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PROTECTION OF PLANT BREEDERS' RIGHTS AND USE OF ADVANCED TECHNOLOGY

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PROTECTION OF PLANT BREEDERS' RIGHTS AND USE OF ADVANCED TECHNOLOGY

Identification of registered and infringing varieties

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Abstract

The main part of this paper presents the results of a simulation of identification of pear varieties using SSR (simple sequence repeats) markers, as well as various issues concerning registered varieties from the viewpoint of protection of plant breeders' rights. The other parts presents the way to strengthen the plant breeder's right of Japan up-to-date.

Thus this paper contains matters such as (1) to described the cases of infringements of and disputes over plant breeders' rights with apples, strawberries and hackberries in the past,(2) illegal import and export of seeds, seedlings and crops, (3) the technology to identify plant varieties by using SSR markers; Simulation of identification of pear varieties by using SSR markers, (4) measures to prevent infringement of plant breeders' rights; Protection of plant breeders' rights by Seeds and Seedlings Law and Customs Tariff Law, (5) and lastly comments on development of SSR markers, establishment of DNA testing organization, qualification of test personnel and agreement of DNA testing technology as future tasks

Keywords: Seeds and Seedlings Law, plant breeders' rights, registered variety, pear, SSR marker, identification

I. Introduction

1. Recently, there have been newspaper stories on misrepresentation of imported agricultural products as registered varieties (varieties registered in accordance with the Seeds and Seedlings Law) and infestation of infringing varieties (varieties for which infringements of rights are suspected) of registered varieties.

2. At the same time, as stronger emphasis has recently placed on the importance of use and protection of intellectual properties from the viewpoints of consolidation of international competitiveness of industries and revitalization of economy, the national government established the Intellectual Property Strategy Council in March 2002. In particular, there have been stronger demands for measures for protection of "plant breeders' rights" (rights of variety registrants) provided by the Seeds and Seedlings Law as the only kind of intellectual property in the fields of agriculture and forestry. To consolidate such protection measures, establishment of prompt identification methods using DNA testing and other advanced technologies for seeds, seedlings and crops of registered varieties is becoming an urgent task to be fulfilled. Such establishment will contribute to smooth operation of the variety registration system in the future.

3. This paper presents the results of a simulation of identification of pear varieties using SSR (simple sequence repeats) markers, as well as various issues concerning registered varieties from the viewpoint of protection of plant breeders' rights.

II. Cases of infringements of and disputes over plant breeders' rights

a) Apples

4. In 1988, the case of infringement of "Variety Y," which was a registered variety, led to a lawsuit in the Tohoku district. This case was eventually settled between the parties concerned without being presented at a court. Although the authors were in charge of variety registration in the Ministry of Agriculture, Forestry and Fisheries at that time, the rapid progress of DNA testing technology, which will be explained later, was still unthinkable. For investigators to seize young apple trees, which were thought to have been propagated and sold illegally and maintain court proceedings for a suspect of a criminal case for infringement of the Seeds and Seedlings Law, sufficient proof to show the identity of the variety was necessary.

5. In the above case, it was necessary to cultivate and harvest "fruit" to investigate whether it is the registered variety or not. As a legal issue, the limitation of prosecution for penal offense (3 years according to the prescriptive regulations under Article 250 of the Criminal Procedure Law in a case of criminal offense for a term of up to 3 years) was presented. It is worthy of special mention that, even if the investigators seize young trees in question, it is quite difficult for them to harvest "fruit" and prepare documentary evidence to maintain court procedures within the limitation of 3 years, in terms of the growth characteristics of fruit trees. In such a case, the results of DNA testing, which can be obtained promptly, are thought to be very effective as documentary evidence for the prosecution.

b) Strawberries

6. In 1995, the amount of "Variety N," a famous variety from Tochigi prefecture, distributed to the market was larger than the production. As a result of investigations, the case of shipping "Variety K" as "Variety N" to the market was discovered. This case was first suspected as an infringement of the Unfair Competition Prevention Law, and then led to a case of infringement of plant breeders' rights to the permission of seed/seedling sales of "Variety K." Although both varieties were registered, identification of the two by DNA testing was attempted at the National Center for Seeds and Seedlings to confirm the possibility of prompt identification between them. First, the difference in band patterns could not be recognized by the RAPD method, which is a form of the PCR method. Meanwhile, the AFLP method, which is a combination of the RFLP and PCR methods, enabled identification of the two varieties. In other words, they were found to be different varieties.

c) Hackberries

7. In 1996, the first court judgment on a mushroom (hackberry) was given concerning whether it was an infringing or registered variety. The lawsuit was presented at a district court by an authorized plant breeder (variety registrant) against an agricultural cooperative to demand suspension of production and sales of the spore and claim for damages. The suit was rejected as it was judged that the variety in question was distinguishable from the registered variety. The reason for the ruling was that the two varieties were not found to be identical as they were different in important characteristics, such as the optimum temperature for the growth of hyphae, the time taken for the harvest and crop yields. Although an appeal was made against this decision, the high court dismissed it in 1997.

III. Illegal import and export of seeds, seedlings and crops

8 Because plants are characterized by self-propagation, it is possible for them to propagate themselves after one purchase of seeds or seedlings. However, a large amount of investment is required for development of new varieties with added characteristics, such as high disease resistance, high quality and improved yield. The Seeds and Seedlings Law is aims to give exclusive distributorship of seeds/seedlings for a certain period and protect plant breeders' rights to make a return on the investment.

9 There is a newspaper story that, although prefectural governments breed excellent strawberry, rush, string bean and other varieties, register them and limit distribution of their seeds/seedlings in the country, cases of import of such varieties have recently increased (*Nihon Keizai Shimbun*, April 21, 2002). Prefectural governments are therefore taking measures to protect themselves against infringements of rights through development of methods for identification of infringing varieties imported illegally from overseas and registered varieties (e.g., DNA and characteristic tests).

10 Because the import and export of seeds, seedlings and crops of registered varieties are subject to plant breeders' rights (for crops, this is only applicable to cases without opportunities to execute rights at the seed/seedling stage), permission of authorized breeders is necessary. If the destination of export is in a country which has not joined the UPOV (Union for the Protection of New Varieties of Plants, established in 1968 to promote development and dissemination of varieties through protection of newly bred varieties of plants. Japan joined it in 1982. The current number of member countries is 52.), or the plant is not subject to protection even if it is in a member country, permission of authorized breeders is necessary for export of seeds and seedlings. Importing crops harvested from seeds/seedlings that were propagated illegally overseas is also an infringement of plant breeders' rights. Authorized breeders may claim for damages or prohibition against import, distribution and selling to importers of seeds/seedlings and distributors and sellers of crops. In this case, it is necessary to prove that the harvested crops are identical to the registered varieties. It requires at least one year to study the characteristics of seeds, seedlings, bulbs, annual plants or vegetables by DUS tests and prove their identification. In the screening for DUS tests, identification from the target variety is determined by the characteristics of the entire plant. For example, out of 72 items for characteristics tests of strawberries, only 11 characteristics such as the form, size and luster of fruit are directly related to "fruit." It is therefore extremely difficult to find difference in characteristics of imported or domestically produced fruits on the market and determine their identification with registered varieties. Identification of fruit trees and other permanent crops by DUS tests of imported fruits is impossible. Although it is also necessary for nursery trees and other seedlings to bear fruit for comparison, it requires several years even if top grafting is conducted. Development of methods is therefore strongly demanded for identification of fruit and other varieties using DNA testing and other advanced technologies.

IV. Identification judging technology

a) Characteristics of SSR

11 A genome usually has a number of DNA sequences repeating several to 100 times with units of 2 to 6 bases. This is also called as SSR. If the unit of repeat base sequence is more than ten, it may be called as a mini-satellite. Each SSR locus has a number of occurrences (mutations) that varies by individual, variety or species. Mendelian inheritance of such

mutations from parents to children is known to occur. Although SSR loci are used for individual identification in human, parentage tests, evolutionary studies, construction of genetic linkage maps and other purposes, they have a problem that enormous cost and labor are required for development of SSR markers for each species (crop).

12 In SSR analysis, SSR primers are designed within flanking regions in order to amplify SSR fragments reproducibility because of flanking regions are highly conserved in species. After SSR fragments are amplified by the PCR method, their length based on sequence are analyzed by using a DNA sequencer.

b) Identification of individuals by DNA testing

13 In development of methods for identification of plant varieties, individual identification methods in human can serve as a reference. At present, combinations of polymorphism detection from the difference in number of occurrences in the range of STR (short tandem repeat, e.g., TH01-type) or mini-satellite (repeat of more than a dozen of bases, e.g., MCT118-type), ABO blood-type tests and other methods are used for individual identification methods in human, suspects in criminal investigations and paternal testing in civil actions. For example, DIS 80 (MCT 110: no. of alleles 29) of first human chromosome, which is a kind of mini-satellite, is a single locus with a number of times of 14 to 24 with a unit of 16 bases (GAAGACCACCGGAAAG) depending on individuals.

14 These DNA and blood types are combined for efficient and accurate paternal testing and personal identification, which are adopted as parts of important documentary evidence in courts. It is also considered possible to identify plant varieties by the difference in the number of times of simple sequences repeats such as STR.

c) Identification of plant varieties using SSR markers

15 Identification of plant varieties using SSR markers is conducted in the following manner. Similarity of DNA types of infringing and registered varieties is estimated from the coincidence of genotypes in several sets of SSR loci. The greatest advantage of SSR markers is that the difference of DNA structure (no. of bases) of the registered variety from other varieties or their uniformity can be proven by indication of numerical values. While the difference in bands appearing on the gel by the RFLP, RAPD and AFLP methods was detected in conventional variety identification, the length of amplified DNA fragments (preserved range and repeat base sequence range) is digitalized and processed by computers for immediate judgment in the case of SSR markers. As shown in Table 1, in the case of SSR locus 02b1, the SSR fragment length of the allele can be digitalized into genotype 256/256 for *Hosui*. In the same way, other SSR loci (05g8, 28f4, CH01E12, CH01F02, CH01H01, CH01H10) can be digitalized into genotypes 107/107, 113/105, 263/263, 165/165, 113/113 and 107/97, respectively. By creating a digitalized database of DNA information concerning SSR of pear varieties, “numerical strings” consisting of different numerical values by variety can be used as variety codes. By adding a new SSR locus to the list of these “number sequences,” accuracy of identification can be improved. When putting this method into practical use, it is necessary to estimate the frequency of alleles, which exist in each species (crop) and develop SSR markers with high identification capacity.

V. Simulation of identification of pear varieties using SSR markers

16 Because there is only limited knowledge of SSR markers of apples, variety identification of pears was attempted using SSR markers (Guilford et al., 1997; Gianfranceschi et al., 1998) developed for apples (*Malus* spp) which is also a rosaceous plant. As a result, it was found that SSR markers for apples could be used for variety identification of pears. Here, identification of registered varieties, their infringing varieties and unknown varieties was attempted using these SSR markers.

17 Figure 1 is a diagram of base sequences in the SSR range. The DNA fragment length amplified by SSR primers varies by the difference in the number of times of simple sequences repeat among varieties. While the preservability of the base sequences in the species is extremely high in the ranges on both sides of the simple repeat base sequence (including SSR primer range), the preservability was thought to decrease with changes of species. It is therefore necessary to develop SSR markers especially for individual species. Figure 2 shows base sequences that can be obtained by SSR markers of each pear variety (gene locus CCH01H01). Table 2 shows the types of alleles for 7 gene loci of 19 varieties of Japanese pears.

18 First, in the case of retrieval by variety names (Table 1), it is possible to find specific variety names by collating 7 genotypes of the "unknown variety" and 7 genotypes of varieties registered on the SSR database and find which varieties correspond completely with the 7 genotypes. In this case, because the genotypes of "unknown variety" corresponds with the genotypes of *Kosui*, it is highly likely that it is the same variety, and information on the variety name and variety registration can be obtained.

19 Next, in Case 1 of Table 3 (identification of same variety), the genotype of this infringing variety that is suspected to be *Hougetsu* corresponds with the genotype of *Hogetsu* (registered variety no. 3946) in all 7 gene loci, it is highly possible that they are the same variety.

20 Also, in Case 2 of Table 3 (identification of different varieties), the genotype of the variety that is suspected to be *Chikusui* was different from that of *Chikusui* in 3 gene loci (05g8, CH01F02, CH01H10) and there is no possibility that the variety is *Chikusui* (registered variety no. 2060). It is therefore considered to be a different variety.

21 Several tens of SSR markers with sufficient polymorphism are currently developed by conducting SSR isolation from pears using genome DNA of Japanese and European pear varieties. It is planned to create a DNA database concerning genotypes of registered pear varieties using these markers. Evidence against infringements of rights is expected to be strengthened by combining such both information on genotypes and characteristics at the time of screening for variety registration. This method may be applied to other crops by developing SSR markers of registered varieties of different crops and creating databases of genotypes (alleles) as necessary in the future.

VI. Measures to prevent infringement of plant breeders' rights

a) Penalties etc. for infringement of plant breeders' rights

22 To protect private rights of authorized plant breeders, the Seeds and Seedlings Law authorizes such breeders to have exclusive rights to produce, transfer, apply to transfer and

import/export varieties in question, as well as to claim for prohibition or damage against unauthorized users of such varieties.

23 Besides such civil relief statements, penalty issue is contained to ensure adequate enforcement of the right. An offender would be sentenced to up to 3-years imprisonment or punished with a fine of up to \3 million for seeds and seedlings cases.

24 However, since damage of the right holder caused by infringement of corporation was larger than that of individuals, introduction of severe punishment to legal person had been strongly demanded. Moreover, expansion of penal provision to harvested materials had also been asked, because it covered only for seeds and seedlings although civil relief had harvested materials in its scope, and infringed materials had been found as a harvested form usually.

25 Then, FY 2003 amendment is made to fulfill both requests; the fine for corporation is raised up to \100 million, and the scope of punishment includes harvested materials in addition to previous seeds and seedlings.

26 As a consequence, present Seeds and Seedlings law covers from seeds to harvested materials and measures for legal persons to meet the needs of the right holders that we believe indispensable for proper enforcement of the right.

27 In addition to control for domestic market, there is a law for border measures. Penalty for the offense of importing contraband (Customs Tariff Law, Article 109), on the other hand, is up to 5-years imprisonment or a fine of \5 million.

b) Prevention of infringement of plant breeders' rights

28 The Seeds and Seedlings Law has a temporary protection system (possibility of claiming for compensation after registration for unauthorized use between application and register) to protect the interest of authorized breeders concerning the use of varieties between the applications for and completion of their registration. In many cases, authorized breeders conclude agreements for use of registered varieties to stop such varieties from being used by parties outside of the agricultural cooperatives and other producers and to prevent propagation and distribution of seeds and seedlings against their will.

29 If possible, it is desirable for authorized breeders to exercise their rights at the seed/seedling stage. The Law authorizes such breeders to have and exercise rights over harvested materials if they did not have appropriate opportunities to exercise such rights at the seed/seedling stage in such cases as unauthorized propagation overseas. More specifically, such cases include (1) when registered varieties are cultivated overseas without permission of authorized breeders and their harvested materials are imported to Japan, (2) seeds and seedlings of registered varieties are produced illegally in Japan and distributed to the market without permission of authorized breeders and (3) the person who violated breeders' rights at the seed/seedling stage is unknown.

30 A much time is required to prepare documentary evidence to prove the identification of varieties by DUS tests. From the standpoint of authorized breeders, it is necessary to establish a DNA database of registered varieties as supplementary data based on molecular science. Provision of supplementary data to authorized breeders may also contribute to prompt solution of disputes and other problems concerning infringement of rights. For civil action, it is necessary to present the proof of the use of "registered variety" in an act of

infringement concerning the subject of the lawsuit, that is, concrete documentary evidence of the "registered variety." Identification of genotype in SSR gene loci of registered and infringing varieties therefore serves as important evidence to prove they are the same variety.

c) Protection of plant breeders' rights by Customs Tariff Law

31 The Customs Tariff Law has a provision to ban the import of goods from overseas that infringe upon patent rights, copyrights and other intellectual properties, and to control the import of such goods at customs (Article 21, Section 1, No. 5). For many years, the Ministry of Agriculture, Forestry and Fisheries repeatedly demanded the inclusion of goods that infringe upon plant breeders' rights (rights of variety registrants) among the list of such contraband whenever the Customs Tariff Law was revised.

32 The term "plant breeders' rights" was introduced into the Seeds and Seedlings Law in 1998 and positioned it is an intellectual property clearly, nevertheless, it did not appear on the list until the latest revision. One of the reasons for this was the lack of a test method for immediately determining whether imported goods were seeds/seedlings propagated illegally or crops harvested from such seeds/seedlings at the customs. Though, the circumstance has been changed gradually through the development of technologies such as DNA analysis, and finally, in its latest revision set in force in this April, plant breeder's right infringed material is put on the list.

33 For control of illegally imported seeds/seedlings and, in particular, fresh flowers, seedlings and fruits at the port of entry, prompt and highly accurate identification of varieties by DNA analysis and other methods is required as a technical factor. In fields other than plants, the Center of Customs Laboratory of the Ministry of Finance has already established DNA testing technology for identification of varieties of whales and other contrabands, which is already used for testing at customs. Variety identification technology for tuna has also been established based on base sequences in cell organelle mitochondorial DNA.

VII. Future tasks

a) Genotype and phenotype

34 A technical problem in DNA testing for variety identification is that only the difference in "genotype" in genome, or the base sequence of genes is currently tested in a simple manner without sufficiently clarifying the relationship between the sequence and the "phenotype" that indicate morphological characteristics. It is therefore necessary to clarify the base sequence of genes and their phenotype.

b) Development of SSR markers

35 Testing and research institutes will have to develop many SSR markers with high identification capacity for each species (crops) of major registered varieties in the future. Such technical development will contribute to smooth operation of the variety registration system and improvement of measures for protection of intellectual properties in the fields of agriculture and forestry.

c) Establishment of DNA testing organization

36 The variety registration system aims to protect private rights and, even if an actual infringement of rights to a registered variety occurs, the national government will not prepare documentary evidence to support the authorized breeder under this system. Claims for damages are supposed to be solved between the parties as civil issues. However, as it is currently difficult for authorized breeders to prove the identification of their registered varieties and infringing varieties scientifically and file lawsuits against infringing parties, it is considered necessary to establish a public organization to conduct DNA testing which can be used by private authorized breeders.

d) Qualification of test personnel

37 In testing of samples as evidence, it is necessary to read the difference in number of bases of alleles with accuracy to the unit of one base in variation identification using SSR, no matter how advanced DNA sequencer and other analysis devices are. It is naturally important that testers are experienced in analysis operation. It is necessary for testers to improve their skills by participating in comprehensive training and education programs of molecular biology, plant genetics, DNA analysis technology and other fields. Certification of DNA testers will be necessary in the future because of the importance of the operation.

e) Agreement of DNA testing technology

38 Depending on the results of DNA testing, certain persons may be subject to criminal penalty or claim for damages in a civil action. It is still unclear whether the principle and technology of this identification method is appropriate for plant varieties or not as there are no judicial precedents. Whether this identification using SSR markers can be a scientifically approved method in the same way as personal identification in criminal investigation or if the analysis methods can serve as evidence for trial is an important issue. It is also considered necessary to request judicial rulings concerning the identification of variety and infringing varieties using documentary evidence for DNA testing in disputes over infringements of plant breeders' rights.

VIII. Conclusion

39 Since the establishment of the variety registration system in 1978, the number of registered varieties has increased and reached 1,119 in FY 2002 (11,355 in total). It is therefore necessary to consolidate measures to protect plant breeders' rights. The Seeds and Seedlings Law, which was revised in FY 1998 and FY2003, clearly positions the rights of breeders as "plant breeders' rights" and stipulate such rights as intellectual properties similar to patent and other rights, Furthermore, it expanded scope of penal provision to include harvested materials and raised fines for legal persons to ensure enforcement. Development and introduction of DNA testing and other scientific methods for prompt and accurate identification with registered varieties are necessary for the provision of civil remedies and criminal punishment under the Seeds and Seedlings Law to work as an effective restraining power against infringing parties. A DNA database, which will be established in the future, is expected to be a type of effective documentary evidence for solution of disputes over "plant breeders' rights" in courts and other places.

40 For the National Center for Seeds and Seedlings, development of variety identification technology to help prevent infringement of plant breeders' rights and contribute to smooth

management of the variety registration system will continue to be a major subject of research in the future. It is also necessary for screening authorities to show their "restraining power" by supporting the development of such variety identification technology and maintaining it, in order to consolidate protection of breeders' rights and prevent infestation of infringing varieties.

41 Lastly, the authors would like to express their sincere gratitude to Dr. Toshiya Yamamoto of the Gene and Department of Breeding, National Institute of Fruit Tree Science, Natural Agricultural Research Organization and Mr. Jun Koide of Seeds and Seedlings division, Ministry of Agriculture, Forestry and Fisheries, and others for their guidance and advice for this paper, especially concerning SSR markers for pears and Seeds and Seedling law of Japan in FY2003 respectively.

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Table 1 Simulation of variety identification of pears by retrieval of DNA database of an unidentified variety

	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Unidentified variety	256/256	107/107	105/105	263/263	178/165	113/113	97/97
* Frequency of appearance of each genotype from the database below	(93%)*	(31%)	(56%)	(43%)	(38%)	(56%)	(19%)

Data collation

(Japanese pear DNA database)

Name of variety	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Hosui	256/256	107/107	113/105	263/263	165/165	113/113	107/97
* *Shinsei* (526)	- -	121/107	105/105	249/249	178/165	113/113	107/97
Kosui	256/256	107/107	105/105	263/263	178/165	113/113	97/97
Choju	256/256	121/107	105/105	263/263	178/178	105/77	107/97
Chojuro	256/256	121/107	105/103	265/261	178/178	77/77	107/97
Okusankichi	256/256	121/107	113/105	248/248	165/165	115/115	107/97
* *Nansei Chabo* (1693)	251/251	121/109	105/105	252/252	168/163	123/123	109/109
Nijusseiki	256/256	107/107	113/105	263/249	178/165	113/113	97/97
Niitaka	256/256	121/107	105/105	265/265	178/165	77/77	107/97
Atago	256/256	107/107	103/103	263/263	178/178	77/77	107/97
* *Chikusui* (2060)	256/256	121/107	105/105	263/263	165/165	113/113	107/107
* *Hachiri* (2532)	256/256	121/107	113/105	263/263	165/165	77/77	107/97
* *Hogetsu* (3946)	256/256	107/107	113/105	247/247	165/165	113/113	107/97
* *Akizuki* (9401)	256/256	121/107	105/105	263/263	178/165	113/113	97/97
Shinsui	256/256	121/107	105/105	263/249	178/165	113/113	107/97
Kinchaku	256/256	111/111	105/105	265/261	165/163	113/113	109/97
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.

Application of DNA information to variety identification

In this case, it is highly possible that the unknown variety is identical to *Kosui*, a variety on the database, and information on the unregistered variety can be obtained.

Note: Varieties marked with * are varieties registered under the Seeds and Seedlings Law as of the end of March 2002, and the numbers in parentheses are the registration numbers (alteration of reference no. 8)

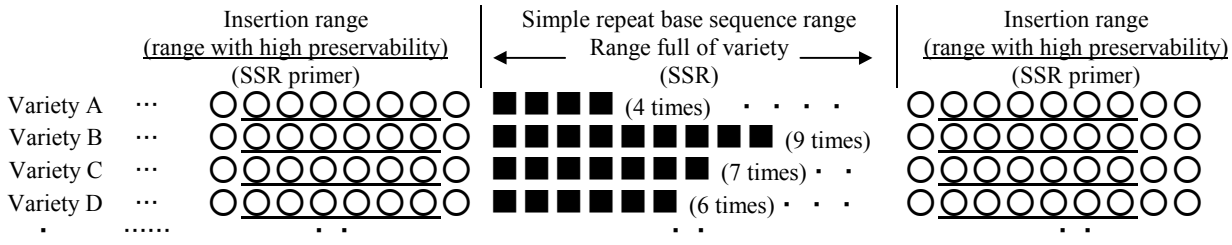

Fig. 1 Diagram showing variation of SSR (difference in number of occurrences) by variety
○ AGTC or other monobasic sequence ■ a unit of repeat sequence such as AG and TC

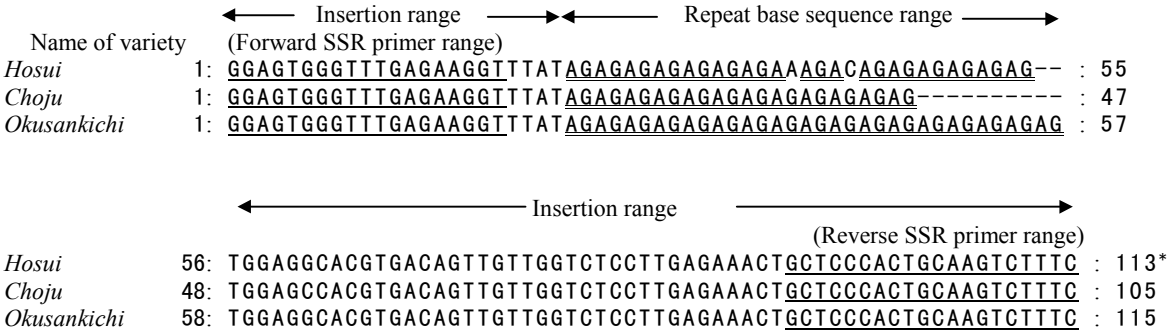

Fig. 2 Comparison of base sequences of SSR gene locus (CH01H01)
- SSR primer base sequence = SSR
- Numerical values indicate the numbers of bases (bp) of DNA fragments amplified for each variety (alteration from a figure in reference no. 8).

Table 2 Types of alleles of 19 Japanese pear varieties in 7 gene loci

Locus	02b1	05g8	28f4	CH01E12		CH01F02		CH01H01		CH01H10
Type of allele (length [bp])	251	107	103	247	261	163	178	77	121	97
	256	109	105	248	263	165		105	123	107
		111	113	249	265	168		113		109
		121		252		169		115		117
Total	2	4	3	7		5		6		4

(Alteration of a table in reference no. 8)

Table 3 Simulation of identification of registered and infringing varieties of pears

Case 1

	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Gene locus of infringing variety (DNA fragment length of each allele [bp])	256/256	107/107	113/105	247/247	165/165	113/113	107/97

Data collation

	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Name of variety: high possibility of being *Hogetsu* (register no. 3946)	256/256	107/107	113/105	247/247	165/165	113/113	107/97

Result: Genotypes are identical in 7 gene loci, and it is highly possible that the infringing variety is identical with the registered variety (*Hogetsu*).

Case 2

	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Name of variety: *Chikusui* (register no. 2060)	256/256	121/107	105/105	263/263	165/165	113/113	107/107

Data collation

	SSR gene locus						
	02b1	05g8	28f4	CH01E12	CH01F02	CH01H01	CH01H10
Infringing variety	256/256	107/107	105/105	263/263	178/165	113/113	97/97

Result: Genotypes differ in 3 gene loci (05g8, CH01F02, CH01H10) and there is no possibility that the registered variety (*Chikusui*) and its infringing variety are identical. They are different varieties.

(Alteration of a table in reference no. 8)

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