Turkish Journal of Agriculture and Forestry

http://journals.tubitak.gov.tr/agriculture/

Research Article

Turk J Agric For
(2019) 43: 174-183
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doi:10.3906/tar-1806-35

Highly polymorphic novel simple sequence repeat markers from Class I repeats in walnut (*Juglans regia* L.)

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Received: 08.06.2018 • **Accepted/Published Online:** 14.10.2018 • **Final Version:** 01.04.2019

Abstract: Walnut (*Juglans regia* L.) is the most important species in the genus *Juglans* due to the high commercial value of its nuts and timber. Simple sequence repeats (SSRs) are considered as the markers of choice owing to their codominant nature. Since very few SSRs have been developed in walnut, this study aimed to develop numerous polymorphic SSRs from Class I repeats by using DNA sequences of the Chandler cultivar. In all, 800 SSRs were designed and tested in 8 Turkish, 3 French, and 5 US walnut cultivars, of which 88 (11%) did not produce bands, 161 (20.1%) were monomorphic, and 551 (68.9%) were polymorphic. In all, 2696 alleles were produced by the 551 polymorphic SSR loci in the 16 walnut cultivars, ranging from 2 to 14 alleles per locus with an average number of 4.9. Polymorphism information content ranged from 0.21 to 0.89 with an average of 0.62. Cluster analysis produced a very robust dendrogram. The walnut cultivars were separated into two main groups: all Turkish cultivars were included in one group, whereas the US and French cultivars were included in the other group. A set of 20 SSRs was selected for their high genetic diversity values to be used in further genetic studies in walnut. The novel SSR markers developed in this study could be used in future studies for constructing a genetic linkage map, analyzing population genetics, identifying parents, and conducting marker-assisted breeding, fingerprinting, and germplasm characterization in walnut.

Key words: *Juglans*, microsatellite, polymorphism, SSR markers, walnut

1. Introduction

Juglans regia L. (walnut) is a monoecious tree crop with a haploid chromosome number of n = 16 and it belongs to the family Juglandaceae (Forde and Griggs, 1972). Although about 20 *Juglans* species are included in the genus, *J. regia* is considered most important owing to its edible nuts (Manning, 1978). Walnut is pollinated by wind (Rom and Carlos, 1987) and its origin is believed to be in Central Asia and neighboring regions (Browicz, 1976). *Juglans* species are also widely distributed in North and South America (Aradhya et al. 2007). In Europe, *J. regia* is the only commonly cultivated species of the genus. Turkey is considered as one of the origins of the species with a high production of nuts (212,140 t/year), which is fourth after China, the United States, and Iran (http://www.fao.org). Walnuts have high nutritional value and contain proteins, fats, vitamins, and minerals and thus they are considered important for human nutrition (Gandev, 2007).

Germplasm characterization, phylogenetic analysis, and genetic diversity studies in walnut have been conducted using a few molecular markers such as restriction fragment length polymorphisms (Fjellstrom et al., 1994), randomly amplified polymorphic DNAs (Nicese et al., 1998), inter-simple sequence repeats (Potter et al., 2002), and amplified length polymorphisms and the selective amplification of microsatellite polymorphic loci (Kafkas et al., 2005). However, most of them were dominant with a lower level of allelic variation and less reproducible and thus have limited application in marker-assisted breeding programs (Ikhsan et al., 2016). Therefore, developing a codominant marker system in this species is necessary. Among the codominant markers, simple sequence repeats (SSRs) have been widely used across studies, including genotyping, parental identification, population genetics, and linkage map construction. In addition to the codominant nature, SSR markers are highly polymorphic, multiallelic, highly reproducible, and have good genome coverage. SSR marker development in *Juglans* was first attempted by Woeste et al. (2002) by using *J. nigra* genomic DNA. Hoban et al. (2008) reported 13 polymorphic microsatellite markers in *J. cinerea*, and Chen et al. (2013) developed 20 SSRs in *J. mandshurica*. Furthermore, several studies have

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focused on SSR development from *J. regia*. Several authors (Zhang et al., 2010; Yi et al., 2011; Zhang et al., 2013) used expressed sequence tag (EST) sequences of *Juglans*, and Chen et al. (2014) and Ikhsan et al. (2016) used the bacterial artificial chromosome (BAC) end sequences (BESs) of the Chandler cultivar deposited in the National Center for Biotechnology Information (NCBI) database. Najafi et al. (2014) and Topcu et al. (2015) used an enrichment method and genomic DNA to develop SSR markers in walnut. Hence, there are about 750 published SSRs for *Juglans*, and most of them were developed from *J. regia*.

A few studies have focused on the characterization of *J. regia* germplasm or populations in different countries, and almost all of them used similar SSR primer pairs developed from *J. nigra* by Woeste et al. (2002). Genetic diversity values of SSR loci are good indicators to choose the best primer pairs for a genetic study. For example, SSR loci with a high number of alleles (*Na*), effective number of alleles (*Ne*), observed and expected heterozygosity (*Ho* and *He*, respectively), and polymorphism information content (*PIC*) provide more genetic information about germplasm collections or populations. They might also have an advantage: they require fewer primer pairs, thereby reducing the cost and labor in a genetic study. SSRs that span ≥20 bp are classified as Class I and those with <20 bp are classified as Class II (Temnykh et al., 2001), and Ikhsan et al. (2016) confirmed that, in walnut, Class I SSRs are more polymorphic than Class II ones.

Therefore, this study aimed to develop novel SSR markers from Class I repeats and create a set of SSR markers that have high genetic diversity values for further genetic studies in walnut. Although a few studies focused on SSR marker development in *Juglans*, the total number is still inadequate to construct an SSR-based genetic linkage map for walnut. Hence, we intended to develop numerous novel polymorphic SSRs for *J. regia* that might provide an opportunity to construct an SSR-based genetic linkage map in walnut.

2. Materials and methods

2.1. Plant materials and genomic DNA extraction

In this study, 8 Turkish (Kaplan-86, Maras-12, Sutyemez-1, Sutyemez-2, Sebin, Kaman-1, Yalova-1, and Bilecik), 3 French (Franquette, Fernor, and Fernette), and 5 US (Chandler, Hartley, Serr, Pedro, and Midland) *J. regia* cultivars were used to test novel SSRs for polymorphism. All plant materials were collected from Kahramanmaraş Sütçü İmam University in Kahramanmaraş Province, Turkey. DNAs were extracted from lyophilized leaf tissues by using the CTAB method (Doyle and Doyle, 1987). DNA concentrations were measured using a Qubit Fluorimeter (Invitrogen) and were diluted to a concentration of 10 ng/µL for PCR reactions.

2.2. Primer design and SSR-PCR amplification

The sequences of BACs from *J. regia* 'Chandler' were retrieved from the NCBI database as described by Wu et al. (2012). SSR screening and primer pair design were conducted using BatchPrimer3 v1.0, a web-based software, as reported by You et al. (2008). The standard settings of the program were used, except for these parameters: max mispriming: 8; pair max mispriming: 16; min GC%: 40; max self-complementarity: 5; max 3' self-complementarity: 1; max poly X: 4. The loci having Class I SSRs were chosen for further analysis, and a total of 800 primer pairs were designed and used in this study.

The SSR-PCRs were performed using the three primer-based strategy described by Schuelke et al. (2000) with minor modifications (Zaloglu et al., 2015). PCR reactions, cycling conditions, and capillary electrophoresis were done as described by Topcu et al. (2015). A fixed annealing temperature (58 °C) was used for all tested primer pairs.

2.3. Data analysis

After the capillary electrophoresis of the SSR loci, genetic diversity values such as the number of alleles (*Na*), the effective number of alleles (*Ne*), expected heterozygosity (*He*), and observed heterozygosity (*Ho*) were calculated using GenAlex v6.5 (Peakall and Smouse, 2012). *PIC* was calculated using PowerMarker software v3.25 (Liu and Muse, 2005).

The allele sizes from all the polymorphic SSR loci were scored in an Excel file and they were used to obtain an unweighted pair group method with arithmetic mean (UPGMA) dendrogram by using band coefficients in NTSYS-pc:2.21 software (Rohlf, 2011). The clustering result of the cultivars was used to reanalyze the genetic diversity values of the novel SSR loci for each subgroup to determine and select the best SSR loci with the highest genetic diversity values in all subgroups. For the selection of the SSR loci, the minimum genetic diversity values were *Ne* = 3.3, *Ho* = 0.50 *He* = 0.70, and *PIC* = 0.65.

3. Results

3.1. Amplification and polymorphism of SSR primer pairs

In this study, a total of 800 Class I SSRs (≥20 bp) were randomly chosen and tested in the Turkish and in the US-French walnut cultivars for amplification and polymorphism. Of them, 551 (68.9%) were polymorphic. The forward and reverse primer sequences, repeat motif, estimated product size, and allele ranges are presented in Supplementary File 1. Of the remaining 249 SSRs, 88 (11%) did not have an amplification product and 161 (20.1%) were monomorphic.

3.2. Genetic diversity values of polymorphic SSR loci

A total of 2696 alleles were produced by the 551 polymorphic SSR loci in the 16 walnut cultivars, ranging from 2 to 14 alleles per locus (*Na*) with an average number of 4.9 (Supplementary File 2). Fifty-seven polymorphic SSR loci produced only two alleles, whereas the JRHR216759 locus amplified the highest number of alleles (14 alleles) in the 16 walnut cultivars. *Ne* was between 1.29 and 9.93. The average number of effective alleles of all 551 SSR loci was 2.94. The lowest *Ne* was noted in JRHR228382, JRHR213941, and JRHR213703 SSR loci, whereas the highest was in the JRHR225189 locus. *Ho* was between 0 and 1, and the average value was 0.52. The lowest *Ho* was noted in JRHR218990, JRHR228372, JRHR220057, JRHR207739, JRHR204228, JRHR219692, JRHR219701, JRHR219908, JRHR215030, and JRHR214289 SSR loci, whereas the highest was calculated in JRHR218332, JRHR225146, JRHR215899, JRHR214227, JRHR221011, JRHR215944, JRHR206452, JRHR217811, JRHR216033, JRHR212973, and JRHR214401 SSR loci. *He* ranged between 0.22 and 0.90 with an average of 0.60. The JRHR225189 locus had the highest and JRHR213941 and JRHR213703 loci had the lowest *He* values. The *PIC* of all SSR loci was between 0.21 and 0.89 with an average of 0.62. The lowest *PIC* value (0.21) was observed in JRHR228372, JRHR213941, and JRHR213703 loci, whereas the highest values were noted in JRHR225189 (0.89), JRHR216759 (0.88), and JRHR211565 (0.87) loci.

3.3. Genetic relationships among walnut cultivars

A total of 2696 alleles from 551 polymorphic SSR loci were used to analyze the genetic relationships of the 16 walnut cultivars. The UPGMA dendrogram (Figure) showed that the walnut cultivars were separated into two main groups based on their origins. All the Turkish cultivars were included in one group, while the US-French cultivars were included in the second group. Similarity coefficients between the 16 walnut cultivars ranged from 0.424 to 0.771 (Table 1). According to the genetic similarity coefficient values, Kaman-1 and Fernor were the most distant cultivars, whereas Fernor and Franquette were the closest pairs of cultivars. Franquette – Midland (0.766), Fernor – Fernette (0.764), Franquette – Hartley (0.758), and Fernette – Franquette (0.754) were the other closest pairs of cultivars. Among the Turkish cultivars, Sutyemez-1 and Sutyemez-2 (0.609) were the closest pairs of cultivars. The average similarity value was 0.503 in the Turkish group, whereas it was 0.670 in the US-French group. The average similarity value between the Turkish and the US-French groups was 0.481. Cultivar Serr was the most diverse cultivar in the foreign group (Table 1; Figure).

3.4. A new SSR set for population and genetic diversity studies in walnut

To use the best SSRs, we determined 20 SSR loci with the highest genetic diversity values from the current study for further studies on germplasm characterization, parental identification, population genetics, and genetic diversity in walnut. The list of these SSRs and their genetic diversity values in the analysis of the Turkish and US-French groups and in all walnut cultivars are shown in Table 2. To choose the best SSRs, we separately calculated genetic diversity values of all the SSR loci for the 8 Turkish and 8 US-French cultivars and the loci having the highest genetic diversity values in both of the groups of cultivars were selected as a new SSR primer set for further genetic studies in walnut.

In the analysis of the 16 walnut cultivars, the *Na* values were between 6 and 13 with an average of 9.3, whereas the *Ne* values ranged from 4.5 to 9.9 with a mean of 6.1. The *He* values of 20 SSR loci ranged between 0.78 and 0.90 with an average of 0.83. The average *PIC* value was 0.81 and it ranged from 0.74 to 0.89. In the separate analysis of Turkish and the US-French groups, the Turkish group had higher average genetic diversity values than the US-French group. For example, Turkish *Na*, *Ne*, *He*, *Ho*, and *PIC* values were 6.8, 5.1, 0.84, 0.79, and 0.76, respectively, whereas they were 6.1, 4.4, 0.81, 0.76, and 0.73, respectively in the US-French group. Moreover, a total of 2292 alleles were obtained from the Turkish group, while the US-French group produced 1689 alleles.

4. Discussion

4.1. Novel polymorphic SSR markers in walnut

SSR markers are widely used in population genetics, parental identification, and genetic linkage map construction owing to their codominant nature, high reproducibility, and good genome coverage. SSRs are also an important marker system to combine parental genetic linkage maps in F1 segregating populations where the genetic maps of two parents are constructed. The lack of a sufficient number of SSRs impedes the construction of an SSR-based genetic linkage map in walnut. Therefore, in this study, the highest number of SSR markers for *J. regia* was produced.

Woeste et al. (2002) were the first to develop SSR markers in *Juglans* by using *J. nigra* genomic DNA. A total of 53 SSR primer pairs were reported by Woeste et al. (2002), Dangl et al. (2005), Foroni et al. (2005; 2007), Victory et al. (2006), Robichaud et al. (2006), Ross-Davis et al. (2008), Pollegioni et al. (2008), and Wang et al. (2008) using the *J. nigra* sequences. Hoban et al. (2008) conducted a study in *J. cinerea* and reported 13 polymorphic microsatellite markers, and Chen et al. (2013) used *J. mandshurica* genomic DNA to develop 20 polymorphic SSRs.

Furthermore, SSRs have been developed from *J. regia*. Several authors (Zhang et al., 2010; Yi et al., 2011; Zhang et al., 2013) used the EST sequences of *Juglans* deposited in the NCBI GenBank and developed a total of 150 SSRs. Najafi et al. (2014) and Topcu et al. (2015) used an enrichment method in *J. regia* and published 13 and 185 polymorphic SSRs, respectively. Chen et al. (2014)

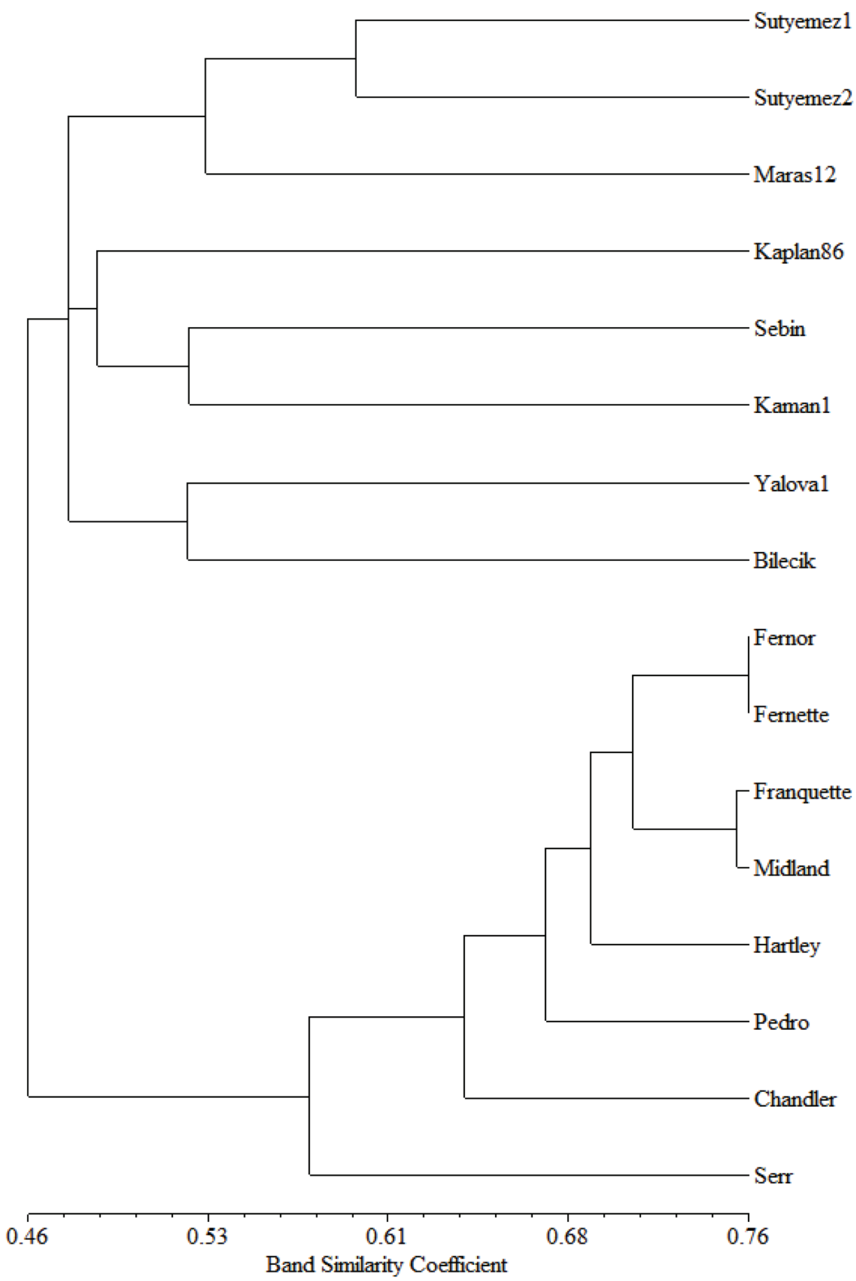

Figure. Dendrogram of 16 walnut cultivars from the unweighted pair group method of arithmetic mean cluster analysis based on band coefficient obtained from 2696 SSR markers.

and Ikhsan et al. (2016) used the BAC end sequences of the Chandler cultivar in GenBank deposited by Wu et al. (2012) and developed 12 and 307 polymorphic SSRs, respectively. In this study, we developed the highest number (551) of polymorphic Class I SSRs that might help in the construction of the first saturated genetic linkage map in walnut; this experiment is underway in our laboratory.

Ikhsan et al. (2016) suggested using Class I SSRs in walnut due to their higher rates of polymorphism and genetic diversity values. Therefore, we used only Class I SSRs in this study and obtained the highest number of polymorphic SSR loci with the highest efficiency (68.9%), whereas Ikhsan et al. (2016) obtained a lower efficiency value (55.0%) when they used 558 Class I and Class II SSRs together.

4.2. Genetic diversity values

SSRs with high genetic diversity values are preferred in different studies such as germplasm characterization,

Table 1. Genetic similarity values between 16 walnut cultivars based on band coefficients obtained from 2696 SSR alleles.

Cultivars	Sutyemez-1	Sutyemez-2	Kaplan-86	Maras-12	Sebin	Kaman-1	Yalova-1	Bilecik	Fernor	Fernette	Chandler	Franquette	Hartley	Serr	Pedro	Midland
Sutyemez-1	1.000															
Sutyemez-2	0.609	1.000														
Kaplan-86	0.506	0.495	1.000													
Maras-12	0.543	0.558	0.503	1.000												
Sebin	0.502	0.498	0.522	0.493	1.000											
Kaman-1	0.478	0.486	0.486	0.487	0.541	1.000										
Yalova-1	0.490	0.478	0.520	0.491	0.498	0.497	1.000									
Bilecik	0.455	0.457	0.491	0.480	0.480	0.500	0.544	1.000								
Fernor	0.472	0.483	0.496	0.511	0.450	0.424	0.504	0.449	1.000							
Fernette	0.479	0.496	0.475	0.516	0.437	0.451	0.509	0.457	0.764	1.000						
Chandler	0.482	0.484	0.479	0.505	0.457	0.452	0.477	0.444	0.648	0.658	1.000					
Franquette	0.504	0.518	0.518	0.532	0.456	0.465	0.528	0.473	0.771	0.754	0.665	1.000				
Hartley	0.487	0.486	0.492	0.502	0.429	0.434	0.512	0.457	0.728	0.673	0.631	0.758	1.000			
Serr	0.470	0.469	0.462	0.474	0.438	0.450	0.481	0.452	0.579	0.554	0.603	0.567	0.571	1.000		
Pedro	0.502	0.523	0.492	0.515	0.454	0.466	0.504	0.463	0.668	0.650	0.670	0.704	0.698	0.636	1.000	
Midland	0.496	0.510	0.498	0.526	0.455	0.484	0.525	0.472	0.676	0.689	0.660	0.766	0.664	0.639	0.720	1.000

Table 2. Selected 20 SSR loci based on their highest genetic diversity values in both Turkish and the US-French clusters.

SSR loci	Cluster	*Na*	*Ne*	*Ho*	*He*	*PIC*
JRHR225564	Turkish	6	5.5	0.83	0.82	0.79
	US-French	6	4.3	0.57	0.77	0.73
	ALL	8	5.2	0.69	0.81	0.78
JRHR221375	Turkish	7	5.3	0.75	0.81	0.79
	US-French	6	4.1	0.86	0.76	0.72
	ALL	9	5.6	0.80	0.82	0.80
JRHR225189	Turkish	6	5.3	1.00	0.81	0.79
	US-French	11	8.0	0.88	0.88	0.86
	ALL	13	9.9	0.92	0.90	0.89
JRHR219141	Turkish	7	4.7	0.75	0.79	0.76
	US-French	5	3.8	0.88	0.73	0.69
	ALL	11	6.0	0.81	0.83	0.81
JRHR221011	Turkish	8	6.4	1.00	0.84	0.83
	US-French	6	4.7	1.00	0.79	0.76
	ALL	9	6.2	1.00	0.84	0.82
JRHR207652	Turkish	5	4.3	0.88	0.77	0.73
	US-French	5	3.7	0.88	0.73	0.69
	ALL	6	4.5	0.88	0.78	0.74
JRHR207413	Turkish	5	3.5	0.63	0.71	0.67
	US-French	5	4.6	0.88	0.78	0.75
	ALL	7	5.3	0.75	0.81	0.78
JRHR210853	Turkish	7	4.6	0.75	0.78	0.75
	US-French	7	5.3	0.75	0.81	0.79
	ALL	11	6.7	0.75	0.85	0.84
JRHR209249	Turkish	9	6.7	0.88	0.85	0.84
	US-French	5	4.7	0.75	0.79	0.76
	ALL	10	7.0	0.81	0.86	0.84
JRHR211565	Turkish	9	7.5	0.88	0.87	0.85
	US-French	5	3.6	0.83	0.72	0.68
	ALL	11	8.3	0.86	0.88	0.87
JRHR215461	Turkish	7	5.4	0.57	0.82	0.79
	US-French	7	3.9	0.88	0.74	0.71
	ALL	11	5.9	0.73	0.83	0.82
JRHR206773	Turkish	6	4.1	0.63	0.76	0.72
	US-French	6	3.8	0.75	0.73	0.71
	ALL	7	4.5	0.69	0.78	0.75
JRHR206716	Turkish	5	3.5	1.00	0.71	0.67
	US-French	5	3.9	0.63	0.74	0.70
	ALL	8	5.8	0.80	0.83	0.81

Table 2. (Continued).

JRHR212973	Turkish	6	5.1	1.00	0.81	0.78
	US-French	5	3.9	1.00	0.74	0.70
	ALL	6	4.7	1.00	0.79	0.76
JRHR217272	Turkish	6	3.7	0.88	0.73	0.69
	US-French	7	5.3	0.50	0.81	0.79
	ALL	11	6.1	0.69	0.84	0.82
JRHR213185	Turkish	6	3.8	0.75	0.73	0.69
	US-French	8	4.4	0.88	0.77	0.75
	ALL	9	5.5	0.81	0.82	0.80
JRHR215575	Turkish	7	5.3	0.88	0.81	0.79
	US-French	8	6.4	1.00	0.84	0.83
	ALL	10	6.5	0.94	0.85	0.83
JRHR217037	Turkish	7	6.4	0.88	0.84	0.82
	US-French	5	3.5	0.88	0.71	0.67
	ALL	8	5.4	0.88	0.82	0.79
JRHR207981	Turkish	9	5.8	1.00	0.83	0.81
	US-French	5	3.8	0.71	0.73	0.69
	ALL	10	6.7	0.87	0.85	0.83
JRHR222329	Turkish	7	4.0	0.88	0.75	0.72
	US-French	4	3.4	0.71	0.70	0.65
	ALL	10	5.5	0.80	0.82	0.80
Average	Turkish	6.8	5.1	0.84	0.79	0.76
	US-French	6.1	4.4	0.81	0.76	0.73
	ALL	9.3	6.1	0.82	0.83	0.81

population genetics, and genetic linkage map construction. In this study, we developed novel SSRs having high genetic diversity values. For example, 71.9% of the total SSRs had ≥4 alleles and 50.6% of the SSR loci had ≥5 alleles in the analysis of 16 walnut cultivars. Another factor that can affect SSR applicability is expected heterozygosity: 76.0% of the SSRs had *He* ≥0.50, 55.5% had ≥0.60, and about one-third had *He* ≥0.70. Among the 551 novel SSRs, dinucleotide SSRs had the highest genetic diversity values, followed by tri- and hexanucleotides (data not shown). Similar results were also obtained by Ikhsan et al. (2016).

When the genetic diversity values were compared to those reported previously in walnut, the highest genetic diversity values were obtained in this study. The average number of alleles ranged between 3.0 (Zhang et al., 2010) and 4.3 (Topcu et al., 2015) in the literature and it was 4.9 in this study. The *Ne* value was between 1.07 and 5.56 with an average of 2.7 in a study performed by Topcu et al. (2015), whereas it was between 1.29 and 9.93 and the average value was 2.94 in this study. *He* values express genetic diversity in a population and are a good factor for selecting highly diverse SSR loci. Zhang et al. (2010), Topcu et al. (2015), and Ikhsan et al. (2016) obtained *He* values of 0.52, 0.55, and 0.51, whereas it was *He* = 0.60 in the current study. *PIC* ranged from 0.46 (Ikhsan et al., 2016) to 0.50 (Topcu et al., 2015) in previous SSR development studies, whereas it was 0.55 in this study. SSRs with dinucleotide motifs had higher genetic diversity values than the other motif types in the study performed by Ikhsan et al. (2016), and similar results were also obtained in the current study.

4.3. Genetic relationship among walnut cultivars

The genetic relationships among the 16 walnut cultivars were determined using 2696 alleles from 551 novel SSR loci with a UPGMA dendrogram constructed using the band similarity coefficient. We obtained a very robust dendrogram with 2696 alleles and 16 walnut cultivars were separated into two main groups: Turkish cultivars were included in one group and the US-France cultivars were included in the second group. Dogan et al. (2014) used RAPD, ISSR, and SSR techniques for the characterization of 59 walnut cultivars and genotypes in the germplasm of Turkey and obtained results similar to the current study on the division of Turkish and the US-French walnut cultivars.

The average genetic similarity was 0.503 in the Turkish group, while it was 0.670 in the US-French group, suggesting high genetic diversity in the Turkish group or close relationships among the US-French cultivars. For example, the average genetic diversity values in the Turkish group (*Na* = 4.2, *Ne* = 3.0, *Ho* = 0.47, *He* = 0.54) were higher than those in the US-French group (*Na* = 3.1, *Ne* = 2.2, *He* = 0.60, *Ho* = 0.50). Some of the cultivars in the US-French group are progenies of several cultivars in the same group. For example, Fernor and Fernette are the progenies of the Franquette and Lara cultivars, and Midland is a progeny of the Payne and Franquette cultivars (Dangl et al., 2005). This is the possible reason for lower genetic diversity in the US-French group than in the Turkish one, which included cultivars selected from different parts of Turkey (Kafkas et al., 2005; Dogan et al., 2014). Sutyemez-1 and Sutyemez-2 were the closest cultivars in the Turkish group. Kafkas et al. (2005) used AFLP and SAMPL techniques for the characterization of 21 walnut cultivars and found that Sutyemez-1 and Sutyemez-2 were close relatives.

4.4. Novel SSR set in walnut

A few studies have been conducted on genetic diversity and population genetic analysis in walnut and all of them used certain SSR primer pairs in *J. regia* that were developed from *J. nigra* by Woeste et al. (2002). Dangl et al. (2005) used 14 SSRs for the characterization of 44 *J. regia* cultivars in California and obtained an average of *Na* = 5.2. Karimi et al. (2010) studied genetic diversity of seven *J. regia* populations (15 accessions from each population) in Iran by using 11 polymorphic SSRs, and the *Na* was between 3 and 11 with an average of 5.7. The average *Ne*, *He*, *Ho*, and *PIC* values were 3.7, 0.71, 0.68, and 0.69, respectively. Ebrahimi et al. (2011) characterized 35 Iranian walnut genotypes using nine previously published polymorphic SSR loci and obtained average *Na*, *Ne*, *He*, and *Ho* values of 5.1, 3.4, 0.80, and 0.72, respectively. Ruiz-Garcia et al. (2011) used 19 polymorphic SSR primer pairs to characterize a collection of 57 walnut cultivars in Spain. The authors obtained average *Na*, *Ne*, *He*, and *Ho* values of 5.1, 2.6, 0.58, and 0.52, respectively. Pop et al. (2013) used seven polymorphic SSRs to study genetic relationships of 20 *J. regia* accessions from the Romanian National Collection and obtained genetic diversity values of *Na* = 6.7, *Ne* = 3.7, *He* = 0.72, *Ho* = 0.64, and *PIC* = 0.66.

We selected 20 novel polymorphic SSRs with the highest genetic diversity values from this study (Table 2), and the averages of *Na*, *Ne*, *He*, *Ho*, and *PIC* values in the characterization of only 16 walnut cultivars were higher (9.3, 6.1, 0.83, 0.82, and 0.81, respectively) than those mentioned in the previous studies. Therefore, the novel SSRs in this study can be used for choice of SSRs in further genetic studies in walnut owing to their high genetic diversity values. The lower genetic diversity values in the previous studies than those obtained in the present work can be attributed to the use of similar polymorphic SSR loci that were developed from *J. nigra*. SSRs with the highest genetic diversity values in a study are essential to obtain more genetic information about germplasm collections or populations with low cost and labor.

It is concluded that, in this study, we have developed 551 novel polymorphic SSR loci from *J. regia*. This is the highest number of SSR loci reported so far in walnut, and this was possible because Class I SSR motifs provided the highest genetic diversity values in the characterization of 16 Turkish, US, and French walnut cultivars. Therefore, Class I SSRs should be used in SSR development studies if sufficient sequence information is available in a species. A total of 2696 alleles were produced by 16 walnut cultivars and a robust dendrogram was obtained. The cultivars were separated into two groups, and the Turkish group produced a higher number of alleles and genetic diversity values than the US-French group. The chosen 20 SSRs from this study that have high genetic diversity values can be used in further genetic studies in *J. regia* to obtain more genetic information with low cost and labor. The numerous novel SSRs developed in this study might also be very useful to construct the first SSR-based genetic linkage map, which might help to conduct marker-assisted cultivar breeding, QTL analysis, and comparative and evolutionary genetics in walnut.

Acknowledgments

This project was financially supported by the Scientific and Technological Research Council of Turkey (Project No. TÜBİTAK TOVAG 214O140) and the Çukurova University Scientific Research Projects Unit (Project No. FYL-2015-4852).

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Supplementary File 1. The SSR loci, repeat motifs, forward and reverse primer sequences, estimated band sizes, and allele ranges of 551 SSR loci developed from *J. regia*.

SSR locus	Repeat motif	Forward primer (5’ – 3’)	Reverse primer (5’ – 3’)	Estimated size (bp)	Allele ranges
JRHR225164	$(GA)_{26}$	TTTATGATGGGGCATGCTTAC	GAACAGCCAATACCTGGCTTA	226	204–241
JRHR221481	$(AG)_{22}$	CCATGCAAAACAGAGCAAACT	GAGCTCGCAATCTCTGGTTC	182	165–197
JRHR221792	$(GA)_{25}$	TGGGAGTGCTCTATGGAAGTG	AACCCCTACATGACCTTCACC	163	137–151
JRHR225029	$(AG)_{20}$	GTACTTGGTTGTGCCTTTTGC	TGTTTCGGGTGTTGTAGGTATG	175	166–200
JRHR219358	$(TC)_{19}$	TCAGGGCTTGAATTTGGAAC	AGTCTTTGAGCAGCACTCTGG	189	199–215
JRHR218380a	$(CA)_{17}$	ATTTCCCAATCCTCCTACGAA	CGTACTTGTGAATTAGCCAACC	170	168–191
JRHR218308	$(AT)_{17}$	GCATGCAGGAAAAGTCGATA	GACAAGTTCAGCCCCAATTC	168	176–191
JRHR218863	$(GA)_{20}$	CAAGAGCTAGGGTTTCAGCAC	CCGAATGACTAAACCCGGATA	183	186–203
JRHR225564	$(AT)_{18}$	ACAAGCACGGAAGGAATTTT	AGCAAGACGGGAATAAATGGA	214	213–233
JRHR222947	$(TCT)_{11}$	CAGAAAGGTGAAAATGCATGG	GGTGTCGTTTGGATAATGAGC	270	277–290
JRHR221375	$(TA)_{20}$	ACCTGACGATCACGGCTATCT	TTCGACTTTCGATTGATCACC	179	182–198
JRHR228489	$(GA)_{16}$	CCTACAGGTTGTTTGCCCTTT	TCTCCTAACACTGCAATTGTATCC	150	161–170
JRHR225189	$(TA)_{19}$	ATTTCCAACCAGATGCCTAGC	TCATGTGAGGTCGTTATTCCA	213	219–238
JRHR218605	$(AG)_{18}$	ATATATGTGGGAACGGTGCTG	TCAGCCAAACACGTACACAAG	182	182–199
JRHR225644	$(AT)_{15}$	AACAACAGCCAGCTTCACATC	TCTTCGGTCTAGGAAATGCAA	146	150–175
JRHR218990	$(AT)_{15}$	CAGCCTTATGTATATGCTCGAA	CTTAAGAAACCAACCACCCATA	212	218–227
JRHR221529	$(AT)_{16}$	CGAATTGAAGTACCTGGTTGG	TCAGTCAACAGACATGCATAACC	186	195–203
JRHR218737	$(GGCTCA)_{5}$	GTTTTGGCTATGGCTTTGGTT	CATCATTCAGCGATGCTTCTT	155	175–187
JRHR218478	$(GA)_{16}$	GCTAGGGTTTCGGCACTTAAC	GCCTCCTCTACCTTCATCACC	166	176–184
JRHR228481	$(AG)_{15}$	CAACCAACATTTCCTCAGGTG	TCTTTGGGAGTTCTCGATAGGA	185	197–205
JRHR221458	$(AT)_{15}$	CCCCAATTTAGGATGGCACTA	CAAACTCACAACAGCTTCTCG	262	263–277
JRHR222791	$(TA)_{14}$	AATCAAAACCCATGCTTGTC	CATTTCTTGGCATCATGGTACA	258	272–276
JRHR228467	$(CA)_{15}$	GCCTTCTTTCTGATGAACTCG	AAGAACACATGAGAGGCATGG	181	196–203
JRHR218590	$(GA)_{15}$	ATTGGCTCCTAAGGCTGACC	AGGAGACTGGGCCTGAGATAG	227	240–260
JRHR225423	$(CT)_{14}$	CAGCCACTAAGCTGTGCTAGG	ACAGTGGGCGTGAGCTACTT	174	186–196
JRHR218332	$(AT)_{15}$	TACCTGCAGCCAGGAGTTTAG	GCATAAAATCTCCCAAGATCG	167	164–172
JRHR225191	$(TA)_{14}$	GTGCATGAGAGTGGGAGAGAG	TGAGAACGTACAGGACTGAGGA	122	117–137
JRHR218689	$(GA)_{14}$	CGATCGAAGAAAAGGGTTCA	CAGCGCTTTGAAGCATAA	203	208–221
JRHR218500	$(AG)_{14}$	GTCTGCGTTCTGATCTTGCTT	GAACCAGTCATGGCTTGAAAA	177	194–232
JRHR222679	$(TA)_{13}$	TCTAGATCCATCGCGTCCTT	TACCGTACGTTTCCTCCTTTG	162	153–163
JRHR218647	$(TA)_{14}$	AATTTGCGCGAGATTTGTGT	CGCGATATTTACACATTTTGAGACC	171	179–216
JRHR218465	$(AG)_{14}$	TTCCTGGTCTTGAAACGCTAC	TGCATGACACCAAGAAGAAGA	199	212–218
JRHR225546	$(CT)_{13}$	AACTTAGTCTGGCGGAAATGC	ATCCGTGTCGTAGTCATCGTC	178	191–201
JRHR219017	$(AT)_{14}$	TCCACACATGAGGGAGAGTGT	GTGCACATCATCTTTCCTACAA	172	181–192
JRHR228443	$(AGA)_{9}$	GCCAGGGCAAGATTAATAGGT	CCTTTGATTTCTGCATGGTGT	211	217–240
JRHR225388	$(AT)_{13}$	CATGTTAATCCATCCCTCTCAA	TCCGAATACCTCAGGAAGTTACA	178	187–211
JRHR218910a	$(TC)_{14}$	GAACTGTCCGCAAGAACAAGT	ATGGCTCAGGGAAGGAAAATA	181	196–217
JRHR221447	$(AT)_{14}$	CTGTTCAAACCCAATGGAAAG	GCTCGTGACATATTTGGAAGG	165	171–187
JRHR222846	$(ATG)_{9}$	AGATGGTCCTGCAACATATCG	TAATTAGCATTGGCCTGGAGA	209	212–225
JRHR225377	$(AT)_{13}$	TTCATGGGTCTGCATGTTAAAG	AAATTGGCTGGCCTCAGTTAT	207	220–226

Supplementary File 1. (Continued).

JRHR218769	$(AG)_{14}$	CTCCTCAATTCAGTCCCATCC	TTGCTCCCGTACTCTCAACTC	175	189–212
JRHR225484	$(TTA)_{9}$	GGGCCAAATGAGATTTATTTCC	GCTTCAAATCCGAATGTGCT	279	278–288
JRHR219223	$(TA)_{13}$	GTAATTCCTCGCCGCAATAGT	TGCATCCTCAAAACATGGTG	162	181–191
JRHR218727	$(AT)_{14}$	ATTCTTCAAATCCCACCATCC	TCCTTTAACGATAGATGAAGAGACC	154	158–186
JRHR219052	$(AG)_{13}$	TAAATATCTCCACCCCGGTTC	CAGAGCAGCAACTTTTCCAAG	184	201–209
JRHR219048	$(TA)_{13}$	CAAAGGATCTCCACGAGCTTT	GTTCCATACGAATCAAACCCTA	262	267–278
JRHR221565a	$(AT)_{13}$	GGTTTTGCATGAAACATCAGG	GCGATTCTCCAAATCCACTTT	160	166–178
JRHR218922	$(AT)_{13}$	AAACTCCATACCCCAATTCCA	CCACTTCCCTTTCTCGATTTT	197	201–213
JRHR218276	$(TA)_{13}$	CAGCCAAATAGTTCGGTCAAA	GTGGACGCAAGTGAAGTGATT	198	201–229
JRHR222705	$(GA)_{12}$	CTGGTCGATCAAGCTTTGTGT	GCCATCTGTAAGAAAGCAGCA	176	191–196
JRHR224961	$(CGTTGC)_{4}$	CGCAGAAGTTCACAGCAGTAG	TTTGTCTCCTCATGCACCAAT	179	194–200
JRHR225615	$(AGCGGA)_{4}$	GCACCATCGAGAGATCAGAAA	CTTCTCCGAAGGAAGCAGGT	161	169–180
JRHR224896	$(TA)_{12}$	GGAGAATGGGGTTATTCCTCA	ATGTATTAGTGCGTGGCAAGG	213	227–249
JRHR218204	$(AT)_{13}$	TGCGTGAGGACGATTCTATTC	TGCATCTCATGATGTTCCTAGC	168	179–185
JRHR225405	$(TC)_{12}$	CCGAATCGTTTGTCTTTTCT	CGGGGACGACTGACTAACTTT	181	195–209
JRHR219179	$(TA)_{12}$	AGTTCAACATCCAAACGCAAC	ATCCTGACAGACATGAGCAAT	201	216–236
JRHR221879	$(TA)_{13}$	ACATGATAACCGACTCGTGAA	CGGCCTCTTTCATTTCCATAG	271	276–289
JRHR225292	$(AT)_{12}$	GGTATGTCTCCTTGCGCTAAA	CAACTCGTCCTCTTTCTTACGAG	291	206–310
JRHR221724	$(TA)_{13}$	GTCATCTAGAAACCAGTGC	GTGGTACGCCCTTGATTATTT	241	247–271
JRHR225155	$(CT)_{12}$	GTCAGAATACGCCCTTTGTTG	TTTAGGCCGATCGAGAAGATT	180	191–201
JRHR218764	$(TA)_{12}$	CGCTAGCTGTTCATTACTCCA	AGTCCATTGCCTTGCACATTA	188	198–210
JRHR221368	$(TA)_{12}$	GTTCGTCGCACTTTGTGAAAT	GAGTCTGTTTGGCTGTGAAGAA	164	179–183
JRHR228435	$(GA)_{11}$	GACGGTGATCAAGGTGGAGTA	GTCACTCCAGGCCACTCCTAT	165	185–190
JRHR218699	$(CCTGGG)_{4}$	GAAAGAAAACTCACCGAACGA	TACCCAAGCTCAAATTCCAAC	170	175–209
JRHR218602	$(TC)_{12}$	CACTTGGAAGAACGAGAACCA	ATTCACAGATTTCAGGTGTCG	186	195–214
JRHR228317	$(TA)_{11}$	ATTTGGACTTGCTTGCTGCTG	TTTCGGTGAGTGTAAGCATTGT	165	177–185
JRHR222130	$(AT)_{12}$	TTCTGTTGTATTTGCCCCTCT	CAGTTATCGGTGGAGAGCAGT	187	195–215
JRHR221727	$(AT)_{12}$	TCACATTTAGGTTCTTGGATGG	TTCAGAGTGACGATTTTAGGC	159	161–182
JRHR218302	$(AAAT)_{6}$	GAGACAGAGAGAACCCCAACC	GTAGGCCCTCAATGTTCACAA	199	216–225
JRHR222788	$(TA)_{11}$	CGTCGGTCCAACCAGCTA	GACAAGGGCGTCCAAATTTAT	222	170–184
JRHR222084	$(AT)_{12}$	TGCATGGTATGATTCTCTCA	GTGCTCCACTTAATTTGTAACCAG	182	195–211
JRHR221373	$(AT)_{12}$	TACACTTTGCATCCCAAAAGG	AGATCAAAGCACGTTCACAT	265	271–285
JRHR228525	$(GA)_{11}$	GAAGCATGCAAACCCAGAATA	TGTTTTCGCAGTTCACTCTCA	157	159–173
JRHR221370	$(TA)_{12}$	TATATTGAGGTGGGGTTGACG	GGGTTTTGGCATAAGCTTTAGA	181	191–204
JRHR222666	$(AT)_{11}$	TTACGTATGCATCCCCTTTTG	AAGGCTTTCTGGCACACTACA	195	201–215
JRHR225264	$(AT)_{11}$	GGGTGCTCTATCTCCATTCTG	CAAACCCGGTATTTTCAGCTC	178	196–211
JRHR219141	$(AT)_{11}$	TGCATGAACTGATGAACATACG	AAAGTGACACGGTCAATCACA	300	311–334
JRHR225161	$(AT)_{11}$	CCAATTAAAGTCGGCATAGCA	TCTTTGTGCCACGTATTTGTTC	259	270–282
JRHR221565b	$(GA)_{11}$	GTGGAAAACAGAGGGATGAGG	CCGACCCCACCATACTAAAGA	176	194–205
JRHR225533	$(AG)_{11}$	ATGCTCAACATTGCACACAAG	CCACAGCTGAGACTGAAGGAC	181	197–211
JRHR225096	$(AG)_{11}$	AGCTCAGCCTATGACCACAAC	GAGGCCCCAGTTGCTTAAATA	196	213–224
JRHR218910b	$(AT)_{11}$	TCTCGCTTCGAACATACGATT	ATCACAGGCACTGCTCCATAG	181	195–206
JRHR224863	$(TA)_{10}$	TGACGCTCAGACACAAGGTAA	CGCAAGCCCTATTACGAATCT	187	195–222
JRHR218879	$(AT)_{11}$	CTATTCATCCGACCTGCAAAC	TCCCTCAGATTGTCAAATCCA	176	186–192

Supplementary File 1. (Continued).

JRHR225426	$(TA)_{11}$	AACGGATCCTTATCACCTCGT	CGGGAACCATTAAAGTTGGTG	149	156–165
JRHR219400	$(AT)_{11}$	CAGGTTTCAGTTCAGCCATTC	ACCACTGGGATTTTGGGTAAA	228	240–252
JRHR218756	$(TA)_{11}$	AAACCCTGTGTCGAATTTTCC	TCGTCTTCATGTGCATGTTGT	193	205–212
JRHR221425	$(CT)_{11}$	AACTGCCTTTTCCTTGCATGT	AAGCCCAAGACTAGGTCCAAC	183	180–201
JRHR225387	$(AT)_{10}$	ACGTTGCAGCTGACCCTTTAT	CCGTTAACACGATTTGACACC	185	192–202
JRHR222096	$(TA)_{11}$	TTATTGAGCCAAATCCTGCAC	AAGGTGGCTTTCTAGCATCTTG	247	262–296
JRHR221380	$(TA)_{11}$	TAGGGAATCAAAGCACTTCCA	CCATCACCCTGTGAAACAAAT	198	212–236
JRHR222963	$(CT)_{10}$	GCCTTCTCTGCATCTCAACAA	AGCAAGGGGCATTATCTCAAT	175	190–201
JRHR222887	$(TA)_{10}$	ATTGTCTGAACCTGCGATTGA	CATGATCCATACCCGACACTC	167	180–187
JRHR225490	$(AAT)_{7}$	CTGAGACTTCCCACTGTCTTCA	TATGGATTTGATGGCCCTGTA	186	195–204
JRHR228555	$(AT)_{10}$	TGCCAAATTTTCAGTTTCCTC	TCATTTTCCCAGTCAGTGATGTA	240	253–266
JRHR225421	$(CT)_{10}$	TCTCATTCGTTCCGTTCTCAC	GCAGATGGAGTTCCCTTTACG	145	166–184
JRHR222659	$(CTTTT)_{4}$	GAAAGATGTATTCAGCCCCTTT	GCAGTTTGTGAATGAGTTAGAG	177	196–198
JRHR228372	$(AAAAT)_{4}$	AACAGGGTGATCTCATCTGGA	AATTAGAGCTGCCACAATTCG	174	181–192
JRHR225602	$(AAAAT)_{4}$	CTTAACCCGCCTTTCAATTTC	TGTCCCTTAGGTGAGGTACCAG	249	262–267
JRHR228357	$(TTCAT)_{4}$	CAGCCCTTCTCCCTCACTATT	TAAGCGAGAGAGCACTTTTGG	185	195–200
JRHR225530	$(TA)_{10}$	GAGGGAGCTACATTTTGGGTA	TTGGTAGTGGGAGAGCATTTG	231	238–247
JRHR225281	$(TTTC)_{5}$	GGTACTGAGGGGAGGTCATGT	CTAGCGTATTTCCAGCCCAAA	187	208–212
JRHR225235	$(AT)_{10}$	AGTGGGTCAACATCACCAGAC	AACGTTGGCTCACAACAGCTA	165	176–185
JRHR219256	$(ATCTC)_{4}$	TCTCTGTCACTTAGGTTCCGTTT	ATGTTCCCGGGTTAAGTTGTT	284	203–207
JRHR225225	$(AT)_{10}$	TTTTGTGGGGCAATACCTTAGT	TGCTAGCTCGTGTTAAGTAGGAA	165	180–186
JRHR224834	$(AT)_{10}$	TCCTTCGCCTCATCATGTACT	AGAGGTTTTGTACGCCCATTT	172	185–197
JRHR222064	$(TA)_{10}$	ATGAGGGAAGCCATTAGGAGA	ATTCCCGCTAGCTCCTGTATT	212	227–231
JRHR225146	$(AT)_{10}$	AAACTACTCCCAAGCCACCAC	TCCATGATTGTTGAGAGACACA	240	250–264
JRHR225024	$(AT)_{10}$	TCTGATCACGAAACATGCAA	TGGTCGGTTTTGAACATGAA	245	259–270
JRHR219444	$(TG)_{10}$	TGCATGCGAAGGATAAACTTG	TCGACAAACACTTCACTTCCA	175	193–197
JRHR218782	$(GA)_{10}$	TGCCCTGCGTTGAACTTT	TCCAGTTCGGACATAGAGGTG	175	191–193
JRHR219356	$(TC)_{10}$	GTCCCAAACAGGCATGAAATA	TTCCCCTAATGAGGAGCAATTA	156	141–150
JRHR221483	$(AT)_{10}$	CCTAGGCTGTGTTTGATGTGTC	AGAATTCCAGGTTCACCCAAC	170	190–196
JRHR218506	$(TA)_{10}$	TGTACGTGTGCGTTTCTACTTC	AGCTCCACACTCCTACACACC	233	226–250
JRHR221397	$(ATTTT)_{4}$	AATACATTTTCCCCGACCTTG	TCTCGATAAGGCCATTTAGCA	203	202–209
JRHR218268	$(AT)_{10}$	GGAGAGGTAATAAGTTCACCAA	GGGGTCGGCTAGAAGATA	257	263–273
JRHR218380b	$(AT)_{10}$	TGTGGGCGTTTCCTAAAGATT	ACCGTACGTAAAGGAGGAAAA	230	239–250
JRHR218582	$(AAAAG)_{4}$	GAGCACAAGATCATTTGACCA	CCTTTCCCATAAGCACTCCAT	162	175–182
JRHR218355	$(TA)_{10}$	TTCTAACTACTTCACCACCTGCAT	AACTGGGTGATAATTGATACGG	251	267–277
JRHR218527	$(AT)_{10}$	CAAAAGCTAGTGCGCTAAATCA	CAAAGATCCCCTTTCCTAACG	175	186–203
JRHR218350	$(TA)_{10}$	GAACGCAAGGCTAGTGTGAGA	GCAGAACACAGTGATACCACAA	182	195–206
JRHR218339	$(TA)_{10}$	GTGACGATCAGAAGAATATTGCAG	GCGTTGAAACTGAAAGTTGTTGAAG	177	195–205
JRHR220931	$(GA)_{10}$	TCACCGAGAGAGAAGTGAAATGT	TAGGCCACCTTAGTCAGTAGCAA	188	204–206
JRHR221033	$(AG)_{10}$	GATCGAAACTCAATCTGGAGACA	CACCCACTACTTGTGTTCTTGTG	204	220–231
JRHR217756	$(CATGC)_{4}$	ATTGCTTATTGGCATTGGAGAC	TTGCTGATGGTTAGACTTTAGGC	171	178–187
JRHR220995	$(AG)_{10}$	CTCATCCTTCCTCCAATTTTCA	ACTAGGAGCTCAGTACCCTACCC	203	207–221
JRHR221243	$(TC)_{10}$	CTTGTGTATAAGCGACCGGAAT	TTGCGTAATGTAAGCCAAACTC	173	190–196
JRHR217494	$(TTTAT)_{4}$	CCGGCAGCATCTCATCTTA	GTCATGTCAAAGGAGATCAATGG	169	189–195

Supplementary File 1. (Continued).

JRHR221141	$(AAAG)_5$	AATCGAGAAACATCACGAGCTAC	AAGAGGTAGGAGTTACGAACATCAA	197	198–214
JRHR220352	$(AG)_{10}$	CGGAGTTGGAGTTAAGAGTGTTG	ATTACCAGACAAGTAGCCCGAAA	143	156–164
JRHR217270	$(TTTA)_5$	CCCTGATAGAGATTGTAGCATCG	CTCCGGCCATCTGTACATTAAC	195	211–219
JRHR222378	$(ATTTT)_4$	GGCTCTTAGGCTCTTAGCTATTCA	GCTTTAGCTGTACGTAAATCAGGA	275	283–290
JRHR219666	$(TTTA)_5$	GGTGATTACAACAAGAGAGTACACG	GCTCAGATCTCTTCCCCTCATA	174	186–198
JRHR217036	$(GA)_{10}$	CATAGTCTAAGTGCGCAGCAAA	CCCTTTATTCAAACGAATGCTC	204	220–224
JRHR220057	$(AG)_{10}$	ACGTCTCATCTGGAAACAAACAG	CTGTTTTCCATGTCCTCTACTGC	162	178–179
JRHR222268b	$(TA)_{11}$	CCATCCATAACATAATCCCTTG	GGTACTCATTCTTCACACACACG	229	292–297
JRHR219595	$(CATA)_5$	CGTACATACATACATTCATCCATCC	GCCATCAATATCATCACCATCTC	188	206–222
JRHR216999	$(AAACA)_4$	GACGGACTAGCCATACAAAGAAAA	CACCCTCCAAGATGGTTACTCT	201	210–222
JRHR210570	$(CTCTT)_4$	CCCGAAATTTTACGTACCCTCT	AATAGAGGATGGTGGACAGTGAG	189	187–204
JRHR210521	$(TTTTC)_4$	GAAATGCAAGCTGTCAGTAAAGG	GTTGAAGTCACAGACATGATCCA	201	214–219
JRHR216257	$(ATAAC)_4$	ACAGTTCCCCATATGCACTGTAA	GACATCTAAAACTGGTGGGTGTA	167	169–171
JRHR210129	$(AG)_{10}$	GCAGCAAGTTGAGAAGTCGTTAT	TGTCAGTTGAGGAGTTGCAGTAG	188	205–213
JRHR216543	$(GA)_{10}$	TTGTGAAACAAGGTGAAGGTTG	TGAGAGGCTTTTATTCTGTCGTC	174	177–205
JRHR210111	$(CA)_{10}$	GAGAAGGTTGAGCTCTTCCAGTA	ACGAGTCAGTGCTGCTTCTAAAT	180	196–210
JRHR216529	$(CTAG)_5$	CTAGAGGATCAGGGAATTTTGAAC	GATCCGATTTGACTGCAACA	211	223–227
JRHR216158	$(CA)_{10}$	CTCAGCAATTTCCAGTTTAGTCG	GCGGTATATTCTACGAACCCAAA	165	182–190
JRHR212650	$(TA)_{10}$	AGCATTTCTCTTTGCCAACACT	AAAGGAGGTTGAGGTTGTAATCC	162	172–190
JRHR215899	$(TGTT)_5$	AAAGAAACAGACGTGGCCATTA	GCAAGATTCCAAACAAGGGAGTA	175	173–194
JRHR215522	$(TTTC)_5$	TTCTCTAGGCCCTTCACCTTTAG	TCTCTCTCTCTCTCCACACAACA	219	235–252
JRHR213085	$(TC)_{10}$	TATATGTCTTCCCATTCGGTCAG	GACAGAGCAGAAAGTGAGTGGAG	210	225–233
JRHR215811	$(GCCAG)_4$	AATATTTCGGGCAGGACAAG	TTCCAGCAACTTGTATGGGTTT	173	179–194
JRHR215500	$(TA)_{10}$	TCTTCATGATCTGCGAACAACT	CGATCTTCCCTCTCAAGCTTTTA	180	197–207
JRHR215759	$(TA)_{10}$	ATGTAGCTGGGACGTTAACAGAA	TAAAGATCAGAGCATGCACACAG	158	169–175
JRHR212591	$(TC)_{10}$	ATACCCTTCATCCGACTGAGATT	GAAACTGGTTTTGCTTTTGGTG	169	185–192
JRHR215387	$(AAAAT)_4$	CTCGTATTCAAGTGCATCTCATTC	TAGACCTGCATCAAGGTAATTGG	187	191–204
JRHR215995	$(TC)_{10}$	CTGTTCCACCTCCTCAAGAATAA	GGAGATGAATAGTTGCAGGAGAA	141	153–162
JRHR215534	$(AATA)_5$	ACCTCTTGTGGGCTCTCTAACTC	GAGGCATGAATATGGTCTGATGT	189	200–205
JRHR212442	$(ATAC)_5$	TGTTAGCAATTTCGTAGCTCAGG	CAGTCAATGGCTCCTTCCTTAAT	232	245–255
JRHR215007	$(TCATC)_4$	TGTAGAGGTCCGTTTGGATACAG	GAGGAAGTGCTCTTACCGGATTA	234	250–255
JRHR211818	$(AG)_{10}$	ACAGGTAGAGGTTTTGGTTGGTT	CTGCCTAACAGAAGCATTAGCAA	172	182–188
JRHR212376	$(TA)_{10}$	GTCTGAAAAGCCACACGAAAA	CGTAATTTGTGTATGTCGCGTA	220	234–242
JRHR212162	$(TGAGA)_4$	AAAGGAGAGGAGAAAGGAGTGAA	CTTCGGGATGATGCGAATA	316	330–342
JRHR212270	$(AT)_{10}$	CTGACTGACCCTGCACATAAATA	ATTTCCTGCTACATGCATTTCC	200	213–220
JRHR212022	$(TA)_{10}$	TTGTTGGAGCTTGTTCTCTTGA	GCCTACTCCCTCACCATTTTCTA	144	158–170
JRHR211727	$(TG)_{10}$	GGATAACACGGGTACCACCTTAC	CATATAATTCGAACCTCCTCACG	173	169–198
JRHR212264	$(TA)_{10}$	CTAGAGGATCGGCCCTAACG	CAGGGAACCTGAAAGATCAGAA	157	169–191
JRHR214764	$(TC)_{10}$	GGTTCTCCCTCTCTCTCTCAAAT	AGCAAAGTTATCGAACTGAGACC	170	185–199
JRHR211298	$(GA)_{10}$	GGGGAGGCATCATCTTAGC	GGGGAAAGAACTTAACCGTACAC	174	178–196
JRHR210929	$(TG)_{10}$	GCATGCTCTGCAGTAGACTTGAT	GCCCACTGTTGTAAATACCTCAT	190	198–218
JRHR214742	$(TA)_{10}$	GAGGTTTCTGCCTAAGGTTGATTA	GAAACACCAGCATCATAGCTAAAG	200	209–238
JRHR214308	$(ATGC)_5$	TTAAGCCAGTTTGGATTGAGAG	GAGTATCTCAGAATCACGACAAAAG	275	288–299
JRHR211142	$(AGCCA)_4$	TCTAGAGGATCAGCTTGTTGCAT	CGAGTCGAGCTCAAACATAGAAT	151	158–168

Supplementary File 1. (Continued).

JRHR214715	$(CAAA)_5$	CCAGCAAGCAACTACGTATTCA	CCACAGCCAATTTACCCTTTT	115	123–128
JRHR211559	$(CTAG)_5$	AAGCAACTATTTGATGGGAGGA	AGTTAGGTGTTTTGTGATCAGGAG	128	133–162
JRHR210875	$(CATA)_5$	GACCTCCATCTCCCAATGTATC	GCAAGCTGGTTGTGACATGTAT	154	172–184
JRHR211023	$(AG)_{10}$	CAACTAGTGGCTTCTCTGTGGTG	TCGTATCCACTCCTTTCTGGTAA	152	168–180
JRHR214635	$(TA)_{10}$	GTCAGCAACCAAAGAAGGTAACA	CTCTCTCTCCAAGGGGTTAAGAC	167	178–184
JRHR211428	$(AGATT)_4$	CACTGTAAGTCCCGCTTCTTTTA	AGTCACCGAAACACCACAACATA	216	232–237
JRHR216898	$(AT)_{10}$	AGGTGAGCATTGGAAGAAACAT	GGTGCTTTCCTTTATAGGCTGTC	179	196–202
JRHR214565	$(TA)_{10}$	TATCTTAGGTCCCATGTGTCTCG	GCCAATATGGCCTGCTGA	197	213–228
JRHR210954	$(AG)_{10}$	CTGGAATCATATCGCAAAACTC	CTCGTCTAAGCATAGGAACGAAA	174	190–194
JRHR216889	$(AT)_{10}$	CGAAAAGCACAGAGAAAGAGAGA	GAACCCTAACCCTAAGCACAGAT	184	183–205
JRHR214227	$(AT)_{10}$	TGAGTGTGAAGTCTTGTTTGTCG	TGCTCAGATAGGGTTATTTTCCTC	163	180–202
JRHR208031	$(TA)_{10}$	GCGAAGTATCACAAGGAGAAAAG	GCTTGGGCCTGATTATAACATT	231	247–255
JRHR207403	$(CT)_{10}$	GAGATGAGCTTCATTTTGTACCG	CTTCCTTGCTGACCTCATTCTT	188	205–219
JRHR213833	$(ATTT)_5$	ATATTTGAAGTGGTGAGGCTGGT	CTGTTTGTGTGAAATGTAGGAAGG	152	159–171
JRHR207986	$(TC)_{10}$	TTAGGAGAGTTCATCACCCCAAT	CCTAGAGTTCCCGAACATGAATA	172	182–193
JRHR214134	$(CATCT)_4$	CATGGTATACTTTGCCCTCTCAC	GTGTGGGGATTTGAGAAAGTTGT	160	179–197
JRHR207739	$(TA)_{10}$	GCATGTACTCGTGCCTCTGTAG	GTTGGATCACGGACGTCATAA	177	190–198
JRHR209954	$(AGACT)_4$	GGATTGTTGGGTTCTAGGGTTTA	CTCAGAAACTCTGCTTTGATACCAT	185	199–205
JRHR214078	$(ATTT)_5$	CCTCGCTTCACTCTTTCCTTAAT	TCTCACGTCACTCCACACCTAGT	184	188–201
JRHR204228	$(TTTA)_5$	GACGTGGTTCGATGTGATATGTT	GACTTGGGAGACTTTTAAGTGGAA	228	241–245
JRHR207031	$(CGGTC)_4$	AACAGCATACCCAACAGAGTAGC	AAAAGGGCGGACCGACTG	178	174–193
JRHR206327	$(AT)_{10}$	AAAGGACAGCTGGAGTTGATAGA	CTGCAGCATGCATCACGTA	159	174–182
JRHR204198	$(GA)_{10}$	GTGAAACAACAGCAGTGAGGACT	ATATAAACCTATCTCCGGGCTTG	170	187–206
JRHR204149	$(AG)_{10}$	AAGAACCATGTCTATTCGCTCTG	CTGTGGCACTGTCTTCATCTGTA	271	287–290
JRHR206858	$(CTCAA)_4$	GGTTACCAAACTCATCTCAACTCA	CTTCTCCCTCACTCATAAGTCCA	244	251–260
JRHR209611	$(AT)_{10}$	GCACTACTCTTGTGCAAGTTCAT	AATTCTCATCTCACCCTCCAAAC	115	131–148
JRHR206750	$(AT)_{10}$	CTCCAAAGTCCCTCAAAGAAAGT	TCTTATATACGGGACGGAAACAG	204	217–227
JRHR209140	$(TA)_{10}$	TTCAACATGACTCTTCAACG	TCAGTACAAGATCAACTGCATGG	174	193–241
JRHR209503	$(TA)_{10}$	AAGTCTCGCATTAAGCCACATC	CCATGGTACTTAAAGCATGGAAC	164	177–187
JRHR207121	$(TCAAC)_4$	ACCTTATGATTCTCTCTCGTTGC	TGTTACCAAGCTGAGGACTAAAC	213	222–232
JRHR209484	$(TA)_{10}$	CAGGTGTAGGAAAGGTTTGAAGA	CTTGCATATACAGGCCAAATACTC	179	196–206
JRHR221269b	$(AT)_{12}$	TTCTGGGAGGAAGCATATGAGTA	GCTTCCATGTCTTTCATCAGTTC	128	191–202
JRHR216691	$(CGT)_7$	GGAAGCGATATTACCTCATACGAA	GAATATGTGGGTATTGCTCTGGT	151	161–164
JRHR221011	$(ACC)_7$	ATTGGAGTGGTGGTAACAGTACG	TATCCTCGAAGTAGTGCCTCTTG	261	166–185
JRHR215454	$(AAG)_7$	TGGAGAGAACTGATTATGGGCTA	TTTCTCTTTTCTTGCTGCTCGT	205	208–220
JRHR211274b	$(TA)_{13}$	GGTGTAGTTGATCTTTTGCTTCC	ACATGACTTTGACCATGGCTTT	163	148–150
JRHR220864b	$(TG)_{14}$	TGATGATGATGATGATGACGAC	AGGCATTGGACTTGATAAGTGG	180	211–228
JRHR212407	$(TTA)_7$	CCAAAATGCATCTCTTCAAGGT	AGTCACGAAAGTGTACTGGGAAA	175	180–200
JRHR213914	$(TTA)_7$	CGAAACATGGGACATGAAGATT	TCTCTACGGAAGAAGTTGATAACC	170	182–194
JRHR210120	$(TTA)_7$	CGTCTCTAGTAAAATGAACGGTGT	CTTTCGTGGCCTGCTACTACTT	312	307–333
JRHR213756	$(CTT)_7$	CGATCAATCTCAGAAGCTCATTC	TGTGGCCTTGACTCTTCTCTAAA	184	206–215
JRHR220056	$(CCA)_7$	GCAAACGTACAGTCGTACAGAAA	GGTTGATCTTTCAAGGACCTCTT	165	177–181
JRHR214390	$(TGA)_7$	GTGTGAAAGTGGATGGCATAATC	CCAGAGTGATGAAATCAGCAAA	155	169–177
JRHR207644	$(ACC)_7$	TAACCTGTTCAGAGGTCGGATT	ATTGAAAGCTGAGAGATGGAGGA	145	164–167

Supplementary File 1. (Continued).

JRHR217522	$(AT)_{11}$	GACATGACCTTGATTTTCACCAC	TTAATGCATGCTACATCGATCC	185	197–203
JRHR209458	$(AAT)_{7}$	CAATGCTACACAACCTCACCAAC	TGCTACTATTCACACAACCTCCA	208	213–217
JRHR220805	$(CT)_{11}$	CCCTCTCTCTCGATCTCTCTCTC	GATAGGGGTGGCCTACACAA	216	265–283
JRHR216983	$(GA)_{11}$	CCTAAAGAAGAAGATCACCAGA	CTAGCTACCTCCGTCCTTCAAAT	198	216–231
JRHR209120	$(ATT)_{7}$	CAGTTTTAATTGTCCCTCATCTGC	AAAATCGCCGGAAAAGATGT	256	266–271
JRHR220755	$(AT)_{11}$	TAGTCGTGATATTCACACAGGAG	GCCCGAAACATAGATTAATTCC	199	171–174
JRHR217314	$(TA)_{11}$	AGGCTTGATTACGCTTAACTTG	GAGATACTTTTGTGAGCCAATCG	241	254–269
JRHR220370	$(AT)_{11}$	TCAGTGCAGTCTACTTGGTCATT	CTGAGGTCCCGACATGAGTATAA	176	189–228
JRHR217914	$(AT)_{11}$	GACATGACCTTGATTTTCACCAC	TTAATGCATGCTACATCGATCC	185	197–203
JRHR220525	$(AG)_{11}$	CCACTCCTGATACCATCCATAAA	ACCATCTCCATTTGTCTTGTACG	169	184–192
JRHR220211	$(TA)_{11}$	TAATTAGGCAGACATGGCAAAC	GTGGAAAAGTGAAAGGGAATCA	108	118–129
JRHR217869	$(CA)_{11}$	GCTTAGTGGAATGATTGTGCAGT	TTGGCCCACTTATACGGTCTATT	191	205–212
JRHR220524	$(GA)_{11}$	GTCATCATGCATCTTTTCTGGT	AGGGGTGGAAAGACAACATTACT	164	181–191
JRHR221203	$(TA)_{11}$	TCTGCTTGGTCGATCTTCTTCTA	CGTACACATGAGAGCCAGCTT	210	220–226
JRHR220462	$(AT)_{11}$	GTAGTGTGATGTGATTCCAATGAG	GTAGTGTGATGTGATTCCAATGAG	172	143–158
JRHR222320	$(GA)_{11}$	CACGTGTAAGTGTCCAACTAGCA	GAACATGTCCAGAGAGGATGAAG	171	187–191
JRHR219547	$(TA)_{11}$	CAATTAATGCTGACTGGGAAAG	ATAACCCTTGATGACCATGTGA	215	225–239
JRHR216048	$(AT)_{11}$	GAGGATCCACCAATACTACCACT	CCAATGTTACCATGCACTTTTC	193	192–211
JRHR213245	$(TC)_{11}$	CTAGAGGATCTGCACCCCTTT	ACTAGTGGTGGTGGTTACACCTG	172	180–202
JRHR222268a	$(AAAAT)_{4}$	ATCATCGACTGTCCTTTTGTACG	GGACGGTGCCTATAAAATGTGT	280	237–248
JRHR210660	$(CT)_{11}$	CATGTCAAGAGCCATTTACAGGT	TGCCATACGGATAAGTTCTTCAC	195	196–208
JRHR212928	$(AT)_{11}$	GACTTCATTCCTTGTGGCAATC	CCACTGTATTTGCAGGATCTGTT	325	345–359
JRHR219692	$(AT)_{11}$	TGAGATGAAAGTAAGATGGTGGTG	GTGGCAAGACACGTTGTATGTTA	335	352–358
JRHR216875	$(TA)_{11}$	TGCAGTAGTTTGTTGAGAGAGCA	ATATAAACGGAGCACTGTCTTGG	161	176–188
JRHR210627	$(AC)_{11}$	ACAAGGCATCAAACTGGATTTC	GGCTTGTTGTCTATTCGGATTT	176	177–199
JRHR216639	$(TA)_{11}$	TTACGCTCCAACTTTTCAACCT	ATCTTTCTCTTGAGATCCGTGTG	160	160–178
JRHR212629	$(TC)_{11}$	GTACCGGTCAAGTCCAAACAAAT	CAATCCACAAAGAGAATGACGTG	184	203–215
JRHR216537	$(GA)_{11}$	ACAGACCACCAAATCACATCAAC	GAACCTACGAGGAAAACTGCATA	175	192–211
JRHR210443	$(TA)_{11}$	GTTTGATGAAAGAATCCCCGTA	ATGCATTCTCACAAAAGCTGTC	176	185–193
JRHR212583	$(AT)_{11}$	CTTTTAACGTGTCGTCCACTGAT	GGTCGAATTCATGAGCAAAAGT	247	264–272
JRHR216269	$(AT)_{11}$	TAGCCAGGTTGGTCTTGAGTTTA	GTGATCAGTTGCGTCATATACA	246	253–263
JRHR215884	$(AT)_{11}$	CAGTTCACGTTGTAAACCCTTGA	CACTGTGTGGACTTTTCTTTTCC	200	208–210
JRHR212214	$(AT)_{11}$	CATGCTCTTCACGTACTTTAGGC	GACGTCGGCATCATACAGATATAG	179	193–208
JRHR212175	$(TA)_{11}$	AACTGAAACTTTGGCACCAATC	GCTCCTTGATGGCTACATTAACA	284	298–318
JRHR214544	$(TC)_{11}$	CGTCTGCTCCTTATCCTCAAAG	CAACGATCTTTCAAACAGTACCC	151	164–172
JRHR211028	$(AT)_{11}$	TCAGAGCTCCTTACCTTGAACAG	GGTTATACGAATCAAGCATGCAC	169	176–184
JRHR212010	$(AT)_{11}$	GCTAACGTTTGGTTTGTTAGTGG	ACCAGGGGTTTGATAATCTTGA	162	170–180
JRHR214460	$(TC)_{11}$	TCTCCGTCCCTCTCTCTTTCTAC	TTACGTAGACTGGAAACGCATTC	191	203–213
JRHR216894	$(AG)_{11}$	CGCTCAAGAAGTAGGACAAAGAA	AAAGGAGCAATTACAACGATGG	175	181–203
JRHR211940	$(AT)_{11}$	GAACCGAGTGGGGTTTGATA	TACACCACACATAACATGCACAC	203	216–234
JRHR214359	$(AT)_{11}$	TTTTGCTAGTCTCCCAAGGAGTT	GAGCTGGTGAAGTATTCCTGCTT	167	185–195
JRHR212382	$(CT)_{11}$	CGAGTTTTACCCTTAGCAAGATG	AAGTGGGAAGAAATGATCTAGGG	160	177–181
JRHR211534	$(AT)_{11}$	CATGGATTCTAGAGAGCTTGCAT	GGGACAGAAAGGCTAATTAAGGA	208	225–239
JRHR212348	$(TA)_{11}$	CCATTTTATAATCTGCGCCTACC	TTAACGAGGGTCCAGAAAGAAAG	163	176–188

Supplementary File 1. (Continued).

JRHR211195	$(AT)_{11}$	CCTTCAATCTTCAACCATCCTCT	CGATCAACAAACTCATGTACGAC	184	202–220
JRHR213725	$(TA)_{11}$	TGAGTAGGGGAACCTTTTCTAGG	TAGGATAGCCATGATGAGCAGTT	224	242–253
JRHR213642	$(CT)_{11}$	ATCTCCAGCATCATCAGATCTTC	CACTCATCGCTCATCTCTCTTTT	182	198–212
JRHR204187	$(AT)_{11}$	GGTGTATAGCATTACTCCAA	ATCTTCCAGACGTGGCTTAGAT	138	147–156
JRHR209553	$(AT)_{11}$	TCGGTCTTTCTTCCTTCTAGTCC	GCTTGACACCCAAACATCATTA	178	197–210
JRHR208066	$(AT)_{11}$	GCTCCTTGATGGCTACATTAACA	AACTGAAACTTTGGCACCAATC	284	295–314
JRHR204109	$(AT)_{11}$	CAATTTGTGGCTGTATCACTCATC	ATGTACCACTAATCGCATTGCTC	166	183–193
JRHR209472	$(AG)_{11}$	CCCTTGATTTCATTGTGAGAGAG	GGAGATCTACTGTTCATTCCAT	202	220–235
JRHR207926	$(TC)_{11}$	CTACCATCACAGTCATCTCCACA	AGACTGATATCTTGTTGGGCTTG	174	182–195
JRHR209958	$(AG)_{11}$	GTTGTTGGGCTCACTAGCTAAAA	CAAGTGGGATATCTTGAAAGTCG	178	188–208
JRHR207617	$(CT)_{11}$	TGAAACTCCAAGTCCAAATTCC	TCAGCTAAACCGTACAAATACGC	181	197–203
JRHR218079	$(AT)_{12}$	AACTCTGGGGAGAAAGTAGATGC	ACCCTTTATGCTGAGATGGTACA	175	190–199
JRHR204498	$(GA)_{11}$	GTGTCCACATCCTCAAACTCCT	AATGGCAGAGTAAATCCCTCTCT	180	195–201
JRHR206934	$(CT)_{11}$	AAAGGAGCAATTACAACGATGG	CGCTCAAGAAGTAGGACAAAGAA	175	193–207
JRHR218067	$(TTTTAT)_{4}$	GCCACTGCACATGTAACGAC	CTAACACACACGTGCTTGGAGTA	194	208–214
JRHR207488	$(AT)_{11}$	ATTCGACCCCGACTCAATTATAC	CTTCTTGGCTCTTGACCTTGTAA	204	221–227
JRHR206788a	$(AT)_{11}$	GCAGCGAATACAGGCTACATAAA	TTAGGGCATTCACTGATCTCTTC	204	213–232
JRHR217806	$(TTA)_{8}$	TATGTGTCCTGGGTTGAGCTAAT	GCATAGCAAACCCCAAATCTT	158	226–242
JRHR220728	$(TA)_{12}$	CGGTAGAGTAGTACCGCTCAAAA	CCCCTTGAACATGTACCTAAGAA	195	205–213
JRHR217319	$(AG)_{12}$	TGGAAGAACTTGCATCTAGTGTG	AGGAGTAAAAGGAATGCTCA	161	176–178
JRHR221269a	$(GAA)_{7}$	TAGCACCACCAACTTCCTTTAGA	TACTCATATGCTTCCTCCCAGAA	181	138–155
JRHR220683	$(TA)_{12}$	CGTGGATCTGGGTAAAGTAGTGA	CCAGGCTGTCAAAGAAGCATA	224	236–248
JRHR217255	$(AT)_{12}$	GGATTAATGCAGAAGATCACCAG	TTACGCACTTCACGATTGTACG	263	279–285
JRHR217720	$(TTTTAT)_{4}$	GCCACTGCACATGTAACGAC	CTAACACACACGTGCTTGGAGTA	194	206–213
JRHR217215	$(TAGA)_{6}$	CAGGGAAAGGAAGAGAGAACAAT	TGAGACTTGGCTAGCTTGGATTA	217	225–233
JRHR220936	$(AT)_{12}$	AGCAGAGCACTTGAAGAAGCTAA	TCCCATTCTATTCTACGAACCAG	194	207–215
JRHR217708	$(AT)_{12}$	AACTCTGGGGAGAAAGTAGATGC	ACCCTTTATGCTGAGATGGTACA	175	190–196
JRHR220384	$(AT)_{12}$	CTACCAATCCTTGTCAAACAACTG	AAATCGAGGAACTTGTGTGTCTC	224	243–251
JRHR220911	$(AAT)_{8}$	GTCGACGATGTTTCATCTAATC	CAGTTCAATATCCAAACGTTGC	221	230–240
JRHR217056	$(TA)_{12}$	TGTCCCTCACCTAAAATCACAAC	AGAAGCTCGCTAGGAGAAAACAT	178	193–204
JRHR217382	$(TC)_{12}$	CCTCACAAAGTTCTCTGCAGTTC	CTCTTACAACAGCTTGCAAATCC	181	195–203
JRHR217034	$(GA)_{12}$	ATTCCAGTCCATCATCCACAAT	TTTGCTTGGAATAACCCTGCTA	178	193–211
JRHR220014	$(TA)_{12}$	CAACACTATAGAACTCCACAAATGC	GTGGCTCATGTTTGTATGCTACTT	197	207–221
JRHR219972	$(TTG)_{8}$	CCGAACCACGTAATCTCTGTTT	CAAGCAGAGTCCCTTTTGTCTTA	188	199–211
JRHR219680	$(TA)_{12}$	TCTAGAGGATCGCTAAGAAA	TCATTTGCACTACTAGCATGACTG	155	141–149
JRHR219969	$(AT)_{12}$	TGCCCATAAGTATAACCTGAGTGA	GTGGTAGCTAGCGTAGTGAGCAT	233	266–273
JRHR219645	$(TA)_{12}$	TACGCATCATCCTCACACACTAC	GGAGCTTGCCCCTATTATTACTC	319	169–205
JRHR222595	$(TG)_{12}$	TGGATGGAACTTTCGTGAAT	GGAAGGAGAACTTGGATTTTAGC	241	198–211
JRHR222528	$(GA)_{12}$	CTGCTAGAGGCTAGGTTGGTTTG	GTCTGTGGCATAATCATCACCAT	183	194–211
JRHR219542	$(AT)_{12}$	TGTAGTGTGACGTCTTCTGCATT	GACATGCACCAACTATGAAAAC	229	174–191
JRHR216846	$(TA)_{12}$	CATGACATTGATCTTCCTGCAT	GTGGCTCTTCGTCCAAATAAAAC	244	221–244
JRHR216491	$(AT)_{12}$	GCAAGCAACAAGATCATCAATC	TGTCCTTCCCAATATAGTTCAC	186	208–223
JRHR210292	$(CAAAAA)_{4}$	TCCTTGTTGCAATACTAGCAGGT	GGTTACACCCAATCCTAATCTGG	188	190–204
JRHR215123	$(TA)_{10}$	ACAAACCCAGGCATTAAACGA	AGCACCCTGTCCGTTAGATGAG	176	213–219

Supplementary File 1. (Continued).

JRHR215389	$(CTTT)_6$	CTGGAAGCGAAACAGAATTGACT	TGTGCTACCTTGCCTCAATAATC	165	209–224
JRHR215944	$(TA)_{12}$	CTCTCCATTGACAGCACCAC	GTTAGCCCATTTTACTCCCTTGA	230	220–236
JRHR213108	$(AT)_{12}$	TCATGATGCATACCTTCCTT	GTGTGTCGTGCATGTGTTAATCT	173	194–212
JRHR215853	$(AT)_{12}$	CTATCAAATGTTCCTGTGGCTGT	GAACTTGACCTTCATGACCCTTA	160	242–251
JRHR213035	$(TGAACT)_4$	ACCTTCACTCTGGTTAATGATGC	CAGTTCAAGTTCCAGTTCATGTC	276	165–176
JRHR215589	$(AAAT)_6$	GTAATTGACCCATCTGGAACTTG	AGCTCCCTAGTTGTGATGACCTA	197	176–192
JRHR211991	$(ACAG)_6$	CCGAGACCCACTTAACTTCTTTT	ATCTCAGACTCAGCAGACACACA	206	196–209
JRHR214258	$(TATG)_6$	TTATTCTACGGATCACATGACCAC	TCAAGACACAATTTGGTAGC	130	132–147
JRHR211337	$(AT)_{12}$	ATCCTTCTCAACCCAATCCAA	TGTCGAGTTATTTGCGACAT	222	235–253
JRHR214808	$(AT)_{12}$	CTTTCTCTCGGCACATTTCTTT	GCAGACCCTTTCATCTCTTGTAA	194	207–215
JRHR207958	$(TTTCTT)_4$	CTCAGTGTTCGACTTGGAGTTTT	CTGGTTGCTGTGTGTCATTAGAA	266	288–300
JRHR214546	$(AT)_{12}$	GGGGAATTAGTATCAATCCGAGAA	ATTCAGCAGTTGCATATCTCACG	173	177–198
JRHR214130	$(GA)_{12}$	AGCTGAAAATTGAGGTTCATGG	AAGGACGGTTGTGTGGATAGATT	241	246–270
JRHR214485	$(AG)_{12}$	GCTACACAATGAAGAATAGTACTGCTG	TAGAGCTAGCAAGATCCAGAACC	167	183–191
JRHR211505	$(TATG)_6$	TCGACTATTCCTCATGATCCGTA	GATGAAGTGTCAGGATTGTCTCC	201	213–221
JRHR207652	$(AGACAG)_4$	ATCTCGTACAGTCTTGCTCTTGC	TGGTGCTGTAGCCATCTATTTATC	175	177–200
JRHR211471	$(CT)_{12}$	GATGATTTCTTCGACCCTTTCA	TCGCAGAGAGAGAGAGAGAGAGA	175	189–197
JRHR213593	$(TC)_{12}$	GGTACGATCGATAGATGTGCATAA	CAGCTCAAGAAAGCACTTGACAT	170	187–212
JRHR207578	$(TA)_{12}$	CCCATCTCCTAGCTACAACCTTT	TATTCGCCTCTATATCTCGTTCG	182	181–210
JRHR209986	$(GA)_{12}$	ACTTCTAGAGGCGGTTGATGTG	ATTGAGGAAGAGGAAAGCTGAAC	174	192–194
JRHR206534	$(AAAG)_6$	AACTAACTCGATTGTGCGGATT	GTGGTGCTGCTACTCATGATATTT	313	322–334
JRHR207575	$(AATA)_6$	CTCAGGCTATCTATGTTGAAGCAAT	GCCCTATCTTGAAAAGGATGAA	181	190–197
JRHR206452	$(AT)_{12}$	CAGTTTTAGTGGGCATTTGCTA	GTGGCACTAGCAGGACTTATTTG	176	168–188
JRHR207413	$(GA)_{12}$	CACAATTTGGGGTTAAAACAGG	TTTATTTGCCTTATCCGTGAGC	179	192–210
JRHR209905	$(GA)_{12}$	AACCGAGTTAGTGAGATCTGTGC	AATTCCATGTAACTACTCCCTTCC	176	195–214
JRHR207304	$(CA)_{12}$	GCTCCATGATGATTGATTTTCC	CCCAAGGTAATGAAAGGAAGAGA	204	215–219
JRHR204468	$(AT)_{12}$	ACCTTTCAACTTTCCATGTGCT	GATTGGTGGTTGTTTCTTCCAA	176	186–196
JRHR207275	$(TTTTTA)_4$	TCGTGGGGTACTTAAAAGAGTCA	AATTATTCTCCAACACCCTCCTC	214	229–232
JRHR209600	$(AT)_{12}$	CCTTAGGGAGATCAATCGAACA	GTTCAAAACTCACATGCACTACG	163	176–186
JRHR217354	$(GATGA)_5$	CAGCCATTCGAGTTAAGACTTGT	TCGATTAAGAGCTCGTTTGGAT	209	212–228
JRHR220224	$(ATGAG)_5$	GGTGAGGTTTGGATAGTGAGTTG	GAAAGTGAGTTGGATTCAGAGTTG	236	240–256
JRHR217950	$(TA)_{13}$	GATCGAAGACACAACCCAGTAAG	GCCAAAGTTATGTTGGACACTTC	195	209–247
JRHR219701	$(CTCAT)_5$	AAACTGTCTGCTCTTGCTTCCTA	CAAGTTAGGGCTCGTTTGTTTT	277	292–295
JRHR217811	$(AT)_{13}$	GCGTGAGGACGATTCTATTCTAC	GCATCTCATGATGTTCCTAGCTT	166	174–183
JRHR207838	$(GTTGA)_5$	CGAGTTGAGTTGTTGGGTTAAAG	ACTCATCTTAGGTAGGTTCCAT	210	212–227
JRHR211683	$(CGACC)_5$	GTCATATTGTTGGACGGATAGGAT	GGTTTCAACGGGTTCGAC	199	211–227
JRHR217736	$(AT)_{13}$	ACAAGCTTTGCATGTACTCCACT	CTCCCCACCCATTTTCTTATATTC	156	167–189
JRHR217505	$(TA)_{13}$	GATCGAAGACACAACCCAGTAAG	GCCAAAGTTATGTTGGACACTTC	195	210–228
JRHR219908	$(AT)_{13}$	ATTAAATCAATGGACCCCTAGC	GCATCCGGAGTAGTTCTTTAGTG	167	176–185
JRHR216551	$(AT)_{13}$	CAATGAGGGACATGATCAGTTG	GACAAAAGCTCAAACACAAGCTC	189	190–201
JRHR212831	$(AT)_{13}$	GTCCAGTTAGGTCTTGAAAAGGAA	GGTATATGATTCGGGATGATGAG	165	178–200
JRHR216082	$(AG)_{13}$	CTCACAGAAGCAGAATGATTGAC	AACCGAGGTTCGAAGTACCTTT	157	167–173
JRHR212660	$(TA)_{13}$	GTGTTGGTTTTGTTCCTCCACTA	AGCCTTTGTAGGTGCTTTAGTCC	168	180–190
JRHR217342	$(AT)_{13}$	GGATCTGACTAGCTTAACCATGC	AGGAGGAACGTACTTTTGGAGAT	193	206–228

Supplementary File 1. (Continued).

JRHR212612	$(TA)_{13}$	TTACCGAACTGGACTCTCCATAA	GGTTCCGTACGTTGAATGAAAT	181	189–203
JRHR219598	$(AT)_{13}$	TTAATTTGGCCATGTGCTGA	AATTAATGCAGCGCAAGTACG	225	232–254
JRHR210714	$(AT)_{13}$	CGTCTATACGGACTTGGAATAA	CTGAGCTCTCAAGGCATTAACTC	158	165–169
JRHR220348	$(TC)_{13}$	TTCTATATGTCTCACTCACACACG	GAAAACTCCATGCCCTTTAGAA	344	355–400
JRHR219585	$(CT)_{13}$	AACTTAAAACCTAGCCCCTAGCC	TAGAGGAGGAGTCAATGAGGATG	165	180–198
JRHR213103	$(AT)_{13}$	GTGCCATAAATTGGATCTAGCTATC	ATTTCTACCATGCCGGCTCAGTT	148	165–183
JRHR215674	$(CT)_{13}$	TCTAGAGGATCTCAAACGGACAT	ATTCTCCAACAGACGTAGCAATC	158	171–179
JRHR212846	$(AG)_{13}$	GGCGACTTACAGTGGAGATCTAA	CGTAGAACTCACATGAACCCAAT	145	147–173
JRHR215253	$(AG)_{13}$	GAGGAAAGGAAATCATCACCAG	ACGTCGTCTCTCCGCAGTACTAT	178	181–196
JRHR214996	$(TA)_{13}$	GATTGCTTATACTCCTCCACCTCT	CAAGGAGGCTAAAGAGGACTGAT	189	202–222
JRHR211576	$(TC)_{13}$	TGTTAGCACGAAGAGACAAAAGG	GAAGCCAAGGAATTCTACGAGAT	175	186–192
JRHR210853	$(GA)_{13}$	GCAAAATCTAGTGGCATCATAGG	CCCTTAAATCTCTCTCTCTCAACA	167	178–204
JRHR215252	$(AG)_{13}$	CACCACTATGCACAAAATCCAA	CTTCCCTCGAGTGGCTCTTA	202	213–221
JRHR211468	$(AT)_{13}$	CCAAAGACATAAACGGTGATTG	CGTACCCATGTACGTAGTAGACAAA	238	246–259
JRHR215183	$(AT)_{13}$	TACGTAGTGTGCCTACAAAACCA	GAACTTCATGTAACAGATCGAGGA	132	148–162
JRHR211274a	$(TTC)_{7}$	TGCAATAATGCGATGAACGA	GGGAAGCAAAAGATCAACTACAC	128	173–185
JRHR213450	$(AT)_{13}$	ACTCAACAAGCATTGCCAAAC	GATAACATGCTCTGCCAAGTACC	191	128–145
JRHR212194	$(AG)_{13}$	ACGATCACGGAGTAAAGTAGCTG	CCAATAAAAGTTAACGCAGTAGGG	173	187–191
JRHR214550	$(AG)_{13}$	GAGGATCCCCTAAAATATAGCTTTC	CAGAAACAATTTCCTCTCTTCTCTC	134	149–155
JRHR211118	$(TC)_{13}$	CTTTTGCATTTACACCACTCTG	CAACAAAATCACCCCAAAAGTC	209	221–227
JRHR214370	$(AG)_{13}$	ATCTGAGAGCCTGAGAGGGAGAT	CCTTCCCCTCTATCATTTTCACT	135	136–153
JRHR210980	$(TA)_{13}$	CAAGCATTAACCCCTTGGAAT	AGTGTGTAAATGTCGTTCAGTCG	262	266–280
JRHR207406	$(GA)_{13}$	CCTACTTTGTGAGAGGATTCCAA	AAGCTACCCTTCTAGGAGATTGA	191	193–207
JRHR210057	$(TA)_{13}$	GAATACCAATCTCCATGTATTCGAC	ACAACCAATGATGCTAATGCAG	144	153–168
JRHR209732	$(GA)_{13}$	TGTTCAGATGGATCGATTAGGAG	CCTCTTTCTTTAGATGCTTGTGG	257	266–291
JRHR216816	$(CGT)_{9}$	CTACCTTGCCAGTCTTCCTGA	GGTTTCTGATGATTCTCTTCGTG	194	197–213
JRHR220864a	$(ATG)_{7}$	ATCATTGGCATATTGTCCTTCC	CACACACACACACACACAAAGTC	195	181–198
JRHR207851	$(TTA)_{9}$	ATACACCGGTTCAACGTGTCAG	ATTAGTACGCCGATCGATAATGC	177	189–198
JRHR209249	$(TA)_{13}$	AGTTGTTGGTCTGTACGTGGTCT	CCGTGCATATATAACATGAGATGG	180	193–220
JRHR217386	$(TA)_{14}$	CGAGGCTTTGGATGAGAAAATA	ACACACGTACACATGACACCATT	261	266–278
JRHR209244	$(TA)_{13}$	ATGGTCTCGCGCGTTTATATT	ACAAGGACACGACCAATTATCAC	135	141–173
JRHR206788b	$(CAG)_{9}$	CCAATCCCAAGTACATAGTCCAA	GGGTTAGTATCATGCTGCTCCTT	194	195–208
JRHR217311	$(TA)_{14}$	AGCCTAAGAGCAATGAAGAGAGA	GAGCAAGGTTGGGATAGAAAGAG	159	166–186
JRHR216951	$(AG)_{14}$	ACTTCCAGCGACTTGATTTGTT	ACACTGACACTTCTTCACCTGCT	175	188–195
JRHR210599	$(AG)_{14}$	GACGTTTACCTTCTTTCTTGACC	CAGTCTGATTCGCTCCAT	165	171–183
JRHR220269	$(AT)_{14}$	ATACACCCATGAACCAACAACA	AAGCGGTTGTCTTCACCTATCTT	183	178–180
JRHR216284	$(TC)_{14}$	CATTTTCATCAAAGGTCACCAG	GTGACACGAGAAAAGACAGATTG	174	186–195
JRHR216172	$(AT)_{14}$	TACTATTCCCCACAAGTCCAGAA	GCGAGTCTTGCTATATGCAGTTT	203	210–230
JRHR210261	$(AT)_{14}$	GGTGAACTTCCATCGGTTCTT	TTTCCTTCTCCTTTTACCTACCG	231	243–259
JRHR212582	$(AG)_{14}$	TGCTCTATCTGTTCTGTGGACAA	TGTCCATGCCCTTCTATATTCTCT	172	181–193
JRHR219728	$(AT)_{14}$	TTCTTGAATAACACTCTCTCCATCC	AAGTGCAATGAGTTCTGTCTATGG	252	267–283
JRHR213218	$(TC)_{14}$	AATCTGTCTGTAACGTGGTTGGT	AACAGCCTTAGGAACTCGAAGAA	165	177–199
JRHR216693	$(GA)_{14}$	CTATCGGATTTCACATTCCTACC	GTCACTATTCGTTTGGAGCACAT	175	192–207
JRHR215778	$(AG)_{14}$	CAACTGTGTGTGTGTGTGAGAGA	AGTCATCGACATGCAACTCCTAT	153	169–176

Supplementary File 1. (Continued).

JRHR216541	$(CT)_{14}$	TATGATAGAGACTTGGCGAGAGG	GGGTGATTATCGAACATGAGGTA	192	201–213
JRHR210629	$(AT)_{14}$	GTATTTCAAGTTGGGCAGATCAC	GGACCATATATACCTCCAAT	239	238–258
JRHR215721	$(AT)_{14}$	ACTACAATCACTGGGCTGAAAGA	TTGAGAACGGAGAACTCAGAAA	196	208–220
JRHR215008	$(CT)_{14}$	GGGTGGTACTCAGAATTTTCCTT	AGCTCCCAAAAGTATTCAATGG	284	293–334
JRHR214002	$(TC)_{14}$	AGGAACTGGAACAGGTAATGGTT	TCATATTTCCAAGTGGCAACG	186	201–205
JRHR214823	$(CT)_{14}$	CAGGTAGACTTGTAGGAGTTCTTGTTT	AAGAGATAGCAACCTTCTTCTTGC	226	235–241
JRHR213941	$(AG)_{14}$	AATCACATACAGCGAGAAGTGGT	TGTCACTTGAACCCTGTCAAAAC	246	263–275
JRHR212338	$(AT)_{14}$	TTCAGAAACAACTACGGATGGAG	CCAAGAAAACGCACATCAACAT	191	201–214
JRHR211565	$(AT)_{14}$	TATTACGGGCTAGAGATCAGCAA	CGAACCAATTATTAGCTAGTCACG	169	177–215
JRHR213682	$(CT)_{14}$	CGAATCTTTTCAGCTTCTACACC	ACCCCTAACATACTCTCTAACCA	183	197–201
JRHR207188	$(CT)_{14}$	TCAAACTGGAGGGGTGTTAAGTA	GCGAGAGAAGTGACAACTTGAG	251	242–304
JRHR212067	$(GA)_{14}$	AGGGACTACCTCTTGAAAACTGG	CTCAGTGCTAAAATCAATCTGTCTC	194	195–219
JRHR211481	$(CT)_{14}$	ATGATATCTAGTGCCACCGTCTG	GCAAGGCATCTGAGACACG	159	172–208
JRHR213537	$(TC)_{14}$	GTCGAGTTCTTATTTCCCCATT	CATCCTGTGTACTTGGGCTATTC	179	190–200
JRHR211878	$(CT)_{14}$	CGAATACTGAAACTGGCTGTGTA	GATACCAGTTCACCCTCGTCTTA	191	196–220
JRHR211116	$(CT)_{14}$	AGAGGATCTAGTGGATTGGTTCG	GAGATAGACCGATTGAAGGTCAG	193	197–209
JRHR207496	$(GA)_{14}$	AGAGGAGAAGTAGGGAGCTGAAA	CACACTTTCTCACTGACCAAACA	177	167–195
JRHR209467	$(AT)_{14}$	CATTCGTCATCAATGCAGAGAC	GGTTCCATGAATGCTCTAGTACG	242	256–272
JRHR215049	$(AT)_{14}$	CTGGTACTCATGAATCTGGATCG	TCCTGATGAATTTGGCCATT	188	191–203
JRHR218066	$(TA)_{15}$	GAACAAATCATGTGGAGCGTTA	CTGGAGATGTACTCATGGTATGC	209	219–227
JRHR218062	$(TA)_{15}$	GTATAATCCCCTGTCCATCCACT	AAACGGTATATTTCGGCTGTACC	177	205–223
JRHR220716	$(ATA)_{10}$	TGGACCGAATACCCCTATAGATT	GGGTCGAAAATACACATTAGACG	145	163–181
JRHR219900	$(TA)_{15}$	TGTCCAAGTGTAGATTCCTACGG	CAAAATGAAGTACTGCCCCTTCT	265	271–287
JRHR220566	$(AG)_{15}$	GAGGAGAAATGTCAAGGAAGACC	GAGATCATCACAGGTTCCACATC	178	192–200
JRHR220247	$(CT)_{15}$	GTAGTTGGTTTGATTGCTGCTGT	AACATACATGCAAGATCGTC	272	222–242
JRHR220219	$(TA)_{15}$	GTTCATGAGAGTCATCTTTACCC	CAAGCTGTACTTCTATGCTGACAAA	174	178–184
JRHR217655	$(TA)_{15}$	GTATAATCCCCTGTCCATCCACT	AAACGGTATATTTCGGCTGTACC	177	186–206
JRHR220176	$(TA)_{15}$	TGGTTACCTATCTTGATCATCTTCG	CGGATACCTCTGATTTTCGACTA	224	223–249
JRHR217486	$(AT)_{15}$	AATCTGATGTCTGCAATCAAGC	GGTGGAGTGCTAAGTTCACAAAA	179	178–208
JRHR216616	$(AT)_{15}$	GGACTCACCGGAGTAACTTTAGG	TTAGCAATTTTAGCTGGGGAGA	199	214–219
JRHR220903	$(GA)_{15}$	TACCTAAAACAGGAGGGGAAAA	TCTCCTTTATCTCTGTCCGTCTG	171	183–201
JRHR217153	$(AG)_{15}$	TAGATCAGAGATCACCCCAGAGA	CTCTGCATGTCGGTTTCTTTTAG	177	192–198
JRHR215854	$(AT)_{15}$	GAAATGCCAACCAAAGAATG	CCCACGTACTCTTTGATCTTGTT	259	264–292
JRHR212363	$(CT)_{15}$	GTTACACTGTCAGGGCCTCTGTT	GCTACACTATCATAAGCCACAACG	204	217–253
JRHR216291	$(AT)_{15}$	CGTCCTGTGATAGGCTCTGATAC	TGAACCCCATCATGCTATGTTA	221	224–238
JRHR210387	$(TG)_{15}$	TATTCTTATTGCCTGGTGCTCTG	GGGGTTCCATAATTCCATTCTT	182	198–211
JRHR215635	$(TC)_{15}$	TGGCTTTGATATTAGAGGTGAGAG	CCCCTGAATTGTCTTGAATATG	194	194–216
JRHR212326	$(CT)_{15}$	ACCTACATGACTGGCCACATAAC	CCTCCCAAAACTGTAGCTGTAAA	174	195–201
JRHR216261	$(AT)_{15}$	GCTAGCTAAGTCAACCAAAA	AGCGCTGGAATCATTTTCAGTA	136	141–152
JRHR210265	$(CT)_{15}$	AGGGATCATCAGATTGGTGACAT	ACGTTTGGAGAAGAAGAAGGAAG	174	172–193
JRHR215590	$(AT)_{15}$	TATGTGTACGTAGCGTGGAATTG	CCACATGGTGCCACTTAGTTAAT	285	290–304
JRHR212042	$(TA)_{15}$	CTCTTCAAACATGATCTGCTCCA	CTTCTCTTTTAACCCAGCTCTCC	175	180–194
JRHR213115	$(TA)_{15}$	CGAGCAACAAGAGTACTACAGAAA	GACTGTGCATGTGATGATGAGTA	215	215–235
JRHR211847	$(CT)_{15}$	CCTAGTTTGCAGTGGATTATGCT	ATCTGTTCTCCATACTCGGCATT	216	226–240

Supplementary File 1. (Continued).

JRHR210596	$(GA)_{15}$	CGACCGAATTCCTTATAAACATGG	TATGGACGGTCAGGATGTAATCT	161	175–222
JRHR210554	$(AAAAAC)_{5}$	CAAAATGCCATGTCAGCAAT	CTGAAGTAGAGGAAGGCAATGAA	205	200–218
JRHR211692	$(TC)_{15}$	TTACAAAGCTTGGAGTGAGGAAC	CACTCAAGTTGGCCTTCATCTAT	160	171–183
JRHR211605	$(AT)_{15}$	TTGGGTACATTATCCTGCCACTA	TGACTGAGATCTAACGCAAAACTC	166	174–188
JRHR214440	$(AT)_{15}$	CTCATCTGTCTTATGTGCTAGT	GCATGATCCCCAACTGTTAAT	180	192–200
JRHR215094	$(TA)_{15}$	GACCACTTATTTGAACCGAGGAC	TTAGGGTCGGTCCCATATAGAAA	168	176–190
JRHR213620	$(AG)_{15}$	GTGTCTCGGGTAGAGAGAAACAA	TCCATCTCCATCATTCTATGTCC	202	211–230
JRHR207525	$(AAAT)_{5}$	AAATGAAACATGCGGGAAAG	GGACCCAAAATTGGTATAGTTGG	171	180–194
JRHR214378	$(CAAAAC)_{5}$	GTACTCGGCAATGGAAGTAAGAA	CCTGAAGGTAGGGTGTATATTGG	183	178–196
JRHR209868	$(TA)_{15}$	ACCTCTATCTGCATGTGTTCCTG	GAGATCGTGTTTAGCAATCTTGG	177	237–257
JRHR214968	$(AG)_{15}$	ATAAGAAGGGATGATGAGCAGGA	GGAAGGTGTTGATAACGAAGAAG	196	204–223
JRHR213554	$(TA)_{15}$	GTCCAGTTTTCATGACTTGATCC	GGAATAGATCAGAGATTGGTAGGC	221	218–242
JRHR214886	$(AT)_{15}$	ATTTTCAACCAGGAAAGAGAGG	CCAAGAGGCTTCACAAGAAAA	168	182–188
JRHR211529	$(AT)_{15}$	CTTAGTGATTCTTTGCCATCGAC	CCATCCAATATACACCAAAACC	176	180–197
JRHR213483	$(AT)_{15}$	TACGTAGTGTGCCTACAAAACCA	GAACTTCATGTAACAGATCGAGGA	136	149–164
JRHR206564	$(AT)_{15}$	AACGTAATGAGACCAAGCAAGAC	CAGGCATACGAAACACAACATT	202	179–189
JRHR217880	$(AT)_{16}$	TGTACAGAGCACGCATTACAATC	CTTTAAGGGCCCCGATGTT	128	142–166
JRHR217714	$(TC)_{16}$	ACTGCAAGGATCTGGTCTATGG	AGTACAGCGAACAAAGATTGAGG	128	180–203
JRHR216317	$(AG)_{16}$	CTTCGCATCATCATAGCTGTTC	AAGAAAGGTACGGTTCGTATAAGG	189	186–198
JRHR206446	$(TC)_{15}$	GAGCAGTGATGCTTCCAGTATTC	GACGCTGTTCTGTACTGTTCTTTT	170	161–165
JRHR221037	$(TA)_{16}$	TCTTCACTTTATCCGTACGATCC	CAAGAAGAACCCGGACAAGTAG	147	200–222
JRHR217573	$(AT)_{16}$	TGTACAGAGCACGCATTACAATC	TCTTTAACCAAGAGGAGGAAACC	170	197–209
JRHR209430	$(AG)_{15}$	TGTGCCTCCTTCATCTAACTTCT	TGCAATATACGTAGGCTTCATCTG	148	122–143
JRHR220543	$(AT)_{16}$	ACACAGTACACCACTTTCCCATC	AACTGATCTTGTATCGGTCATGC	199	206–246
JRHR217266	$(AT)_{25}$	CTGCCAAACATATATAGAAGGTCGT	ATCTGTGTGTGTGTGTGTGTGTG	200	168–177
JRHR213204	$(AT)_{16}$	GGTTAGACCAAAGTACACGGATG	TGTTATATCTCCCAACCTAATACCG	175	173–179
JRHR220451	$(AG)_{16}$	GGAGTTGGACAGGAAGGTTTTAT	TTCAAAGTACAAGGTAGCCGATG	228	227–231
JRHR217092	$(AT)_{16}$	TCAGTGTGAGTGATTTTGAGCAC	CACAAAATGATAGGGAGACATGC	224	241–247
JRHR209295	$(CT)_{15}$	GAATCGACCAAACTCCCAAAT	TGTGGCAGTGCTAATCCTCAT	162	182–186
JRHR220410	$(TA)_{16}$	GTTCTCCTTTTCTTTTCGGTGTC	GGATATGAATGCTCGACTACTGC	211	211–229
JRHR215859	$(GA)_{16}$	ATCTCCTCATGATCCGAATGTC	TGGTCACTGAAAAGCACATGA	324	333–343
JRHR217721	$(AT)_{16}$	TCTAGAGGATCCCCAATGCTAAC	TTGCTAGTTGGAGAGTGAAAAGTG	203	373–375
JRHR222477	$(TA)_{16}$	TTCAGAAGCTACGTACTGGAAAGA	CATGATCCCGCGTATAGCAT	112	184–218
JRHR215620	$(CT)_{16}$	TTGTTGATTGAGAGGGGTACCTA	TCCTTCAGCATCAGATTTTCCT	263	186–207
JRHR215461	$(AT)_{16}$	CCGAGAGAGAATACAAAATCAAGG	GCGTTTGGAGAAAGGAATTTAG	176	280–307
JRHR214591	$(TA)_{16}$	TGGTCATGGAATATTGAACC	GAATAGCGAGCAAGAGATATGGA	306	195–213
JRHR204398	$(AG)_{16}$	GATGCATGGGAGATATGGTTTT	ACTTTTGAAGAAGCACACGAACC	145	184–211
JRHR216033	$(AAG)_{11}$	CTCCACCATAGAAGAAAGAAGGA	AGAGCAGAGGGCTAAGCTATACA	200	173–188
JRHR215365	$(AT)_{16}$	CTGATCATGTTGCATGTTTGGTC	GGAGCATATATACCGTGAAACA	274	196–220
JRHR214369	$(AT)_{16}$	TAGGCGTCCAGCTTATACTTCAG	GTTGGCTTGTTTGAGGGAAGAT	191	284–290
JRHR207191	$(CT)_{16}$	CTGTGTTCCTCTTCCGTTACCTA	ATGTAACCCAGAAGCCTAAAAGC	184	178–197
JRHR211760	$(AT)_{16}$	AAAGGTACGGCCTCATACATACA	GTCCTTAACTCCAGGCTAAAACC	190	183–212
JRHR214262	$(TC)_{16}$	CTGTAAGCGTTTCAATCATCTGG	CCTTCGGTCTCCTTCAGTTCTAT	265	153–169
JRHR206773	$(AT)_{16}$	GAGAATTGATTGTTGGGTCTACG	AGCACCGCTCATTTCCATATC	175	185–199

Supplementary File 1. (Continued).

JRHR206716	$(AG)_{16}$	GGTATTGAAACTCCTCCCTGTTT	CAAGAGCCCAGAATAGAGAACAT	175	177–196
JRHR215030	$(AT)_{16}$	CGATCGAAAGATCAGGAAAGAA	CTGAAGCTCCTTTTCAGGAGATAA	210	203–213
JRHR217332	$(CA)_{17}$	TAGCAAAAGTGCCTTTCGATCT	ATAAGAAGTCGTGGTGAGGTGAG	136	164–184
JRHR215529	$(GA)_{17}$	CACCTCTGTATCCAAACAGCCTA	ACCTTACGAGGATCAGTATTGGA	172	153–172
JRHR210933	$(TA)_{17}$	CTGTCAAGATTGATTCAGGTGTC	CTTCTGCAAGTCATTAGGATGGT	203	170–187
JRHR214123	$(CT)_{17}$	CAACAAGGTCTGGGTACGAGTTA	GAACAACTTAGAGGCAAAGGTCA	166	230–238
JRHR220292	$(TA)_{17}$	TAATGTGGAGATGATGACGACTG	CTCTCTAATGAATCGTCCCTTGA	143	202–216
JRHR210650	$(CA)_{17}$	CAGGAAATATGGACAACCAGATG	ATTGGTTTCCTTGGAGTGAAGA	199	187–197
JRHR213149	$(CT)_{17}$	GTCACTCGACCACTCTCATGTC	GTTTCTCTCTAGGAAAGTGATGGAA	179	156–181
JRHR212973	$(TA)_{17}$	CTACCCTGCCCTATGCAGTC	TTTCTAACTTACCTCGCACCTGA	148	246–256
JRHR214339	$(GA)_{17}$	GAGGTGAGCTTTAGTGGAGAGAA	GTAGAAACTCCCCAACGTTATCC	135	188–199
JRHR216872	$(AT)_{17}$	GCCTTGAGCAGAGGAACTAGC	CAAAACTAATGGACGGTGTTTG	178	176–207
JRHR220704	$(TC)_{18}$	CTCAATACTCTTCCTCCCCTTTC	TGCGTACACAAAAGAACAAGTG	228	155–167
JRHR213174	$(CT)_{18}$	GATCCTAGTGCCAATTCATACCA	GTGCATAGCTGGAAGACAAACTC	175	193–209
JRHR214289	$(TA)_{18}$	TGACATCTCCTCCTCATCATTCT	CTGTCAATCCTGTTGTGTAGGC	203	185–187
JRHR217463	$(CCCTAA)_{6}$	CCTGTGAACCACTAGGTCTTCTG	TTTGAGGTTAGGGTTAGGGTTTC	172	152–167
JRHR215639	$(AT)_{18}$	ACTGGGTTTATCTACTGGCCTCT	TCATTTGCATGCCTACTTTCAG	161	174–193
JRHR211069	$(AT)_{18}$	CCCACAAATTAAAAGGTTGCTC	TCGAAACATTTAGAGACTCAGCAG	345	172–176
JRHR219977	$(GA)_{18}$	GGGATCACTCTATCTTCATCCAA	AGCTCTTGAAATCCTCTCATTCC	156	168–194
JRHR215364	$(TC)_{18}$	GAACTATTGCTGAAAGTCCGTTTCT	GTGTTTGCAGTTCCAGAGCTATT	174	173–199
JRHR216880	$(TA)_{18}$	TTTAAGGTCGGACATCTCGAA	AGCTCCCACTAACATAAGCTCAA	175	173–186
JRHR213696	$(TC)_{18}$	TATTCTTCTTTCACCCTCCATCC	TATGCTGGCCTATTATGATCCAC	170	185–213
JRHR216273	$(AG)_{18}$	TGAGTGTGTGTGTGTGTGTGTTT	TTGCCTCACCATATCTCCTCATA	164	178–198
JRHR214458	$(TA)_{18}$	TTTCCTTAATAGCAGGTGTGTC	TATGTCCACCAAATGTATCCAC	200	208–222
JRHR207766	$(CT)_{18}$	ACCGCTATGCTCTTGGTAAGTC	GGTGACTAGGATAAGGTCGAAGG	156	159–192
JRHR209936	$(AT)_{18}$	CATCCTATCTGATTTCATGTCTCG	ACATTGCCCAACCGCTAGT	175	149–170
JRHR209418	$(CT)_{18}$	TGTGACCAGATAAGGACTAGACAA	GGATGTTTGGGTGGGAAAA	337	182–204
JRHR204300	$(TC)_{18}$	GAAATGAAGGTGGGATAATGCTC	CCATGCATAGAACAAGGTAAAGC	144	189–201
JRHR218007	$(AT)_{19}$	TTATAATTAACCCTCCCCACTCC	CCATGAATTCTCTGATCGAGCTA	171	178–193
JRHR217272	$(AT)_{19}$	AAAGAAACATGGAGCTAGGGTCT	CTACCTCTACGGCTCTGGTGAAT	228	182–205
JRHR213185	$(AT)_{19}$	GTATTTGCGTTGGCCATACATCT	CGTGTCACAAGGTAGAAAATCAG	151	226–252
JRHR207107	$(AT)_{18}$	CGGCTACACACACACATAGAGAG	CATTTATTCTTCAGCAGCCAGAG	181	195–207
JRHR217121	$(GA)_{19}$	GTTTTAACGAATGACTTGGAGGAG	AGAGGTTCTGTGATTGTGGAAAC	181	203–237
JRHR215575	$(AT)_{19}$	AGTATTCGTACCGCATAAACCAC	ATAAGCATCCATTTGGGGTAGA	228	115–150
JRHR221078	$(TC)_{19}$	CAAGAGGTACGGAGACATATTGC	TTCATCGTGTATCTAGGGAAAGC	228	228–249
JRHR217037	$(AT)_{19}$	ACGACAACACTATCTTTGCTTCG	GTTTGTAAAGACAGATGGGACAAG	189	122–144
JRHR206963	$(GA)_{18}$	GGTGCATCTAATCTTATCGTCCA	CTGCAATCTGTCCTCTGAATCTA	220	151–179
JRHR216759	$(AT)_{19}$	CTGCATCAACTACGTTTCTGGAC	ATCAGTGCCAAACTCTAATCTGC	125	180–215
JRHR211735	$(AT)_{19}$	TTTATTCCTTCAACTCCGCATC	CTAGATCAAGAAGTTGGCTTATGG	185	175–193
JRHR213132	$(ATT)_{13}$	CACCTTAGTTCTTTCCAGTTGCT	AGAGGTATACGGGTTTGAAGAGG	187	226–238
JRHR210580	$(GA)_{20}$	ACTGGATGGCAATCAACAAAGT	CTTTAGGAGGCAGTGATGAAGAA	248	182–192
JRHR214401	$(AT)_{19}$	TAGCTATTTGCTCATGCTCACAG	CAAATGGGGCAAGTAGATTCAT	171	180–199
JRHR211396	$(AT)_{19}$	CAATTAATCTGGATCGATGGTG	CTAGCTGTTAGCCTGCTTGC	175	228–242
JRHR220403	$(TA)_{20}$	GACGCAAAGAGGAAAAGCTTAGT	TTAATCGACCGTCAGTTGTACCT	310	192–210

Supplementary File 1. (Continued).

JRHR215290	$(AT)_{20}$	CCTAGAGCTAAACCATTGATTCC	GGAGTGATATATGATGCTTG	178	195–228
JRHR217131	$(GA)_{20}$	CCATTGGGATATGAGAGAGAGG	TTGACGTTTTAGTGCCATCAAC	186	177–195
JRHR213380	$(TA)_{19}$	CCAAAGGCACGTATCCTAATCTT	CAACATCCAAACACACCCTAAA	257	282–292
JRHR209217	$(GA)_{19}$	GTCTGCCCATCAATAACACAGAT	CCAATACATGGAAAAGAGTGCTG	175	218–233
JRHR207981	$(AT)_{19}$	CAACGCATACGTACGACAAAAT	CAAATAATTGCTCCACGGGTAT	276	272–291
JRHR216969	$(ATG)_{13}$	GTGATATGTTGGCAATAGAACCTG	CATCTCATCTCATCATGGACTT	210	192–207
JRHR222329	$(AT)_{21}$	TCAGCATGATCAGTAGCTAGGTC	CATGAGCTCCCCTCAGATAGATT	188	164–193
JRHR214612	$(GA)_{21}$	CATGTCAGTACAAAAGTGGTTGC	GCTCCTCTCGAGTGATCTGAAT	191	155–187
JRHR211717	$(TA)_{20}$	CTTTTGGTGGGCTTTGTAAACT	CTTTATATCGATCTCGGGCTTC	169	216–242
JRHR210729	$(TA)_{21}$	AAGAAGCCAGATGAAAGGTCTCT	TTAAGGGGTTTAGGTGTTTGGA	157	230–248
JRHR215307	$(AT)_{21}$	CCTAAAATATTGAAGCCCTAGC	ACCGGCCTATGAGCTGTG	109	182–199
JRHR211835	$(TA)_{21}$	CGACTGGATCGTAAGTCATGTTA	AAGAATTTGGGGCAGAGTGTAT	182	120–129
JRHR211622	$(CT)_{21}$	AAATCTTCCTCTCCTCTGCTTGT	ACAATATTCCGTCTTTGCCTTG	184	210–239
JRHR214189	$(TA)_{22}$	CCGAGGTTGTTCCCTAGTATATG	ACACACACACACACACACACAAT	174	165–167
JRHR207058	$(AT)_{25}$	CCAACAAGTATATATGACCGGAGA	CGACCTAGCAAAACACAGAAATG	189	230–260
JRHR209461	$(GA)_{26}$	ACGCAAGAGAGAGATGGAGAAG	GCACTCTCACGTCAAAACCATAG	197	164–189
JRHR206565	$(GA)_{25}$	AACCCTTGCTAGAAACCGTACAT	AATCTCTTTCTGGCCTCACCTT	243	186–204
JRHR206412	$(TA)_{25}$	TGGATCTGCAGTACTTAGCTTTTG	CTGTCCTTACTCACACACACACA	189	175–184
JRHR217355	$(AT)_{27}$	AGACCTCAAAAGACGAAAACCA	ATGCGGGAAGCTTAAACACTC	239	173–200
JRHR213703	$(TAT)_{16}$	GTTGGGAAGTTGCATTATCTCAC	CAGACTCTATCCCGACATATCCA	177	203–230
JRHR216068	$(TA)_{27}$	CTCTTCGTTCTCGCAACTATACG	CACACACTCACTCTCACACACAA	179	164–180
JRHR213012	$(GA)_{28}$	TCCTTAACTCAAATCCCTTCCAC	GGGAGCTAACAAATTCCACTATG	159	177–192
JRHR215867	$(ATT)_{18}$	GTGGGGTATAGAAAGGTGGACTT	GTATGTATGCAGGATGCAGGTTC	199	207–211
JRHR222225	$(AG)_{43}$	GTGTGAGTGTGTGTGTGTTTGTG	CCATATATTCCCTGTCATCGGTA	264	262–276
JRHR216505	$(AAT)_{21}$	CTAGTGGCTATTGCAAAATCAGG	GAATATTGTAACGACCCGATCC	204	185–223
JRHR217144	$(TA)_{32}$	CAGTTACGCACTCTTCTTGGAAT	TCACTCACTCTCTCTCACTCTCTCTC	207	240–246
JRHR215929	$(GA)_{41}$	CTTGCTAACTTCAAACTCCACCA	CCGCTTCTATCCCTACATTCTTC	175	232–263

Supplementary File 2. SSR loci, number of alleles (*Na*), effective number of alleles (*Ne*), expected (*He*) heterozygosity, observed (*Ho*) heterozygosity, and polymorphism information content (*PIC*) of 551 polymorphic SSR loci in the characterization of 16 walnut cultivars.

SSR locus	*Na*	*Ne*	*He*	*Ho*	*PIC*
JRHR225164	5	2.32	0.57	0.25	0.54
JRHR221481	4	2.89	0.65	0.50	0.59
JRHR221792	5	2.49	0.60	0.81	0.56
JRHR225029	4	2.69	0.63	0.40	0.58
JRHR219358	5	1.83	0.45	0.43	0.42
JRHR218380a	7	3.82	0.74	0.69	0.70
JRHR218308	4	2.84	0.65	0.81	0.59
JRHR218863	5	2.64	0.62	0.81	0.56
JRHR225564	8	5.20	0.81	0.69	0.78
JRHR222947	4	1.68	0.41	0.17	0.37
JRHR221375	9	5.56	0.82	0.80	0.80
JRHR228489	3	2.47	0.60	0.94	0.52
JRHR225189	13	9.93	0.90	0.92	0.89
JRHR218605	5	3.01	0.67	0.44	0.61
JRHR225644	8	4.46	0.78	0.80	0.75
JRHR218990	3	2.42	0.59	0.00	0.51
JRHR221529	5	2.30	0.57	0.42	0.53
JRHR218737	3	2.02	0.50	0.67	0.41
JRHR218478	3	2.38	0.58	0.87	0.51
JRHR228481	6	3.10	0.68	0.88	0.62
JRHR221458	7	4.30	0.77	0.63	0.74
JRHR222791	4	2.34	0.57	0.44	0.52
JRHR228467	2	1.97	0.49	0.63	0.37
JRHR218590	4	2.34	0.57	0.81	0.49
JRHR225423	5	2.12	0.53	0.44	0.46
JRHR218332	4	2.40	0.58	1.00	0.50
JRHR225191	6	3.66	0.73	0.75	0.68
JRHR218689	5	2.52	0.60	0.38	0.53
JRHR218500	11	6.65	0.85	0.50	0.83
JRHR222679	4	2.89	0.65	0.44	0.59
JRHR218647	9	4.00	0.75	0.25	0.73
JRHR218465	4	1.86	0.46	0.25	0.42
JRHR225546	4	1.53	0.34	0.20	0.32
JRHR219017	5	1.30	0.23	0.25	0.22
JRHR228443	6	4.03	0.75	0.56	0.71
JRHR225388	6	2.78	0.64	0.31	0.58
JRHR218910a	6	1.59	0.37	0.36	0.36
JRHR221447	7	4.46	0.78	0.60	0.74
JRHR222846	4	3.39	0.71	0.69	0.65
JRHR225377	3	1.84	0.46	0.64	0.38

Supplementary File 1. (Continued).

JRHR218769	6	3.53	0.72	0.69	0.68
JRHR225484	4	1.86	0.46	0.63	0.40
JRHR219223	5	1.72	0.42	0.31	0.40
JRHR218727	7	2.28	0.56	0.64	0.54
JRHR219052	3	1.93	0.48	0.21	0.43
JRHR219048	3	2.03	0.51	0.75	0.43
JRHR221565a	6	2.93	0.66	0.56	0.62
JRHR218922	3	1.55	0.35	0.31	0.31
JRHR218276	10	2.44	0.59	0.56	0.57
JRHR222705	4	3.14	0.68	0.81	0.62
JRHR224961	2	2.00	0.50	0.25	0.38
JRHR225615	3	1.89	0.47	0.38	0.39
JRHR224896	6	2.25	0.55	0.50	0.51
JRHR218204	3	2.67	0.63	0.29	0.55
JRHR225405	5	2.60	0.62	0.60	0.57
JRHR219179	9	5.68	0.82	0.71	0.80
JRHR221879	5	1.91	0.48	0.4	0.44
JRHR225292	5	3.13	0.68	0.62	0.62
JRHR221724	9	6.04	0.83	0.54	0.81
JRHR225155	4	2.24	0.55	0.46	0.50
JRHR218764	4	1.93	0.48	0.40	0.42
JRHR221368	3	2.18	0.54	0.17	0.46
JRHR228435	3	1.69	0.41	0.53	0.35
JRHR218699	8	3.97	0.75	0.56	0.72
JRHR218602	6	3.26	0.69	0.63	0.65
JRHR228317	3	2.02	0.50	0.07	0.43
JRHR222130	8	2.57	0.61	0.56	0.59
JRHR221727	4	2.93	0.66	0.86	0.59
JRHR218302	4	2.94	0.66	0.60	0.59
JRHR222788	5	2.22	0.55	0.53	0.51
JRHR222084	9	6.02	0.83	0.94	0.81
JRHR221373	5	2.45	0.59	0.56	0.55
JRHR228525	4	1.48	0.32	0.31	0.30
JRHR221370	6	5.30	0.81	0.57	0.78
JRHR222666	7	3.68	0.73	0.69	0.69
JRHR225264	3	2.30	0.56	0.63	0.50
JRHR219141	11	5.95	0.83	0.81	0.81
JRHR225161	7	4.34	0.77	0.81	0.74
JRHR221565b	5	3.63	0.72	0.25	0.68
JRHR225533	5	2.89	0.65	0.63	0.59
JRHR225096	5	3.03	0.67	0.50	0.61
JRHR218910b	7	5.28	0.81	0.50	0.78
JRHR224863	4	1.64	0.39	0.33	0.36

Supplementary File 1. (Continued).

JRHR218879	4	1.71	0.42	0.31	0.39
JRHR225426	4	2.96	0.66	0.56	0.60
JRHR219400	6	2.43	0.59	0.56	0.54
JRHR218756	4	2.12	0.53	0.38	0.49
JRHR221425	6	2.98	0.66	0.38	0.61
JRHR225387	7	2.78	0.64	0.50	0.61
JRHR222096	4	2.50	0.60	0.62	0.52
JRHR221380	6	3.22	0.69	0.81	0.64
JRHR222963	5	2.72	0.63	0.38	0.58
JRHR222887	4	2.91	0.66	0.58	0.60
JRHR225490	4	3.10	0.68	0.81	0.61
JRHR228555	10	4.49	0.78	0.63	0.76
JRHR225421	3	1.34	0.26	0.14	0.24
JRHR222659	3	2.52	0.60	0.31	0.53
JRHR228372	3	1.29	0.23	0.00	0.21
JRHR225602	3	2.38	0.58	0.63	0.51
JRHR228357	2	1.75	0.43	0.50	0.34
JRHR225530	4	2.93	0.66	0.44	0.61
JRHR225281	2	1.36	0.26	0.31	0.23
JRHR225235	5	2.10	0.52	0.69	0.48
JRHR219256	2	1.44	0.30	0.13	0.26
JRHR225225	4	2.80	0.64	0.31	0.58
JRHR224834	6	3.37	0.70	0.88	0.66
JRHR222064	3	2.47	0.60	0.50	0.52
JRHR225146	9	4.23	0.76	1.00	0.73
JRHR225024	4	1.35	0.26	0.21	0.25
JRHR219444	2	2.00	0.50	0.60	0.38
JRHR218782	2	1.36	0.26	0.19	0.23
JRHR219356	3	1.59	0.37	0.47	0.32
JRHR221483	2	1.49	0.33	0.25	0.28
JRHR218506	3	2.82	0.65	0.50	0.57
JRHR221397	3	1.38	0.28	0.25	0.26
JRHR218268	5	3.44	0.71	0.79	0.66
JRHR218380b	5	3.24	0.69	0.25	0.64
JRHR218582	4	1.39	0.28	0.19	0.27
JRHR218355	5	3.22	0.69	0.75	0.64
JRHR218527	6	2.23	0.55	0.53	0.51
JRHR218350	7	2.72	0.63	0.63	0.60
JRHR218339	3	1.55	0.35	0.25	0.31
JRHR220931	2	1.75	0.43	0.63	0.34
JRHR221033	6	3.10	0.68	0.73	0.63
JRHR217756	2	1.68	0.40	0.44	0.32
JRHR220995	5	3.44	0.71	0.27	0.66

Supplementary File 1. (Continued).

JRHR221243	4	2.52	0.60	0.63	0.54
JRHR217494	3	2.11	0.53	0.31	0.44
JRHR221141	4	1.42	0.29	0.27	0.28
JRHR220352	4	2.17	0.54	0.53	0.49
JRHR217270	3	1.37	0.27	0.31	0.25
JRHR222378	4	3.03	0.67	0.31	0.60
JRHR219666	3	1.55	0.35	0.19	0.31
JRHR217036	3	1.89	0.47	0.44	0.39
JRHR220057	2	1.35	0.26	0.00	0.23
JRHR222268b	2	1.47	0.32	0.27	0.27
JRHR219595	3	1.74	0.43	0.29	0.36
JRHR216999	5	3.15	0.68	0.47	0.63
JRHR210570	5	4.61	0.78	0.94	0.75
JRHR210521	2	1.44	0.30	0.25	0.26
JRHR216257	2	1.44	0.30	0.38	0.26
JRHR210129	5	1.83	0.45	0.44	0.42
JRHR216543	8	4.53	0.78	0.81	0.75
JRHR210111	5	2.07	0.52	0.27	0.48
JRHR216529	3	1.97	0.49	0.55	0.41
JRHR216158	3	2.18	0.54	0.55	0.46
JRHR212650	4	1.56	0.36	0.36	0.33
JRHR215899	5	3.61	0.72	1.00	0.67
JRHR215522	5	3.15	0.68	0.67	0.63
JRHR213085	3	2.57	0.61	0.27	0.54
JRHR215811	5	3.76	0.73	0.63	0.69
JRHR215500	4	2.68	0.63	0.50	0.56
JRHR215759	3	1.57	0.36	0.19	0.33
JRHR212591	4	3.10	0.68	0.60	0.61
JRHR215387	3	2.25	0.55	0.75	0.46
JRHR215995	4	1.71	0.41	0.19	0.39
JRHR215534	3	2.34	0.57	0.92	0.48
JRHR212442	4	2.16	0.54	0.50	0.48
JRHR215007	2	1.97	0.49	0.25	0.37
JRHR211818	2	1.82	0.45	0.31	0.35
JRHR212376	3	2.13	0.53	0.20	0.42
JRHR212162	3	2.16	0.54	0.44	0.48
JRHR212270	5	3.12	0.68	0.69	0.62
JRHR212022	6	2.98	0.66	0.80	0.61
JRHR211727	9	4.13	0.76	0.69	0.73
JRHR212264	8	3.88	0.74	0.64	0.71
JRHR214764	6	2.02	0.51	0.50	0.49
JRHR211298	5	2.81	0.64	0.94	0.60
JRHR210929	7	3.50	0.71	0.36	0.68

Supplementary File 1. (Continued).

JRHR214742	8	2.40	0.58	0.31	0.56
JRHR214308	5	3.91	0.74	0.69	0.70
JRHR211142	2	1.52	0.34	0.31	0.28
JRHR214715	2	1.99	0.50	0.40	0.37
JRHR211559	6	2.11	0.53	0.33	0.50
JRHR210875	4	2.24	0.55	0.73	0.52
JRHR211023	3	2.53	0.60	0.40	0.52
JRHR214635	4	2.90	0.66	0.20	0.59
JRHR211428	2	1.88	0.47	0.50	0.36
JRHR216898	3	1.37	0.27	0.25	0.25
JRHR214565	6	4.30	0.77	0.69	0.73
JRHR210954	3	2.99	0.67	0.36	0.59
JRHR216889	11	7.53	0.87	0.63	0.85
JRHR214227	4	2.26	0.56	1.00	0.46
JRHR208031	4	2.38	0.58	0.38	0.49
JRHR207403	6	4.02	0.75	0.87	0.71
JRHR213833	3	2.13	0.53	0.87	0.42
JRHR207986	5	2.00	0.50	0.13	0.47
JRHR214134	3	2.27	0.56	0.27	0.46
JRHR207739	3	1.47	0.32	0.00	0.29
JRHR209954	2	1.97	0.49	0.33	0.37
JRHR214078	2	1.36	0.26	0.31	0.23
JRHR204228	2	1.60	0.38	0.00	0.30
JRHR207031	2	1.36	0.26	0.31	0.23
JRHR206327	5	2.96	0.66	0.63	0.61
JRHR204198	5	2.12	0.53	0.69	0.49
JRHR204149	3	2.96	0.66	0.31	0.59
JRHR206858	2	1.88	0.47	0.63	0.36
JRHR209611	5	2.42	0.59	0.44	0.50
JRHR206750	5	3.91	0.74	0.60	0.70
JRHR209140	4	1.57	0.36	0.31	0.33
JRHR209503	5	3.76	0.73	0.94	0.69
JRHR207121	3	1.58	0.37	0.31	0.34
JRHR209484	3	2.11	0.53	0.44	0.44
JRHR221269b	3	1.76	0.43	0.44	0.38
JRHR216691	2	1.82	0.45	0.69	0.35
JRHR221011	9	6.24	0.84	1.00	0.82
JRHR215454	3	2.34	0.57	0.92	0.48
JRHR211274b	3	1.80	0.44	0.44	0.40
JRHR220864b	3	1.48	0.32	0.38	0.30
JRHR212407	5	2.76	0.64	0.47	0.57
JRHR213914	3	1.89	0.47	0.31	0.42
JRHR210120	4	2.92	0.66	0.60	0.59

Supplementary File 1. (Continued).

JRHR213756	4	2.68	0.63	0.69	0.56
JRHR220056	2	1.97	0.49	0.88	0.37
JRHR214390	4	1.91	0.48	0.20	0.45
JRHR207644	2	1.88	0.47	0.50	0.36
JRHR217522	5	3.32	0.70	0.88	0.64
JRHR209458	3	1.92	0.48	0.44	0.43
JRHR220805	3	1.99	0.50	0.13	0.44
JRHR216983	5	2.21	0.55	0.53	0.50
JRHR209120	2	1.99	0.50	0.94	0.37
JRHR220755	2	1.94	0.48	0.82	0.37
JRHR217314	6	2.15	0.54	0.63	0.51
JRHR220370	7	5.42	0.82	0.33	0.79
JRHR217914	4	3.04	0.67	0.64	0.60
JRHR220525	5	1.88	0.47	0.29	0.44
JRHR220211	5	2.64	0.62	0.69	0.55
JRHR217869	4	3.53	0.72	0.63	0.66
JRHR220524	6	2.02	0.50	0.44	0.48
JRHR221203	4	2.93	0.66	0.63	0.59
JRHR220462	3	1.46	0.31	0.13	0.28
JRHR222320	3	2.23	0.55	0.67	0.48
JRHR219547	5	2.84	0.65	0.50	0.59
JRHR216048	4	2.70	0.63	0.54	0.56
JRHR213245	6	2.87	0.65	0.27	0.61
JRHR222268a	6	3.48	0.71	0.75	0.67
JRHR210660	2	1.52	0.34	0.19	0.28
JRHR212928	4	2.65	0.62	0.27	0.57
JRHR219692	4	1.81	0.45	0.00	0.42
JRHR216875	7	4.84	0.79	0.45	0.76
JRHR210627	5	3.26	0.69	0.69	0.64
JRHR216639	5	3.06	0.67	0.40	0.62
JRHR212629	2	1.72	0.42	0.20	0.33
JRHR216537	3	1.97	0.49	0.27	0.43
JRHR210443	4	3.39	0.71	0.69	0.65
JRHR212583	4	1.57	0.36	0.19	0.33
JRHR216269	4	3.35	0.70	0.63	0.65
JRHR215884	2	1.95	0.49	0.69	0.37
JRHR212214	6	3.57	0.72	0.33	0.68
JRHR212175	5	3.88	0.74	0.67	0.70
JRHR214544	5	3.49	0.71	0.60	0.67
JRHR211028	3	1.92	0.48	0.67	0.41
JRHR212010	6	3.82	0.74	0.38	0.70
JRHR214460	4	1.62	0.38	0.40	0.35
JRHR216894	8	5.63	0.82	0.93	0.80

Supplementary File 1. (Continued).

JRHR211940	7	3.44	0.71	0.57	0.67
JRHR214359	5	3.38	0.70	0.50	0.65
JRHR212382	2	1.52	0.34	0.31	0.28
JRHR211534	7	3.75	0.73	0.67	0.69
JRHR212348	6	4.16	0.76	0.81	0.73
JRHR211195	7	2.83	0.65	0.44	0.62
JRHR213725	4	2.78	0.64	0.80	0.58
JRHR213642	5	3.12	0.68	0.88	0.62
JRHR204187	4	2.18	0.54	0.44	0.45
JRHR209553	4	2.80	0.64	0.20	0.60
JRHR208066	4	3.28	0.70	0.56	0.64
JRHR204109	4	3.10	0.68	0.69	0.62
JRHR209472	7	2.12	0.53	0.33	0.50
JRHR207926	6	2.59	0.61	0.44	0.54
JRHR209958	4	2.38	0.58	0.44	0.49
JRHR207617	3	2.02	0.51	0.56	0.41
JRHR218079	4	2.43	0.59	0.67	0.53
JRHR204498	3	2.46	0.59	0.25	0.51
JRHR206934	4	2.99	0.67	0.50	0.61
JRHR218067	2	1.82	0.45	0.44	0.35
JRHR207488	4	2.07	0.52	0.63	0.47
JRHR206788a	5	3.71	0.73	0.56	0.68
JRHR217806	2	1.44	0.30	0.38	0.26
JRHR220728	4	3.10	0.68	0.56	0.62
JRHR217319	2	1.99	0.50	0.56	0.37
JRHR221269a	5	2.81	0.64	0.63	0.59
JRHR220683	6	4.51	0.78	0.36	0.74
JRHR217255	3	1.81	0.45	0.19	0.37
JRHR217720	2	1.82	0.45	0.44	0.35
JRHR217215	3	2.26	0.56	0.56	0.47
JRHR220936	5	3.54	0.72	0.87	0.68
JRHR217708	3	2.35	0.57	0.79	0.48
JRHR220384	5	2.78	0.64	0.80	0.57
JRHR220911	4	2.04	0.51	0.44	0.43
JRHR217056	4	1.80	0.44	0.44	0.40
JRHR217382	4	2.28	0.56	0.63	0.48
JRHR217034	4	3.58	0.72	0.44	0.67
JRHR220014	7	3.74	0.73	0.69	0.69
JRHR219972	3	2.35	0.57	0.57	0.49
JRHR219680	4	1.38	0.28	0.25	0.26
JRHR219969	6	2.71	0.63	0.40	0.60
JRHR219645	8	3.39	0.71	0.94	0.66
JRHR222595	4	2.20	0.54	0.69	0.47

Supplementary File 1. (Continued).

JRHR222528	5	2.52	0.60	0.44	0.55
JRHR219542	7	5.17	0.81	0.88	0.78
JRHR216846	4	1.32	0.24	0.13	0.23
JRHR216491	3	1.55	0.35	0.44	0.31
JRHR210292	7	4.34	0.77	0.69	0.74
JRHR512533	4	2.91	0.66	0.58	0.59
JRHR215389	3	2.03	0.51	0.63	0.43
JRHR215944	4	2.26	0.56	1.00	0.46
JRHR213108	4	1.76	0.43	0.47	0.40
JRHR215853	5	3.79	0.74	0.81	0.70
JRHR213035	3	1.64	0.39	0.38	0.33
JRHR215589	4	2.16	0.54	0.38	0.48
JRHR211991	5	2.06	0.52	0.40	0.48
JRHR214258	4	2.59	0.61	0.88	0.55
JRHR211337	7	3.63	0.72	0.38	0.70
JRHR214808	5	3.53	0.72	0.93	0.67
JRHR207958	3	2.18	0.54	0.25	0.46
JRHR214546	5	2.38	0.58	0.63	0.51
JRHR214130	5	3.18	0.69	0.56	0.64
JRHR214485	5	3.53	0.72	0.31	0.68
JRHR211505	4	1.30	0.23	0.25	0.22
JRHR207652	6	4.45	0.78	0.88	0.74
JRHR211471	4	3.19	0.69	0.47	0.63
JRHR213593	6	3.47	0.71	0.57	0.70
JRHR207578	11	6.43	0.84	0.73	0.83
JRHR209986	2	1.68	0.40	0.31	0.32
JRHR206534	3	1.64	0.39	0.38	0.33
JRHR207575	2	1.75	0.43	0.25	0.34
JRHR206452	7	3.66	0.73	1.00	0.69
JRHR207413	7	5.28	0.81	0.75	0.78
JRHR209905	6	4.20	0.76	0.63	0.72
JRHR207304	2	1.99	0.50	0.40	0.37
JRHR204468	5	1.78	0.44	0.47	0.41
JRHR207275	3	1.92	0.48	0.27	0.41
JRHR209600	6	5.17	0.81	0.81	0.78
JRHR217354	4	3.01	0.67	0.69	0.61
JRHR220224	2	1.87	0.46	0.47	0.36
JRHR217950	6	2.64	0.62	0.25	0.58
JRHR219701	2	1.80	0.44	0.00	0.35
JRHR217811	5	3.41	0.71	1.00	0.66
JRHR207838	3	2.00	0.50	0.43	0.43
JRHR211683	5	2.11	0.53	0.31	0.49
JRHR217736	5	3.00	0.67	0.50	0.61

Supplementary File 1. (Continued).

JRHR217505	6	3.19	0.69	0.40	0.65
JRHR219908	2	1.97	0.49	0.00	0.37
JRHR216551	4	2.43	0.59	0.46	0.53
JRHR212831	8	4.04	0.75	0.50	0.72
JRHR216082	2	1.97	0.49	0.13	0.37
JRHR212660	5	3.91	0.74	0.73	0.70
JRHR217342	8	5.60	0.82	0.36	0.80
JRHR212612	6	1.61	0.38	0.38	0.37
JRHR219598	10	4.08	0.76	0.79	0.72
JRHR210714	3	1.68	0.40	0.31	0.37
JRHR220348	11	6.65	0.85	0.31	0.83
JRHR219585	3	2.07	0.52	0.20	0.45
JRHR213103	6	2.57	0.61	0.47	0.57
JRHR215674	4	3.14	0.68	0.64	0.62
JRHR212846	6	3.92	0.74	0.93	0.71
JRHR215253	4	2.80	0.64	0.94	0.57
JRHR214996	7	2.28	0.56	0.57	0.54
JRHR211576	4	2.65	0.62	0.38	0.55
JRHR210853	11	6.74	0.85	0.75	0.84
JRHR215252	5	1.49	0.33	0.31	0.31
JRHR211468	5	3.66	0.73	0.63	0.68
JRHR215183	6	2.59	0.61	0.67	0.57
JRHR211274a	5	3.79	0.74	0.56	0.69
JRHR213450	3	2.95	0.66	0.73	0.59
JRHR212194	3	1.40	0.29	0.33	0.26
JRHR214550	3	1.54	0.35	0.43	0.31
JRHR211118	4	2.63	0.62	0.67	0.55
JRHR214370	3	2.38	0.58	0.44	0.51
JRHR210980	8	3.26	0.69	0.56	0.66
JRHR207406	4	3.04	0.67	0.79	0.62
JRHR210057	6	2.53	0.60	0.67	0.58
JRHR209732	10	5.92	0.83	0.80	0.81
JRHR216816	4	2.89	0.65	0.50	0.59
JRHR220864a	5	2.77	0.64	0.63	0.58
JRHR207851	4	2.99	0.67	0.82	0.60
JRHR209249	10	7.01	0.86	0.81	0.84
JRHR217386	6	2.82	0.65	0.57	0.60
JRHR209244	8	4.22	0.76	0.79	0.73
JRHR206788b	5	3.05	0.67	0.50	0.62
JRHR217311	7	4.09	0.76	0.67	0.72
JRHR216951	4	1.59	0.37	0.25	0.35
JRHR210599	3	1.68	0.40	0.38	0.37
JRHR220269	2	1.97	0.49	0.88	0.37

Supplementary File 1. (Continued).

JRHR216284	3	2.33	0.57	0.88	0.50
JRHR216172	7	4.43	0.77	0.58	0.74
JRHR210261	4	1.38	0.28	0.31	0.26
JRHR212582	7	4.49	0.78	0.81	0.75
JRHR219728	6	2.83	0.65	0.47	0.59
JRHR213218	6	3.60	0.72	0.50	0.68
JRHR216693	5	3.29	0.70	0.50	0.65
JRHR215778	4	1.39	0.28	0.19	0.27
JRHR216541	4	1.59	0.37	0.31	0.35
JRHR210629	6	2.69	0.63	0.25	0.59
JRHR215721	8	5.02	0.80	0.63	0.77
JRHR215008	6	3.71	0.73	0.23	0.69
JRHR214002	3	2.76	0.64	0.60	0.57
JRHR214823	4	2.80	0.64	0.44	0.60
JRHR213941	3	1.29	0.22	0.13	0.21
JRHR212338	5	3.76	0.73	0.77	0.69
JRHR211565	11	8.34	0.88	0.86	0.87
JRHR213682	2	2.00	0.50	0.60	0.38
JRHR207188	6	2.88	0.65	0.38	0.61
JRHR212067	6	3.41	0.71	0.93	0.67
JRHR211481	6	4.88	0.80	0.42	0.77
JRHR213537	4	2.02	0.50	0.47	0.46
JRHR211878	7	3.00	0.67	0.60	0.62
JRHR211116	2	1.69	0.41	0.57	0.32
JRHR207496	8	5.16	0.81	0.86	0.78
JRHR209467	5	3.19	0.69	0.62	0.63
JRHR215049	5	2.60	0.61	0.71	0.57
JRHR218066	5	3.66	0.73	0.64	0.68
JRHR218062	3	2.61	0.62	0.63	0.54
JRHR220716	3	1.55	0.35	0.31	0.31
JRHR219900	6	3.13	0.68	0.38	0.64
JRHR220566	4	2.17	0.54	0.42	0.48
JRHR220247	5	2.11	0.53	0.31	0.49
JRHR220219	4	2.54	0.61	0.40	0.54
JRHR217655	7	3.98	0.75	0.67	0.72
JRHR220176	8	5.49	0.82	0.67	0.80
JRHR217486	5	2.80	0.64	0.06	0.60
JRHR216616	3	1.70	0.41	0.46	0.35
JRHR220903	4	2.86	0.65	0.88	0.60
JRHR217153	3	1.58	0.37	0.25	0.34
JRHR215854	6	2.05	0.51	0.60	0.47
JRHR212363	5	3.07	0.67	0.38	0.63
JRHR216291	4	1.93	0.48	0.38	0.44

Supplementary File 1. (Continued).

JRHR210387	6	3.63	0.72	0.40	0.69
JRHR215635	4	2.10	0.52	0.31	0.48
JRHR212326	3	2.36	0.58	0.15	0.51
JRHR216261	6	2.75	0.64	0.31	0.61
JRHR210265	4	1.71	0.42	0.36	0.39
JRHR215590	7	4.26	0.77	0.71	0.74
JRHR212042	5	3.88	0.74	0.60	0.7
JRHR213115	6	3.98	0.75	0.54	0.71
JRHR211847	7	3.70	0.73	0.64	0.69
JRHR210596	6	2.95	0.66	0.29	0.63
JRHR210554	5	2.13	0.53	0.38	0.50
JRHR211692	7	2.50	0.60	0.73	0.57
JRHR211605	7	3.58	0.72	0.75	0.68
JRHR214440	5	4.30	0.77	0.69	0.73
JRHR215094	5	3.35	0.70	0.36	0.65
JRHR213620	6	1.61	0.38	0.31	0.37
JRHR207525	2	1.69	0.41	0.57	0.32
JRHR214378	5	2.29	0.56	0.31	0.50
JRHR209868	7	4.21	0.76	0.40	0.73
JRHR214968	6	3.38	0.70	0.69	0.66
JRHR213554	5	3.84	0.74	0.62	0.69
JRHR214886	4	2.29	0.56	0.36	0.51
JRHR211529	7	4.17	0.76	0.60	0.73
JRHR213483	7	3.79	0.74	0.81	0.71
JRHR206564	5	3.19	0.69	0.57	0.63
JRHR217880	4	2.13	0.53	0.38	0.49
JRHR217714	6	3.33	0.70	0.73	0.65
JRHR216317	3	1.61	0.38	0.15	0.34
JRHR206446	3	2.26	0.56	0.31	0.47
JRHR221037	8	3.74	0.73	0.81	0.71
JRHR217573	4	1.64	0.39	0.13	0.36
JRHR209430	5	2.89	0.65	0.38	0.59
JRHR220543	5	3.11	0.68	0.43	0.63
JRHR217266	2	1.99	0.50	0.93	0.37
JRHR213204	3	2.33	0.57	0.67	0.49
JRHR220451	3	2.24	0.55	0.43	0.46
JRHR217092	3	2.38	0.58	0.50	0.51
JRHR209295	2	1.56	0.36	0.47	0.29
JRHR220410	6	3.05	0.67	0.63	0.62
JRHR215859	6	5.11	0.80	0.80	0.78
JRHR217721	2	1.42	0.29	0.21	0.25
JRHR222477	9	4.61	0.78	0.94	0.75
JRHR215620	7	4.45	0.78	0.71	0.74

Supplementary File 1. (Continued).

JRHR215461	11	5.92	0.83	0.73	0.82
JRHR214591	7	3.32	0.70	0.75	0.66
JRHR204398	4	2.51	0.60	0.64	0.55
JRHR216033	3	2.12	0.53	1.00	0.42
JRHR215365	8	5.37	0.81	0.93	0.79
JRHR214369	4	2.68	0.63	0.15	0.56
JRHR207191	6	3.94	0.75	0.81	0.71
JRHR211760	7	3.70	0.73	0.21	0.69
JRHR214262	6	4.17	0.76	0.54	0.73
JRHR206773	7	4.45	0.78	0.69	0.75
JRHR206716	8	5.84	0.83	0.80	0.81
JRHR215030	4	2.68	0.63	0.00	0.56
JRHR217332	4	2.41	0.58	0.33	0.50
JRHR215529	6	4.04	0.75	0.93	0.71
JRHR210933	4	2.47	0.59	0.29	0.51
JRHR214123	4	2.44	0.59	0.55	0.52
JRHR220292	8	5.07	0.80	0.44	0.78
JRHR210650	4	2.27	0.56	0.15	0.47
JRHR213149	5	3.10	0.68	0.81	0.62
JRHR212973	6	4.72	0.79	1.00	0.76
JRHR214339	4	2.28	0.56	0.40	0.49
JRHR216872	2	1.97	0.49	0.87	0.37
JRHR220704	2	1.93	0.48	0.81	0.37
JRHR213174	4	3.54	0.72	0.27	0.67
JRHR214289	2	1.99	0.50	0.00	0.37
JRHR217463	5	2.89	0.65	0.63	0.59
JRHR215639	6	3.66	0.73	0.71	0.69
JRHR211069	3	1.93	0.48	0.71	0.40
JRHR219977	7	3.58	0.72	0.56	0.68
JRHR215364	11	3.56	0.72	0.81	0.70
JRHR216880	3	2.30	0.57	0.38	0.47
JRHR213696	7	3.53	0.72	0.50	0.67
JRHR216273	7	3.58	0.72	0.69	0.68
JRHR214458	5	3.76	0.73	0.75	0.69
JRHR207766	5	4.10	0.76	0.56	0.71
JRHR209936	8	5.22	0.81	0.69	0.78
JRHR209418	3	2.42	0.59	0.56	0.52
JRHR204300	4	2.26	0.56	0.31	0.46
JRHR218007	7	4.95	0.80	0.87	0.77
JRHR217272	11	6.10	0.84	0.69	0.82
JRHR213185	9	5.51	0.82	0.81	0.80
JRHR207107	8	3.24	0.69	0.38	0.66
JRHR217121	9	3.94	0.75	0.31	0.71

Supplementary File 1. (Continued).

JRHR215575	10	6.48	0.85	0.94	0.83
JRHR221078	7	4.27	0.77	0.81	0.73
JRHR217037	8	5.45	0.82	0.88	0.79
JRHR206963	9	5.16	0.81	0.93	0.78
JRHR216759	14	8.82	0.89	0.67	0.88
JRHR211735	5	4.45	0.78	0.21	0.74
JRHR213132	3	1.37	0.27	0.31	0.25
JRHR210580	5	3.68	0.73	0.75	0.68
JRHR214401	9	5.45	0.82	1.00	0.79
JRHR211396	7	4.41	0.77	0.75	0.74
JRHR220403	7	4.57	0.78	0.50	0.75
JRHR215290	9	4.67	0.79	0.14	0.76
JRHR217131	6	3.66	0.73	0.27	0.69
JRHR213380	6	5.60	0.82	0.43	0.80
JRHR209217	7	4.65	0.79	0.56	0.75
JRHR207981	10	6.72	0.85	0.87	0.83
JRHR216969	5	3.74	0.73	0.75	0.69
JRHR222329	10	5.49	0.82	0.80	0.80
JRHR214612	7	4.23	0.76	0.63	0.73
JRHR211717	9	5.28	0.81	0.81	0.79
JRHR210729	5	2.68	0.63	0.50	0.58
JRHR215307	7	4.04	0.75	0.86	0.73
JRHR211835	4	3.65	0.73	0.67	0.67
JRHR211622	2	1.44	0.30	0.38	0.26
JRHR214189	2	2.00	0.50	0.20	0.38
JRHR207058	8	6.24	0.84	0.13	0.82
JRHR209461	9	6.32	0.84	0.43	0.82
JRHR206565	5	3.65	0.73	0.25	0.69
JRHR206412	5	3.17	0.68	0.13	0.64
JRHR217355	7	2.99	0.67	0.64	0.64
JRHR213703	3	1.29	0.22	0.25	0.21
JRHR216068	3	1.93	0.48	0.14	0.40
JRHR213012	3	2.03	0.51	0.50	0.43
JRHR215867	2	2.00	0.50	0.17	0.38
JRHR222225	4	2.50	0.60	0.23	0.52
JRHR216505	4	3.56	0.72	0.62	0.67
JRHR217144	3	2.03	0.51	0.63	0.43
JRHR215929	9	4.17	0.76	0.43	0.74
Average	4.89	2.94	0.60	0.52	0.54