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Analysis of tea powder for adulterant

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Abstract: *In the present study 25 sample of tea were collected from the local market of the Allahabad, Bhadohi, and Varanasi and were analyzed for the purpose to check the adulteration in it. Both branded as well as unbranded sample were selected for study to determine the presence of iron filling, leather, caffeine, catechu, coal tar, sand, bulk density and pH were determined. After the tests it was found that out of 5 branded sample 3 adulterated by the coal tar and iron particle, 4 sample was adulterated by the catechu and out of 20 non-branded samples 9 sample adulterated by the coal tar, 17 sample adulterated by the iron particle,13 samples adulterated by the catechu. The products containing adulterants were identified in branded and non- branded tea sample. This study after completed to bring in awareness to the public on the important subject to adulteration in tea and various simple methods available to detect adulteration in tea.*

Keyword; *Adulteration, Tea Powder, Caffeine, Iron Filling, Forensic Science*

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I. Introduction

Drinking tea plays an important part in our lives, it is such a universal phenomenon with millions of people the world take the tea on a daily basis, that it is a very critical to assuming a world without tea and yet while the Eastern world has been using tea since more than 5000 years.

Tea is composed by different types of many components. These components have various effects depending upon the amount of tea ingested and the quality of the tea a part from that tea having various useful properties which are helpful for human body. Indian scenario every person are regular user of Tea, but they not aware about presented not permitted materials in tea which play harmful effect. Now, different brand and non-brand Tea Powder are available they are containing different type of not permitted materials. Tea is divided in to10 types, Anti-Acidity Tea, Anti-Aging Herbal Tea, Anti-Cough Tea, Green Tea, Herbal Tea, Lemongrass Tea, Moringa Green Tea, Organic Tea, Orthodox Tea, and Slimming Tea.

II. Methodology

Suspected 25 tea samples were collected from different local market of Allahabad, Bhadohi and Varanasi and labelled as S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, and S25.Sample S14, S15, S16, S17, S25 branded sample and sample S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S18, S19, S20, S21,
S22, S23, S24 non branded sample.
After collection various tea samples where tested for presence of different not permitted ingredient such as iron particle, coal tar, leather flakes, sand, catechu as well as caffeine, bulk density and acidity.

2.1 Method for determination of various not permittedingredient

Determination of various not permitted ingredients with help of the different physical and chemical test., for iron particle gets separated by using a magnet through the sample, for coal tar sample is melted in a test tube and 5 ml of dilute sulphuric acid or concentrated Hydrochloric acid to it if Pink colour or crimson colour is produced then coal tar dye present. For leather flakes Small quantity of tea sample was taken in spatula and burnt. If a small amount of sample is placed on it the leather flakes if present emits an odour. For sand If any sediment is formed by shaking leaves with water means sand is present. For catechu a porcelain dish is washed with dilute solution of ferric chloride and suspected tea solution is added to it, if catechu is present. A green ppt.isformed.

2.2 Determination ofcaffeine:

10 g. Tea sample were taken in 400-ml beaker from each collected sample of Tea powder, and 150 ml water was added to it. All suspected tea samples was boiled for about 30 minutes and filtered into another clean beaker. To the filtrate, 10% aqueous solution of lead acetate was added with constant stirring until no precipitate was seen. The resulting mixture was thoroughly stirred and then filtered by filter paper. The filtration

was transferred to another clean beaker. The filtrate was transferred to another clean beaker and concentrated by boiling to a volume of about 25ml. This was cooled to room temperature. 25ml of chloroform was added to the cold filtrate which was stirred thoroughly with a glass rod. The resulting mixture was transferred into a clean separation funnel. When the mixture separated in to two distinct layers, the lower chloroform layer was separated in to clean distillation flask. To the aqueous layer , 20 ml of chloroform was added and the mixture was shaken well. After some time the two phases separated and the lower chloroform layer was once again collected in to a china dish. The aqueous layer was once again extracted with another lot of 20 ml of chloroform. Collect the chloroform in pre weighed using an analytical balance.

$$\text{Percentage of adulterant} = \frac{\text{weight of substance obtained}}{\text{weight of powder taken}} \times 100$$

2.3 Procedure for analysis of bulkdensity:

The bulk density defines as the ratio of the mass of the powder to its bulk volume.

$$\text{Bulk density} = \frac{mass of the powder}{\text{Bulk volume}}$$

The bulk density determine as, a weight quantity of tea sample was insert into a graduated measuring cylinder. The measuring cylinder was tapped manually till a constant volume was obtained .This volume is known as the bulk volume of the tea.

2.4 Determination ofacidity:

2 g. Tea sample were taken in clean beaker from each collected sample of Tea powder, and 20 ml. of water was added to it. The solution was heated till it boiled, after which the beaker was kept covered and allowed to stand for cooling at room temperature. After cooling filter the solution with help of the filter paper. Take filtrate in a clean test tube and using the digital pH meter.

III. Result And Discussion

After analysis of the tea samples with help of the physical and chemical test found that out of 5 branded sample 3 adulterated by the coal tar and iron particle, 4 sample was adulterated by the catechu and out of 20 non-branded samples 9 sample adulterated by the coal tar, 17 sample adulterated by the iron particle,13 samples adulterated by the catechu.

Table 1. Determination of adulteration in tea and coffee samples

S.No	**Sample no.**	**Presence of different types not permitted ingredients**				
		Iron fillings	*Coal tar*	*Leather flakes*	*Sand*	*Catechu*
1	S1	yes	no	no	no	yes
2	S2	yes	no	no	no	yes
3	S3	no	no	no	no	no
4	S4	yes	yes	no	no	no
5	S5	yes	yes	no	no	yes
6	S6	yes	no	no	no	yes
7	S7	yes	yes	no	no	no
8	S8	yes	no	no	no	yes
9	S9	yes	no	no	no	yes
10	S10	no	no	no	no	yes
11	S11	yes	no	no	no	yes
12	S12	yes	yes	no	no	no
13	S13	yes	no	no	no	no
14	S14	yes	yes	no	no	yes
15	S15	yes	yes	no	no	yes
16	S16	no	yes	no	no	yes
17	S17	no	no	no	no	no
18	S18	yes	no	no	no	yes

19	S19	yes	yes	no	no	no
20	S20	yes	yes	no	no	yes
21	S21	yes	no	no	no	yes
22	S22	yes	no	no	no	yes
23	S23	yes	yes	no	no	no
24	S24	yes	yes	no	no	yes
25	S25	no	no	no	no	yes

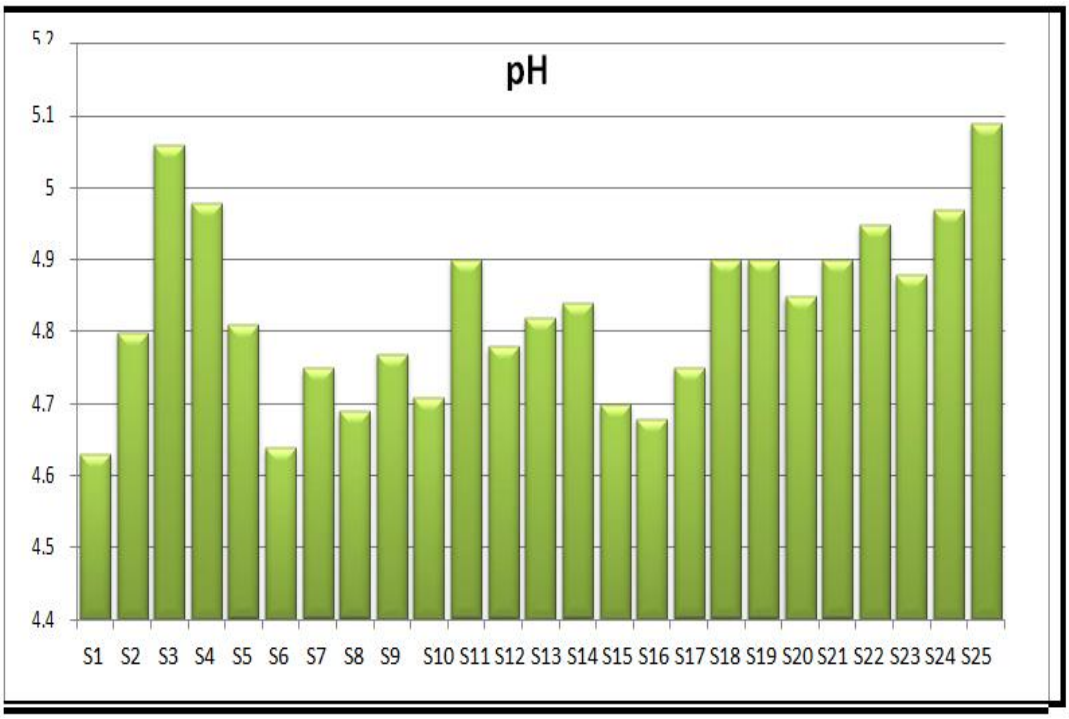

Figure 1: pH of the different brands of tea powder

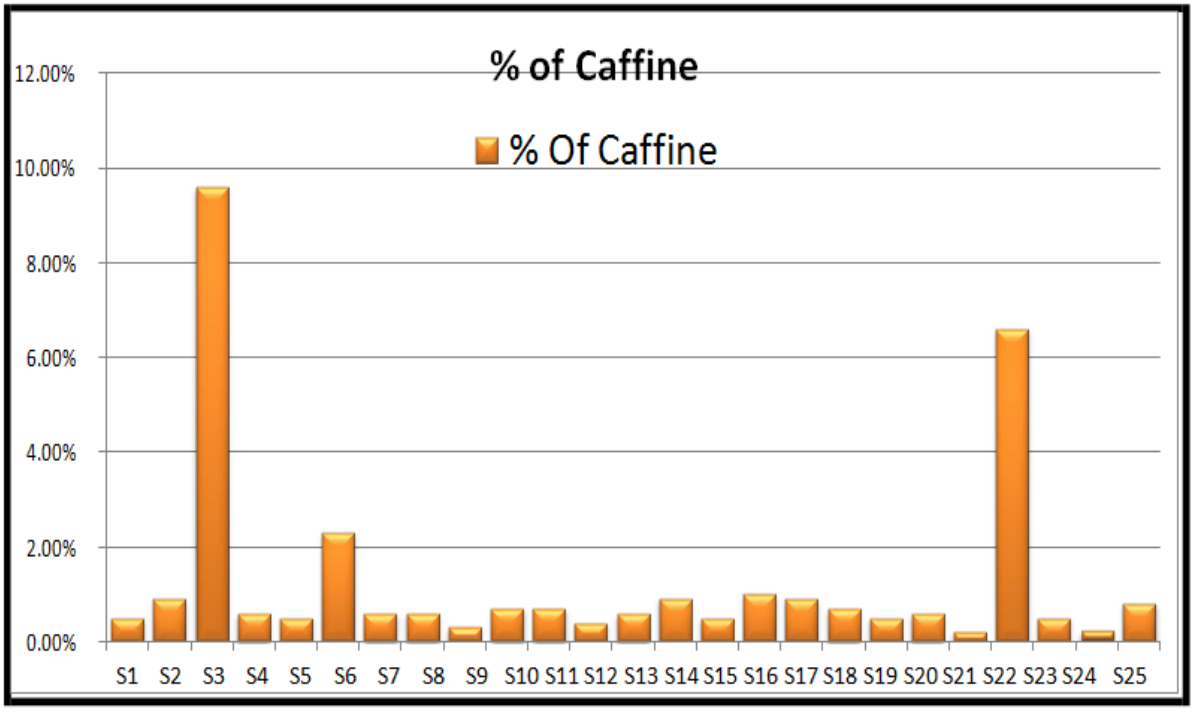

Figure 2: Caffeine content of the different brands of tea powder

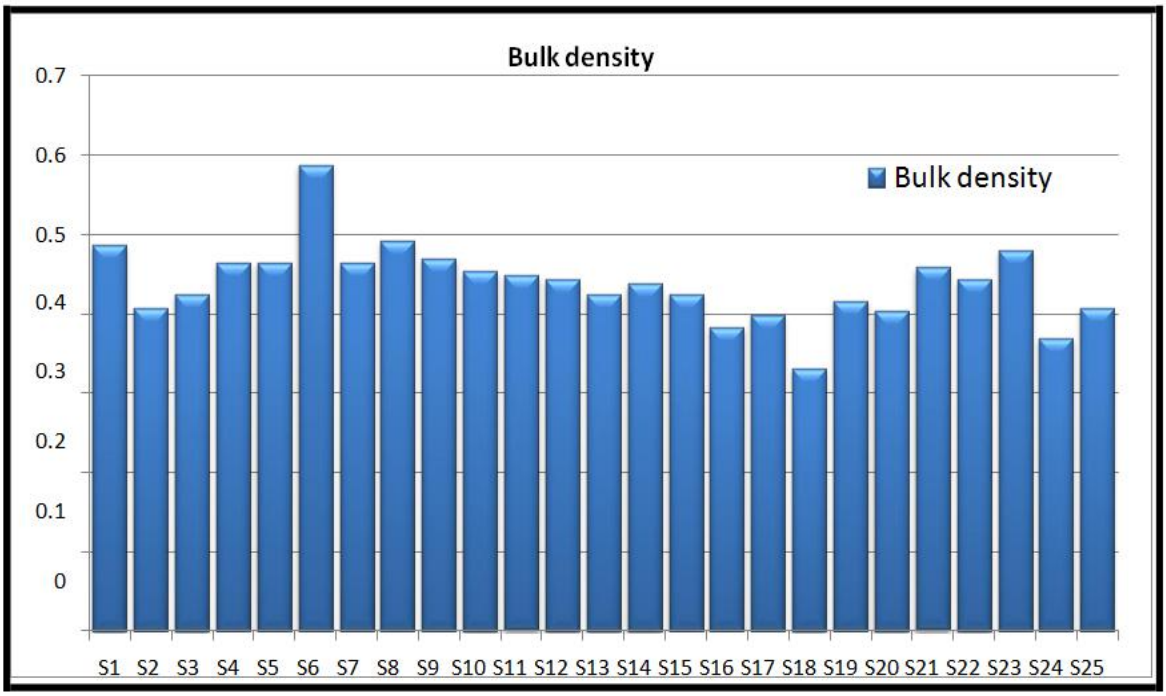

Figure 3: Bulk Density of the different brands of tea powder

IV. Discussion

Tea acidity and taste: The results [Figure 1 and Table 2] showed that the tea sample S6 had the lowest pH among the products tested, sample S3 and S25 showed a pH of 5.09, which ranks both products as having the highest pH. The rest of the products fall in between, with pH of 5.0. With regard to the taste of the products, the results show correlation between the pH and the taste

Table 2 determination of acidity of tea samples

S.no.	Sample	pH
1	S1	4.63
2	S2	4.80
3	S3	5.06
4	S4	4.98
5	S5	4.81
6	S6	4.64
7	S7	4.75
8	S8	4.69
9	S9	4.77
10	S10	4.71
11	S11	4.90
12	S12	4.78
13	S13	4.82
14	S14	4.84
15	S15	4.70
16	S16	4.68
17	S17	4.75
18	S18	4.90
19	S19	4.90
20	S20	4.85
21	S21	4.90
22	S22	4.95
23	S23	4.88
24	S24	4.97
25	S25	5.09

Caffeine content: The results [Table 3 and Figure 2] show that sample S3 has the highest caffeine content of 9.60%/25 grams of tea. The lowest caffeine content was seen in sample S24, which had only 0.20%the other products fall in between.

Table 3 Determination of caffeine

S.No.	Sample	% of Caffeine
1	S1	0.50%
2	S2	0.90%
3	S3	9.60%
4	S4	0.60%
5	S5	0.50%
6	S6	2.30%
7	S7	0.60%
8	S8	0.60%
9	S9	0.30%
10	S10	0.70%
11	S11	0.70%
12	S12	0.40%
13	S13	0.60%
14	S14	0.90%
15	S15	0.50%
16	S16	1.00%
17	S17	0.90%
18	S18	0.70%
19	S19	0.50%
20	S20	0.60%
21	S21	0.20%
22	S22	6.60%
23	S23	0.50%
24	S24	0.20%
25	S25	0.80%

Bulk density: The results[Table 4 and Figure 3] showed that tea sample S6 Contains Very High density and tea sample S18, S24 Contains low bulk density [Table 2 and Figure 3]. That could be seen since the other 22 products were having Bulk Density Between 0.4 to 0.49i.e the space occupied for air is more that the particles.

Table 4. Bulk Density of the seven different brands of Tea powder

S.No.	Sample	Bulk density
1	S1	0.487
2	S2	0.408
3	S3	0.426
4	S4	0.465
5	S5	0.465
6	S6	0.588
7	S7	0.465
8	S8	0.493
9	S9	0.470
10	S10	0.454
11	S11	0.449
12	S12	0.444
13	S13	0.426
14	S14	0.439
15	S15	0.425
16	S16	0.384
17	S17	0.400
18	S18	0.333
19	S19	0.416
20	S20	0.404
21	S21	0.459
22	S22	0.444
23	S23	0.481
24	S24	0.370
25	S25	0.408

V. Conclusion

After analysis it was found that out of 5 branded sample 3 adulterated by the coal tar and iron particle, 4 sample was adulterated by the catechu and out of 20 non-branded samples 9 sample adulterated by the coal tar, 17 sample adulterated by the iron particle,13 samples adulterated by the catechu. The variation in their content may be due to difference in manufacturing process. Adulteration tests performed showed that some adulterants are mixed with the tea sample which is a matter of concern. Further elaborative studies are required in this respect.

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