



BEST PRACTICES

LOW ALCOHOL BEER

ACHIEVING LOW ABV THROUGH LOW WORT FERMENTABILITY

Brewery wort contains fermentable sugars of low and medium molecular weight and unfermentable sugars of high molecular weight. While all brewing yeast strains are able to ferment low molecular weight sugars such as glucose, the ability to ferment medium molecular weight sugars such as maltotriose varies by yeast strain (Figure 1). Wort fermentability is reduced by optimizing mash conditions to minimize the level of fermentable sugar and maximize the level of maltotriose and unfermentable dextrin in the wort (Figure 2). Alcohol production is further limited by using a yeast strain that is unable to metabolize maltotriose, such as LalBrew® Windsor and LalBrew® London.

This method produces low alcohol beers by creating a wort of low fermentability. It utilizes a combined method of high temperature mashing, low original gravity and fermentation using a strain of *Saccharomyces cerevisiae* that will not metabolise maltotriose to limit alcohol production. In this case LalBrew® Windsor or LalBrew® London.

RECOMMENDED LOW ALCOHOL PROCEDURE

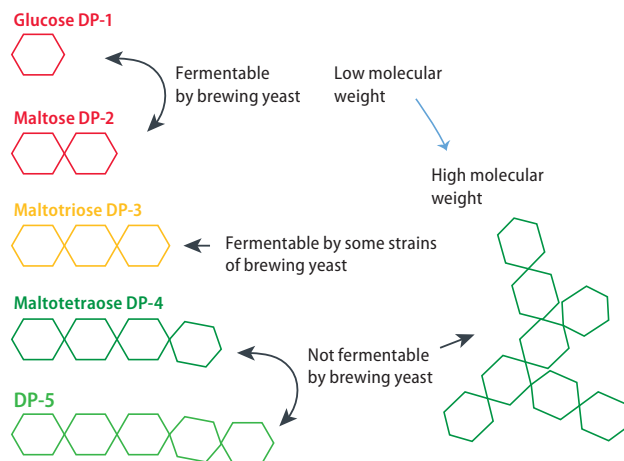
- 1 - Mash a well modified ale malt at an initial temperature between 82-86°C (180-187°F).
- 2 - Target a low OG between 1.020 – 1.027 (5.1-6.8°P)
- 3 - Lauter as normal but ensure pH and gravity remain within normal brewing levels. (5.1-5.4) Acid additions may be necessary.
- 4 - Boil as normal, again being careful to maintain normal pH levels. It is also possible to add lactose at this stage to increase mouthfeel.
- 5 - Ferment using a maltotriose negative yeast strain such as LalBrew® Windsor and LalBrew® London to lower the potential alcohol yield.

IMPORTANT THINGS TO CONSIDER

- The pH needs to be tightly controlled due to a lower buffering capacity in low gravity wort. This can be done with acid additions or by using acid malt in the grist
- Mouthfeel can be enhanced by using lactose and water enriched in chloride
- Kettle hopping should be kept to a minimum
- This work was done with well modified British ale malts

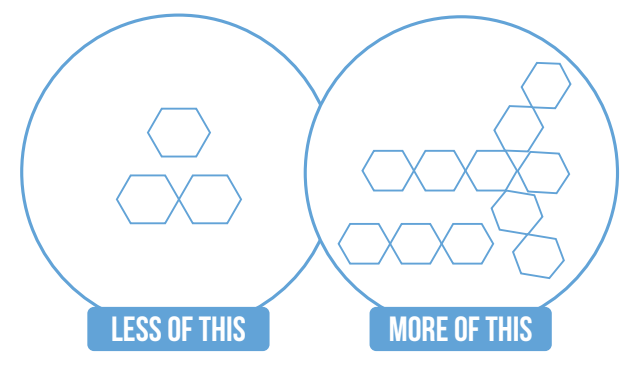
THE SUGARS PRESENT WITHIN ORDINARY BREWERY WORTS

FIG. 1



THE AIMS OF LOW ABV MASHING PROCEDURE

FIG. 2



This table shows wort fermentability and potential alcohol yields using the method above over a range of mash temperatures and different yeast strains. The optimal mash temperature range for achieving the lowest alcohol yields (82-86°C) is shown in green. When mashing between 82-86°C, 0.5-0.6% abv can be achieved using maltotriose negative strains (orange) and 0.01% abv can be achieved using maltose negative strains (green).

WORT FERMENTABILITY AND POTENTIAL ALCOHOL YIELDS

FIG. 3

MASH TEMPERATURE °C (°F)	MASH TIME (min)	% UNFERMENTABLE SUGARS			POTENTIAL % ABV		
		MOST BREWING YEAST STRAINS	MALTOTRIOSE NEGATIVE STRAINS (LalBrew® Windsor or LalBrew® London)	MALTOSE NEGATIVE STRAINS*	MOST BREWING STRAINS	MALTOTRIOSE NEGATIVE STRAINS (LalBrew® Windsor or LalBrew® London)	MALTOSE NEGATIVE STRAINS*
74 (165.2)	60	2	24	89	1.3	1.0	0.03
78 (172.4)	60	24	42	94	1.0	0.8	0.02
82 (179.6)	60	44	57	95	0.7	0.6	0.01
86 (186.8)	60	63	71	96	0.6	0.5	0.01
95 (203)	60	53	62	96	0.8	0.7	0.01

* Slants available by request from the Siebel Institute of Technology - yeast.genetics@siebelinstitute.com