The use of pectin-based finings in commercial-scale beer making

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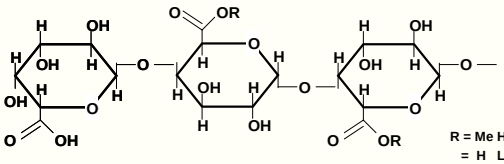
INTRODUCTION

We previously reported a new non-animal finings material based on plant pectins, apple and citrus, that gives equivalent performance to animal collagens, including isinglass. This knowledge allowed us to optimise the composition of the plant-based finings, and these were subsequently tested in brewery trials. We investigated dosage requirements, brand specificity, injection optimisation, clarification rates, and stability. Treated beer was tested for sensory properties, physical and chemical stability and sensory properties. Beers clarified using pectin-based finings scored highly in taste tests, were true to brand-type, and exhibited excellent flavour and physical stability. We have shown that these finings are suitable for all the barley malt beers we have tested, as well as most of the wheat beers. We have shown that they are commercially competitive and that the quality of the final treated beer is at least comparable to that obtained with alternatives or after prolonged storage of untreated beer. This provides the beer maker with choice, with options when it comes to serving different consumer markets.

RATIONAL

Plant pectins can be isolated from a variety of plants. They all exhibit the same polygalacturonic acid background, but vary greatly in the degree of esterification of the acidic groups and the degree of branching and the nature of the branches, and the choice of sugar moieties. They also vary greatly in molecular weight. Despite what seems to be a plethora of choice, commercial pectin manufacturers can produce remarkably consistent and stable products, targeting defined molecular weights, degree of esterification and reactivity towards metal ions. This makes it possible to produce pectin-based finings agents in commercial quantities, and with versatility as regards the raw material source.



R = Me High methyl ester (HM) pectin
= H Low methyl ester (LM) pectin
= NH_2 Amidated pectin

BREWING TRIALS AND METHODS

A series of brewing trials were completed using pectin finings during July-September 2006 at Abbotsford and Yatala breweries and about 0.4MhL beer was produced during the trials.

Two types of pectins (both LM pectins) were used in the trials and dosage rate was between 1.2-3.0g active pectin per hL beer.

Pectin finings effect was compared to an animal-based finings material. Beer was normally mixed inline with those finings solutions and stored at 2-4˚C for 2-5days. Filtration performance and DE powder consumption were monitored.

Physical and flavour stability of the pectin-fined beer was evaluated by an inhouse taste penal and also confirmed by chemical and ESP measurements.

RESULTS

Filtration performance between pectin finings and the control

Online filtration data indicated the behaviour of the pectin-fined beer was different to the control (animal-based finings) as regards to filter pressure, filtration length and clarity of the filtered beer.

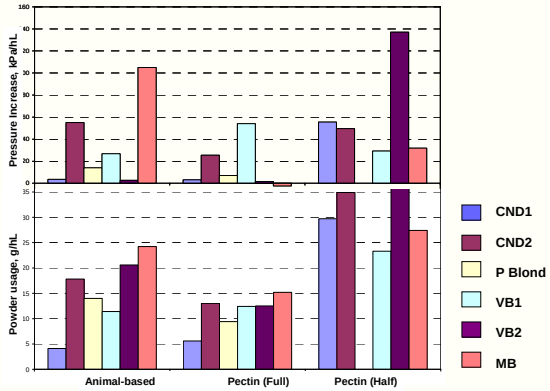
Dosage rate on filtration effectiveness

Data from 6 weeks Abbotsford plant trial showed the filtration performance of the pectin finings was at least equivalent, if not better compared to the control when an appropriate dosage rate was used. However, underdosing of pectin led to an increase in filtration pressure. Total sludge volume and DE powder consumption also increased.

Animal-based finings		Pectin (3.0g/hL)		Pectin (1.5g/hL)	
Total Volume Filtered (hL)	22870	Total Volume Filtered (hL)	21045	Total Volume Filtered (hL)	16218
Total DP increase (kPa)	1120	Total DP increase (kPa)	847	Total DP increase (kPa)	1818
Total time spent filtering (h)	45.7	Total time spent filtering (h)	42.1	Total time spent filtering (h)	32.4
Total sludge vol (L)	3963	Total sludge vol (L)	3574	Total sludge vol (L)	5993
Overall change in DP with time (kPa/h)	24.5	Overall change in DP with time (kPa/h)	20.1	Overall change in DP with time (kPa/h)	56.0
Overall average powder usage (g/L)	0.133	Overall average powder usage (g/L)	0.130	Overall average powder usage (g/L)	0.283

Brand variation on pectin finings effect

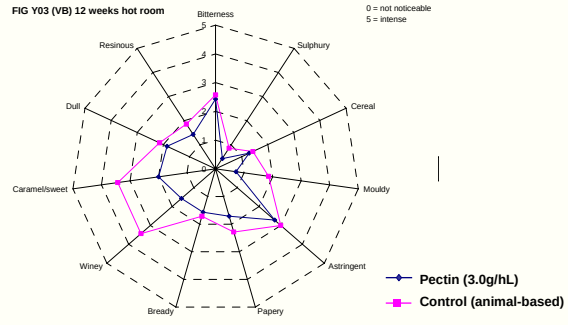
Filtration pressure and powder usage were largely dependent on beer brand. But overall averaging across all brands, pectin-fined beer generated lower filter pressure and resulted in less DE powder consumption.



Physical and flavour evaluation

Beer stability tests showed that the pectin-fined beer was more stable than the control. Sensory analysis repeatedly showed that pectin-fined beer scored higher in Triangular, Rating and Preference Test tests.

		Control	Pectin (3.0g/hL)
Chill Haze FTU, ASBC	Initial	25	25
	4wks	30	30
	12wks	135	155
Chill Haze, Forced, FTU, ASBC		180	170
ESR, lag time (min)	12wks	76	63
Flavour comments	12wks	Slight sulphur and estery, thin	Papery, winey, sweet, aged
Ranking	12wks	5	4



CONCLUSIONS

- Filtration performance of the pectin finings is at least equivalent to the animal-based finings material.
- The pectin finings suit all lager and draught beers and most wheat beer types.
- The pectin-fined beers performed better in forced aging tests.
- No large capital expenditure required for the replacement of conventional finings with pectins.
- pectin finings are cost effective.

References

International patent WO/2006/032088

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