

Field Survey and Collection of Crop Landraces, Wild *Vigna* Genetic Resources, and Their Root Nodules in Kikaijima, Kakeromajima, and Amami Oshima Islands in Japan in 2022

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Summary

We conducted a field survey to collect crop landraces on Kikaijima Island, including *Vicia faba* L., *Sesamum indicum* L., *Capsicum frutescens* L., and wild *Vigna* plants with their root nodules on Kikaijima, Kakeromajima, and Amami Oshima Islands in Kagoshima Prefecture, Japan, from August 22 to 26, 2022. We collected 13 accessions of crop landraces, including six accessions of *V. faba*, one accession of *S. indicum*, one accession of *C. frutescens*, five accessions of other crops, and 24 accessions of wild *Vigna* plants, including three accessions of *Vigna luteola*, five accessions of *Vigna reflexo-pilosa* Hayata, and 16 accessions of *Vigna marina* (Burman) Merrill. Notably, *V. luteola* accessions from Amami Oshima Island were the first and northernmost collection for the National Agriculture and Food Research Organization (NARO) Genebank. Eight root nodules were collected from *V. marina* and *V. luteola* to isolate symbiotic rhizobia. All collected materials are conserved in the NARO Genebank of Japan. Multiple seeds are available on request for research, breeding, and educational purposes.

KEY WORDS: Crop landraces, *Vigna luteola*, Root nodule, Kikaijima, Kakeromajima, Amami Oshima

Introduction

The National Agriculture and Food Research Organization (NARO) Genebank has been conducting collection trips for *ex-situ* conservation of crop landraces and their wild relatives distributed in Japan and abroad (Annual Report on Exploration and Introduction of Plant Genetic Resources, https://www.gene.affrc.go.jp/publications.php#plant_report). Through seven field surveys of leguminous plants and their symbiotic rhizobia (Muto *et al.* 2015; Baba-Kasai *et al.* 2016, 2017, 2018, 2019; Takahashi *et al.* 2017, 2018), we noticed that our legume collections in the subtropical zone mostly

originated from the islands of Okinawa Prefecture, with a few originating from the islands of Kagoshima Prefecture.

Kagoshima Prefecture is one of the most remote island prefectures in Japan, with an island population of 149,620, an island area of 2,482 km², and 28 inhabited islands (<https://www.pref.kagoshima.jp/ac07/pr/shima/gaiyo/pamph2022.html>). The Amami Islands in Kagoshima Prefecture have a wide range of climatic conditions caused by their complex topography, as well as variations in latitude and longitude. There are topographical contrasts between Kikaijima

and Kakeromajima Islands; nevertheless, both are neighboring Amami Oshima Island. Kikaijima Island is a typical flat island with an oval shape and simple coastline consisting of upheaval coral reefs. Kakeromajima Island has a complex shape and sawtooth coastline. We then performed a 2022 field survey of crop landraces that adapted to subtropical and semiarid environments on Kikaijima Island, and subtropical wild *Vigna* plants and their symbiotic rhizobia on Kikaijima, Kakeromajima, and Amami Oshima Islands.

This study is the first to explore crop landraces on Kikaijima Island and wild legume species on Kakeromajima Island in the NARO Genebank, with the main objectives of collecting crop landrace seeds and their information on Kikaijima Island and surveying *Vigna marina* (Burman) Merrill and *Vigna reflexo-pilosa* Hayata that inhabit Kakeromajima Island. In addition, we aimed to determine the habitats of *Vigna luteola* (Jacq.) Bentham on Amami Oshima Island, which is expected to be its northern habitat limit in Japan. Furthermore, root nodules were collected from wild legume species in parallel with plant surveys in order to isolate diverse rhizobia.

Methods

A field survey of Kikaijima, Kakeromajima, and Amami Oshima Islands in Kagoshima Prefecture, Japan, was conducted from August 22 to 26, 2022. The survey began at the Kikaijima Airport and ended at the Amami Airport (Table 1).

To collect crop landraces, we first visited the Kikai Town Office and the Kikaijima Processing Center to meet key persons who provided us with the seeds of crop landraces. We also visited farmers' markets to collect information on the seeds of the crop landraces.

In the case of wild *Vigna* plants and their root nodules, we searched the area for natural populations when we found naturally growing *V. marina*, *V. reflexo-pilosa*, and other legumes, or when we came across a

habitat with suitable conditions. In this field survey, two methods of seed collection were employed: in one method a large number of seeds from each population were collected in bulk; for the other method, only the pods attached to the stem with root nodules were collected if root nodule symbiosis was found. In this case, we also collected bulk seeds from the surrounding population as a provision for a small number of seeds collected from the stem with root nodules, which were managed with a branch number added to the collection site number (Table 3).

The recorded passport data included the locations of the collection sites, that is, latitude, longitude, and altitude, as shown in Table 3. The collection points of genetic resources in the search area were recorded on Google Maps using a smartphone, and longitude and latitude information were retrieved from Google Maps after returning from the field survey. Altitude information was obtained using Google Earth after the field survey. Maps of the habitats were sketched and any special characteristics of the collected plants were noted. This information was stored in the NARO Genebank database when the collected plant was registered as an accession.

Root nodules were collected from *V. marina* and *V. luteola* from eight habitats (*V. marina*: seven, *V. luteola*: one) and named using a collection site number similar to that of the seeds (Table 3). The collected root nodules were placed in screw bottles for each habitat with desiccant silica gels.

Results and Discussion

As summarized in Table 2, we collected 13 accessions of crop landraces, including six accessions of *V. faba*, two accessions of *Glycine max* L., one accession of *Vigna unguiculata* (L.) Walp., one accession of *Pisum sativum* L., one accession of *Mucuna pruriens* L., one accession of *S. indicum*, one accession of *C. frutescens*, 24 accessions of wild *Vigna* plants, including

Table 1. Itinerary of the field survey in Kikaijima, Kakeromajima and Amami Oshima islands, Kagoshima prefecture (August 22 to 26, 2022)

Date	Itinerary	Stay
2022/8/22	Tsukuba -- Haneda Airport 12:20 -- (JAL659) -- Amami Airport 14:25 -- Amami Airport 15:50 -- (JAL3837) -- Kikai Airport 16:10 -- Stay at Kikai-cho	Kikai-cho
2022/8/23	Exploration on Kikaijima Island	Kikai-cho
2022/8/24	Exploration on Kikaijima Island until afternoon; Kikai Airport 16:40 -- (JAL3836) -- Amami Airport 17:00 -- driving to Setouchi-cho	Setouchi-cho
2022/8/25	Koniya Port 7:00 -- (ferry) -- Sesou Port 7:25 -- Exploration on Kakeromajima Island -- Ikema port 16:30 -- (ferry) -- Koniya Port 16:50 -- Stay at Setouchi-cho	Setouchi-cho
2022/8/26	Exploration on Amami Oshima Island until noon; Amami Airport 15:20 -- (JAL658) -- Haneda Airport 17:35 -- Tsukuba	

16 accessions of *V. marina*, five accessions of *V. reflexopilosa*, three accessions of *V. luteola*, and eight root nodules of wild *Vigna* plants in this field survey.

Crop landraces

Since Kikai Town has recently been utilizing indigenous fava beans and sesame seeds as specialty products to revitalize the town (Teru 2017), we planned to survey the actual situation on-site and collect crop landraces, especially for *Vicia faba* L. and *Sesamum indicum* L., on Kikaijima Island. We were also interested in collecting wild legume genetic resources, but because of time constraints, we prioritized collecting crop landraces and targeted only *V. marina*, which is a wild species but easily found.

At the beginning of our exploration of Kikaijima Island, we paid a courtesy visit to the Kikai Town Hall to ask for the official transfer of Kikaijima's indigenous fava beans and sesame seeds to the NARO Genebank. However, the town hall official told us that to protect their crop landraces, they would first register them under Japan's Geographical Indications (GI) protection system, and only after that they would transfer them to us. Therefore, we left the town hall with the promise that we would be contacted if any progress had been made in the GI registration.

Next, we visited the Kikaijima Processing Center, the workplace of Mr. Teru, who is the author of the paper referred to above, and one of the Kikai Town officials, to interview him about the past and present situation of crop landrace cultivation. He told us that the cultivation of Kikaijima's sesame seeds began in the Edo period, and by the Meiji period, they had been cultivated in all the villages of the island. After World War II, their production decreased annually, and they were cultivated only in Araki village. However, 35 years ago, the oil refining company of Kagoshima Prefecture in the south of Kyushu, which was looking for sesame seeds cultivated in Japan, paid attention to Kikaijima's sesame seeds and increased their production again as an intercrop of sugarcane and as a side income in all villages on Kikaijima Island. Kikaijima Island has well-drained soils derived from upheaval coral reefs and receives little rainfall during the summer. This makes the island a major production center for sesame in Japan because of its favorable conditions for sesame cultivation.

Furthermore, Mr. Teru provided detailed information on the fava bean landraces on Kikaijima Island. He said that the cultivation of Kikaijima's fava beans should have also begun in the Edo period and the

advantage of fava beans is that they are a winter crop and are not affected by typhoons, therefore, it used to be said on Kikaijima Island that if 100 kg of fava beans were stored at home, it would protect the family from starvation. In his opinion, the smallest fava bean in Photo 1 is the original landrace, and the recent increase in the number of green-skinned and large-grained fava beans may be the result of hybridization with non-native species introduced because they are sweet and good for the stomach. However, there is no unified view on this matter, so Mr. Teru introduced us to a representative of a cooperative society named Kikaijima Yui, which promoted the commercialization of Kikaijima's landraces.

Ms. Taioka, who is CEO of Kikaijima Yui, showed us Kikaijima fava beans purchased from farmers on the island. The beans were divided into five groups (Photo 2). The smallest ones (KKA_31) have been produced in the Araki district for a long time, but are not a representative landrace of Kikaijima Island. She believed that the second smallest landrace (KKA_32) was a typical landrace. The remaining three types, the



Photo 1. Comparison of Kikaijima landraces and commercial crops at the Kikaijima Processing Center.



Photo 2. Kikaijima's fava beans were divided into five groups based on their color and size by Ms. Taioka, CEO of Kikaijima Yui.

larger ones (KKA_33), the green ones (KKA_34), and the larger green ones (KKA_35), were thought to have been recently introduced elsewhere or to be hybrids with landraces.

Mr. Teru and Ms. Taioka gave us other beans: Kikaijima's soybeans (KKA_26 and 27), Kikaijima's cowpeas (KKA_28), red peas (KKA_30), and mucuna beans (KKA_37). They believed that soybeans and cowpeas were Kikaijima's landraces, whereas the other two were not. Additionally, we obtained Kikaijima's fava beans (KKA_36), Kikaijima's sesame seeds (KKA_25), and Kikaijima's chili peppers (KKA_29) from a farm stand in the town of Kikai.

Wild *Vigna* plants and their root nodules

Vigna marina

We searched for *V. marina* habitats around the coast of Kikaijima Island and halfway around the coast

of Kakeromajima Island and collected 16 accessions of *V. marina* and seven accessions of root nodules from these two islands (Table 2). Owing to time constraints, we were unable to fully search for it on Amami Oshima Island, and the northernmost coast of this island has remained unexplored as in the previous year (Baba-Kasai *et al.* 2022).

The beaches on Kikaijima and Kakeromajima were not the typical coral sand beaches that are common on the islands of Okinawa Prefecture. Most beaches on Kikaijima Island tend to be rugged and stony beaches which are derived from uplifted corals. We could not find *V. marina* in the northern half of Kikaijima Island (Fig. 1) because the coastal area is particularly rocky, and the short distance to the sea makes it susceptible to tidal cover. In the southern half of Kikaijima Island, we found *V. marina* growing on rocky beaches such as KKA_04 (Photo 3), sometimes climbing huge coral rocks such



Photo 3. *Vigna marina* often grows on rocky beaches on Kikaijima Island. This location is marked as KKA4 on the map (Fig. 1).



Photo 4. *Vigna marina* climbs a huge coral rock at Sugira Beach near Kikai Airport. This location is marked as KKA6 on the map (Fig. 1).

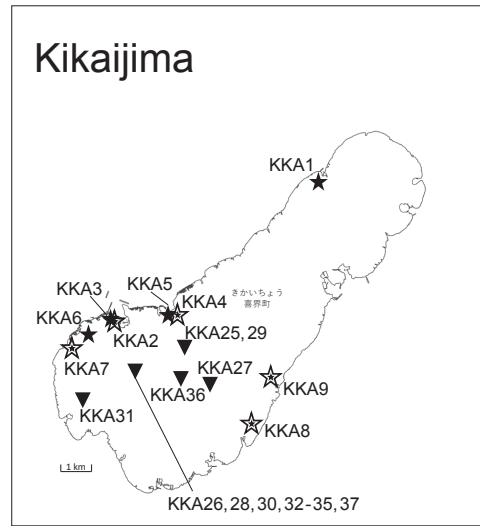
Table 2. Summary of collected materials in Kikaijima, Kakeromajima and Amami Oshima islands

Species	Collected materials	Number of varieties collected			Total
		Kikaijima	Kakeromajima	Amami Oshima	
<i>Vicia faba</i>	Seed	6			6
<i>Glycine max</i>	Seed	2			2
<i>Vigna unguiculata</i>	Seed	1			1
<i>Pisum sativum</i>	Seed	1			1
<i>Mucuna pruriens</i>	Seed	1			1
<i>Sesamum indicum</i>	Seed	1			1
<i>Capsicum frutescens</i>	Seed	1			1
<i>Vigna marina</i>	Seed	9	7		16
<i>Vigna reflexo-pilosa</i>	Seed		1	4	5
<i>Vigna luteola</i>	Seed			3	3
<i>Vigna marina</i>	Nodule	5	2		7
<i>Vigna luteola</i>	Nodule			1	1
Total		27	10	8	32

Amami Oshima



地理院地図
GSI Maps



- ★ Collection sites of seeds from *Vigna marina*
- Collection sites of seeds from *Vigna luteola*
- ☆ Collection sites of seeds and nodules from *Vigna marina*
- ◎ Collection sites of seeds and nodules from *Vigna luteola*
- ▼ Collection sites of seeds from crop landraces
- * Collection sites of seeds from *Vigna reflexo-pilosa*

Fig. 1. The collection and search sites in Kikaijima, Kakeromajima and Amami Oshima islands, Kagoshima prefecture.



Photo 5. A huge colony of *Vigna marina* on a stony beach near Adenfireai Park. This location is marked as KKA9 on the map (Fig. 1).

as KKA_06 (Photo 4). We found a large colony of *V. marina* on a stony beach near Adenfireai Park (Photo 5), where a large quantity of pumice stone made by a submarine volcanic eruption 50 km south of Iwo Jima in the Ogasawara Islands on August 13, 2021, had been drifted by tidal currents.

On Kakeromajima Island, the unique yellow sandy beaches are thought to be derived from the island's soil (Photo 6). We found *V. marina* root had penetrated a piece of coral (Photo 7) and possessed many root nodules (Photo 8). Therefore, we sought to dig up the roots of *V. marina* in the KKA13 habitat to understand its ability to absorb nutrients. The root was well over a meter long, and it was impossible to dig it (Photo 9). The coastline

of Kakeromajima Island is complex, with many narrow beaches covered by waves, then we could find only a few sandy beaches where *V. marina* can inhabit.

Vigna reflexo-pilosa

We searched for *V. reflexo-pilosa* habitats in an

inland area of Kakeromajima Island along a small river running through Shodon Nagahama Beach. Surprisingly, in a village along the river, several varieties of rice are grown in paddy fields (Photo 10). Since the rims of paddy fields and riversides are typical habitats of wild *Vigna* plants, we carefully searched this area and



Photo 6. A typical yellow sandy beach is thought to be derived from the soil on Kakeromajima Island. This location is marked as KKA12 on the map (Fig. 1).



Photo 9. The *Vigna marina* root is well over a meter long. This location is marked as KKA13 on the map (Fig. 1).



Photo 7. The *Vigna marina* root penetrates a piece of coral. This location is marked KKA10 on the map (Fig. 1).



Photo 10. Several varieties of rice are grown in paddy fields on Kakeromajima Island. This location is near KKA15 on the map (Fig. 1).



Photo 8. *Vigna marina* roots are attached to many root nodules. This location is marked as KKA13 on the map (Fig. 1).



Photo 11. The first accession of Kakeromajima's *Vigna reflexo-pilosa* (KKA15) for NARO Genebank, with a yellow flower on the riverside of a small river running through Shodon Nagahama Beach. This location is marked as KKA15 on the map (Fig. 1).

found one accession of *V. reflexo-pilosa* (KKA15) with few pods at the riverside. This is the first accession of Kakeromajima's *V. reflexo-pilosa* to the NARO Genebank (Photo 11).

On the way to Amami Airport, we stopped in the central-eastern part of Amami Oshima to search for



Photo 12. *Vigna reflexo-pilosa* colony hangs down on the bank facing the riverside of the Sumiyo River on Amami Oshima Island. This location is marked as KKA20 on the map (Fig. 1).



Photo 13. A large colony of *Vigna luteola* along an agricultural canal along the Sendai River. The location of collection sites are marked as KKA22-24 on the map (Fig. 1).



Photo 14. Yellow flowers of *Vigna luteola* (KKA22-24) are the northernmost accessions in Japan for NARO Genebank.

V. reflexo-pilosa and *V. luteola*. Despite the fact that a colony of *V. reflexo-pilosa* was seen along the Sumiyo River in 2019, it took some time to identify the colony that was hanging down on the bank facing the riverside of the Sumiyo River as if hidden by bushes (Photo 12). We collected four accessions of *V. reflexo-pilosa* (KKA18-21) at the bank, two from the riverside and two from the bush side.

Vigna luteola

An old specimen of *V. luteola* collected from the eastern part of Amami Oshima Island (specimen_id: KAG029709, collector date: 1958/8/10), is preserved at the Kagoshima University Museum. It is the only evidence that *V. luteola* inhabited in Amami Oshima Island. Although we could not obtain other new information, we assume that there is potential to maintain the growth of *V. luteola* in the central-eastern part of Amami Oshima Island. Therefore, this year we searched along the Sumiyogawa River, a little downstream from where we looked the previous year (Baba-Kasai *et al.* 2022), but were unable to find it. However, we suddenly bumped into a large colony of *V. luteola* along an agricultural canal in the Sendai River (Photos 13 and 14). Notably, this is the first collection of *V. luteola* in Kagoshima Prefecture and Amami Oshima Island for the NARO Genebank. Furthermore, they (KKA22-24) are the northernmost accessions among accessions of NARO Genebank.

Field surveys in 2021 (Baba-Kasai *et al.* 2022) and 2022 (in this study) allowed us to collect wild *Vigna* plants from the Amami Islands that were missing from the NARO Genebank collection and to link the Okinawa and Honshu collections. Wild *Vigna* plants from subtropical islands possess useful traits for crop breeding such as salt and high-temperature tolerance. Since southern accessions tend to flower later and are more difficult to propagate in Tsukuba, it is very important that we were able to collect wild *Vigna* plants from the Amami Islands, located north of the Okinawa Islands.

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2022年の喜界島，加計呂麻島，奄美大島における 在来作物およびササゲ属遺伝資源とその根粒の 現地調査・収集について

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和文摘要

本報告は、2022年8月22日から8月26日に行なった鹿児島県の喜界島，加計呂麻島，奄美大島における在来植物およびササゲ属植物遺伝資源とその根粒の現地調査収集報告書である。現地調査の結果，喜界島在来ソラマメを6点，喜界島在来ゴマ1点，島唐辛1点，その他の作物5点を含む合計13点の在来作物と，*Vigna luteola* 3点，*Vigna reflexo-pilosa* 5点，*Vigna marina* 16点の合計24点のササゲ属作物近縁植物を収集した。特に，奄美大島の*V. luteola*は，農業・食品産業技術総合研究機構（NARO）ジーンバンクにとって鹿児島県からの初収集かつ日本最北端のコレクションとなった。*V. marina*と*V. luteola*の8箇所の生息地では，根粒の採取も実施した。収集された材料はすべてNAROジーンバンクに保存され，増殖した種子は，研究，育種，教育目的のために，要望に応じて提供される予定である。

Table 3. Passport information of collected materials

Col. site No. / Map ID	JP No.	Scientific name	Japanese name (和名)	Col. Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Soil sample	Remarks	100 seed weight (g)
KKA_01	288823	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	23 Aug, 2022	Wild	Onotsu, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 小野津	N28°21'55.7"	E129°59'55.0"	4	elevated coral reef	1 Plant	no	no	no	At a concrete seawall in a lawn park beside the Onotsu beach	5.50
KKA_02	288824	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Wan, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 湾	N28°19'27.9"	E129°56'04.3"	3	coral sand	1 Plant	no	yes	yes	At a part of the coast of the Wan Port near the Kikai-Daiichi Hotel	6.67
KKA_02_2	288825	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Wan, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 湾	N28°19'27.9"	E129°56'04.3"	3	coral sand	bulk	no	no	no	At a part of the coast of the Wan Port near the Kikai-Daiichi Hotel	6.28
KKA_03	288826	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Wan, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 湾	N28°19'26.0"	E129°56'04.4"	4	sandy loam	bulk	no	no	no	At a lawn roadside toward the Kikai-Daiichi Hotel from the coast	6.37
KKA_04	288827	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Ikeji, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 池治	N28°19'39.4"	E129°57'11.1"	2	coral sand	1 Plant	no	yes	yes	At the Ikeji beach	4.75
KKA_04_2	288828	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Ikeji, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 池治	N28°19'39.4"	E129°57'11.1"	2	coral sand	bulk	no	no	no	At the Ikeji beach	5.21
KKA_05	288829	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	85-1 Ikeji, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 池治	N28°19'37.2"	E129°57'08.9"	2	coral sand	bulk	no	no	no	At the Ikeji beach	5.47
KKA_06	288830	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Nakazato, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 中里	N28°19'18.6"	E129°55'20.6"	2	elevated coral reef	bulk	no	no	no	At the Sugira beach near the Kikai Airport	5.67
KKA_07	288831	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Nakazato, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 中里	N28°19'11.7"	E129°55'16.2"	4	coral sand	1 Plant	no	yes	yes	At the Sugira beach near the Kikai Airport	5.54
KKA_07_2	288832	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Nakazato, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 中里	N28°19'11.7"	E129°55'16.2"	4	coral sand	bulk	no	no	no	At the Sugira beach near the Kikai Airport	5.56
KKA_08	288833	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Keraji, Kikai-chou Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 花良治	N28°17'26.2"	E129°58'34.4"	6	coral sand	1 Plant	no	yes	yes	Beside a seawall at the Keraji beach	4.36

Table 3. (Continued).

Col. site No. / Map ID	JP No.	Scientific name	Japanese name (和名)	Col. Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Soil sample	Remarks	100 seed weight (g)
KKA_08_2	288834	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Keraji, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 花良治	N28°17'26.2"	E129°58'34.4"	6	coral sand	1 Plant	no	no	no	Beside a seawall at the Keraji beach	6.69
KKA_09	288835	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Aden, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 阿伝	N28°18'21.5"	E129°59'10.9"	6	gravel or cobbles over coral sand	1 Plant	no	yes	yes	At a stony beach, where the pumice stone made by submarine volcanic eruption in last year were drifted, near the Adenfireai park	4.57
KKA_09_2	288836	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	24 Aug, 2022	Wild	Aden, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 阿伝	N28°18'21.5"	E129°59'10.9"	6	gravel or cobbles over coral sand	bulk	no	no	no	At a stony beach, where the pumice stone made by submarine volcanic eruption in last year were drifted, near the Adenfireai park	5.15
KKA_10	288837	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Ikema, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 池間	N28°06'17.6"	E129°19'27.1"	5	sandy loam with coral gravel	1 Plant	no	yes	yes	At a seaside along prefectural road 614 between Ikema ferry port and Doren village.	3.71
KKA_10_2	288838	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Ikema, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 池間	N28°06'17.6"	E129°19'27.1"	5	sandy loam with coral gravel	bulk	no	no	no	At a seaside along prefectural road 614 between Ikema ferry port and Doren village. The plants were almost withered by salt damage from tides.	4.00
KKA_11	288839	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Doren, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 渡連	N28°06'37.1"	E129°19'57.1"	4	sandy loam with gravel and rock	bulk	no	no	no	At a seaside along prefectural road 614 between Ikema ferry port and Doren village. The plants were almost withered by salt damage from tides.	5.00
KKA_12	288840	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Shodon, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 諸鈍	N28°05'37.5"	E129°19'28.9"	5	sandy loam with gravel and rock	bulk	no	no	no	In the park area of Shodon Nagahama beach. They were almost withered by salt damage from tides or herbicides.	4.83
KKA_13	288841	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Shodon, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 諸鈍	N28°05'24.5"	E129°19'31.6"	11	sandy loam with gravel and rock	1 Plant	no	yes	yes	At Shodon Nagahama beach beside Shodon Deigo trees. This plant has long roots (over one meter) and a lot of root nodules.	5.68
KKA_14	288842	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Shodon, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 諸鈍	N28°05'26.1"	E129°19'31.7"	8	sandy loam	bulk	no	no	no	At Shodon Nagahama beach beside Shodon Deigo trees.	6.72
KKA_15	288843	<i>Vigna reflexo-pilosa</i>	Ooyabutsuruazuki (オオヤブツルアズキ)	25 Aug, 2022	Wild	Shodon, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 諸鈍	N28°05'37.6"	E129°19'48.2"	10	loam	1 Plant	no	no	no	On the bank of a creek that flows into Shodon Nagahama beach. Several rice variety was cultured in a field near the creek.	0.67
KKA_16	288844	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Shokazu, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 諸数	N28°07'03.0"	E129°18'15.3"	6	sandy loam	bulk	no	no	no	At Surihama beach	4.60

Table 3. (Continued).

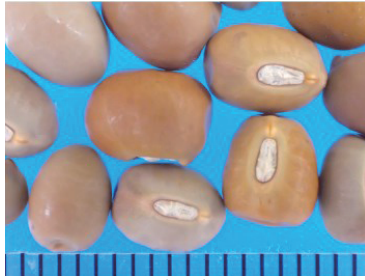
Col. site No. / Map ID	JP No.	Scientific name	Japanese name (和名)	Col. Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Soil sample	Remarks	100 seed weight (g)
KKA_17	288845	<i>Vigna marina</i>	Hamasasage (ハマササゲ)	25 Aug, 2022	Wild	Osai, Setouchi, Oshima District, Kagoshima 鹿児島県 大島郡 瀬戸内町 於齊	N28°06'39.9"	E129°14'57.7"	15	sandy loam	bulk	no	no	no	At the west edge of Osai beach	6.03
KKA_18	288846	<i>Vigna reflexo-pilosa</i>	Ooyabutsuruazuki (オオヤブツルアズキ)	26 Aug, 2022	Wild	Oaza Nishinakama, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 西仲間 141	N28°15'53.2"	E129°24'22.8"	4	loam	bulk	no	no	no	On the bank of Sumiyo river	0.43
KKA_19	288847	<i>Vigna reflexo-pilosa</i>	Ooyabutsuruazuki (オオヤブツルアズキ)	26 Aug, 2022	Wild	Oaza Nishinakama, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 西仲間 92	N28°15'52.0"	E129°24'24.3"	5	loam	bulk	no	no	no	On the bank of Sumiyo river	0.66
KKA_20	288848	<i>Vigna reflexo-pilosa</i>	Ooyabutsuruazuki (オオヤブツルアズキ)	26 Aug, 2022	Wild	Oaza Nishinakama, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 西仲間	N28°15'50.5"	E129°24'25.8"	5	loam	bulk	no	no	no	On the bank of Sumiyo river	0.41
KKA_21	288849	<i>Vigna reflexo-pilosa</i>	Ooyabutsuruazuki (オオヤブツルアズキ)	26 Aug, 2022	Wild	Oaza Nishinakama, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 西仲間	N28°15'51.0"	E129°24'25.1"	6	loam	1 Plant	no	no	no	On the bank of Sumiyo river	0.13
KKA_22	288850	<i>Vigna luteola</i>	Nagabahasasage (ナガバハマササゲ)	26 Aug, 2022	Wild	Oaza Surigachi, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 摺勝	N28°17'47.0"	E129°26'20.8"	6	loam	bulk	no	no	no	Growing in clusters from a small bridge over an agricultural canal along the Sendai River to the riverbank downstream	0.82
KKA_23	288851	<i>Vigna luteola</i>	Nagabahasasage (ナガバハマササゲ)	26 Aug, 2022	Wild	Oaza Surigachi, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 摺勝	N28°17'47.3"	E129°26'20.4"	6	loam	1 Plant	yes	yes	no	Growing in clusters from a small bridge over an agricultural canal along the Sendai River to the riverbank downstream	0.34
KKA_24	288852	<i>Vigna luteola</i>	Nagabahasasage (ナガバハマササゲ)	26 Aug, 2022	Wild	Oaza Surigachi, Sumiyocho, Amami, Kagoshima 鹿児島県 奄美市 住用町 大字 摺勝	N28°17'46.4"	E129°26'21.3"	6	loam	bulk	no	no	no	Growing in clusters from a small bridge over an agricultural canal along the Sendai River to the riverbank downstream	0.62
KKA_25	288853	<i>Sesamum indicum</i>	Kikaijima Goma (キカイジマゴマ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	It was marketed as "washed sesame."	0.22
KKA_26	288854	<i>Glycine max</i>	Zairai Daizu (ザイライダイズ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: "Tofumami" (H28 product)	7.00
KKA_27	288855	<i>Glycine max</i>	Zairai Daizu (ザイライダイズ)	23 Aug, 2022	Cultivar	Yamada, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 山田	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from Mr. Teru, one of Kikai Town officials: Yamada area, harvested November 20, 2013 (H25). It was stored in a shochu bottle.	6.80

Table 3. (Continued).

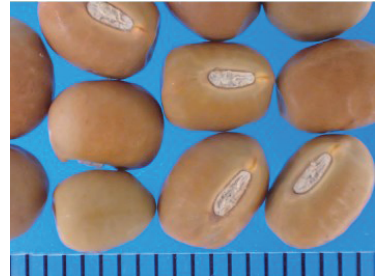
Col. site No. / Map ID	JP No.	Scientific name	Japanese name (和名)	Col. Date	Status	Collection Site (Address)	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Soil sample	Remarks	100 seed weight (g)
KKA_28	288856	<i>Vigna unguiculata</i>	Zairai Sasage (ザイライササゲ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from Mr. Teru, one of Kikai Town officials: (Description: R4.7.21 from Mr. Tanabe) Identified as cowpea based on seed shape, etc.	9.66
KKA_29	288857	<i>Capsicum frutescens</i>	Shimatougarashi (シマトウガラシ)	24 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Sample displayed at a farm stand (harvest date unknown, old)	0.46
KKA_30	288858	<i>Pisum sativum</i>	Akaendo (アカエンドウ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from Mr. Teru, one of Kikai Town officials : harvested in April, 2017 (H29).	25.70
KKA_31	288859	<i>Vicia faba</i>	Zairai Soramame (ザイライソラマメ 極小)	23 Aug, 2022	Cultivar	Araki, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 荒木	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: "Tomamy" For Mr. Teru, this is a typical Kikaijima landrace. Produced in Araki district.	71.50
KKA_32	288860	<i>Vicia faba</i>	Zairai Soramame (ザイライソラマメ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: "Tomamy" For Ms. Taioka, the CEO of "Kikaijima Yui", this is a typical landrace.	91.22
KKA_33	288861	<i>Vicia faba</i>	Soramame (ソラマメ 大)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: It has recently been cultivated because of its rich and tasty flavor. It is considered to be an introduced species or hybrid rather than an isolated derivative of a landrace.	126.21
KKA_34	288862	<i>Vicia faba</i>	Soramame (ソラマメ ミドリ)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: This is also a recent trend. The green one has a sweeter taste than a landrace. It is also considered to be an introduced species or hybrid rather than an isolated derivative of a landrace.	82.16
KKA_35	288863	<i>Vicia faba</i>	Soramame (ソラマメ ミドリ 大)	23 Aug, 2022	Cultivar	Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from "Kikaijima Yui" LLC: This is also a recent trend. It is considered that a large widespread species has hybridized with above green one.	115.00
KKA_36	288864	<i>Vicia faba</i>	Zairai Soramame (ザイライソラマメ)	24 Aug, 2022	Cultivar	Hazato, Kikai-chou, Oshima District, Kagoshima 鹿児島県 大島郡 喜界町 羽里	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Sold at a farm stand. Produced in Hazato district. Usually sown in September on Kikai Island.	81.50
KKA_37	288865	<i>Mucuna pruriens</i>	Mukunamame (ムクナマメ)	23 Aug, 2022	Cultivar	不明	N.D.	N.D.	N.D.	N.D.	bulk	no	no	no	Transferred from Mr. Teru, one of Kikai Town officials : Transferred from another place for trial cultivation.	113.33



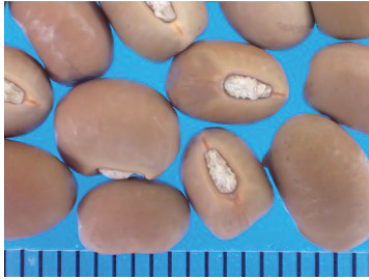
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Vigna marina



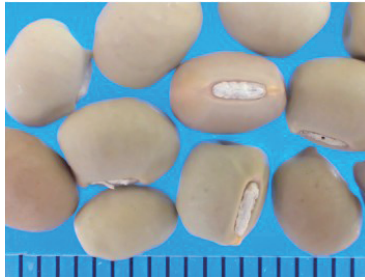
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JP288824 (KKA_02),
Vigna marina



Sample Photo 3.
JP288825 (KKA_02_2),
Vigna marina



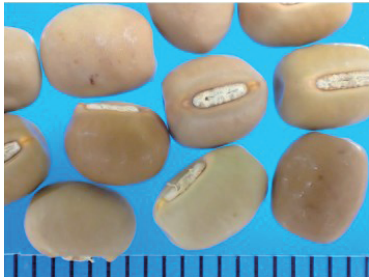
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JP288826 (KKA_03),
Vigna marina



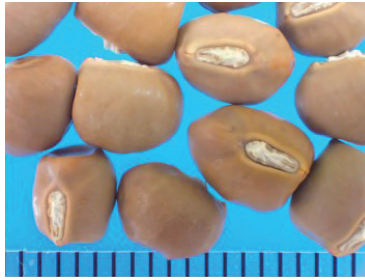
Sample Photo 5.
JP288827 (KKA_04),
Vigna marina



Sample Photo 6.
JP288828 (KKA_04_2),
Vigna marina



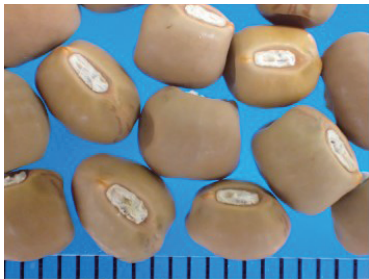
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JP288829 (KKA_05),
Vigna marina



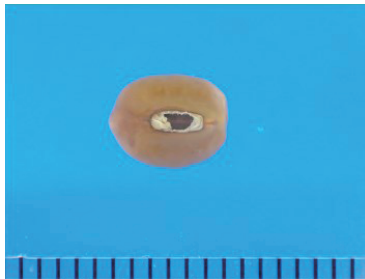
Sample Photo 8.
JP288830 (KKA_06),
Vigna marina



Sample Photo 9.
JP288831 (KKA_07),
Vigna marina



Sample Photo 10.
JP288832 (KKA_07_2),
Vigna marina



Sample Photo 11.
JP288833 (KKA_08),
Vigna marina



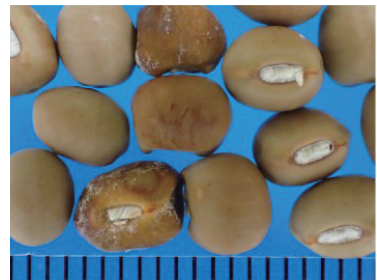
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JP288834 (KKA_08_2),
Vigna marina



Sample Photo 13.
JP288835 (KKA_09),
Vigna marina



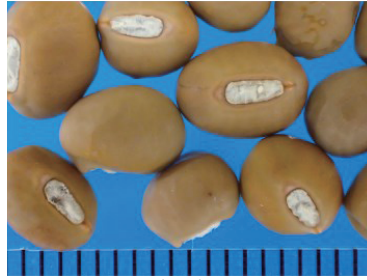
Sample Photo 14.
JP288836 (KKA_09_2),
Vigna marina



Sample Photo 15.
JP288837 (KKA_10),
Vigna marina



Sample Photo 16.
JP288838 (KKA_10_2),
Vigna marina



Sample Photo 17.
JP288839 (KKA_11),
Vigna marina



Sample Photo 18.
JP288840 (KKA_12),
Vigna marina



Sample Photo 19.
JP288841 (KKA_13),
Vigna marina



Sample Photo 20.
JP288842 (KKA_14),
Vigna marina



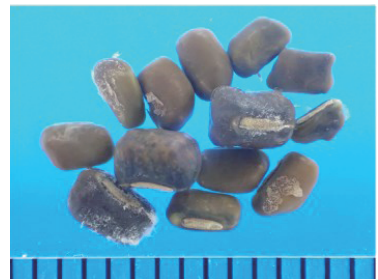
Sample Photo 21.
JP288843 (KKA_15),
Vigna reflexo-pilosa



Sample Photo 22.
JP288844 (KKA_16),
Vigna marina



Sample Photo 23.
JP288845 (KKA_17),
Vigna marina



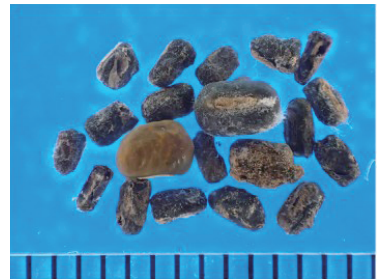
Sample Photo 24.
JP288846 (KKA_18),
Vigna reflexo-pilosa



Sample Photo 25.
JP288847 (KKA_19),
Vigna reflexo-pilosa



Sample Photo 26.
JP288848 (KKA_20),
Vigna reflexo-pilosa



Sample Photo 27.
JP288849 (KKA_21),
Vigna reflexo-pilosa



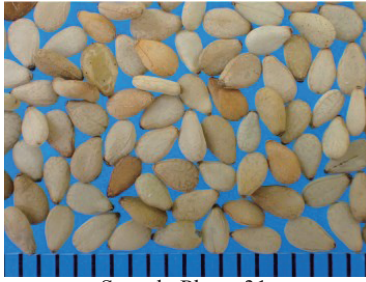
Sample Photo 28.
JP288850 (KKA_22),
Vigna luteola



Sample Photo 29.
JP288851 (KKA_23),
Vigna luteola



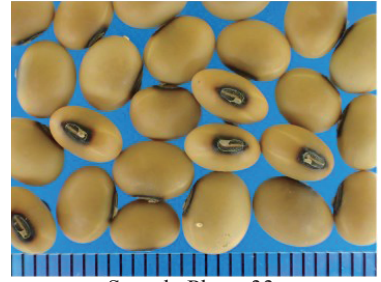
Sample Photo 30.
JP288852 (KKA_24),
Vigna luteola



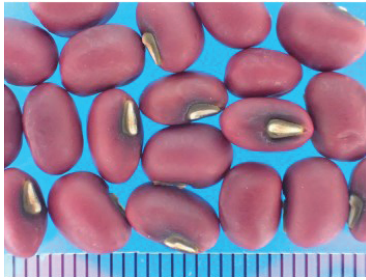
Sample Photo 31.
JP288853 (KKA_25),
Sesamum indicum



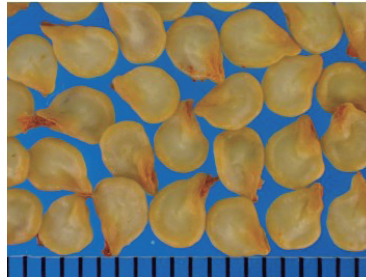
Sample Photo 32.
JP288854 (KKA_26),
Glycine max



Sample Photo 33.
JP288855 (KKA_27),
Glycine max



Sample Photo 34.
JP288856 (KKA_28),
Vigna unguiculata



Sample Photo 35.
JP288857 (KKA_29; seeds),
Capsicum frutescens



Sample Photo 36.
JP288857 (KKA_29; fruits),
Capsicum frutescens



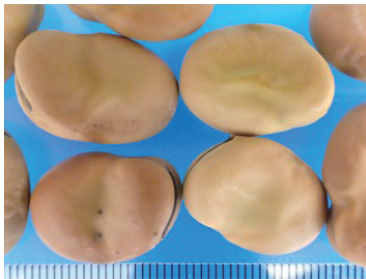
Sample Photo 37.
JP288858 (KKA_30),
Pisum sativum



Sample Photo 38.
JP288859 (KKA_31),
Vicia faba



Sample Photo 39.
JP288860 (KKA_32),
Vicia faba



Sample Photo 40.
JP288861 (KKA_33),
Vicia faba



Sample Photo 41.
JP288862 (KKA_34),
Vicia faba



Sample Photo 42.
JP288863 (KKA_35),
Vicia faba



Sample Photo 43.
JP288864 (KKA_36),
Vicia faba



Sample Photo 44.
JP288865 (KKA_37),
Mucuna pruriens