〔AREIPGR Vol. 30 : 101 ～ 107 , 2014〕

Original Paper

Collection of a Rare and Endangered Wild Grapevine Species, *Vitis kiusiana* Momiyama, in Southern Kyūshū, Japan

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Summary

In Kumamoto, Miyazaki and Kagoshima prefectures we collected specimens of *Vitis kiusiana* Momiyama, a wild grapevine species endemic to this region and classified as critically endangered (IA) in the *Fourth Red List of Threatened Plants of Japan*. We discovered 20 individuals and collected fruits with mature seeds from 5 of them. This vine can cover the canopy of large trees, but the number of individuals remaining is likely to be very small, perhaps in the low hundreds or fewer.

KEY WORDS : fruit tree, grapevine, *Vitis kiusiana*, endangered species, Kumamoto, Miyazaki, Kagoshima

Introduction

Six species of *Vitis* (grapevine) are native to Japan (Ohba, 1999). Fruits of all species are edible, but only *V. coignetiae* Pulliat ex Planch. and *V. kiusiana* Momiyama bear larger fruits up to 1 cm in diameter. The former species is distributed throughout most of the Japanese mainland except for Kyūshū. It is very common in thickets on mountains, especially in northern Japan. Japanese people have collected and eaten its fruits since prehistoric times (Kobayashi, 1990). It is now cultivated in several regions as a specialty product.

In contrast, *V. kiusiana* is distributed only in southern Kyūshū, in Kumamoto, Miyazaki, and Kagoshima prefectures (Hatusima, 2004). It is considered to be very rare, and the exact locations of its habitat have been obscure. The NIAS genebank held only one accession of this species (accession number : JP245466), collected by the Osaka Prefectural University during an exploration of wild Japanese *Vitis* species (Nakagawa *et al*., 1991). Unfortunately, its exact collection site was not recorded or reported.

V. kiusiana is now classified as critically endangered (IA) in the *Fourth Red List of Threatened Plants of Japan* (Ministry of Environment, 2012). This means that the extinction in the near future is deeply concerned. We therefore explored its natural habitat to collect enough accessions to cover its entire genetic diversity.

Methods

We obtained detailed information on the natural habitat of *V. kiusiana* from two specialists in the local flora of this region, Mr. Masataka Otomasu (information on Kumamoto and Kagoshima pref.) and Mr. Tadashi Minamitani (Miyazaki pref.). We also examined herbarium specimens at the Herbarium of the University Museum, Kyoto University (KYO), and the Matsubase Store House of Kumamoto prefecture (no herbarium acronym).

Unlike other grapevine species, it is nearly impossible to propagate *V. kiusiana* by cutting (Mochioka *et al*., 1996) or grafting (our unpublished data). Therefore we sought to collect mature seeds. Our first field investigation was carried out from 30 July to 2 August 2013, when we assessed the fruiting status of each vine. We also tried to propagate the plants by layering: long stems hanging near soil level were girdled and buried in the ground.

Finally we collected seeds from 9 to 11 October 2013.

Results and Discussion

1)Distribution range

We discovered individuals at several sites in Kumamoto, Miyazaki and Kagoshima prefectures. The distribution area ranged from 31°49′N to 32°20′N in latitude and from 130°39′E to 140°10′E in longitude (Fig. 1; Table 1). This range perhaps covers the whole of the distribution of this species except for the western end, because occurrence in Minamata city was recorded (Nakagawa *et al*., 1991), and because a herbarium specimen in KYO (Shimada 9477) was collected there. This area is much larger than that estimated in the previous study from the specimens deposited in seven herbaria, which reported occurrence only in Kumamoto prefecture (Nakagawa *et al*., 1991). As Hatusima (2004) recorded several place names across these three prefectures, this species may grow widely in this area.

2)The natural habitat

The altitudinal distribution ranged from ca. 100 to 600 m a.s.l. The potential natural vegetation of this zone is evergreen broadleaved forest. We found some plants at the border of such forest, but we found others in more disturbed vegetation, namely conifer plantations (*Cryptomeria japonica* or *Chamaecyparis obtusa*) and deciduous broadleaved secondary forest. In most cases, vines climbed neighboring trees up to their crowns (Photo 1), reaching a maximum height of about 20 m. Vines that covered the crowns of large trees often had a thick trunk near the ground (Photo 2).

3)Collection of germplasms

We found 20 individuals in all and collected fruits from 5 of them (Photos 3, 4). We isolated seeds from the fruits (Table 1) and sowed them to obtain seedlings. We found fruits on other vines that were too high to collect. Vines without fruits were perhaps males, although this species is not explicitly described as dioecious (e.g., Momiyama, 1935; Ohba, 1999).

Propagation by layering failed. We do not know whether this was because it was the wrong season (spring might be better) or this species cannot be propagated this way.

4)Remarks for conservation

The ecological niche of *V. kiusiana* is perhaps similar to that of *V. coignetiae*. Therefore, it might survive in this area because the latter species does not grow here. However, the number of individuals is very small. Although an individual can cover the crowns of several trees and be visible from hundreds of meters away, we found only 20 that we visited (and a few more that we couldn’t reach). Therefore, the

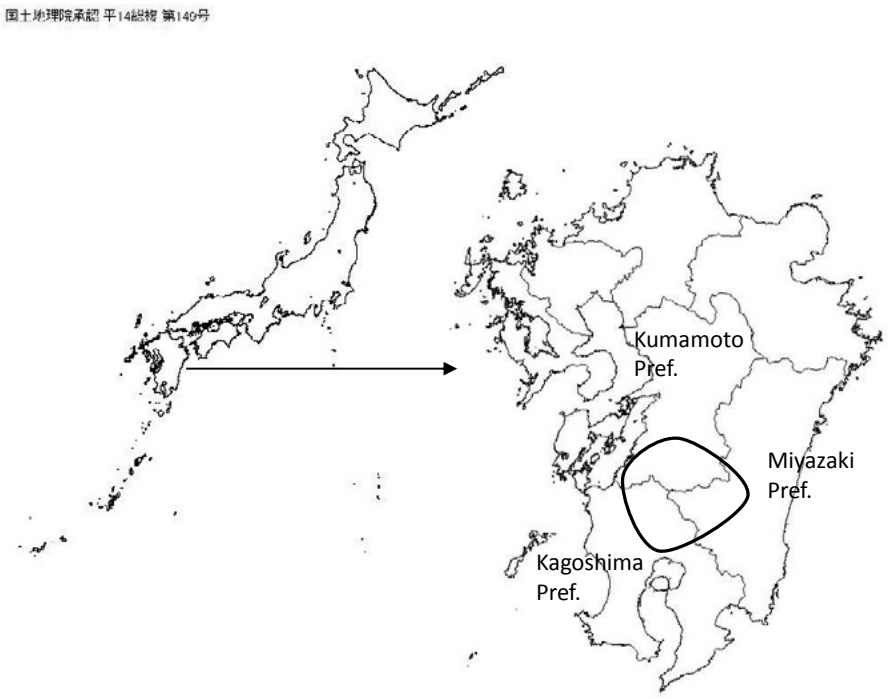

Fig. 1. Distribution range of *Vitis kiusiana* (encircled on the right).
This map was made with KenMap software (Kamada, 2013).

total number of individuals is likely to be very small, perhaps in the low hundreds or fewer. In addition, we could not find any seedlings or juveniles around the mature plants. This suggests that vines are long lived but reproduction is restricted.

One reason that *V. kiusiana* is now critically endangered (IA) *in the Fourth Red List of Threatened Plants of Japan* (Ministry of Environment, 2012) may be the absence of any conservation activities for it. In the case of other fruit tree relatives, *Pyrus calleryana* and *Malus spontanea* are classified as endangered (IB), a less threatened category than IA, even though they number only about 400 and 300 individuals, respectively. However, both species are now protected by the efforts of national and local governments and by non-governmental activities (Iketani and Mase, 2013; Kato *et al*., 2013).

During our field exploration, we heard that some people illegally cut down these vines to collect larvae (e.g., *Nokona*, *Galleria*; Lepidoptera) that they then sell at high prices as fishing bait (Photo 5). As the stems of this species become much thicker (Photo 2) than those of other wild grape species, they make soft targets for poachers. Therefore, we have withheld the details of the collecting sites. Swift action by government against this cutting is necessary.

5)Future prospects

Despite its rarity, *V. kiusiana* features in several horticultural studies (compiled in Horiuchi and Matsui, 1996). These studies report several characteristics in which it differs strongly from other species both horticulturally and taxonomically. These studies relied on limited materials, whereas we collected specimens across most of the distribution area. Our materials suggest a broader range of morphological variations than described previously. For example, one of the discriminative characters of this species is the presence of small spine-like protuberances on the current year's branches (Momiyama, 1935; Ohba, 1999; Photo 6). Our observations suggest instead that the color, size, and density of the protuberances vary among individuals.

Therefore we will investigate and evaluate the characteristics of our materials to support the future use of this untapped genetic resource. We will also estimate how much our materials cover the genetic variation within the species. Our materials will become the first cultivated genetic resources of known origin for the ex situ conservation of this species.

Acknowledgements

We gratefully and sincerely thank Mr. Masataka Otomasu, of Hitoyoshi city, and Mr. Tadashi Minamitani, of Miyazaki City, for providing us with detailed information on distribution. We are also grateful to the Kumamoto-Nanbu District Forestry Office, the Hokusatsu District Forestry Office, and the Miyakonojō Suboffice of the Miyazaki District Forestry Office, Forestry Agency, Ministry of Agriculture, Forestry and Fisheries, for permission to investigate and collect the plant materials.

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Table 1. List of *Vitis kiusiana* accessions investigated.

Individual No.	Date of Exploration	Place	Sex	Number of Collected Seed	Designation	JP Number
1	10/9/2014	Urano, Kuma-mura Village, Kumamoto Pref				
2	10/9/2014	Mae, Yamae-mura Village, Kumamoto Pref.				
3	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.	♀			
4	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.				
5	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.	♀	81	COL/KUMAMOTO/2013/NIFTS/001	251040
6	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.				
7	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.				
8	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.				
9	10/10/2014	Yourahigashi, Sagara-mura Village, Kumamoto Pref.				
10	10/10/2014	Okoba-machi, Hitoyoshi-shi City, Kumamoto Pref.				
11	10/10/2014	Okobafumoto-machi, Hitoyoshi-shi City, Kumamoto Pref.				
12	10/10/2014	Ōkuchishimizu, Isa-shi City, Kagoshima Pref.	♀	100	COL/KAGOSHIMA/2013/NIFTS/001	251041
13	10/10/2014	Ōkuchishimizu, Isa-shi City, Kagoshima Pref.	♀	3	COL/KAGOSHIMA/2013/NIFTS/002	251042
14	10/10/2014	Ōkuchishimizu, Isa-shi City, Kagoshima Pref.	♀	49	COL/KAGOSHIMA/2013/NIFTS/003	251043
15	10/11/2013	Shukukubota, Makizono-chō, Kirishima-shi City, Kagoshima Pref.				
16	10/11/2013	Nagakuino, Kobayashi-shi City, Miyazaki Pref.	♀			
17	10/11/2013	Hiraseno, Kobayashi-shi City, Miyazaki Pref.	♂			
18	10/11/2013	Hiraseno, Kobayashi-shi City, Miyazaki Pref.	♂			
19	10/11/2013	Higashifumoto, Nojiri-chō, Kobayashi-shi City, Miyazaki Pref.	♂			
20	10/11/2013	Kamiya, Nojiri-chō, Kobayashi-shi City, Miyazaki Pref.	♀	3	COL/MIYAZAKI/2013/NIFTS/001	251044

Photo 1. *Vitis kiusiana* (Individual No.12) covering crowns of *Cryptomeria japonica* (30 July 2013).

Photo 2. A stem of *Vitis kiusiana* (Individual No.12) beneath the tree canopy (10 Oct. 2013).

Photo 3. Mature infructescences of *Vitis kiusiana* (Individual No.5) (10 Oct. 2013).

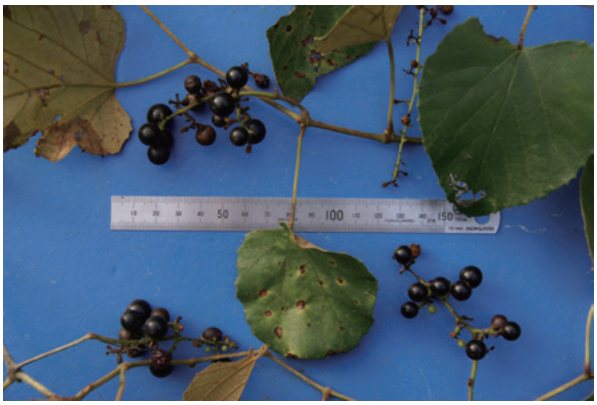

Photo 4. Mature infructescences of *Vitis kiusiana* (Individual No.12) (10 Oct. 2013).

Photo 5. A larva in the vine of *Vitis kiusiana* (Individual No.11) (31 July 2013).

Photo 6. A stem of *Vitis kiusiana* (Individual No.17) (11 Oct. 2013). Many small spine-like protuberances cover the surface.