



A study on the phenology and reproductive biology patterns of tree species in South Bihar

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Abstract

The study examines the phenological patterns of leaf drop, leaf flush, fruit development, and seed maturation across various tree species in South Bihar. The vegetative growth, commencing with bud burst from February to March, was completed by May in 88.0% of the tree species observed. In the majority of species, leaf drop and concurrent leafing take place during the warm-dry period occurring between February and March of the year. Approximately 68.0% of species exhibited multiple leafing. In deciduous trees, flower (28.0%) and fruit (4.0%) formations occurred in March, which is a month earlier than in evergreen trees. The maturation of fruit from March to February occurred one month earlier in deciduous species compared to evergreen tree species.

Keywords: South Bihar, phenophases, temperature, deciduous, evergreen

Introduction

Phenology plays a crucial role in forest ecosystems, linking the growth habits of species to their physical environment. It involves observing life cycle phases or activities of organisms as they occur throughout the year (Lieth, 1973), and aids in utilizing biological products and managing species. Phenological phenomena have been studied by Keolmeyer (1959) and reviewed by Lieth (1974), Longman and Jenik (1974), Opler et al. (1980), Poole and Rathcke (1979), Borchert (1980), and Murray and Miller (1982) in tropical and

temperate tree species. The functional behavior of vegetation reflects a transition between seasonal temperate and tropical forests (Pandey and Singh, 1981). This study focuses on the patterns of leaf drop, leaf flush, and fruit development in tree species to better understand their adaptive behavior and the phenological characteristics of the community.

Materials and Methods

The phenophases—such as bud break, leaf flush, flowering, fruit formation, and seed maturation—of various tree species located in different areas of Bihar Agricultural University, Sabour, in South Bihar, were documented from five trees of each species. Detailed phenological observations for selected trees were recorded fortnightly from March 2022 to February 2023. The monthly phenological activity level for each tree species was determined by summing the fractions of trees exhibiting different phenological activities (leaf drop, leaf flush, flowering, and fruiting) during that month.

Result and Discussion

Among the 25 tree species studied, 67.0% were deciduous, 13.0% semi-deciduous, and 20.0% evergreen. In most deciduous species (60.0%), leaf drop occurred primarily in February and March. In evergreen species, leaf drop was concentrated in April, with the exception of fruit-bearing species such as *Mangifera indica*, *Litchi chinensis*, and *Achras zapota*, which exhibited extended leaf drop, shedding their leaves throughout the year.

Table:1 Phonological traits of selected horti-silvicultural tree species in the Southern region of Bihar.

DECIDUOUS						
Tree species	Leaf drop	Leaf flushing	Vegetative growth	Flowering phase	Fruiting phase	Seed maturity phase
<i>Acacia lenticularis</i>	February - March	March	April	April - June	May - June	March - April
<i>Albiialebeck</i>	February - March	March	April - May	March	April - December	February - March
<i>Albixiapropera</i>	February - March	March	April	March - May	April - December	January - March
<i>Artocarousheteronlyllus</i>	January -	March	March -	March	April -	June -

	February		June		June	August
<i>Azadirachta indica</i>	January - February	February	February - July	February	May June	July
<i>Baubinia variegata</i>	February - March	April	April - June	October - November	December - April	May - June
<i>Brombex ceiba</i>	January - February	March - April	March - July	February	March - April	May
<i>Cassia fistula</i>	February - March	April	May - August	May June	July - February	March - April
<i>Dalbergia sissoo</i>	February	March	March	March - May	April - June	December - January
<i>Delonix regia</i>	February - March	March - April	May - July	May	June - July	February - March
<i>Emblica officinalis</i>	December - January	March	April	April - June	May - November	December - January
<i>Erythrina indica</i>	January - February	April	April - July	March	April - May	June - July
<i>Leucaena leucocephalla</i>	February - March	March	March - October	March	April - September	October - November
<i>Melia azedarach</i>	February	March	March - June	April	April - September	October
<i>Pongamia pinnata</i>	February - March	April	May - June	April	May - August	March
<i>Populus deltoides</i>	November - February	March	March - June	-	-	-
<i>Psidium guajava</i>	September - October	February	February - June	June	June	August - September
<i>Tectona grandis</i>	March - April	April	April - August	July - August	August - October	December - January
<i>Toona ciliata</i>	January	February	February - March	March	April - May	June - July

<i>Ziziphus mauritians</i>	January	February	March- August	September - October	November - December	January - February
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Buds remained dormant during the winter months due to low temperatures, with leaf flushing initiating in February (24.0%) and completing the majority of taxa by March (52.0%). Higher temperatures accelerated flowering, while lower temperatures facilitated bud burst, a phenomenon previously described by Kramer and Kozłowski (1979). The flowering, fruiting, and leafing behaviors of tropical forest trees have been detailed by Hanumantha and Ganga (2022), Balalia and Chauhan (1954) and Ralhan et al. (1985).

In this study, maximum vegetative growth (88.0%), flowering (32.0%), and seed maturation (32.0%) were recorded in May, March, and June, respectively. Mandal (2010) also observed variations in the timing of leaf fall, leaf renewal, flowering, and fruiting in trees growing at Pusa, Samastipur. These variations are attributed to environmental factors.

Full maturation in deciduous trees, which occurred between March and February, was ahead of evergreen species by approximately one month. A peak fruit maturation rate of 25.0% was observed in March for deciduous species, while in evergreen species, fruit maturation occurred between April and July. The coincidence of seed maturity in tree species during dry months appears to be a biological adaptation that enhances seed viability and promotes higher natural regeneration.

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