

Supplemental Table 1. Cultivars used in this research

JP number	variety name	Status	Origin	Sources	Cluster No.*
	Kingwa	Breeders line	USA	USDA	
	Laredo	Breeders line	USA	USDA	
	PI175184	Landrace	India	USDA	
	KAERI 610-3	Landrace	Korea	USDA	
	Peking	Landrace	China	USDA	
	PI602991	Landrace	China	USDA	
	TAMADAIKOKU	Breeders line	Nagano	NAGANO	
	SHINANOWASEGURO	Breeders line	Nagano	NAGANO	
	SHINANOGURO	Landrace	Nagano	NAGANO	
29359	TAMBAGURO	Landrace	Hyogo	NIAS	J5F
29246	ZAIRAI 51-11	Landrace	Aichi	NIAS	
29253	ZAIRAI 51-2	Landrace	Aichi	NIAS	J5E
35378	ZAIRAISHU M 1	Landrace	Aichi	NIAS	
29414	COL/EHIME/1983/UTSUNOMIYA 29	Landrace	Ehime	NIAS	
28582	SHIMIZU 1-8-1	Landrace	Ibaragi	NIAS	
29102	KURO DAIZU(ISHIOKA 45)	Landrace	Ibaragi	NIAS	
29104	KURO DAIZU	Landrace	Ibaragi	NIAS	
76508	KUROMAME	Landrace	Ibaragi	NIAS	J5F
29451	KURO DAIZU(OKAYAMA)	Landrace	Okayama	NIAS	
29452	GANKUI MAME	Landrace	Okayama	NIAS	J5E
49013	KUROSENGOKU KINAI 5	Landrace	Okinawa	NIAS	
28931	KURO DAIZU	Landrace	Kanto-tozan	NIAS	
27863	KUROHIRA	Landrace	Iwate	NIAS	J5E
28460	SANDAN MAME	Landrace	Iwate	NIAS	J3B
76510	KUROMAME	Landrace	Iwate	NIAS	J5E
76545	KUROMAME	Landrace	Iwate	NIAS	J5E
85364	KUROMAME	Landrace	Iwate	NIAS	J5D
85529	KUROMAME	Landrace	Iwate	NIAS	J5D
85537	KUROMAME	Landrace	Iwate	NIAS	J5D
29225	COL/GIFU/1984/OGURI 6	Landrace	Gifu	NIAS	J5C
85551	KUROMAME	Landrace	Miyagi	NIAS	J5E
85554	KUROMAME	Landrace	Miyagi	NIAS	J5E
85555	KUROMAME	Landrace	Miyagi	NIAS	
87834	KUROMAME	Landrace	Miyagi	NIAS	J5F
49593	TANBAKURO/OOGATA/1988	Landrace	Kyoto	NIAS	J5F
29493	KOMUTA	Landrace	Kumamoto	NIAS	E4A
29535	KURO DAIZU	Landrace	Kumamoto	NIAS	J5C
29620	ZAIRAI KURO DAIZU	Landrace	Kumamoto	NIAS	
29697	MIKAWA ZAIRAI 83	Landrace	Kumamoto	NIAS	
29698	KAOU ZAIRAI 83A	Landrace	Kumamoto	NIAS	
29699	KAOU ZAIRAI 83B	Landrace	Kumamoto	NIAS	
29700	KAOU ZAIRAI 83C	Landrace	Kumamoto	NIAS	
29705	IZUMI ZAIRAI 83E	Landrace	Kumamoto	NIAS	
29709	TOUYOU ZAIRAI 83B	Landrace	Kumamoto	NIAS	
29711	ITSUKI ZAIRAI 83A	Landrace	Kumamoto	NIAS	J5F
29719	ITSUKI ZAIRAI 83L	Landrace	Kumamoto	NIAS	
29720	SHICHIJOU ZAIRAI 83A	Landrace	Kumamoto	NIAS	J5F
29721	SHICHIJOU ZAIRAI 83C	Landrace	Kumamoto	NIAS	
29722	SHICHIJOU ZAIRAI 83D	Landrace	Kumamoto	NIAS	
29696	NANKAN ZAIRAI 83	Landrace	Kumamoto	NIAS	J7
28482	KURO	Landrace	Gunma	NIAS	
73035	KURODAIZU	Landrace	Gunma	NIAS	J5E
73036	KUROMAME	Landrace	Gunma	NIAS	J5E
73068	KUROMAME	Landrace	Gunma	NIAS	J5F
28952	HIROSHIMA KURO DAIZU	Landrace	Hiroshima	NIAS	J5F
29459	HIROSHIMA KURO DAIZU	Landrace	Hiroshima	NIAS	
81620	KURODAIZU	Landrace	Kochi	NIAS	J5F
81623	DAIZU	Landrace	Kochi	NIAS	J5F
73149	KUROMAME	Landrace	Saitama	NIAS	J5F
28360	BANSEI KURO DAIZU	Landrace	Mie	NIAS	
90897	KURODAIZU	Landrace	Mie	NIAS	J5F
90899	KUROMAME	Landrace	Mie	NIAS	J5F

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27940	KURO TAIRYUU DAIZU	Landrace	Yamagata	NIAS	
27941	KURO MAME(YAMAGATA)	Landrace	Yamagata	NIAS	
27980	KUROZATOU MAME	Landrace	Yamagata	NIAS	J3B
76513	ITSUTSUPPAMAME	Landrace	Yamagata	NIAS	J5D
76515	KUROMAME	Landrace	Yamagata	NIAS	J5D
76517	KUROMAME	Landrace	Yamagata	NIAS	
76543	BITTARAMAME	Landrace	Yamagata	NIAS	J5E
76548	KUROMAME	Landrace	Yamagata	NIAS	J5E
76549	KUROGOYOU	Landrace	Yamagata	NIAS	
76550	KUROMAME	Landrace	Yamagata	NIAS	
76554	KUROGOYOU	Landrace	Yamagata	NIAS	J5D
76555	ITSUTSUBA	Landrace	Yamagata	NIAS	J5D
76557	KUROMAME	Landrace	Yamagata	NIAS	
76559	KURODAIZU	Landrace	Yamagata	NIAS	J5D
87826	KUROMAME	Landrace	Yamagata	NIAS	J5E
87830	KUROMAME	Landrace	Yamagata	NIAS	
87837	KUROMAME	Landrace	Yamagata	NIAS	J5E
29454	HIROSE KURO DAIZU	Landrace	Yamaguchi	NIAS	J5C
28867	MAEDAMURA ZAIRAI	Landrace	Yamanashi	NIAS	J5F
85523	KURODAIZU	Landrace	Kagoshima	NIAS	J5F
85525	KUROMAME	Landrace	Kagoshima	NIAS	J5F
27846	KURO MAME	Landrace	Akita	NIAS	J2
28229	KURO SAKIGAKE	Landrace	Niigata	NIAS	J5E
28306	WASE KURO MAME	Landrace	Niigata	NIAS	
73049	KUROMAME	Landrace	Niigata	NIAS	
73051	TSUYANASHIKUROMAME	Landrace	Niigata	NIAS	
73055	KUROMAME	Landrace	Niigata	NIAS	J5A
73164	KUROMAME	Landrace	Niigata	NIAS	
73169	KUROMAME	Landrace	Niigata	NIAS	
27742	GOISHI SHIROHANA	Landrace	Aomori	NIAS	J5E
28199	COL/AOMORI/1983-31	Landrace	Aomori	NIAS	
28206	HIKARIKURO	Landrace	Aomori	NIAS	
35264	KURO MAME L 117	Landrace	Aomori	NIAS	
35267	KURO MAME L 120	Landrace	Aomori	NIAS	
35276	COL/AOMORI/1981/L 133	Landrace	Aomori	NIAS	
40256	KURO MAME L99	Landrace	Aomori	NIAS	
81626	COL/AOMORI/1994/MAFF/006	Landrace	Aomori	NIAS	
81627	KUROMAME	Landrace	Aomori	NIAS	J5E
81629	KUROMAME	Landrace	Aomori	NIAS	
28080	KURO DAIZU	Landrace	Aomori	NIAS	
35337	ZAI 52-11	Landrace	Chiba	NIAS	
35348	ZAI 54-12	Landrace	Chiba	NIAS	
35352	ZAI 54-21	Landrace	Chiba	NIAS	
67989	TSURUSENGOKU	Breeders line	Chiba	NIAS	
68015	TSURUMAME CHIBA 4N	Breeders line	Chiba	NIAS	
28539	YASEI DAIZU	Wild	Osaka	NIAS	
76320	MAETUE ZAIRAI 90A	Landrace	Oita	NIAS	
76322	MAETUE ZAIRAI 90C	Landrace	Oita	NIAS	J5F
76327	KOISHIBARA ZAIRAI 90G	Landrace	Oita	NIAS	J5F
29034	CHOUHIN HITASHI 1	Landrace	Nagano	NIAS	
29035	CHOUHIN HITASHI 2	Landrace	Nagano	NIAS	J5E
29036	CHOUHIN HITASHI 3	Landrace	Nagano	NIAS	
29038	CHOUHIN HITASHI 5	Landrace	Nagano	NIAS	J5E
29052	OGAWA ZAIRAI(2)	Landrace	Nagano	NIAS	
29054	OOSHIKA ZAIRAI	Landrace	Nagano	NIAS	
29103	KURO MAME(NAGANO)	Landrace	Nagano	NIAS	
29105	KURO HITASHIMAME	Landrace	Nagano	NIAS	J5E
29190	SHINANO KURO	Landrace	Nagano	NIAS	
35330	COL/NAGANO/1983/HORIUCHI 5-1	Landrace	Nagano	NIAS	
49764	SHINANOKURO	Landrace	Nagano	NIAS	
67654	KUROMAME(NAGANO)	Landrace	Nagano	NIAS	
67655	KUROMAME(SHIOJIRI)	Landrace	Nagano	NIAS	

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67656	KUROMAME(OGAWAMURA)	Landrace	Nagano	NIAS	
67657	KUROMAME(MISATO)	Landrace	Nagano	NIAS	
70214	MINAMI SHINANO ZAIRAI 2	Landrace	Nagano	NIAS	
70225	KAMIMURA SHINOGURI ZAIRAI 3	Landrace	Nagano	NIAS	
70229	OOSHIKA ZAIRAI 1(SOU)	Landrace	Nagano	NIAS	
70230	OOSHIKA ZAIRAI 1(BAN)	Landrace	Nagano	NIAS	
70236	KUROMAME(KAKIZAWA)	Landrace	Nagano	NIAS	
73170	COL/NAGANO/1988/MAFF/195	Landrace	Nagano	NIAS	
73171	COL/NAGANO/1988/MAFF/196	Landrace	Nagano	NIAS	
73174	KUROMAME	Landrace	Nagano	NIAS	J5C
73221	KUROMAME	Landrace	Nagano	NIAS	J5H
73230	KUROMAME	Landrace	Nagano	NIAS	J5H
88531	KUROMAME (SHIROHANA)	Landrace	Nagano	NIAS	
88532	KUROMAME (MURASAKIHANA)	Landrace	Nagano	NIAS	
87845	KURODAIZU	Landrace	Shimane	NIAS	J5F
87847	KUROMAME	Landrace	Shimane	NIAS	J5F
27871	GANKUI 1	Landrace	Tohoku(Unknown)	NIAS	
27872	GANKUI 3	Landrace	Tohoku(Unknown)	NIAS	
28145	SHICHIGATSU MAME	Landrace	Tohoku(Unknown)	NIAS	
29119	KURO DAIZU 1(TOCHIGI)	Landrace	Tochigi	NIAS	
29120	KURO DAIZU 2(TOCHIGI)	Landrace	Tochigi	NIAS	J5E
67660	UJIE ZAIRAI(SHIRO HANA)	Landrace	Tochigi	NIAS	J5E
67661	UJIE ZAIRAI(MURASAKI HANA)	Landrace	Tochigi	NIAS	
68014	OOBATSURUMAME NAKEI 50	Breeders line	Tochigi	NIAS	
90903	KUROMAME	Landrace	Nara	NIAS	J5F
90904	KUROMAME	Landrace	Nara	NIAS	
90905	KUROMAME	Landrace	Nara	NIAS	J5F
90911	DAIZU	Landrace	Nara	NIAS	J5F
90916	DAIZU	Landrace	Nara	NIAS	J5F
110305	KURODAIZU	Landrace	Nara	NIAS	J5C
27392	GOYOU KUROMAME	Landrace	Japan(Unknown)	NIAS	
27679	KURO SHOURYUU	Landrace	Japan(Unknown)	NIAS	
27680	KURO CHUURYUU	Landrace	Japan(Unknown)	NIAS	
27681	MOYASHI MAME	Landrace	Japan(Unknown)	NIAS	
28230	GOISHI MAME(ZAIRAI)	Landrace	Japan(Unknown)	NIAS	J5E
28394	KURO MAME	Landrace	Japan(Unknown)	NIAS	
28698	CHOGAN TOUJI	Landrace	Japan(Unknown)	NIAS	
28731	TEN AN	Landrace	Japan(Unknown)	NIAS	
29106	KOMAMAKI ZAIRAI(KURO)	Landrace	Japan(Unknown)	NIAS	
29107	ZAIRAI KURO DAIZU	Landrace	Japan(Unknown)	NIAS	
29295	CHOUSEN KURO DAIZU	Landrace	Japan(Unknown)	NIAS	
29296	KINAI KURO SENGOKU 2	Landrace	Japan(Unknown)	NIAS	
29299	TOCHIGI KURO SENGOKU	Landrace	Japan(Unknown)	NIAS	
29328	KURO MAME(NAGATA)	Landrace	Japan(Unknown)	NIAS	
29336	SANTOU SHIN CHIKUKAN	Landrace	Japan(Unknown)	NIAS	
29523	GINSUI ZAIRAI	Landrace	Japan(Unknown)	NIAS	
29612	MANSHUU KUROSENGOKU	Landrace	Japan(Unknown)	NIAS	
29627	KINAI KURO SENGOKU	Landrace	Japan(Unknown)	NIAS	
29628	MANSHUU KURO SENGOKU	Landrace	Japan(Unknown)	NIAS	
29629	CHOUSEN KURO SENGOKU	Landrace	Japan(Unknown)	NIAS	
35135	KURO	Landrace	Japan(Unknown)	NIAS	
68009	GURASUDAUN	Landrace	Japan(Unknown)	NIAS	
90782	TOCHIGI CHA SENGOKU NO.3	Landrace	Japan(Unknown)	NIAS	
28257	ZENKOUJI	Landrace	Fukui	NIAS	J5F
28308	COL/FUKUI/1983/MAWAKI 1	Landrace	Fukui	NIAS	J5F
29602	KURO SENGOKU	Landrace	Fukuoka	NIAS	
76306	YABE ZAIRAI 90F	Landrace	Fukuoka	NIAS	J5F
76311	AMAGI ZAIRAI 90B	Landrace	Fukuoka	NIAS	J5F
76312	AMAGI ZAIRAI 90C	Landrace	Fukuoka	NIAS	
76314	YABE ZAIRAI 90B	Landrace	Fukuoka	NIAS	J5F
76317	YABE ZAIRAI 90H	Landrace	Fukuoka	NIAS	
76318	YABE ZAIRAI 90I	Landrace	Fukuoka	NIAS	

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76319	YABE ZAIRAI 90K	Landrace	Fukuoka	NIAS	
28214	KUROGOYOU	Landrace	Fukushima	NIAS	J5D
73028	CHINCHINMAME	Landrace	Fukushima	NIAS	J5E
73061	KUROMAME	Landrace	Fukushima	NIAS	J5E
73109	MOCHIMAME	Landrace	Fukushima	NIAS	
73111	KUROMAME.BETTARAMAME	Landrace	Fukushima	NIAS	J5E
73114	KUROMAME	Landrace	Fukushima	NIAS	
73116	KUROMAME	Landrace	Fukushima	NIAS	J5E
73119	KUROMAME	Landrace	Fukushima	NIAS	
73127	KUROMAME	Landrace	Fukushima	NIAS	
73129	KUROMAME	Landrace	Fukushima	NIAS	
73132	KUROMAME	Landrace	Fukushima	NIAS	
73134	KUROMAME. WASEMAME	Landrace	Fukushima	NIAS	J5D
73139	KUROMAME	Landrace	Fukushima	NIAS	
76565	GOHAMAME	Landrace	Fukushima	NIAS	
76567	KUROMAME	Landrace	Fukushima	NIAS	
76572	KUROMAME	Landrace	Fukushima	NIAS	
76573	KUROMAME	Landrace	Fukushima	NIAS	
76576	KUROMAME	Landrace	Fukushima	NIAS	
76577	KUROMAME	Landrace	Fukushima	NIAS	J5E
76583	KUROMAME	Landrace	Fukushima	NIAS	J5D
76585	KUROMAME	Landrace	Fukushima	NIAS	
90891	KUROMAME	Landrace	Fukushima	NIAS	
90894	KUROMAME	Landrace	Fukushima	NIAS	
49575	TANBA KURO/YAMAGATA/1987	Landrace	Hyogo	NIAS	J5F
27384	KURO	Landrace	Hokkaido	NIAS	
27431	WASE KURO SENGOKU	Landrace	Hokkaido	NIAS	J3B
27707	CHUUSEI KURO DAIZU	Landrace	Hokkaido	NIAS	
27708	BANSEI HIKARIKURO	Landrace	Hokkaido	NIAS	J5D
27709	HIKARIKURO	Landrace	Hokkaido	NIAS	
28073	KUROKAWA SEIOU	Landrace	Hokkaido	NIAS	
28453	HIYAMA KURO 2	Landrace	Hokkaido	NIAS	
28454	WASE KUROIHIKARI	Landrace	Hokkaido	NIAS	
49462	KONSEN 27	Landrace	Hokkaido	NIAS	J3E
53324	AKANUKANAI	Landrace	Hokkaido	NIAS	
53354	NAGAHA KURODAIZU	Landrace	Hokkaido	NIAS	
53356	KURO(YAGI 2)	Landrace	Hokkaido	NIAS	
53399	KONSEN 40	Landrace	Hokkaido	NIAS	
28261	GOYOU KURO MAME	Landrace	Iokuriku(Unknown)	NIAS	
110329	KURODAIZU	Landrace	Wakayama	NIAS	
110336	KUROMAME	Landrace	Wakayama	NIAS	J5F

\*: Kaga *et al.*(2010)