Serra Gaúcha is the most important Brazilian viticultural area, where Merlot and Cabernet Sauvignon are among the most important cultivars for quality wines. However, there is no study concerning the clonal behavior of these two cultivars. For this reason, this work was carried out with the objective to evaluate the enological potential of clones of Merlot and Cabernet Sauvignon grapevines. In this way, four Merlot and five Cabernet Sauvignon vineyards, located in Bento Gonçalves, RS, were used. Grapes were harvested in 2010 and winemaking was made in duplicate in glass recipients of 20 L each. Later on, variables mainly related to sugar, acidity, and phenolic compounds were analyzed and data were subjected to the principal component analysis (PCA). Principal components 1 and 2 (PCs) represented 66.19% and 13.50%, respectively, of the total variation. The PCA shows that there were three groups of wines. The CP1 discriminated the Cabernet Sauvignon R5, 341, and 163 which had higher values of hue, pH, and volatile acidity; on the other hand, it discriminated the Merlot 346, 348, 347, and 181, which presented higher values of titratable acidity, alcohol, reducing sugar, absorbance at 420, 520, and 620 nm, color intensity, total polyphenols, dry extract, tannins, and alcohol in weight/reduced dry extract ratio. The CP2 discriminated the Cabernet Sauvignon 18A wine, characterized by lower values of density. These results show that the Merlot and Cabernet Sauvignon clones evaluated present differences among them, which suggest the possibility to have wines with different sensory characteristics.