Quantitative assessment & comparison of preparations of cured *Camellia sinensis* leaves in the United Kingdom

Sophie Cooke,[1] Katy Hickson,[2] Daniella Nice,[3] Aisha McLean,[4] Mikey Warr,[5] Seth Tay Lambert,[6]
George Wormald-Kelly,[7] Daniel Parker,[8] Dale Patrick,[9] Thomas Brooks, and Tom Wilkinson[10, 11, 12]

[1]*Department of Chemistry, University of Manchester*
[2]*School of Architecture, University of Manchester*
[3]*Clinical Biochemistry, CMFT*
[4]*Institute of Neuroscience, University of Manchester*
[5]*School of Electrical & Electronic Engineering, University of Manchester*
[6]*Faculty of Life Sciences, University of Manchester*
[7]*306th Manchester Scout Group*
[8]*School of Health Sciences, University of Salford*
[9]*School of Environment & Development, University of Manchester*
[10]*Institute of Inflammation & Repair, University of Manchester*
[11]*Centre for Imaging Sciences, University of Manchester*
[12]*Tinker Tailor Soldier Sponge*[*]
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Background: Tea is a fundamental part of British life but the best tea is a contentious topic and very subjectively assessed.

Purpose: To determine the best commercially available tea in the United Kingdom in 2012.

Methods: Double blind study. Tea was brewed according to ISO3103:1980. Tea was scored on taste, colour and aroma on a scale of 0 - 10. It was also qualitatively determined if tasters would consume the tea again.

Results: Tetley tea tasted best but was not significantly different from the top 9 teas. Yorkshire tea smelt best but was not significantly different from the top 5 teas. PG Tips tea had the best colouration but was only signigicantly different from Whittard tea. PG Tips scored the highest on cumulative score from the 3 parameters investigated. Participants were most likely to drink 6 of the teas again.

Conclusions: The majority of tea brands aren't significantly different and choice of tea is really down to personal preference. Readers should bear in mind that price doesn't necessarily ensure quality. Future studies could use an improved, standardised scoring system.

Keywords: tea; *Camellia sinensis*; scones; cheesecake; tasting; Yorkshire; PG Tips; Tetley; Trivial Pursuit

I. INTRODUCTION

Tea is an important part of British life and has inspired some of our greatest writers.[5][1] The best tea is very subjective and based on personal preference. It can also prove a hotly debated topic. It is possible, however, to subjectively rank several important parameters of tea - namely taste, aroma and colour.

Of these taste is probably the most important but the other factors are are all part of the experience that is tea. This study will investigate all 3 parameters and their cumulative score.

Another hotly debated topic is the correct method of brewing tea. Fortunately, however, there is an ISO standard to ensure correct sensory testing of tea.[3] Despite the existence of this document though tea lovers will still argue about whether milk should be added before or after the brewed tea (c.f The jam/cream on scones debate). Variations of the brewing method exist between regions and are also affected by personal preference.

This study set out to determine the best commercially available tea in the United Kingdom this year (2012).

II. METHODS

An experiment was carried out to determine the best commercial available infusion of *Camellia sinensis* (tea). 10 people aged between 19 and 26 tasted a selection of both supermarket own brand teas and popular branded teas. All tea tasters were regular tea drinkers and therefore well versed in the tasting of tea.

All experimentation was carried out at Scout House 4.0 in November 2012.

Tea was served at approximately regular intervals with allowances for toilet breaks and an ample supply of scones[1] (with jam & cream), cheesecake[2] and biscuits[3]. Entertainment was provided for all participants via YouTube with highlights including:

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[*] Corresponding author:tom@tinkertailorsoldiersponge.com

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[1] Generously provided by Mr. Brooks
[2] Provided by Tinker, Tailor, Soldier, Sponge
[3] Provided by Tinker, Tailor, Soldier, Sponge

- Cup of Brown Joy by Professor Elemental[2]

- Tea Making Tips[4]

- Tea Chemistry[7]

Following the conclusion of the tea tasting a friendly game of Trivial Pursuit was carried out while results were collated and the tea brands revealed to the participants.

A. Teas

Red label own brand tea (or it's nearest equivalent) was purchased from every major supermarket chain within a 3 mile radius.[4] A selection of popular[5] branded teas were also purchased. Table I shows the price of tea per box and per bag.

Tea Brand	Price per box	Price per bag
ASDA	£1.31	£0.03
Clipper	£2.55	£0.03
Lancashire	£1.74	£0.02
Marks & Spencer	£2.58	£0.03
Morrisons	£1.30	£0.03
PG Tips	£1.35	£0.03
Sainsbury's	£1.31	£0.02
Tesco	£0.70	£0.02
Tetley	£1.23	£0.03
Twinings	£5.70	£0.04
Typhoo	£2.29	£0.03
Whittard	£3.95	£0.08
Yorkshire	£5.99	£0.02

TABLE I. Tea brands by price. Price per bag is given to the nearest penny.

B. Blinding

The teas were prepared in a separate room by the two researchers present who did not enjoy tea. Teas were arranged by colour and height of box to randomise the order in which they were brewed. Tasters labelled the teas A to M and after completion of all tasting the brewers provided a key so that analysis could be carried out (Table II).

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[4] Waitrose was outside this range.
[5] This was decided based on personal opinion of the tasters and by their prevalence in popular culture.

Assigned letter	Tea Brand
A	Sainsbury's
B	Whittard
C	Typhoo
D	Morrisons
E	ASDA
F	Tesco
G	Marks & Spencer
H	Clipper
I	Twinings
J	Yorkshire
K	PG Tips
L	Lancashire
M	Tetley

TABLE II. Tea brands and their assigned letter during blinding.

C. Brewing

The tea was brewed according to the ISO Standard for brewing tea with some modifications.[3] In brief:

- The pot should be white porcelain or glazed earthenware and have a partly serrated edge. It should have a lid that fits loosely inside the pot.

- If a large pot is used, it should hold a maximum of 310 ml ($\pm$8 ml) and must weigh 200 g ($\pm$10 g).

- If a small pot is used, it should hold a maximum of 150 ml ($\pm$4 ml) and must weigh 118 g ($\pm$10 g).

- 2 grams of tea (measured to $\pm$2% accuracy) per 100 ml boiling water is placed into the pot.

- Freshly boiling water is poured into the pot to within 46 mm of the brim. Allow 20 seconds for water to cool.

- The water should be similar to the drinking water where the tea will be consumed

- Brewing time is six minutes.

- The brewed tea is then poured into a white porcelain or glazed earthenware bowl.

- If a large bowl is used, it must have a capacity of 380 ml and weigh 200 g ($\pm$20 g)

- If a small bowl is used, it must have a capacity of 200 ml and weigh 105 g (20 g)

- If the test involves milk, then it is added before pouring the infused tea.

- Milk added after the pouring of tea is best tasted when the liquid is between 65 - 80°C.

- 5 ml of milk for the large bowl, or 2.5 ml for the small bowl, is used.

Due to a lack of suitable bowls standard tea cups were used. 5 tea bags were used in each teapot as it was not possible to accurately weigh the tea. As the tasters had different preferences for milk and sugar they were allowed to add milk and sugar to taste as long as they were consistent between teas. The teapot was always passed counter-clockwise to ensure that the brewing time was consistent for each taster.

D.   Scoring

Tea tasters were asked to rank each tea on a scale from 0 to 10. 3 categories were assessed:

- Taste

- Aroma

- Colour

A further qualitative question was asked: Would you drink this tea again?. Finally tasters were advised to leave any comments they had about the teas.

III.   RESULTS

A.   Taste

Tetley tea scored the highest for taste with an average of 6.57±0.34. There was no significant difference, however, between Tetley and the rest of the top nine teas. Tetley was significantly better (P <0.05) that Morrisons, Lancashire, Whittard & Sainsbury's. Sainsbury's scored the lowest with an average of 4.67±0.47. Figure 1 shows the results in full.

B.   Aroma

Yorkshire tea scored the highest for aroma with an average of 6.43±0.45. There was no significant difference, however, between Yorkshire and the rest of the top five teas. Yorkshire was significantly better (P <0.05) than Twinings, Typhoo, Clipper, Morrisons, ASDA, Tesco, Whittard & Sainsbury's. Whittard scored the lowest with an average of 3.80±0.78. Figure 2 shows the results in full.

C.   Colour

PG Tips tea scored the highest for colour with an average of 8.33±0.61. There was no significant difference, however, between PG Tips and the rest of the teas except Whittard. PG Tips was significantly better (P <0.01) than Whittard only. Whittard scored the lowest with an average of 4.44±0.39. Figure 3 shows the results in full.

D.   Cumulative Score

PG Tips tea scored the highest with a cumulative score[6] of 20.19±0.80. Yorkshire came in 2nd place and Tetley in 3rd. The worst tea by far on cumulative score was Whittard with a score of 13.04±1.04. Figure 4 shows the results in full.

E.   Drink Again?

Table III shows the teas ranked by whether participants would consider drinking them again in future.[7] This correlated loosely with the ranking for taste (R^2 = 0.5416). ASDA, Clipper, PG Tips, Tesco, Tetley & Yorkshire all ranked highly with half of the particpants willing to drink them again. Sainsbury's was the least likely tea to be drunk again.

Brand	Score
ASDA	5
Clipper	5
PG Tips	5
Tesco	5
Tetley	5
Yorkshire	5
Morrisons	4
Twinings	4
Typhoo	4
Whittard	4
Lancashire	3
Marks & Spencer	3
Sainsbury's	1

TABLE III. Responses to the question "Would you drink this tea again?" ranked in order highest to lowest.

F.   Comments

Only one participant left comments for all teas. The other participants only left comments when they had a particular strong opinion to convey.

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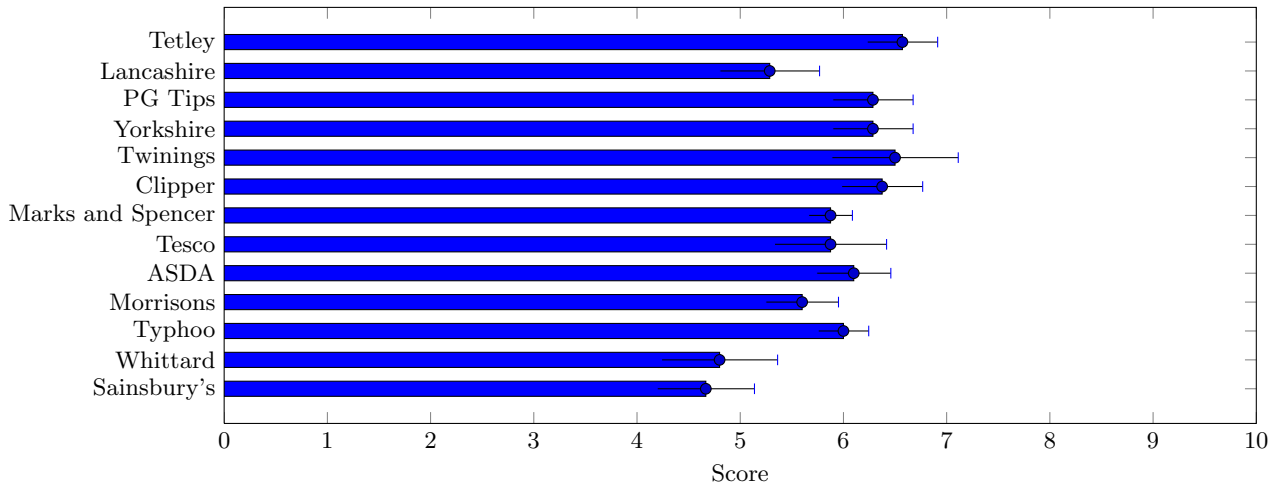[6] Addition of the three categories.
[7] Outside of test conditions

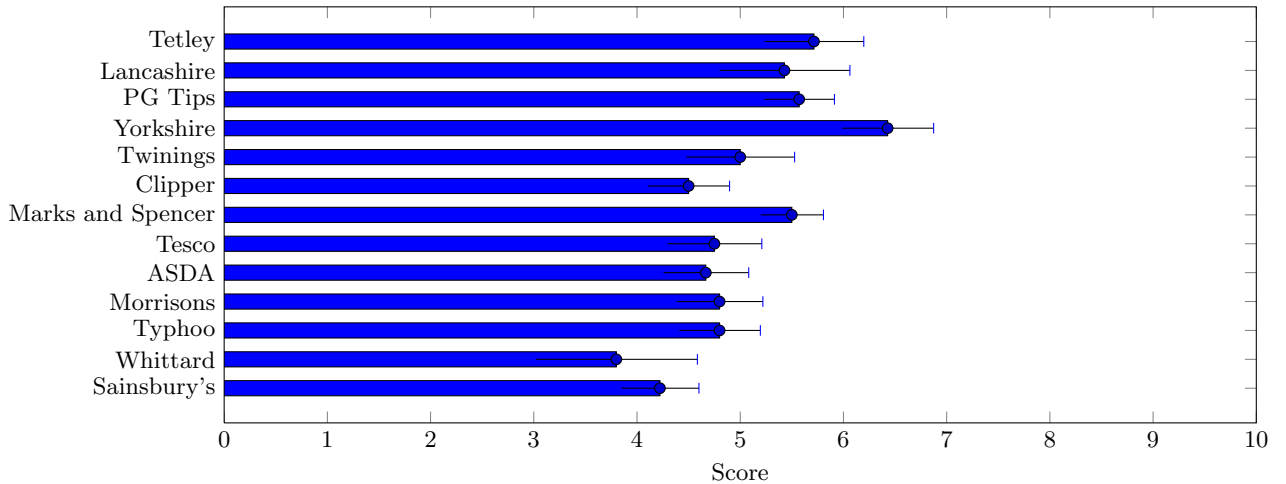FIG. 1. Taste by brand. Tetley tea scores the highest with an average value of 6.57±0.34.

FIG. 2. Aroma by brand. Yorkshire scores the highest with an average of 6.43±0.45.

One participant found Marks & Spencer's tea to taste "bitter" and PG Tips was described as "nasty" by another. Despite winning on taste one participant described Tetley tea as "flavourless but drinkable".

Both Sainsbury's & Whittard had negative comments about there aroma and taste. Sainsbury's was described as having a "bad smell" by one participant and simplay as "Bleurgh!" by another. Whittard (the tea which scored worst on aroma) was described as both smelling "chemically" and "like ass!".

Finally Yorkshire tea was found to smell like pumpkin by two participants and vegetables by another.

G. Confounding Factors

One participant unused to the sheer volume of tea consumed was sick after their eighth tea sample. Results for their ninth tea were very low and were ignored for the purposes of analysis as they later commented that they were still feeling sick when that tea was sampled.

IV. CONCLUSIONS

Seasoned tea drinkers failed to find a significant difference in taste between the top 9 teas. This is likely due to competition between the brands for a 'generic brew'. Lancashire and more surprisingly Sainsbury's and Whittard teas were significantly worse in taste.

Participants failed to find a significant difference between the top 5 teas' aroma. Yorkshire was found to have the best aroma with Whittard scoring lowest.

Participants also failed to find a significant difference between the teas for colour with the exception of Whittard which scored significantly worse than the others. Previous experience in reviewing teas for Tinker, Tailor, Soldier, Sponge where colour is usually described as
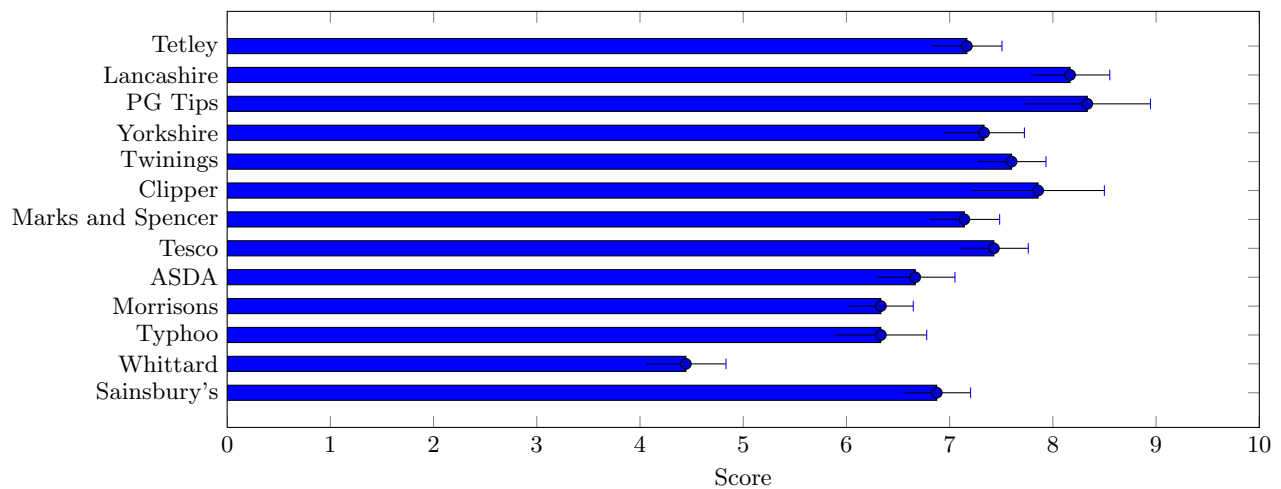
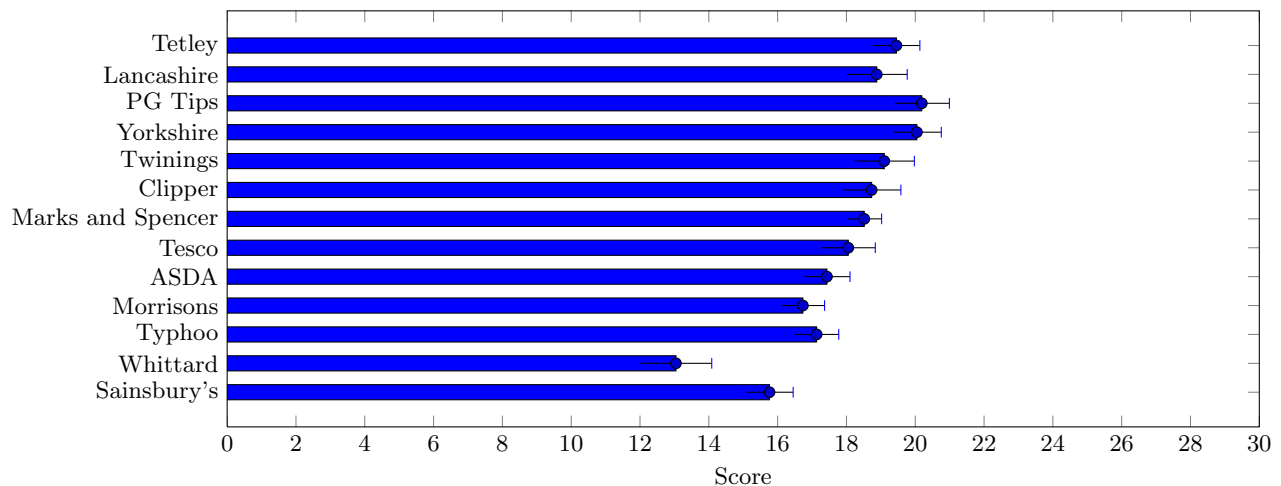FIG. 3. Colour by brand. PG Tips scores the highest with an average of 8.33±0.61.

FIG. 4. Cumulative Score by brand. PG Tips scores the highest with an average of 20.19±0.80.

"brown" or variations on that theme mean that little variation was expected. Whittard scored poorly because of its grayish hue.

When the cumulative score was calculated PG Tips came out highest only just ahead of Yorkshire and Tetley. However, these top 3 teas are all within error of each other. Whittard, the most expensive tea per bag, scored the worst overall. Price cannot be said to necessarily ensure a good cuppa though this study did limit itself to bagged teas. A future study could well be conducted into whether leaf tea is significantly better than bagged tea.

5 of the tea brands (ASDA, Clipper, PG Tips, Tetley, Tesco, Yorkshire) would be drunk again by at least 5 participants. Interestingly Whittard would be drunk again by 4 participants despite it's low overall score. It is possible that this tea is an acquired taste as looking at the raw data it was clearly favoured by 4 participants (scores between 6 - 7) while the other participants gave low scores (<5). There seems to be strong agreement that Sainsbury's tea would not be drunk in the future by

participants (only 1 participant would drink again).[8]

In future studies an improved, standardised scoring system could be used to improve comparison between the teas and reduce errors.

Overall it would appear there is little difference between the major tea brands and supermarket own brands.[9] Despite these results, however, most tea drinkers are staunch supporters of a few, if not one, brand. It is possible that these differences would be hidden by a study of this size as if every participant were to rank their favourite highest the score would still average out. It could also be a symptom of brand psychology.[6]

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[8] The inhabitants of Scout House 4.0 have sadly been lumbered with the remaining 70 odd bags.

[9] With the exception of a few particularly poor teas.

[1] Douglas Adams. *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time*. William Heinemann Ltd., London, 2002.

[2] Professor Elemental. Cup of brown joy. YouTube, 2008.

[3] International Organization for Standardization. ISO 3103:1980 - Tea - preparation of liquor for use in sensory tests, 1980.

[4] British Film Institute. Tea making tips, 1941.

[5] George Orwell. *The Collected Essays, Journalism and Letters of George Orwell*. Penguin Books, 1968.

[6] Bernd Schmitt. The consumer psychology of brands. *Journal of Consumer Psychology*, 22:7–17, January 2012.

[7] Periodic Videos. Tea chemistry - periodic table of videos, 2009.