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Study on Seasonal Cycle of *Stewartia koreanna* Nak. a Plant Indigenous to Korea

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The great leader Comrade Kim Il Sung said:

"In particular, great efforts should be exerted to protecting and increasing those animals and plants which are indigenous only to our country and those which are rare and small in number."

Stewartia koreanna Nak *is a* wild plant indigenous to Korea. It grows only in the mountainous region of Unchang-ri, Yangdok County in the northern part of Korea. For its big beautiful flowers and strong look, it is cultivated mainly for ornament. The paper is on the seasonal phase of *Stewartia koreanna* Nak.

1. Materials and Method

Stewartia koreanna Nak. that grows in Unchang-ri, Yangdok County and in the Unjong Botanical Garden was used for study.

On the basis of the precedent research findings on *Stewartia koreanna* Nak. [1－3], the study was done on its 5 seasonal phases; vegetative growth, bud-forming, flowering, fruition, the end of the vegetative growth which were again subdivided.

The table of seasonal phase of a year set March 1 as the beginning date, with reference to literature [1].

The average of seasonal days of the successive years was calculated by using the formula $M=E_x/n$. In this formula, M stands for the average of seasonal days of the successive years (d), E_x for the seasonal days of the successive years (d), and n for the number of years.

2. Results and Consideration

2.1. A yearly change in the seasonal phases of the *Stewartia koreanna* Nak.

Table 1 shows the changes in the yearly phenophase of the *Stewartia koreanna* Nak growing in the natural habitat in Unchang-ri, Yangdok County and those growing in the Unjong botanical garden, Phyongsong City.

As shown in table 1, the early seasonal phases (periods for vegetative growth, bud-forming, flowering) start earlier in the Unjong botanical garden where the average annual temperature is comparatively high, and the late phases (fruition, end of vegetative growth) end earlier in Yangdok area where the average annual temperature is comparatively low.

Table 1. Seasonal phases and their periods of the *Stewartia koreanna* Nak.

Seasonal phase and Sub-phase \ Stage	Yangdok		Phyongsong	
	Start /M.Day	End /M.Day	Yangdok 1	Phyongsong 2
Vegetative growth				
Period when leaf buds grow	4.25	5.11	4.10	4.29
Period when leaves foliate	5.9	5.21	4.19	5.8
Period when leaves grow	5.12	6.18	5.2	6.7
Period when the winter buds appear	7.2	8.5	6.9	7.27
Bud-forming				
Period when floral buds grow	4.29	5.19	4.21	5.15
Period of desquamation of floral buds	5.11	5.22	4.29	5.19
Period when the buds grow	5.20	7.1	5.11	6.22
Flowering				
Flower initiation period	6.16	6.29	6.7	6.15
Blooming period blossom	6.22	7.15	6.13	5.19
Dropping period	6.28	7.16	6.17	6.22
Fruition				
Fruit-growing period	7.1	8.19	6.27	8.16
Fruit-maturing	9.21	10.27	7.17	10.20
Period fruit-falling period	10.9	11.8	10.16	11.15
End of vegetative growth				
Period of red leaves	9.1	10.7	9.10	10.22
Leaf-falling period	10.15	11.10	10.21	11.25

2011

The process of the change in the annual and seasonal phases of the *Stewartia koreanna* Nak. that grow in Yangdok area and in the Unjong botanical garden is diagrammatized as follows.

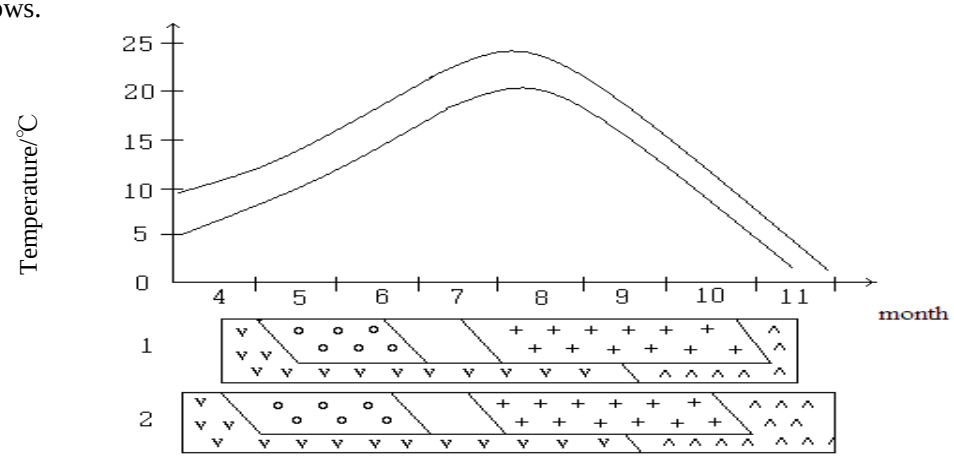

Fig. Model of the seasonal phases of the *Stewartia koreanna* Nak. that grow in Yangdok area(1) and in the Unjong botanical garden (2).(2011)

▽ Vegetative growth, ⊙ Bud-forming, □ Flowering,

+ Fruition, ^ End of vegetative growth

As shown above, the vegetative growth (period when the leaf bud grows) of the *Stewartia koreanna* Nak. begins when the net mean temperature is 5～10℃, that is, in early April in the Unjong botanical garden and in late April in Yangdok area. It ends in November when the monthly mean temperature falls below 10℃. Nearly all leaves fall by Nov 10 in Yangdok and Nov 25 in the Unjong botanical garden.

At the stage of developing sexual organ, flowering period is from June 29 to July 16 in Yangdok and from June 7 to July 10 in the Unjong botanical garden. Monthly mean temperature during the flowering period is 20~24℃.

Fruition period is from July 1 to November 8 in Yangdok area and from June 27 to Nov 15 in the Unjong botanical garden. Fruit-maturing period at the phase of fruition is from September 21 to October 27 in Yangdok and from September 17 to October 20 in the Unjong botanical garden where fruit ripen earlier.

However the fruit-falling period starts earlier in Yangdok and there were some cases there in which immature seeds fell due to the weather condition.

2.2. Average seasonal days of the *Stewartia koreanna* Nak. of the successive years

At the stage when leaves start to grow the average days of the successive years are as follows (table 2).

Table 2. Seasonal days at the stage that leaves begin to come out

Inspection Year	Period when the leaves begin to Grow/M.Day	Seasonal day from 1st March/d	$a = X - M$
2008	4.20	51	0.2
2009	4.18	49	−1.8
2010	4.19	50	−0.8
2011	4.21	52	1.8
2012	4.21	52	1.8
N=5		$\sum x$=254	

As shown in table 2, n is 5 and $\sum x$=254.

So yearly key mean seasonal day (M) for the *Stewartia koreanna* Nak. at the stage in which leaves start to come out is as follows;

$$M = \frac{E_x}{n} = \frac{254}{5} = 50.8 \approx 51$$

The leaves of the *Stewartia koreanna* Nak. start to come out within 51 days on average from March 1. According to Table 1 it falls on April 20.

In the same way, the beginning and end of each seasonal phase and sub-phases of the *Stewartia koreanna* Nak. were calculated from the mean duration of its phenophase for the successive years as in table 3.

Table 3. Seasonal phases and yearly key mean seasonal day for the *Stewartia koreanna* Nak

Section / Seasonal phase and the sub-phases	Period/M.Day		Duration beginning on March 1/ M.Day	
	Beginning	End	1	2
Vegetative growth period				
Period when the leaf bud grows	4.12	4.28	43	49
Period when the leaf starts to grow	4.20	5.9	51	70
Period when the leaf grows	4.27	6.11	58	103
Period when the winter bud appears	6.12	7.29	104	157
Bud-making period				
Period when the floral bud grows	4.23	5.15	54	76
PERIOD when the bud grows	5.12	6.21	73	113
Flowering period				
Flower initiation period	6.8	6.19	100	111
Blooming period	6.15	7.6	107	128
Blossom dropping period	6.19	7.12	111	134
Fruiting period				
Fruit-growing period	6.25	8.17	117	170
Fruit-maturing period	8.14	10.1	167	215
Fruit falling period	9.25	10.15	209	229
End of vegetative growth				
Period of the red leaves	9.8	10.21	192	235
Leaf falling period	10.20	11.26	234	271

As shown in table 3, for 5 consecutive years the average date when flowers start to bloom is June 8, which means that the first flower blooms within 100 days from March 1. Other yearly key mean seasonal day and dates when sub-phases start and end, the seasonal duration starting from March 1 are given in the table.

Conclusion

By studying the seasonal phase of the *Stewartia koreanna* Nak., a plant indigenous to Korea, the time when each seasonal phase and the sub-phase starts and their duration were clarified, to provides reference data for the effective use of its ornamental aspect and effective technical maintenance such as seed collection and cultivation.

References

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