

Exploration and Collection of Vegetable Genetic Resources in Northern Cambodia, 2020

Sreynech OUCH¹⁾, Katsunori TANAKA²⁾, Dolla ROS¹⁾, Sophany SAKHAN¹⁾,
Vathany THUN¹⁾, Makara OUK¹⁾, Yoichi KAWAZU³⁾, Kenji KATO⁴⁾

- 1) *Cambodian Agricultural Research and Development Institute*, National Road 3, Prateah Lang, Kambol, P.O. Box 01, Phnom Penh, Cambodia
- 2) *Faculty of Agriculture and Life Science, Hirosaki University*, 3 Bunkyo, Hirosaki, Aomori 036-8561, Japan
- 3) *Institute of Vegetable and Floriculture Science, National Agriculture and Food Research Organization (NARO)*, 360 Kusawa, Ano, Tsu, Mie 514-2392, Japan
- 4) *Graduate School of Environmental and Life Science, Okayama University*, 3-1-1 Tsushima-Naka, Kita, Okayama, Okayama 700-8530, Japan

Communicated by Y. YOSHIOKA (Tsukuba University)

Received Sep. 16, 2021, Accepted Dec. 13 2021

Co-corresponding authors: K. TANAKA (e-mail: k-tana3@hirosaki-u.ac.jp)

K. KATO (e-mail: kenkato@okayama-u.ac.jp)

Summary

Cambodia is an important center of vegetable crop diversity, including varieties of Cucurbitaceae and Solanaceae crops, and could provide useful genetic resources for crop breeding programs. Field exploration was conducted in northern Cambodia to collect vegetable genetic resources based on cultivation methods and characteristics. A total of 71 samples of six crops, including 28 melons, 22 pumpkins, 11 amaranths, eight maize, one cucumber, and one Solanaceae species, were collected from 36 sites in four provinces. These samples were collected at new sites, with the exception of one amaranth sample, *Amaranthus spinosus*, which was a different Amaranth species collected from a previously visited site. Based on interviews with farmers and previous reports, we obtained the following overview: common local names for pumpkins, melons, and maize; distinct names for amaranth species; cultivation occurs during the rainy season; comparatively less frequent use of fertilizer and agrochemicals for pumpkin and melon; and frequent cultivation of amaranths in backyard gardens. The observed morphological traits showed variations comparable to those reported in previous studies, such as plant height and panicle length in amaranth, plant height variation among three species of amaranth, and cob length variation in maize. The overview and morphological information provided useful references in the study of Cambodian genetic resources as well as for the management of the collected species. The seeds were divided between the CARDI and the gene bank at NARO.

KEY WORDS: breeding, melon, pumpkin, amaranth, maize, variation

Introduction

Cucurbitaceae is one of the most important vegetable families in crop production. The total biomass of cucumbers, gherkins, gourds, melons,

pumpkins, squash, and watermelons produced in 2019 was estimated at over 238 million tons (FAO, 2021). The level of Cucurbitaceae crop production is maintained by the utilization of improved varieties

with higher yield, appearance and nutritional values of edible part, and pest/disease resistant traits. Indian landraces have provided most of the insect and disease resistance traits observed in modern varieties (Dhillon *et al.* 2012). However, access to Indian Cucurbitaceae genetic resources requires the establishment of a proper agreement for benefit-sharing between the provider and the user under the Nagoya Protocol. Access to genetic resources can also be gained through a third party, such as the U.S. National Plant Germplasm System (NPGS), where the largest number of accessions are preserved.

Fortunately, many countries in south and southeast Asia have realized the importance of conserving their Cucurbitaceae genetic resources in the face of rapid replacement by improved varieties. Therefore, in 2014, the Cambodian Agricultural Research and Development Institute (CARDI), Cambodia, signed a Joint Research Agreement (JRA) with the Genetic Resources Center of the National Agriculture and Food Research Organization (NGRC), Japan, to explore and collect vegetable genetic resources in Cambodia for utilization in breeding programs. This JRA falls under the Plant Genetic Resources in Asia Project (PGRAsia) supported by the Ministry of Agriculture, Forestry, and Fisheries of Japan (https://sumire.gene.affrc.go.jp/pgrasia/index_en.php). Since then, several survey expeditions have been conducted by multiple collaborating researchers, including Matsunaga *et al.* (2015, 2018, 2019), Tanaka K. *et al.* (2016, 2017, 2019), Tanaka Y. *et al.* (2016), Okuizumi *et al.* (2017), Sugita *et al.* (2017), Matsushima *et al.* (2018), Yashiro *et al.* (2019), Kondo *et al.* (2019), Kawazu *et al.* (2020), Takeshima *et al.* (2020), and Sudasinghe *et al.* (2020). Over 1,000 samples were

collected from these explorations and registered as genetic resources in both CARDI and NGRC. Of these, five were performed in northern and northwestern Cambodia (Matsunaga *et al.* 2015; Okuizumi *et al.* 2017; Sugita *et al.* 2017; Tanaka *et al.* 2017; Kondo *et al.* 2019).

This paper reports the findings of survey expeditions conducted for 10 days from late November to early December 2020, specifically for the collection of Cucurbitaceae genetic resources in never before surveyed areas of northern Cambodia. Passport data, including the cultivation method and utilization of collected samples, were also recorded.

Methods

An annual exploration was conducted in 2020 with a specific letter of agreement signed by the CARDI and NGRC. This study was conducted in four provinces of northern Cambodia, including Kampong Thom, Preah Vihear, Oddar Meanchey, and Siem Reap (Fig. 1), during the dry season from November 23 to December 2, 2020 (Table 1). Due to the Covid-19 pandemic, only the CARDI team, composed of researchers, research assistants, and one driver, was able to conduct the exploration, using a Toyota Prado (Photo 1).

To determine important areas for sample collection, we gathered information from representatives of the Provincial Departments of Agriculture, Forestry, and Fisheries (PDAFF) and various village leaders (Fig. 1). Samples were collected from roadsides, vegetable stands, farmers' houses, backyard gardens, and fields, and the precise positions of the sites were recorded using a Garmin Foretrex 401 (Garmin International Inc., Olathe,

Table 1. Itinerary of the exploration of plant genetic resources in northern Cambodia, 2020

| Date (month/day) | Day | Itinerary | Stay |
|---------------------|-----|-------------------------------|--------------|
| 11/23 | Mon | Phnom Penh - Kampong Thom | Kampong Thom |
| 11/24 | Tue | Kampong Thom | Kampong Thom |
| 11/25 | Wed | Kampong Thom | Kampong Thom |
| 11/26 | Thu | Kampong Thom - Preah Vihear | Preah Vihear |
| 11/27 | Fri | Preah Vihear - Oddar Meanchey | Samraong |
| 11/28 | Sat | Oddar Meanchey | Samraong |
| 11/29 | Sun | Oddar Meanchey - Siem Reap | Siem Reap |
| 11/30 | Mon | Siem Reap | Siem Reap |
| 12/1 | Tue | Siem Reap | Siem Reap |
| 12/2 | Wed | Siem Reap - Phnom Penh | |

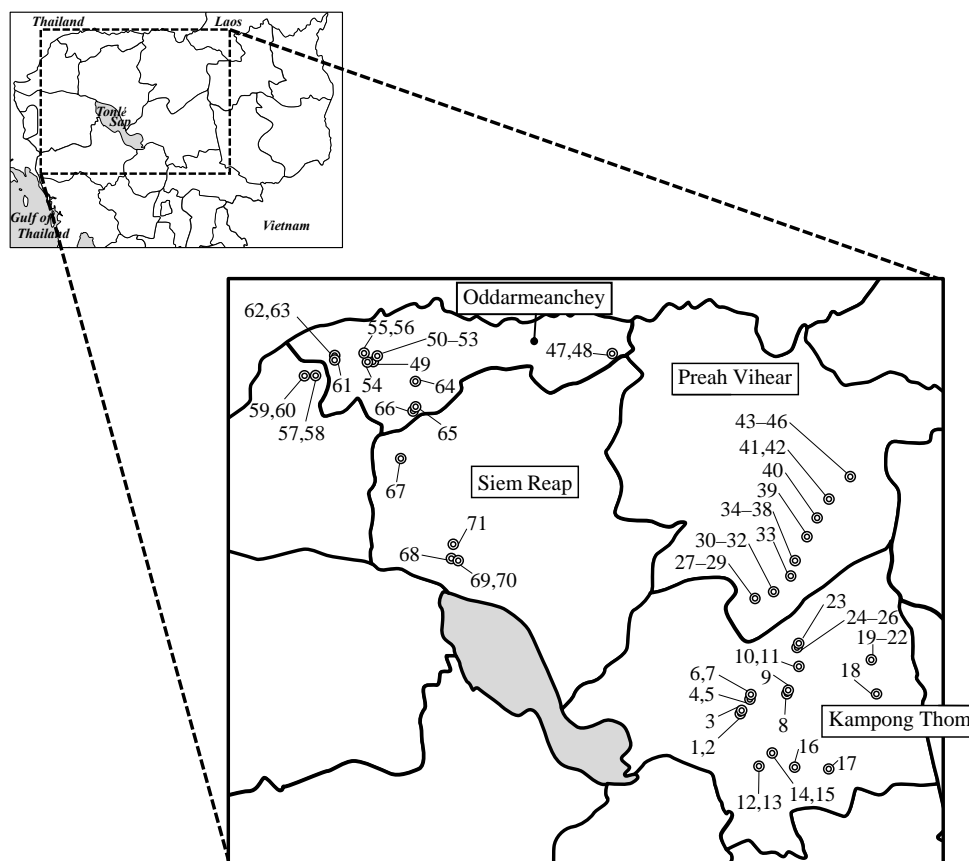


Fig. 1. A map of the collection sites in northern Cambodia. Each collection site is indicated by a double circle with a corresponding accession number(s). Collection numbers “2020B-01,” “2020B-02,” “2020B-03,” etc. are abbreviated as “1,” “2,” “3,” etc., respectively.



Photo 1. Survey members.

Kansas, USA). Other relevant information, including local crop names and cultivation methods (e.g., location, sowing and harvest times, fertilizer application, and fruit usage), was also collected by interviews (Photo 3). Seeds that were collected from either a single fruit, many fruits (at one farmer’s house), or a plant (at a backyard garden) were registered as one sample.

Natural condition in study areas

The exploration included lowland areas surrounding the Tonlé Sap and the area bordering with Thailand, at an altitude ranging from 9 to 111 m above sea level. During the survey, we observed a water-abundant area

near Tonlé Sap and a dry area distant from Tonlé Sap. Agricultural products had already been harvested in most areas visited by the team, but only one amaranth sample (PJ274072, Photo 2) was still grown in the fields and backyard gardens. Dry and water-abundant areas have also been developed for cultivation of certain cash crops, including rubber, cassava, pepper, and sugarcane.

Results and Discussion

A total of 71 samples were collected from 36 sites, including 28 melons (*Cucumis melo*), 22 pumpkins (*Cucurbita moschata*), 11 amaranths (*Amaranthus* spp.), 8 maize (*Zea mays*), one cucumber (*Cucumis sativus*), and one Solanaceae species (Table 2). The samples were collected from farmers’ storage, backyard gardens, and fields. The team collected *Amaranthus spinosus* (JP274123) from a previously visited site where *Amaranthus blitum* (JP269418) was collected by Kondo *et al.* (2019). Thus, all the samples collected in the present study were new genetic resources for both CARDI and NGRC.

Overviews of the crops are described in the following paragraphs, except for the cucumber and Solanaceae species, that were only represented by a single sample each.



Photo 2. Collecting naturally occurring amaranth JP274072 in a melon field.

Melon

All 28 melon samples were collected as seeds from farmers' houses and generally originated from more than one fruit, except for sample 20-086 (JP274073, Table 3). According to farmer reports, fruit shapes varied and included round, elliptical, and oblong. A total of 23 samples were landraces that farmers cultivated for self-consumption and sale. There were five samples that were not landraces, among which three samples (JP274073, JP274114, and JP274122) were related to an F₃ hybrid, and another two samples (JP274064 and JP274113) were F₂ hybrid related. Farmers reported that they used the bulk of the seeds in the following year's planting.

Melons are normally cultivated once a year during the wet season, and their seeds are sown from May to June and harvested from July to October. Several farmers sowed seeds in September and harvested them in

November. However, the farmer who provided us with sample JP274069 cultivated melon in both wet and dry seasons because of sufficient water supply during the dry season. All melon samples shared one local name, "trosok srov," and were previously collected in large regions of Cambodia (Table 3; e.g., Matsunaga *et al.* 2015; Tanaka K. *et al.* 2016, 2017, 2019; Tanaka Y. *et al.* 2016; Yashiro *et al.* 2019). No chemical fertilizers or agrochemicals were applied for melon cultivation, except for three melon samples (JP274060, JP274069, and JP274071), which were cultivated using either chemical fertilizer or compost and organic pesticide. Application of chemical fertilizer and agrochemicals in northern Cambodia was used only in the case of improved varieties (Tanaka K. *et al.* 2016) or in cases of two to four cultivations per year in southern Cambodia (Tanaka *et al.* 2019).

Pumpkin

All pumpkin samples were classified as *Cucurbita moschata* by the pentagonal-shaped peduncle at the joint shared with the fruit (Table 3, Photo 4). Fruit varied in weight from 1.0 to 10.0 kg. Pumpkins were cultivated only once in the wet season, with sowing from May to August and harvesting from July to November. Their local name was "lpov" among pumpkin samples and same to those collected in the previous explorations, in which "lapao" and "lpoa" were assigned for pumpkin,



Photo 3. Interview with farmers during seed separation and cleaning of JP274077 (left) and JP275119 (right).

Table 2. A summary of the genetic resources collected in northern Cambodia, 2020

| Date | Province | Altitude (m) | Total | <i>Cucumis melo</i> | <i>Cucumis sativus</i> | <i>Cucurbita moschata</i> | <i>Amaranthus</i> species | Solanaceae species | <i>Zea mays</i> |
|-------|---------------|--------------|-------|---------------------|------------------------|---------------------------|---------------------------|--------------------|-----------------|
| 11/24 | Kampong Thom | 9 – 23 | 11 | 2 | | 5 | 3 | | 1 |
| 11/25 | Kampong Thom | 13 – 111 | 15 | 7 | 1 | 2 | 3 | | 2 |
| 11/26 | Preah Vihear | 40 – 98 | 20 | 8 | | 6 | 2 | 1 | 3 |
| 11/27 | Oddarmeanchey | 80 | 2 | 1 | | | 1 | | |
| 11/28 | Oddarmeanchey | 34 – 74 | 15 | 8 | | 4 | 1 | | 2 |
| 11/29 | Siem Reap | 18 – 66 | 4 | 1 | | 2 | 1 | | |
| 11/30 | Siem Reap | 39 – 46 | 4 | 1 | | 3 | | | |
| Total | | | 71 | 28 | 1 | 22 | 11 | 1 | 8 |

though those pronunciations were same each other and to “lpov” (Tanaka *et al.* 2017; Kondo *et al.* 2019). Farmers in the Kampong Thom province used “lpov kingkuk” for three samples (JP274067, JP274068, and JP274077), which was also the name in Battambang and Pailin (JP259044 and JP259060, Okuizumi *et al.* 2017). “lpov tru” was collected from Kampong Thom (JP274082), Siem Reap (JP274127), as well as Preah Vihear province (JP269491, Kondo *et al.* 2019) and Pailin province (JP259061, Okuizumi *et al.* 2017) in previous studies. These varieties can be introduced into a wide range of areas. Fertilizers and pesticides were not used during cultivation, with the exception of two samples (JP274059 and JP274124). However, the use of fertilizers and pesticides in pumpkin cultivation may be rare, though a few cases have been observed in northern, southern, and western Cambodia (personal communication with K. Tanaka: the second author in this paper).

Amaranth

Amaranth samples were collected from backyard gardens, except for one sample (JP274072) that grew naturally in the farmers’ melon fields (Photo 2). The amaranth samples were classified into three species: *A. blitum*, *A. spinosus*, and *A. viridis*, based on the key characteristics described by Takeshima *et al.* (2020) (Table 3). These three species were also collected in previous explorations in northern Cambodia (*A. blitum* in Kondo *et al.* 2019), southern Cambodia (*A. blitum* and *A. spinosus* in Sudasinghe *et al.* 2019), and eastern Cambodia (all species in Takeshima *et al.* 2020). Similar to a previous report by Takeshima *et al.* (2020), plant height varied between species, from 30 to 170 cm, specifically: *A. blitum* (30 cm), *A. spinosus* (mean, 68 cm), and *A. viridis* (mean, 148 cm). Leaf length also varied among the three species: *A. blitum* (4 cm), *A. spinosus* (5 cm on average), and *A. viridis* (9 cm on average). Morphological variation was also observed in panicle length, which ranged from 7 to 45 cm and showed a strong correlation with plant height ($r = 0.749$),

although the number of samples was limited. Similar to a previous study (Takeshima *et al.* 2020), farmers called each species by a different name: *A. blitum* is known as “pty achmoan,” *A. spinosus* as “pty banla,” and *A. viridis* as “pty dOUNg.” These amaranths are only used as leafy vegetables (Sudasinghe *et al.* 2020; Takeshima *et al.* 2020). Although no instances of grain consumption was reported, the grains from two amaranth accessions from northern Cambodia, JP 258759 and JP258774, were reported by farmers to have sticky textures (personal communication with K. Tanaka). The different frequencies between the two culinary uses indicate the difficulty of finding a minority in Cambodia.

Maize

Eight samples were collected from the farmers’ storage facilities (Table 3). Three samples were collected from a single ear and five samples were collected from more than one ear. Maize is cultivated once in the rainy season and seeds are sown from May to June and ears are harvested from July to October in northern Cambodia, similar to the planting season in Kratie province, Eastern Cambodia (Okuizumi *et al.* 2020). No agricultural chemicals for pests, diseases, or fertilizers were used for maize cultivation. The single local name “pout” for maize samples was reported by the Khmer tribe in the Kampong Thom, Preah Vihear, and Oddar Meanchey provinces. Other local names (not collected in this study) include “pout chun cheat” (Ouch *et al.* 2016), “pout damnoeb” (Okuizumi *et al.* 2017), “port ksay” (Kondo *et al.* 2019), “pout phnong” (Okuizumi *et al.* 2020), though both “pout damnoeb” and “pout ksay” were reported for the Khmer tribe in the Oddar Meanchey and Preah Vihear provinces of northern Cambodia, respectively. Cob length ranged from 6 to 15 cm in eight samples, similar to the variation observed in a previous report, which ranged from 9 to 18 cm in four samples (Okuizumi *et al.* 2017). The kernels had a white or purple color or a bicolor and sticky texture.

Conclusion

The genetic resources collected in this survey expedition occurred at novel sites in northern Cambodia, except for one amaranth sample from a previously visited site. The different species names of the amaranth samples indicate that all samples in the present study are new genetic resources. An overview of the local information collected includes common local names for pumpkins, melons, and maize; distinct names for amaranth species; cultivation occurs during the rainy season; less frequent use of fertilizer and agrochemicals



Photo 4. Peduncle shape at joint with fruit of JP274099, 2020B-42.

for pumpkin and melon; and frequent cultivation of amaranth in backyard gardens. Morphological traits showed variations comparable to those reported in previous studies, such as plant height and panicle length in amaranth, plant height variation among three species of amaranth, and cob length variation in maize. The overviews and morphological information reported by this and previous reports are useful references in the study of Cambodian genetic resources, as well as for the management of the samples collected.

Genetic resources

The seeds of the 71 samples were stored at the CARDI Genebank and divided into two subsets. A subset was placed in the NARO Genebank with JP number 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 the following year.

Acknowledgements

This work was supported by MAFF commissioned project study on “A Collaborative Research Project on Characterization and Evaluation of Plant Genetic Resources for Food and Agriculture (PGRAsia)” Grant Number JPJ007117).

The collaborative exploration was performed under the Joint Research Agreement (JRA) signed by Dr. Hirohiko Hirochika, President of the National Institute of Agrobiological Sciences (NIAS), Japan, and Dr. Makara Ouk, Director of the Cambodian Agricultural Research and Development Institute, Cambodia (CARDI), in 2014. Because of a merger between NARO and NIAS in April 2016, the National Agriculture and Food Research Organization (NARO) succeeded in fulfilling all the obligations and rights of NIAS under the JRA.

We thank Dr. Kentaro Kawaguchi, NGRC, and Dr. Ouk Makara, CARDI, for generously supporting our field exploration; Dr. Norihiko Tomooka, Genetic Resources Center, NARO, and Dr. Hiroshi Matsunaga, NARO Institute of Vegetable and Floriculture Science, for supporting our field activities.

References

Dhillon NPS, Monforte AJ, Pitrat M, Pandey S, Singh PK, Reitsma KR, Garcia-Mas J, Sharma A and McCreight JD (2012). Melon landraces of India: Contributions and Importance. *In*: Plant Breed Rev, Vol 35. Janick J (ed.). Wiley-Blackwell, New Jersey, pp. 85-150.
[CrossRef]

FAO (2021). FAOSTAT.

[<http://www.fao.org/faostat/en/#data>], [Accessed 4 July 2021].

Kawazu Y, Kuzuya M, Ouch S, Sakhan S and Ouk M (2020). Collaborative exploration of Cucurbitaceae genetic resources in Eastern Cambodia, 2019. AREIPGR 36: 92-111.

[Genebank, NARO], [JaLC]

Kondo F, Layheng S, Tokuda M, Rathnayaka RMSMB, Sakhan S and Matsushima K (2019). Collaborative exploration of plant genetic resources in north Cambodia, 2018. AREIPGR 35: 162-184.

[Genebank, NARO], [JaLC]

Matsunaga H, Matsushima K, Tanaka K, Theavy S, Layheng S, Channa T, Takahashi Y and Tomooka N (2015). Collaborative exploration of the Solanaceae and Cucurbitaceae vegetable genetic resources in Cambodia 2014. AREIPGR 31: 169-187.

[Genebank, NARO], [JaLC]

Matsunaga H, Yokota M, Leakhena M and Sakhan S (2018). Collaborative exploration of Solanaceae vegetable genetic resources in Southern Cambodia 2017. AREIPGR 34: 102-117.

[Genebank, NARO], [JaLC]

Matsunaga H, Tanaka Y, Leakhena M and Sakhan S (2019). Collaborative exploration of Solanaceae vegetable genetic resources in Central and Mid-Western Cambodia 2018. AREIPGR 35: 106-120.

[Genebank, NARO], [JaLC]

Matsushima K, Layheng S, Hatakeyama K, Kurumada S and Sakhan S (2018). Collaborative exploration of plant genetic resources in Eastern Cambodia, 2017. AREIPGR 34: 118-136.

[Genebank, NARO], [JaLC]

Okuizumi H, Nonaka E, Layheng S, Orn C, Sakhan S and Ouk M (2017). Collaborative exploration and collection of plant genetic resources in Cambodia in December 2016. AREIPGR 33: 143-173.

[Genebank, NARO], [JaLC]

Ouch S, Sakhan S, Nonaka E and Okuizumi H (2016). Collaborative exploration and collection of plant genetic resources in Cambodia November 2015. AREIPGR 32: 89-107.

[Genebank, NARO], [JaLC]

Sudasinghe SP, Leakhena M, Bando K, Yamaguchi K, Sakhan S, Ouk M and Matsushima K (2020). Collaborative exploration of plant genetic resources in Southern Cambodia, 2019. AREIPGR 36: 128-147.

[Genebank, NARO], [JaLC]

- Sugita T, Matsunaga H, Theavy S and Sakhan S (2017). Collaborative exploration of *Capsicum* genetic resources in Northern Cambodia, 2016. AREIPGR 33: 207-221.
[Genebank, NARO], [JaLC]
- Takeshima R, Nemoto K, Leakhena M, Ros D, Ouch S, Sakhan S and Ouk M (2020). Collaborative exploration of amaranth vegetable germplasm in Cambodia, 2019. AREIPGR 36: 112-127.
[Genebank, NARO], [JaLC]
- Tanaka K, Duong TT, Yamashita H, Lay Heng S, Sakhan S, Kato K (2016). Collection of cucurbit crops (Cucurbitaceae) from Eastern Cambodia, 2015. AREIPGR 32: 109-137.
[Genebank, NARO], [JaLC]
- Tanaka K, Shigita G, Sophea Y, Thun V, Sakhan S and Kato K (2017). Collection of melon and other Cucurbitaceous crops in Cambodia in 2016. AREIPGR 33: 175-205.
[Genebank, NARO], [JaLC]
- Tanaka K, Shigita G, Dung TP, Sophea Y, Thun V, Sakhan S and Kato K (2019). Collection of melon and other Cucurbitaceous crops in Cambodia in 2017. AREIPGR 35: 121-146.
[Genebank, NARO], [JaLC]
- Tanaka Y, Matsunaga H, Theavy S, Lay Heng S and Sakhan S (2016). Collaborative survey of Solanaceous genetic resources in Eastern Cambodia, 2015. AREIPGR 32: 139-157.
[Genebank, NARO], [JaLC]
- Yashiro K, Tanaka K, Sophea Y, Thun V, Sakhan S and Kato K (2019). Collaborative exploration of Cucurbitaceae vegetable genetic resources in Western and Northwestern Cambodia in 2018. AREIPGR 35: 147-161.
[Genebank, NARO], [JaLC]

カンボジア北部における 野菜遺伝資源探索，2020 年

Sreynech OUCH¹⁾・田中 克典²⁾・Dolla ROS¹⁾・Sophany SAKHAN¹⁾・
Vathany THUN¹⁾・Makara OUK¹⁾・川頭 洋一³⁾・加藤 鎌司⁴⁾

1) カンボジア農業開発研究所

2) 弘前大学 農学生命科学部

3) 国立研究開発法人 農業・食品産業技術総合研究機構 野菜花き研究部門

4) 岡山大学 大学院 環境生命科学研究科

和文摘要

カンボジアはウリ科作物やナス科作物などの野菜の多様性中心の一つで，同国における作物遺伝資源は育種計画において有益な遺伝資源として活用できる．そこで，カンボジア北部において遺伝資源探索を実施し，野生遺伝資源とともにそれら遺伝資源の栽培方法の情報や特性評価情報を収集した．71 点の野菜遺伝資源が 4 つの州における 36 地点から収集された．その内訳は，28 点のメロン，22 点の日本カボチャ，11 点のアマランサス，8 点のトウモロコシ，それぞれ 1 点のキュウリおよびナスである．収集した試料は，1 点を除いて，新規の地点から収集された遺伝資源であり，また，残る 1 点のアマランサスにおいて種名が従前の探索で収集されたアマランサスとは異なっていたことから，新規の試料であった．日本カボチャ，メロン，アマランサスおよびトウモロコシについて農家からの聞き取り調査によって，呼称がアマランサス種間で異なること，これらの作物が主に雨季に栽培されること，日本カボチャやメロンの栽培においてはほとんど肥料や農薬を施用しないこと，および，アマランサスは家の庭において栽培されていることがわかった．アマランサスの 3 つの種間における草丈，葉や穂の長さの違い，ならびにトウモロコシにおける雌穂長といった形質変異は既報においても認められた．既報や本調査における 4 つの作物についての概要や形質の情報はカンボジアの遺伝資源に関する研究や本調査で収集された遺伝資源の管理・利用に有益だと考えられた．

Table 3. The genetic resources collected in northern Cambodia in 2020

| JP No. | CARDI No. | Coll. No. | Crop Name | Species | Province | District | Commune | Village | North Latitude | East Longitude | Altitude (m) | Tribe | Collection method | Collection source | Local Name | Sowing time (ST) Harvest time (HT) |
|--------|-----------|-----------|-----------|----------------------------|--------------|----------------|--------------|--------------------|----------------|----------------|--------------|-------|-------------------|-------------------|------------------|---------------------------------------|
| 274058 | 20-071 | 2020B-01 | Amaranth | <i>Amaranthus spinosus</i> | Kampong Thom | Kampong Svay | Chey | Prey Tub | 12 48 52.8 | 104 56 56.0 | 9 | Khmer | Single plant | Backyard garden | Pty Banla | |
| 274059 | 20-072 | 2020B-02 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Kampong Svay | Chey | Prey Tub | 12 49 25.9 | 104 57 20 .5 | 20 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: September |
| 274060 | 20-073 | 2020B-03 | Melon | <i>Cucumis melo</i> | Kampong Thom | Kampong Svay | Chey | Prey Tub | 12 49 25.9 | 104 57 20 .5 | 20 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274061 | 20-074 | 2020B-04 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Kampong Svay | Chey | Lvea | 12 51 56.5 | 104 58 44.9 | 13 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: September |
| 274062 | 20-075 | 2020B-05 | Maize | <i>Zea mays</i> | Kampong Thom | Kampong Svay | Chey | Lvea | 12 51 56.5 | 104 58 44.9 | 13 | Khmer | Bulk fruits | Farmer's storage | Pout | ST: May HT: July |
| 274063 | 20-076 | 2020B-06 | Amaranth | <i>Amaranthus viridis</i> | Kampong Thom | Prasat Ba-lang | Salavisai | Bos Sramaoch | 12 52 35.7 | 104 59 12.1 | 18 | Khmer | Single plant | Backyard garden | Pty Doung | |
| 274064 | 20-077 | 2020B-07 | Melon | <i>Cucumis melo</i> | Kampong Thom | Prasat Ba-lang | Salavisai | Bos Sramaoch | 12 52 37.0 | 104 59 09.3 | 23 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274065 | 20-078 | 2020B-08 | Amaranth | <i>Amaranthus viridis</i> | Kampong Thom | Prasat Sambou | Chhouk | Chhouk Krous | 12 52 18.4 | 105 07 40.8 | 16 | Khmer | Single plant | Backyard garden | Pty Doung | |
| 274066 | 20-079 | 2020B-09 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Prasat Sambo | | Beung Kvek | 12 53 04.1 | 105 08 14.4 | 18 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: July |
| 274067 | 20-080 | 2020B-10 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Sandann | Meanchey | Rumpork | 13 00 48.6 | 105 12 29.0 | 23 | Khmer | Single fruit | Farmer's storage | Lpov Kingkuk | ST: May HT: September |
| 274068 | 20-081 | 2020B-11 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Sandann | Meanchey | Rumpork | 13 00 49.6 | 105 12 31.4 | 23 | Khmer | Single fruit | Farmer's field | Lpov Kingkuk | ST: May HT: November |
| 274069 | 20-082 | 2020B-12 | Melon | <i>Cucumis melo</i> | Kampong Thom | Santuk | Tang Krasang | Viang Khang Cheung | 12 34 35.6 | 105 03 14.8 | 13 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: Jun-Nov HT: Aug-Jan |
| 274070 | 20-083 | 2020B-13 | Cucumber | <i>Cucumis sativus</i> | Kampong Thom | Santuk | Tang Krasang | Viang Khang Cheung | 12 34 35.6 | 105 03 14.8 | 13 | Khmer | Bulk fruits | Farmer's storage | Trosok Kanchreab | ST: Jun-Nov HT: Aug-Jan |
| 274071 | 20-084 | 2020B-14 | Melon | <i>Cucumis melo</i> | Kampong Thom | Santuk | Prasat | Chambak Chrung | 12 36 46.1 | 105 05 14.0 | 14 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: September HT: November |
| 274072 | 20-085 | 2020B-15 | Amaranth | <i>Amaranthus blitum</i> | Kampong Thom | Santuk | Prasat | Chambak Chrung | 12 36 48.5 | 105 05 15.3 | 14 | Khmer | Bulk plant | Farmer's field | Pty Achmoan | |
| 274073 | 20-086 | 2020B-16 | Melon | <i>Cucumis melo</i> | Kampong Thom | Santuk | Sangkrou | Beung Lvea | 12 34 50.7 | 105 08 55.6 | 16 | Khmer | Single fruit | Farmer's storage | Trosok Srov | ST: June HT: October |
| 274074 | 20-087 | 2020B-17 | Maize | <i>Zea mays</i> | Kampong Thom | Santuk | Kraya | Kraya | 12 34 45.4 | 105 15 38.8 | 34 | Khmer | Single fruit | Farmer's storage | Pout | ST: May HT: October |
| 274075 | 20-088 | 2020B-18 | Amaranth | <i>Amaranthus viridis</i> | Kampong Thom | Sandann | Tumring | Tumring | 12 54 05.3 | 105 25 27.1 | 102 | Khmer | Single plant | Backyard garden | Pty Doung | |
| 274076 | 20-089 | 2020B-19 | Amaranth | <i>Amaranthus viridis</i> | Kampong Thom | Sandann | Meanrith | O'Pouk Samki | 13 01 10.7 | 105 24 16.3 | 111 | Khmer | Single plant | Backyard garden | Pty | |
| 274077 | 20-090 | 2020B-20 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Sandann | Meanrith | O'Pouk Samki | 13 01 21.1 | 105 24 12.7 | 111 | Khmer | Bulk fruits | Farmer's storage | Lpov Kingkuk | ST: May HT: October |
| 274078 | 20-091 | 2020B-21 | Melon | <i>Cucumis melo</i> | Kampong Thom | Sandan | Meanrith | O'Pouk Samki | 13 01 21.1 | 105 24 12.7 | 111 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: October |
| 274079 | 20-092 | 2020B-22 | Melon | <i>Cucumis melo</i> | Kampong Thom | Sandann | Meanrith | O'Pouk Samki | 13 01 21.1 | 105 24 12.7 | 111 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |

Table 3. (Continued).

| JP No. | CARDI No. | Coll. No. | Crop Name | Species | Province | District | Commune | Village | North Latitude | East Longitude | Altitude (m) | Tribe | Collection method | Collection source | Local Name | Sowing time (ST) Harvest time (HT) |
|--------|-----------|-----------|-----------|---------------------------|--------------|----------|-------------|----------------|----------------|----------------|--------------|-------|-------------------|-------------------|-------------|---------------------------------------|
| 274080 | 20-093 | 2020B-23 | Melon | <i>Cucumis melo</i> | Kampong Thom | Sandann | Svay | Ngorn | 13 05 23.1 | 105 12 04.9 | 36 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274081 | 20-094 | 2020B-24 | Maize | <i>Zea mays</i> | Kampong Thom | Sandann | Svay | Ngorn | 13 04 48.9 | 105 11 58.8 | 28 | Khmer | Bulk fruits | Farmer's storage | Pout | ST: May HT: July |
| 274082 | 20-095 | 2020B-25 | Pumpkin | <i>Cucurbita moschata</i> | Kampong Thom | Sandann | Svay | Ngorn | 13 04 48.9 | 105 11 58.8 | 28 | Khmer | Bulk fruits | Farmer's storage | Lpov Tru | ST: May HT: September |
| 274083 | 20-096 | 2020B-26 | Melon | <i>Cucumis melo</i> | Kampong Thom | Sandann | Svay | Ngorn | 13 04 48.9 | 105 11 58.8 | 28 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274084 | 20-097 | 2020B-27 | Maize | <i>Zea mays</i> | Preah Vihear | Roveang | Romney | Khang Lech | 13 18 31.0 | 105 00 44.9 | 97 | Khmer | Single fruit | Farmer's storage | Pout | ST: June HT: August |
| 274085 | 20-098 | 2020B-28 | Maize | <i>Zea mays</i> | Preah Vihear | Roveang | Romney | Khang Lech | 13 18 31.0 | 105 00 44.9 | 97 | Khmer | Single fruit | Farmer's storage | Pout | ST: June HT: August |
| 274086 | 20-099 | 2020B-29 | Amaranth | <i>Amaranthus viridis</i> | Preah Vihear | Roveang | Romney | Khang Lech | 13 18 31.0 | 105 00 44.9 | 97 | Khmer | Single plant | Backyard garden | Pty Doung | |
| 274087 | 20-100 | 2020B-30 | Melon | <i>Cucumis melo</i> | Preah Vihear | Roveang | Rong Reoung | Thnal Keng | 13 20 06.3 | 105 04 43.5 | 64 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274088 | 20-101 | 2020B-31 | Melon | <i>Cucumis melo</i> | Preah Vihear | Roveang | Rong Reoung | Thnal Keng | 13 20 06.3 | 105 04 43.5 | 64 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274089 | 20-102 | 2020B-32 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Roveang | Rong Reoung | Thnal Keng | 13 20 06.3 | 105 04 43.5 | 64 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: July |
| 274090 | 20-103 | 2020B-33 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Roveang | Reaksmeay | Sambork Pha-em | 13 23 28.7 | 105 07 51.4 | 57 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: July |
| 274091 | 20-104 | 2020B-34 | Melon | <i>Cucumis melo</i> | Preah Vihear | Roveang | Rikreay | | 13 26 02.9 | 105 08 02.6 | 63 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274092 | 20-105 | 2020B-35 | Melon | <i>Cucumis melo</i> | Preah Vihear | Roveang | Rikreay | | 13 26 02.9 | 105 08 02.6 | 63 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274093 | 20-106 | 2020B-36 | Melon | <i>Cucumis melo</i> | Preah Vihear | Roveang | Rikreay | | 13 26 02.9 | 105 08 02.6 | 63 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274094 | 20-107 | 2020B-37 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Roveang | Rikreay | | 13 26 02.9 | 105 08 02.6 | 63 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: July |
| 274095 | 20-108 | 2020B-38 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Roveang | Rikreay | | 13 26 02.9 | 105 08 02.6 | 63 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: July |
| 274096 | 20-109 | 2020B-39 | Melon | <i>Cucumis melo</i> | Preah Vihear | Chey Sen | Put Trea | Put Trea | 13 31 51.0 | 105 12 27.4 | 40 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: June HT: September |
| 274097 | 20-110 | 2020B-40 | Maize | <i>Zea mays</i> | Preah Vihear | Chey Sen | Sa-ang | O'Pha-av | 13 37 00.3 | 105 14 32.2 | 67 | Khmer | Bulk fruits | Farmer's storage | Pout | ST: May HT: July |
| 274098 | 20-111 | 2020B-41 | Melon | <i>Cucumis melo</i> | Preah Vihear | Chey Sen | Torsu | O'Sneat | 13 40 59.5 | 105 17 17.9 | 75 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274099 | 20-112 | 2020B-42 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Chey Sen | Torsu | O'Sneat | 13 40 59.5 | 105 17 17.9 | 75 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: July |
| 274100 | 20-113 | 2020B-43 | Unknown | Solanaceae sp. | Preah Vihear | Chheb | Chheb Mouy | Srok Reusey | 13 46 11.8 | 105 23 37.1 | 89 | Khmer | Bulk fruits | Backyard garden | Trab Rolouy | Annual harvest |
| 274101 | 20-114 | 2020B-44 | Melon | <i>Cucumis melo</i> | Preah Vihear | Chheb | Chheb Mouy | Srok Reusey | 13 46 11.8 | 105 23 37.1 | 89 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |

Table 3. (Continued).

| JP No. | CARDI No. | Coll. No. | Crop Name | Species | Province | District | Commune | Village | North Latitude | East Longitude | Altitude (m) | Tribe | Collection method | Collection source | Local Name | Sowing time (ST) Harvest time (HT) |
|--------|-----------|-----------|-----------|----------------------------|----------------|-----------------|-----------------|-----------------|----------------|----------------|--------------|-------|-------------------|-------------------|-------------|---------------------------------------|
| 274102 | 20-115 | 2020B-45 | Amaranth | <i>Amaranthus viridis</i> | Preah Vihear | Chheb | Chheb Mouy | Srok Reusey | 13 46 11.8 | 105 23 37.1 | 89 | Khmer | Bulk plant | Backyard garden | Pty Doung | |
| 274103 | 20-116 | 2020B-46 | Pumpkin | <i>Cucurbita moschata</i> | Preah Vihear | Chheb | Chheb Mouy | Srok Reusey | 13 46 11.8 | 105 23 37.1 | 89 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: September |
| 274104 | 20-117 | 2020B-47 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Trapiang Prasat | Trapiang Prasat | Trapiang Prasat | 14 11 30.5 | 104 21 51.4 | 80 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274105 | 20-118 | 2020B-48 | Amaranth | <i>Amaranthus viridis</i> | Oddar Meanchey | Trapiang Prasat | Trapiang Prasat | Trapiang Prasat | 14 11 30.5 | 104 21 51.4 | 80 | Khmer | Bulk plant | Backyard garden | Pty doung | |
| 274106 | 20-119 | 2020B-49 | Amaranth | <i>Amaranthus viridis</i> | Oddar Meanchey | Samrong | Bos Sbov | O'Preal | 14 10 50.4 | 103 24 44 | 42 | Khmer | Bulk plant | Backyard garden | Pty doung | |
| 274107 | 20-120 | 2020B-50 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Samrong | Bos Sbov | O'Preal | 14 11 06.8 | 103 24 49.5 | 54 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274108 | 20-121 | 2020B-51 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Samrong | Bos Sbov | O'Preal | 14 11 06.8 | 103 24 49.5 | 54 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274109 | 20-122 | 2020B-52 | Pumpkin | <i>Cucurbita moschata</i> | Oddar Meanchey | Samrong | Bos Sbov | O'Preal | 14 11 06.8 | 103 24 49.5 | 54 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: September |
| 274110 | 20-123 | 2020B-53 | Maize | <i>Zea mays</i> | Oddar Meanchey | Samrong | Bos Sbov | O'Preal | 14 11 06.8 | 103 24 49.5 | 54 | Khmer | Bulk fruits | Farmer's storage | Pout | ST: May HT: September |
| 274111 | 20-124 | 2020B-54 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | | | 14 10 11.1 | 103 22 30.8 | 34 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: September |
| 274112 | 20-125 | 2020B-55 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | Kork Khpus | Keab | 14 13 36 | 103 20 47 | 60 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: September |
| 274113 | 20-126 | 2020B-56 | Pumpkin | <i>Cucurbita moschata</i> | Oddar Meanchey | Banteay Ampil | Kork Khpus | Keab | 14 13 36 | 103 20 47 | 60 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: September |
| 274114 | 20-127 | 2020B-57 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | Kork Lolork | Pongror Tonle | 14 07 49.6 | 103 09 54.1 | 49 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274115 | 20-128 | 2020B-58 | Pumpkin | <i>Cucurbita moschata</i> | Oddar Meanchey | Banteay Ampil | Kork Lorlok | Pongror Tonle | 14 07 49.6 | 103 09 54.1 | 49 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: July |
| 274116 | 20-129 | 2020B-59 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | Ampil | Doun Tea | 14 08 02.7 | 103 07 05.6 | 60 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274117 | 20-130 | 2020B-60 | Pumpkin | <i>Cucurbita moschata</i> | Oddar Meanchey | Banteay Ampil | Ampil | Doun Tea | 14 08 02.7 | 103 07 05.6 | 60 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: July |
| 274118 | 20-131 | 2020B-61 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | Ampil | Pong Teuk | 14 12 55.9 | 103 10 45.5 | 60 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274119 | 20-132 | 2020B-62 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Banteay Ampil | Ampil | Pong Teuk | 14 13 09.2 | 103 10 43.4 | 66 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274120 | 20-133 | 2020B-63 | Maize | <i>Zea mays</i> | Oddar Meanchey | Banteay Ampil | Ampil | Pong Teuk | 14 13 09.2 | 103 10 43.4 | 66 | Khmer | Bulk fruits | Farmer's storage | Pout | ST: May HT: July |
| 274121 | 20-134 | 2020B-64 | Pumpkin | <i>Cucurbita moschata</i> | Oddar Meanchey | Chongkal | Kandol Dom | Pongro | 14 04 53.7 | 103 33 17.4 | 66 | Khmer | Single fruit | Farmer's storage | Lpov | ST: May HT: September |
| 274122 | 20-135 | 2020B-65 | Melon | <i>Cucumis melo</i> | Oddar Meanchey | Chongkal | Chongkal | Banteay Thmey | 13 58 16 | 103 34 15 | 66 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274123 | 20-136 | 2020B-66 | Amaranth | <i>Amaranthus spinosus</i> | Oddar Meanchey | Chongkal | Chongkal | Prey Thom | 13 56 40.1 | 103 34 01.3 | 31 | Khmer | Single fruit | Backyard garden | Pty Banla | |

Table 3. (Continued).

| JP No. | CARDI No. | Coll. No. | Crop Name | Species | Province | District | Commune | Village | North Latitude | East Longitude | Altitude (m) | Tribe | Collection method | Collection source | Local Name | Sowing time (ST) Harvest time (HT) |
|--------|-----------|-----------|-----------|---------------------------|-----------|--------------|-------------|---------|----------------|----------------|--------------|-------|-------------------|-------------------|-------------|---------------------------------------|
| 274124 | 20-137 | 2020B-67 | Pumpkin | <i>Cucurbita moschata</i> | Siem Reap | Srey Snom | Moung | Kvek | 13 48 09.4 | 103 31 30.7 | 18 | Khmer | Bulk fruits | Farmer's storage | Lpov | |
| 274125 | 20-138 | 2020B-68 | Pumpkin | <i>Cucurbita moschata</i> | Siem Reap | Banteay Srey | Preah Dak | Ta Koas | 13 29 23.5 | 103 56 29.2 | 46 | Khmer | Bulk fruits | Farmer's storage | Lpov | ST: May HT: July |
| 274126 | 20-139 | 2020B-69 | Melon | <i>Cucumis melo</i> | Siem Reap | Banteay Srey | Preah Dak | Ta Kaos | 13 29 17.9 | 103 56 41.1 | 46 | Khmer | Bulk fruits | Farmer's storage | Trosok Srov | ST: May HT: July |
| 274127 | 20-140 | 2020B-70 | Pumpkin | <i>Cucurbita moschata</i> | Siem Reap | Banteay Srey | Preah Dak | Ta Kaos | 13 29 17.9 | 103 56 41.1 | 46 | Khmer | Bulk fruits | Farmer's storage | Lpov Tru | ST: May HT: July |
| 274128 | 20-141 | 2020B-71 | Pumpkin | <i>Cucurbita moschata</i> | Siem Reap | Banteay Srey | Khna Sanday | Khna | 13 32 13.2 | 103 56 39.5 | 39 | Khmer | Single fruit | home store | Lpov | ST: August HT: November |



Sample Photo 1.
JP274058, B-01,
Amaranthus spinosus



Sample Photo 2.
JP274059, B-02,
Cucurbita moschata



Sample Photo 3.
JP274060, B-03,
Cucumis melo



Sample Photo 4.
JP274061, B-04,
Cucurbita moschata



Sample Photo 5.
JP274062, B-05,
Zea mays



Sample Photo 6.
JP274063, B-06,
Amaranthus viridis



Sample Photo 7.
JP274064, B-07,
Cucumis melo



Sample Photo 8.
JP274065, B-08,
Amaranthus viridis



Sample Photo 9.
JP274066, B-09,
Cucurbita moschata



Sample Photo 10.
JP274067, B-10,
Cucurbita moschata



Sample Photo 11.
JP274068, B-11,
Cucurbita moschata



Sample Photo 12.
JP274069, B-12,
Cucumis melo



Sample Photo 13.
JP274070, B-13,
Cucumis sativus



Sample Photo 14.
JP274071, B-14,
Cucumis melo



Sample Photo 15.
JP274072, B-15,
Amaranthus blitum



Sample Photo 16.
JP274073, B-16,
Cucumis melo

Sample Photos. The samples were collected during this exploration. A title each samples indicates “JP number,” “collection number,” and “species.” Collection numbers “2020B-01,” “2020B-02,” “2020B-03,” etc. are abbreviated as “B-01,” “B-02,” “B-03,” etc.



Sample Photo 17.
JP274074, B-17,
Zea mays



Sample Photo 18.
JP274075, B-18,
Amaranthus viridis



Sample Photo 19.
JP274077, B-20,
Cucurbita moschata



Sample Photo 20.
JP274078, B-21,
Cucumis melo



Sample Photo 21.
JP274079, B-22,
Cucumis melo



Sample Photo 22.
JP274080, B-23,
Cucumis melo



Sample Photo 23.
JP274081, B-24,
Zea mays



Sample Photo 24.
JP274082, B-25,
Cucurbita moschata



Sample Photo 25.
JP274083, B-26,
Cucumis melo



Sample Photo 26.
JP274084, B-27,
Zea mays



Sample Photo 27.
JP274085, B-28,
Zea mays



Sample Photo 28.
JP274086, B-29,
Amaranthus viridis



Sample Photo 29.
JP274087, B-30,
Cucumis melo



Sample Photo 30.
JP274088, B-31,
Cucumis melo



Sample Photo 31.
JP274089, B-32,
Cucurbita moschata



Sample Photo 32.
JP274090, B-33,
Cucurbita moschata

Sample Photos. (Continued).



Sample Photo 33.
JP274091, B-34,
Cucumis melo



Sample Photo 34.
JP274092, B-35,
Cucumis melo



Sample Photo 35.
JP274093, B-36,
Cucumis melo



Sample Photo 36.
JP274094, B-37,
Cucurbita moschata



Sample Photo 37.
JP274095, B-38,
Cucurbita moschata



Sample Photo 38.
JP274096, B-39,
Cucumis melo



Sample Photo 39.
JP274097, B-40,
Zea mays



Sample Photo 40.
JP274098, B-41,
Cucumis melo



Sample Photo 41.
JP274099, B-42,
Cucurbita moschata



Sample Photo 42.
JP274100, B-43,
Solanaceae sp.



Sample Photo 43.
JP274101, B-44,
Cucumis melo



Sample Photo 44.
JP274102, B-45,
Amaranthus viridis



Sample Photo 45.
JP274103, B-46,
Cucurbita moschata



Sample Photo 46.
JP274104, B-47,
Cucumis melo



Sample Photo 47.
JP274105, B-48,
Amaranthus viridis



Sample Photo 48.
JP274106, B-49,
Amaranthus viridis

Sample Photos. (Continued).



Sample Photo 49.
JP274107, B-50,
Cucumis melo



Sample Photo 50.
JP274108, B-51,
Cucumis melo



Sample Photo 51.
JP274109, B-52,
Cucurbita moschata



Sample Photo 52.
JP274110, B-53,
Zea mays



Sample Photo 53.
JP274111, B-54,
Cucumis melo



Sample Photo 54.
JP274112, B-55,
Cucumis melo



Sample Photo 55.
JP274113, B-56,
Cucurbita moschata



Sample Photo 56.
JP274114, B-57,
Cucumis melo



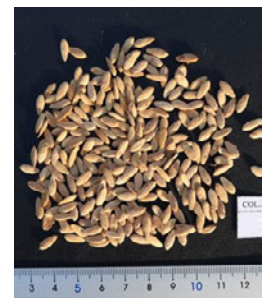
Sample Photo 57.
JP274115, B-58,
Cucurbita moschata



Sample Photo 58.
JP274116, B-59,
Cucumis melo



Sample Photo 59.
JP274117, B-60,
Cucurbita moschata



Sample Photo 60.
JP274118, B-61,
Cucumis melo



Sample Photo 61.
JP274119, B-62,
Cucumis melo



Sample Photo 62.
JP274120, B-63,
Zea mays



Sample Photo 63.
JP274121, B-64,
Cucurbita moschata



Sample Photo 64.
JP274122, B-65,
Cucumis melo

Sample Photos. (Continued).



Sample Photo 65.
JP274123, B-66,
Amaranthus spinosus



Sample Photo 66.
JP274124, B-67,
Cucurbita moschata



Sample Photo 67.
JP274125, B-68,
Cucurbita moschata



Sample Photo 68.
JP274126, B-69,
Cucumis melo



Sample Photo 69.
JP274127, B-70,
Cucurbita moschata



Sample Photo 70.
JP274128, B-71,
Cucurbita moschata

Sample Photos. (Continued).