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Short Communication

Phenological diversity of some woody plants of Niwari District of Madhya Pradesh, India

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Abstract

The present paper provides the information regarding the phenological events of some woody plants of Niwari district of Madhya Pradesh. The phenological characteristics such as flowering, fruiting and fruit fall were recorded for 27 woody plants. The results revealed that the six types flowering and fruiting behavior in these woody plants. Two major periods of fruit fall viz. winter and summer were recognized. In rare cases (Alangium lamarckii, Azadirachta indica, Cordia myxa) the fruit fall occurs in rainy season. It is hoped that the present study may be useful for conservation and management of forests.

Keywords: Phenology, woody plants, flowering, fruiting, fruitfall.

Introduction

Niwari is one of the Northern district of Madhya Pradesh and belongs to central part of Bundekhand region. Niwari was a tehsil of the Tikamgarh district. On 1 October 2018 it was separated and existed in the form of a new district. It became the 52nd district of the Madhya Pradesh. It is bounded by Uttar Pradesh in the East, North, and West. The Tikamgarh district of Madhya Pradesh located on south of Niwari district. It is the smallest district of Madhya Pradesh in terms of area as well as population. The vegetation of Niwari district and its adjoining area is transitional between the Southern and Northern tropical dry deciduous forest. The forest area of Niwari district encompasses great number of woody plants which shows the diversity in their phenological behaviour.

Phenological observations provide a background for information on functional rhythms of plants and plant communities[1-3]. The phenological events are meaningful in describing and explaining the seasonal aspects of ecological phenomenon[4]. Detailed description of various phenological events of plants is helpful in understanding of ecosystem functioning and their impact on ecology of herbivores[5-7]. Phenological studies have been used for studying the dispersal behaviour of seed in certain shrubs[8].

Plants are responsive to various climatic factors and their responses are expressed in the form of externally visible changes which are called phenophases and the study of such phenophases is called phenology. In the tropical climate which has distinct pattern of seasonality. Phenology of vegetation is regulated by functional climate parameters such as temperature, rainfall, humidity etc. Phenological descriptions like vegetative growth, leafing, leaf fall, flowering, fruiting, ripening of fruits and fruit fall give ecologiaclly valuable information about the plant communities. The study of phenology provides an analytical insight into the behaviour of primary producer component with respect to ecosystem functioning[9]. Phenology is therefore a good indicator of climate change as the timing of development is strongly influenced by warming and related environmental changes[10,11].

Phenology is the study of morphological changes in respect to the climatic change in the life cycle of a plant. The flowering, fruiting, and fruit fall events are included under phenological study. The exact knowledge of phenological behaviors of plants play very important role for conservation and management of forest[12]. Therefore, a study was undertaken to record phenological diversity of some woody plants of Niwari district of Madhya Pradesh.

Materials and methods

To document the phenological events of woody plants, the study site was monthly visited on a definite date. The phenological characteristics such as commencement and completion of flowering, fruiting and fruit fall were recorded. The informations about all the plant species have been listed at the end of the season. The phenological observations were carried out for 27 woody plants of Niwari district.

Results and discussion

During the course of this work, 27 woody plants were carried out for the phenological study of Niwari district of Madhya Pradesh. The phenological observations (viz. flowering, fruiting and fruit fall behaviours) of some selected woody plants have been presented in Tables 1-3.

Flowering: The observations about the time of commencement and completion of flowering of different tree species are given in Table-1. The *Azadirachta indica*, *Cordia myxa*, *Albizia lebbeck, Bauhinia vahlii,* and *Ziyphus xylopyrus* are completed their flowering in summer season. While *Acacia leucophloea Acacia torta, Anogeissus pendula, Helicteres isora, Tectona grandis, Zizyphus oenoplea* have completed their flowering during the monsoon season. The *Annona sqamosa, Aegle marmelos, Cassia fistula, Pongamia glabra, Tamarindus indica, Terminalia arjuna, Wrightia tinctoria* are initiated their flowering from summer and continued to monsoon season. *Nyctanthes arbotristis* and *Zizyphus jujuba* started their flowering from monsoon and continued to winter season. The *Alangium lamarckii, Butea frondosa, Flacourtia ramontchii, Holoptelia integrifolia, Lannea coromandelica* and *Salmalia malabarica* begins their flowering from winter and continued to summer season. Out of twenty seven species only *Sterculia urens* has completed flowering event in winter season .

Table-1: Flowering event of some woody plants of Niwari District.

Sr.	Name of the plant species	Vernacular Name	Month of beginning	Month of completion
P-1	*Alangium lamarckii*	Akola	February	April
P-2	*Anogeissus pendula*	Kardhai	July	September
P-3	*Acacia leucophloea*	Reuanja	August	October
P-4	*Acacia torta*	Ail	July	September
P-5	*Aegle marmelos*	Bel	April	July
P-6	*Azadirachta indica*	Neem	March	April
P-7	*Albizia lebbeck*	Siris	March	June
P-8	*Annona sqamosa*	Sitafal	April	July
P-9	*Bauhinia vahlii*	Mahuli	April	June
P-10	*Butea frondosa*	Chhewla	January	April
P-11	*Cassia fistula*	Amaltas	April	July
P-12	*Cordia myxa*	Labhera	March	April
P-13	*Flacourtia ramontchii*	Katai	February	April
P-14	*Holoptelia integrifolia*	Chirol	January	March
P-15	*Helicteres isora*	Aithani	August	September
P-16	*Lannea coromandelica*	Gunja	January	April
P-17	*Nyctanthes arbotristis*	Harsingar	August	November
P-18	*Pongamia glabra*	Karanj	April	July
P-19	*Sterculia urens*	Kulla	November	February
P-20	*Salmalia malabarica*	Semal	December	March
P-21	*Tamarindus indica*	Imli	June	August
P-22	*Tectona grandis*	Sagon	July	September
P-23	*Terminalia arjuna*	Kahua	April	July
P-24	*Wrightia tinctoria*	Dudhi	March	August
P-25	*Zizyphus jujuba*	Ber	August	November
P-26	*Zizyphus oenoplea*	Makora	July	October
P-27	*Ziyphus xylopyrus*	Ghont	April	June

Thus six type of flowering patterns were observed in these woody plants. The similar flowering patterns recognized in dry deciduous forest of Aravali Hills of Rajasthan[13] e.g. i. Summer (March-June), ii. Summer-Monsoon, iii. Monsoon (July-October), iv. Monsoon-Winter, v. Winter (November-February), vi. Winter-Summer, vii. All Seasons. None of these species included in last (7^{th}) category of flowering pattern. Further, flowering activity was observed to be correlated with the leaf flashing which occur during March-April. This is a confirmation with the observation of some researchers[14,15,9].

Fruiting: The observations regarding the time of initiation and completion of fruiting event of various woody plants are given in Table-2. Fruiting of *Alangium lamarckii, Azadirachta indica, Butea frondosa, Cordia myxa, Flacourtia ramontchii,* and *Lannea coromandelica* was completed in the summer season. The fruiting of *Acacia torta, Anogeissus pendula, Albizia lebbeck, Zizyphus oenoplea* and *Ziyphus xylopyrus* was completed during monsoon season. The fruiting event in *Acacia leucophloea* was completed in winter season. The *Aegle marmelos, Annona sqamosa, Bauhinia vahlii, Cassia fistula, Pongamia glabra, Terminalia arjuna* and *Wrightia tinctoria* have initiated their fruiting event from summer and continued up to monsoon season. The *Holoptelia integrifolia, Sterculia urens* and *Salmalia malabarica* have completed their fruiting event from winter to summer season. The fruiting event of *Helicteres isora, Nyctanthes arbotristis, Tamarindus indica, Tectona grandis* and *Zizyphus jujuba* was initiated from monsoon and continued to winter season. Fruiting event of these plants also showed the similar pattern[13] as recognized the seven type of fruiting patterns viz. i. Summer(March-June) ii. Summer-Monsoon iii. Monsoon (July-October) iv. Monsoon-Winter v. Winter (November-February) vi. Winter-Summer vii. All Seasons. None of the species belongs to the last category of fruiting pattern.

Fruit fall: The observations with respect the time of beginning and completion of fruit fall event for various species are given in Table-3. The fruit fall in *Albizia lebbeck, Anogeissus pendula, Annona sqamosa, Helicteres isora, Terminalia arjuna, Zizyphus oenoplea* and *Ziyphus xylopyrus* was completed their fruit fall during winter season. The *Aegle marmelos, Butea frondosa, Flacourtia ramontchii, Holoptelia integrifolia, Lannea coromandelica Sterculia urens* and *Salmalia malabarica* have completed their fruits fall event in summer season. The *Acacia leucophloea, Acacia torta, Bauhinia vahlii, Cassia fistula, Nyctanthes arbotristis, Pongamia glabra, Tamarindus indica, Tectona grandis, Wrightia tinctoria* and *Zizyphus jujuba* all these woody plants initiated their fruit fall from winter and continued up to summer season.

The fruit fall in *Alangium lamarckii, Azadirachta indica* and *Cordia myxa* was started from June and completed to end of the July. Sometime the fruits remain attached to their trees in August too, but the percentage of such fruits is very negligible. Thus the fruit fall of these woody plants occurs during rainy (monsoon) season[16]. Two major periods of the fruit-fall viz. winter and summer were recognized. The winter fruit-fall started from October to March in which majority of species commenced their fruit fall.

Table-2: Fruiting event of some woody plants Niwari District.

Sr.	Name of the plant species	Vernacular Name	Month of beginning	Month of completion
P-1	*Alangium lamarckii*	Akola	April	May
P-2	*Anogeissus pendula*	Kardhai	August	October
P-3	*Acacia leucophloea*	Reuanja	October	January
P-4	*Acacia torta*	Ail	August	October
P-5	*Aegle marmelos*	Bel	June	August
P-6	*Azadirachta indica*	Neem	April	May
P-7	*Albizia lebbeck*	Siris	July	October
P-8	*Annona sqamosa*	Sitafal	June	September
P-9	*Bauhinia vahlii*	Mahuli	May	July
P-10	*Butea frondosa*	Chhewla	March	April
P-11	*Cassia fistula*	Amaltas	May	August

P-12	*Cordia myxa*	Labhera	April	May
P-13	*Flacourtia ramontchii*	Katai	March	May
P-14	*Holoptelia integrifolia*	Chirol	February	April
P-15	*Helicteres isora*	Aithani	September	October
P-16	*Lannea coromandelica*	Gunja	March	May
P-17	*Nyctanthes arbotristis*	Harsingar	September	December
P-18	*Pongamia glabra*	Karanj	June	August
P-19	*Sterculia urens*	Kulla	January	March
P-20	*Salmalia malabarica*	Semal	February	March
P-21	*Tamarindus indica*	Imli	August	December
P-22	*Tectona grandis*	Sagon	September	October
P-23	*Terminalia arjuna*	Kahua	June	July
P-24	*Wrightia tinctoria*	Dudhi	June	October
P-25	*Zizyphus jujuba*	Ber	October	December
P-26	*Zizyphus oenoplea*	Makora	September	October
P-27	*Ziyphus xylopyrus*	Ghont	August	October

Table-3: Fruit fall event of some woody plants Niwari District.

Sr.	Name of the plant species	Vernacular Name	Month of beginning	Month of completion
P-1	*Alangium lamarckii*	Akola	June	July
P-2	*Anogeissus pendula*	Kardhai	January	February
P-3	*Acacia leucophloea*	Reuanja	February	April
P-4	*Acacia torta*	Ail	February	April
P-5	*Aegle marmelos*	Bel	May	June
P-6	*Azadirachta indica*	Neem	June	July
P-7	*Albizia lebbeck*	Siris	November	March
P-8	*Annona sqamosa*	Sitafal	November	January
P-9	*Bauhinia vahlii*	Mahuli	January	May
P-10	*Butea frondosa*	Chhewla	April	June
P-11	*Cassia fistula*	Amaltas	February	May

P-12	*Cordia myxa*	Labhera	June	July
P-13	*Flacourtia ramontchii*	Katai	May	June
P-14	*Holoptelia integrifolia*	Chirol	April	May
P-15	*Helicteres isora*	Aithani	December	March
P-16	*Lannea coromandelica*	Gunja	May	June
P-17	*Nyctanthes arbotristis*	Harsingar	January	April
P-18	*Pongamia glabra*	Karanj	January	June
P-19	*Sterculia urens*	Kulla	April	May
P-20	*Salmalia malabarica*	Semal	April	May
P-21	*Tamarindus indica*	Imli	February	April
P-22	*Tectona grandis*	Sagon	January	April
P-23	*Terminalia arjuna*	Kahua	December	March
P-24	*Wrightia tinctoria*	Dudhi	January	April
P-25	*Zizyphus jujuba*	Ber	January	May
P-26	*Zizyphus oenoplea*	Makora	November	January
P-27	*Ziyphus xylopyrus*	Ghont	October	December

Conclusion

On foregoing discussion it is concluded that the woody plants of this region have shown six types of flowering and fruiting patterns and two major periods of fruit fall (such as winter and summer season fruit fall). In rare cases the fruit fall of plants occurs in rainy season but the percentage of such trees is very negligible.

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