

Introduction

Saison or Farmhouse beers are a traditional Belgian style of beer that have been gaining in popularity in recent years in the craft brewing industry. The yeast character in this style of beer is the defining factor, as the other characteristics of the beer (colour, alcoholic content and bitterness) have such a wide range it becomes difficult to incorporate these into a succinct beer style description. Fermentations may consist of strains of *Saccharomyces cerevisiae*, wild yeast, *Brettanomyces* spp., lactic acid bacteria as well as other bacteria (Markowski, 2004). The metabolism by-products of these yeasts and bacteria contribute significantly to the character of the beer (Markowski, 2004; Tonsmiere, 2014). To date little scientific study has been carried out examining how these yeast perform as fermentation conditions change. The work presented in this poster begins to address this gap in knowledge.

Materials and Methods

Four strains of *S. cerevisiae* sold as 'Saison' or 'Farmhouse' strains were sourced from White Labs (USA) and The Yeast Bay (USA). These strains were confirmed as being *Saccharomyces cerevisiae* strains by growth on melibiose and at growth 37°C (ASBC yeast 10A and B). Wort (OG 1.042) was prepared in the 2HL pilot brewery at the ICBBD using 100% extra pale malt (Crisp, UK), bittered with Columbus hop pellets (Hop Growers of America, USA) to approximately 25 IBU's. Mini-fermentations were carried out according to the method of Quain *et al.*, (1985) (Figure 1). Ester and higher alcohol analysis was carried out using GC-FID, vicinal diketones using GC-ECD and 4-vinyl guaiacol by HPLC with fluorescence detection. Chemicals and reagents were all purchased from Fisher Scientific (UK) or Sigma Aldrich (UK).



Figure 1.

Experimental set-up

Results and Discussion

The higher temperature (28°C) had a positive effect on the degree of apparent attenuation for all strains (Figure 2).

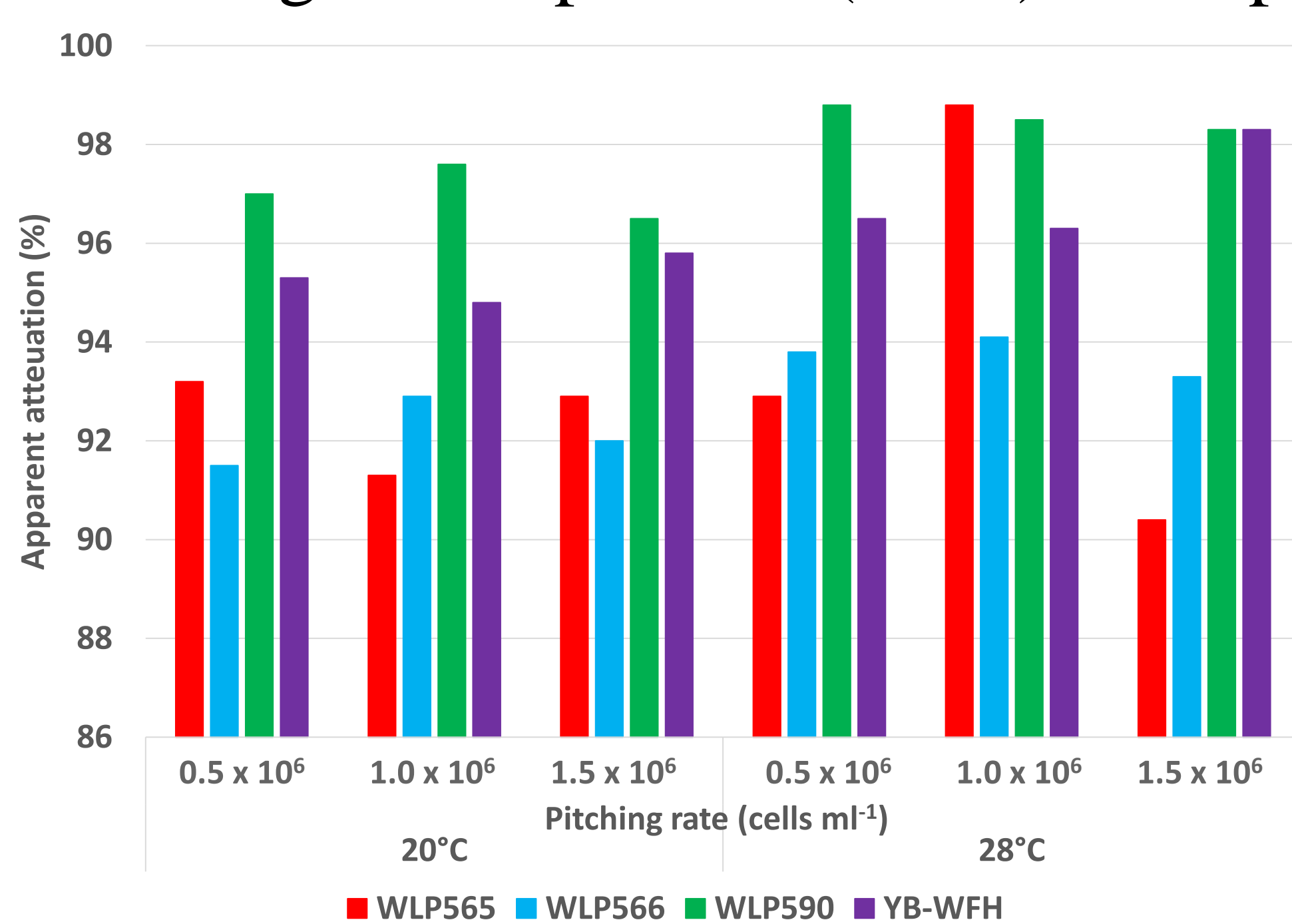


Figure 2. Influence of pitching rate and temperature on attenuation.

Pitching rate does not appear to impact upon apparent attenuation.

Results and Discussion

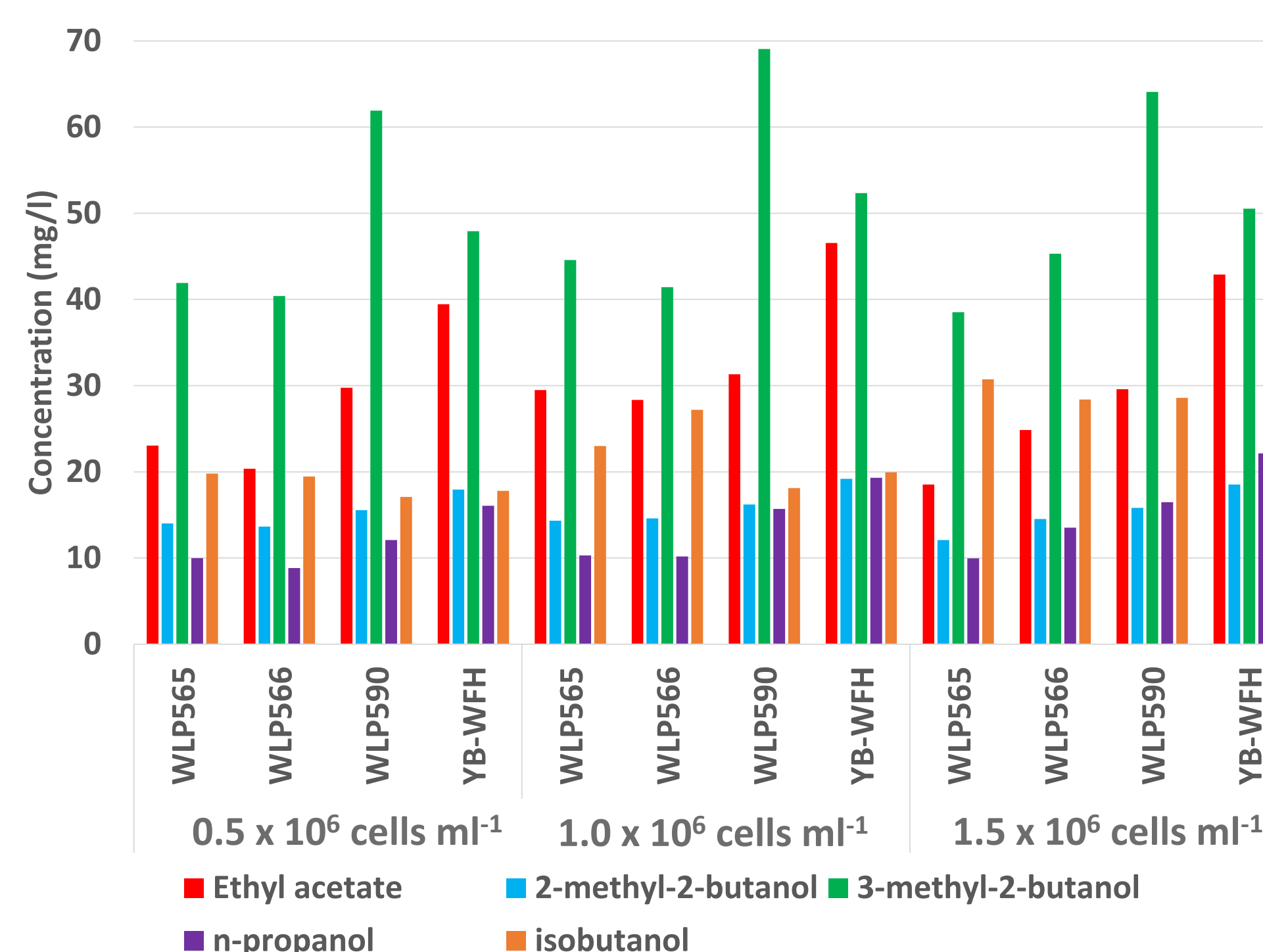


Figure 3. Esters and higher alcohols at the end of fermentation (20°C).

The optimum pitching rate for the production of ethyl acetate appeared to be 1 x 10⁶ cells ml⁻¹ (Figure 3). Strain YB-WFH was the only strain where ethyl acetate was detected at levels above the sensory threshold.

- Surprisingly isoamyl acetate was not detected at or above the sensory threshold level (data not shown).
- Most higher alcohols produced were found to be under the threshold for sensory detection.
- Production of vicinal diketones (butanedione and pentanedione) were below sensory threshold levels regardless of pitching rate or fermentation temperature (data not shown).
- Addition of lactic acid to the wort to simulate the presence of lactic acid bacteria was found to have a strain specific effect on the yeast.

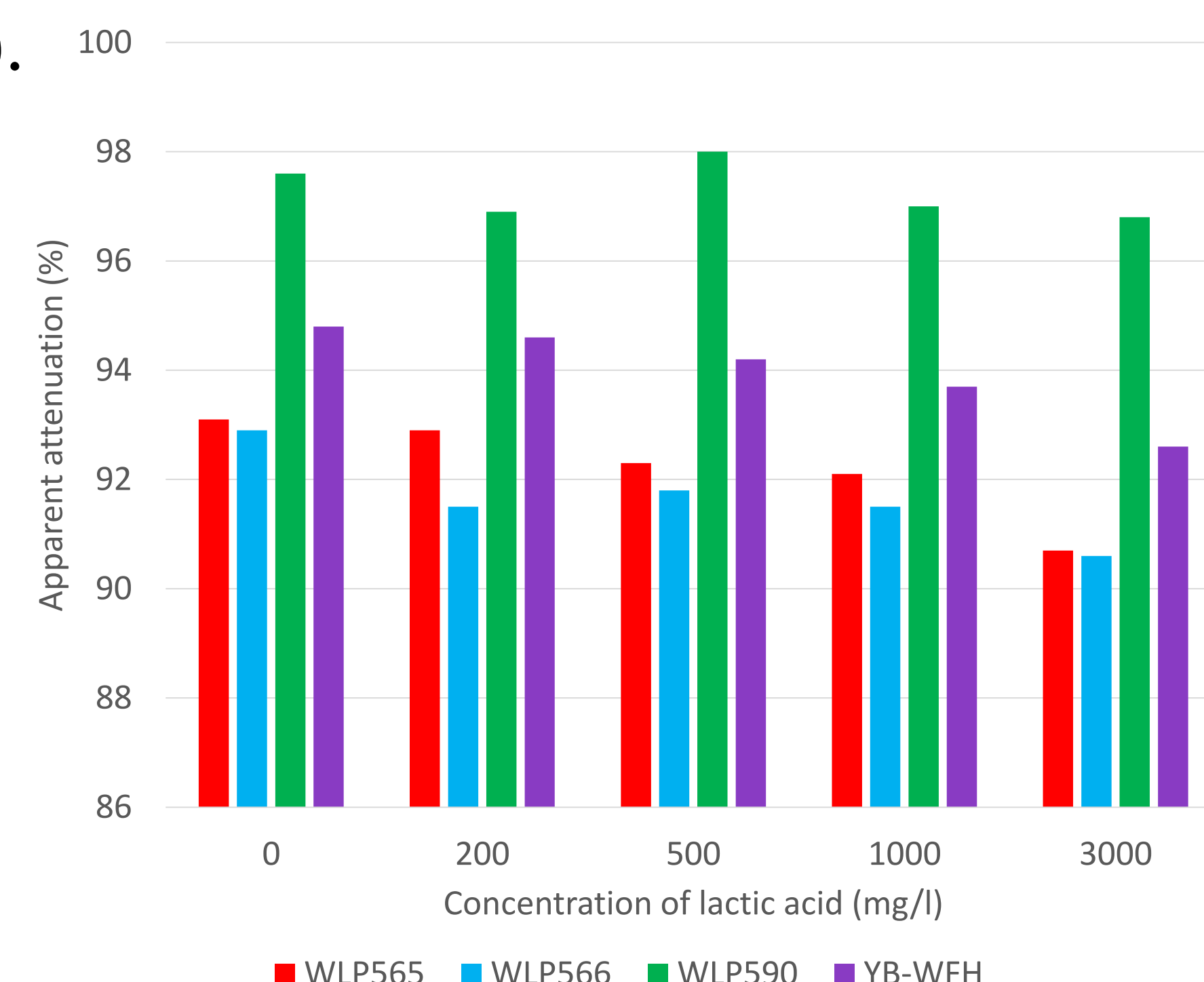


Figure 4. Impact of lactic acid addition on apparent attenuation.

The results presented in this poster suggest that the choice of yeast will indeed have a marked impact on the final product. Further work in this area could aid brewers' in their strain selection.

References

- Markowski, P., (2004). Farmhouse ales: Culture and craftsmanship in the Belgian Tradition. *Brewers Pub. USA*.
 Quain *et al.*, (1985). *Lab. Pract.*, **34**, 84.
 Tonsmiere, (2014). American sour beers: Innovative techniques for mixed fermentations. *Brewers Pub. USA*.

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