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Classification of Japonica Rice Varieties in Yunnan Province, China, Based on Reaction Patterns to Several Isolates of Blast Fungus

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Abstract

Two hundred twenty-six japonica rice varieties bred in Yunnan Province, China were inoculated at the seeding stage by spraying a spore suspension with one each of the six isolates belonging to the different Japanese races of blast fungus, *Pyricuralia oryzae* Cavara, collected in the Province, i.e. the race 001, 003, 007, 017t^+, 037t^+ and 137t^+. The varieties tested were divided into seven groups, designated as I through VII, on the basis of the reaction patterns to the isolates. Varieties in the Group I, IV and II, III were further divided into three and two subgroups, respectively. One hundred ninety-eight varieties classified in the Groups I through VI were susceptible at least to one of the six isolates, and 28 varieties in the Group VII were resistant to all the isolate inoculated. The varieties in the Group VII were further divided into four subgroups by eight isolates which were virulent to the varieties bearing at least one of the following resistance genes, i.e. *Pi-b*, *Pi-z*, *Pi-ta*^{2} and *Pi-z*^{t}. These isolates had been collected in Yunnan Province, Hainan Island of China and Japan. It is presumed that the Group I-1 corresponds to Shin 2 type according to the Kiyosawa's classification, and that the varieties in the Group I-2 and I-3 have at least a resistance gene or genes to be identified yet. The varieties in the Group II may possibly have at least a resistance gene *Pi-a*, the Group III *Pi-i*, the Group IV *Pi-k*, the Group V *Pi-k*^{m}, and the Group VI *Pi-ta*, respectively. The varieties in the Group VII-1 may have *Pi-b*, the Group VII-2 *Pi-b* and other resistance gene or genes, the Group VII-3 *Pi-z*^{t}, respectively. Seven varieties in the Group VII-4 which were resistant to all the isolates may have a resistance gene, or genes, which requires further identification.

Discipline: Crop production
Additional key words: *Pyricularia oryzae*, rice disease, resistance gene, varietal resistance

Varietal resistance to rice blast is divided into "true resistance" controlled by major genes, functions of which are highly specific, and "field resistance". Because of frequent incidences of breakdown of high resistance dependent on true resistance genes, strengthening of the breeding program dealing with field resistance is required in order to stabilize a crop yield in the outbreak of blast disease. Field resistance has been generally recognized to be non-specific to pathogenic races of blast fungus. This implies that the function of field resistance can be only assessed in the absence of true resistance genes effective to prevailing races.

Multiple races generally exist in an infested paddy field, and the kinds of the races and their relative frequencies in the field vary from season to season[7]. Iwano et al.[1] reported annual changes of the race constitution in paddy fields in Yunnan Province, China. In case where the test for blast resistance of a number of varieties bearing different true resistance genes is conducted in a given field simultaneously, the degree of infection in each rice variety can be strongly affected by the kinds of races and their relative frequencies in the test field.

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Field resistance to blast, therefore, can only be compared among the varieties which bear the same reaction pattern to blast races, i.e. among the varieties bearing the same resistance gene or a set of genes, if the test is undertaken under a natural infection. Therefore, in identifying field resistance of a given variety in a breeding program for blast resistance, information on the gene constitution associated with true resistance of that variety is very necessary indeed.

Objectives of the present study are: (1) to classify japonica rice varieties in Yunnan Province based on their reaction patterns to several isolates collected from Yunnan Province, Hainan Island and Japan; and (2) to obtain preliminary information on true resistance genes carried by these varieties.

Materials and methods

Two hundred twenty-six rice varieties from twelve agricultural science institutes in Yunnan Province, 29 varieties from Japan, nine Japanese differential varieties[9] and two additional differential lines (BL 1 and K 59 with a resistance gene of *Pi-b* and *Pi-t*, respectively) were tested in the experiments.

The rice plants were grown in plastic nursery boxes of approximately 5 × 15 cm and 10 cm in depth, or in galvanized iron flats of approximately 30 × 35 cm and 6 cm in depth under upland conditions in a greenhouse. The former boxes contained five varieties each and the latter flats did 75 varieties each; seven to ten seeds of each variety were sown. The amount of fertilizers applied for the former boxes and the latter flats was: 2 g and 12 g of a granular fertilizer as a basal dressing, and 0.2 g and 2 g of ammonium sulfate as a top dressing, respectively, on the 5th day before inoculation.

The plants were inoculated at the 4th-leaf stage by spraying with a spore suspension. The spores for inoculation were produced by using an oatmeal decoction sucrose agar. The inoculated plants were kept in a moistchamber for approximately 20 hr at 24–26°C and in a greenhouse thereafter. A record on symptoms was taken on the 7th–9th day after inoculation.

Experiment 1: Two hundred fifty-five rice varieties from Yunnan and Japan were inoculated by six isolates collected in Yunnan as shown in Table 1 and classified into varietal groups on the basis of their specific reaction patterns.

Experiment 2: To further classify the 28 varieties which showed resistance to all the isolate used in the Experiment 1, those varieties were inoculated by eight isolates collected in Yunnan, Hainan Island and Japan as presented in Table 3.

Experiment 3: To further classify the nine varieties which showed susceptibility to all the isolates used in the Experiment 1, they were inoculated by an isolate Y87-01 (race 006) collected in Yunnan.

Experiment 4: To further classify the 16 varieties which showed resistance to Y-34 (race 001), Y87-018 (003) and Y88-15 (007), while showing susceptibility to Y88-14 (017t^+), Y88-25 (037t^+) and Y88-45 (137t^+) in the Experiment 1, they were inoculated by Y88-137 (011) collected in Yunnan.

Results and discussions

Two hundred twenty-six japonica rice varieties in Yunnan Province were devided into seven groups, i.e. from I to VII, on the basis of reaction patterns to the six isolates belonging to different races. Varieties of Groups I, IV and II, III were further divided into three and two subgroups, respectively, as shown in Table 1. The result of classification is presented in Table 2.

The varieties of Group I-1 were susceptible to all the isolates used. Out of the 226 varieties tested, 48 varieties including Xinan 175 and Zujin 3, both of which are improved varieties widely grown in Yunnan, were put in this group. Shin 2, one of the Japanese differential varieties, and eight Japanese varieties all belonging to a Shin 2 type[10] were also susceptible to the six isolates. This result indicates that the Group I-1 corresponds to Shin 2 type in terms of the reaction pattern to blast races. Yuner-tian 02 of the Group I-2 and Zujin 9 of the Group I-3 might have a resistance gene or genes to be identified yet.

Thirty-one varieties of the Group II-1 were resistant to the isolate Y-34 (001) but susceptible to other five isolates. Aichiasahi among the differentials and nine Japanese varieties belonging to the Aichiasahi type[10] indicated the same reaction pattern to the six isolates. This result implies that the Group II-1 corresponds to the Aichiasahi type and that the varieties in this group have a gene *Pi-a*. It also suggests that Jinning 277 of the Group II-2 bear the same

Table 1. Classification of japonica rice varieties in Yunnan Province based on reaction patterns to Yunnan blast fungus isolates

Group	Sub-group	Y-34 (001)	Y87-018 (003)	Y88-15 (007)	Y88-14 (017t^+)	Y88-25 (037t^+)	Y88-45 (137t^+)	Number of varieties
I	1	+	+	+	+	+	+	48
	2	+	+	+	+	−	+	1
	3	+	+	+	−	+	+	1
II	1	−	+	+	+	+	+	31
	2	−	+	+	−	+	+	1
III	1	−	−	+	+	+	+	40
	2	−	−	+	+	−	−	4
IV	1	−	−	−	+	+	+	34
	2	−	−	−	+	−	+	4
	3	−	−	−	+	−	−	5
V	1	−	−	−	−	+	+	24
VI	1	−	−	−	−	−	+	5
VII		−	−	−	−	−	−	28

+ : Susceptible reaction, − : Resistant reaction.
The figures in parentheses are race numbers of the fungus isolates.

gene *Pi-a* and another unknown gene or genes. Such a gene composition is to be identified yet, since the reaction of this variety to Y84-14 (017t^+) is not stable.

Forty varieties of the Group III-1 were resistant to Y-34 (001) and Y87-018 (003), but susceptible to the remaining four isolates. Ishikarishiroke among the differentials and six Japanese varieties belonging to the Ishikarishiroke type[10] and the Shinsetsu type[2] also showed the same reaction pattern to the six isolates. This group may include varieties of the following two different genotypes; *Pi-i* and *Pi-a Pi-i*. Four varieties of the Group III-2 were susceptible to Y88-15 (007) and Y88-14 (017t^+), but resistant to the remaining four isolates. This suggests that those varieties have the gene *Pi-i* and another gene or genes not identified so far.

Thirty-four varieties of the Group IV-1 were resistant to Y-34 (001), Y87-018 (003) and Y88-15 (007), but susceptible to the remaining three isolates. Kanto 51 among the differentials and four Japanese varieties belonging to To-to type[10] expressed the same reaction pattern to the six isolates. This group may include varieties of the following three different genotypes, i.e. *Pi-k*, *Pi-a Pi-k* and *Pi-i Pi-k*. Four varieties of the Group IV-2 and five varieties of the Group IV-3 may have *Pi-k* and another unknown gene or genes.

Twenty-four varieties of the Group V-1 were resistant to Y-34 (001), Y87-018 (003), Y88-15 (007) and Y88-14 (017t^+), but susceptible to the remaining two isolates. Tsuyuake among the differentials and BR No. 1[6] bearing *Pi-a* and *Pi-k^m* also showed the same reaction pattern to the six isolates. This group may include varieties of the following different genotypes; *Pi-k^m*, *Pi-a Pi-k^m* and *Pi-i Pi-k^m*.

Five varieties of the Group VI-1 were susceptible to Y88-45 (137t^+), but resistant to the remaining five isolates. Yashiromochi among the differentials and Wasetoramochi belonging to Yashiromochi type[3] had also the same reaction pattern to the six isolates. The result indicates that the Group VI-1 corresponds to Yashiromochi type and the varieties of this group have the gene *Pi-ta*.

Twenty-eight varieties of the Group VII were resistant to all the isolates. To classify them further into subgroups, the varieties of the Group VII were inoculated with eight isolates which were virulent to the varieties bearing at least one of the following true resistance genes, i.e. *Pi-z*, *Pi-ta^2*, *Pi-z^t* and *Pi-b*. Varieties of the Group VII were divided into four subgroups as shown in Table 3. The results of classification are shown in Table 4.

The nine varieties of the Group VII-1 may have the gene *Pi-b*, since these varieties were susceptible

Table 2. Classification of japonica rice varieties in Yunnan Province[a)]

Group I-1;	Dahuanuo, Dian-er 2-4, Dianjing 5-3, Dianhua 4, Heixuan 5, Helian 1, Hexi 10, Hexi 11, Hexi 12, Jiangxuan 2, Jingguo 9-2, Jingguo 9-3, Jingjin 1, Jingjin 2, Jinnuo 1, Keqing 3, Kunjin 3, Lijiang 2, Lijiang 942, Lijiang-xintuanheigu, Taifu 4, Xinan 175, Xirong 101, Yun 129, Yun 2117, Yun-er-tian 01, Yunjin 5, Yunjin 9, Zaojin 841, Zaotong-maxiangu, Zujin 2, Zujin 3, Zujin 11, 77 nuo, 04-108-14, 04-1267, 04-1984, 04-1984-1, 26-11-4, 6562, 65113, 65-36, 83-250, 85-632, 86-6, 86-7, 86-22, 87-212, (Ginga, Hayanishiki, Kochikaze, Nihonbare, Norin 24, Sachikaze, Sekitori, Shin 2*, Suzuharamochi)
Group I-2;	Yun-er-tian 02
Group I-3;	Zujin 9
Group II-1;	Beizimeigu, Dalijin 2, Dianhua 3, Gujin 5, Hexi 21, Jinhong 1, Maqie, Nongli 3-1, Nongli 3-2, Qiajiyu, Shuiyun 1, Yunguang 1, Yunjin 20, Yunyu 1, Zhi 282, 86-Inuo, 280 nuo, 04-453-10, 04-2342-1, 73-44, 79-635, 84-82, 84-343, 84-360, 85-144, 85-787, 85-788, 86-65, 86-70, 770-56, 77056-13, (Aichiasahi*, Akihikari, Akihomare, Asominori, Chiyonishiki, Kinmaze, Kogyoku, Musashikogane, Norin 17, Ou 320)
Group II-2;	Jinning 277
Group III-1;	Beizigu (2), Beizinou, Dianyu 1, Guihuang 62, Hexi 1, Hexi 3, Hexi 4, Hexi 5, Hexi 6, Hexi 9, Hexi 14, Hexi 19, Hexi 23, Kunjin 4, Kunming 108, Kunming 80-2, Lei 4113, Maoyugu, Pannong 1, Shanyou 2-13, Shanyou 6-3, Xuan-yi, Yunjin 133, Yunjin 135, Yunjin 136, Yunjin 225, Zhulanggaoxuanza, A210, 04-2356, 75-64, 77-196, 78-185, 86-167, 86-168, 782, 7904, 7907-1, 8501, 8315-212, 8365-51, (Chubu 45, Chubu 46, Hanahikari, Hananomai, Ibukiwase, Ishikarishiroke*, Todorokiwase)
Group III-2;	76012-9, 76012-21, 77507-22, 78032-71
Group IV-1;	Banjiemang, He 16, Hexi 2, Hexi 7, Hexi 8, Hexi 18, Jindiao 3, Jingjingnou, Jinning 768, Kunming 217, Kunming-beizigu, Kunming-xiaobaigu, Shanyou 1-1, Shanyou 4-10, Shanyou 4-10-1, Shanyou 5-12, Shanyou 18-1, Shanyou 18-54, Shuangjing 5, Xi/Dian-er 18-1, Xihong 131, Xijin 1 xuanxi, Yongli 221, Yunjin 134, Yunjin 219, Zujin 8, Zujin 10, 04-1916, 82-594, 84-7, 85-1-27, 86-42, 7613, 8126, (K 59, Kanto 51*, Kitahikari, Sakakimochi, Teine, Yukara)
Group IV-2;	Aijiaonou, Dahuigu, Yuexi-si 15-5-3
Group IV-3;	Hexi 20, Huaqiaojin, Lanbanou, Sheng 86-yu 4, 1957
Group V-1;	Dian-san 9-3, Hexi 22, Jinning 102, Keyong 12, Shanyou 3-2, Shuangjing 4831, Yuanjin 2, Yuxi-san 47-1, Yunjin 24, Yunjin 25, Yunjin 26, Zujin 7, 78-258, 84-5-20, 85-5-20, 85-303, 85-511, 85-515, 86-151, 86-152, 86-153, 038-2-1, 830, 0021, (BR No. 1, Tsuyuake*)
Group VI-1;	Jin 349, Zujin 4, Zujin 6, 04-2865, 78-251 (Wasetoramochi, Yashiromochi*)
Group VII;	Chenyu 1, Dianjing 8, Hexi 13, Hexi 15, Hexi 16, Hexi 17, Kunnou 2, Sheng 86-yu 10, Sheng 86-yu 20, Taichengdao, Yunjin 23, Yunxi 2, Yunxi 3, Yunxi 4, Ziyu 44, 84-yu 6, 82-7, 82-12, 83-04, 84-62, 84-86, 85-2-4, 85-2-11, 85-166, 86-11-5, 86-75, 87-46, 780136-3, (BL 1, Pi No. 4*, Toride 1*)

a): The contents in this table are presented in Chinese and partly in Japanese in Appendix.
The varieties in parentheses are introduced from Japan.
* Japanese differential varieties.

to Y88-436 ($103b^+$), Y88-24 ($303b^+$) and Y-69 ($137b^+$). The three varieties of the Group VII-2 may have *Pi-b* and other gene such as *Pi-i*, *Pi-k* or $Pi\text{-}k^m$, since those varieties were susceptible to Y-69 ($137b^+$) but resistant to Y88-436 ($103b^+$) and Y88-24 ($303b^+$). The eight varieties of the Group VII-3 have the gene $Pi\text{-}z^t$, since these varieties were susceptible to HA89-41 (403), Y-73 (433) and TH81-04 (437). Eight varieties of the Group VII-4 were resistant to all the isolates used.

All varieties of the Group VII were resistant to HA89-23 (303) and TH77-1 (047). Therefore, it is presumed that none of the japonica rice varieties tested bear either $Pi\text{-}ta^2$ or *Pi-z*. The resistance gene *Pi-t* was found by Kiyosawa[5)] in BL 10, a japonica variety to which a resistance gene of Indonesian variety Tjahaja was introduced. Thirty-six per cent of the isolates collected in Yunnan in 1988 were virulent to K 59 bearing $Pi\text{-}t^{1)}$. Kiyosawa[5)] reported that when avirulent blast fungus was inoculated to a variety bearing only *Pi-t*, a special lesion which he called "halo lesion" was formed on it. In this experiment, when the three isolates which showed avirulence to K 59, i.e. Y-34 (001), Y87-018 (003) and Y88-15 (007), were inoculated to the test varieties, the halo lesion was not formed on them. This

Table 3. Classification of the varieties of Group VII based on reaction patterns to eight isolates with different pathogenicities

Group	Sub-group	Y88-436* (103b^+)	Y88-24* (303b^+)	Y-69* (137b^+)	HA89-41** (403)	Y-73** (433)	TH81-04*** (437)	HA89-23** (303)	TH77-1*** (047)
VII	1	+	+	+	−	−	−	−	−
	2	−	−	+	−	−	−	−	−
	3	−	−	−	+	+	+	−	−
	4	−	−	−	−	−	−	−	−

+ : Susceptible reaction, − : Resistant reaction.
* Isolate from Yunnan Province. ** Isolate from Hainan Island. *** Isolate from Japan.
The figures in parentheses are race numbers of fungus isolates.

Table 4. Additional classification of japonica rice varieties in Yunnan Province

Group VII-1;	Cenyu 1, Hexi 13, Hexi 15, Hexi 16, Hexi 17, Yunxi 4, 83-04, 84-86, 780136-3, (BL 1)
Group VII-2;	Dianjing 8, Kunnuo 2, Yunjin 23
Group VII-3;	Taicengdao, 84-yu 6, 82-7, 82-12, 84-62, 85-166, 86-75, 87-46, (Toride 1*)
Group VII-4;	Sheng 86-yu 10, Sheng 86-yu 20, Yunxi 2, Yunxi 3, Ziyu 44, 85-2-4, 85-2-11

* Japanese differential variety.

Table 5. Reaction of the varieties of Group I to the isolate Y87-01 (race 006t^+)

Group	Reaction	Varieties
I	+	Lijiang-xintuanheigu
	−	Hexi 10, Hexi 11, Hexi 12, Jingguo 9-2, Jingguo 9-3, Yun-er-tian 02, Zujin 2, Zujin 3

+ : Susceptible reaction, − : Resistant reaction.

indicates that no variety possessing only *Pi-t* exists among the varieties tested.

It is reported by Kiyosawa[4] that the differential variety Shin 2 and some other Japanese varieties have *Pi-k*^{s}. This gene is not effective to any Japanese fungus strains so far isolated but effective to Philippine fungus strain Ken Ph-03. According to Yaegashi et al.[8], some of the Japanese rice varieties have a gene which shows the similar effect to *Pi-k*^{s} when they are exposed to Japanese fungus strain belonging to race 102. The gene is tentatively named *Pi-x* by them[8].

Table 6. Reaction of the varieties of Group IV-1 to the isolate Y88-137 (race 011)

Group	Reaction	Varieties
IV-1	+	Jindiao 3, Kunming-xiaobaigu, 85-1-27
	−	Hexi 2, Hexi 7, Hexi 8, Hexi 18, Jingjingnou, Kunming 217, Jinning 768, Shanyou 1-1, Shanyou 4-10, Shanyou 4-10-1, Shanyou 5-12, Xihong 131, Yunjin 134
	+, −	Xijin 1 xuanxi

+ : Susceptible reaction, − : Resistant reaction.
+, − : Reaction is susceptible or resistant depending upon the plant.

In order to confirm the presence of similar function to *Pi-k*^{s}, nine varieties of the Group I susceptible to the six isolates used were inoculated with an isolate Y87-01 (006t^+). The results are shown in Table 5. Only Lijiang-xintuanheigu was susceptible to that isolate. Eight other varieties were resistant to it, presumably bearing a gene similar to *Pi-k*^{s} or *Pi-x*.

As stated above, the Group IV-1 was subjected to further divisions into some genotype subgroups. In this respect, 16 varieties of the Group IV-1 were inoculated with an isolate Y88-137 (011). Those varieties were divided into two groups as shown in Table 6. The first group is susceptible to Y88-137 (011) and the second group is resistant to it. The first may have only *Pi-k*, while the second *Pi-k* and *Pi-a* or *Pi-i*. The variety of Xijin 1 xuanxi was recognized to be a mixed population of those two genotypes.

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Appendix

Table 2. 雲南省のジャポニカ型品種の類別

Group Ⅰ－1；	大花糯,滇二2-4,滇靖5-3,滇花4号,黒選5号,鶴良1号,合系10号,合系11号,合系12号,江選2号,京国9-2,京国9-3,靖粳1号,靖粳2号,晋糯1号,科情3号,昆粳3号,麗江2号,麗江942,麗江新団黒谷,台幅4号,西南175,西溶101,雲129,雲2117,雲二天01,雲粳5号,雲粳9号,早粳841,昭通麻綫谷,楚粳2号,楚粳3号,楚粳11号,77糯,04-108-14,04-1267,04-1984,04-1984-1,26-11-4,6562,65113,65-36,83-250,85-632,86-6,86-7,86-22,87-212,(銀河,ハヤニシキ,コチカゼ,日本晴,農林24号,幸風,関取,新2号,鈴原糯)
Group Ⅰ－2；	雲二天02
Group Ⅰ－3；	楚粳9号
Group Ⅱ－1；	掸子梅谷,大粒粳2号,滇花3号,沾粳5号,合系21号,晋紅1号,麻切,農黎3-1,農黎3-2,卡九玉,水雲1号,雲広1号,雲粳20号,雲玉1号,植282,86-1糯,280糯,04-453-10,04-2342-1,73-44,79-635,84-82,84-343,84-360,85-144,85-787,85-788,86-65,86-70,770-56,77056-13,(愛知旭,アキヒカリ,アキホマレ,あそみのり,チヨニシキ,金南風,黄玉,むさしこがね,農林17号,奥羽320号)
Group Ⅱ－2；	晋寧277
Group Ⅲ－1；	掸子谷(二),掸子糯,滇楡1号,桂黄62,合系1号,合系3号,合系4号,合系5号,合系6号,合系9号,合系14号,合系19号,合系23号,昆粳4号,昆明108,昆明80-2,雷4113,毛玉谷,攀農1号,山由2-13,山由6-3,選一,雲粳133,雲粳135,雲粳136,雲粳225,逐浪高選雑,A210,04-2356,75-64,77-196,78-185,86-167,86-168,782,7904,7907-1,8501,8315-212,8365-51,(中部45号,中部46号,ハナヒカリ,花の舞,イブキワセ,石狩白毛,トドロキワセ)
Group Ⅲ－2；	76012-9,76012-21,77507-22,78032-71
Group Ⅳ－1；	半節芒,鶴16,合系2号, 合系7号,合系8号,合系18号,粳掉3号,井景糯,晋寧768,昆明217,昆明掸子谷,昆明小白谷,山由1-1,山由4-10,山由4-10-1,山由5-12,山由18-1,山由18-54,双京5号,西/滇ニ18-1,西紅131,西晋1号選系,永立221,雲粳134,雲粳219,楚粳8号,楚粳10号,04-1916,82-594,84-7,85-1-27,86-42,7613,8126,(K59,関東51号,キタヒカリ,サカキモチ,テイネ,ユーカラ)
Group Ⅳ－2；	矮脚糯,大灰谷,越西四15-5-3,
Group Ⅳ－3；	合系20号,花売粳,瀾巴糯,省86-予4,1957,
Group Ⅴ－1；	滇三9-3,合系22号,晋寧102,科永12号,山由3-2,双京4831,遠晋2号,越西三47-1,雲粳24号,雲粳25号,雲粳26号,楚粳7号,78-258,84-5-20,85-5-20,85-303,85-511,85-515,86-151,86-152,86-153,038-2-1,830,0021,(BR No.1,ツユアケ)
Group Ⅵ－1；	晋349,楚粳4号,楚粳6号,04-2865,78-251,(わせとらもち,ヤシロモチ)
Group Ⅶ；	辰預1号,滇靖8号,合系13号,合系15号,合系16号,合系17号,昆糯2号,省86-予10,省86-予20,台城稲,雲粳23号,雲系2号,雲系3号,雲系4号,子預-44,84-予6,82-7,82-12,83-04,84-62,84-86,85-2-4,85-2-11,85-166,86-11-5,86-75,87-46,780136-3,(BL 1, Pi No.4,とりで1号)

注) 括弧内の品種は日本品種