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Conservation of Legume - Symbiotic Rhizobia Genetic Diversity in Laos, 2006

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ラオスにおけるマメ類および共生微生物遺伝資源多様性の保全，2006 年

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Summary

A field survey was conducted in southern Laos (Bolikhamxai, Khammouane, Savannakhet, Saravan and Champasak Provinces) from November 13 to 21, 2006. For cultivated legumes, 1 accession of mungbean (*Vigna radiata*), 6 of cowpea (*V. unguiculata*) were collected. For wild legumes, 9 accessions of *Vigna minima* were collected.

Seed samples as well as root nodules were collected if they are available and were deposited in the country of origin.

Introduction

The National Institute of Agrobiological Sciences, Japan and National Agriculture Research Center, National Agriculture and Forestry Research Institute, Lao PDR have collaborated since 2003 on the survey of legume genetic resources in Laos. This is the report of the fourth survey trip. Trip reports for 2003, 2004 and 2005 have been published (Tomooka *et al*., 2006, Tomooka *et al*., 2005; Tomooka *et al*., 2004; PDF available from http://www.gene.affrc.go.jp/plant/publications.html). Conservation of traditional legume crops, wild relatives and their symbiotic root nodules (rhizobia) are the main objectives.

Methods

We surveyed Bolikhamxai, Khammouane, Savannakhet, Saravan and Champasak provinces from November 13 to 21, 2006 (Table 1, Fig. 1). Seeds, herbarium specimens and if available root nodules were collected. Information on collection sites including village name, altitude, latitude, longitude, habitat and other ecological data together with detailed sketch map of the collection sites were recorded as passport data (Table 3). Identification of wild *Vigna* was done based on the a key prepared by Tomooka *et al.* (2002).

Results and Discussion

A total of 16 accessions consisting of 3 species were collected (Table 2). Detailed information of each accession is listed in the passport data table (Table 3). The locality of the collection sites is shown (Fig. 1).

Cultivated legume

Two cultivated legume species were collected. Among them, cowpea (*Vigna unguiculata*) is the most commonly cultivated legume species and 6 accessions were collected. Seed color was either black or red.

One accession of mungbean (*Vigna radiata*) was collected in Bolikhamxai Province. A farmer who was growing mungbean said that mungbean has recently become a good cash crop. He bought mungbean seeds from a nearby market at 11000K/kg (10000K = 1US $) and will be able to sell the harvest crop at 6000K/kg. Price of rice and corn is only 800 - 900K/kg according to the farmer.

Wild legumes

Only one species of wild *Vigna* (*V. minima*) was found and 9 accessions were collected (Table 2). This number is a remarkably contrast with the last year's survey in the northern Laos where 7 wild *Vigna* species were found.

V. minima is a common species in southern Laos. The main habitat of this species in southern Laos is grassland between farmer's house and paddy fields or backyard forests. This species is frequently found growing on light white sandy soil where severe drought seems to be common after rainy season when this species reaches maturity stage. In some populations, shape of leaflet is highly variable.

V. minina is commonly used as a vegetable in southern Laos. We have interviewed farmers at 5 collection sites (Savannakhet, Salavan and Champasak Provinces) of this wild legume. All the farmers interviewed told us that they usually collect flowers and young pods as vegetables. A farmer told us she also collected mature seeds but it was time consuming and not efficient work because of the unsynchronized maturity and pod shattering. Local names for *V. minima* are "tua nyo nye", "tua siang" or "tua pee".

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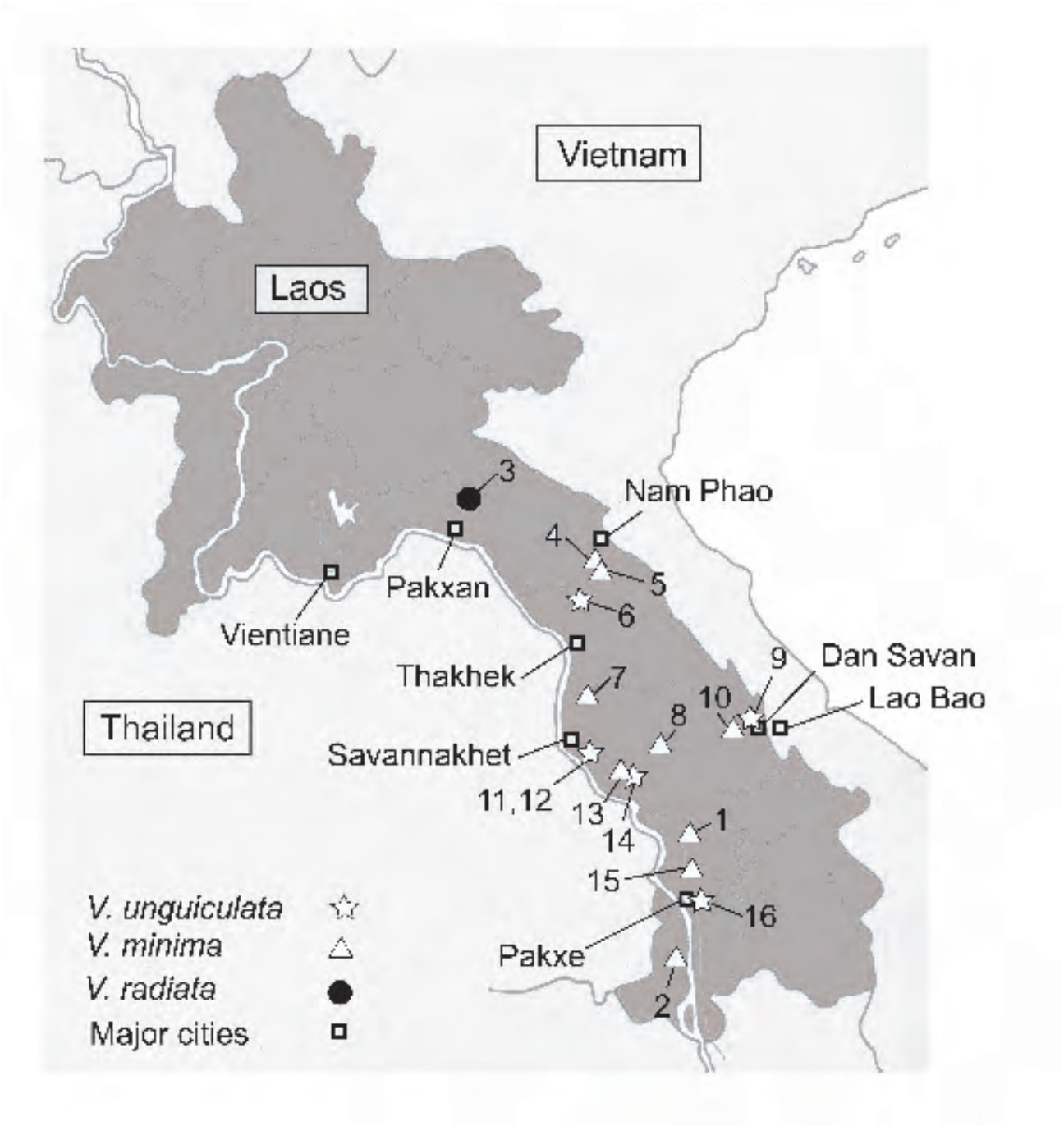

Fig. 1. Collection sites for each species.
Number represent collection number.

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和文摘要

本報告は，ラオスにおいて行っているマメ科植物遺伝資源共同調査の 4 年目の報告である．本年度の調査では，ラオスの Bolikhamxai 県，Khammouane 県，Savannakhet 県，Salavan 県，Champasak 県を 2006 年 11 月に探索し，伝統的マメ科作物，その近縁野生種および共生している根粒菌の収集保全を行った．その結果，栽培種としてリョクトウ (*Vigna radiata*) 1 系統，ササゲ (*V.unguiculata*) 6 系統を，野生種として *Vigna minima* 9 系統を収集した．ラオス南部に広く分布していることが確認された *V. minima* は，その花や若莢が野菜として利用されていた．

Table 1. Itinerary of the field survey in Laos, 2006　　ラオスにおける 2006 年度の調査日程

Date	Day	Itinerary	Stay
15-Oct	Sun	Bangkok 18:50 -- QV425 -- 20:10 Vientiane	Vientiane
16-Oct	Mon	Discussion at NARC	Vientiane
17-Oct	Tue	Around Vientiane	Vientiane
18-Oct	Wed	Vientiane 06:30 -- QV512 -- 07:40 Pakxe	Pakxe
19-Oct	Thu	Pakxe -- Ubon Rchatani 20:25 -- TG031 -- 21:30 Bangkok	Bangkok
13-Nov	Mon	Narita 10:45 -- TG641 -- 15:45 Bangkok 19:45 -- TG692 -- Vientiane	Vientiane
14-Nov	Tue	Vientiane (NARC) -- Pakxan	Pakxan
15-Nov	Wed	Pakxan -- Lak Xao -- Nam Pao -- Lak Xao	Lak Sao
16-Nov	Thu	Lak Xao -- Thakhek	Thakhek
17-Nov	Fri	Thakhek -- Xeno -- Dan Sayan -- Nabao	Nabao
18-Nov	Sat	Nabao -- Savannakhet	Savannakhet
19-Nov	Sun	Savannakhet -- Pakxe	Pakxe
20-Nov	Mon	Pakxe 9:15 -- QV302 -- 10:30 Vientiane 12:50 -- QV414 -- Bangkok	Bangkok
21-Nov	Tue	Bangkok 8:20 -- TG676 -- 16:00 Narita	

Table 2. A summary of collected species during 4 years (2003 - 2006) in Laos.
2003 年から 2006 年に，ラオスにおいて収集したマメ科植物のリスト

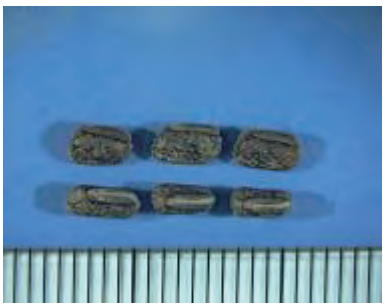
Species	Japanese name	status	2003	2004	2005	2006	Total
Glycine max	ダイズ	cultivated	0	1	5	0	6
Lablab purpureus	フジマメ	cultivated	0	1	1	0	2
Phaseolus vulgaris	インゲンマメ	cultivated	0	0	1	0	1
Psophocarpus tetragonolobus	シカクマメ	cultivated	0	1	1	0	2
Vigna mungo	ケツルアズキ	cultivated	0	0	1	0	1
Vigna radiata	リョクトウ	cultivated	0	0	5	1	6
Vigna umbellata	ツルアズキ	cultivated**	5	11	10	0	26
Vigna unguiculata	ササゲ	cultivated**	1	5	7	6	19
Vigna angularis ＊	ヤブツルアズキ	wild	0	0	3	0	3
Vigna hirtella ＊	アズキ近縁種	wild	7	9	6	0	22
Vigna minima ＊	コバノツルアズキ	wild	5	4	3	9	21
Vigna reflexo-pilosa ＊	オオヤブツルアズキ	wild	1	1	1	0	3
Vigna tenuicaulis ＊	アズキ近縁種	wild	0	2	4	0	6
Vigna trinervia ＊	アズキ近縁種	wild	0	0	4	0	4
Vigna umbellata	ツルアズキ	wild	0	0	10	0	10
Total			19	35	62	16	132

＊：　New record in Laos
** : include escaped population
Survey area:　2003　Vientiane, Luang Prabang, Champasak, Saravan
2004　Udomxai, Luang Nam Tha, Phongsali
2005　Xaisonbun, Xieng Khouang, Houa Phan, Luang Prabang, Sayabouli
2006　Bolikhamxai, Khammouane, Savannakhet, Salavan, Champasak

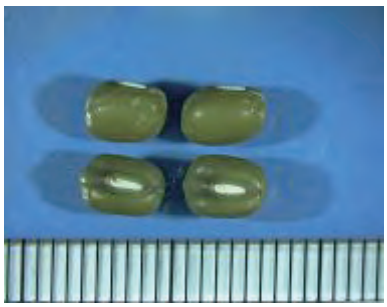
Table 3. A passport data of collected materials

収集品のパスポートデータ

Date	Col. No. / JP No.	Species name	Status	Collection Site	Province	Alt.	Latitude	Longitude	Seed	Herbarium	Nodule	Soil	Remarks
18-Oct	2006L1 JP230749	*Vigna minima*	wild	Ban Bun Gan, Khongxedon	Salavan	90m	N15-33-22	E105-48-40	yes	yes	no	clay	beside paddy, sporadically, stem no hairs, flowering, called "tua nyo nye", farmers eat flowers and young pods as vegetable
19-Oct	2006L2 JP230750	*Vigna minima*	wild	Ban Non Na, near Wat Phou	Champasak	90m	N14-45-09.0	E105-53-46.2	yes	yes	no	clay	beside paddy, lady farmer said she sometimes collect flowers, young pod and eat. Mature seeds are also eaten after boiled. Called "tua siang"
14-Nov	2006L3 JP230751	*Vigna radiata*	cultivated	Borikhan, north of Pakxan	Bolikhamxai	156m	N18-33-27.5	E103-43-18.5	yes	no	no	sand	farmer's field, called "tua kiao", he bought seeds at market 11000K/kg and can sell 6000K/kg, better than rice or maize about 800-900K/kg
15-Nov	2006L4 JP230752	*Vigna minima*	wild	Ban Nape, west of Lak Xao	〃	515m	N18-15-59.7	E105-02-06.8	yes	yes	no	clay	beside stream in paddy field, past maturity
15-Nov	2006L5 JP230753	*Vigna minima*	wild	S of Nongmek, S of Lak Xao	〃	625m	N18-00-25.1	E105-03-13.4	yes	yes	no	clay	beside paddy, leaf shape variable, paddy developed 5 years ago
16-Nov	2006L6 JP230754	*Vigna unguiculata*	cultivated	a village about 13km east of route 13, before zinc mining village "Bo Khua Pontiu, NE of Thakhek"	Khammouane	143m	N17-48-37.7	E104-36-70.9	yes	no	no	clay	beside paddy field, near lime stone mountain, past maturity, seed not fully developed for unknown reason, maybe vegetable yard long bean type for young pod but pod not so long
17-Nov	2006L7 JP230755	*Vigna minima*	wild	Ban Sala Nadeng, south of Thakhek	Savannakhet	150m	N16-59-47.7	E104-56-27.1	yes	yes	yes	clay	Wet place beside paddy. Lady farmers said they collect and eat mainly the young pods. Seeds larger than former collection.
17-Nov	2006L8 JP230756	*Vigna minima*	wild	26km W of Phin on route 9, between Savannakhet and Lao Bao	〃	205m	N16-34-49.4	E105-48-20.3	yes	yes	no	fine white sand	on the grass floor of Dipterocarpus forest edge beside paddy field. Sporadically grown climbing on the grasses. Leaflet shape highly variable.
18-Nov	2006L9 JP230757	*Vigna unguiculata*	cultivated	between Savannakhet and Lao Bao, near Nabao	〃	216m	N16-42-42.8	E106-09-08.2	yes	no	no	sandy	home garden beside paddy
18-Nov	2006L10 JP230758	*Vigna minima*	wild	Ban Non Gop, N of Muang Phin, between Savannakhet and Lao Bao	〃	205m	N16-41-58.5	E106-08-24.7	no	yes	yes	fine white sand	only nodules and herbarium specimens collected, seeds maybe available from herbarium specimens, grassland beside paddy, seems to be drought tolerant
19-Nov	2006L11 JP230759	*Vigna unguiculata*	cultivated	Savannakhet market	〃	140m			yes	no	no	unknown	market, called tua daen "red bean"
19-Nov	2006L12 JP230760	*Vigna unguiculata*	cultivated	Savannakhet market	〃	140m			yes	no	no	unknown	market, called tua dam "black bean"
19-Nov	2006L13 JP230761	*Vigna unguiculata*	cultivated	Ban Gendon, between Savannakhet and Pakxe	〃	133m	N16-11-25.7	E105-17-21.5	yes	no	no	fine white sand	home garden beside paddy, black seeded
19-Nov	2006L14 JP230762	*Vigna minima*	wild	Ban Gendon, between Savannakhet and Pakxe	〃	133m	N16-11-25.7	E105-17-21.5	yes	yes	no	fine white sand	in a bush beside farmers house, farmer eats young pods.
19-Nov	2006L15 JP230763	*Vigna minima*	wild	Ban Buttapan, N of Khongxedon between Savannakhe and Pakxe	Salavan	158m	N15-41-11.6	E105-46-16.5	yes	yes	no	fine white sand	in a bush beside paddy, called "tua pee". Farmer eat young pods and flowers. Farmer also use grinded green leaves for bamboo soup to make it green color.
20-Nov	2006L16 JP230764	*Vigna unguiculata*	cultivated	Pakxe market	Champasak	100m			yes	no	no	unknown	market, red seeded, bruchid laid eggs



2006L1 *Vigna minima*
Salavan Province



2006L3 *Vigna radiata*
Bolikhamxai Province

2006L6 *Vigna unguiculata*
Khammouane Province

2006L8 *Vigna minima*
Savannakhet Province

2006L9 *Vigna uncuiculata*
Savannakhet Province

2006L11 *Vigna uncuiculata*
Savannakhet market

2006L5 *Vigna minima*, leaflet shape variable at this site, beside paddy, Bolikhamxai Province

2006L7 *Vigna minima*, wet shady place beside paddy, Savannakhet Province

Habitat of *V. minima* (2006L8), at edge of Dipterocarpus forest, Savannakhet Province

Habitat of *V. minima* (2006L15), in a bush beside farmer's house, Salavan Province