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Original Paper

Collaborative Exploration of Vegetable Genetic Resources in Western Cambodia

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Summary

This report describes an exploration of vegetable genetic resources in western Cambodia, jointly conducted by the National Agriculture and Food Research Organization (NARO), Ibaraki Agriculture Center, and the Cambodian Agricultural Research and Development Institute (CARDI). We conducted a field survey in western Cambodia from November 30 to December 6, 2022. The main objectives were collecting accessions of cucumber, melon, and other cucurbitaceous vegetables from the Kampong Chhnang, Pursat, and Battambang provinces in western Cambodia. We collected a total of 36 accessions, including 12 of *Cucumis melo*, 3 of *Cucurbita moschata*, 3 of *Luffa cylindrica*, 2 of *Luffa actangula*, 3 of *Benincasa hispida*, 7 of *Vigna unguiculata* (6 of yard long bean and 1 of cowpea), 3 of *Vigna radiata*, and 1 each of *Solanum melongena*, *Sesamum indicum*, and *Capsicum annuum*. All accessions were collected as seeds and stored in the CARDI Genebank, while a subset was transferred to the Research Center of Genetic Resources from NARO using the standard material transfer agreement.

KEY WORDS: Cambodia, Genetic resources, Cucurbitaceae, Field survey, Vegetable

Introduction

Collecting new plant genetic resources is crucial for developing new crop varieties with desirable traits such as resistance to pests and diseases, high yield, and high quality. To promote the collection of plant genetic resources, The Plant Genetic Resources in Asia (PGRAsia) project was developed in 2014 and funded by the Japanese Ministry of Agriculture, Forestry and Fisheries. Represented by the National Agriculture and Food Research Organization (NARO), the PGRAsia project is conducted at nine universities and eight institutions. Its objectives are exploring, collecting, evaluating, and utilizing plant genetic resources for food and agriculture (PGRFA) in collaboration with four Asian countries as well as developing open databases related to PGRFA for their effective use in Japan. The exploration and collection of plant genetic resources in Asian countries is the research topic of this project.

Cambodia, which is located in Mainland Southeast Asia, is an important center of diverse vegetable genetic

resources, including Cucurbitaceae and Solanaceae plants. Previous explorations of vegetable genetic resources in Cambodia were conducted in the western and northwestern areas in 2014 (Matsunaga *et al.* 2015) and 2018 (Yashiro *et al*. 2019), in the southwestern area in 2022 (Yon *et al*. 2022), and in the northern area in 2016 (Tanaka *et al*. 2017), 2018 (Kondo *et al*. 2019), and 2020 (Ouch *et al*. 2021a). Additionally, explorations were carried out in the southern area in 2017 (Tanaka *et al*. 2019) and 2019 (Sudasinghe *et al*. 2020), in the northeastern area in 2021 (Ouch *et al*. 2021b), and in the eastern area in 2015 (Tanaka *et al*. 2016), 2016 (Tanaka *et al*. 2017), 2017 (Matsushima *et al*. 2018), and 2019 (Kawazu *et al*. 2020). Despite this, some areas remain to be explored. Moreover, landraces have been disappearing at a faster pace each year due to economic development and the spread of developed cultivars in the western area. Therefore, the areas that have not yet been explored in previous reports need to be surveyed.

Here, we report the results of an exploration and collection of vegetables in western Cambodia, mainly comprising cucurbitaceous plants such as melon (*Cucumis melo*), pumpkin (*Cucurbita moschata*), sponge gourd (*Luffa cylindrical*), ridge gourd (*L. actangula*), and wax gourd (*Benincasa hispida*). This survey of vegetable genetic resources in the western province of Cambodia was jointly conducted by the NARO and Ibaraki Agriculture Center from Japan and the Cambodian Agricultural Research and Development Institute (CARDI).

Methods

From November 30 to December 6, 2022, we explored and collected vegetable genetic resources from rural areas in the Kampong Chhnang, Pursat, and Battambang provinces in western Cambodia (Table 1). This exploration was conducted at the very beginning of the dry season, which is the characteristic season when rice is simultaneously planted, headed, and harvested (Figs. 1 and 2).

The genetic resources collected from farmers'

Fig. 1. Rice field and farmhouse in Cambodia.

Fig. 2. Harvested rice drying in the garden.

Table 1. Itinerary of survey in western Cambodia, 2022

Date	Day	Itinerary	Stay
28-Nov	Mon	Narita 11:45 (TG643) - 17:05 Thailand, 18:25 (TG2584) - 19:55 Phnom Penh	Phnom Penh
29-Nov	Tue	Meeting at Cambodian Agricultural Research and Development Institute (CARDI)	Phnom Penh
30-Nov	Wed	Phnom Penh -- Kampong Chhnang (Kampong Chhnang Prov.)	Kampong Chhnang
1-Dec	Thu	Pursat	Pursat
2-Dec	Fri	Pursat	Pursat
3-Dec	Sat	Pursat -- Battambang (Battambang Prov.)	Battambang
4-Dec	Sun	Battambang	Battambang
5-Dec	Mon	Battambang	Battambang
6-Dec	Tue	Battambang -- Phnom Penh	Phnom Penh
7-Dec	Wed	Visit to CARDI, Phnom Penh 20:55 (TG2585) -- 22:00 Thailand, 23:55 -- 7:40 Narita	

houses, cultivation fields, and community seed bank were mainly landraces. Neither fruits nor seeds were collected from markets because most sold vegetables were improved varieties. The latitude, longitude, and altitude of the collection sites were recorded using a Garmin eTrex20xJ GPS (Garmin International Inc., Olathe, KS, USA). During genetic resource collection, we interviewed farmers regarding the local names, cultivation methods (sowing and harvesting season), fruit usage, seed preservation methods, and other information related to cultivation (Fig. 3). All accessions were collected as seeds. As seeds were sometimes stored as a mixture of several crops, we separated them according to each crop and registered them independently as individual seed samples.

Results and Discussion

The field survey was conducted in the lowlands to the west of Tonle Sap Lake, at altitudes ranging 8–35 m above sea level (Table 3). The main road was paved, but most of the branching roads were dirt roads. As it was the beginning of the dry season, some areas were still affected by rains, and the water had not receded in certain roads. We were unable to reach such places and

Fig. 3. Interview survey with farmers.

Fig. 4. Farming villages and fields flooded during the rainy season.

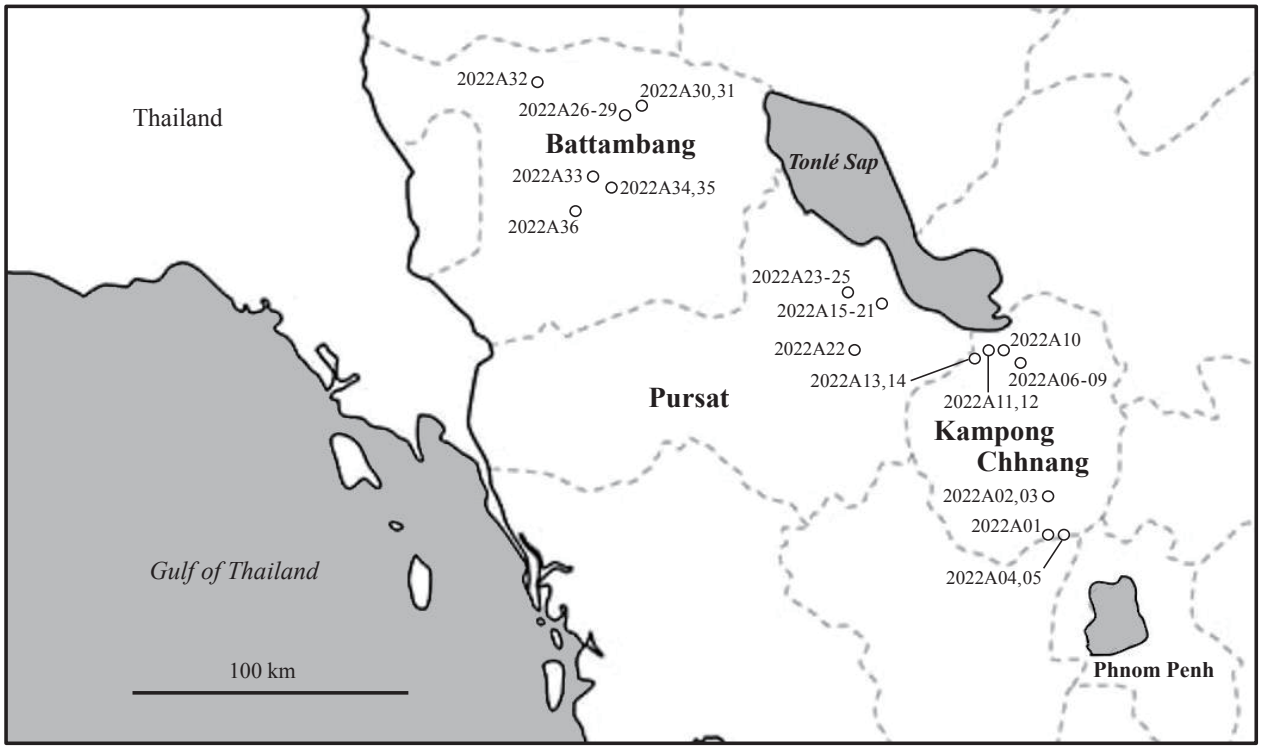

Fig. 5. Collection sites in western Cambodia. Each is indicated by a circle with a corresponding number(s).

had to cross the river to reach some farmhouses on foot (Fig. 4).

During the survey, we collected a total of 36 accessions at 17 sites : 12 of *C. melo* (melon), seven of *V. unguiculata* (six of yard long bean and one of cowpea), three of *C. moschata* (pumpkin), *B. hispida* (wax gourd), *L. cylindrica* (sponge gourd), *V. radiata* (mung bean), two of *L. actangula* (ridge gourd), one of *S. melongena* (eggplant), *S. indicum* (sesame), and *C. annum* (Chili pepper) (Fig. 5 and table 2). All samples were collected as seeds (Table 3 and "photos of collected samples"). Three main uses for seeds were observed: self-use, sale to neighboring farmers, and shared use by community seed bank. In the community seed bank, seeds of various crops, such as melon, sponge gourd, ridge gourd, pumpkin, yard long bean, and cowpea, were stored (Fig. 6). Local farmers stored their seeds in storage cases such as plastic bottles and netted or plastic bags. Sponge and ridge gourds, in particular, were stored in dry fruits. Some farmers further stored seeds of multiple crops and varieties as a mixture (Fig. 7). Vegetable seeds were multiplicated via open pollination.

Table 2. List of collected genetic resources

Plant species	Number of accessions
Cucumis melo	12
Cucurbita moschata	3
Luffa cylindrica	3
Luffa actangula	2
Benincasa hispida	3
Vigna unguiculata	7
Vigna radiata	3
Solanum melongena	1
Sesamum indicum	1
Capsicum annuum	1
Total	36

1) Melon

The twelve accessions of melon were all called "Trosok srov." According to information provided by the farmers, the color of mature fruits is diverse, appearing as yellow, orange, white, pale green, and dark green; additionally, some fruits show green, orange, white, or gray stripes. Fruit length ranges 20‑60 cm, and most farmers sow melon seeds from December to January and harvest fruits from February to March. Many farmers use the mature fruit for salads. We were only able to observe the fruit of a single accession (2022A36), which had powdery textured flesh (Fig. 8) and appeared to be Cucumis melo var. momordica from South Asia (Robinson and Decker-Walters 1997; Dhillon *et al*. 2012).

Fig. 7. Mixed and stored seeds of melon, sponge (or ridge) gourd, and yard long bean.

Fig. 6. Various crop seeds stored in community seed bank.

Fig. 8. Accession 2022A36 (melon) with powdery textured flesh.

2) Pumpkin

All three pumpkins collected were *C. moschata*, locally referred to as "Lpov Sang Khya" or "Lpov Rory." Cucurbitaceous vegetables are often planted with multiple varieties mixed together, and pumpkins were cultivated in the same way. Most farmers use the mature fruit for soup or desert. One farmer cultivated a mixture of *C. moschata* and *C. maxima* (Fig. 9). While *C. moschata* is considered to be a landrace, *C. maxima* is an improved variety for the market. This particular farmer used the two types of pumpkin differentially, with *C. moschata* used to make soups and desserts, while the young shoots of *C. maxima* were fried or used for salads.

3) Sponge gourd and ridge gourd

Of the five *Luffa* genus accessions, three were *L. cylindrica* (sponge gourd) and two were *L. actangula* (ridge gourd). *L. cylindrica* plants were called "Nonong" or "Nonong Tan," whereas *L. actangula* were called "Nonong Troeung" or "Nonong Ornluork." Most farmers use these two gourds to make soup and store their seeds as dry fruits. Based on farmer interviews, these gourds are year-round cultivation crops, which we often observed cultivated in yards or hedges during the survey (Fig. 10).

Fig. 9. Mixture of *Cucurbita moschata* (right side, white leaf vine) and *C. maxima* (left side).

Fig. 10. Sponge (or ridge) gourd cultivated in hedges.

4) Wax gourd

The three accessions of wax gourd were *B. hispida*, locally referred to as "Trolarch" or "Trolarch Srov." Wax gourd and sponge gourd are also cultivated year round to make soup.

The number of melon accessions we collected in western Cambodia was lower than that reported in previous studies, in which 31 (Yashiro *et al*. 2019) or 41 accessions (Matsunaga *et al*. 2015) were collected. In addition, no landraces were found for cucumber during the present survey. Although there have been similar reports for cucumber (Yashiro *et al*. 2019, Matsunaga *et al*. 2015), collecting landraces from farmers in western Cambodia has become more difficult year by year. The reason for this is that farmers buy seeds or fruits of improved variety from the market and use these seeds for subsequent cultivations. Particularly in cucumber, a high tendency exists to cultivate improved varieties; in one village, improved varieties were cultivated in a vast field (Fig. 11). Based on our interviews with farmers, the use of improved varieties is preferred because they are easier to cultivate than landraces. Additionally, consumers also prefer to select improved varieties owing to their small fruits, which are better for cooking, rather than landraces with larger fruits. These factors may contribute to the landraces of cucurbitaceous vegetables being gradually lost.

Other than the Cucurbitaceae family, we collected accessions of 6 yard long beans, 3 mung beans and 1

Fig. 11. Vertically cultivated improved cucumber cultivars in vast field.

cowpea from the Leguminosae family, 1 eggplant and chili pepper from the Solanaceae family, and 1 sesame.

Owing to the construction of paved roads that allow the transport of goods everywhere, Cambodia is developing rapidly. New agricultural varieties and technologies are being introduced, so local farmers are turning to new varieties that are easier to grow and are more consumer-friendly. In the process of variety conversion, the seeds of landraces tend to be discarded without being stored. Therefore, as Cambodia develops, useful landraces are being lost that should be collected as soon as possible. The accessions collected in this study will be evaluated for several agronomic traits such as disease resistance and fruit appearance. If they show useful agronomic traits, we expect to develop new varieties with those useful traits in the near future.

Genetic resources

All seeds of the 36 accessions collected have been stored as genetic resources in the CARDI gene bank. Additionally, subsets have been transferred to the NARO Genebank with JP numbers under the standard material transfer agreement of the International Treaty on Plant Genetic Resources for Food and Agriculture. We plan to multiply the genetic resources and evaluate them in future.

Acknowledgments

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カンボジア西部における野菜遺伝資源の共同探索，2022 年

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和文摘要

カンボジア農業研究開発研究所（CARDI），茨城県農業総合センター生物工学研究所および国立研究開発法人 農業・食品産業技術総合研究機構（農研機構）が連携して，2022 年にカンボジア西部において野菜遺伝資源の探索・収集を実施した．本探索では，2022 年 11 月 30 日から 12 月 6 日にかけて，カンボジア西部の 3 つの州（Kampong Chhnang, Pursat, Battambang）において，合計 36 点の遺伝資源を収集した．その内訳はメロン（*Cucumis melo*）が 12 点，ニホンカボチャ（*Cucurbita moschata*）が 3 点，ヘチマ（*Luffa cylindrica*）が 3 点，トカドヘチマ（*Luffa actangula*）が 2 点，トウガン（*Benincasa hispida*）が 3 点，ジュウロクササゲ（*Vigna unguiculata* cv-gr. Sesquipedalis）が 6 点，リョクトウ（*Vigna radiata*）が 3 点，ナス（*Solanum melongena*），ゴマ（*Sesamum indicum*），トウガラシ（*Capsicum annuum*) , ササゲ（*Vigna unguiculata* cv-gr. Unguiculata）がそれぞれ 1 点であった．収集した遺伝資源の種子の半分は CARDI に保管し，残りの半分は標準材料移転契約（SMTA）に基づいて農研機構遺伝資源研究センターに送付した．

Table 3. List of genetic resources collected in Cambodia duing the 2022 survey

JP. No.	Coll. No.	Coll. date 2022	Species name	Crop name	Local name	Type of sample	Status of sample	Coll. source	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Remarks
288424	2022A01	30-Nov	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek Troeung	seed	landrace	farm store	Kampong Chhnang	Samakki Meanchey	Beng Puos	Rolang	N11-49-07.63	E104-38-50.94	32	Sowing in June, harvesting in July; making salad, soup, stir frying; maintains seeds for several years, but origin unknown.
288425	2022A02	30-Nov	*Vigna radiata*	Mung bean	Sandek Bay	seed	landrace	farm store	Kampong Chhnang	Samakki Meanchey	Thlok Vien	Chhouk	N11-57-09.96	E104-38-59.16	26	Sowing in June, harvesting in August; making cake mix with sticky rice, dessert and drink.
288426	2022A03	30-Nov	*Sesamum indicum*	Sesame	Lngor	seed	landrace	farm store	Kampong Chhnang	Samakki Meanchey	Thlok Vien	Chhouk	N11-57-09.96	E104-38-59.16	26	Sowing in June, harvesting in August; for topping sticky rice.
288427	2022A04	30-Nov	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Kampong Chhnang	Samakki Meanchey	Svay	Kyang Tboung	N11-49-20.38	E104-42-19.00	16	Mature fruit has yellow skin with white line; length 50 - 60 cm; maintains for more than 10 years; sowing from December to January, harvesting in March; making fruit salad.
288428	2022A05	30-Nov	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek Troeung	seed	landrace	farm store	Kampong Chhnang	Samakki Meanchey	Svay	Kyang Tboung	N11-49-20.38	E104-42-19.00	16	The other local name is "Sandek Kour"; year-round cultivation; making salad, soup and stir frying.
288429	2022A06	1-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Kampong Chhnang	Baribour	Koah Ta Mov	Koah Ta Mov	N12-23-06.40	E104-33-11.90	12	Mature fruit has yellow skin with orange line; length 30-40cm; acquired from a neighbor 4-5 years ago; sowing from May to June, harvesting form July to August; making fruit salad.
288430	2022A07	1-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Kampong Chhnang	Baribour	Koah Ta Mov	Koah Ta Mov	N12-23-06.40	E104-33-11.90	12	Mature fruit has white skin with green line; length 40-50 cm, cylindrical shape; sowing from May to June, harvesting from July to August; making fruit salad.
288431	2022A08	1-Dec	*Vigna radiata*	Mung bean	Sandek Bay	seed	landrace	farm store	Kampong Chhnang	Baribour	Koah Ta Mov	Koah Ta Mov	N12-23-06.40	E104-33-11.90	12	Sowing in May, harvesting in June; making cake mix with sticky rice; maintains for about 45 years.
288432	2022A09	1-Dec	*Vigna radiata*	Mung bean	Sandek Bay	seed	landrace	farm store	Kampong Chhnang	Baribour	Koah Ta Mov	Koah Ta Mov	N12-23-06.40	E104-33-11.90	12	Sowing in May, harvesting in June; making cake mix with sticky rice; using sprout; maintains for long time.
288433	2022A10	1-Dec	*Luffa cylindrica*	Sponge gourd	Nornong	seed	landrace	farm store	Kampong Chhnang	Baribour	Khon Rang	Serei	N12-25-19.54	E104-29-20.40	8	Year-round cultivation; making soup.
288434	2022A11	1-Dec	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek Troeung	seed	landrace	farm store	Kampong Chhnang	Baribour	Ponlei	Chrolong Ponlei	N12-25-22.18	E104-26-48.66	13	Year-round cultivation; making salad, soup and stir frying.
288435	2022A12	1-Dec	*Benincasa hispida*	Wax gourd	Trolarch srov	seed	landrace	farm store	Kampong Chhnang	Baribour	Ponlei	Chrolong Ponlei	N12-25-22.18	E104-26-48.66	13	Year-round cultivation; making soup.
288436	2022A13	1-Dec	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek Troeung	seed	landrace	farm store	Kampong Chhnang	Baribour	Pech Changvar	Krang Kakaoh	N12-23-52.49	E104-23-49.50	20	Year-round cultivation; making salad, soup and stir frying.
288437	2022A14	1-Dec	*Benincasa hispida*	Wax gourd	Trolarch srov	seed	landrace	farm store	Kampong Chhnang	Baribour	Pech Changvar	Krang Kakaoh	N12-23-52.49	E104-23-49.50	20	Year-round cultivation; making soup; fruit is bigger than the No. 12; length 50-60 cm; harvesting and using only immature fruit.
288438	2022A15	2-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	From community seed bank; mature fruit has yellow skin with green line; flesh color is yellow or orange; length 30-40 cm; sowing in December, harvesting in February; making fruit salad.

Table 3. (Continued).

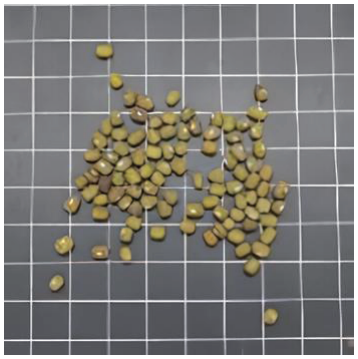
JP. No.	Coll. No.	Coll. date 2022	Species name	Crop name	Local name	Type of sample	Status of sample	Coll. source	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Remarks
288439	2022A16	2-Dec	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek leak	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	from community seed bank; year-round cultivation; the other local name is "Sandek Kour"; fruit color is purple.
288440	2022A17	2-Dec	*Luffa cylindrica*	Sponge gourd	Nonong Tan	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	From community seed bank; year-round cultivation; fruit color is green, seed color is black; fruit texture is relatively firm; fruit have a lower water content than others; making soup and stir frying with meet.
288441	2022A18	2-Dec	*Luffa cylindrica*	Sponge gourd	Nonong	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	From community seed bank; year-round cultivation; fruit color is white or pale green; fruit texture is softer than No. 17; making soup and stir frying with meet.
288442	2022A19	2-Dec	*Luffa actangula*	Ridge gourd	Nonong Ornluork	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	From community seed bank; year-round cultivation; making soup and stir frying with meet.
288443	2022A20	2-Dec	*Cucurbita moschata*	Pumpkin	Lpov Roy	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	From community seed bank; year-round cultivation; making soup and dessert.
288444	2022A21	2-Dec	*Vigna unguiculata* cv-gr. Unguiculata	Cowpea	Sandek Khmao	seed	landrace	farm store	Pursat	Krakor	Kampong Pou	Pou Robang	N12-34-44.97	E104-05-32.11	20	Year-round cultivation; making cake mixed with sticky rice and placed inside a bamboo tube.
288445	2022A22	2-Dec	*Cucurbita moschata*	Pumpkin	Lpov Roy	seed	landrace	farm store	Pursat	Krakor	Orndoung svay	Orndoung svay	N12-25-10.84	E103-59-40.05	35	Fruit size is smaller than others; sowing in November, harvesting in January; making soup and dessert.
288446	2022A23	3-Dec	*Solanum melongena*	Eggplant	Trob Srouy	seed	landrace	farm store	Pursat	Kandieng	Sya	Jaroek	N12-36-44.12	E103-59-20.12	12	Year-round cultivation; making soup and salad.
288447	2022A24	3-Dec	*Luffa actangula*	Ridge gourd	Nonong Trung	seed	landrace	farm store	Pursat	Kandieng	Sya	Jaroek	N12-36-44.12	E103-59-20.12	12	Year-round cultivation; making soup and stir frying with meet.
288448	2022A25	3-Dec	*Capsicum annuum*	Chili pepper	Mates leak	seed	landrace	farm store	Pursat	Kandieng	Sya	Jaroek	N12-36-44.12	E103-59-20.12	12	Year-round cultivation.
288449	2022A26	4-Dec	*Cucurbita moschata*	Pumpkin	Lpou Sang Khya	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Rohal Soung	N13-10-56.88	E103-14-38.01	17	Currently no longer cultivate due to fruit size and thin flesh; sowing from December to January, harvesting from February to March; steam fruit inside with coconut and egg; seeds are selling for USD 1/kg.
288450	2022A27	4-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Rohal Soung	N13-11-01.53	E103-14-41.67	13	Mature fruit has yellow skin with white line; length 20-30 cm; sowing from December to January, harvesting from February to March; making fruit salad, and shake mixed with other plant fruit.
288451	2022A28	4-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Rohal Soung	N13-11-01.53	E103-14-41.67	13	Mature fruit has dark green skin with yellow line; length 25-30 cm; seeds size is small; sowing from December to January, harvesting February to March; making fruit salad, and shake mixed with other plant fruit.
288452	2022A29	4-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Rohal Soung	N13-11-01.53	E103-14-41.67	13	Mature fruit has white skin; sowing from December to January, harvesting February to March; making fruit salad, and shake mixed with other plant fruit.

Table 3. (Continued).

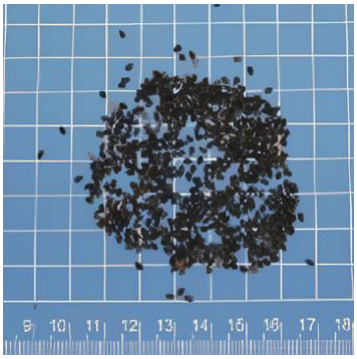
JP. No.	Coll. No.	Coll. date 2022	Species name	Crop name	Local name	Type of sample	Status of sample	Coll. source	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Remarks
288453	2022A30	4-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Prek Trab	N13-12-53.70	E103-17-41.51	13	Mature fruit has pale green skin; length 30-40cm; seeds are keeping from 3 years ago; sowing from December to January, harvesting February to March; making fruit salad, and shake mixed with other plant fruit.
288454	2022A31	4-Dec	*Cucumis melo*	Melon	Trosok srov	seed	landrace	farm store	Battambang	Ek Phnom	Prek Norin	Prek Trab	N13-12-53.70	E103-17-41.51	13	Mature fruit has yellow skin with green line; length 30-40cm; seeds are keeping from 3 years ago; sowing from December to January, harvesting February to March; making fruit salad, and shake mixed with other plant fruit.
288455	2022A32	4-Dec	*Vigna unguiculata* cv-gr. Sesquipedalis	Yard long bean	Sandek Troeung	seed	landrace	farm store	Battambang	Bavel	Khnach Romeas	Balang Loeu	N13-16-29.77	E102-57-10.84	17	GPS data on the road near the collected point; yard long bean; year-round cultivation; making salad, soup and stir frying.
288456	2022A33	5-Dec	*Benincasa hispida*	Wax gourd	Trolarch	seed	landrace	farm store	Battambang	Banan	Chheu Teal	Borboas	N12-58-16.87	E103-08-16.19	25	Sowing from June to July, sowing in September; making soup.
288457	2022A34	5-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Banan	Bay Damram	Prey Totueng	N12-56-53.04	E103-12-05.36	20	Seeds are maintained mixed with No. 35 (One fruit is pale green skin, and the other is green skin with gray line); Length 40-60 cm; seed size is big.
288458	2022A35	5-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Banan	Bay Damram	Prey Totueng	N12-56-53.04	E103-12-05.36	20	Seeds are maintained mixed with No. 35 (One fruit is pale green skin, and the other is green skin with gray line); Length 40-60 cm; seed size is small.
288459	2022A36	5-Dec	*Cucumis melo*	Melon	Trorsork srov	seed	landrace	farm store	Battambang	Banan	Chaeng Mean Chey	Boh Khnor	N12-52-02.88	E103-05-01.51	32	Length 20-30 cm; sowing in December, harvesting in February; making fruit salad.

Photos of collected samples

Sample Photo 1.
JP288424 (2022A01),
Vigna unguiculata cv-gr. Sesquipedalis



Sample Photo 2.
JP288425 (2022A02),
Vigna radiata



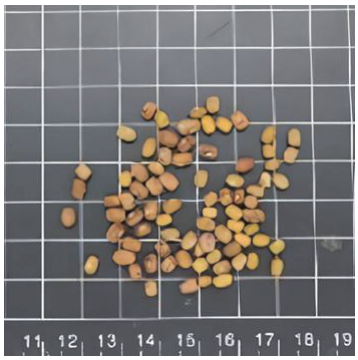
Sample Photo 3.
JP288426 (2022A03),
Sesamum indicum

Sample Photo 4.
JP288427 (2022A04),
Cucumis melo

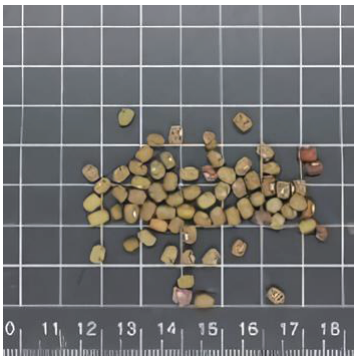
Sample Photo 5.
JP288428 (2022A05),
Vigna unguiculata cv-gr. Sesquipedalis

Sample Photo 6.
JP288429 (2022A06),
Cucumis melo

Sample Photo 7.
JP288430 (2022A07),
Cucumis melo



Sample Photo 8.
JP288431 (2022A08),
Vigna radiata



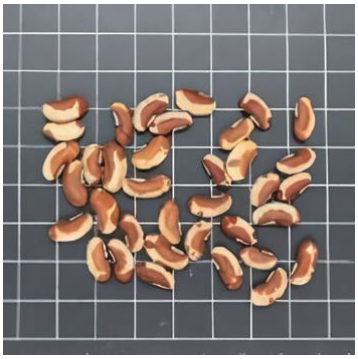
Sample Photo 9.
JP288432 (2022A09),
Vigna radiata

Sample Photo 10.
JP288433 (2022A10),
Luffa cylindrica

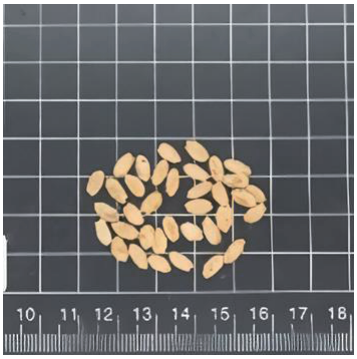
Sample Photo 11.
JP288434 (2022A11),
Vigna unguiculata cv-gr. Sesquipedalis

Sample Photo 12.
JP288435 (2022A12),
Benincasa hispida

Photos of collected samples

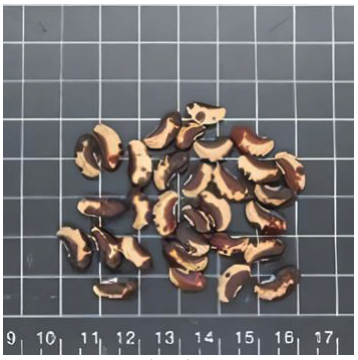


Sample Photo 13.
JP288436 (2022A13),
Vigna unguiculata cv-gr. Sesquipedalis



Sample Photo 14.
JP288437 (2022A14),
Benincasa hispida

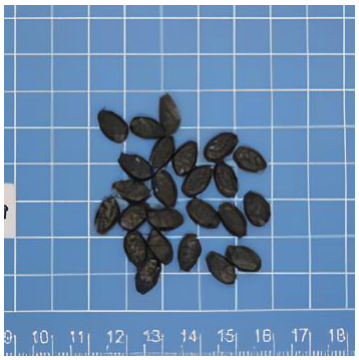
Sample Photo 15.
JP288438 (2022A15),
Cucumis melo



Sample Photo 16.
JP288439 (2022A16),
Vigna unguiculata cv-gr. Sesquipedalis

Sample Photo 17.
JP288440 (2022A17),
Luffa cylindrica

Sample Photo 18.
JP288441 (2022A18),
Luffa cylindrica



Sample Photo 19.
JP288442 (2022A19),
Luffa actangula

Sample Photo 20.
JP288443 (2022A20),
Cucurbita moschata

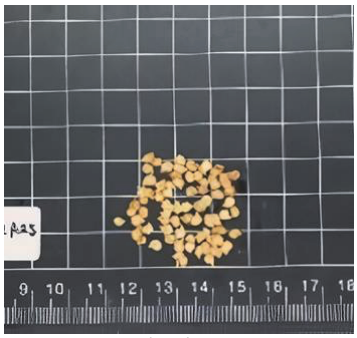
Sample Photo 21.
JP288444 (2022A21),
Vigna unguiculata cv-gr. Unguiculata

Sample Photo 22.
JP288445 (2022A22),
Cucurbita moschata

Sample Photo 23.
JP288446 (2022A23),
Solanum melongena

Sample Photo 24.
JP288447 (2022A24),
Luffa actangula

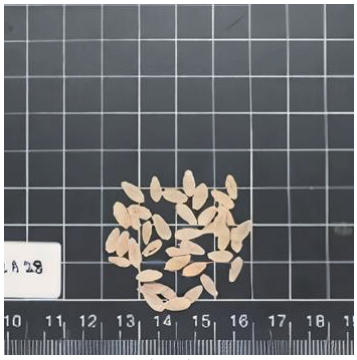
Photos of collected samples



Sample Photo 25.
JP288448 (2022A25),
Capsicum annuum

Sample Photo 26.
JP288449 (2022A26),
Cucurbita moschata

Sample Photo 27.
JP288450 (2022A27),
Cucumis melo



Sample Photo 28.
JP288451 (2022A28),
Cucumis melo

Sample Photo 29.
JP288452 (2022A29),
Cucumis melo

Sample Photo 30.
JP288453 (2022A30).
Cucumis melo

Sample Photo 31.
JP288454 (2022A31),
Cucumis melo

Sample Photo 32.
JP288455 (2022A32),
Vigna unguiculata cv-gr. Sesquipedalis

Sample Photo 33.
JP288456 (2022A33),
Benincasa hispida

Sample Photo 34.
JP288457 (2022A34),
Cucumis melo

Sample Photo 35.
JP288458 (2022A35),
Cucumis melo

Sample Photo 36.
JP288459 (2022A36),
Cucumis melo