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## The GrapeReSeq 18k Vitis genotyping chip

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**Summary.** With the aim to develop a 20K genotyping chip for the international community, 43 *Vitis vinifera ssp vinifera*, 4 *V. vinifera ssp sylvestris*, 3 *V. cinerea*, 3 *V. berlandieri*, 3 *V. aestivalis*, 3 *V. labrusca*, 1 *V. lincecumii*, 5 *M. rotundifolia* genotypes were paired end re-sequenced using Illumina platforms. An average of 4.3 and of 3.4 millions SNP were detected respectively per *V. vinifera* and per other *Vitis* species genotypes. SNPs were first filtered upon technical criteria: Illumina score >0.9 and class I type. The project aimed at developing two subsets of SNPs for the chip: a *V. vinifera* specific subset and a general *Vitis* species subset. For the *V. vinifera* subset, SNPs in regions involved in structural variations and repetitions were filtered out and the remaining SNPs were then selected based on their even physical repartition along the genome together with their MAF (Minimum Allele Frequency). For the *Vitis* species subset, SNPs in repeated regions were filtered out and the remaining SNPs were chosen based on their level of heterozygosity and evenly distributed along the genome. In the end, 14,817 *Vitis vinifera* SNPs and 4,978 *Vitis* species SNPs were selected along with 205 control SNPs to design a 20K grapevine Infinium genotyping chip ([http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq\\_Illumina\\_20K](http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq_Illumina_20K)). Illumina designed an 18,071 SNP chip. **Acknowledgements:** Grant Plant-KBBE-2008-GrapeReSeq ; ANR-2008-Muscares; the authors thank PS Paul Stephen Raj<sup>1</sup>, M Ponnaiah<sup>1</sup> for help in result analysis

## 1. Chip development

## 2. Chip delivery

Leaf harvest and DNA prep  
43 diverse *Vitis vinifera*  
4 *Vitis sylvestris*  
3 *V. cinerea*  
3 *V. berlandieri*  
3 *V. aestivalis*  
3 *V. labrusca*  
1 *V. lincecumii*  
5 *M. rotundifolia*

INRA, JKI, ICVV, IGA  
Carrier et al. (2011) An efficient and rapid protocol for plant nuclear DNA preparation suitable for next generation sequencing methods. *Am J Botany* 98: e13–e15.

DNA quantification  
Library prep  
Illumina GAI/ HiSeq sequencing

INRA-EPGV/CNG and IGA platforms  
README\_EPGV\_DataTransfer\_Illumina\_Sequencing.pdf  
([http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq\\_Illumina\\_20K](http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq_Illumina_20K))

Trimming for quality

URGI and IGA platforms, ICVV  
GrapeReSeq\_Illumina\_20K\_SNP\_chip\_read\_me.pdf  
([http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq\\_Illumina\\_20K](http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq_Illumina_20K))

Alignment on the genome seq  
SNP detection

URGI, IGA and Illumina  
GrapeReSeq\_Illumina\_20K\_SNP\_chip.xls  
([http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq\\_Illumina\\_20K](http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq_Illumina_20K))

Submission of 20K loci for an Infinium Illumina Grapevine Genotyping Array  
*V. vinifera*: 15022 SNP  
*V. aestivalis*: 1000 SNPs (ae)  
*V. berlandieri*: 1000 SNPs (be)  
*V. labrusca*: 1000 SNPs (lb)  
*V. cinerea*: 1000 SNPs (cn)  
*V. lincecumii*: 400 SNPs (li)  
*M. rotundifolia*: 578 SNPs (mu)

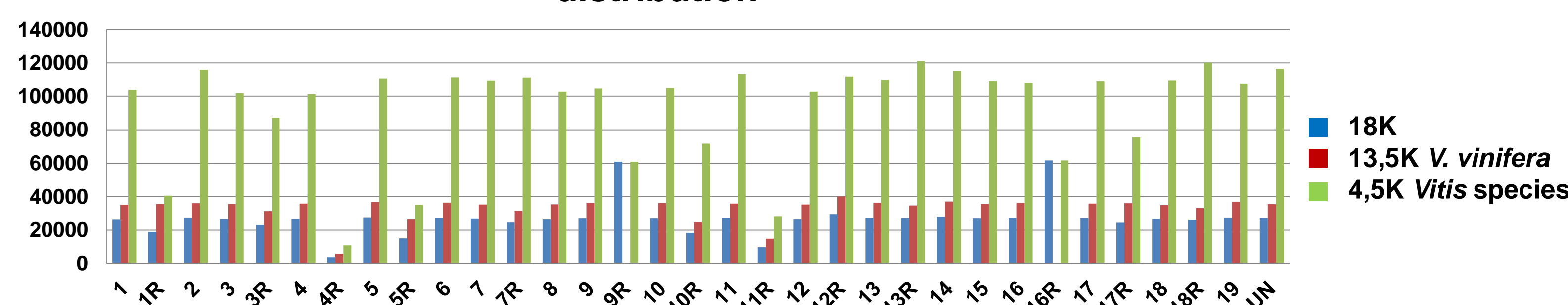
Genotyping 2300 samples with the delivered 18K array

INRA-EPGV/CNG platform

A 90% success rate for the bead synthesis

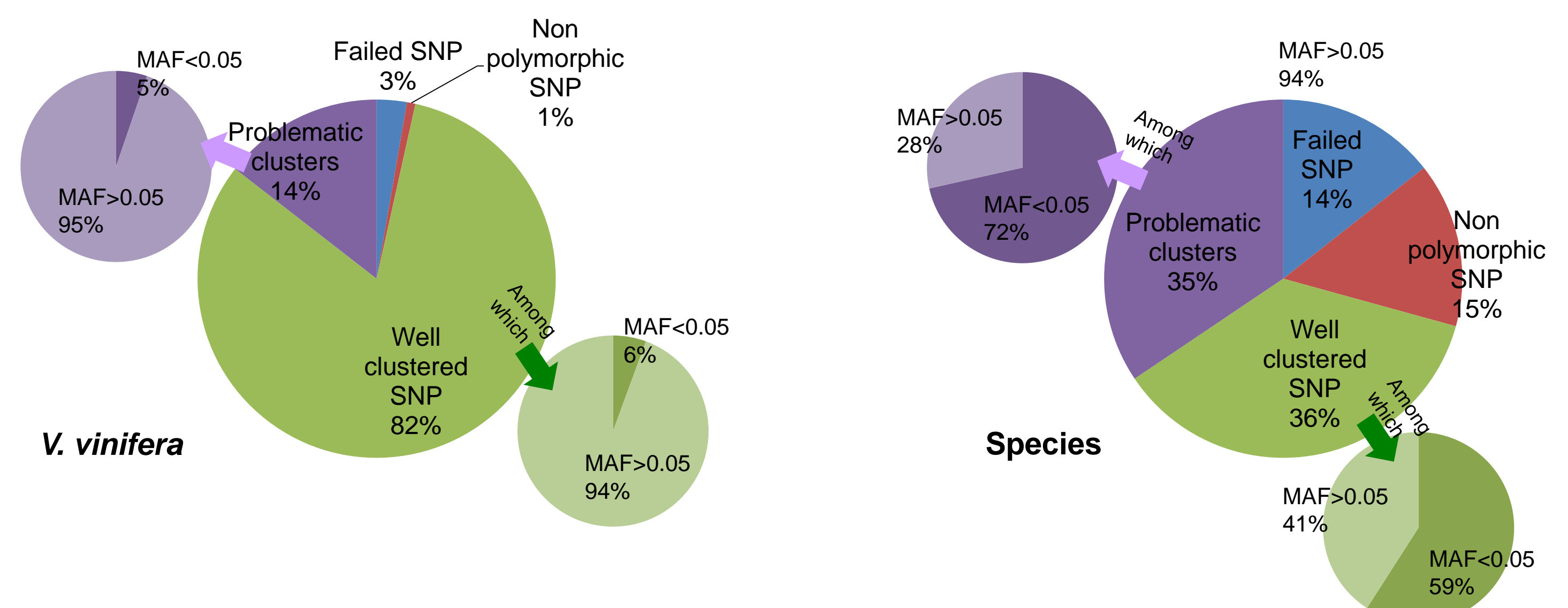
	<i>V. Vinifera</i> set	<i>Vitis</i> species set	Chloroplast	Total
No. SNP	13,537	4,510	24	18,071
Average dist. between 2 SNP	31,296	94,059		26,745bp

Average distance between 2 SNP : chromosome distribution

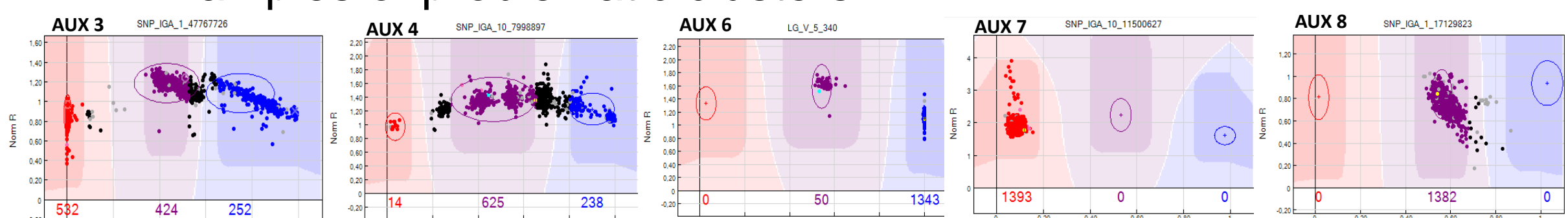


## 3. Genotyping of 2278 individuals with 18071 SNP

	<i>V. Vinifera</i> progenies	Hybrid progenies	Species diversity	Hybrid diversity	<i>V. sylvestris</i> diversity	<i>V. vinifera</i> diversity	Total
No. indiv	397	193	135	500	99	954	2278



Examples of problematic clusters



The use of such SNP may depend on the population considered

Cluster file freely available at [http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq\\_Illumina\\_20K](http://urgi.versailles.inra.fr/Species/Vitis/GrapeReSeq_Illumina_20K)

<sup>1</sup> [http://www.cng.fr/fr/organisation/laboratoires/inra\\_epgv](http://www.cng.fr/fr/organisation/laboratoires/inra_epgv)

<sup>2</sup> <http://urgi.versailles.inra.fr>

<sup>3</sup> <http://umr-agap.cirad.fr/>

<sup>4</sup> <http://www.versailles.inra.fr/urgv>

<sup>5</sup> <http://www.appliedgenomics.org>

<sup>6</sup> <http://www.jki.bund.de/en/startseite/institute/rebenzuechtung.html>

<sup>7</sup> <http://www.icvv.es/>