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NEWS & VIEWS
Art and science of tea brewing

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The art of brewing tea is to select and adjust the parameters of brewing so that any desired result can be achieved from any given tea. The science of brewing tea relates to an understanding of all the factors that influence the brewing and extraction of tea flavour. The conclusion is that from any sample of large leaf tea it is possible to make a much stronger cup of tea with more flavour and less astringency and bitterness by grinding the tea and brewing for 30 sec. It is now possible to make tea concentrates to create tea 'cuppatino' with frothed milk or iced tea in 30 sec.

The whole history of tea brewing innovation has been to devise ways to brew teas without bitterness rather than to get a better brewing process. The great majority of books about tasting tea present tea as a two dimensional product – with or without bitterness. This is incorrect as there is a third aspect which is ignored almost completely – astringency. This is not surprising because if you follow standard brewing instructions on packets of tea in the West for leaf tea and standard practice in tea tasting rooms, tea is brewed for 3–5 min and astringency is always present. In fact there are two types of bitterness – bitterness at the back of the throat caused by over brewing and the presence of tannin, and astringency which is detected at the sides of the tongue. The astringency only seems to be absent when the brewing time is 30 sec or less for all sizes of tea leaf. With extended brewing there is increasing astringency.

The principles of brewing tea relate to the following:

1. The smaller the leaf size the larger the surface area and the faster and more complete the extraction

2. The extraction is related to the time of brewing AND the surface area

3. If sufficient water is used with any tea and there is bitterness from astringency or tannin, it will be diluted until it is barely recognizable.

4. The tea leaf is similar to a potato in having the flavour spread evenly through the leaf rather than a tomato where the surface pulp is totally different to the seeds inside the tomato.

5. The extraction only takes place on the surface of the leaf and not internally. This can easily be proven by making the following test. Brew large leaf tea, drain off the liquid, dry the extracted leaf until it is brittle, grind it finely and brew it again. It will be obvious that there is a majority of flavour left unextracted in the brewed leaf. Conversely, brew large leaf tea and drain the liquid off and brew again – there is hardly any extraction at all.

6. Tea leaves brew best where there is turbulence. When the leaves are trapped in teabags or any form of filter container, there is reduced extraction unless there is vigorous agitation.

7. Tea sinks. When tea leaves are allowed to brew undisturbed at the bottom of the pot, the extract remains between the tea leaves and is distributed through the whole pot when the leaves are stirred.

8. Brewed tea in a pot will become layered if not stirred.

9. Tea staling is related to oxidation. If you take an oxidized aluminium sheet, the oxidation will be on the surface and acts as a barrier to oxidizing the sheet underneath. The same occurs with tea – the tea oxidizes on the surface and remains fresh underneath. This can easily be demonstrated by taking leaf tea and grinding it. Brew the large leaf and the ground tea – there will be little aroma or flavour from the large leaf and much more aroma from the same tea ground.

10. Freshly ground large leaf tea will have a better flavour than stale small leaf tea.

11. The hotter the water, the greater the extraction. One study shows that for every ten degrees Celsius that the temperature is lowered, the extraction is reduced by one half, i.e a 20°C reduction in temperature results in a 75% reduction in flavour.

12. The level of concentration of flavour is important, too high a concentration of flavour from using too much tea will at some point be unpleasant and too much

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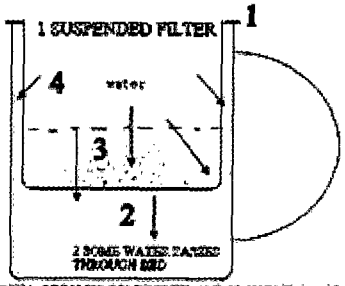
dilution will make the liquor unrecognizable as tea.

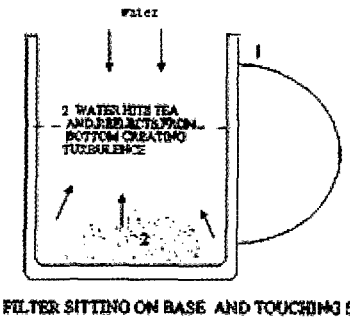
13. The astringency seems to come out only when the brewing time is more than 30 sec for all sizes of tea leaf. With extended brewing, there is increasing astringency.

14. Tea made through a suspended filter where there is little turbulence will have a different extraction rate to the same tea made in a filter which sits on the bottom of the vessel and reflects the poured water to make turbulence which causes each particle of tea to be surrounded by hot water for maximum extraction. Pouring boiling water over tea suspended in a filter causes the leaves to be compressed and the water runs out the side of the filter without contacting all the tea and properly extracting the tea.

The position of a filter in a brewer is important. If it is suspended, the brewing is inefficient. If it rests on the bottom, the result is turbulence and each particle of tea is surrounded by water and the result is maximum extraction.



In a conventional filter the water trying to pass through the tea compresses it and finds it easier to pass through the side wall of the filter. Much of the water does not even touch the tea which remains effectively under brewed.



When the filter rests on the bottom the water is reflected from the bottom causing turbulence. Fannings/ dust can be used giving an extremely short brewing time around 30 seconds. After steeping the filter is lifted out and drains leaving a mug of hot tea.

The brewing process passes through three tasting phases

1. Flavour alone – brewing time up to 30 seconds;

2. Flavour and astringency – brewing time more than 30 seconds and less than 5 minutes;

3. Flavour with astringency and tannin bitterness.- brewing time more than 5 minutes.

Taking all these factors into account it should be a simple matter to design a cup of tea – weak, strong, bitter, smooth.

It follows from all the points above that all the intrinsic characteristics of a tea are released if it is brewed in small leaf form in a brewer where there is turbulence for 30 seconds. The result will be a tea with maximum flavour without bitterness and very little astringency.

If a larger leaf is used, there will be less flavour, more astringency and possibly bitterness.

If a stale large leaf tea is used as the basis and then ground, it will have a different and better flavour because the fresh solubles from the interior of the leaf will be released and it will have more aroma.

If CTC tea, fannings and dust are vacuum packed within 24 hr of manufacture, the essential freshness of the tea will be preserved much longer than the UPASI research results of 3 months life shows.[1,2]

The Chaicoffski tea filter above has been designed to make a strong cup of tea without bitterness. The filter is made from 60-mμ stainless steel mesh.

The tea is brewed with the filter sitting on the bottom and after 30 sec removed to separate the tea leaves from the brewed tea.

Tea and Health from Small Leaf Tea

The following results[3] in Table 1 show the results of extracting polyphenols (antioxidants) from fannings for 30 sec and large leaf green tea for 5 min.

Interpretation

Tea Polyphenols are the antioxidants.

Line one twice means three grams of tea through Tea-Cha filter produce 25.8 g TP compared with line 3 = 9.5 g TP long leaf tea – 171% increase.

Line one times 3.33 means 5 g of tea is used compared to line 4 = 5 g long leaf tea. 12.9 × 3.333 = TP 42.99 compared with line 4 = TP 10.5 means 4.09 times as much TP weight for weight.

Three and a third cups of large leaf of 5 g tea brewed for five minutes produce as much TP as one cup fannings

Table 1: Test Results

Sample No.	Test Items	Units	Test Results
1. Broken Tea (1.5 g, First Cup) [in Tea-Cha filter]	TP	g/100 g	12.9
2. Broken Tea (1.5 g, Second Cup) [in Tea-Cha filter]	TP	g/100 g	5.6
3. Long Leaf Tea (3.0 g, 5 min) [in Tea-Cha filter]	TP	g/100 g	9.5
4. Long Leaf Tea (5.0 g, 5 min) [in Tea-Cha filter]	TP	g/100 g	10.5

TP, tea polyphenols.

green tea made from 1.5 g brewed for 30 sec.

If you brew the tea twice – add lines 1 and 2, TP = 18.5 or 5.3 times as much TP as line 4.

The Tea-Cha filter brewed tea for 30 sec.

Conclusion

The Tea-Cha filter using fannings produces much greater health benefits. The Chaicoffski filter can be used to brew tea for 30 sec also.

Explaining Chinese tea brewing

Chinese tea brewing culture can be explained using the principles above. The traditional method uses a lot of green tea leaves in a very small pot. The first brew is thrown out, allegedly because it is to wash the tea but it seems that this is the only time that tea is washed when making tea. Other methods do not involve washing the tea at all which indicates that the washing is for another purpose. The first brew is very strong and could be unpleasant so it is discarded. Thereafter many small pots of tea are brewed with very short brewing times and the tea poured into very small cups. The process is repeated many times. Each successive brewing cycle extracts a little more of the tea essence until there is no more extraction possible with this method. By reducing the temperature for different teas, less extraction takes place at each brewing and more remains for later brews. As far as I can see, there is no scientific evidence that different brewing temperatures actually achieve better results. Ultimately the Chinese tea ceremony can be seen as a social occasion involving tea. Around 12% of tea in China is made the traditional way.

Water at lower temperatures is commonly recommended.

"A number of substances in the leaf contribute to the flavor and aroma of green tea. The overall flavor and sweetness of green tea is determined by a variety of amino acids and natural sugars. Bitterness and astringency are contributed by polyphenols ("tannins"). Amino acids dissolve at 140°F (60°C) while tannins dissolve at 176°F (80°C). Therefore, brewing green tea at lower temperatures will ensure that its sweet and complex flavors will not be overpowered by the bitter-tasting flavors."[4]

It is important to note that no brewing time is specified.

It can be seen that every variation of time and temperature is used to brew Chinese and Japanese tea without bitterness irrespective of the amount of tea needed to get a good result.

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