

Article

Assessing the Impact of Finings on the Perception of Beer

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Academic Editor: Ombretta Marconi

Received: 15 May 2017; Accepted: 14 June 2017; Published: 16 June 2017

Abstract: In recent years, a number of commentators have suggested that the use of finings to clarify beer can impair the flavour, because of the removal of key volatile aromatic molecules from the drink. However, are such claims necessarily correct? Unaware of any previous attempt to address this question empirically, we conducted both a blind and a sighted taste test. The test made use of two beers from the same batch, one made using finings and the other made without. In neither experiment did the use of finings affect flavour or liking ratings amongst the social drinkers ($N = 235$) tested. Thus, the present results clearly suggest that the use of finings does not necessarily impact either the sensory-discriminative or hedonic ratings of beer, despite its influence on the clarity of the finished product.

Keywords: finings; beer tasting; blind tasting; visual appearance

1. Introduction

According to Wikipedia: “Finings are substances that are usually added at or near the completion of the processing of brewing wine, beer, and various nonalcoholic juice beverages. Their purpose is for removal of organic compounds; either to improve clarity or adjust flavor/aroma.” Meanwhile, according to Webster’s dictionary, ‘fining’ is defined as meaning “to become pure or clear” ([1]; see also [2]). Cask finings in beer products typically consist of an aqueous suspension of collagen from the swim bladder of fish preserved with sulphur dioxide, to which sodium metabisulphite has been added ([3,4]; see [5,6], on the various fining agents used for wine). That said, while isinglass (fish protein) is a particularly popular fining aid, many other materials have been used in the production of beer (including bentonite, animal gelatin, polyvinylpolypyrrolidone, carrageenan), and presumably each approach might be expected to have a somewhat different impact on the taste/flavour profile of that to which they have been added. See [1] or [7] for the wide range of fining agents used in the production of wine. Certainly, a number of consumers and commentators appear to be convinced that the use of finings not only changes the appearance but also the taste/flavour of, for example, beer. The problem with the use of finings, at least as far as unfined advocates are concerned, is that they also bind with proteins and hop oils and consequently tend to ‘suck’ out some of the flavour from the beer [3,8]. The claim is not only that “natural” (i.e., unfined) beers are vegan-friendly (some even claiming that drinking the yeast has health benefits, too), but that they are also more vivid and flavourful (see [8]). However, are such claims to be trusted? Is it always true that the addition of finings impairs the taste/flavour of a drink? And where is the scientific evidence to address this question? We were unable to find any solid empirical evidence on this question that is of growing relevance

to the brewing community. The only relevant anecdotal finding that we could find was reported by Justin Moore who runs the Moor Beer Company, suggesting that the difference between the fined and unfined casks of the same beer tasted at the Minehead Beer Festival were as different as night and day (see [4]). The unfined version apparently came out on top of more than 100 beers on show.

A priori, it would be easy to believe that the unequivocal effect of finings on the visual appearance of a beer, i.e., turning it from cloudy to clear, would affect drinkers' expectations regarding the beer's likely taste profile. In the present study, we attempted to distinguish between the two ways in which finings might affect flavour perception. On the one hand, there might be a direct effect on flavour perception. On the other, there might be an indirect impact on flavour attributable to the change in the visual appearance of the drink itself (see [9], on the complex definition of flavour). The latter route might well change people's flavour expectations which, in turn, might be expected to modulate flavour perception (see [10]). It is, after all, well-known that the visual appearance of a beer can have a significant effect on both taste and flavour perception [11,12], not to mention consumption behaviour [13]. We therefore first conducted a blind tasting in which the participants (social drinkers attending the 2017 Edinburgh Science Festival) were invited to rate two beers served from black tasting vessels (i.e., to obscure the differences in visual appearance). Thereafter, we conducted a more naturalistic, sighted tasting of the two beers in clear glasses. However, contrary to the claims of many of those writing on the topic, no significant differences between the two beers were identified in terms of their sensory-discriminative or hedonic attributes (beyond the visual appearance differences identified in the sighted tasting). Possible explanations for these null results on the taste/flavour ratings of social drinkers are discussed below.

2. Materials and Methods

2.1. Participants

Two experiments were conducted at the 2017 Edinburgh Science Festival (see <https://www.sciencefestival.co.uk/>) with separate groups of participants attending the festival on different days. A total of 117 participants (mean age: $M = 33.8$ years, $SD = 8.7$ years; 49 male) took part in Experiment 1, in which the beers were sampled blind (i.e., from dark tasting vessels). Meanwhile, a total of 118 participants (age: $M = 29.6$ years, $SD = 8.2$ years; 51 male/female) took part in Experiment 2, in which the beers were sampled from clear glasses instead.¹ All of the participants met the minimum age requirements for drinking beer in Scotland (namely, 18 years).

2.2. Procedure

Barney's Beer, a small independent microbrewery based in Edinburgh (<http://barneysbeer.co.uk/>), created two versions of the same beer, one using finings and the other without.² The beer used was Barney's Vital Juices Session IPA (3.8% ABV) which is one of the brewery's regular beers. It is a 'hoppy/moderately hoppy' beer, with aroma hop additions at 'flame out' (i.e., the end of the boil) and dry hops added post fermentation. The beer served at the Science Festival was dispensed from a British style cask using a traditional hand pull. Two casks were filled on the same day from the same batch, one with finings (Commercial isinglass finings sourced from Murphy & Son were added to the casks at an additions rate of 10 mL per litre), the other without. The fined beer was 're-racked' at the brewery and decanted to a second cask once clarification had taken place (as there was no permanent cellar at the event venue). Both casks were kept in the brewery cold store prior to the event.

¹ According to the required sample size test, roughly 100 participants per group would be needed to give a medium effect size ($d = 0.3$), given the exact hypotheses regarding what was expected to emerge from our data.

² Neither of the beers tested in the present study were filtered. It has also been argued that the use of filtration (the alternative to fining/sedimentation for clarifying a beer) can strip some of the flavour out of a beer. This should perhaps not come as any surprise, though, given that filtration constitutes a more rigorous physical process.

We conducted both blind and sighted tastings of the two beers. In Experiment 1, the participants rated the beers blind (i.e., in obscure black cardboard cups). In Experiment 2, the participants rated them sighted, that is, in clear glasses (see Figure 1). The order of presentation of the two beers (i.e., with or without finings) was approximately counterbalanced within each experiment. In the first experiment, the participants were told that they were tasting a regular beer, but that it was part of an experiment connected to the festival. In the second experiment, if the participants asked why the beer they were tasting was cloudy, they were told that it was unfiltered, fact which may have resulted in a conversation about what exactly finings are.



Figure 1. The two beers served to participants in the present study (Experiment 2). The beer to which finings have been added is shown on the left.

Each participant rated each of the beers on five different scales ranging from 0 to 10, including ‘On average, how often do you drink beer?’, ‘How would you rate the taste of the beer?’, ‘How would you rate the quality of the beer?’, ‘How hoppy do you find the beer?’, and ‘How likely would you be to buy the beer in the future?’ In Experiment 2, the same scales were used, except that the ‘How likely would you be to buy the beer in the future?’ question was replaced by ‘How much do you like the appearance of the beer?’

On average, how often do you drink beer?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Several times a day	(Nearly) every day	A few times a week	Once a week	A few times a month	Once a month	Every few months	Once a year	Less often	Never

How would you rate the taste/flavour of the beer?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9
Very poor				Average				Very good

How would you rate the quality of the beer?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9
Very poor				Average				Very good

How would you rate the hoppiness of the beer?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9	
No discernible hops				Average hops				Very hoppy	

How likely would you be to buy the beer in future?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9	
Very unlikely		Neither likely nor unlikely					Very likely		

3. Data Analysis and Results

For each of the two experiments, each of the scale data sets was analysed with independent-sample *t*-tests with the group factor of finings (with vs. without). The data were analysed using independent-sample *t*-tests and followed up with correlation analyses, according to our a priori hypotheses. The averages of all the ratings collected in both experiments are summarised in Table 1.

Table 1. Means, together with their standard errors (SEs), for all the ratings collected in Experiments 1 (blind tasting from black tasting glasses) and 2 (sighted tasting of beers from clear glasses) for the beers made with and without finings (clear and cloudy beer, respectively).

		<i>How Often?</i>		<i>Taste</i>		<i>Quality</i>		<i>Hop</i>		<i>Buy</i>		<i>Appearance</i>	
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Experiment 1	<i>Without finings</i>	4.0	0.3	6.4	0.2	7.0	0.2	6.7	0.2	5.5	0.3		
	<i>With finings</i>	4.1	0.2	6.6	0.2	7.0	0.2	6.7	0.2	6.1	0.2		
Experiment 2	<i>Without finings</i>	4.3	0.2	6.2	0.2	6.8	0.2	6.8	0.2			6.4	0.2
	<i>With finings</i>	4.0	0.2	6.3	0.2	6.8	0.2	6.3	0.3			7.0	0.2

The analysis of the results of Experiment 1 revealed no discernible difference in terms of taste/flavour, or, in fact, on any of the other response measures between the two beers: How often— $t(115) = -0.227, p = 0.821, d = -0.042$; Taste— $t(115) = -0.752, p = 0.454, d = -0.139$; Quality— $t(115) = 0.156, p = 0.876, d = 0.029$; Hops— $t(115) = -0.042, p = 0.966, d = -0.008$; Willingness to buy— $t(108.1) = -1.34, p = 0.182, d = -0.248$), as a function of the beer that was being tasted (i.e., either made with, or without, the use of finings).

Next, the sighted data from Experiment 2 were analysed. Surprisingly, once again no difference in taste/flavour ratings across the two beers in relation to the use of finings was reported, even though in this case the participants could now clearly see the difference between the two beers: How often— $t(116) = 1.16, p = 0.249, d = 0.215$; Taste— $t(116) = -0.190, p = 0.849, d = -0.139$; Quality— $t(116) = -0.057, p = 0.955, d = -0.011$; Hops— $t(116) = 1.52, p = 0.131, d = 0.282$). The only significant effect was that on the appearance scale ($t(115.08) = -2.33, p = 0.021, d = -0.417$), indicating that, on average, the participants preferred the appearance of the beer that had been made with finings.

Finally, we looked for any correlation between our participants’ visual appearance ratings and their ratings of the hoppiness of the beer in Experiment 2. A significant correlation was observed, revealing that the more the participants liked the appearance of the beer, the higher they rated the hoppiness ($r = 0.231, p = 0.012$).

4. Conclusions

The results of the present study reveal that finings need not impact flavour perception in beer in the way that some commentators might lead you to believe (and as captured, for example,

by the following quote from Justin Hawke of Moor Beer: “Without question, it intensifies aroma and flavour,” quoted in [4].³ Interestingly, if one goes back to Reference ([2], p. 119), the early article on the fining of beer, the author clearly states that the aim of the addition of finings is to “cause this suspended matter to coagulate without altering the p_u , and without removing or adding substances which would affect the taste.” In the present study, the addition of finings appears to have matched Burns’ definition of not changing the taste. That said, our results demonstrate that changes in the visual appearance of the beer were correlated with ratings of the beer’s hoppiness.

Of course, beyond any direct perceptual effects of the appearance (cloudy vs. clear) of a beer, a cloudy appearance of a beer may well trigger certain cognitive beliefs about the origins of, or brewing process involved in, the drink’s creation. Here it is interesting to note what a profound effect such beliefs about e.g., brand, organic, or free-range have been shown to have in people’s ratings of beer and many other foods/drinks [14–17]. Crucially, while such beliefs can be elicited by naming, branding, pricing, and even the weight of the bottle or the use of bottle versus can as the packaging format [18,19], they can also be driven by the visual appearance of the beer too. However, in the case of the largely British social drinkers tested in the present study, no such differences were obtained. That said, there are likely to be cultural differences in the associations that beer drinkers in different parts of the world have with cloudy beer. While cloudy beers are not uncommon on the continent, for many years they have been associated with a poor product in the minds of British drinkers (see [3,8]; see also [20]).

Finally, it is worth remembering that we only tested social drinkers—i.e., those without any particular beer-tasting expertise—in the present study. As such, we cannot rule out the possibility that expert beer-tasters might detect a difference in flavour that was not obvious to the social drinkers under the relatively uncontrolled and noisy experimental conditions offered by the opportunity to test those at a science festival (see [21,22]). Under such noisy and naturalistic conditions, it is also not possible to control if participants had consumed drinks previously and, if so, how much people might have had to drink before they turned up at the experimental counter. That said, it is hard to see how random prior alcohol consumption might have systematically affected the results we report. It is also worth noting that testing those who may have consumed some alcohol beforehand is very much the naturalistic conditions that we would wish to understand.

In future research, it would also be interesting to assess the response of those individuals with an affinity for natural/organic products in order to see whether they respond differently to the randomly selected sample of regular drinkers tested in the present study.

In closing, it is important to stress the fact that the present research only assessed the impact of one kind of finings on the taste of one kind of beer. As such, no broad generalisations about the impact of finings on taste/flavour can be made. Nevertheless, we would like to argue that the present null results do caution against an uncritical claim, such as those that are sometimes found in the literature, that the addition of finings necessarily impairs taste/flavour.

Acknowledgments: CS would like to acknowledge the AHRC Rethinking the Senses grant (AH/L007053/1).

Author Contributions: A.B. and C.S. conceived and designed the experiments; A.B. performed the experiments; G.J. analyzed the data; A.B. contributed materials; C.S., A.B., and G.J. wrote the paper.

Conflicts of Interest: The authors declare no conflict of interest.

³ Given the null results of fining on taste perception reported in the present study, it is perhaps worth looking a little more closely at where the claims for the use of finings impairing the taste of beer comes from. It turns out that a number of the online references to ‘stripping out’ hop flavours seem to have originated from the same source (the owner of Moor Beer; Moor Beer, incidentally, happens to produce, you guessed it, unfinned beer).

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