

## THE MOISTURE CONTENT OF MADE TEA.

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In the last number of this Journal it was stated that properly fired tea should contain 3-5 per cent of moisture and that tea should be packed containing 5-6 per cent of moisture. If tea is packed with more moisture than allowed above, it is liable to go off on storage and in transit. Such teas are usually reported on as being flat and sometimes as tainted.

The reason that teas containing a high moisture content deteriorate on keeping is that certain changes which are not yet understood can take place in a moist tea, and during packing and handling tea is liable to pick up any micro-organisms that may be on the floor or in the air of the factory. These organisms will flourish on a moist tea and produce mushiness or mouldiness in the tea.

The usual causes of high moisture content in tea are:—

- (1) Improper firing of the fermented leaf.
- (2) Absorption of moisture during grading and storage.

If the fermented leaf is passed through the firing machine too quickly the discharged tea will contain too much moisture and this is a common fault, especially when a light wither is taken. When the exhaust temperature is too high and a light wither is taken, case-hardening occurs and again teas with a high moisture content are discharged. When this occurs it will be generally accompanied by blistering, especially in the big bulk, and a moisture content of the order of 9-10 per cent will be found in the discharged tea.

Although tea may be discharged from the drier with the proper amount of moisture it will absorb moisture under certain conditions which are fairly well known. According to Deuss, (*De Thee*, September, 1926 pp. 96-101) an illustration of the absorptive capacity of tea for water is that cigars can be kept dry by storing them in tea in a stoppered bottle. He found that when tea was kept in a dry atmosphere, such as is obtained over quicklime, it lost moisture until the moisture content was about  $\frac{1}{2}$  per cent. The greatest loss occurred during the first two days, and after twelve days the teas had deteriorated in quality. Tea should not, therefore, be dried too far. All teas stored in an atmosphere of 50% humidity lost moisture, while teas exposed to a saturated atmosphere absorbed moisture until they contained 26.5%. In an atmosphere of 70-80% humidity teas with the high moisture content of 14.8-15.8% lost moisture, while those containing 1.9% gained moisture. The conclusions drawn by Deuss and which have been previously published in the first issue of this journal by Petch were:—

- (1) If the relative humidity of the air is not above 60-65% made tea should be sifted and stored within two days.
- (2) If the relative humidity of the air is about 70-80% made tea should be sifted and stored within twenty-four hours.
- (3) The sifting room should be as damp-proof as possible and it should be capable of being dried by drawing in warm air. It is preferable to have a humidity of 60-65%.
- (4) If the humidity in the sifting room is less than 55% the tea loses moisture. It is not desirable to put tea on the market with too low a moisture content, since it is bad for quality and uneconomic.

In practice it is found that properly fired tea will pick up moisture very rapidly, even when kept overnight in boxes, graded and stored within 24 hours. This will be seen from the data supplied in the following table:

**CHANGES IN MOISTURE CONTENT OF TEA DURING GRADING ETC.**

		<i>Moisture</i> %	<i>Moisture</i> %	<i>Moisture</i> %
Dhool after firing	1.2.3	2.75	3.18	4.25
	4	2.58	3.08	4.70
	B. B.	2.55	3.25	5.08
Next morning before grading	1.2.3	4.67	5.85	6.17
	4	7.60	6.41	7.40
	B. B.	7.96	6.28	8.46

		<i>Moisture</i> %	<i>Moisture</i> %	<i>Moisture</i> %
B.O.P.	...	6.35	6.77	5.47
B.P.	...	8.85	7.51	7.08
Flowery Pekoe	...	5.66	5.83	7.00
Pekoe	...	7.95	8.07	8.80
Fannings	...	8.08	7.34	7.66
Dust	...	7.47	6.75	7.30
Broken Mixed	...	8.70	7.65	8.25
Pickings	...	8.90	8.04	9.32
Fluff	...	13.90	9.85	11.10
Average hygrometric difference in grading room.	}	3°F.	3°F.	3°F.

The moisture content of the stored tea containing the teas described above at the time of packing was as follows:

	Per cent.
Surface of the B.O.P. in bins.....	7.86
B.O.P. from the bottom of the bins.....	6.30
Flowery Pekoe from the top of the bin.....	7.66
"    "    "    " bottom of the bin.....	8.92

The remarkable feature of these figures is the rapidity with which tea picks up moisture while stored for grading, and during the actual grading operation itself. There has been a certain amount of absorption during storage in the bins, but this is not very great as compared with the rapid change during the period between the discharge of the tea from the drier and the time the tea is stored in the bins. Although this may be true for well-constructed bins it is not true where the bins are not reasonably airtight and not situated in a dry and well-ventilated position. Unfortunately, bins are not always of good construction and properly placed in a factory. If they lie along an outside wall they should be watched very carefully, especially if there is a stream in the vicinity or if an earth wall runs alongside the factory. This frequently happens when the factory building runs into a bank, which prevents proper drying of the factory wall.

Since teas pick up moisture so readily once they have been discharged from the drier it is necessary to grade them as soon as is reasonably possible after firing. They should not be left lying about the drying room floor longer than is necessary to cool them after firing, but they should be stored in boxes and covered over while waiting to be picked and graded. It must be remembered that the drier fans suck in moist outside air into the factory, especially when the stove is inside the drying room, and unless care is taken this air may pass over the dry tea while it is cooling.

Another source of moisture gain is picking over, as this is very often done on the verandah of the sifting or drying room and generally in the lightest locality possible, i.e., near the windows. Such positions are often damp owing to leaks in the windows or in the corrugated roof, and although it is difficult to avoid this the writer desires to draw attention to the risk of the absorption of moisture when this is done. When the danger is realised precautions can be taken to minimise the trouble.

If the humidity of the grading room is high during the working period then all the grading operations will give the teas another chance of picking up moisture. The air in this room should therefore be kept fairly dry, i.e., 60-65% humidity, and this can be done by drawing in warm air from the drying room with a fan. This fan can also be used to exhaust the fluff from the grading room but the fan opening in the outside wall should be covered up during non-working hours to prevent the moist outside air from entering into the room. A wet and dry bulb hygrometer should therefore be kept in the grading room so that the humidity of the air can be checked.

Finally, care must be taken that the loft fans used for artificial withering do not draw cold outside air into the factory through the bins. If these fans are starved for air they will cause a suction effect in the drying room and draw through any leaks available, and in some instances moist air has been drawn over the stored tea in this way.

It may be argued that the absorption of moisture after firing may be corrected by refiring the tea before packing. This is true to a certain extent, especially where breaks are sent away every few days, but this is not always true where tea has to be kept some time before it is packed. If the tea in such factories is stored with too high a moisture content deterioration will take place in the bins, and refiring, although checking any further deterioration, is not a complete cure. It is therefore necessary to prevent teas from absorbing moisture during grading as much as possible.

A question that is frequently asked is, is final firing necessary? Some estates final fire as a regular practice, while others will not do so under any condition. The fact that actual complaints of soft teas have not been received is no proof that this deterioration may not have happened at times, especially when the teas are sold on the local market. It must be borne in mind that the teas may be right when they are bought in Colombo, but it is possible for these teas to arrive at their destination in a bad condition without picking up any further moisture. Complaints may then be made or not, but the buyer will take good care not to buy this mark again. Such an occurrence came to my notice during the past year, but in this instance the buyers were obliging enough to complain and also to return samples of the tea, which they described as "thin and going soft, although quite bright". The teas were reported on favourably at the time they were sold although they contained 9% of moisture. The returned samples had not picked up any appreciable quantity of moisture but had 9.8% moisture.

It is thus necessary to re-fire teas before they are packed if they contain more than 6% moisture.

It does not follow, however, that every break and every grade must be final fired before they are packed, since this is not necessary. The truth of this can be seen from the following figures which give the moisture content of tea obtained for packing at various times.

## % MOISTURE.

Invoice		B.O.P.	B.P.	F.P.	Pekoe
A	...	10'47	11'05	9'25	9'89
B	...	7'65	9'30	7'90	9'86
C	...	5'50	6'88	5'82	—
D	...	4'80	5'30	4'00	—
E	..	4'60	—	4'00	—

It is obvious that every grade in Break A requires refiring, but in C only the B.P. grade needs final firing. On the other hand it is a waste of time and fuel to final fire any of the grades in D and E.

I have also noticed that in many cases final firing has not reduced the moisture content of the tea to any appreciable extent, when this was already of a low order. It is therefore necessary to know the moisture content of the tea in order to decide whether refiring is necessary or not.

The efficacy of the first firing should also be checked by determining the moisture content of the tea discharged from the drier. The determination of moisture in tea is dealt with in the following article: