

作物近縁野生種の収集と調査, 1997
3. 近畿地方におけるアズキおよびダイズ野生種

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Collection of the Wild Relatives of Crops 1997.

3. The Azuki Bean (*Vigna angularis* var *angularis*) Genepool and Soybean
(*Glycine max*) Genepool in the Kinki Region of Honshu, Japan

4-1 1th November

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Summary

Wild azuki beans (*Vigna angularis* var. *nipponensis*) was found in disturbed, open, habitats of rural areas throughout the region visited. This species is well adapted to riverside banks, herbaceous waste land and roadside verges. Population size varied from less than 10 plants to populations of several 100m². Four populations appeared to be weedy *V. angularis* and one population appeared to be a mixture of wild and weedy azuki. Two explanations for the origin of weedy azuki are that it is a hybrid between the wild and cultivated species (possibly the situation with collection no. 97069 and 97097) or that it is an escape from cultivation (possibly the situation with collection no. 97074 and 97091).

Glycine soja was generally more abundant than *Vigna angularis* var *nipponensis* but was not common in the interior parts of Wakayama (和歌山) and Mie (三重) prefectures. In several sites *Glycine soja* and wild *Vigna* grew together, even growing up the same plant. Where the two species grew together *Glycine soja* was usually the more abundant the exception was collection site 58 (collection numbers 97095 and 96) where wild *Vigna* was the more abundant.

A total of 36 seed samples were collected (Table below) in most cases herbarium specimens and root nodule samples were also collected. All collecting sites were located using a global positioning system and complete passport data was obtained. After seed increase, accessions will be preserved in the MAFF genebank. Herbarium specimens are deposited in the MAFF genbank herbarium.

Species	Number of samples
<i>Vigna angularis</i> var. <i>nipponensis</i> (wild)	13
<i>Vigna angularis</i> var. <i>angularis</i> (weedy)	4
<i>Vigna angularis</i> var. <i>angularis</i> (cultigen)	2
Mixture of wild and weedy <i>Vigna</i>	1
<i>Glycine soja</i>	12
<i>Glycine max</i>	3
<i>Leersia</i>	1

KEY WORDS : genetic resources, in-situ conservation, wild azuki beans, wild soybeans.

Field observations

The collecting mission started from Himeji (姫路市) and travelled northwest towards Tsuyama (津山市) (Table 1, Fig. 1). In the city of Sayo (佐用町), Hyogo prefecture (兵庫県) both wild (97068) and weedy (97069) populations were found but in different locations. The wild population was on a railway bank and edge of a rice paddy. The population covered several 100m² and seeds were both mottled black and brown. The weedy population was in a small area of waste land adjacent to cultivated azuki beans. This weedy *Vigna* could either be an escape from cultivation or hybrid between wild and cultivated adzuki. The seed colors of weedy azuki were mottled green, brown and black. Sayo (佐用町) is noted for cultivation of white seeded adzuki bean but the field of cultivated adzuki we examined had red seeded beans.

Close to Tsuyama (津山市) at the farming village of Katsube (勝部) wild *Vigna* (97071) was found on a roadside bank adjacent to rice paddies. A large population of *Glycine soja* (97072) was growing near by on flat ground that was probably an abandoned paddy field.

From eastern Chugoku (東中国地方) the team travelled to the mountains of southern Nara prefecture (奈良県), south of Osaka (大阪府). At Hattacho (八田町), Nara (奈良), in a small, heavily shaded field with a few plants of weedy *Vigna* were found. The field also

Table 1 Itinerary of the exploration and the collected samples on each day
探索収集日程と収集品の数

Date 日付	Itinerary and collection sites number 行程と収集地点番号	Collected species and number of accessions 収集した種と系統数
11/4 (Mon)	Hyogo Himeji Kamigohri 兵庫県姫路市 --- 87 --- 上郡町 --- 88,89 --- Sayo Okayama Tsuyama 佐用町 --- 岡山県津山市	<i>V. angularis</i> var. <i>nipponensis</i> 2 <i>G. soja</i> 1 Weedy <i>V. angularis</i> 1 Cultivated <i>V. angularis</i> 1
11/5 (Tue)	Tsuyama Wakayama 津山市 --- 90 --- 和歌山県高野町	<i>V. angularis</i> var. <i>nipponensis</i> 1 <i>G. soja</i> 1
11/6 (Wed)	Nara Oyodo 高野町 --- 91 --- 奈良県大淀町 --- 92 --- Wakayama Wakayama 和歌山県和歌山市	<i>V. angularis</i> var. <i>nipponensis</i> 2 <i>G. soja</i> 1 <i>G. max</i> 2 Weedy <i>V. angularis</i> 1 <i>Leersia</i> 1
11/7 (Thu)	Wakayama Shimizu Gobo 和歌山県 --- 清水町 --- 93 --- 御坊町 --- Tanabe 94 --- 田辺市	<i>V. angularis</i> var. <i>nipponensis</i> 2 <i>G. max</i> 1 Weedy <i>V. angularis</i> 1
11/8 (Fri)	Tanabe Kamitoda Kozagawa 田辺市 --- 上富田町 --- 95 --- 古座川町 --- Nachi-Katsuura 96 --- 那智勝浦町 --- 97 --- 新宮市	<i>V. angularis</i> var. <i>nipponensis</i> 3 <i>G. soja</i> 3
11/9 (Sat)	Mie Mihama Wakayama 新宮市 --- 三重県御浜町 --- 98,99 --- 和歌山 Kumanogawa Mie Owase 県熊野川村 --- 100,101 --- 三重県尾鷲市	<i>V. angularis</i> var. <i>nipponensis</i> 2 <i>G. soja</i> 2 Weedy <i>V. angularis</i> 1
11/10 (Sun)	Owase Kii-Nagashima 尾鷲市 --- 102 --- 紀伊長島町 --- 103 --- Odai Taki 大台町 --- 104 --- 多気町 --- 105,106 --- Tsu 津市	<i>V. angularis</i> var. <i>nipponensis</i> 1 <i>G. soja</i> 3 Wild & weedy <i>Vigna</i> complex 1 Cultivated <i>V. angularis</i> 1
11/11 (Mon)	Tsu Tsukuba 津市 --- 107 --- つくば市	<i>G. soja</i> 1
Total		<i>G. soja</i> 12 <i>G. max</i> 3 <i>V. angularis</i> var. <i>nipponensis</i> 13 Weedy <i>V. angularis</i> 4 Wild & weedy <i>Vigna</i> complex 1 Cultivated <i>V. angularis</i> 2 <i>Vicia</i> sp. 1 <i>Leersia</i> 1 Total : 36 samples from 21 sites



Fig.1 Collecting route and collecting sites in Kinki

had a few rows of black seeded soybeans. The most of the pods of the weedy *Vigna* (97074) were immature, perhaps, because the field was heavily shaded. The weedy *Vigna* consisted of two types. One type growing in the field which was determinate whereas the type growing in the bushes at the field edge were indeterminate. The cultivated soybean was black seeded and the seed size varied greatly from plant to plant (weight of each seed on a per plant basis ranged from 0.27g to 0.61g).

One of the largest populations of wild *Vigna* was found just north of Wakayama city (和歌山市) at Sakata (坂田) (97078). This population covered several 100m² of abandoned land dominated by *Solidago* up which wild *Vigna* climbed.

At two locations wild *Vigna* was found in interior mountainous regions of Wakayama (和歌山県) [Shimizu (清水)] and Mie (三重県) [Owase-shi (尾鷲市)] prefectures. Both populations (97081 and 97092) were on well drained river banks and were small populations of about 10 plants each.

At Iya (熊野), Gobo city (御坊市), Wakayama prefecture (和歌山県) wild and weedy *Vigna* were found in close proximity (about 100m apart). The large wild population (97082) was growing up *Solidago* beside a rice paddy (Fig. 2). The weedy population (97083) was beside an irrigation channel in a damp low laying area (Fig. 3). The weedy population, as observed in other locations, was less mature than the wild population and seed color was green and not mottled.

At Shirahama (白浜町), Wakayama (和歌山) a very large population of *Glycine max* (97084) and smaller population of wild *Vigna* (97085) were growing together on the bank of a elevated road beside the large river, Tonda (富田川). Plants of both species were growing side by side in some places. A very similar situation was observed at Kozagawa (古座川町), Wakayama (和歌山) (97086 *Vigna*, 97087 *Glycine*) but at this location both species were, in places, right at the rivers edge (Fig. 4). In Kozagawa (古座川町) in some places the two species were found growing together up the same plant (Fig. 4).

At Kamiichigi (上市木), Mihama (御浜町), Mie (三重), a small population of weedy *Vigna angularis* (97091) was found (11 plants). This population was almost completely covered by taller herbaceous vegetation. This population was notable because it consisted of 9 plants without nodules and 2 plants with abundant unusually large nodules (Fig. 5). The reasons for the variation in nodulation among plants is to be investigated.

At most of the locations where wild *Vigna* and *Glycine* were growing near one another *Glycine* was the more abundant of the two species. However, in Degaito (出垣内), Kiinagashima (紀伊長島町), Mie (三重) (97095, 96) *Vigna* was the more abundant of the two species and only a few plants of *Glycine soja* were found.

A mixed population of wild and weedy *Vigna* was found along a railway embankment in Sawara (佐原), Odai (大台町), Mie (三重) (97097). The origin of the weedy plants may be the result of hybridization between wild and cultivated azuki since the population was close to home gardens. However, local people said that azuki beans were not currently grown in the area. The seed color in this population was mottled green or black.

Nishiyoshino (西吉野村) is deep in the mountains of southern Nara prefecture (奈良県). In this area we did not find wild adzuki. According to one elderly lady many years ago in upland fields there were various types of "wild" adzuki which they harvested. One type had long seeds and long pods. This may have been *V. umbellata* (escape) since occasionally *V. umbellata*, which has these characteristics is grown in Wakayama.

Another type had short pods. These “wild adzuki” beans had various colors. Since upland field have been planted now to orchards, mainly persimmon, these plants are no longer found in the area since vegetation under orchard trees is regularly cut.

Cultivated azuki and soybean-observations and farmers comments.

In Wakayama (和歌山) and Mie (三重) prefectures farmers in several locations made the same comment, that azuki bean used to be grown but is not any more. Throughout the trip soybeans were more commonly seen than azuki beans. Small scale production of azuki was observed in Shimizu (清水町) and Tsu (津市).

One farmer, from the Shimizu (清水) area, Wakayama prefecture (和歌山県), explained that they cultivated three soybean varieties-white (yellow), black and green. The green variety, grown in small quantities on field levees, was for home consumption and easier to grind and cook. Black and white varieties were grown in larger quantities in the field for sale. The green variety had recently been introduced into the area. Outside one house in Shimizu (清水) we saw 4 different varieties drying in the sun. However, the owner was absent and could not be interviewed.

In the Shimizu area the collecting team observed very small rice paddies, about 1m² (Fig. 6), and use of a straw cutter (Fig. 7). The cut rice straw was incorporated into the heavy soil to lighten it.

Table 2 A list of collected samples in Kinki district, Japan, 1997
 近畿地方で収集した作物近縁野生種遺伝資源, 1997

No.	Month /date	Site No.	Col. No.	Acc. No.	Genus & Species	Status	Locality			Latitude Longitude	Alt.	Topog- raphy	Shading
							Prefecture	District	Village				
1	11/4	87	CED 97066	03030211	<i>Vigna angularis</i>	wild	Hyogo 兵庫県	Kamigouri 上郡町	Yoi 与井	34°51'45.0"N 134°22'03.4"E	150 m	Mountains	open
2	"	"	CED 97067	03030212	<i>Glycine soja</i>	"	"	"	"	"	"	"	"
3	"	88	CED 97068	03030213	<i>Vigna angularis</i>	"	"	Sayo 佐用町	Ohtsubo 大坪	34°59'23.1"N 134°20'57.8"E	200 m	"	"
4	"	89	CED 97069	03030214	"	weedy	"	"	"	"	"	"	"
5	"	"	CED 97060	03030215	"	cultivated	"	"	"	"	"	"	"
6	11/5	90	CED 97071	03030216	"	wild	Okayama 岡山県	Tsuyama 津山市	katsube 勝部	35°05'08.9"N 134°01'42.2"E	10 m	"	"
7	"	"	CED 97072	03030217	<i>Glycine soja</i>	"	"	"	"	"	"	"	"
8	11/6	91	CED 97073	03030218	"	"	Nara 奈良県	Oyodo 大淀町	Hatta 八田町	34°22'41.2"N 135°45'54.9"E	90 m	"	"
9	"	"	CED 97074	03030219	<i>Vigna angularis</i>	weedy	"	"	"	"	"	Mountains	medium
10	"	"	CED 97075	03030220	<i>Glycine max</i>	cultivated	"	"	"	"	"	"	"
11	"	"	CED 97076	03030221	"	weedy ?	"	"	"	"	"	"	medium
12	"	"	CED 97077	-	<i>Leersia</i>	"	"	"	"	"	"	"	heavy
13	"	92	CED 97078	03030222	<i>Vigna angularis</i>	wild	Wakayama 和歌山県	Wakayama 和歌山市	Sakata 坂田	34°16'12.8"N 135°05'16.0"E	25 m	hills	open
14	"	"	CED 97079	03030223	"	"	"	"	"	"	"	"	"
15	11/7	93	CED 97080	03030224	"	"	"	Shimizu 清水町	Shimizu 清水	34°05'15.7"N 135°25'34.3"E	210 m	Mountains	"
16	"	"	CED 97081	03030225	<i>Glycine max</i>	cultivated	"	"	"	"	"	"	"
17	"	94	CED 97082	03030226	<i>Vigna angularis</i>	wild	"	Gobo 御坊市	Iya 熊野	33°53'16.8"N 135°10'42.4"E	0 m	hills	"
18	"	"	CED 97083	03030227	"	weedy	"	"	"	"	"	"	"

Degree of disturbance	Population size	Growth stage	Seed samples	Nodule samples	Specimens	Characteristics and notes	Associated plants
high	3 m ²	mature	11+bulk	1	4	near waste area, seed shade varied	
"	1 m ²	mature past maturity	bulk	0	0	road embankment	
"	>100m ²	past maturity	20+bulk	0	3	farmland	<i>Pueraria labat</i> Grasses
"	15×15 m	mature	18	1	2	waste land near cultivated field, 69-8:big seed	<i>Solidago altissima</i> Grasses
"	3×50 m rows	"	bulk	1	0	cultivated field	soybean field
"	scattered 100m ²	"	11+bulk	1	4	on terrace bank and disturbed area	<i>Solidago altissima</i> , <i>Pueraria labat</i>
"	50×50 m	past maturity	11+bulk	1	0		<i>Solidago altissima</i>
"	20 m × 2 + scattered in whole area	"	10+bulk	1	0	waste land	<i>Solidago altissima</i>
"		flowering	13	1	4	this pop is young, may be because the field gets little sun	
"	2 rows 50 m	pre-mature	bulk	1	0	semi-abandoned field, black-large seeded soybean	weedy szuki
"		mature (mature before 75)	4	0	1	earlier maturity than main cultivar, black seeded	
			bulk	0	0	Not often mature seeds seen, so was collected	<i>Echinochloa</i> sp.
high	100×100 + scattered	mature	12+bulk	1	3	waste land, edge of former paddy, very large vigorous population	<i>Solidago altissima</i>
low in wall	3 m ²	"	3 + bulk	0	2	steep slope of small stream, waste land	<i>Solidago altissima</i>
high	50m ²		8 + bulk	1	3	embankment of river, adjacent to cultivated field	<i>Pueraria labat</i> , Not <i>solidago</i>
"	25×50 field	mature	bulk	0	0	Black seeded soybean, large nodules	very weedy field, Grasses
high	50×10 m	"	17+bulk	1	4	waste land next to paddy black and grey black pods	<i>Solidago altissima</i>
"	small	flowering to mature	10+bulk	1	5	Red seeds	<i>Coix</i> sp. in creek + <i>taro</i> + <i>Setaria</i> sp.

Table 2 A list of collected samples in Kinki district, Japan, 1997 (cont.)
 近畿地方で収集した作物近縁野生種遺伝資源, 1997 (続き)

No.	Month /date	Site No.	Col. No.	Acc. No.	Genus & Species	Status	Locality			Latitude Longitude	Alt.	Topog- raphy	Shading
							Prefecture	District	Village				
19	11/8	95	CED 97084	03030228	<i>Glycine soja</i>	wild	Wakayama 和歌山県	Shirahama 白浜	Horo 保呂	33°41'04.3"N 135°24'52.6"E	0 m		open
20	"	"	CED 97085	03030229	<i>Vigna angularis</i>	"	"	"	"	"	"	"	"
21	"	96	CED 97086	03030230	"	"	"	Kozagawa 古座川町	Takaïke 高池	33°31'53.8"N 135°48'54.3"E	0 m	hills	"
22	"	"	CED 97087	03030231	<i>Glycine soja</i>	"	"	"	"	"	"	"	"
23	"	97	CED 97088	03030232	"	"	"	Nachi- Katsuura 那智勝浦町	Ukui 宇久井	33°39'37.2"N 135°58'45.0"E	20m		"
24	"	"	CED 97089	03030233	<i>Vigna angularis</i>	"	"	"	"	"	"	hills	light
25	11/9	98	CED 97090	03030234	<i>Glycine soja</i>	"	Mie 三重県	Mihama 御浜町	Shimoichigi 下市木	33°49'38.7"N 136°02'51.5"E	0 m	"	open
26	"	99	CED 97091	03030235	<i>Vigna angularis</i>	weedy	"	"	Kamiichigi 上市木	33°50'23.4"N 136°01'18.0"E	50m	"	"
27	"	100	CED 97092	03030236	"	wild	Wakayama 和歌山県	Kumanogawa 熊野川町	Tamakiguchi 玉置口	33°53'35.8"N 135°53'06.9"E	0 m	Mountains	open
28	"	101	CED 97093	03030237	<i>Glycine soja</i>	wild	Mie 三重県	Owase 尾鷲市	Minamiura 南浦	34°04'03.1"N 136°11'26.9"E	0 m	hills	"
29	"	"	CED 97094	03030238	<i>Vigna angularis</i>	"	"	"	"	"	"	"	"
30	11/10	102	CED 97095	03030239	"	"	"	Kii-Nagashima 紀伊長島町	Degaitu 出垣内	34°12'30.3"N 136°19'45.4"E	0 m	"	"
31	"	"	CED 97096	03030240	<i>Glycine soja</i>	"	"	"	"	"	"	"	open
32	"	103	CED 97097	03030241	<i>Vigna angularis</i>	wild & weedy	"	Odai 大台町	Sawara 佐原	34°23'31.6"N 136°24'10.4"E	<100m	hills valley	"
33	"	104	CED 97098	03030242	<i>Glycine soja</i>	wild	"	Taki 多気町	Gokatsura 五桂	34°28'47.3"N 136°32'41.6"E	<100m	hills	"
34	"	105	CED 97099	03030243	"	"	"	Tsu 津市	Isshiki 一色	34°43'47.1"N 136°28'05.3"E	<100m	plain	"
35	"	106	CED 97100	03030244	<i>Vigna angularis</i>	cultivated	"	"	"	34°44'15.8"N 136°27'15.7"E	<100m	"	"
36	11/11	107	CED 97101	03030245	<i>Glycine soja</i>	wild	"	"	Tousebashi 塔世橋	34°43'34.4"N 136°30'39.4"E	"	"	"

Degree of disturbance	Population size	Growth stage	Seed samples	Nodule samples	Specimens	Characteristics and notes	Associated plants
high	>500m ²	mature	14+bulk	1	2 ?	waste road side	wild azuki, <i>Solidago altissima</i>
"		"	11+bulk	2	2		<i>Solidago altissima</i> , <i>Glycine soja</i>
"	scattered over 300m +	"	10+bulk	1	3	waste road side	<i>Miscanthus sinensis</i> , <i>Solidago altissima</i> , <i>Xanthium</i> sp.
"	scattered over 300m +	"	10+bulk	1	3	river side, road side verge, river side seems natural habitat	<i>Xanthium</i> sp., <i>Solidago altissima</i> , <i>Miscanthus sinensis</i>
"	scattered allover 100m ²	"	bulk	0	0	waste land	Bamboos
"	20×5m	"	10	1	0	waste land by road	<i>Solidago altissima</i>
"		"	bulk	0	0	edge of road, waste land	<i>Miscanthus sinensis</i> , <i>Solidago altissima</i>
		past maturity	11	2	1	two plants(6,7)had hyper nodulation ?	mainly among <i>Setaria</i> sp.
high	20×3m	pre-mature	9	1	3	edge of park like area, river bank	<i>Miscanthus sinensis</i>
"	300×50 m allover	past maturity	10+bulk	0	1+2 ?	waste river side	<i>Solidago altissima</i> , <i>Miscanthus sinensis</i> ,
"	5×5m	"	6 +bulk	1	1	"	"
"	100×100m	mature	10+bulk	1	3	waste land, population cut or burnt	<i>Solidago altissima</i> , <i>Setaria</i> sp.
"		past maturity	1 +bulk	0	2	waste land	wild Vigne, <i>Setaria</i> sp., <i>Solidago altissima</i>
"	300×3m	mature	22+bulk	0	3	railway edge, waste land, wild:97-13~22 weedy:97-1~12	<i>Solidago altissima</i>
"	5 m ²	"	bulk	0	0	waste land	<i>Echinochloa</i> sp., <i>Compositae</i> , <i>Grassese</i>
"		past maturity	10+bulk	0	0	waste land, large pop. under High way	<i>Solidago altissima</i>
"	one row 20m long	mature	bulk	1	0	cultivated field	
"	20×20m	flowering mature past maturity	bulk	0	0	river bank under bridge	<i>Glysin</i> dominant here, <i>Solidago altissima</i>



Fig.2 Wild azuki in unused land beside a paddy field. Samples were taken at 1-2m intervals throughout the population. Population 97082.



Fig.7 Cutting rice straw prior to incorporation into the rice paddy soil, Shimizu (清水), Wakayama (和歌山).



Fig.3 Habitat of weedy azuki along an irrigation stream about 100m from population 97082 shown in fig.1. Population 97083.



Fig.5 Population 97091 consisted of 2 plants with large root nodules over most of the root system (right) and 8 plants with no visible root nodules (left).

Fig.6 Rice terraces in Mie prefecture (三重県). Tiny field are indicated with arrow.



Fig. 4 Riverside populations of wild azuki (right arrow) and wild soybeans (left arrow) twining up adjacent plants. Populations 97086-87