

Collection and Conservation of Wild Leguminous Crop Relatives from the Prefectures of Toyama, Ishikawa, Fukui, Gifu, Aichi, and Mie in Japan, 2015

Chiaki MUTO¹⁾, Kohtaro ISEKI²⁾, Ken NAITO¹⁾

1) Genetic Resources Center, National Agriculture and Food Research Organization, Kannondai 2-1-2, Tsukuba, Ibaraki 305-8602, Japan

2) Japan International Research Center for Agricultural Sciences, Ohwashi 1-1, Tsukuba, Ibaraki 305-8686, Japan

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Corresponding author: K. NAITO (Email: knaito@affrc.go.jp)

Summary

We surveyed the prefectures of Toyama, Ishikawa, Fukui, Gifu, Aichi, and Mie in Japan for wild relatives of leguminous crops from the 19th to 23th of October, 2015. From 43 collection sites, we collected 51 accessions, including comprising 30 *Vigna angularis* var. *nipponensis* accessions and 21 *Glycine soja* accessions. We found *V. angularis* var. *nipponensis* in the prefectures of Toyama, Ishikawa, Fukui, and Gifu but not Mie and Aichi; and *G. soja* was found in all six prefectures. We registered all the collected accessions in the NARO Genebank. We will multiply the seeds of the collected accessions and evaluate their growth traits in 2016 at our experimental field in the city of Tsukuba. The multiplied seeds will become available upon request for research, breeding and educational purposes.

KEYWORDS: wild legumes, *Vigna*, *Glycine*, genetic resources

Introduction

The NARO Genebank project has been conducting field surveys for the collection and conservation of *Vigna* and *Glycine* germplasm distributed throughout Japan (Vaughan *et al.*, 2010; Tomooka *et al.*, 2010; see also Annual Report on Exploration and Introduction of Plant Genetic Resources, https://www.gene.affrc.go.jp/publications.php#plant_report). The genera *Vigna* and *Glycine* belong to the legume family (Leguminosae) and include a variety of crops, including azuki bean (*Vigna angularis* (Willd.) Ohwi & H. Ohashi, Japanese name: azuki), and soybean (*Glycine max* (L.) Merr., Japanese name: daizu).

We have recently focused on collecting wild and naturally growing accessions of these species because such accessions are likely adapted to the environmental conditions of their corresponding habitats and, thus, may possess tolerance to corresponding biotic and abiotic stresses (McCouch *et al.*, 2013). Wild

azuki bean (*V. angularis* var. *nipponensis* (Ohwi) Ohwi & H. Ohashi) and wild soybean (*G. soja* Siebold & Zucc.) are regarded as the wild ancestors of azuki bean and soybean, respectively. In Japanese language, wild azuki bean is called as yabutsuruazuki, and wild soybean is called as tsurumame.

In the present survey, we explored central region of the main island of Japanese because only a few accessions had been previously collected from this region. We surveyed the prefectures of Toyama, Ishikawa, Fukui, Gifu, Mie, and Aichi from 19th to 23th October, 2015.

Methods

Table 1 shows the schedule of this field survey. On the first of the survey, we started in the city of Toyama, drove east to Nakashinkawa county, turned west, and drove through the city of Himi to the city of Nanao. On the second day, we drove around Noto Peninsula, from the city of Tamasu to Wajima City. On the third day, we started in Kanazawa City and drove down to the city of Echizen. On the fourth and fifth days, we surveyed the Nobi plain in the prefectures of Gifu, Mie, and Aichi (Fig. 1).

Prior to the field survey, we had selected survey sites using Google Earth. The selected sites were located on riverbanks, edges of canals, and borders between paddy fields and shrines or dwellings. For the collection sites, we recorded the corresponding addresses, altitudes, latitudes, longitudes; sketched the surrounding habitat; and noted other ecological information as passport data. The GPS data was measured using handheld GPS device (GPSMAP 62SC; Garmin), and when *V. angularis* var. *nipponensis* or *G. soja* population were located, we collected bulked seed samples.

Results and Discussion

We found either of *V. angularis* var. *nipponensis* or *G. soja* at 36 of the 43 survey site (Table 2, Fig. 1) and neither at seven sites, of which six and one were located in the prefectures of Gifu and Mie, respectively. We collected 30 accessions of *V. angularis* var. *nipponensis*, mostly from the prefectures of Toyama, Ishikawa, and Fukui, and 21 accessions of *G. soja*, which was found in all six of the surveyed prefectures (Table 3). The passport data are summarized in Table 4. Photos of the collection sites and collected seeds are shown in Photos 1-55 and Seed Photos 1-51, respectively. We found both *V. angularis* var. *nipponensis* and *G. soja* at six sites, (Toyama 2, Noto 5, Ishikawa 5, Fukui 3, Fukui 4, and Gifu 6), and the two species formed sympatric populations at Toyama 2, Ishikawa 5, and Gifu 6 but not at Noto 5, Fukui 3, and Fukui 4.

Table 1. Itinerary of the field exploration in Hokuriku and Tokai (Toyama, Ishikawa, Shiga, Gifu, Aichi, and Mie)

Date	Itinerary	Stay
2015/10/19	NARO (Ibaraki) → (railway) → Toyama (Toyama) → (Rent a Car) → Yao → Nakashinkawa → Himi → Nanao (Ishikawa)	Nanao (Ishikawa)
2015/10/20	Nanao (Ishikawa) → Noto Island → Housu → Suzu → Wajima (Ishikawa)	Kanazawa (Ishikawa)
2015/10/21	Kanazawa (Ishikawa) → Hakusan → Nomi → Komatsu → Kaga → Awara → Sakai (Fukui) → Fukui → Sabae → Echizen (Fukui)	Nagahama (Shiga)
2015/10/22	Oogaki (Gifu) → Ibi → Motosu → Gifu → Minokamo → Kamo → Mizuho → Hashima (Gifu)	Gifu (Gifu)
2015/10/23	Kaizu (Gifu) → Aisai (Aichi) → Kuwana (Mie) → Oobu (Aichi) → Chita → Nagoya → (railway) → NARO	-

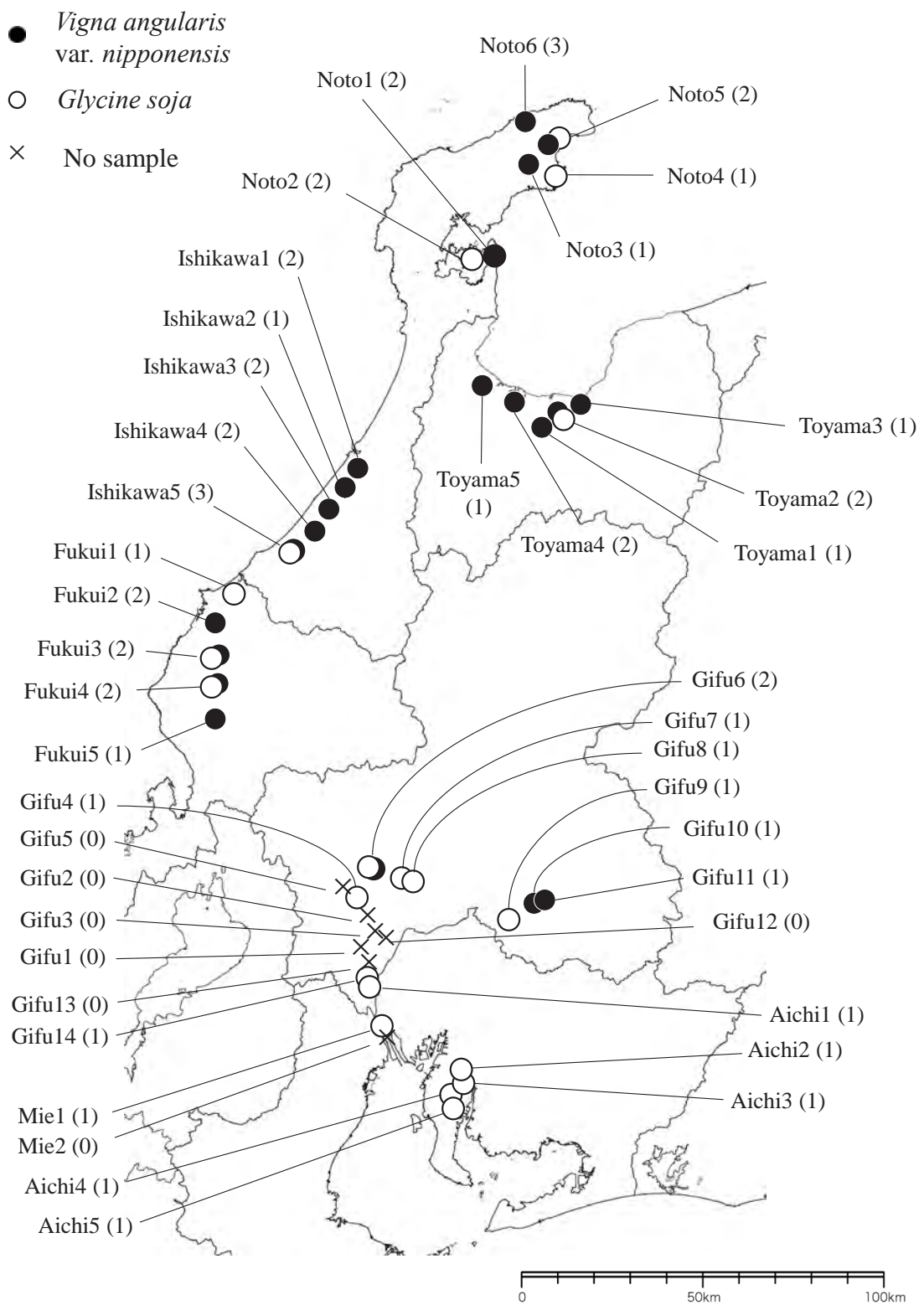


Fig.1. A map of collection sites. The numbers in parentheses indicate numbers of collected samples

The collected accessions will be evaluated for their growth traits and be multiplied in 2016 at our experimental field in Tsukuba City. The multiplied seeds will become available upon request for research, breeding, and educational purposes.

Table 2. A summary of collection sites

No. of sites	Toyama	Ishikawa	Fukui	Gifu	Aichi	Mie	Total
Collected	5	12	5	8	5	1	36
<i>Vigna angularis</i> var. <i>nipponensis</i> *	5	9	4	3	0	0	21
<i>Glycine soja</i> **	1	5	3	6	5	1	21
Not collected	0	0	0	6	0	1	7
Total	5	12	5	14	5	2	43

*** The number of sites were double counted if the two species found in same site

Table 3. A summary of collected samples in each prefecture

Species	Toyama	Ishikawa	Fukui	Gifu	Aichi	Mie	Total
<i>Vigna angularis</i> var. <i>nipponensis</i>	6	16	5	3	0	0	30
<i>Glycine soja</i>	1	5	3	6	5	1	21
Total	7	21	8	9	5	1	51

Vigna angularis var. *nipponensis*

We collected 30 accessions of *V. angularis* var. *nipponensis*. In Ishikawa 4, we found one population, but the seeds were immature and, thus, not collected. Of the 30 accessions, we suspected that 10 represented weedy forms (i.e., forms intermediate between domesticated and wild forms; Table 4). Of these 10 accessions, Noto 6-2, Ishikawa 1-2, Ishikawa 3-1, Ishikawa 4-2, Ishikawa 4-3, and Ishikawa 5-2 exhibited light brown seed coats, a phenotype that is typical of weedy forms (Seed photos 17, 20, 22, 24, 25, and 27; Tomooka *et al.*, 2011). We also suspected that Noto 3-1 (Seed photo 12), Noto 6-3 (Seed photo 18), and Ishikawa 3-2 (Seed photo 23) were weedy because they exhibited intermediate phenotypes in regards to seed size, branching, twining, and pod shattering. Accession Ishikawa 4-1 also exhibited weedy phenotypes; however, seeds were not collected. We also noted that the accession obtained from Gifu 11 lived at the bottom of a shallow stream (Photo 47), which was the wettest habitat encountered during this survey.

Since *V. angularis* var. *nipponensis* often lives along the edges of paddy fields, fallows, canals, and riverbanks, we surveyed such locations and easily identified populations in the prefectures of Toyama, Ishikawa, and Fukui. In these areas we found accessions at 18 of 22 survey sites. An example of a population found in a fallow was the population identified at Toyama 1, where we found a 10 m x 10 m population (Photos 1-3) that was growing in wet soil with grasses. In addition, the *V. angularis* var. *nipponensis* plants at this site were associated with *Persicaria longisetata* (Creeping smartweed, inutade) and *Youngia japonica* (Oriental false hawksbeard, onitabirako). Meanwhile, a typical canal-edge population was identified at Ishikawa 1, where we found a 3 m x 100 m population growing in a riverbank (Photos 20 and 21). In this survey site the plants of *V. angularis* var. *nipponensis* were associated with *Miscanthus sinensis* Andersson (Japanese silver grass, susuki) and *Equisetum arvense* L. (Field Horsetail, sugina). Fukui 3 was a typical riverbank habitat. At this survey site, we found a 10 m x 10 m population growing along the bank of Hino River (Photo 33 and 34), and the plants were associated with *Solidago canadensis* var. *scabra* L. (Canada goldenrod, seitaka awadachisou). Therefore, we concluded that *V. angularis* var. *nipponensis* thrived in these three prefectures (Toyama, Ishikawa, and Fukui).

In the prefectures of Gifu, Mie, and Aichi, however, it was difficult to locate populations, and we were only able to identify *V. angularis* var. *nipponensis* at three of the 14 survey sites, all of which were

located in Gifu prefecture.

Before this survey, we had conserved few *V. angularis* var. *nipponensis* accessions from the prefectures of Toyama, Ishikawa, Fukui, Gifu, Mie, or Aichi in NARO Genebank. The present survey allowed us to obtain accessions from Toyama, Ishikawa, Fukui, and Gifu, but not Mie or Aichi. Therefore, we should resurvey the prefectures of Mie and Aichi, probably in areas with higher altitude, such as mountain villages, which are also thought to serve as habitats for the species (Tomooka *et al.*, 2015).

Glycine soja

Compared to other regions in Japan, the central region of the main island of Japan is poorly represented in regards to *G. soja* in NARO Genebank. During the present survey, we collected and added accessions from six prefectures. The habitat of *G. soja* is similar to *V. angularis* var. *nipponensis*. However, *V. angularis* var. *nipponensis* was typically found beside streams or canals, whereas *G. soja* was also found in drier habitat, such as Noto 2-1 (Photo 12), which *G. soja* was found growing near an unpaved parking lot. The distribution of *G. soja* also seemed to differ among the prefectures, and the trend was opposite that observed for *V. angularis* var. *nipponensis*. For example, In Toyama prefecture, we only identified a single *G. soja* accession, and in the prefectures of Mie and Aichi, we identified *G. soja* at six of the seven survey site.

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富山県，石川県，福井県，岐阜県，愛知県，三重県に おけるマメ科植物遺伝資源の探索収集，2015年

武藤 千秋¹⁾・井関 洸太郎²⁾・内藤 健¹⁾

1) 農研機構・遺伝資源センター

2) 国際農林水産業研究センター

和文摘要

本報告は2015年10月19日から23日にかけて実施した富山・石川・福井・岐阜・愛知および三重の6県におけるマメ科作物近縁野生種の探索についての報告である。本調査において43箇所の収集地点を探索し、30系統のヤブツルアズキ (*V. angularis* var. *nipponensis*) と21系統のツルマメ (*G. soja*) を収集した。ツルマメは6県全てで収集できたのに対し、ヤブツルアズキの大部分は富山・石川・福井の3県で収集され、岐阜では3点のみ、三重・愛知での探索地点においては全く発見できなかった。これら収集系統は全て農研機構遺伝資源センター（つくば市）にて栽培し、特性評価および種子増殖を行う予定である。増殖した種子は配布可能な遺伝資源として農研機構ジーンバンクで保存する。

Table 4. A passport data of collected materials

	JP No.	Site No.	Coll. No.	Coll. Date (2015)	Species Name	Status	Collection Site	Latitude	Longitude	Altitude (m)	Land use	Habitat	Shading	Degree of disturbance	Population size (mxm)	Growth stage	Disease		Pest		Seed
																	leaf	pod/seeds	leaf	pod/seeds	
1	254555	Toyama 1	2015Toyama1-1	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Nishijintsuu, Yao, Toyama	N36-35-35.84	E137-10-47.36	49	fallow field	bushes/grassland	open	low	10x10	flowering/mature	mid	low	low	low	Bulk
2	254556	Toyama 2	2015Toyama2-1	19-Oct	<i>Glycine soja</i>	wild	Shimonoban, Toyama, Toyama	N36-38-12.88	E137-15-59.35	82	paddy canal bank	bushes	open	low	2x2	post maturity	-	-	-	-	Bulk
3	254557	Toyama 2	2015Toyama2-2	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Shimonoban, Toyama, Toyama	N36-38-12.88	E137-15-59.35	82	paddy canal bank	bushes	open	low	5x5	mature	no	no	heavy	heavy	Bulk
4	254558	Toyama 3	2015Toyama3-1	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Arashimizu, Kamiichimachi, Nakaniikawagun, Toyama	N36-42-21.0	E137-19-20.3	11	bank of fallow field	bushes	open	none	2x10, 2x10	mature	low	low	low	low	Bulk
5	254559	Toyama 4	2015Toyama4-1	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Nishifutamata, Toyama, Toyama	N36-42-55.0	E137-07-51.7	4	paddy canal bank	bushes	open	low	2x1<	post maturity	-	-	-	-	Bulk
6	254560	Toyama 4	2015Toyama4-2	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Nishifutamata, Toyama, Toyama	N36-42-55.0	E137-07-51.7	1	paddy canal bank	bushes	open	low	2x20	post maturity	-	-	-	-	Bulk
7	254561	Toyama 5	2015Toyama5-1	19-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Kamitako, Himi, Toyama	N36-48-35.1	E136-59-50.2	21	bank of fallow field	bushes	open	low	2x100	mature/past paturity	mid	-	mid	low	Bulk
8	254562	Noto 1	2015Noto1-1	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Koudamachi, Notojima, Ishikawa	N37-07-41.8	E136-59-53.1	11	fallow field	bushes	open	low	20x5	post maturity	-	-	-	heavy	Bulk
9	254563	Noto 1	2015Noto1-2	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Koudamachi, Notojima, Ishikawa	N37-07-41.8	E136-59-53.1	11	fallow field	bushes	open	low	1x1	-	-	-	-	-	Bulk
10	254564	Noto 2-1	2015Noto2-1-1	20-Oct	<i>Glycine soja</i>	wild	Neya-Fishing Park, Neyamachi, Notojima, Ishikawa	N37-08-00.4	E136-55-51.3	5	open space	bushes	open	-	3x20	mature	-	-	low	low	Bulk
11	254565	Noto 2-2	2015Noto2-2-1	20-Oct	<i>Glycine soja</i>	wild	Neya-Fishing Park, Neyamachi, Notojima, Ishikawa	N37-07-47.6	E136-55-40.1	3	marsh in fallow field	bushes	open	low	2x2	mature	mid	mid	no	no	Bulk
12	254566	Noto 3	2015Noto3-1	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Terabun, Notochou, Housu, Ishikawa	N37-20-47.9	E137-05-16.5	84	fallow field	bushes	open	low	10x20	-	low	low	low	low	Bulk
13	254567	Noto 4	2015Noto4-1	20-Oct	<i>Glycine soja</i>	wild	Shinbo, Notochou, Housu, Ishikawa	N37-18-44.5	E137-14-43.18	11	paddy chanal bank	bushes	open	low	1x2	mature	low	no	no	no	Bulk
14	254568	Noto 5	2015Noto5-1	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Ushima, Houryuumachi, Suzu, Ishikawa	N37-23-55.2	E137-14-13.4	6	paddy canal bank	bushes	open	low	2x2	-	low	low	low	low	Bulk
15	254569	Noto 5	2015Noto5-2	20-Oct	<i>Glycine soja</i>	wild	Ushima, Houryuumachi, Suzu, Ishikawa	N37-23-58.0	E137-14-15.8	5	fallow field	bushes	open	low	15x15	mature	low	low	mid	low	Bulk
16	254570	Noto 6	2015Noto6-1	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Ookawa, Machinomachi, Wajima, Ishikawa	N37-26-32.3	E137-04-27.5	0	paddy canal bank	bushes	open	low	1x1	post maturity	-	-	-	low	Bulk
17	254571	Noto 6	2015Noto6-2	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Ookawa, Machinomachi, Wajima, Ishikawa	N37-26-27.5	E137-04-28.5	0	paddy canal bank	bushes	open	low	1x20	mature	low	low	mid	low	Bulk
18	254572	Noto 6	2015Noto6-3	20-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Ookawa, Machinomachi, Wajima, Ishikawa	N37-26-32.3	E137-04-27.5	0	paddy canal bank	bushes	open	low	-	mature	-	-	-	-	Bulk
19	254573	Ishikawa 1	2015Ishikawa1-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Sakimorimachi, Kanazawa, Ishikawa	N36-35-20.8	E136-35-28.7	17	paddy canal bank	bushes	open	low	3x100	mature	low	low	heavy	mid	Bulk
20	254574	Ishikawa 1	2015Ishikawa1-2	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Sakimorimachi, Kanazawa, Ishikawa	N36-35-20.8	E136-35-28.7	17	paddy canal bank	bushes	open	low	-	-	-	-	-	heavy	Bulk

Table 4 (Continued).

	JP No.	Site No.	Coll. No.	Coll. Date (2015)	Species Name	Status	Collection Site	Latitude	Longitude	Altitude (m)	Land use	Habitat	Shading	Degree of disturbance	Population size (mxm)	Growth stage	Disease		Pest		Seed
																	leaf	pod/seeds	leaf	pod/seeds	
21	254575	Ishikawa 2	2015Ishikawa2-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Sougomachi, Hakusan, Ishikawa	N36-32-27.9	E136-32-55.8	11	paddy canal bank	grassland	open	high	1x1	mature	low	low	low	low	Bulk
22	254576	Ishikawa 3	2015Ishikawa3-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Asahiten, Kawakitamachi, Nomigun, Ishikawa	N36-27-47.9	E136-29-15.3	9	paddy canal bank	bushes	open	low	2x500	flowering/mature	low	-	low	low	Bulk
23	254577	Ishikawa 3	2015Ishikawa 3-2	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Asahiten, Kawakitamachi, Nomigun, Ishikawa	N36-27-50.2	E136-29-13.9	9	paddy canal bank	bushes	open	low	-	mature	low	low	heavy	heavy	Bulk
24	-	Ishikawa 4	2015Ishikawa4-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Kibagata, Sandanimachi, Komatsu, Ishikawa	N36-22-15.8	E136-27-04.7	5	paddy canal bank	bushes/grassland	open	low	2x5	flowering	mid	no	no	no	Not collected
25	254578	Ishikawa 4	2015Ishikawa4-2	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Kibagata, Sandanimachi, Komatsu, Ishikawa	N36-22-09.1	E136-27-01.1	5	paddy canal bank	grassland	open	-	2x20	flowering/mature	-	-	-	-	Bulk
26	254579	Ishikawa 4	2015Ishikawa4-3	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Kibagata, Sandanimachi, Komatsu, Ishikawa	N36-22-04.8	E136-27-12.2	5	paddy canal bank	bushes	open	low	1x1	mature	-	-	-	-	Bulk
27	254580	Ishikawa 5	2015Ishikawa5-1	21-Oct	<i>Glycine soja</i>	wild	Ashikiribashi, Nakajimamachi, Kaga, Ishikawa	N36-20-35.2	E136-23-14.5	10	paddy channal bank	bushes	open	low	10x10	mature/post maturity	-	low	-	low	Bulk
28	254581	Ishikawa 5	2015Ishikawa5-2	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	Ashikiribashi, Nakajimamachi, Kaga, Ishikawa	N36-20-35.2	E136-23-14.5	10	paddy canal bank	bushes	open	low	3x3	post maturity	-	-	mid	mid	Bulk
29	254582	Ishikawa 5	2015Ishikawa5-3	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Ashikiribashi, Nakajimamachi, Kaga, Ishikawa	N36-20-30.2	E136-23-15.2	5	paddy canal bank	bushes	open	low	2x2	post maturity	-	-	-	mid	Bulk
30	254583	Fukui 1	2015Fukui 1-1	21-Oct	<i>Glycine soja</i>	wild	Hosorogi, Awara, Fukui	N36-15-45.3	E136-14-32.0	6	fallow field	bushes	open	low	5x5	past maturity	-	no	-	no	Bulk
31	254584	Fukui 2	2015Fukui2-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Umori-shrine, Kawasaki, Mikunichou, Sakai, Fukui	N36-11-37.4	E136-09-26.7	6	paddy bank	bushes	open	low	5x10	mature	low	low	low	mid	Bulk
32	254585	Fukui 2	2015Fukui2-2	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Umori-shrine, Kawasaki, Mikunichou, Sakai, Fukui	N36-11-37.4	E136-09-26.7	6	grounds of a shrine	bushes	light	none	3x10	mature	mid	low	mid	mid	Bulk
33	254586	Fukui 3	2015Fukui3-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	hakusan-shrine, Nishishimonochou, Fukui, Fukui	N36-04-00.9	E136-09-57.0	17	river bank	bushes	open	low	10x10	flowering/mature/post maturity	mid	-	low	heavy	Bulk
34	254587	Fukui 3	2015Fukui3-2	21-Oct	<i>Glycine soja</i>	wild	hakusan-shrine, Nishishimonochou, Fukui, Fukui	N36-04-02.5	E136-09-58.5	5	bush beside paddy	bushes	open	low	10x100	mature	low	no	mid	low	Bulk
35	254588	Fukui 4	2015Fukui4-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Sugimotochou, Sabae, Fukui	N35-58-47.6	E136-09-53.2	15	river bank	bushes	open	low	10x100	mature	low	low	mid	low	Bulk
36	254589	Fukui 4	2015Fukui4-2	21-Oct	<i>Glycine soja</i>	wild	Sugimotochou, Sabae, Fukui	N35-58-46.3	E136-09-52.1	12	river bank	bushes	open	low	5x5	past maturity	low	low	low	low	Bulk
37	254590	Fukui 5	2015Fukui5-1	21-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	Tsukino-oohashi, Hirosechou, Echizen, Fukui	N35-52-56.4	E136-10-08.9	46	paddy canal bank	bushes	open	low	5x100	mature/post maturity	low	-	low	mid	Bulk
38	-	Gifu 1	-	22-Oct	-	-	Imafukuchou, Oogaki, Gifu	N35-18-43.8	E136-37-47.5	14	-	-	-	-	-	-	-	-	-	-	Not collected

Table 4 (Continued).

	JP No.	Site No.	Coll. No.	Coll. Date (2015)	Species Name	Status	Collection Site	Latitude	Longitude	Altitude (m)	Land use	Habitat	Shading	Degree of disturbance	Population size (mxm)	Growth stage	Disease		Pest		Seed
																	leaf	pod/seeds	leaf	pod/seeds	
39	-	Gifu 2	-	22-Oct	<i>Amphicarpaea edgeworthii</i> var. <i>japonica</i>	wild	Shimozagura, Oonochou, Ibi, Gifu	N35-25-06.1	E136-37-52.1	20	grounds of a shrine	bushes	heavy/medium	low	5x50	flowering/mature	heavy	heavy	mid	heavy	Not collected
40	-	Gifu 3	-	22-Oct	-	-	Shimozagura, Oonochou, Ibi, Gifu	N35-24-36.4	E136-38-07.4	23	river bank	-	open	-	-	-	-	-	-	-	Not collected
41	254591	Gifu 4	2015Gifu4-1	22-Oct	<i>Glycine soja</i>	wild	Honjou, Oonochou, Ibi, Gifu	N35-25-36.5	E136-37-25.7	20	beside canal	bushes	open	mid	1x5	mature	low	low	low	low	Bulk
42	-	Gifu 5	-	22-Oct	-	-	Miwa, Ibigawachou, Ibi, Gifu	N35-29-02.3	E136-33-56.9	53	-	-	-	-	-	-	-	-	-	-	Not collected
43	254592	Gifu 6	2015Gifu6-1	22-Oct	<i>Glycine soja</i>	wild	986, Koumi, Motosu, Gifu	N35-32-13.2	E136-38-33.0	83	bush beside fallow field	grassland	open	low	2x2	past maturity	-	-	-	-	Bulk
44	254593	Gifu 6	2015Gifu6-2	22-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	986, Koumi, Motosu, Gifu	N35-32-13.2	E136-38-33.0	83	beside fallow field	grassland	open	low	1x1	flowering/mature	mid	low	mid	mid	Bulk
45	254594	Gifu 7	2015Gifu7-1	22-Oct	<i>Glycine soja</i>	wild	1-61, Murayama, Gifu, Gifu	N35-29-02.4	E136-43-16.4	16	bush beside fallow field	bushes	open	mid	1x3	post maturity	-	no	-	no	Bulk
46	254595	Gifu 8	2015Gifu8-1	22-Oct	<i>Glycine soja</i>	wild	Mitahora, Gifu, Gifu	N35-28-47.9	E136-47-06.0	36	bush beside fallow field	bushes	open	none	10x30	mature	mid	mid	mid	low	Bulk
47	254596	Gifu 9	2015Gifu9-1	22-Oct	<i>Glycine soja</i>	wild	Makino, Minokamo, Gifu	N35-27-06.5	E137-04-16.1	99	paddy dike	bushes	open	high	2x4	mature	low	low	low	low	Bulk
48	254597	Gifu 10	2015Gifu10-1	22-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	2280, Wachi, Yaotsuchou, Kamogun, Gifu	N35-28-24.6	E137-06-03.9	121	paddy canal bank	bushes	open	high	1x1	flowering/mature	low	low	low	low	Bulk
49	254598	Gifu 11	2015Gifu11-1	22-Oct	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	2094-1, Wachi, Yaotsuchou, Kamogun, Gifu	N35-28-34.3	E137-06-16.9	121	river bed	bushes	open	none	2x5	mature	mid	low	low	low	Bulk
50	-	Gifu 12	-	23-Oct	-	-	Sobue, Mizuho, Gifu	N35-22-20.1	E136-41-02.6	-	-	-	-	-	-	-	-	-	-	-	Not collected
51	-	Gifu 13	-	23-Oct	-	-	Umaminami, Kuwabarachou, Hashima, Gifu	N35-15-29.2	E136-40-46.1	1	farm road	-	-	-	-	-	-	-	-	-	Not collected
52	254599	Gifu 14	2015Gifu14-1	23-Oct	<i>Glycine soja</i>	wild	Morishita, Kaizuchou, Kaizu, Gifu	N35-10-56.2	E136-39-47.6	2	bush beside soybean field	bushes	open	low	2x20	mature/post maturity	mid	low	low	low	Bulk
53	254600	Aichi 1	2015Aichi1-1	23-Oct	<i>Glycine soja</i>	wild	47, Fukuhara, Tatsudachou, Aisai, Aichi	N35-08-19.3	E136-40-28.0	7	beside canal	bushes	open	low	1x50	post maturity	no	no	no	no	Bulk
54	254601	Mie 1	2015Mie1-1	23-Oct	<i>Glycine soja</i>	wild	614, Nishikawa, Nagashimachou, Kuwana, Mie	N35-07-00.2	E136-41-08.0	3	open space beside paddy	bushes	open	low	10x100	post maturity	low	low	low	low	Bulk
55	-	Mie 2	-	23-Oct	-	-	Oshitsuke, Nagashimachou, Kuwana, Mie	N35-05-45.3	E136-42-12.2	9	paddy	-	-	-	-	-	-	-	-	-	Not collected
56	254602	Aichi 2	2015Aichi2-1	23-Oct	<i>Glycine soja</i>	wild	Kounosu, Kyowamachi, Obu, Aichi	N35-02-26.1	E136-56-21.4	38	road bank	bushes	open	low	3x50	mature/post maturity	low	low	low	low	Bulk
57	254603	Aichi 3	2015Aichi3-1	23-Oct	<i>Glycine soja</i>	wild	Nagakusamachi, Oobu, Aichi	N35-00-57.0	E136-56-32.0	21	road bank	bushes	open	low	10x10	mature	-	-	-	-	Bulk
58	254604	Aichi 4	2015Aichi4-1	23-Oct	<i>Glycine soja</i>	wild	1, Santanda, Chita, Aichi	N34-58-50.4	E136-53-23.4	14	beside canal	bushes	open	low	2x500	mature	low	low	low	low	Bulk
59	254605	Aichi 5	2015Aichi5-1	23-Oct	<i>Glycine soja</i>	wild	41, Hosoike, Kusagi, Aguichou, Chita, Aichi	N34-57-08.5	E136-54-02.4	31	beside canal	bushes	open	low	3x20	mature	-	-	-	-	Bulk



Photo 1. Toyama1
Habitat of *V. angularis* var. *nipponensis*



Photo 2. Toyama1
Population of *V. angularis* var. *nipponensis*



Photo 3. Toyama1
V. angularis var. *nipponensis* at maturing stage.

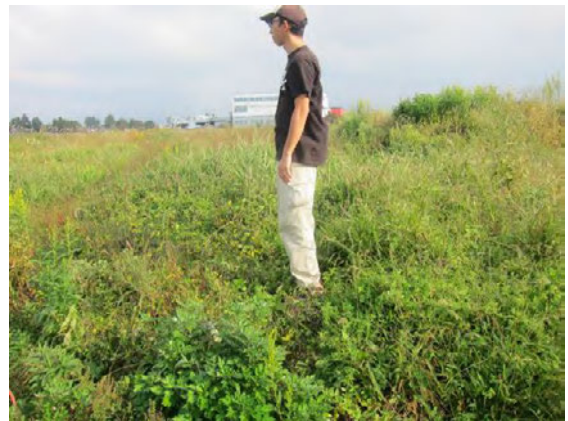


Photo 4. Toyama2
Habitat of *V. angularis* var. *nipponensis*.



Photo 5. Toyama2-1
V. angularis var. *nipponensis* at maturing stage.



Photo 6. Toyama2-2
G. soja at past maturity stage.



Photo 7. Toyama3
Habitat of *V. angularis* var. *nipponensis*



Photo 8. Toyama4
Habitat of *V. angularis* var. *nipponensis*



Photo 9. Toyama5
Habitat of *V. angularis* var. *nipponensis*.



Photo 10. Noto1
Habitat of *V. angularis* var. *nipponensis*.



Photo 11. Noto1
Population of *V. angularis* var. *nipponensis*.



Photo 12. Noto2-1
Habitat of *G. soja*.



Photo 13. Noto2-2
Habitat of *G. soja*.



Photo 14. Noto3
Habitat of *V. angularis* var. *nipponensis*.



Photo 15. Noto4
Habitat of *G. soja*.



Photo 16. Noto5-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 17. Noto5-2
Habitat of *G. soja*.



Photo 18. Noto5
A neighboring field of *V. angularis* var. *angularis*.



Photo 19. Noto6
Habitat of *V. angularis* var. *nipponensis*.



Photo 20. Ishikawa1-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 21. Ishikawa1-2
Habitat of *V. angularis* var. *nipponensis*.



Photo 22. Ishikawa2
Habitat of *V. angularis* var. *nipponensis*.



Photo 23. Ishikawa3-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 24. Ishikawa3-2
Habitat of *V. angularis* var. *nipponensis*.



Photo 25. Ishikawa4-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 26. Ishikawa4-2
Habitat of *V. angularis* var. *nipponensis*.



Photo 27. Ishikawa4-3
Habitat of *V. angularis* var. *nipponensis*.



Photo 28. Ishikawa5-1
Habitat of *V. angularis* var. *nipponensis* and *G. soja*.



Photo 29. Ishikawa5-3
Habitat of *V. angularis* var. *nipponensis*.



Photo 30. Fukui1
Habitat of *G. soja*.



Photo 31. Fukui2-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 32. Fukui2-2
Habitat of *V. angularis* var. *nipponensis*.



Photo 33. Fukui3-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 34. Fukui3-2
Habitat of *G. soja*.



Photo 35. Fukui4-1
Habitat of *V. angularis* var. *nipponensis*.



Photo 36. Fukui4-2
Habitat of *G. soja*.



Photo 37. Fukui5
Habitat of *V. angularis* var. *nipponensis*.



Photo 38. Gifu2
Population of *Amphicarpaea edgeworthii* var *japonica*



Photo 39. Gifu2
Flowering and maturing stage of *Amphicarpaea edgeworthii* var *japonica*.



Photo 40. Gifu4
Habitat of *G. soja*.



Photo 41. Gifu6-1
Habitat of *G. soja*.



Photo 42. Gifu6-2
Habitat of *V. angularis* var. *nipponensis*.

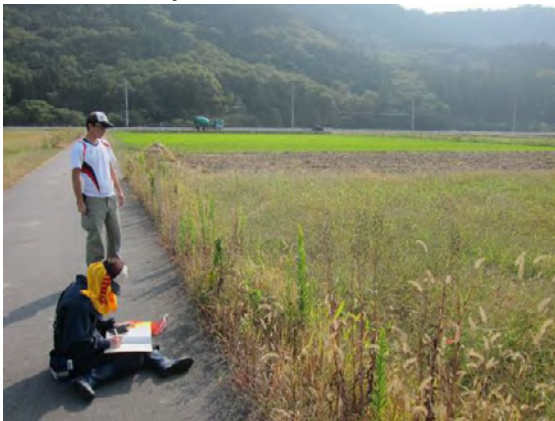


Photo 43. Gifu7
Habitat of *G. soja*.



Photo 44. Gifu8
Habitat of *G. soja*.



Photo 45. Gifu9
Habitat of *G. soja*.



Photo 46. Gifu10
Habitat of *V. angularis* var. *nipponensis*.



Photo 47. Gifu11
Habitat of *V. angularis* var. *nipponensis*.



Photo 48. Gifu14
Habitat of *G. soja*.



Photo 49. Aichi1
Habitat of *G. soja*.



Photo 50. Aichi2
Habitat of *G. soja*.



Photo 51. Aichi3
Habitat of *G. soja*.



Photo 52. Aichi4
Habitat of *G. soja*.



Photo 53. Aichi5
Habitat of *G. soja*.



Photo 54. Mie1
Habitat of *G. soja*.



Photo 55. Mie1
Habitat of *G. soja*.



Seed Photo 1. Toyama1-1 (JP254555)
V. angularis var. *nipponensis*



Seed Photo 2. Toyama2-1 (JP254556)
G. soja



Seed Photo 3. Toyama2-2 (JP254557)
V. angularis var. *nipponensis*



Seed Photo 4. Toyama3-1 (JP254558)
V. angularis var. *nipponensis*



Seed Photo 5. Toyama4-1 (JP254559)
V. angularis var. *nipponensis*



Seed Photo 6. Toyama4-2 (JP254560)
V. angularis var. *nipponensis*



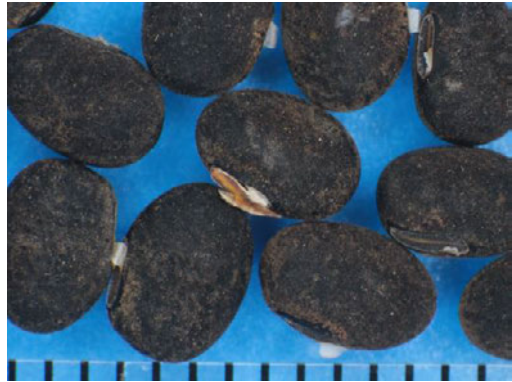
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V. angularis var. *nipponensis*



Seed Photo 8. Noto1-1 (JP254562)
V. angularis var. *nipponensis*



Seed Photo 9. Noto1-2 (JP254563)
V. angularis var. *nipponensis*



Seed Photo 10. Noto2-1-1 (JP254564)
G. soja



Seed Photo 11. Noto2-2-1 (JP254565)
G. soja



Seed Photo 12. Noto3-1 (JP254566)
V. angularis var. *nipponensis* (weedy)



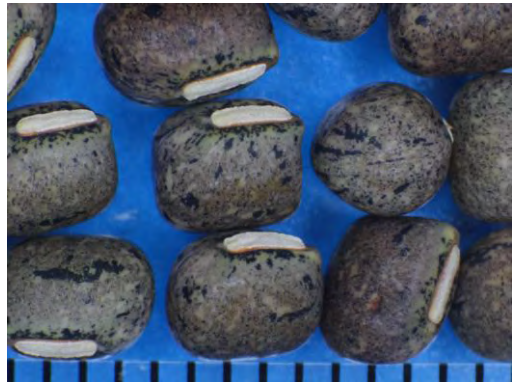
Seed Photo 13. Noto4-1 (JP254567)
G. soja



Seed Photo 14. Noto5-1 (JP254568)
V. angularis var. *nipponensis*



Seed Photo 15. Noto5-2 (JP254569)
G. soja



Seed Photo 16. Noto6-1 (JP254570)
V. angularis var. *nipponensis*



Seed Photo 17. Noto6-2 (JP254571)
V. angularis var. *nipponensis* (weedy)



Seed Photo 18. Noto6-3 (JP254572)
V. angularis var. *nipponensis* (weedy)



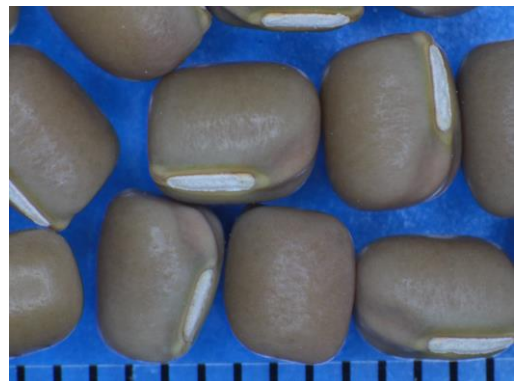
Seed Photo 19. Ishikawa1-1 (JP254573)
V. angularis var. *nipponensis*



Seed Photo 20. Ishikawa1-2 (JP254574)
V. angularis var. *nipponensis* (weedy)



Seed Photo 21. Ishikawa2-1 (JP254575)
V. angularis var. *nipponensis*



Seed Photo 22. Ishikawa3-1 (JP254576)
V. angularis var. *nipponensis* (weedy)



Seed Photo 23. Ishikawa3-2 (JP254577)
V. angularis var. *nipponensis* (weedy)



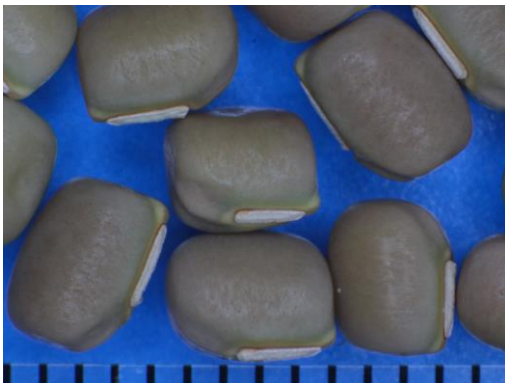
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V. angularis var. *nipponensis* (weedy)



Seed Photo 25. Ishikawa4-3 (JP254579)
V. angularis var. *nipponensis* (weedy)



Seed Photo 26. Ishikawa5-1(JP254580)
G. soja



Seed Photo 27. Ishikawa5-2 (JP254581)
V. angularis var. *nipponensis* (weedy)



Seed Photo 28. Ishikawa5-3 (JP254582)
V. angularis var. *nipponensis*



Seed Photo 29. Fukui1-1 (JP254583)
G. soja



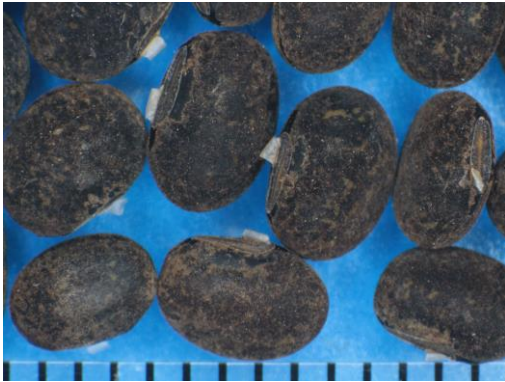
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V. angularis var. *nipponensis*



Seed Photo 31. Fukui2-2 (JP254585)
V. angularis var. *nipponensis*



Seed Photo 32. Fukui3-1 (JP254586)
V. angularis var. *nipponensis*



Seed Photo 33. Fukui3-2 (JP254587)
G. soja



Seed Photo 34. Fukui4-1 (JP254588)
V. angularis var. nipponensis



Seed Photo 35. Fukui4-2 (JP254589)
G. soja



Seed Photo 36. Fukui5-1 (JP254590)
V. angularis var. nipponensis



Seed Photo 37. Gifu4-1 (JP254591)
G. soja



Seed Photo 38. Gifu6-1 (JP254592)
G. soja



Seed Photo 39. Gifu6-2 (JP254593)
V. angularis var. nipponensis



Seed Photo 40. Gifu7-1 (JP254594)
G. soja



Seed Photo 41. Gifu8-1 (JP254595)
G. soja



Seed Photo 42. Gifu9-1 (JP254596)
G. soja



Seed Photo 43. Gifu10-1 (JP254597)
V. angularis var. *nipponensis*



Seed Photo 44. Gifu11-1 (JP254598)
V. angularis var. *nipponensis*



Seed Photo 45. Gifu14-1 (JP254599)
G. soja



Seed Photo 46. Aichi1-1 (JP254600)
G. soja



Seed Photo 47. Mie1-1 (JP254601)
G. soja



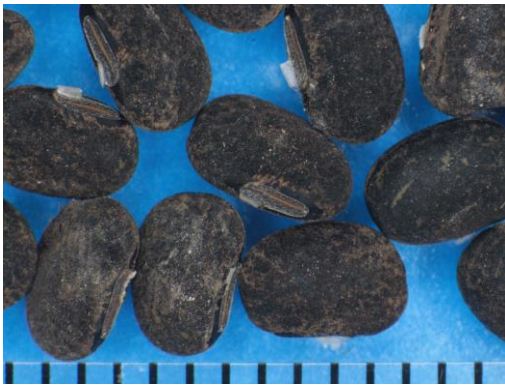
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G. soja



Seed Photo 49. Aichi3-1 (JP254603)
G. soja



Seed Photo 50. Aichi4-1 (JP254604)
G. soja



Seed Photo 51. Aichi5-1 (JP254605)
G. soja