

30 years of fuel ethanol production in Brazil: identification and selection of dominant industrial yeast strains

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Over the last 30 years, significant developments in industrial processes of alcoholic fermentation have increased the overall yield of the Brazilian distilleries from 75-80% to 90-92% and reduced the costs of production. Several factors contributed to the improvement of industrial processes, including the identification, monitoring and selection of yeast strains. Currently there are four industrial yeast strains commercialized in Brazil (PE2, CAT1, BG1 and SA1) selected from industrial fermentations in the 90's. It was possible due to use of molecular techniques (electrophoretic karyotyping) associated to intensive program of yeast evaluation in laboratory and industrial scale. Traditionally, Baker's yeast, laboratory and brewing strains were used as starter yeast by the distilleries. However, these strains don't survive in industrial fermentations for ethanol production because of stressful conditions of the process (temperature, ethanol, acid treatment of the yeast, toxic compounds from molasses and sugarcane juices, bacterial contamination, recycle of cells). Baker's yeast, laboratory and brewing strains are quickly replaced by wild *Saccharomyces* as demonstrated by karyotyping. Most of these wild *Saccharomyces* present undesirable traits, such as low fermentation yield, flocculation and excessive foam formation. For this reason, several Brazilian distilleries have used a mix of Baker's yeast with PE2 and CAT1 or other selected strains. After 15-20 days the Baker's yeast disappears while PE2 or CAT1 arise in the fermentation medium. Industrial yeast strains must be able to grow and dominate in the fermentor, but this trait is an attribute of few *Saccharomyces* strains. Moreover, these yeast strains must be persistent during the successive recycles of fermentation. Without these characteristics of persistence and dominance, it is not possible to introduce new strains in the fermentation process. Strains such as PE2 and CAT1, have presented the highest rate of implantation in different distilleries where these strains have been introduced. Concerning the conservation of microorganisms, several yeast strains have been stored in a viable and lyophilized form over 15 years. Now, a new generation of yeast strains are been selected for fermentation processes.