Murraya koenigii, Azadirachta indica, Spondias pinnata* all these exhibited flower initiation in response to increasing length to photoperiod (about 55%).

Fruiting activity:

After flowering all the species start fruiting. The peak period of maturation of fruit was May—June of majority of the species concerned. Here 45% species showed brief fruiting activity where as 55% showed extended fruiting activity. In the month of May—June most of the species (40%) showed fruiting activity which is found to be followed by the month of climax of flowering which was in the month of April—May.

Due to various developmental activities like construction of railways, roadways, bridges etc the forest flora of this district are often disturbed. The problem of infiltration is a well known fact which is responsible for rapid degradation of forest land and this is particularly true in the district of Goalpara which is located in the extreme western part of the state Assam. Thus while studying on the phenology of the medicinal plant species the forest flora of the district is seen to be disturbed or depleted to a considerable extend. Besides other plant species there are such medicinal plants in the study area which are enlisted in red data book as rare, endangered and critically endangered. Mention may be made of the species like *Andographis paniculata* (Vulnerable), *Bacopa monnieri* (Vulnerable), *Cissus quadrangularis* (Rare), *Euryle ferox* (Vulnerable), *Oroxylum indicum* (Endangered), *Rauvolfia densiflora* (Endangered), *Rauvolfia serpentine* (Endangered), *Sapindus mukorossii* (Vulnerable) etc.

It is a fact that not only Goalpara but most of the immigrant predominant districts recorded very low percentages of the forest land below the state average of 23.62 percent (Das, 2012). In the district of Goalpara of the study area the forest cover being only 16. 27 percent. Due to decrease of forest besides loss of biodiversity there is increase there is increase in temperature, decrease in rainfall reliability, run off of fertile soil, silt ration for which again the water holding capacity of the tributaries of the Brahamaputra of the district like Jinari, Jingiram, Dudhnoi, Krishnai is decreasing which leads to unexpected flooding which is a common phenomenon of the whole of the state Assam.

Often it is seen that there is a delay in flowering and fruiting of some medicinal plant species of the study area due to habitat disturbance. This leads to lowering the rate of seed viability so lesser germination in nature. If it goes on continuously there will be disturbance in phenological cycle of increased number of species day by day for which there is definite possibility of inclusion of more and more medicinal and other plant species in the red data book list.

So, people should be conscious enough about the plant resources of the district and important must be given to protect and coverage the plant resources and use them in a judicious manner so that we do not exhaust them. We can plant such medicinal plants in our home garden as required and we should use the resources in such a way that we can always save enough of these for our future generation. Besides the role of general people the district administration, some NGO's have to do much on this sensitive issue of environmental protection and conservation. Through such type of work of the paper on the condition of the flora of this vulnerable district we can know what actually happening to the biodiversity in the finest or accurate level. Works on micro level should not be continued to research level or scientific community but we should make it open to the public about the position, situation of vegetation and terrible effect of loss of biodiversity and all. Every step should be taken to conserve the medicinal or other plant diversity of the district which is already in a critical level that can be justified by observing the present percentage of forest, inclusion of species in red data book or changed phenological behaviour of the plant species.

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