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PHENOLOGICAL CHARACTERISTICS OF TREE SPECIES IN M.N. COLLEGE VISNAGAR, MEHSANA (NORTH GUJARAT)

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ABSTRACT:

Phenology is the study of the timing of repeated biological occurrences, the factors influencing those timings in terms of abiotic and biotic forces, and the relationships between phases of the same or distinct events. Present study aims to record the phenological diagrams of various tree species in M.N. College Visnagar campus which is located in the Mehsana district in the north region of the Gujarat state, including tree lifecycle like leaf fall, vegetative growth, fruiting, new foliage and flowering, from 2020 to 2023. Phenological phases of tree species exhibited peak of leaf fall in cool dry period in month of January (68%) and fruiting in the beginning of warm dry period in May (60%) while flowering in warm dry period in March to April month 73% and 76% respectively.

KEYWORDS: *Flowering, Fruiting, Leaf, Phenology, Shedding, Tree.*

INTRODUCTION:

The science of phenology examines how the development of buds, flushing of leaves, anthesis, fruiting, and leaf fall relate to seasons or years with meteorological conditions. A description of phenological patterns in plants helps researchers understand how biotic and abiotic factors influence the onset of disease and various occurrences called phenophases.

Most biological creatures have repetitive life cycles, but plant phenology is undoubtedly the most researched. Plant phenology covers

processes such as leaf emergence, flowering fruiting, seeding, and leaf senescence, all of which are intimately linked to ecosystem function and services. As a result, changes in phenological events may have consequences for biogeochemical cycles, including carbon cycles, as well as population dynamics of species linked at various trophic levels or in competitive and mutualistic relationships. Plant phenology can also cause temporal adjustments in animal phenology, potentially resulting in phenological mismatching if the species involved do not respond similarly to environmental changes.

Furthermore, phenological patterns are frequently linked to certain reproductive techniques that maximise a species reproductive success. The phenology of a plant can influence interspecies interactions like herbivory, pollination rate, and other interactions such as dispersal of fruit and seeds. Variations in resource availability caused by the duration and frequency of different phenophases may have an impact on the population dynamics of animal species that rely on these resources, such as pollinators, frugivores, and herbivores. Phenological investigations are crucial in the context of from the point of view of tree genetic resources, as well as forestry management and for an improved comprehension of ecological adaptations of various plant species and interactions at the community level. The community's interactions between plants and animals are based on knowledge of the seasonality of plant components.

In this present study, we integrated data from observations of the phenology of 59 tree species from M.N. College Visnagar, Mehsana.

METHODOLOGY:

The phenological data reported in this study were obtained from different field sites on college campus between 2020 and 2023. In terms of geographical distribution, the research region is located at 23.69900 N latitude and 72.53930 E longitude. Several systematic plant phenology studies conducted through visual observations begin to emerge. Using visual observations leaf fall, vegetative growth, fruiting, new foliage and flowering were measured monthly for all trees whose canopy was visible to the observer using the point method (1958). Since the beginning of the study, 59 tree species on the college campus have been permanently marked, and phenological diagrams have been monthly recorded.

RESULTS AND DISCUSSIONS:

In the present study, which spans the years 2020 and 2021, a total of 59 plant species from 22 families were recorded. Phenological traits seen in the include leaf fall, vegetation growth, fruiting, and flowering. The phenological diagrams of the selected tree species were monitored and recorded monthly observation in all seasons.

During the investigation The Fabaceae family with 17 species, which had highest relative species value, and the 11 families, which each had one species and with the lowest relative species value, were the tree species that were identified on campus (Table 1 & Figure 1)

The phenological data of 59 tree species were observed and recorded month by month using a phenological diagram (Table 2).

In the current study, the months of November to February saw the highest leaf fall, while March to October saw the lowest. August through December saw the highest levels of vegetative growth, while February and March saw the lowest levels. The months of July to August saw the newest foliage, while March to May saw the least amount. The months of May-June and March-April saw the most fruiting and flowering, respectively, while November, January, and November saw the least amount of both (Table 3 & Figure 3).

CONCLUSION:

The maximum number of leaf falls were recorded in January and February, while the lowest number occurred in July. The vegetative growth of plant species is at peaks in the month of October, while the lowest vegetative growth is observed in the month of March as shown in table 3 and figure. As appear in figure and table, the months of May-June and March-April saw the most fruits and flowering, respectively. The months of January and November, respectively, saw the least amount of fruiting and flowering.

According to the results of the current phenological study, most tree species phenological phases showed a peak in leaf fall during the cool dry period in January (68%), fruiting at the start of the warm dry period in May (60%) and flowering during the warm dry period in March to April (73% and 76%, respectively). The months of April and July see the most fruiting. The majority of plant species have vegetative development between July and December. The current analysis concluded that the college campus area was a semi-arid climatic zone.

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Table 1: List of plants according to families

Family	Number of species.	Species % (Relative)
Annonaceae	2	3.38

Capparaceae	1	1.69
Malvaceae	4	6.77
Rutaceae	4	6.77
Simaroubaceae	2	3.38
Meliaceae	1	1.69
Rahmnaceae	1	1.69
Sapindaceae	1	1.69
Anacardiaceae	1	1.69
Fabaceae	17	28.81
Combretaceae	1	1.69
Myrtaceae	4	6.67
Sapotaceae	3	5.08
Salvadoraceae	1	1.69
Apocynaceae	2	3.38
Boraginaceae	2	3.38
Olacaceae	1	1.69
Santalaceae	1	1.69
Euphorbiaceae	2	3.38
Moraceae	6	10.16
Casuarinaceae	1	1.69
Areaceae	1	1.69

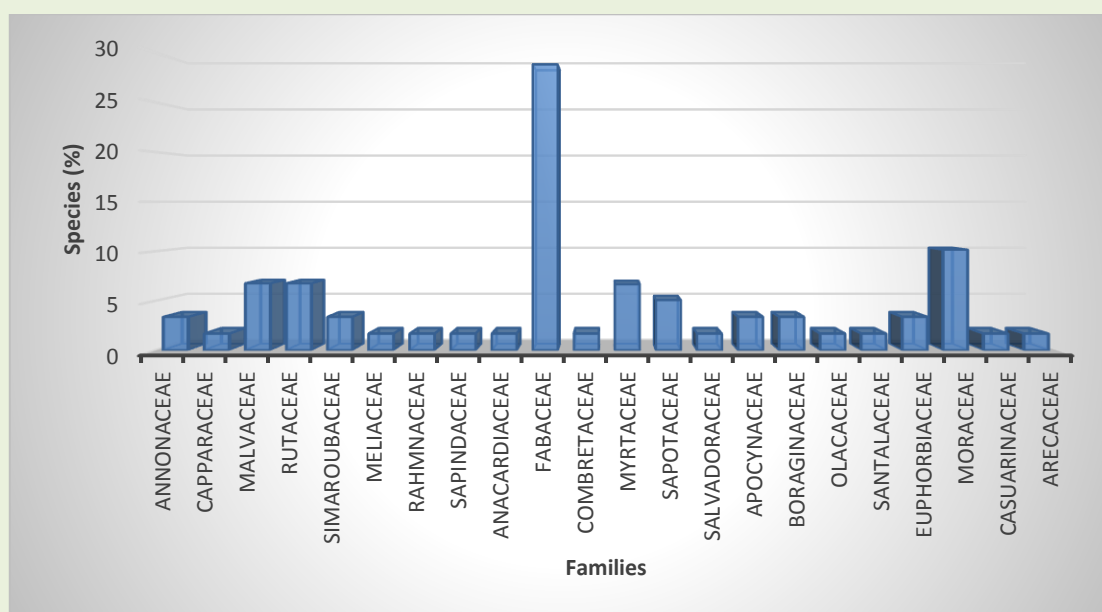





































































































































































































Figure 1: Showing the family wise species % of college campus

Table 2: Showing the phenological diagram

Plant Name	January	February	March	April	May	June	July	August	September	October	November	December
<i>Annona squamosa</i> L.												
<i>Polyalthia longifolia</i> (Sonn.) Thw.												
<i>Crateva religiosa</i> G. Forst												
<i>Adansonia digitata</i> L.												
<i>Bombax ceiba</i> L.												
<i>Guazuma ulmifolia</i> L.												
<i>Aegle marmelos</i> L.												
<i>Citrus limon</i> L.												
<i>Citrus medica</i> L.												
<i>Thepesia populnea</i> L. Soland ex. Corr.												
<i>Limonia acidissima</i> L.												
<i>Ailanthus excelsa</i> L.												

<i>Simarouba glauca</i> DC.													
<i>Azadirachta indica</i> A. Juss.													
<i>Ziziphus jujuba</i> Mill.													
<i>Sapindus trifoliatus</i> L.													
<i>Mangifera indica</i> L.													
<i>Acacia auriculiformis</i> Benth.													
<i>Acacia nilotica</i> L.													
<i>Acacia tomentosa</i> L.													
<i>Albizia lebbek</i> (L.) Banth.													
<i>Bauhinia purpurea</i> L.													
<i>Butea monosperma</i> (Lam.)													
<i>Cassia fistula</i> L.													
<i>Cassia roxburghii</i> DC.													
<i>Dalbergia sissoo</i> L.													
<i>Delonix regia</i> (Hook.) Raf.													

<i>Pongamia pinnata</i> L.												
<i>Parkinsonia aculeata</i> L.												
<i>Peltophorum pterocarpum</i> DC.												
<i>Pithecellobium Dulce</i> (Roxb.) Bth.												
<i>Prosopis cineraria</i> L.												
<i>Saraca asoca</i> (Roxb.) Wild.												
<i>Tamarindus indica</i> L.												
<i>Terminalia catappa</i> L.												
<i>Eucalyptus citrioda</i> Hook. L.												
<i>Psidium guajava</i> L.												
<i>Callistemon lanceolatus</i> DC.												
<i>Syzygium cumini</i> L.												
<i>Madhuca indica</i> L.												
<i>Manilkara hexandra</i> L.												

<i>Mimusops elengi</i> L.												
<i>Salvadora persica</i> L.												
<i>Alstonia scholaris</i> L.												
<i>Plumeria obtusa</i> L.												
<i>Cordia dichotoma</i> G. Forst.												
<i>Cordia sinensis</i> Lam.												
<i>Nyctanthes arborescens</i> L.												
<i>Santalum album</i> L.												
<i>Embilica officinalis</i> L.												
<i>Putranjiva roxburghii</i> Will.												
<i>Artocarpus heterophyllous</i> Lam.												
<i>Ficus amplissima</i> Sm.												
<i>Ficus benghalensis</i> L.												
<i>Ficus carica</i> L.												
<i>Ficus racemosa</i> L.												











































<i>Ficus religiosa</i> L.														
<i>Casuarina equisetifolia</i> L.														
<i>Phoenix dactylifera</i> L.														

Table 3: Month wise phenological observation of tree species.

Month	Leaf fall	Vegetative growth	Fruiting	New foliage	Flowering
January	41	15	9	7	16
February	30	8	12	10	26
March	6	6	14	6	44
April	4	12	22	7	46
May	3	16	36	4	23
June	3	18	34	13	19
July	2	30	27	21	12
August	3	41	17	20	12
September	3	46	13	10	10
October	7	47	12	5	10
November	14	43	9	8	9
December	24	34	10	2	11

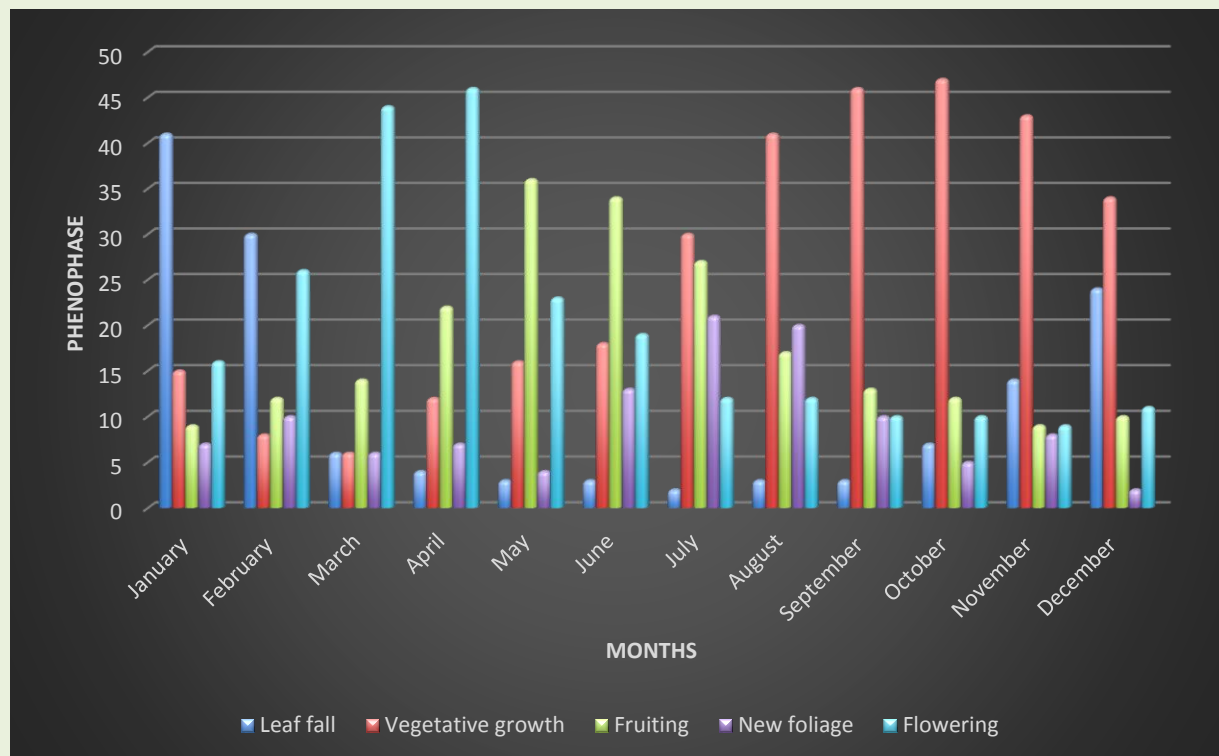


Figure 2: Showing Month wise phenological observation of tree species