



**Figure S1.** Cumulative proportion of explained variance of the principal component analysis (PCA) used to describe the genetic structure of selected diploid and tetraploid parental populations from a cytoplasmic male sterility (CMS)-based hybrid breeding program of perennial ryegrass (*Lolium perenne* L.). The PCA was calculated using a SNP marker-based distance matrix generated by DNA sequencing. The first three components PC 1, PC 2, and PC 3 (x-axis) explained 30.96, 19.19, and 13.54% of the total genotypic variance, respectively, amounting to 63.69% cumulative variance (y-axis).