

原著論文

## 新潟県佐渡島におけるマメ科植物遺伝資源の 探索収集, 2010年

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## Collection and conservation of wild leguminous crop relatives on Sado island, Niigata, Japan, 2010

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### Summary

A field survey was conducted on Sado island, Niigata prefecture, Japan, from 12<sup>th</sup> to 16<sup>th</sup> October, 2010. As a result, 22 accessions of leguminous plants consist of 9 accessions of *Glycine soja* and 13 of *Vigna angularis* (1 cultivated, 10 weedy, 2 wild) were recorded and seed samples were collected. All the seed materials collected were deposited at NIAS genebank, Japan.

Key Words : Sado island, Niigata prefecture, wild legumes, *Glycine*, *Vigna*

### Introduction

In order to conserve genetic diversity of wild relatives of leguminous crops, the genebank of National Institute of Agrobiological Sciences, Japan has been conducting domestic exploration. This is the first report of a field survey on wild relatives of leguminous crops on Sado island, Niigata prefecture, Japan (Fig. 1).

### Methods

We surveyed Sado island by car from 12<sup>th</sup> to 16<sup>th</sup> October, 2010 (Table 1, Fig. 1). Seeds, herbarium specimens and root nodules (if available) were collected (Table 2). Information on

collection sites including village name, altitude, latitude, longitude, habitat sketch map and other ecological data were recorded on passport data sheets as summarized in Table 3.

## Results and Discussion

A total of 22 accessions of leguminous plants consist of 9 accessions of *Glycine soja* and 13 of *Vigna angularis* were recorded and seed samples were collected (Table 2 & 3). Collected seed samples are conserved at NIAS genebank, Tsukuba, Japan and will be multiplied and evaluated in 2011.

### *Glycine soja* (Wild soybean, Tsuru-mame in Japanese)

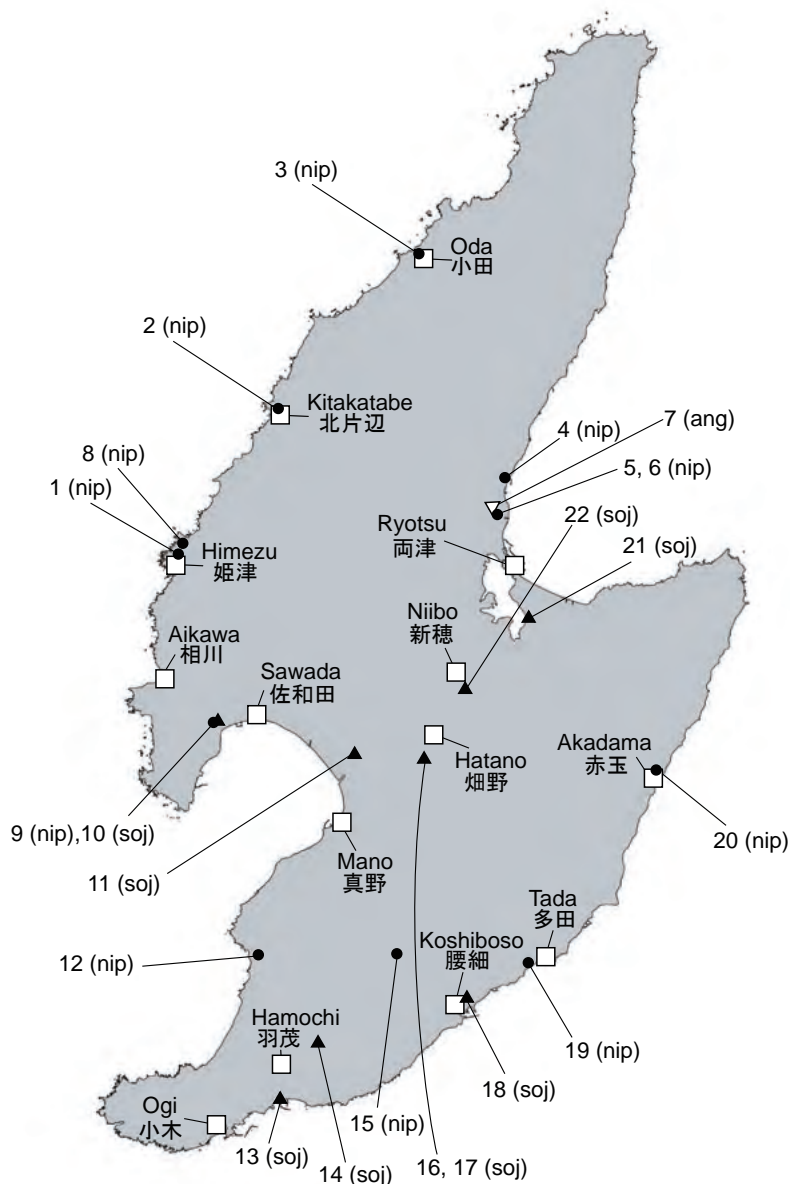


Fig. 1. A map of Sado island, Niigata, Japan. Main cities or locations are indicated by a rectangle (□) and their names are indicated.

Collection sites are indicated by black circle (●) for *Vigna angularis* var. *nipponensis*, (▽) for *V. angularis* var. *angularis*, and (▲) for *Glycine soja*. For each collection site, collection number of each accession is listed with species name abbreviations in a parenthesis.

Species abbreviations: ang : *Vigna angularis* var. *angularis*, nip : *V. angularis* var. *nipponensis*, soj : *Glycine soja*.

Table 1. Itinerary of the field survey on Sado island. 日程表（佐渡島）.

Date	Itinerary	Stay
2010/10/12	Tsukuba -- (Tsukuba Express train) -- Tokyo -- (Shinkansen express train) -- Niigata -- (High speed boat) - Ryotsu (Sado island) -- (car) -- Himezu	Himezu
2010/10/13	Himezu -- Kitakatabe -- Oda -- Ryotsu -- Himezu	Himezu
2010/10/14	Himezu -- Aikawa -- Sawada -- Mano -- Ogi -- Hamochi -- Hatano -- Ryotsu	Ryotsu
2010/10/15	Ryotsu -- Koshiboso -- Tada -- Akadama -- Niibo -- Ryotsu	Ryotsu
2010/10/16	Ryotsu -- (High speed boat) -- Niigata -- (Shinkansen express train) -- Tokyo -- (Tsukuba Express train) -- Tsukuba	

Table 2. A summary of collected samples  
佐渡における収集品の内訳

Species	Cultivated	Weedy	Wild	Total
<i>Glycine soja</i>			9	9
<i>Vigna angularis</i>	1	10	2	13
Total	1	10	11	22

The NIAS genebank has been conducting comprehensive collecting survey of wild soybean throughout Japan, and genetic structure of wild soybean has been clarified (Kuroda et al, 2006, 2008, 2009, 2010). However, this is the first survey by NIAS genebank for collecting wild soybean on Sado island. The previous exploration reports are available from the NIAS genebank web page. Most of the reports were written in Japanese with English summary.

<http://www.gene.affrc.go.jp/publications.php?section=plant>. (List of Annual Report on exploration)

[http://www.gene.affrc.go.jp/pdf/publications/plant-exp\\_200911\\_p27.pdf](http://www.gene.affrc.go.jp/pdf/publications/plant-exp_200911_p27.pdf) (a report of domestic exploration as an example)

*G. soja* could not be found in the northern part of Sado island. All the 9 populations were found in central and southern part (Fig. 1). Habitat of *G. soja* seems to be limited to open disturbed grassland and in a dry river bed sites (Photos 6, 7, 8). Seeds of three *G. soja* accessions (Sado-14, 16 and 18) are shown (Photos 14, 15 and 16, respectively).

#### *Vigna angularis* (Wild, weedy and cultivated azuki bean)

Weedy populations of *Vigna angularis* were found near paddy field or in an abandoned farmer's field in Sado island (Photos 1, 2). Among 13 *V. angularis* populations found, 10 populations were classified as weedy azuki bean (Table 2). Five weedy azuki bean accessions have tan seed coat color (Sado-01, 02, 04, 08, 09, Photos 9 and 11). Sado-03 accession is growing naturally but has large red seeds, and therefore it is considered as an escaped

population from cultivation. Sado-05 and 06 have small black seeds (Photo 10). However, stem color is green which is an indicator of outcrossing with cultivated azuki bean in the past. Sado-19 and Sado-20 have apparently larger seeds compared with typical wild azuki bean.

A wild azuki bean population (Sado-12) was found at dry river bed near Nishimikawa Gold Park (Photos 3 and 4). The site seems to be flooded frequently after heavy rain. Seeds are small and black (Photo 12). Stem color was purple. Another wild azuki bean population (Sado-15, Photo 5) was found between Kamikawamo and Toyama, near Hakusan shrine. The plants were climbing on a fence beside road near abandoned paddy field.

An accession of cultivated azuki bean (Sado-07, Photo 13) was also collected.

## Reference

- Kuroda Y, Kaga A, Tomooka N and Vaughan D.A. 2006. Population genetic structure of Japanese wild soybean (*Glycine soja*) based on microsatellite variation. *Molecular Ecology* 15: 959-974
- Kuroda Y, Kaga A, Tomooka N and Vaughan D.A. 2008. Gene flow and genetic structure of wild soybean (*Glycine soja*) in Japan. *Crop Science* 48: 1071-1079.
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- Kuroda Y, Kaga A, Tomooka N and Vaughan D.A. 2010. The origin and fate of morphological intermediates between wild and cultivated soybeans in their natural habitats in Japan. *Molecular Ecology* 19: 2346-2360.

## 和文摘要

本報告は、新潟県佐渡島におけるマメ科植物遺伝資源の調査報告である。調査は、2010年10月12日～10月16日にかけて行った。調査の結果、野生ダイズであるツルマメ (*Glycine soja*) 9点、栽培アズキ1点、自生する野生アズキ2点、雑草アズキ10点、合計22点の遺伝資源を収集保存した。これらの遺伝資源は、2011年度につくば市の農業生物資源研究所において栽培し、特性評価、種子増殖を行い配布可能なアクティブコレクションとして生物研ジーンバンクにおいて保存する予定である。

Table 3. A passport data of collected materials 収集品のパスポートデータ

Col. No.	JP No.	Species name	Status	Date	Collection Site
2010 SADO-01	239335	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/13	新潟県佐渡市 相川町 姫津 Himezu, Aikawa, Sado, Niigata
2010 SADO-02	239336	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/13	新潟県佐渡市 相川町 北片辺 Kitakatabe, Aikawa, Sado, Niigata
2010 SADO-03	239337	<i>Vigna angularis</i> var. <i>nipponensis</i>	escape	2010/10/13	新潟県佐渡市 相川町 小田 Koda, Aikawa, Sado, Niigata
2010 SADO-04	239338	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/13	新潟県佐渡市 両津 椿 Tsubaki, Ryotsu, Sado, Niigata
2010 SADO-05	239339	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/13	新潟県佐渡市 両津 梅津周辺水田脇 Umezu, Ryotsu, Sado, Niigata
2010 SADO-06	239340	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/13	新潟県佐渡市 両津 梅津周辺水田脇 Umezu, Ryotsu, Sado, Niigata
2010 SADO-07	239341	<i>Vigna angularis</i>	cultivated	2010/10/13	新潟県佐渡市 両津 羽吉, 藤田キヨコさん Hayoshi, Ryotsu, Sado, Niigata
2010 SADO-08	239342	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/14	新潟県佐渡市 相川町 姫津 Himezu, Aikawa, Sado, Niigata
2010 SADO-09	239343	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/14	新潟県佐渡市 沢根町 河内 902, もちや 建具店の向かい Sawane, Sado, Niigata
2010 SADO-10	239344	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 沢根町 河内 小木屋看板横 Sawane, Sado, Niigata
2010 SADO-11	239346	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 真野町 金丸, 国府川 (こ うのがわ) 横, ため池脇 beside Kounogawa-river, Kanamaru, Mano, Sado, Niigata
2010 SADO-12	239347	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	2010/10/14	新潟県佐渡市 真野町 西三川 Gold Park 横, 川原の砂地 on flood prone sandy river side, Mano, Sado, Niigata
2010 SADO-13	239348	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 羽茂 (はもち) 川横休耕地, 小木港から東に 3 k m abandoned field beside Hamochigawa- river, Sado, Niigata
2010 SADO-14	239349	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 羽茂 (はもち) 大崎. 不 動橋横河原 in a river side near Fudo bridge, Hamochi-Oosaki, Sado, Niigata

Alt. (m)	Latitude	Longitude	seed	Herbarium	Nodule	Soil	Remarks
33m	N38-04-59.9	E138-14-47.1	yes	yes	yes	clay	beside paddy. green stem, black pod, pale brown seeds.
10m	N38-09-17.3	E138-18-07.8	yes	yes	yes	clay	growing in a house garden climbing on vinyl house steel pole, green stem, black pod, pale brown seeds.
8m	N38-13-49	E138-23-10	yes	no	no	clay	beside azuki bean field. probably escaped from cultivation. seed color: red.
1m	N38-07-18.9	E138-26-15.5	yes	yes	yes	clay	in an abandoned paddy field. green stem, brown pod, brown seeds.
9m	N38-06-27.4	E138-26-01.7	yes	yes	yes	clay	beside paddy near irrigation stream, green stem, black pod, black seeds.
9m	N38-06-27.4	E138-26-01.7	yes	no	no	clay	beside paddy near irrigation stream, green stem, black pod, black small seeds.
45m	N38-06-24.4	E138-25-09.5	yes	no	no	clay	cultivated on paddy bunds. no insecticide applied, sown in June, harvesting on 13th Oct. cooked with glutinous rice, make bean paste and sweets.
40m	N38-05-05.8	R138-14-50.6	yes	yes	yes	clay	in a fallow paddy. green stem, black pod, pale brown seeds.
15m	N38-00-16.8	E138-15-48.3	yes	yes	yes	clay	between road and paddy. green stem, black pod, pale brown seeds.
9m	N38-00-16.3	E138-15-54.8	yes	yes	yes	clay	beside abandoned paddy near a pond. narrow leaf.
3m	N37-59-42.3	E138-20-58.9	yes	yes	yes	clay	in a grassland beside irrigation pond, before maturity.
19m	N37-53-53.2	E138-17-43.8	yes	yes	yes	sand	growing on flood prone sandy river side.
9m	N37-49-56.0	E138-18-29.0	yes	no	no	clay	in a ditch beside fallow paddy.
80m	N37-52-25.3	E138-20-22.8	yes	no	no	muddy	in a river side near Fudo bridge. large leaves and large pods.

Table 3(Continued).

Col. No.	JP No.	Species name	Status	Date	Collection Site
2010 SADO-15	239350	<i>Vigna angularis</i> var. <i>nipponensis</i>	wild	2010/10/14	新潟県佐渡市 外山～上川茂, 上川茂集 落開発センター近く, 白山神社そば between Kamikawamo and Toyama, Hamochi, Sado, Niigata
2010 SADO-16	239351	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 畑野町, 飯持, 水田脇 Iimochi, Hatano, Sado, Niigata
2010 SADO-17	239352	<i>Glycine soja</i>	wild	2010/10/14	新潟県佐渡市 畑野町, 飯持, 水田脇 Iimochi, Hatano, Sado, Niigata
2010 SADO-18	239353	<i>Glycine soja</i>	wild	2010/10/15	新潟県佐渡市 三川 (腰細), 小川のへり Koshiboso, Mikawa (Koshiboso), Sado, Niigata
2010 SADO-19	239354	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/15	新潟県佐渡市 浜河内, 新行橋そば Hamakawachi, Sado, Niigata
2010 SADO-20	239355	<i>Vigna angularis</i> var. <i>nipponensis</i>	weedy	2010/10/15	新潟県佐渡市 赤玉 Akadama, Sado, Niigata
2010 SADO-21	239356	<i>Glycine soja</i>	wild	2010/10/15	新潟県佐渡市 吾潟, 加茂湖の横. beside Kamo-lake, Agata, Sado, Niigata
2010 SADO-22	239357	<i>Glycine soja</i>	wild	2010/10/15	新潟県佐渡市 新穂大野 Niibo-Oono, Sado, Niigata

Alt. (m)	Latitude	Longitude	seed	Herbarium	Nodule	Soil	Remarks
190m	N37-54-14.1	E138-23-18.3	yes	yes	yes	clay	climbing on a fence beside fallow paddy. purple stem, black pod, black small seeds.
42m	N37-58-40.0	E138-23-55.7	yes	no	no	clay	beside water path at the edge of newly developed paddy area, small leaves.
43m	N37-58-43.8	E138-23-54.8	yes	yes	yes	clay	side of road, in newly developed paddy area.
23m	N37-53-17.4	E138-25-58.9	yes	yes	yes	sand	beside an irrigation ditch. many large nodules formed.
22m	N37-54-46.5	E138-28-17.2	yes	yes	yes	clay	in a wet fallow paddy.
37m	N37-59-45.8	E138-31-54.3	yes	yes	yes	unknown	beside road. black pods, black seeds.
0m	N38-03-09.0	E138-26-48.8	yes	yes	yes	sand	in a fallow paddy. no nodules found.
34m	N38-00-45.4	E138-25-31.5	yes	yes	yes	sand	road side slope. near a ditch.





Photo 1. *Vigna angularis* var. *nipponensis*, weedy population (2010 Sado-06) growing edge of paddy, Umezu, N of Ryotsu. Green stem, black pod, black small seeds (see also Photo 2).



Photo 2. A plant of 2010 Sado-06 population. It has a thick green stem which indicates that it is a weedy plant. Although the plant is robust, its seeds are black and small.



Photo 3. Collection site of wild azuki (*V. angularis* var. *nipponensis*) population (2010 Sado- 12). River side near Nishimikawa Gold Park.



Photo 4. Plants of wild azuki population (2010 Sado-12) growing on a flood-prompt river side.



Photo 5. *Vigna angularis* var. *nipponensis* population (2010 Sado-15) growing on a fence beside road near abandoned paddy, between Kamikawamo and Toyama. Near Hakusan shrine.



Photo 6. A collection site of *Glycine soja* (2010 Sado-14) growing beside a Hamochi river, Hamochi-Ohsaki.



Photo 7. A population of *Glycine soja* (2010 Sado-16), limochi, Hatano. Paddy field area.



Photo 8. A collection site of *Glycine soja* population (2010 Sado-18). Koshiboso village.



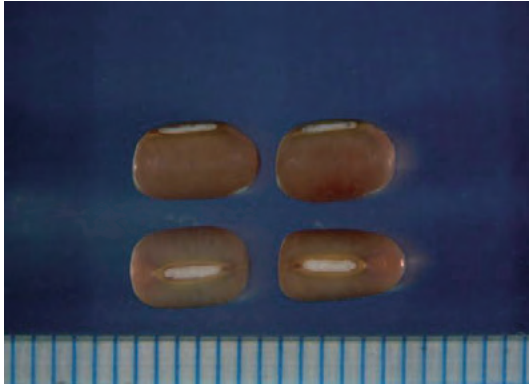


Photo 9. Pale brown seeds of weedy *Vigna angularis* var. *nipponensis* population (2010 Sado-04), Tsubaki, Ryotsu town.

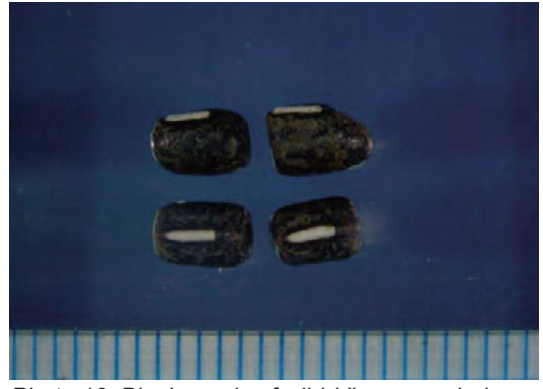


Photo 10. Black seeds of wild *Vigna angularis* var. *nipponensis* population (2010 Sado-06), Umezu, Ryotsu town.

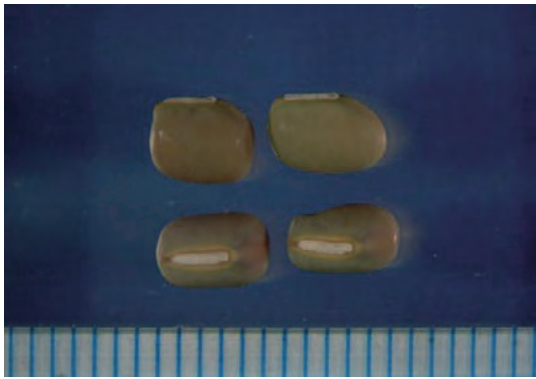


Photo 11. Pale greenish brown seeds of weedy *Vigna angularis* var. *nipponensis* (2010 Sado-08), Himezu, Aikawa town.



Photo 12. Seeds of wild *Vigna angularis* var. *nipponensis* river side population (2010 Sado-12), Nishimikawa, Mano town.



Photo 13. Seeds of cultivated *Vigna angularis* population (2010 Sado-07), on the bunds of paddy field, Hayoshi, Ryotsu town.

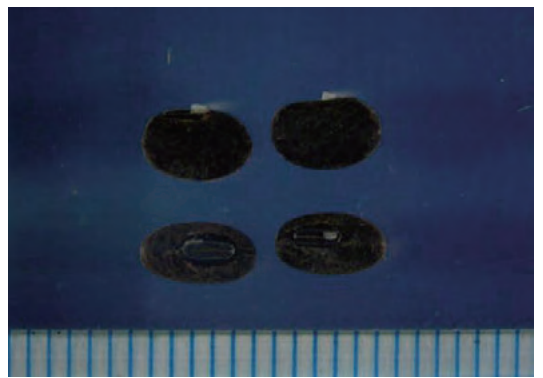


Photo 14. Seeds of *Glycine soja* population (2010 Sado-14), in a river near Fudo bridge, Hamo Shimo-Osaki, Hamo town.

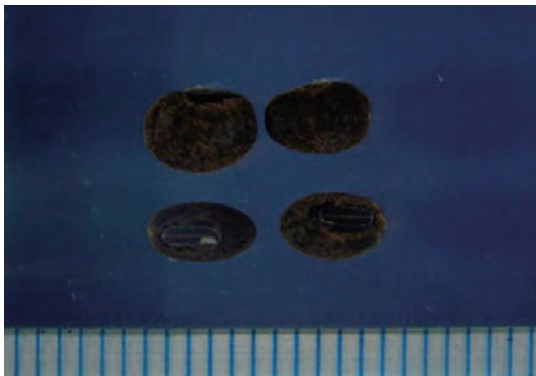


Photo 15. Seeds of *Glycine soja* population (2010 Sado-16), beside paddy, limochi, Hatano town.

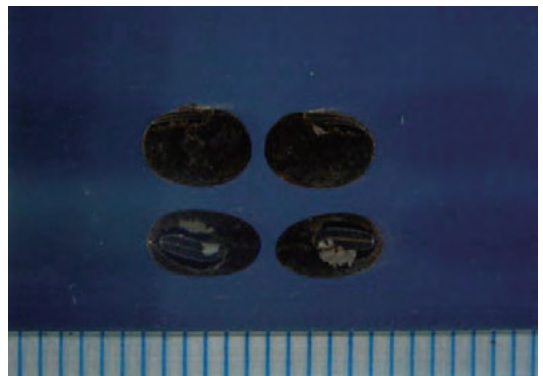


Photo 16. Seeds of *Glycine soja* population (2010 Sado-18), beside stream, Koshiboso, Akadomari town.