**Figure 1.** Distribution of the total number of genotyped individuals (left panel) and the total number of informative individuals (right panel) for each *minK* value and in the full-ped configurations in the simulation study.
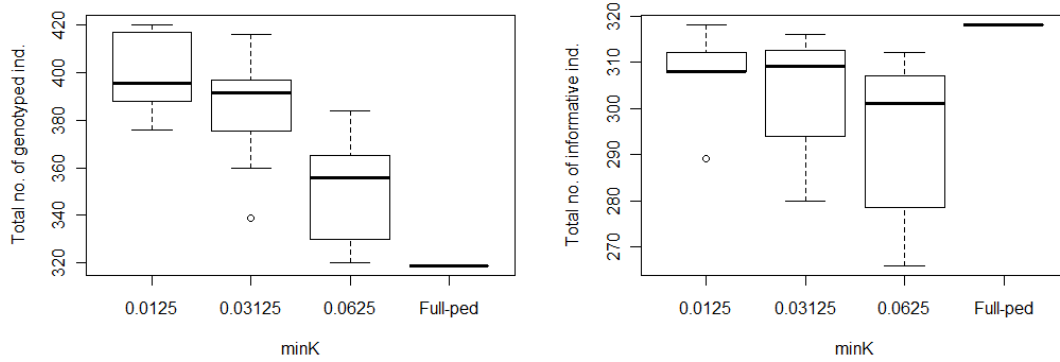
**Figure 2.** Ratio between the power of the MS over the power of the full-ped analysis according to the proportion of variance explained by the QTL ( $h^2_{QTL}$ ) by significance level α and summary statistic.
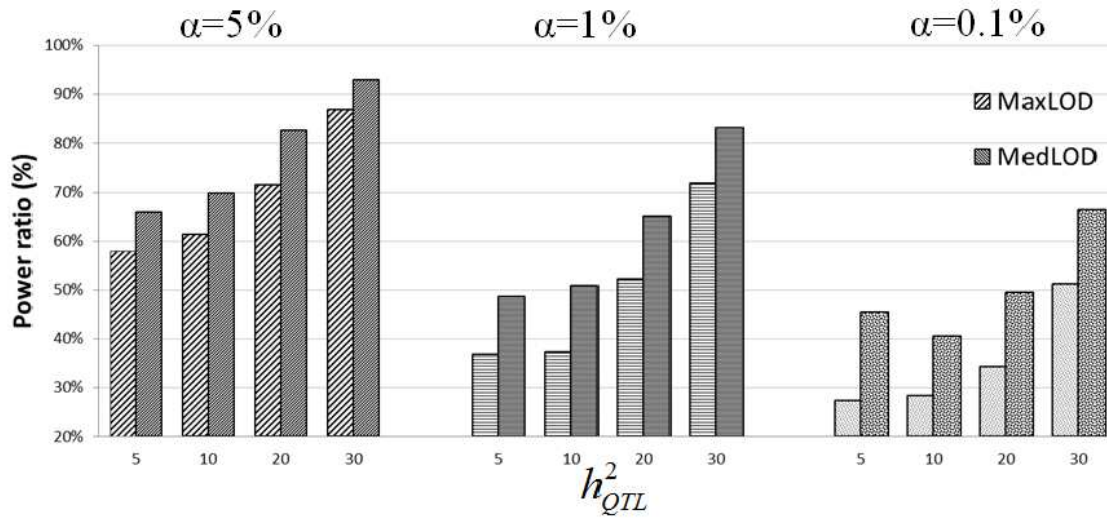
**Figure 3.** Distribution of the total number of genotyped individuals (left panel) and the total number of informative individuals (right panel) for each *minK* value and in the full-ped configurations in the real case scenario.
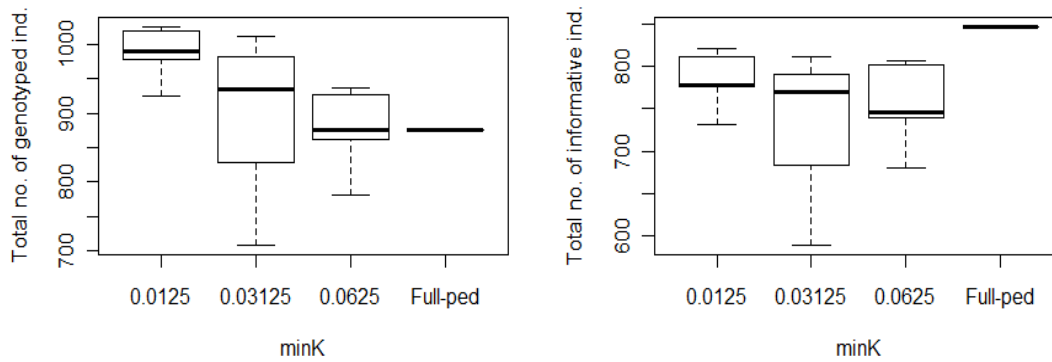
**Figure 4.** Distribution of heritability (%) for each *minK* value in the real case scenario.
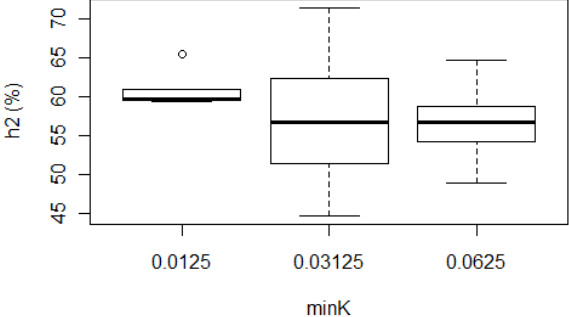
**Figure 5.** Distribution of heritability (%) according to the quantile distribution of the number of individuals (A), the number of informative individuals (B), the number of genotyped individuals (C) and the number of phenotyped individuals (D) in the real case scenario.
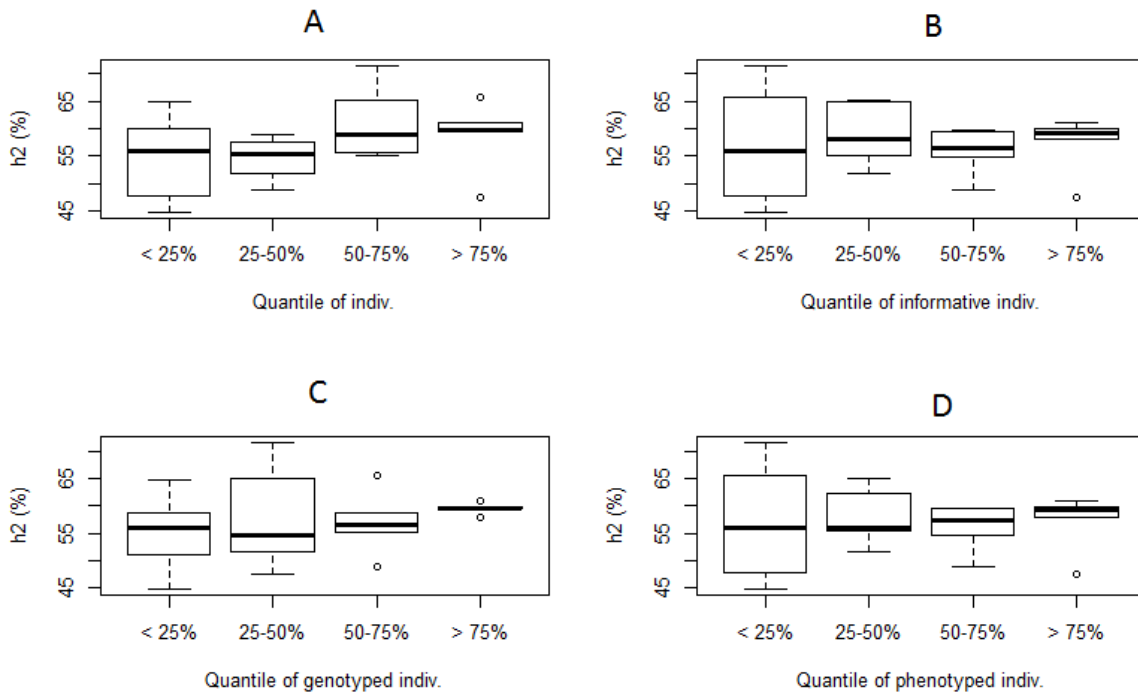
**Figure 6.** MS analysis on chromosome 22. LOD-score distribution of each pedigree configuration based on STR (left panels) and SNP (right panels) arrays. The STR and SNP positions are shown on the top and bottom horizontal axes, respectively. In each of the panels, scans from the pedigrees obtained with a *minK* of 0.0125, 0.03125, and 0.0625, are highlighted in blue, red, and green, respectively. Vertical dotted lines indicate the reference 1-LOD region from [18].
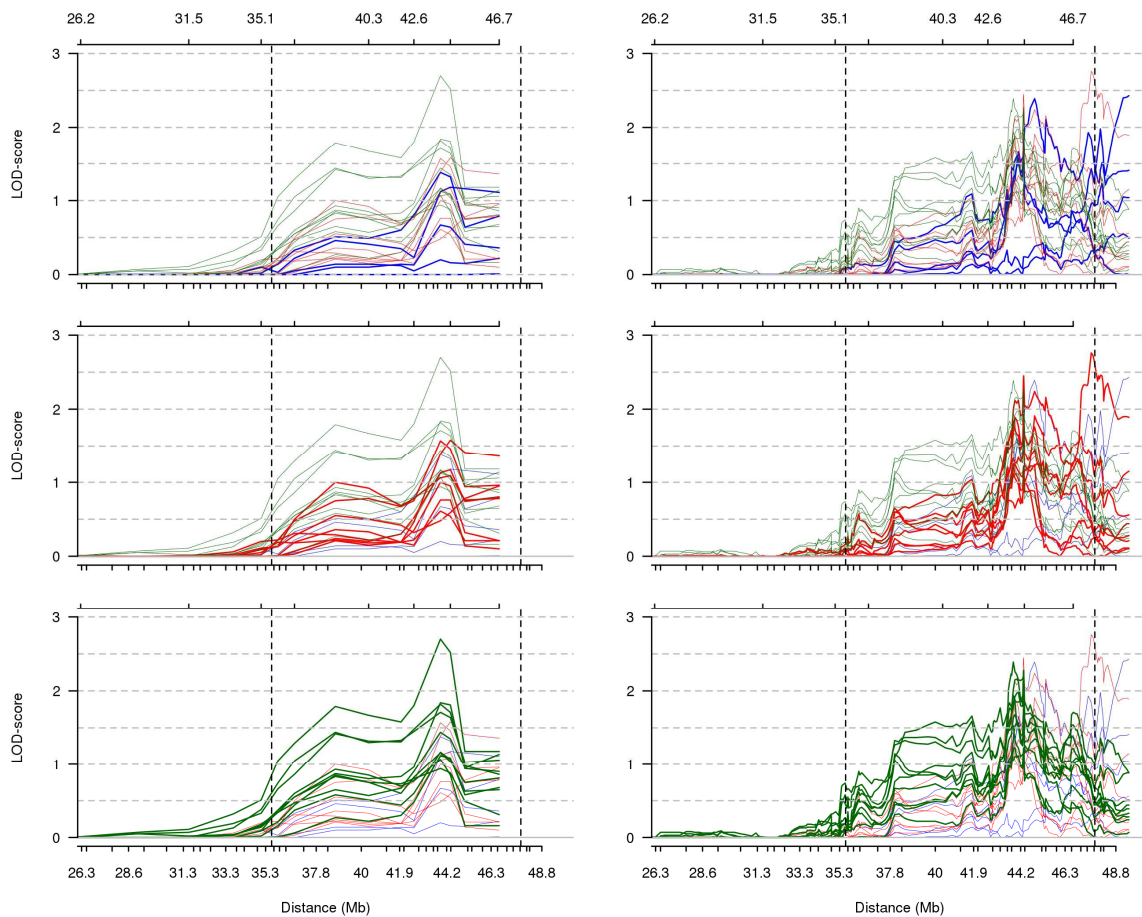
**Table 1.** Characteristics of the pedigree before splitting.

| | Pedigree used for simulation | Pedigree used in the real-case scenario |
|---|---|---|
| Relative pairs | | |
| Parent/Offspring | 908 | 3,126 |
| Sib/Sib | 491 | 1,417 |
| Grandparents | 1,174 | 3,506 |
| Avuncular | 1,403 | 3,511 |
| Half sib | 5 | 32 |
| Cousin | 1,670 | 3,640 |
| Loops | 43 | 110 |
| | | |
| Individuals characteristics | | |
| Male | 294 | 1,116 |
| Female | 304 | 1,103 |
| Founder | 144 | 656 |
| Non-founder | 454 | 1,563 |
| Total | 598 | 2,219 |

**Table 2.** Asymptotic and empirical significance LOD-score thresholds at α = 5%, 1%, and 0.1% in the full-ped, in each pedigree configuration, and for the summary statistics used in the MS approach.

| Threshold | | 5.00% | 1.00% | 0.10% |
|---|---|---|---|---|
| Full-ped | | 0.567 | 1.124 | 2.068 |
| MS | Ped. conf. no. 1 | 0.551 | 1.077 | 1.868 |
| | Ped. conf. no. 2 | 0.546 | 1.084 | 1.85 |
| | Ped. conf. no. 3 | 0.554 | 1.065 | 1.875 |
| | Ped. conf. no. 4 | 0.557 | 1.091 | 1.858 |
| | Ped. conf. no. 5 | 0.554 | 1.081 | 1.874 |
| | Ped. conf. no. 6 | 0.543 | 1.063 | 1.843 |
| | Ped. conf. no. 7 | 0.551 | 1.067 | 1.776 |
| | Ped. conf. no. 8 | 0.556 | 1.074 | 1.827 |
| | Ped. conf. no. 9 | 0.559 | 1.097 | 1.797 |
| | Ped. conf. no. 10 | 0.556 | 1.082 | 1.876 |
| | Ped. conf. no. 11 | 0.565 | 1.102 | 1.89 |
| | Ped. conf. no. 12 | 0.556 | 1.1 | 1.778 |
| | Ped. conf. no. 13 | 0.559 | 1.093 | 1.892 |
| | Ped. conf. no. 14 | 0.552 | 1.085 | 1.799 |
| | Ped. conf. no. 15 | 0.558 | 1.1 | 1.916 |
| | Ped. conf. no. 16 | 0.547 | 1.07 | 1.81 |
| | Ped. conf. no. 17 | 0.566 | 1.109 | 2.012 |
| | Ped. conf. no. 18 | 0.547 | 1.055 | 1.797 |
| | Ped. conf. no. 19 | 0.562 | 1.134 | 1.878 |
| | Ped. conf. no. 20 | 0.567 | 1.129 | 1.945 |
| | Ped. conf. no. 21 | 0.574 | 1.096 | 1.836 |
| | Ped. conf. no. 22 | 0.571 | 1.099 | 1.919 |
| | Ped. conf. no. 23 | 0.567 | 1.116 | 1.879 |
| | Ped. conf. no. 24 | 0.563 | 1.104 | 1.876 |
| | Ped. conf. no. 25 | 0.562 | 1.112 | 1.937 |
| | Ped. conf. no. 26 | 0.558 | 1.101 | 1.901 |
| | Ped. conf. no. 27 | 0.564 | 1.123 | 1.864 |
| | Ped. conf. no. 28 | 0.565 | 1.1 | 1.875 |
| | Ped. conf. no. 29 | 0.565 | 1.102 | 1.854 |
| | Ped. conf. no. 30 | 0.555 | 1.093 | 1.963 |
| | *MaxLOD* | 1.443 | 2.072 | 2.94 |
| | *MedLOD* | 0.338 | 0.669 | 1.209 |

*Empirical thresholds based on 45 000 replicates under the hypothesis of no linkage. The asymptotic thresholds derived from a mixture of Chi-squares with 0 and 1 degrees of freedom were 0.588, 1.175 and 2.074 at $\alpha$ =5%, 1% and 0.1% respectively.