

葉の表皮組織にもとづくツブラジイとスタジイの雑種の判別

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Satoshi Kobayashi, Shozo Hiroki and Takafumi Tezuka : **Discrimination of Hybrids between *Castanopsis cuspidata* and *C. sieboldii* Based on the Structure of their Leaf Epidermis**

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Castanopsis species are main components of evergreen broad-leaved forests in Japan. Yamazaki and Mashiba (1987 a, b) have classified Japanese *Castanopsis* into two species and one variety based on the comparison with the allies in Korea and Taiwan. *Castanopsis cuspidata* (Thunb.) Schottky and *C. sieboldii* (Makino) Hatus. are distributed in Honshu, Shikoku and Kyushu except Hokkaido and the Ryukyu Islands, while *C. sieboldii* (Makino) Hatus. var. *lutchuensis* (Koidz.) T. Yamaz. et Mashiba ranges in the Ryukyu Islands (Yamazaki and Mashiba 1987 b). For the identification of Japanese *Castanopsis*, Yamazaki and Mashiba (1987 a, b) chose two key characters, i.e. fruit shape and epidermis structure (one cell layer of epidermis in *C. cuspidata* and two cell layers in *C. sieboldii*) of leaves which have already been noticed by Kobayashi and Sugawa (1959).

It is well known that there is an intermediate type between *C. cuspidata* and *C. sieboldii*. Whether the intermediate type is a natural hybrid or not has not been strictly discussed neither among plant taxonomists nor ecologists for a long time. Based on the fruit shape, Hiroki and Ichino (1991) regarded the existence of natural hybrids between the two species. We, however, noticed that the fruit shape is not always appropriate for the identification of the two species and the hybrid. As the epidermis structure seemed to be a useful key character to identify the two species, we examined the epidermis structure of the two species and the presumed hybrid.

To compare the epidermis structure of the two *Castanopsis* species and the presumed hybrids, leaves were sampled at following localities.

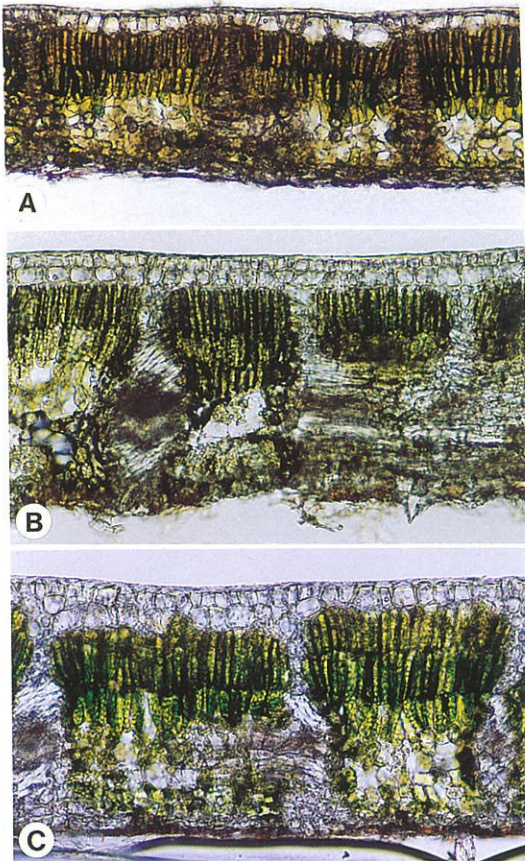
Leaves of *C. cuspidata* were sampled at Mt. Kinkasan and Mino City, Gifu Prefecture and in the *Castanopsis* forest in Toyokawa City, Aichi Prefecture. Those of *C. sieboldii* were sampled on Miyakejima Island and at the Kinumaki Shrine, Tottori Prefecture and Izumo Taisha Shrine, Shimane Prefecture. Those of the presumed hybrids were sampled at the Zaikaji Temple, Aichi Prefecture, where there is a *Castanopsis* population with intermediate type of fruits, and Hiroki and Ichino (1991) regarded it as of hybrid origin. Leaves of ten individuals were sampled from each locality. The leaves were transversely sectioned with a microtome (30 μ m in thickness) and observed by a light microscope (10 \times 20).

The leaves of the same individual showed the same pattern in the two species and in the presumed hybrids. As the results of the observation, it was clarified that; 1) the presumed hybrids from the Zaikaji Temple have one and two cell layered epidermis within a single leaf, 2) all *C. cuspidata* and all *C. sieboldii* have only one cell layered and two cell layered epidermis, respectively (Table 1). The typical cross sections of the two species and the presumed hybrids were indicated in Fig. 1. From these results, we concluded that the presumed hybrids of Zaikaji Temple are surely the natural hybrids of *C. cuspidata* and *C. sieboldii* because of the exactly intermediate epidermal morphology. The ratio of one cell to two cell layers varies among the individuals in the Zaikaji hybrid population.

Based on these results, hereafter, it will be required to clarify the relation between the type of leaf epidermis and other key characters (fruit shape etc.) of the two species and of the hybrids.

Table 1. The number of leaf epidermis layers of *Castanopsis cuspidata*, *C. sieboldii* and the hybrids between both species

	Sampling Locality	Number of epidermis layers		
		One	Two	One and two
<i>Castanopsis cuspidata</i>	Mt. Kinkasan (Gifu Prefecture)	10	0	0
	Mino City (Gifu Prefecture)	10	0	0
	Toyokawa City (Aichi Prefecture)	10	0	0
<i>Castanopsis sieboldii</i>	Miyakejima Island (Tokyo Metropolis)	0	10	0
	Kinumaki Shrine (Tottori Prefecture)	0	10	0
	Izumo Taisha Shrine (Simane Prefecture)	0	10	0
Hybrids	Zaikaji Temple (Aichi Prefecture)	0	0	10

Fig. 1. Epidermis of *Castanopsis cuspidata* (A), *C. sieboldii* (B) and hybrids between *C. cuspidata* and *C. sieboldii* (C). Bar = 20 μ m.

We have already found a difference of DNA between *C. cuspidata* and *C. sieboldii* by the RAPD-PCR methods (Kobayashi et al. 1997). However, we have not yet confirmed relationships between the epidermis structure of leaves and the DNA pattern among them. These issues are currently being investigated.

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小林悟志・広木詔三・手塚修文： 葉の表皮組織にもとづくツブラジイとスダジイの雑種の判別

ツブラジイとスダジイおよび両種の雑種を葉の表皮組織の形態学的な差異から判別を試みた。ツブラジイの葉は、岐阜県の金華山と美濃市および愛知県の豊川市近郊で、また、スダジイの葉は山陰地方の絹巻神社と出雲大社および伊豆諸島の三宅島で採取した。さらに、両種の雑種と思われる個体の葉は愛知県豊川市の財賀寺で採取した。試料とした葉のサンプルは、それぞれの採取地点で10個体から採取した。表皮組織の層の数は、ツブラジイではいずれ

も一層であるのに対して、スダジイではいずれも二層であつた。また、ツブラジイとスダジイの中間的な形態の果実を産する財賀寺の個体群においては、いずれの個体も一層と二層の表皮組織が一枚の葉に混在していた。このことにより、この財賀寺の個体群は、ツブラジイとスダジイの雑種と同定した。したがって、葉の表皮組織の形状は、ツブラジイとスダジイおよび両種の雑種の判別に有効であることが示された。

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