

Exploration and Collection of Plant Genetic Resources in Southwestern Cambodia, 2022

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Summary

The Cambodian Agricultural Research and Development Institute (CARDI) conducted an exploration and collection of plant genetic resources in Southwestern Cambodia in 2022 in cooperation with the National Agriculture and Food Research Organization (NARO), Japan. The exploration was conducted within the framework of the Plant Genetic Resources in Asia (PGRAsia) project funded by the Ministry of Agriculture, Forestry, and Fisheries, Japan. The team mainly explored cucurbitaceous vegetables in four provinces of Southwestern Cambodia (Kampot, Kampong Speu, Koh Kong, and Preah Sihanouk) and collected a total of 85 samples, including 22 accessions of pumpkin (*Cucurbita moschata*), 30 of melon (*Cucumis melo*), 5 of cucumber (*Cucumis sativus*), 3 of watermelon (*Citrullus lanatus*), 1 of wax gourd (*Benincasa hispida*), 9 of eggplant (*Solanum melongena*), and 15 of chili pepper (*Capsicum* spp.). The seeds of each sample were divided into two parts: half were conserved in CARDI and the other half were transferred to the Research Center of Genetic Resources, NARO, using the standard material transfer agreement (SMTA).

KEY WORDS: Pumpkin, Melon, Cucumber, Genetic resource, Cambodia

Introduction

It is important to collect new plant genetic resources in order to develop new varieties of crops that have desirable traits, such as resistance to pests or diseases, high quality, and high yield. To promote the collection of plant genetic resources, a new research project, the Plant Genetic Resources in Asia (PGRAsia) project, was started in 2014, and funded by the Ministry of Agriculture, Forestry and Fisheries, Japan. The objective of the project is to collect, characterize, evaluate, and utilize Plant Genetic Resources for Food and Agriculture

(PGRFA) in collaboration between Asian countries and Japan, and to develop open databases related to PGRFA for the effective use thereof. One of the research topics of this project was to explore and collect plant genetic resources in Asian countries.

Cucurbitaceous vegetables were collected in Western and Northwestern Cambodia in 2014 (Matsunaga *et al.* 2015) and 2018 (Yashiro *et al.* 2019), Northern Cambodia in 2016 (Tanaka *et al.* 2017), 2018 (Kondo *et al.* 2019) and 2020 (Ouch *et al.* 2021a), Southern Cambodia in 2017 (Tanaka *et al.* 2019) and 2019

(Sudasinghe *et al.* 2020), Northeastern Cambodia in 2021 (Ouch *et al.* 2021b), and Eastern Cambodia in 2015 (Tanaka *et al.* 2016), 2016 (Tanaka *et al.* 2017), 2017 (Matsushima *et al.* 2018) and 2019 (Kawazu *et al.* 2020). The sites where melon, pumpkin, and cucumber accessions were collected between 2014 and 2019 have been summarized by Kawazu *et al.* (2020). Here, we report the results of our exploration and collection of cucurbitaceous vegetables, such as pumpkin, melon, cucumber, and watermelon, in Southwestern Cambodia. Cambodian scientists and Japanese scientists initially planned to conduct the field exploration together. However, Japanese scientists could not travel abroad due to the COVID-19 pandemic. Therefore, we discussed the details before the exploration by e-mail, and only Cambodian scientists explored and collected the plant genetic resources.

Methods

The collection activities began on January 11, 2022 and lasted for 10 days. The exploration was performed by car using a Toyota Land Cruiser (Table 1). The team travelled from Phnom Penh to Kampot province and spent three days collecting samples in Kampot province. On January 13, the team travelled to Kampong Speu province and spent four days collecting and preparing seeds. On January 17, the team travelled to Koh Kong province and spent two days collecting samples. On January 19, the team travelled to Preah Sihanouk province and spent one day collecting samples. On January 20, the team returned to Phnom Penh and the exploration was concluded (Table 2). During collection, fruit and seed samples of vegetables were collected from farmers in backyards or fields, roadsides, and local

markets. In the case of fruit samples, the team took seeds out of the fruits, washed the seeds with tap water, placed them into nets, and left them to air-dry. Most farmers kept seeds of different vegetables together, and in this case, the team spent time separating the seeds. The passport data of each sample were recorded, including the local vegetable name, vegetable status, sowing season, harvest season, usage, and cultivation methods. The team also recorded the collection sites, including the name of the site, latitude, longitude, and altitude, using Garmin Foretrex 401 (Garmin International Inc., Olathe, KS, USA).

Results and Discussion

We collected 85 samples in total, including 22 accessions of pumpkin (*Cucurbita moschata*), 30 of melon (*Cucumis melo*), 5 of cucumber (*Cucumis sativus*), 3 of watermelon (*Citrullus lanatus*), 1 of wax gourd (*Benincasa hispida*), 9 of eggplant (*Solanum melongena*), and 15 of chili pepper (*Capsicum* spp.) (Table 2). Most of the cucurbitaceous samples that were collected were pumpkins and melons, which is similar to previous reports of sample collection in other regions of Cambodia (Kawazu *et al.* 2020; Ouch *et al.* 2021a, 2021b). Table 3 contains detailed information on all collected samples. The seeds of each sample were equally divided into two parts, one of which was kept by the Cambodian Agricultural Research and Development Institute (CARDI) and the other was transferred to the Research Center of Genetic Resources for the National Agriculture and Food Research Organization (NARO), based on the standard material transfer agreement (SMTA).

Table 1. Itinerary of the exploration and collection of plant genetic resources in Southwestern Cambodia, 2022

Date (month/day)	Day	Itinerary	Stay
1/11	Tue	Phnom Penh - Kampot	Kampot
1/12	Wed	Kampot	Kampot
1/13	Thu	Kampot - Kampong Speu	Kampong Speu
1/14	Fri	Kampong Speu	Kampong Speu
1/15	Sat	Kampong Speu	Kampong Speu
1/16	Sun	Kampong Speu (Seed preparation)	Kampong Speu
1/17	Mon	Kampong Speu - Koh Kong	Koh Kong
1/18	Tue	Koh Kong	Koh Kong
1/19	Wed	Koh Kong - Preah Sihanouk	Preah Sihanouk
1/20	Thu	Preah Sihanouk - Phnom Penh	

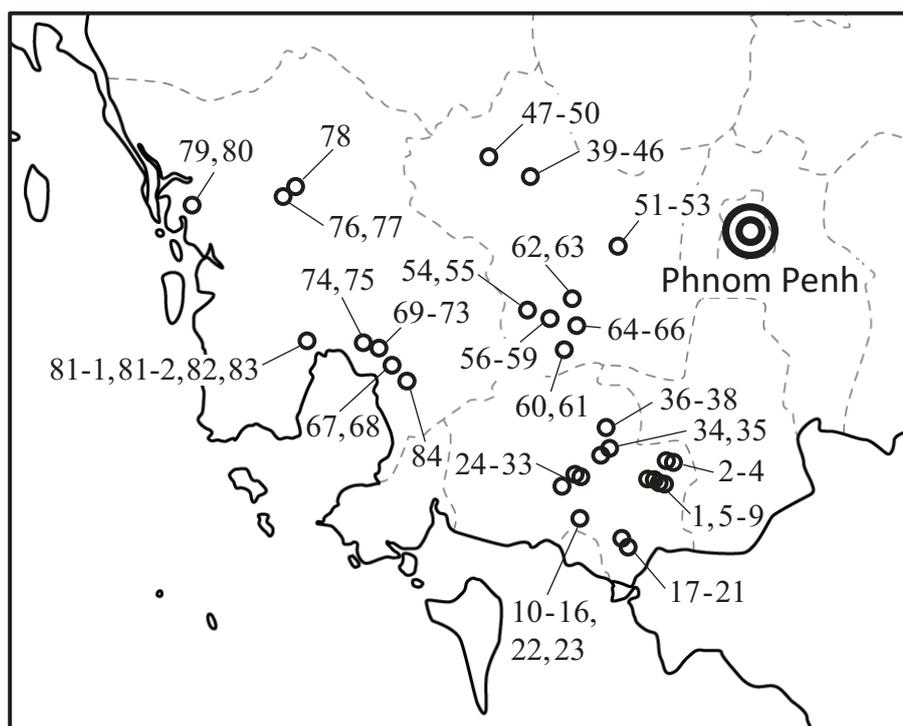


Fig. 1. Sites in Southwestern Cambodia where plant genetic resources were collected (collection numbers 1- 84).

Table 2. A summary of the collected genetic resources in Southwestern Cambodia, 2022

Date	Province	District	Altitude (m)	<i>Cucurbita moschata</i>	<i>Cucumis melo</i>	<i>Cucumis sativus</i>	<i>Citrullus lanatus</i>	<i>Benincasa hispida</i>	<i>Solanum melongena</i>	<i>Capsicum</i> spp.	Total	
1/11	Kampot	Angkorchey	8 - 13	1					1	2	4	
1/11	Kampot	Banteay Meas	3 - 24	1	1	1				2	5	
1/12	Kampot	Teuk Chhuo	9	1	3				1	2	7	
1/12	Kampot	Kampong Trach	7 - 15		2				2	1	5	
1/12	Kampot	Teuk Chhuo	9		1		1				2	
1/13	Kampot	Teuk Chhuo	6	1	1						2	
1/13	Kampot	Dangtong	6 -14	3	2		1			2	8	
1/13	Kampot	Chhuk	4 - 10	1					1		2	
1/13	Kampot	Chum Kiri	7		2					1	3	
1/14	Kampong Speu	Aou Ral	15-106	5	1				3	3	12	
1/14	Kampong Speu	Samrong Torng	6		2	1					3	
1/15	Kampong Speu	Phnom Sruoch	4 - 19	4	6			1	1	1	13	
1/17	Koh Kong	Srae Ambel	6 - 27	2	4	2				1	9	
1/18	Koh Kong	Thma Bang	10 - 21	1	2						3	
1/18	Koh Kong	Khemara Phoumin	19	1	1		1				3	
1/19	Koh Kong	Botum Sakor	5	1	1	1					3	
1/19	Preah Sihanouk	Kampong Seila	40		1						1	
Total					22	30	5	3	1	9	15	85

Pumpkin

All pumpkin samples belonged to *Cucurbita moschata* species (Table 3). Six samples were collected as fruits, and the other 16 samples were collected as seeds. Pumpkins are named according to the shape of the fruit or local farmers. For example, the fruit referred to as ‘Lapov’ (A03, A07, A25, A30, A39, A44, A50, A55, A68, A73, A80, and A82) has a narrow pear shape (Samples A25, A68, A73, and A82). In contrast, the fruit

of ‘Lapov Srae’ (A63), ‘Lapov Thmar’ (A13, A27, and A34), and ‘Lapov Kdam’ (A33) have transverse medium or broad elliptic shapes. The fruit of ‘Lapov Kordarb’ (A64), ‘Lapov Tru’ (A61 and A78), ‘Lapov Doung’ (A41) and ‘Lapov Kiing Kok’ (A48) have medium elliptical shapes with dots (Sample Photos A64 and A78). Pumpkins are generally used as main dishes and can be used to make many types of soup mixed with other vegetables. They can also be used in desserts and

are often steamed and mixed with eggs, coconut milk, and sugar. In addition to the fruits, farmers also use other parts of the pumpkin in their daily menus, such as the younger leaves, male and female flowers, and young top branches. Based on information from farmers and field observations, pumpkins were cultivated by mixing or rotating with other crops, such as taro, lemon, or banana. Pumpkin cultivation begins in the early rainy season, specifically in early May. During cultivation, some pumpkin plants are damaged by lady bugs and hoppers that eat flowers and younger leaves. Farmers usually grow two or three pumpkin plants near their houses to share with their neighbors (Photo 1). In some instances, pumpkins are cultivated in large fields along roads, which is convenient for sale, as shown in Photo 2.

Melon

The team collected 30 melon samples in Kampot (12 samples), Kampong Speu (nine samples), Koh Kong (eight samples), and Preah Sihanouk (one sample). Six of these were collected as fruits and the others as seeds. The local names are ‘Trarsork Srav,’ ‘Trarsork Pa'em,’ and ‘Trarsork Pa'ork.’ The fruit weight ranged from 1.0 kg to 3.0 kg, and all of the melon fruits were vertically oblong in shape (Sample Photos A09, A21, A24, A69, A70 and A72). The skin color of the melon fruits was green

or yellow, with a stripe. During the survey, we found that some farmers cultivated melons or other vegetable plants in durian fields (Photos 3 and 4). A lady (a farmer in Photo 3) said that she took melon seeds from fruits and kept them for many years; however, the first melon fruits or seeds were bought from a market or introduced by her siblings or neighbors. Additionally, melon seeds were mixed with other vegetable seeds (Photo 5). Some farmers obtained melon seeds from fruits after they had been eaten, as shown in Photo 6. The seeds were cleaned and dried and stored in plastic bags for the next



Photo 1. Pumpkin plants near a farmer's house.



Photo 2. A pumpkin field near the road side.



Photo 3. Vegetables cultivated in a durian field.



Photo 4. Melon plants between durian trees.



Photo 5. Melon seeds with other vegetable seeds.



Photo 6. Melon seeds, which the farmers collected after they had eaten the melon.

cultivation season. Farmers applied chemical fertilizers and pesticides for melon cultivation in the field.

Cucumber

We collected five cucumber samples (one in Kampot, one in Kampong Speu, and three in Koh Kong). Two of them were collected as fruits, and the others as seeds. The local names are ‘Trarsork Pa'ork,’ ‘Trasork,’ or ‘Trarsork Treung.’ The fruits (A67 and A83) were collected directly from the farmers’ fields. The farmers said that they bought A52, A74, and A83 seeds from markets and that they were improved varieties. The seeds of A05 and A67 were introduced from another province and were distanced from their area.

Watermelon

We collected three samples of watermelon seeds (A22 and A31 in Kampot, and A81-2 in Koh Kong). The local name is ‘Ov Leuk.’ According to interviews with farmers, fruits from A22 and A31 were oblong with dark green skin, and were improved varieties sold in markets. A81-2 seeds were mixed with A81-1 (melon seeds) when collected from a farmer; thus, we separated these two species.

Wax gourd

At Kampong Speu, a wax gourd sample was collected in the form of seeds. Seeds were obtained from bulked fruits that were oblong with gray skin. The local name is ‘Trar Lach.’ The seeds were maintained for a long period of time.

Eggplant

The team collected nine eggplant samples (five from Kampot and four from Kampong Speu) over the course of the exploration. Three of them were collected

as fruits, and the others as seeds. Similarly to the pumpkin, the local name of the eggplant varies and is dependent on its shape. The fruit shape of ‘Trab Sor Vaeng’ (A01), ‘Trab’ (A12 and A20) and ‘Trab Vaeng’ (A18) is oblong (Sample Photos A12 and A20), while the shapes of ‘Trab Srouy (Sor)’ (A43), ‘Trab Srouy (Kheiv)’ (A45), ‘Trab Kram Meas’ (A49) and ‘Trabsrouy’ (A57) were round (Sample Photo A43). Based on information from farmers, most eggplant seeds are passed on from generation to generation. As shown in Sample Photo A49, some farmers cut eggplant fruits and dry them near fireplaces or kitchens. Cambodian people use eggplants to make many types of soups and salads.

Chili pepper

We collected 15 chili pepper samples (10 from Kampot, four from Kampong Speu, and one from Koh Kong). Eight of them were collected as seeds, and the others as fruits. Locally, they are referred to as ‘M'tes Achsart,’ ‘M'tes Sor,’ ‘M'tes Dei Neang,’ ‘M'tes’ or ‘M'tes Dei Neang.’

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カンボジア南西部における 植物遺伝資源の探索・収集，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) と国立研究開発法人 農業・食品産業技術総合研究機構 (農研機構) が連携して、2022年にカンボジア南西部において植物遺伝資源の探索・収集を実施した。この探索は、農林水産省委託プロジェクト研究「海外植物遺伝資源の民間等への提供促進」(PGRAsia プロジェクト) の予算により実施した。本探索ではカンボジア南西部の4つの州 (Kampot, Kampong Speu, Koh Kong, Preah Sihanouk) において、合計85点の遺伝資源を収集した。その内訳はニホンカボチャ (*Cucurbita moschata*) が22点、メロン (*Cucumis melo*) が30点、キュウリ (*C. sativus*) が5点、スイカ (*Citrullus lanatus*) が3点、トウガン (*Benincasa hispida*) が1点、ナス (*Solanum melongena*) が9点、トウガラシ (*Capsicum* spp.) が15点である。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. Passport data of genetic resources collected in Southwestern Cambodia, 2022

JP No.	Coll. No.	Crop Name	Species	Province	District	Commune	Village	North Latitude	East Longitude	Altitude (m)	Sample Type	Collection Source	Local Name	Remarks
285964	2021A-01	Eggplant	<i>Solanum melongena</i>	Kampot	Angkorchey	Brar Phnom	Reussey dom	10-43-54	104-35-36	12	Seed	Farmer's storage	Trab Sor Vaeng	Fruit: Oblong with white skin for immature and yellow for mature fruit
285965	2021A-02	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Angkorchey	Angkorchey	Preychherteal	10-49-5.93	104-38-50.59	8	Fruit	Farmer's field	M'tes Achsart	Fruit from sigle plant, fruit with green skin for immature and red for mature fruit
285966	2021A-03	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Angkorchey	Angkorchey	Preychherteal	10-49-6.8	104-38-18.53	13	Seed	Farmer's storage	Lapov	Seed from bulked fruits with green stripes and orange skin color
285967	2021A-04	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Angkorchey	Angkorchey	Preychherteal	10-49-6.8	104-38-18.53	13	Fruit	Farmer's field	M'tes Sor	Bulk fruits from single plant with white skin for immature and orange for mature fruit
285968	2021A-05	Cucumber	<i>Cucumis sativus</i>	Kampot	Banteay Meas	Samroang Leu	Bariveas	10-44-10.7	104-34-43	12	Seed	Farmer's storage	Trarsork Pa'ork	Fruit: Oblong with green skin for immature and dark green for mature fruit
285969	2021A-06	Chili pepper	<i>Capsicum</i> sp.	Kampot	Banteay Meas	Samroang Leu	Bariveas	10-44-10.7	104-34-43	12	Seed	Farmer's	M'tes Sor	Fruits with white skin for immature and orange for mature fruit
285970	2021A-07	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Banteay Meas	Samroang Leu	Bariveas	10-44-37.3	104-34-00.7	3	Seed	Farmer's storage	Lapov	Seeds from bulked fruits
285971	2021A-08	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Banteay Meas	Samroang Leu	Bariveas	10-44-34	104-33-41	24	Fruit	Farmer's field	M'tes Sor	Fruits from single plant with white skin for immature and orange for mature fruit
285972	2021A-09	Melon	<i>Cucumis melo</i>	Kampot	Banteay Meas	Samroang Leu	Bariveas	10-44-00	104-35-30.1	11	Fruit	Market	Trarsork Srav	Fruit : 3 kg, yellow skin, oblong
285973	2021A-10	Melon	<i>Cucumis melo</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Trarsork Srav	Fruit: 1-3 kg, yellow skin, oblong
285974	2021A-11	Chili pepper	<i>Capsicum</i> sp.	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	M'tes Dei Neang	Seeds from bulked fruits
285975	2021A-12	Eggplant	<i>Solanum melongena</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Trab	
285976	2021A-13	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Lapov Thmar	Seeds from bulked fruits
285977	2021A-14	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Fruit	Farmer's field	M'tes Sor	Fruit: green skin for immature and orange for mature fruit
285978	2021A-15	Melon	<i>Cucumis melo</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Trarsork Srav	
285979	2021A-16	Melon	<i>Cucumis melo</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Trarsork Srav	
285980	2021A-17	Chili pepper	<i>Capsicum</i> sp.	Kampot	Kampong Trach	Beung Sala Kangchheurng	Dasskour	10-31-39.67	104-29-19.34	7	Seed	Farmer's storage	M'tes Sor	Fruit: white skin for immature and orange/red for mature fruit
285981	2021A-18	Eggplant	<i>Solanum melongena</i>	Kampot	Kampong Trach	Beung Sala Kangchheurng	Dasskour	10-31-39.67	104-29-19.34	7	Seed	Farmer's storage	Trab Vaeng	Fruits have two skin colors: purple and white
285982	2021A-19	Melon	<i>Cucumis melo</i>	Kampot	Kampong Trach	Beung Sala Kangchheurng	Dasskour	10-31-39.67	104-29-19.34	7	Seed	Farmer's storage	Trarsork Srav	Fruit: yellow skin, oblong
285983	2021A-20	Eggplant	<i>Solanum melongena</i>	Kampot	Kampong Trach	Beung Sala Kangchheurng	Dasskour	10-31-39.67	104-29-19.34	7	Fruit	Farmer's field	Trab	Fruit: yellow skin, oblong
285984	2021A-21	Melon	<i>Cucumis melo</i>	Kampot	Kampong Trach	Kampong Trach	Kampong Trach	10-33-30.31	104-28-3.87	15	Fruit	Market	Trarsork Srav	Fruit weight: 2 kg
285985	2021A-22	Watermelon	<i>Citrullus lanatus</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Ov Leuk	Fruit: round shape with green stripes, around 1-2 kg/fruit

Table 3. (Continued).

JP No.	Coll. No.	Crop Name	Species	Province	District	Commune	Village	North Latitude	East Longitude	Altitude (m)	Sample Type	Collection Source	Local Name	Remarks
285986	2021A-23	Melon	<i>Cucumis melo</i>	Kampot	Teuk Chhuo	Konsat	Konsat	10-35-53	104-20-42	9	Seed	Farmer's storage	Trarsork Srav	Oblong with yellow skin for mature fruit, around 1.5-2.5 kg/fruit
285987	2021A-24	Melon	<i>Cucumis melo</i>	Kampot	Teuk Chhuo	Prey Khnorng	Tvea Thmey	10-42-56.7	104-18-24.33	6	Fruit	Market	Trarsork Srav	Fruit: Oblong, yellow skin with 1.2 kg
285988	2021A-25	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Teuk Chhuo	Prey Khnorng	Tvea Thmey	10-42-56.7	104-18-24.33	6	Fruit	Market	Lapov	Fruit with 0.8 kg
285989	2021A-26	Melon	<i>Cucumis melo</i>	Kampot	Dangtong	La'ang	La'ang	10-44-26.03	104-20-33.55	14	Seed	Farmer's storage	Trarsork Srav	Bulked seeds from mature fruits with yellow or green skin
285990	2021A-27	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Dangtong	La'ang	La'ang	10-44-26.03	104-20-33.55	14	Seed	Farmer's storage	Lapov Thmar	
285991	2021A-28	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Dangtong	La'ang	La'ang	10-44-26.03	104-20-33.55	14	Seed	Farmer's storage	M'tes Achsart	Small fruit
285992	2021A-29	Chili pepper	<i>Capsicum annum</i>	Kampot	Dangtong	La'ang	La'ang	10-44-26.03	104-20-33.55	14	Seed	Farmer's storage	M'tes Dei Neang	
285993	2021A-30	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Dangtong	La'ang	Beurn	10-43-37.21	104-21-23.36	8	Seed	Farmer's storage	Lapov	Seeds from a small fruit with yellow skin
285994	2021A-31	Watermelon	<i>Citrullus lanatus</i>	Kampot	Dangtong	La'ang	Beurn	10-43-37.21	104-21-23.36	8	Seed	Farmer's storage	Ov Leuk	Seeds from bulked fruits
285995	2021A-32	Melon	<i>Cucumis melo</i>	Kampot	Dangtong	La'ang	Beurn	10-43-40.53	104-21-42.73	6	Seed	Farmer's storage	Trarsork Srav	Bulked seeds from mature fruits with yellow or green skin
285996	2021A-33	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Dangtong	La'ang	Beurn	10-43-40.53	104-21-42.73	6	Seed	Farmer's storage	Lapov Kdam	Seeds from a small fruit with yellow skin
285997	2021A-34	Pumpkin	<i>Cucurbita moschata</i>	Kampot	Chhuk	Beung Nimol	Beong	10-47-20.28	104-25-1.0	10	Seed	Farmer's storage	Lapov Thmar	Seeds from a small fruit with yellow skin
285998	2021A-35	Eggplant	<i>Solanum melongena</i>	Kampot	Chhuk	Sat Pornng	Trarpang Andoung	10-48-52.87	104-26-42.5	4	Fruit	Farmer's field	Trorb	5 fruits from 3 plants
285999	2021A-36	Melon	<i>Cucumis melo</i>	Kampot	Chum Kiri	Trarpang Rang	Damrei Kon	10-54-22.3	104-26-3.32	7	Seed	Farmer's storage	Trarsork Srav	Bulked seeds from mature fruits with yellow or green skin
286000	2021A-37	Melon	<i>Cucumis melo</i>	Kampot	Chum Kiri	Trarpang Rang	Damrei Kon	10-54-22.3	104-26-3.32	7	Seed	Farmer's storage	Trarsork Pa'em	Seeds from round fruits with yellow or orange skin
286001	2021A-38	Chili pepper	<i>Capsicum frutescens</i>	Kampot	Chum Kiri	Trarpang Rang	Damrei Kon	10-54-22.3	104-26-3.32	7	Seed	Farmer's storage	M'tes Sor	Seeds from bulked fruits from different plants
286002	2021A-39	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-24.92	104-11-12.27	5	Seed	Farmer's storage	Lapov	Bulked seeds from narrow pear shaped fruits
286003	2021A-40	Chili pepper	<i>Capsicum</i> sp.	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-24.92	104-11-12.27	5	Seed	Farmer's storage	Sandaek Thgnon	Seeds from fruits with purple skin
286004	2021A-41	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Seed	Farmer's storage	Lapov Doung	
286005	2021A-42	Chili pepper	<i>Capsicum frutescens</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Seed	Farmer's storage	M'tes Achsart	Seeds from fruits of a single plant with green skin for immature and red for mature fruit
286006	2021A-43	Eggplant	<i>Solanum melongena</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Fruit	Farmer's field	Trab Srouy (Sor)	Fruit: round shape with yellow skin for mature fruit
286007	2021A-44	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Seed	Farmer's storage	Lapov	Seeds from a fruit with around 4 kg

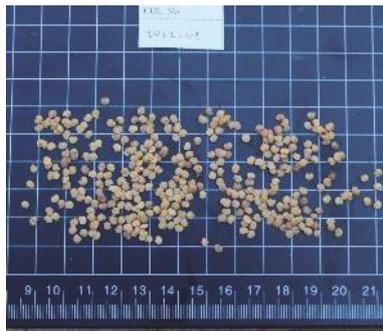
Table 3. (Continued).

JP No.	Coll. No.	Crop Name	Species	Province	District	Commune	Village	North Latitude	East Longitude	Altitude (m)	Sample Type	Collection Source	Local Name	Remarks
286008	2021A-45	Eggplant	<i>Solanum melongena</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Seed	Farmer's storage	Trab Srouy (Kheiv)	Seeds from a single fruit
286009	2021A-46	Chili pepper	<i>Capsicum frutescens</i>	Kampong Speu	Aou Ral	Sangkaer Srartab	Trarpang Korg	11-40-20.43	104-11-44.05	15	Fruit	Farmer's field	M'tes	
286010	2021A-47	Melon	<i>Cucumis melo</i>	Kampong Speu	Aou Ral	Trarpang Chou	Pot Thea	11-44-49.0	104-3-00.4	106	Seed	Farmer's storage	Trarsork Srav	Seeds from fruits with yellow skin and green stripes with oblong shape
286011	2021A-48	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Aou Ral	Trarpang Chou	Pot Thea	11-44-49.0	104-3-00.4	106	Seed	Farmer's storage	Lapov Kiing Kok	
286012	2021A-49	Eggplant	<i>Solanum melongena</i>	Kampong Speu	Aou Ral	Trarpang Chou	Pot Thea	11-44-49.0	104-3-00.4	106	Seed	Farmer's storage	Trab Kram Meas	Seeds from fruits with yellow skin
286013	2021A-50	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Aou Ral	Trarpang Chou	Pot Thea	11-44-49.0	104-3-00.4	106	Seed	Farmer's storage	Lapov	
286014	2021A-51	Melon	<i>Cucumis melo</i>	Kampong Speu	Samrong Torng	Tong Krang	Ek Pheap	11-30-46.52	104-27-45.52	6	Seed	Farmer's storage	Trarsork Srav	Seeds from fruits with yellow skin with oblong shape
286015	2021A-52	Cucumber	<i>Cucumis sativus</i>	Kampong Speu	Samrong Torng	Tong Krang	Ek Pheap	11-30-46.52	104-27-45.72	6	Seed	Farmer's storage	Trasork	Seeds from fruits with green skin for immature and orange for mature fruit, 0.4-0.8 kg/fruit
286016	2021A-53	Melon	<i>Cucumis melo</i>	Kampong Speu	Samrong Torng	Tong Krang	Ek Pheap	11-30-46.52	104-27-45.72	6	Seed	Farmer's storage	Trarsork Pa'ork	Seeds from fruits with green skin and dark green stripes for immature fruits
286017	2021A-54	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Veal Veng	11-17-16.7	104-10-7.5	4	Seed	Farmer's storage	Trarsork Srav	Fruit weight around 1.5-2.5 kg, oblong with orange skin and green stripes
286018	2021A-55	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Veal Veng	11-17-16.7	104-10-7.5	4	Seed	Farmer's field	Lapov	Fruit: 0.7 kg
286019	2021A-56	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Phum II	11-16-13.47	104-13-54.33	9	Seed	Farmer's storage	Trarsork Srav	Seeds from bulked fruits
286020	2021A-57	Eggplant	<i>Solanum melongena</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Phum II	11-16-13.47	104-13-54.33	9	Seed	Farmer's storage	Trabsrouy	Seeds from bulked fruits
286021	2021A-58	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Phum II	11-16-13.47	104-13-54.33	9	Seed	Farmer's storage	Trarsork Srav	Seeds from bulked fruits, oblong with yellow skin in mature fruit, and 1-2 kg/fruit
286022	2021A-59	Wax gourd	<i>Benincasa hispida</i>	Kampong Speu	Phnom Sruoch	Traeng Traueng	Phum II	11-16-13.47	104-13-54.33	9	Seed	Farmer's storage	Trar Lach	Seeds from bulked fruits, oblong with gray skin for mature fruit, and 1-2 kg/fruit
286023	2021A-60	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Ou	Koma Pet	11-9-1.76	104-17-32.72	19	Seed	Farmer's storage	Trarsork Srav	Seeds from bulked fruits, oblong with yellow skin for mature fruit, and 1-2 kg/fruit
286024	2021A-61	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Phnom Sruoch	Ou	Koma Pet	11-9-1.76	104-17-32.72	19	Seed	Farmer's storage	Lapov Tru	Seeds from bulked fruits, narrow pear shaped with orange skin for mature, and around 1 kg/fruit
286025	2021A-62	Chili pepper	<i>Capsicum frutescens</i>	Kampong Speu	Phnom Sruoch	Ou	Salat Thmey	11-20-45.82	104-18-48.72	8	Fruit	Farmer's field	M'tes	Fruit with white skin for immature and red for mature fruit
286026	2021A-63	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Phnom Sruoch	Ou	Salat Thmey	11-20-45.82	104-18-48.72	8	Seed	Farmer's storage	Lapov Srae	Seeds from bulked fruits, transverse broad elliptic shape with orange skin for mature fruit
286027	2021A-64	Pumpkin	<i>Cucurbita moschata</i>	Kampong Speu	Phnom Sruoch	Dambouk Rung	Teuk Thla	11-14-4.86	104-19-21.34	10	Fruit	Farmer's field	Lapov Kordarb	Fruit with orange skin and 1 kg weight
286028	2021A-65	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Dambouk Rung	Teuk Thla	11-14-4.86	104-19-21.34	10	Seed	Farmer's storage	Trasork Srav	Seeds from bulked fruits with oblong and orange skin for mature fruit
286029	2021A-66	Melon	<i>Cucumis melo</i>	Kampong Speu	Phnom Sruoch	Dambouk Rung	Teuk Thla	11-14-4.86	104-19-21.34	10	Seed	Farmer's storage	Trasork Srav	Seeds from bulked fruits with green stripes and orange skin

Table 3. (Continued).

JP No.	Coll. No.	Crop Name	Species	Province	District	Commune	Village	North Latitude	East Longitude	Altitude (m)	Sample Type	Collection Source	Local Name	Remarks
286030	2021A-67	Cucumber	<i>Cucumis sativus</i>	Koh Kong	Srae Ambel	Beung Preav	Beung Preav	11-05-31.1	103-46-38.8	27	Fruit	Farmer's field	Trarsork Pa'ork	Green fruit with white stripes for immature and orange with white stripes for mature fruit
286031	2021A-68	Pumpkin	<i>Cucurbita moschata</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-4-55.58	103-46-21-03	11	Fruit	Farmer's field	Lapov	Fruit with transverse broad elliptic shape with orange skin for mature fruit
286032	2021A-69	Melon	<i>Cucumis melo</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-9-5.99	103-43-52.54	14	Fruit	Market	Trarsork Srav	Oblong fruit
286033	2021A-70	Melon	<i>Cucumis melo</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-9-5.99	103-43-52.54	14	Fruit	Market	Trarsork Srav	
286034	2021A-71	Chili pepper	<i>Capsicum chinense</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-9-5.99	103-43-52.54	14	Fruit	Market	M'tes Achsart	
286035	2021A-72	Melon	<i>Cucumis melo</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-9-5.99	103-43-52.54	14	Fruit	Market	Trarsork Srav	
286036	2021A-73	Pumpkin	<i>Cucurbita moschata</i>	Koh Kong	Srae Ambel	Beung Preav	Chhroy	11-9-5.99	103-43-52.54	14	Fruit	Market	Lapov	Fruit: narrow pear shaped with orange skin for mature fruit, around 1 kg/fruit
286037	2021A-74	Cucumber	<i>Cucumis sativus</i>	Koh Kong	Srae Ambel	Chi Kho Leu	Chi Kho Leu	11-10-13.27	103-41-13.79	6	Seed	Farmer's storage	Trarsork Treung	Seeds from green fruits with white stripes for immature and orange with white stripes for mature fruit
286038	2021A-75	Melon	<i>Cucumis melo</i>	Koh Kong	Srae Ambel	Chi Kho Leu	Chi Kho Leu	11-10-13.27	103-41-13.79	6	Seed	Farmer's storage	Trarsork Srav	Seeds from green fruits with white stripes for immature and orange with white stripes for mature fruit
286039	2021A-76	Melon	<i>Cucumis melo</i>	Koh Kong	Thma Bang	Russei Chrum	Kiri Chrum	11-38-48.2	103-23-47.36	10	Seed	Farmer's storage	Trarsork Srav	Seeds from green fruits with white stripes for mature fruit, and 2-3 kg/fruit
286040	2021A-77	Melon	<i>Cucumis melo</i>	Koh Kong	Thma Bang	Russei Chrum	Kiri Chrum	11-38-48.2	103-23-47.36	10	Seed	Farmer's storage	Trarsork Srav	Seeds from green fruits with white stripes for mature fruit, and 1-2 kg/fruit
286041	2021A-78	Pumpkin	<i>Cucurbita moschata</i>	Koh Kong	Thma Bang	Russei Chrum	Kiri Chrum	11-41-15.5	103-26-24.6	21	Fruit	Farmer's field	Lapov Tru	Fruit: narrow pear shaped and orange skin with green stripes
286042	2021A-79	Melon	<i>Cucumis melo</i>	Koh Kong	Khemara Phoumin	Smach Meanchey	Toul Koki	11-35-47.3	103-03-48.5	19	Seed	Farmer's storage	Trarsork Srav	Seeds from bulked fruits with green skin for immature and orange for mature fruit
286043	2021A-80	Pumpkin	<i>Cucurbita moschata</i>	Koh Kong	Khemara Phoumin	Smach Meanchey	Toul Koki	11-35-47.3	103-03-48.5	19	Seed	Farmer's storage	Lapov	Seeds from bulked fruits with transverse broad elliptic shape with orange skin for mature fruit
286044	2021 A-81-1	Melon	<i>Cucumis melo</i>	Koh Kong	Botum Sakor	Andong Teuk	Tapao	11-10-52.92	103-27-19.56	8	Seed	Farmer's storage	Trarsork Srav	Seeds from oblong fruits with orange skin for mature fruit
286452	202 A-81-2	Watermelon	<i>Citrullus lanatus</i>	Koh Kong	Botum Sakor	Andong Teuk	Tapao	11-10-52.92	103-27-19.56	8	Seed	Farmer's storage	Ov Leuk	The seeds of A81-2 had been mixed with A81-1 when we collected them from a farmer.
286045	2021A-82	Pumpkin	<i>Cucurbita moschata</i>	Koh Kong	Botum Sakor	Andong Teuk	Tapao	11-10-52.92	103-27-19.56	8	Fruit	Farmer's field	Lapov	Fruit from a plant, green skin for immature and orange for mature fruit
286046	2021A-83	Cucumber	<i>Cucumis sativus</i>	Koh Kong	Botum Sakor	Andong Teuk	Tapao	11-10-52.92	103-27-19.56	8	Fruit	Farmer's field	Trarsork Treung	Fruit from a plant, green skin for immature fruit
286047	2021A-84	Melon	<i>Cucumis melo</i>	Preah Sihanouk	Kampong Seila	Kampong Seila	Dei Kroham	11-2-51.55	103-49-23.05	40	Seed	Farmer's storage	Trarsork Srav	Seeds from bulked fruits with green skin for immature and yellow for mature fruit

Photos of collected samples



Sample Photo A01.
JP285964,
Solanum melongena



Sample Photo A02.
JP285965,
Capsicum frutescens



Sample Photo A03.
JP285966,
Cucurbita moschata



Sample Photo A04.
JP285967,
Capsicum frutescens



Sample Photo A05.
JP285968,
Cucumis sativus



Sample Photo A06.
JP285969,
Capsicum sp.



Sample Photo A07.
JP285970,
Cucurbita moschata



Sample Photo A08.
JP285971,
Capsicum frutescens



Sample Photo A09.
JP285972,
Cucumis melo



Sample Photo A10.
JP285973,
Cucumis melo



Sample Photo A11.
JP285974,
Capsicum sp.



Sample Photo A12.
JP285975,
Solanum melongena



Sample Photo A13.
JP285976,
Cucurbita moschata



Sample Photo A14.
JP285977,
Capsicum frutescens



Sample Photo A15.
JP285978,
Cucumis melo



Sample Photo A16.
JP285979,
Cucumis melo



Sample Photo A17.
JP285980,
Capsicum sp.



Sample Photo A18.
JP285981,
Solanum melongena



Sample Photo A19.
JP285982,
Cucumis melo



Sample Photo A20.
JP285983,
Solanum melongena



Sample Photo A21.
JP285984,
Cucumis melo



Sample Photo A22.
JP285985,
Citrullus lanatus



Sample Photo A23.
JP285986,
Cucumis melo



Sample Photo A24.
JP285987,
Cucumis melo



Sample Photo A25.
JP285988,
Cucurbita moschata



Sample Photo A26.
JP285989,
Cucumis melo



Sample Photo A27.
JP285990,
Cucurbita moschata



Sample Photo A28.
JP285991,
Capsicum frutescens



Sample Photo A29.
JP285992,
Capsicum annuum



Sample Photo A30.
JP285993,
Cucurbita moschata



Sample Photo A31.
JP285994,
Citrullus lanatus



Sample Photo A32.
JP285995,
Cucumis melo



Sample Photo A33.
JP285996,
Cucurbita moschata



Sample Photo A34.
JP285997,
Cucurbita moschata



Sample Photo A35.
JP285998,
Solanum melongena



Sample Photo A36.
JP285999,
Cucumis melo



Sample Photo A37.
JP286000,
Cucumis melo



Sample Photo A38.
JP286001,
Capsicum frutescens



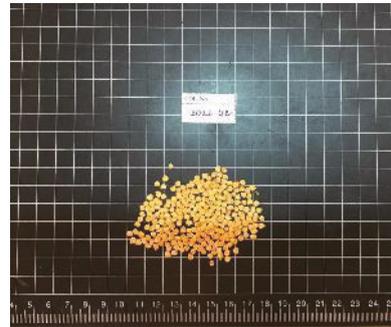
Sample Photo A39.
JP286002,
Cucurbita moschata



Sample Photo A40.
JP286003,
Capsicum sp.



Sample Photo A41.
JP286004,
Cucurbita moschata



Sample Photo A42.
JP286005,
Capsicum frutescens



Sample Photo A43.
JP286006,
Solanum melongena



Sample Photo A44.
JP286007,
Cucurbita moschata



Sample Photo A45.
JP286008,
Solanum melongena



Sample Photo A46.
JP286009,
Capsicum frutescens



Sample Photo A47.
JP286010,
Cucumis melo



Sample Photo A48.
JP286011,
Cucurbita moschata



Sample Photo A49.
JP286012,
Solanum melongena



Sample Photo A50.
JP286013,
Cucurbita moschata



Sample Photo A51.
JP286014,
Cucumis melo



Sample Photo A52.
JP286015,
Cucumis sativus



Sample Photo A53.
JP286016,
Cucumis melo



Sample Photo A54.
JP286017,
Cucumis melo



Sample Photo A55.
JP286018,
Cucurbita moschata



Sample Photo A56.
JP286019,
Cucumis melo



Sample Photo A57
JP286020,
Solanum melongena



Sample Photo A58.
P286021,
Cucumis melo



Sample Photo A59.
JP286022,
Benincasa hispida



Sample Photo A60.
JP286023,
Cucumis melo



Sample Photo A61.
JP286024,
Cucurbita moschata



Sample Photo A62.
JP286025,
Capsicum frutescens



Sample Photo A63.
JP286026,
Cucurbita moschata



Sample Photo A64.
JP286027,
Cucurbita moschata



Sample Photo A65.
JP286028,
Cucumis melo



Sample Photo A66.
JP286029,
Cucumis melo



Sample Photo A67.
JP286030,
Cucumis sativus



Sample Photo A68.
JP286031,
Cucurbita moschata



Sample Photo A69.
JP286032,
Cucumis melo



Sample Photo A70.
JP286033,
Cucumis melo



Sample Photo A71.
JP286034,
Capsicum chinense



Sample Photo A72.
JP286035,
Cucumis melo



Sample Photo A73.
JP286036,
Cucurbita moschata



Sample Photo A74.
JP286037,
Cucumis sativus



Sample Photo A75.
JP286038,
Cucumis melo



Sample Photo A76.
JP286039,
Cucumis melo



Sample Photo A77.
JP286040,
Cucumis melo



Sample Photo A78.
JP286041,
Cucurbita moschata



Sample Photo A79.
JP286042,
Cucumis melo



Sample Photo A80.
JP286043,
Cucurbita moschata



Sample Photo A81-1.
JP286044,
Cucumis melo



Sample Photo A81-2.
JP286452,
Citrullus lanatus



Sample Photo A82.
JP286045,
Cucurbita moschata



Sample Photo A83.
JP286046,
Cucumis sativus



Sample Photo A84.
JP286047,
Cucumis melo