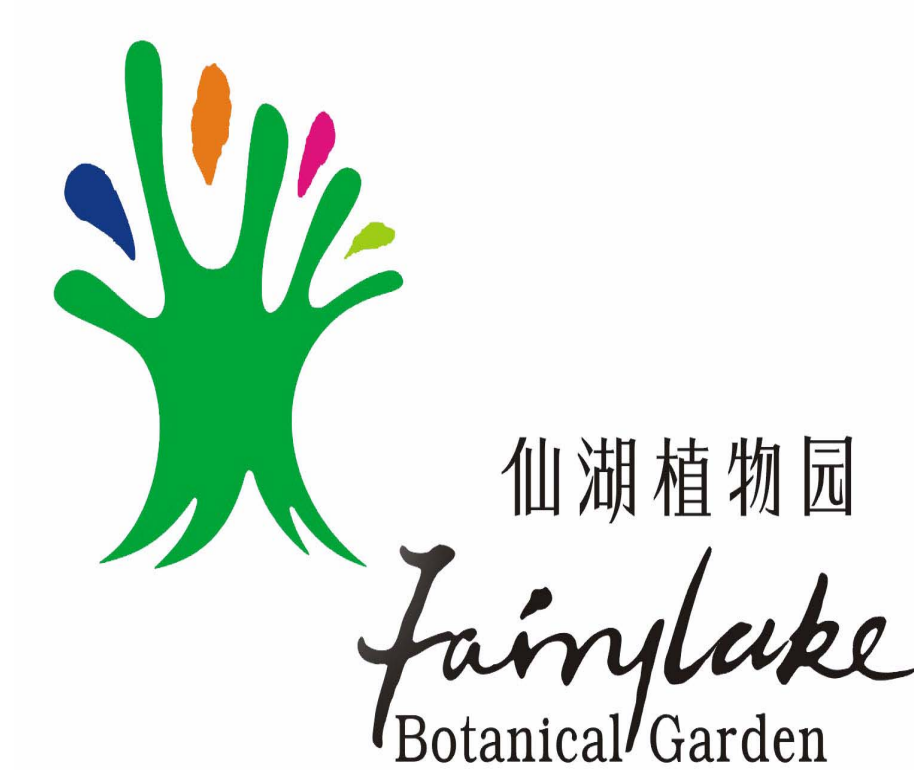


Flowering Age and Failure of Seed Production of Magnoliaceae Species Grown in the Living Collections of Shenzhen Fairy Lake Botanical Garden

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Summary

Living magnolia collections in Shenzhen Fairy Lake Botanical Garden initiated in 1991. More than 120 China magnoliaceae species had been collected over the years. The flowering and seed production records of the years 2000 and 2006 were used to calculate plant flowering age. The planting years of the species collected as saplings without age records were taken as age zeros. Some species flowered very early but some species had not flowered after 17 years. The percentage of the taxa entering flowering age is roughly proportional to plant age. Although many species had entered flowering age, less species had been successful in producing seeds. Comparatively more species of *Michelia* were able to produce seeds than the species of *Magnolia* and *Manglietia*. The poor capability in seed production of magnoliaceae species had been confirmed by field survey. The success in developing fruit and plant flowering age were two factors correlated plant threatened status in the wild.

Materials and Methods

1. Materials

The living collections of *Magnolia*, *Manglietia*, and *Michelia* in the magnolia garden of Shenzhen Fairy Lake Botanical Garden were used in this study. The name list of the taxa used in the study had been presented in a poster of the same congress by Jiao et al.

2. Plant age calculation

The living collection had been introduced into the garden as seeds or saplings. If the sapling age was not known, the time after the saplings were planted into the garden was used for age calculation.

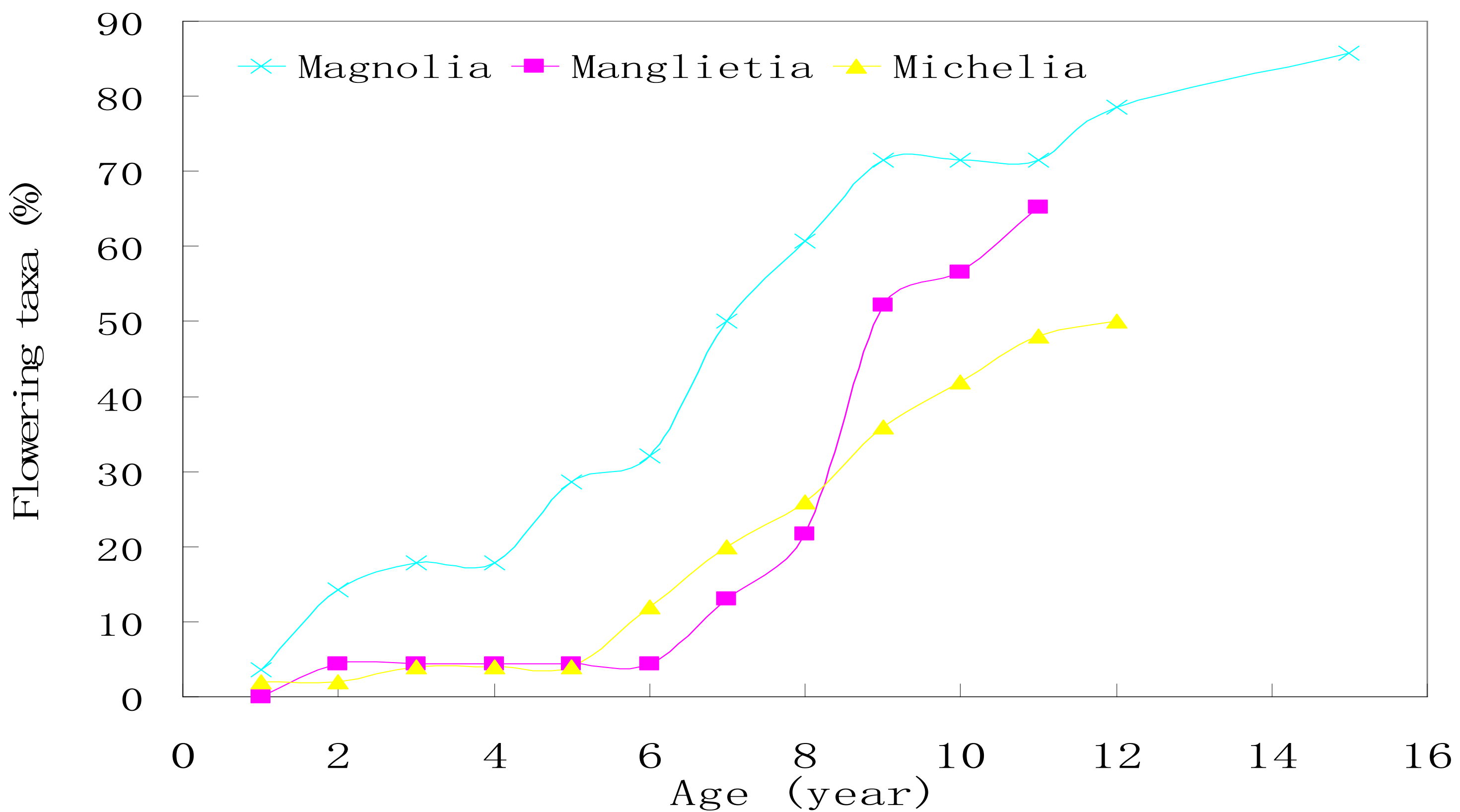


Figure 2. The percentage of the taxa of *Magnolia*, *Manglietia*, and *Michelia* entering flowering age increased with plant age.

Table 3. Field cases showing shortage of seed production resulted in rareness of the plants.

Taxa	Site	Population status	Seed production status
<i>Magnolia championii</i>	Fairy Lake Botanical Garden	Single big plant	No developed fruit found
<i>Michelia pachycarpa</i>	China Yunnan Maguan	Two big plants	No developed fruit found
<i>Michelia ingrata</i>	China Yunnan Maguan	Three big plants and one sapling	No developed fruit found

Discussion

The developmental time required for the plant to enter flowering age and the success of developing fruit are two factors found in this study related with threatened status of the plants. The ratio of the taxa showing development of fruits was lower in *Magnolia*, higher in *Manglietia*, and highest in *Michelia* (Table 1). *Magnolia* taxa flowered earlier than those of *Manglietia* and *Michelia* (Figure 2). The ratio of flowering taxa in all the threaten taxa was higher in *Magnolia*, lower in *Manglietia*, and lowest in *Michelia* (Table 2), indicating long developmental time required for *Michelia* to enter flowering age related with their threatened status.

It had been found in this study that *Michelia* developed normal looking fruits but no or few viable seeds. This phenomenon should be studied further.

Field works had found that shortage of seed production could be a popular factor causing the threatened status of magnolias (Table 3). Further study is needed for developing better measures for conserving magnolias.

Introduction

Plants reproduce themselves mainly by flowering and making seeds and the reproduction is a key process determining plant capability to maintain population vitality and survivor in long term. It is well understood that missing of an agent of plant reproduction process can cause the plant to become rare and endangered. China magnolias have a high ratio of rare and endangered taxa. Reproduction of magnolias had been studied in many cases for understanding mechanisms causing magnolias to become rare and endangered. What had been found including few fruit setting (Dieringer and Espinosa, 1994), very low ratio of viable seeds (Fan et al. 1992), high probability of failure in megaspore and pollen development (Pan et al. 2003), short stigma acceptable time (Gong et al. 1998), etc. It is difficult to understand that many kinds of traits reducing the chance of plant proliferation had been conserved over time and endangered plant survivor in long term. The present study used magnolia living collections in Shenzhen Fairy Lake Botanical Garden to examine plant reproduction in relation to their possibility to become rare and endangered. It had been found that failure to develop fruit and the time before flowering were correlated with plant threatened status in the wild.

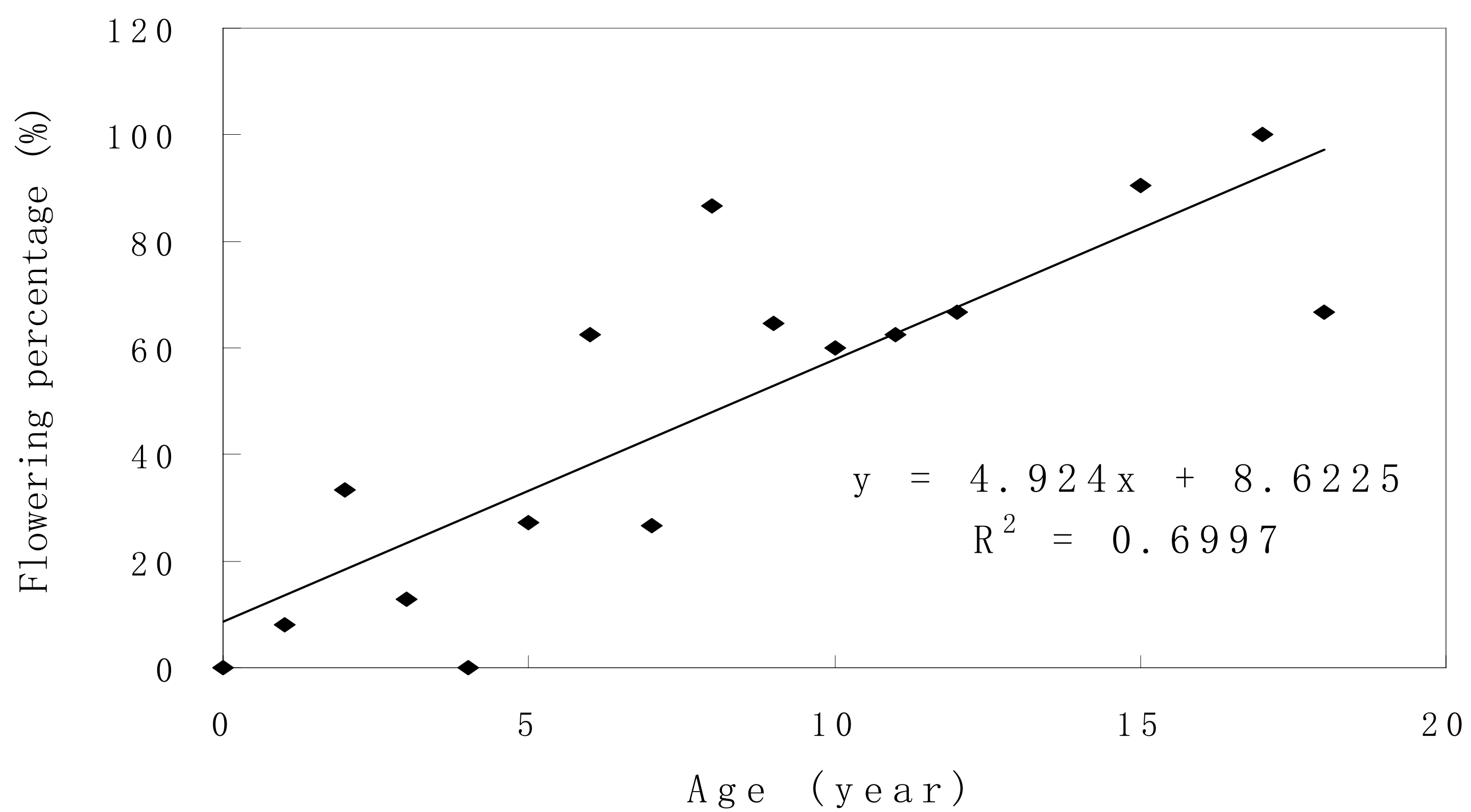


Figure 1. The percentage of the taxa of *Magnolia*, *Manglietia*, and *Michelia* in flowering age correlated with plant age.

Table 1. The number of flowering and fruiting taxa of *Magnolia*, *Manglietia*, and *Michelia* and the percentage of fruiting taxa in all flowering taxa.

	Number of taxa			Fruiting percentage (%)
	Total	Flowering	Fruiting	
Magnolia	28	24	7	29.2
Manglietia	23	15	7	46.7
Michelia	50	26	14	53.8

Table 2. The number and percentage of flowering, fruiting, and threatened taxa of *Magnolia*, *Manglietia*, and *Michelia*.

	Number of taxa*							Percentage (%)	
	Total	China	IUCN	New	Combined	Flowering	Fruiting	Threatened	Flowering
Magnolia	28	4	3	5	8	7	0	28.6	87.5
Manglietia	23	4	12	8	15	10	6	65.2	66.7
Michelia	50	2	10	11	21	3	1	42.0	14.3

* China denotes protection by China national regulation, IUCN protection by IUCN, New newly recommended taxa for protection, Combined all the taxa combined from above three categories, Flowering taxa in flowering age, Fruiting taxa showed development of fruits.

Conclusion

- Magnolia* flowered earlier than *Manglietia* and *Michelia*.
- Success in developing fruit and developmental time required to enter flowering age were related with plant threatened status, and their importance changed among genera.
- Shortage of seed production were a popular factor resulting in magnolia threatened status.

Acknowledgement

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