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Original Paper

Collaborative Survey of *Amaranthus* and *Capsicum* Genetic Resources in Nepal, February 2016

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Summary

A Joint Research Agreement (JRA) on the Characterization and Evaluation of Plant Genetic Resources for Food and Agriculture was made in June 2015 between the National Institute of Agrobiological Sciences (NIAS) of Japan and the Nepal Agricultural Research Council of Nepal. All obligations and rights of the NIAS under the JRA were transferred to the National Agriculture and Food Research Organization (NARO), owing to the merger of the NARO and NIAS in April 2016. Based on the agreement, the first collaborative survey for *Amaranthus* and *Capsicum* genetic resources in Nepal was carried out from 12th to 23rd February 2016 in the districts of Rasuwa, Kathmandu, Lalitpur, Bhaktapur, and Kavre in the Central Development Region. During the survey, a total of 88 samples were collected, including 15 *Amaranthus* samples and 42 samples of *Capsicum* samples. These materials were conserved in the gene bank of Nepal. Using the Standard Material Transfer Agreement (SMTA), a subset of the 87 samples, with the exception of an *Oryza sativa* L. sample, was transferred to NARO gene bank in Japan.

KEY WORDS: *Amaranthus*, *Capsicum*, Chili pepper, Grain amaranths, Nepal

Introduction

Nepal is rich in the altitudinal and topological variation, and this environmental diversity has resulted in high agro-biodiversity, including various indigenous landraces of crops (Gautam, 2008). Therefore, the country is likelyto possess a diversity of crop genetic resources.

The National Institute of Agricultural Sciences (NIAS) in Japan and the National Agriculture Genetic Resources Center, under the umbrella of the Nepal Agriculture Research Council (NARC) in Nepal, established a Joint Research Agreement (JRA) on Characterization and Evaluation of Plant Genetic

Resources for Food and Agriculture in June 2015. All obligations and rights of the NIAS under the JRA have been transferred to the National Agriculture and Food Research Organization (NARO), owing to merger of the NARO and the NIAS in April 2016. Based on this agreement, the first collaborative exploration of the Central Development Region of Nepal was conducted in February 2016. At first, the expedition was planned to survey the Far-western Development Region of Nepal in November 2015. However, due to the fuel crisis that occurred in October 2015, the expedition was postponed to February 2016 and, instead, surveyed the area near Kathmandu. The survey targeted *Amaranthus* and *Capsicum* spp., but other crop genetic resources were also collected.

Here, we report the results of the first exploration of the Central Development Region of Nepal within the framework of the project of Plant Genetic Resources in Asia (PGRAsia), funded by the Ministry of Agriculture, Forestry and Fisheries, Japan.

Methods

We traveled to five districts (Lalitpur, Rasuwa, Bhaktpur, Kavre, and Kathmandu), which are located in the Bagmati Zone, Central Development Region, Nepal. The survey was conducted from 12th to 23rd February 2016 (Table 1, and Fig.1), and we traveled using a four-wheel drive car that was hired or provided by the NARC. In Kathmandu, we collected from Assan bazaar.

During the survey, we visited farmers' houses and fields. Since February is the off-season for major field crops, most of the samples were collected from farmers' storage. We mainly focused on collecting amaranths and chili peppers but also collected landraces of other field crops. During the survey, we interviewed farmers to obtain information about the samples, including their local name, usage, sowing and harvesting times, and cultivation. Meanwhile, collection site information, including elevation, was obtained using GPS instrument.

Results and Discussion

A total of 88 samples were collected from 15 survey sites in five districts in the Central Development Region (Tables 2 and 3). The samples included 15 samples of *Amaranthus* samples and 42 *Capsicum* samples, and samples were collected from diverse elevations, ranging from 1478 to 2230 m above sea

Table 1. Itienerary of the field survey in Nepal, February 2016

Date	Day	Itinerary	Stay
Feb 12	Fri	Ina -- Haneda	
13	Sat	Haneda 00:20 (TG661) -- 04:50 Bangkok, Bangkok 10:15 (TG319) -- 12:25 Kathmandu Courtesy visit and meeting at Genbank, NARC	Kathmandu
14	Sun	Kathmandu -- Dalchowki -- Sankhu -- Dalchowki (Lalitpur Dist.)	Dalchowki
15	Mon	Dalchowki -- Kathmandu, Courtesy visit Excutive Director, NARC	Kathmandu
16	Tue	Kathmandu -- Dunche -- Syafrubesi (Rasuwa Dist.)	Syafrubesi
17	Wed	Syafrubesi -- Goljung -- Gatlang -- Syafrubesi	Syafrubesi
18	Thu	Syafrubesi -- Sano Bharkhu -- Kathmandu	Kathmandu
19	Fri	Kathmandu -- Nashikasthan (Kavre Dist.) -- Suryabinayak (Bhaktapur Dist.) -- Nashikasthan --	Kathmandu
20	Sat	Visit Assan market in Kathmandu	Kathmandu
21	Sun	Seed cleaning and packing at Genebank. Preparation for export permit.	Kathmandu
22	Mon	Visit Plant Quarantine Office for sanitary certificate.	Kathmandu
23	Tue	Kathmandu 13:30 (TG320) -- Bangkok 18:15, Bangkok 22:45 (TG682) --	On flight
24	Wed	-- Haneda 06:55	

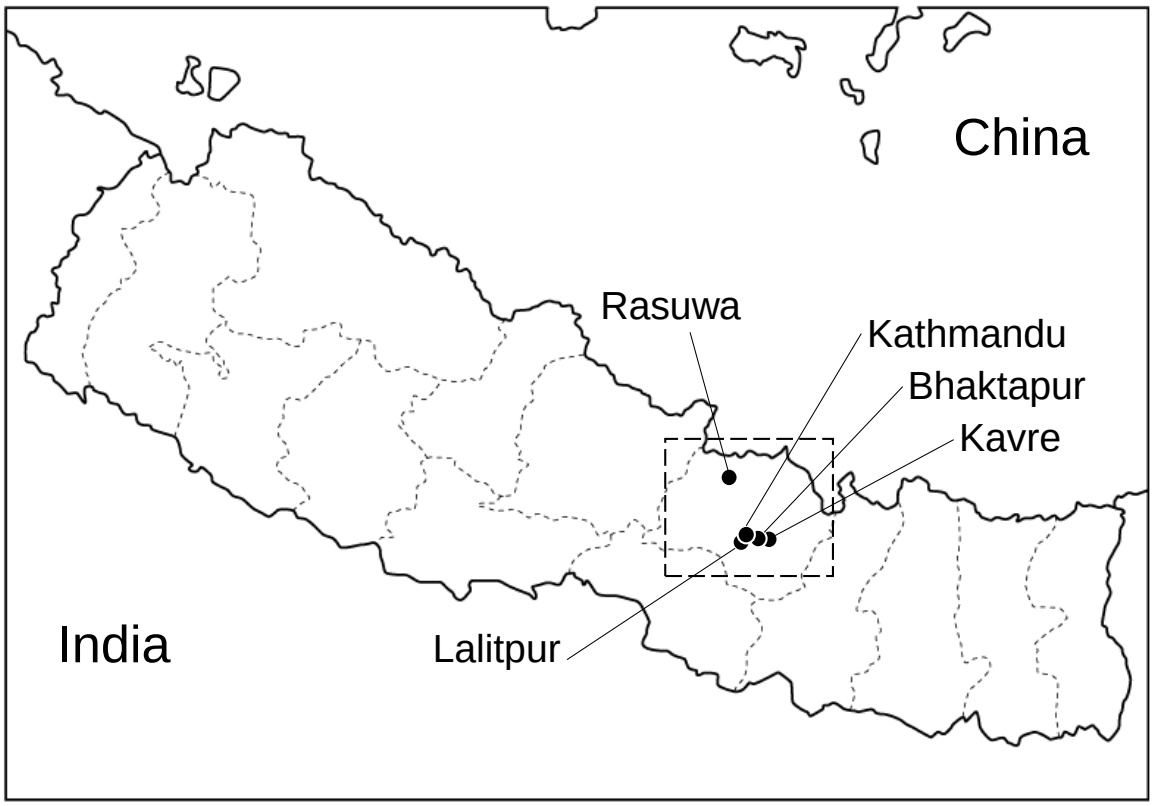

Fig. 1. Main collection sites of the exploration in Central Nepal, February, 2016

level. We shared the collected seed samples, except for one rice sample (No. 34), with the NARO and NARC.

1) Dalchowki, Lalitpur District (Photos 1-6)

On 14th and 15th February, we visited the Dalchowki area of Lalitpur District and 28 samples from 10 genera (Table 2). The area is located ~35 km south of Kathmandu and is home to the Tamang. Field crop landraces have been well conserved in the area because a community seed bank was established in 1998, supported by the Unitarian Service Committee of Canada (USC), which is a non-profit, international development organization. We surveyed the villages of Silinge, Sankhu, Silinge Besi, Gothbhanjyang, and Sirudanda.

2) Rasuwa District (Photos 7-14)

On 16th, 17th and 18th February, we visited Rasuwa District, which is located ~150 km north of Kathmandu and collected 22 samples from 8 genera (Table 2). It took ~7 hours to reach the area. On the first day, we visited the village of Syafrubesi. On the way, we visited the District Agriculture Office at the village of Dhunche. On the second day, we visited the villages of Goljung and Gatlang. The district of Rasuwa is one of the locations that was most damaged by an earthquake that occurred on 25th April 2015, and we found the remains of landslides in many places along the way. In the villages of Goljung and Gatlang, we observed severe earthquake damage. Many stone-built houses were destroyed, and people were forced to stay in temporary huts. In such areas, farmers reported that they had no remaining seeds to sow. On the way back to Kathmandu, we surveyed the village of Sano Bharukhu.

3) Bhaktapur and Kavre Districts

On 19th February, we visited the districts of Bhaktapur and Kavre, which are locatedeast of Kathmandu, and collected 29 samples from eight genera (Table 2).

4) Assan bazaar in Kathmandu (Photos 15 and 16)

At the Assan market, we collected two amaranth samples and seven chili pepper samples (Table 2). According to informants, the chili peppers were brought from the villages of Dharke and Dhunbesi (Dhading District), the village of Manthali (Ramechhap District), the villages of Dharan and Jhapa (Sunsari District), and the village of Kirtipur (Kathmandu District), and the amaranth samples were from Kavre District.

5) Amaranths

A total of 15 *Amaranthus* samples, representing three species were collected, including 10 samples from farmers' storage (Photos 5 and 6), three samples from field collection (Photos 11, 18, and 19), and two samples from the market (Photo 15). Seven of these were samples identified as *A. caudatus* L., according to the species' typical characteristics of drooping inflorescence and red seed coat (Nemoto *et al*., 2016). Another seven samples were identified as *A. hypochondriacus* L., and the last sample was identified as *A. cruentus* L. In Nepali, *A. hypochondriacus* is the dominant species (Nemoto *et al*., 1998); however, many *A. caudatus* samples were also collected in the present survey. In Nepal, the amaranths were called 'Latte', whereas, in Tamang, they were called 'Mendo', which means "flower". Interestingly, all three species (*A. hypochondriacus*, *A. caudatus*, and *A. cruentus)* were called by the same name. Various seed coat colors, including white, pale yellow, dark brown, and red, were observed among the samples (Photo 20), and in one sample from a farmers' storage, dark colored seeds were mixed with pale yellow seeds (Collection No. 6; Photos 20). Both waxy and non-waxy perisperm was observed in the *A. hypochondriacus* samples. The two samples from the market collection were non-waxy, whereas the others were waxy. The *A. cruentus* sample was also waxy, and according to Nemoto *et al*. (2016), the seeds of *A. caudatus* are low-amylose type.

Table 2. A summary of collected samples in Central Nepal, February 2016

District	Total No. of samples in Dist.	Genus	No. of samples
Lalitpur	28	*Amaranthus*	5
		Capsicum	11
		Brassica	4
		Cucurbita	2
		Sorghum	1
		Perilla	1
		Pisum	1
		Holdeum	1
		Phaseolus	1
		Chenopodium	1
Rasuwa	22	*Amaranthus*	6
		Capsicum	6
		Cucurbita	4
		Phaseolus	2
		Lens	1
		Oryza	1
		Holdeum	1
		Fagopyrum	1
Kavre	27	*Amaranthus*	2
		Capsicum	16
		Fagopyrum	3
		Holdeum	1
		Luffa	1
		Phaseolus	1
		Eleusine	2
		Zea	1
Bhaktapur	2	*Capsicum*	2
Kathmandu	9	*Amaranthus*	2
		Capsicum	7
		Total	**88**

6) Chili peppers

In the present survey, a total of 42 chili peppers samples were collected. Of these, 28 were identified as *C. annuum* L. Two others were identified as *C. frutescens* L., four samples were identified as *C. baccatum* L. However, the other eight accessions could not be identified.

In Nepali, the chili peppers were generally called 'Khursani', whereas, in Tamang, they were called 'Malta'. Ten of the 28 samples were identified as *C. annuum* and were called 'Khursani'. At the time

of field survey, four samples that were called 'Jire Khursani' or related names (e.g., 'Seto (=White) Jire Khursani' or 'Sano (=Samll) Jire Khursani') were identified as *C. frutescens,* based on their local names and small pod size. However, when cultivated later in Japan, two of these samples were re-identified as *C. annuum*. The word 'Jire' means "the person who is small but strong" in Nepali. The fruits of 'Jire Khursani' are small but have strong pungency. The chili peppers identified as *C. frutescens* were generally called 'Jire Khursani'. However, some small and pungent chili peppers that were identified as *C. annuum* were also called 'Jire Khursani'. Interestingly, NAGRC/SU-16-089 (JP 256503) were morphologically segregated into *C. annuum*- and *C. frutescens*-type during field evaluation in Japan and, therefore, treated as *Capsicum* sp. This accession could be an interspecific hybrid.

A total of 15 chili samples were called 'Akbare Khursani', 'Jyanmara Khursani', or 'Dalle Khursani' and had round-shaped pods. Among them, eight samples were identified as *C. annuum*, but the remaining seven accessions could not be identified. The unidentified 'Akbare Khursani'-type samples possessed greenish white corollas, like *C. frutescens* and *C. chinense* but paler; had two or three peduncles per a node, like *C. frutescens* or *C. chinense*; and had a fruit shape that was similar to that of *C. chinense* or *C.annuum*. According to previous molecular phylogenetic studies (Konisho *et al*., 2005; Baral and Bosland, 2002), the unidentified 'Akbare Khursani'-type chili peppers were higher similarity to the *C. annuum* group and located at the border between the *C. annuum* and *C. frutesens-chinense* groups. The 'Akbare Khursani' types are thought to have originated in eastern Nepal. The name 'Akbare Khursani' refers to the name of a historical Indian King, 'Akbare'. The variety is known as the king of chili peppers, owing to their taste, peculiarity, and popularity in Nepal and is also known as 'Jyanmara Khursani', which mean "injure human body," based on its strong hot taste. Another variety name, 'Dalle Khursani', refers to the round (='Dalle') shape of the fruits. However, because the varietal name 'Akbare' could not be found in the list of genetic resource collected from Nepal by Shinshu University during the 1980s to the 1990s, the varietal name is considered relatively new. Interestingly, the fruits of 'Akbare Khursani' are believed to possess medical value for the stomach ailments, despite their capsaicinoid content.

Even though the cultivation of *C. baccatum* has not been previously recorded in Nepal, four *C. baccatum* samples were collected during the present survey. These samples were probably introduced to the farming villages crops by NGOs. One of the *C. baccatum* samples, which was called as 'Boke Khursani' NAGRC/SU-16-017 (JP256437), was collected from the village of Silinge Besi (Lalitpur District) and was reported by farmers to have a unique character. The term 'Boke' means "male goat" in Nepalese, and the farmers reported that the fruit of 'Boke Khursani' smelled like a male goat. In *C. Chinense*, the Mexican variety 'Habanero' is known for its unique smelling fruit. Therefore, it is necessary to evaluate the smell of 'Boke Khursani' during cultivation.

Acknowledgements

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References

Baral J and Bosland P W (2002) Genetic diversity of a Capsicum germplasm collection from Nepal as determined by randomly amplified polymorphic DNA marker. J. Amer. Soc. Hort. Sci. 127 (3): 316-324.

Gautam JC (2008) Country report on the State of the Nepal's Plant Genetic Resources for Food and

Agriculture, FAO pp.1-91.
Konisho K, Minami M, Matsushima K and Nemoto K (2005) Phylogenetic relationship and species identification by RAPD analysis in genus capsicum. Hort. Res. (Japan) 4(3): 259-264. (In Japanese with English abstract)
Nemoto K., Minami M and Nagamine T (2016) Variation and geographical distribution of perisperm starch in grain amaranths (*Amaranthus* spp.), and the origin of waxy perisperm type. Tropical Agriculture and Development 60(3): 172-178.
Nemoto K, Baniya BK, Minami M, and Ujihara A (1998) Grain amaranths research in Nepal. J Fac. Agr. Shinshu Univ. 34(2): 49-58.

ネパールにおけるアマランサスおよびトウガラシ遺伝資源の共同探索，2015 年 2 月

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和文摘要

2015 年 6 月に国立研究開発法人農業生物資源研究所ジーンバンクとネパール農業研究評議会との間で交わされた共同研究契約に基づき，アマランサス属およびトウガラシ属を主な対象とした第 1 回目の植物遺伝資源共同探索調査を 2016 年 2 月 12 日から 23 日にかけてネパール中西部開発地区（ラリトプール，ラスワ，バクタプール，カブレおよびカトマンズの 5 郡）において実施した．本探索では，対象作物の他にも幅広く作物遺伝資源を収集し，合計 88 点の種子を収集した．これらの遺伝資源のうち，アマランサス属は 15 点，トウガラシ属は 42 点であった．収集した遺伝資源はネパール国立農業遺伝資源センターのジーンバンクに保存するとともに，イネ 1 点を除いた 88 点については，半量を標準材料移転契約 (SMTA) に基づいて農研機構・遺伝資源センターのジーンバンクに保存した．

Table 3. Passport data of samples collected in Central Nepal, February 2016

No.	Collection number	JP No.	Coll. Date	Species	Local name	Districts	Village Development Committee	Village	North	East	Altitude	Remarks
									Latitude	Longitude	(m)	
1	NAGRC/SU-16-001	256421	14, Feb 2016	*Capsicum annuum* L.	Akbare Khursani	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	Used as spices
2	NAGRC/SU-16-002	256422	14, Feb 2016	*Capsicum annuum* L.	Bakle Khursani	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	
3	NAGRC/SU-16-003	256423	14, Feb 2016	*Capsicum annuum* L.	Thulo Jire Khursani	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	
4	NAGRC/SU-16-004	256424	14, Feb 2016	*Capsicum annuum* L.	Jyanmara Khursani	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	
5	NAGRC/SU-16-005	256425	14, Feb 2016	*Sorghum* sp.	Seto Junelo	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	
6	NAGRC/SU-16-006	256426	14, Feb 2016	*Amaranthus caudatus* L.	Local Latte	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1783	Roasted grains eaten with milk by elder people
7	NAGRC/SU-16-007	256427	14, Feb 2016	*Amaranthus hypochondriacus* L.	Seto Latte	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1785	
8	NAGRC/SU-16-008	256428	14, Feb 2016	*Capsicum annuum* L.	Akbare Dallo Khursani	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1785	
9	NAGRC/SU-16-009	256429	14, Feb 2016	*Cucurbita moschata* Duch.	Thulo Farsi	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1785	
10	NAGRC/SU-16-010	256430	14, Feb 2016	*Cucurbita moschata* Duch.	Sano Farsi	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1785	
11	NAGRC/SU-16-011	256431	14, Feb 2016	*Pisum sativum* L.	Sano Kerau	Lalitpur	Dalchoki-5	Silinge	27.532	85.333	1785	
12	NAGRC/SU-16-012	256432	15, Feb 2016	*Capsicum annuum* L.	Akbare Khursani	Lalitpur	Sankhu-6	Sankhu	27.517	85.338	1816	
13	NAGRC/SU-16-013	256433	15, Feb 2016	*Capsicum annuum* L.	Jyanmara Khursani	Lalitpur	Sankhu-6	Sankhu	27.517	85.338	1785	
14	NAGRC/SU-16-014	256434	15, Feb 2016	*Capsicum annuum* L.	Nepale Khursani	Lalitpur	Sankhu-6	Sankhu	27.517	85.338	1785	
15	NAGRC/SU-16-015	256435	15, Feb 2016	*Capsicum annuum* L.	Sthaniya Khursani	Lalitpur	Sankhu-6	Sankhu	27.517	85.338	1785	
16	NAGRC/SU-16-016	256436	15, Feb 2016	*Brassica* sp.	Bari Tori	Lalitpur	Sankhu-6	Sankhu	27.517	85.338	1785	
17	NAGRC/SU-16-017	256437	15, Feb 2016	*Capsicum baccatum* L.	Boke Khursani	Lalitpur	Dalchoki-5	Silinge Besi	27.529	85.336	1487	Smell like male goat (boka)
18	NAGRC/SU-16-018	256438	15, Feb 2016	*Perilla frutescens* (L.) *Britton* var. *frutescens*	Seto Silam	Lalitpur	Dalchoki-5	Silinge Besi	27.529	85.336	1487	
19	NAGRC/SU-16-019	256439	15, Feb 2016	*Amaranthus cruentus* L.	Pahenlo Latte	Lalitpur	Dalchoki-3	Gothbhanjyang	27.538	85.331	1997	
20	NAGRC/SU-16-020	256440	15, Feb 2016	*Chenopodium album* L.	Bethe	Lalitpur	Dalchoki-6	Sirudanda	27.532	85.333	1850	Used as leafy vegetables
21	NAGRC/SU-16-021	256441	15, Feb 2016	*Amaranthus caudatus* L.	Rato Latte	Lalitpur	Dalchoki-6	Sirudanda	27.532	85.333	1850	Used as leafy vegetables, and roasted grains
22	NAGRC/SU-16-022	256442	15, Feb 2016	*Hordeum vulgare* L.	Seto Jau	Lalitpur	Dalchoki-6	Sirudanda	27.532	85.333	1900	As satu and also in different Tamang cultures
23	NAGRC/SU-16-023	256443	15, Feb 2016	*Capsicum baccatum* L.	Local Khursani	Lalitpur	Chaughare-6	Sirudanda	27.540	85.340	2028	
24	NAGRC/SU-16-024	256444	15, Feb 2016	*Phaseolus vulgaris* L.	Seto Simi	Lalitpur	Chaughare-6	Sirudanda	27.540	85.340	2028	
25	NAGRC/SU-16-025	256445	15, Feb 2016	*Amaranthus caudatus* L.	Rato Latte	Lalitpur	Chaughare-6	Sirudanda	27.540	85.340	2028	
26	NAGRC/SU-16-026	256446	15, Feb 2016	*Brassica juncea* (L.) Czern. Cernua Group	-	Lalitpur	Dalchoki-3	Gothbhanjyang	27.532	85.333	2035	
27	NAGRC/SU-16-027	256447	15, Feb 2016	*Brassica juncea* (L.) Czern. Cernua Group	-	Lalitpur	Dalchoki-3	Gothbhanjyang	27.532	85.333	2035	
28	NAGRC/SU-16-028	256448	15, Feb 2016	*Brassica juncea* (L.) Czern. Cernua Group	-	Lalitpur	Dalchoki-3	Gothbhanjyang	27.532	85.333	2035	
29	NAGRC/SU-16-029	256449	17, Feb 2016	*Lens culinaris* Medik.	Kalo Musuro	Rasuwa	Goljung-5	Goljung	28.172	85.316	2047	
30	NAGRC/SU-16-030	256450	17, Feb 2016	*Capsicum annuum* L.	Local Khursani	Rasuwa	Goljung-5	Goljung	28.172	85.316	2047	
31	NAGRC/SU-16-031	256451	17, Feb 2016	*Amaranthus caudatus* L.	Rato Latte/Mendo Ola	Rasuwa	Goljung-8	Goljung	28.172	85.316	2047	
32	NAGRC/SU-16-032	256452	17, Feb 2016	*Amaranthus caudatus* L.	Kalo Latte/Mendo Mlang	Rasuwa	Goljung-5	Goljung	28.172	85.316	2047	
33	NAGRC/SU-16-033	256453	17, Feb 2016	*Fagopyrum esculentum* Moench	Mithe Fapar/Chyabre	Rasuwa	Goljung-7	Goljung	28.172	85.316	2047	
34	NAGRC/SU-16-034	-	17, Feb 2016	*Oryza sativa* L.	Borang dhan	Rasuwa	Goljung-4	Goljung	28.172	85.316	2047	
35	NAGRC/SU-16-035	256454	17, Feb 2016	*Amaranthus hypochondriacus* L.	Seto Latte/Mendo Tar	Rasuwa	Gatlang-1	Gatlang	28.163	85.265	2230	
36	NAGRC/SU-16-036	256455	17, Feb 2016	*Phaseolus vulgaris* L.	Seto Simi	Rasuwa	Gatlang-6	Gatlang	28.163	85.265	2230	Used as Daal, pole type
37	NAGRC/SU-16-037	256456	17, Feb 2016	*Phaseolus vulgaris* L.	Chhirbire Simi	Rasuwa	Gatlang-6	Gatlang	28.163	85.265	2230	Bush type
38	NAGRC/SU-16-038	256457	17, Feb 2016	*Hordeum vulgare* L.	Local Jau	Rasuwa	Gatlang-5	Gatlang	28.163	85.265	2230	

Table 3 (Continued).

No.	Collection number	JP No.	Coll. Date	Species	Local name	Districts	Village Development Committee	Village	North	East	Altitude	Remarks
39	NAGRC/SU-16-039	256458	17, Feb 2016	*Amaranthus hypochondriacus* L.	Seto Latte/Mendo Tar	Rasuwa	Syafru-9	Syafrubesi	28.162	85.335	1610	Roasted grains, green vegetables
40	NAGRC/SU-16-040	256459	17, Feb 2016	*Capsicum annuum* L.	Lamcho Khursani	Rasuwa	Syafru-9	Syafrubesi	28.162	85.335	1610	
41	NAGRC/SU-16-041	256460	17, Feb 2016	*Capsicum annuum* L.	Local Khursani	Rasuwa	Syafru-9	Syafrubesi	28.162	85.335	1610	
42	NAGRC/SU-16-042	256461	17, Feb 2016	*Amaranthus caudatus* L.	Rato Latte/Mendo Ola	Rasuwa	Syafru-4	Sano Bharkhu	28.138	85.320	1850	
43	NAGRC/SU-16-043	256462	17, Feb 2016	*Amaranthus hypochondriacus* L.	Seto Latte/Mendo Tar	Rasuwa	Syafru-4	Sano Bharkhu	28.137	85.320	1894	
44	NAGRC/SU-16-044	256463	17, Feb 2016	*Cucurbita moschata* Duch.	Seto Farsi	Rasuwa	Syafru-4	Sano Bharkhu	28.137	85.320	1894	Good to use as vegetables, white seed
45	NAGRC/SU-16-045	256464	17, Feb 2016	*Cucurbita moschata* Duch.	Rato Farsi	Rasuwa	Syafru-4	Sano Bharkhu	28.137	85.320	1894	Good to use as boiled (sweet), small in size
46	NAGRC/SU-16-046	256465	17, Feb 2016	*Cucurbita moschata* Duch.	Renda Farsi	Rasuwa	Syafru-4	Sano Bharkhu	28.137	85.320	1894	Vegetable in young fruit
47	NAGRC/SU-16-047	256466	17, Feb 2016	*Cucurbita moschata* Duch.	Pangre Farsi	Rasuwa	Syafru-4	Sano Bharkhu	28.138	85.320	1845	Green vegetablea all year round, variegated skin, black seed
48	NAGRC/SU-16-048	256467	17, Feb 2016	*Capsicum annuum* L.	Local Khursani	Rasuwa	Syafru-4	Sano Bharkhu	28.138	85.320	1850	
49	NAGRC/SU-16-049	256468	17, Feb 2016	*Capsicum annuum* L.	Khursani	Rasuwa	Gatlang-1	Gatlang	28.137	85.320	1894	
50	NAGRC/SU-16-050	256469	17, Feb 2016	*Capsicum annuum* L.	Local Khursani	Rasuwa	Gatlang-1	Gatlang	28.137	85.320	1894	
51	NAGRC/SU-16-051	256470	18, Feb 2016	*Capsicum annuum* L.	Local Khursani	Kavre	Nasikasthan-1	Bhainsepati	27.636	85.492	1550	
52	NAGRC/SU-16-052	256471	18, Feb 2016	*Capsicum* sp.	Jyanmara Khursani	Kavre	Nasikasthan-2	Bajhaban	27.636	85.492	1550	
53	NAGRC/SU-16-053	256472	18, Feb 2016	*Capsicum annuum* L.	Parbate Khursani	Bhaktapur	Suryabinayak-14	-	27.652	85.443	1520	
54	NAGRC/SU-16-054	256473	18, Feb 2016	*Capsicum* sp.	Akbare Khursani	Bhaktapur	Suryabinayak-14	-	27.652	85.443	1520	
55	NAGRC/SU-16-055	256474	18, Feb 2016	*Capsicum* sp.	Akbare Khursani	Kavre	Nasikasthan-2	Bajhaban	27.636	85.492	1550	
56	NAGRC/SU-16-056	256475	18, Feb 2016	*Capsicum annuum* L.	Local Dalle Khursani	Kavre	Nasikasthan-1	Bhainsepati	27.636	85.492	1550	
57	NAGRC/SU-16-057	256476	18, Feb 2016	*Capsicum annuum* L.	Sthaniya Dalle	Kavre	Nasikasthan-1	Bhainsepati	27.636	85.492	1550	
58	NAGRC/SU-16-058	256477	18, Feb 2016	*Capsicum annuum* L.	Akbare/Dalle	Kavre	Nasikasthan-1	Bhainsepati	27.636	85.492	1550	
59	NAGRC/SU-16-059	256478	18, Feb 2016	*Capsicum annuum* L.	Piro Khursani	Kavre	Nasikasthan-1	Bhainsepati	27.636	85.492	1550	
60	NAGRC/SU-16-060	256479	18, Feb 2016	*Capsicum annuum* L.	Bhaktapure Local	Kavre	Nasikasthan-2	Bajhaban	27.636	85.492	1550	
61	NAGRC/SU-16-061	256480	18, Feb 2016	*Capsicum annuum* L.	Local Piro Khursani	Kavre	Nasikasthan-2	Bajhaban	27.636	85.492	1550	
62	NAGRC/SU-16-062	256481	18, Feb 2016	*Capsicum baccatum* L.	Machha Khursani	Kavre	Nasikasthan-2	Bajhaban	27.636	85.492	1550	
63	NAGRC/SU-16-063	256482	18, Feb 2016	*Capsicum frutescens* L.	Seto Jire Khursani	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
64	NAGRC/SU-16-064	256483	18, Feb 2016	*Capsicum* sp.	Jyanmara Khursani	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
65	NAGRC/SU-16-065	256484	18, Feb 2016	*Fagopyrum tataricum* Gaertn	Tite Fapar	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
66	NAGRC/SU-16-066	256485	18, Feb 2016	*Fagopyrum esculentum* Moench	Mithe Fapar	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
67	NAGRC/SU-16-067	256486	18, Feb 2016	*Hordeum vulgare* L.	Sthaniya Jau	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
68	NAGRC/SU-16-068	256487	18, Feb 2016	*Phaseolus vulgaris* L.	Daal Simi	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
69	NAGRC/SU-16-069	256488	18, Feb 2016	*Amaranthus caudatus* L.	Rato Latte	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
70	NAGRC/SU-16-070	256489	18, Feb 2016	*Zea mays* L.	Seto Makai	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	No Weevils, Very good taste
71	NAGRC/SU-16-071	256490	18, Feb 2016	*Eleusine coracana* (L.) Gaertn. ssp. *coracana* Hilu et de Wet	Dalle Kodo	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
72	NAGRC/SU-16-072	256491	18, Feb 2016	*Amaranthus hypochondriacus* L.	Kalo Latte	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
73	NAGRC/SU-16-073	256492	18, Feb 2016	*Luffa cylindrica* M. Roem	Sthaniya Ghiraunla	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
74	NAGRC/SU-16-074	256493	18, Feb 2016	*Eleusine coracana* (L.) *Gaertn.* ssp. *coracana* Hilu et de Wet	Latte Kodo	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	

Table 3 (Continued).

No.	Collection number	JP No.	Coll. Date	Species	Local name	Districts	Village Development Committee	Village	North	East	Altitude	Remarks
75	NAGRC/SU-16-075	256494	18, Feb 2016	*Fagopyrum tataricum* Gaertn.	Tite Fapar	Kavre	Nasikasthan-5	Saraswotitar	27.640	85.475	1609	
76	NAGRC/SU-16-076	256495	18, Feb 2016	*Capsicum annuum* L.	Sthaniya Khursani	Kavre	Nasikasthan-6	Sanga	27.640	85.478	1559	
77	NAGRC/SU-16-077	256496	18, Feb 2016	*Capsicum baccatum* L.		Kavre	Nasikasthan-6	Sanga	27.640	85.478	1559	
78	NAGRC/SU-16-078	256497	18, Feb 2016	*Capsicum annuum* L.	Sano Jire Khursani	Kavre	Nasikasthan-6	Sanga	27.640	85.478	1559	
79	NAGRC/SU-16-079	256498	18, Feb 2016	*Capsicum* sp.	Akbare Khursani	Kavre	Nasikasthan-6	Sanga	27.640	85.478	1559	
80	NAGRC/SU-16-085	256499	19, Feb 2016	*Amaranthus hypochondriacus* L.	Latte	Kathmandu	-	Assan	-	-	-	Market collection (grown in Kavre, Bagmati), non waxy type
81	NAGRC/SU-16-086	256500	19, Feb 2016	*Amaranthus hypochondriacus* L.	Latte	Kathmandu	-	Assan	-	-	-	Market collection (grown in Kavre, Bagmati), non waxy type
82	NAGRC/SU-16-087	256501	19, Feb 2016	*Capsicum* sp.	Khursani	Kathmandu	-	Assan	-	-	-	Market collection (grown in Dharke, Dhading, Bagmati)
83	NAGRC/SU-16-088	256502	19, Feb 2016	*Capsicum* sp.	Nya Malta	Kathmandu	-	Assan	-	-	-	Market collection (grown in Dhunibesi, Dhading, Bagmati)
84	NAGRC/SU-16-089	256503	19, Feb 2016	*Capsicum* sp.	Jire Khursani	Kathmandu	-	Assan	-	-	-	Market collection (grown in Manthali, Ramechhap, Janakpur)
85	NAGRC/SU-16-090	256504	19, Feb 2016	*Capsicum annuum* L.	Akbare Khursani	Kathmandu	-	Assan	-	-	-	Market collection (grown in Dharan, Sunsari, Kosi)
86	NAGRC/SU-16-091	256505	19, Feb 2016	*Capsicum frutescens* L.	Jire Khursani	Kathmandu	-	Assan	-	-	-	Market collection (grown in Manthali, Ramechhap, Janakpur)
87	NAGRC/SU-16-092	256506	19, Feb 2016	*Capsicum* sp.	Khursani	Kathmandu	-	Assan	-	-	-	Market collection (grown in Kirtipur, Kathmandu, Bagmati)
88	NAGRC/SU-16-093	256507	19, Feb 2016	*Capsicum* sp.	Jyanmara Malta	Kathmandu	-	Assan	-	-	-	Market collection (grown in Jhapa, Sunsari, Kosi)

Photo 1. Scenery at Dalchowki, Laltpur Dist.

Photo 2. Storage room of Community Seed Bank at Dalchowki, Laltpur Dist.

Photo 3. Fruits of chili pepper at Dalchowki, Laltpur Dist.

Photo 4. Interviewing local people at Dalchowki, Laltpur Dist.

Photo 5. White grains of amaranth at Dalchowki, Laltpur Dist.

Photo 6. Red grains of amaranth at Dalchowki, Laltpur Dist.

Photo 7. Road situation on the way to Goljung, Rasuwa Dist.

Photo 8. Goljung village, Rasuwa Dist.

Photo 9. Damaged residence by earthquake at Goljung, Rasuwa Dist.

Photo 10. Damaged residence by earthquake at Goljung, Rasuwa Dist.

Photo 11. Inflorescence of amaranth in the field at Goljung, Rasuwa Dist.

Photo 12. Scenery on the way to at Gatlang, Rasuwa Dist.

Photo 13. Gatlang village, Rasuwa Dist.

Photo 14. Interviewing local farmer at Gatlang, Rasuwa Dist.

Photo 15. Cereal merchant at Assan market, Kathmandu

Photo 16. Local seed shop at Assan market, Kathmandu

Photo 17. Fruit shapes of chili pepper at Dalchowki

Photo 18. Drooping inflorescence of amaranth at Sanga

Photo 19. Inflorescence of amaranth at Sanga

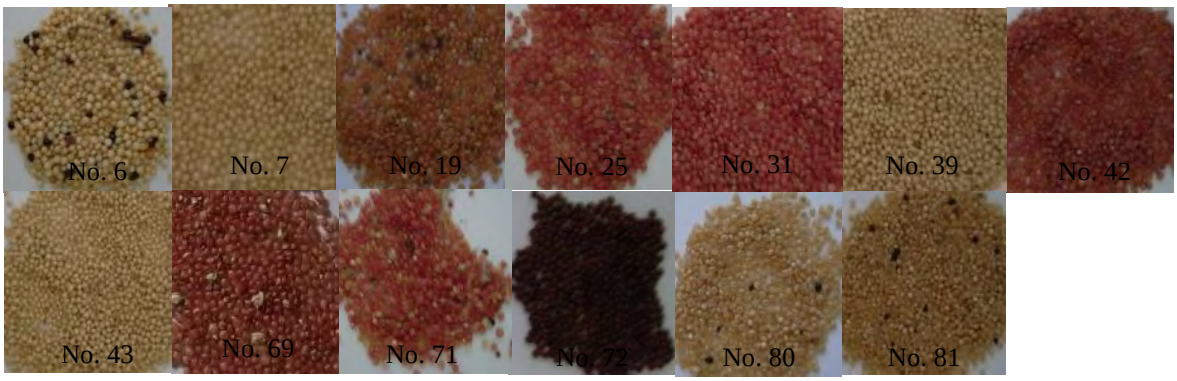

Photo 20. Seed coat color variation of amaranth collected in the survey in Central Nepal, February 2016.