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Research Article

IDENTIFICATION OF SUITABLE CLONES FOR MANUFACTURING GREEN TEA FROM THE EXISTING RELEASED CLONES IN NORTH EAST INDIA

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A B S T R A C T

In India, the existing clones and variety of tea plants have been developed for manufacturing of black tea (CTC & Orthodox Tea). But till now no clone & variety of tea have been identified exclusively for manufacturing of Green Tea (steamed/ roasted) So one humble attempt was made to identify tea clones from the existing released clones for preference of manufacturing Green Tea on the basis of their taste & their Polyphenol: Amino Acid ratio. Selected ten clones representing the China Jat, Assam Jat, Cambod Variety and Industry released Clones of Assam on the basis of their availability and potential quality on CTC & Orthodox Tea were analyzed with their morphological character, chemical analysis and green tea taste by tea taster indicates that TV-17,TV-7,P126 and S3A3 have the best potentiality for manufacturing green tea.

INTRODUCTION

Demand for green tea is growing in both domestic and international markets. The tea clones and seed stocks presently grown by the tea industry in N E India are suitable for black tea (CTC/orthodox).The breeding criteria to develop green tea varieties are different from that of black tea varieties.It is because the good black tea requires higher amount of Total carechin and lower amount of Theanine which is reverse in case of good green tea. Generally the small tea leaf variety, also called China *Jat,* is best for making green tea, while the Assam *Jat*, or big leaf variety, is best processed as black teas. Total catechin-Theanine ratio is a good indicator of taste of green tea. The high ratio of Total catechun to Theanine causes a strong and bitter taste. Whereas tea clones with low Total catechin- Theanine ratio are expected to yield green tea with good taste. Unlike black tea, green tea does not undergo the oxidation (fermentation) process which makes the green leaves to turn brown. Because this step is skipped in the manufacturing of green tea, the chlorophyll remains in the tea leaves which make green tea green. Some of our existing clones that are commonly used for orthodox black tea manufacturing may have potentiality to yield good green tea.

Green tea production in Assam is at its infancy stages. A few tea processing factories are currently producing it. This is because Assam and may other Indian tea producing states predominantly process black tea (CTC&Orthodox Tea) as their major export market product.

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As a result, the green teas that exist in the market are thought not to be as good as the ones which are imported into the country. Research was carried out to determine the suitability of ten selected clones from Tea Research Association of India (TRA) in the production of green tea in 3 different plucking season's viz.spring, summer and autumn and tasted at the Tea Tasting Laboratory of TRA by the panel of Tea Tasters. The results showed that among the different samples of green tea manufactured from the 10 clones TV7.TV17,S_3A_3 and ,P_{126} scored high and the highest score was observed from the manufacturing of green tea during spring season.

Objective of Investigation

1. Study of Morpho physiological characteristics of the selected planting material.
2. Manufacture of Green tea from selected clones in all three plucking seasons and their organoleptic evaluation by the professional and volunteer tea taster.

MATERIALS AND METHODS

Objective 1

The China hybrid TV-7,AC hybrid (Assam X China),TV-1,TV-17,TV-31,Assam type TV-21,Cambod type TV-9,TV-23,TV-26,Industry released clones S3A3 and P126 were evaluated for their potentiality to release as clones for Green Tea.

The observations like growth habit, young leaf colour, mature leaf colour, petiole, leaf shape, leaf size, leaf apex, leaf base,

leaf margin, leaf blade, leaf pubescence, flower colour, flower diameter leaf etc were observed manually and recorded.

Table 1 Collection details of tea samples

Area	Place of collection	Clones/Variety	Month & year of collection
Assam	Borbhetta T.E.,Jorhat	TV-1	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-7	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-9	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-17	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-21	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-23	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-26	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	TV-31	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	P126	May, August & October 2018
Assam	Borbhetta T.E.,Jorhat	S3A3	May, August & October 2018

RESULTS AND DISCUSSION

Table 2 Taster's Report on Experimental Tea Sample Liquor Characteristics

Table 2(a)

SAMPLE	NUMBER	TV-1	TV-7	TV-9	TV-17	TV-21	TV-23	TV-26	TV-31	S3A3	P-126
BRIGHTNESS	Very good Good Fairly good Fair Only Fair Poor	6	7	6	6	6	6	6	6	6	7
BRISKNESS	Very good Good Fairly good Fair Only Fair	6	7	6.5	6.5	6.5	6	6	6	6.5	7

Table 2(b)

SAMPLE	NUMBER	TV-1	TV-7	TV-9	TV-17	TV-21	TV-23	TV-26	TV-31	S3A3	P-126
MELLOWNESS	Very good Good Fairly good Fair Touch Poor	2	4	2	3	3	2	2	2	3	4
FLAVOUR	Prominent Mild Touch Poor	2	4	2	2	2	1.5	1.5	1.5	2	4
QUALITY	Very good Good Fairly good Fair Only fair Poor	6	7	6.5	6.5	6.5	6	6	6	6.75	7
VALUTION											

Table 2(c)

SAMPLE	NUMBER	TV-1	TV-7	TV-9	TV-17	TV-21	TV-23	TV-26	TV-31	S3A3	P-126
BRIGHTNESS	Very good Good Fairly good Fair Only Fair Poor	6	6.75	6	6	6	6	6	6	6	6.75
BRISKNESS	Very good Good Fairly good Fair Only Fair Poor	6	6.75	6.5	6.5	6.5	6	6	6	6	6.75

Table 2(d)

SAMPLE	NUMBER	TV-1	TV-7	TV-9	TV-17	TV-21	TV-23	TV-26	TV-31	S3A3	P-126
MELLOWNESS	Very good Good Fairly good Fair Touch Poor	2	4	2	3	3	2	2	2	3	4
FLAVOUR	Prominent Mild Touch Poor	2	4	2	2	2	1.5	1.5	1.5	2	4
QUALITY	Very good Good Fairly good Fair Only fair Poor	6	7	6.5	6.5	6.5	6	6	6	6.75	7
VALUTION											

NB: The Taster's Score is 1-10.Higher is the score higher is the quality.

Table 3 Morphological characters of the 10 different clones

Sl.No	Characteristics	TV1	TV7	TV9	TV17	TV21
1	Growth Habit	Semi Erect	Semi Erect	Semi Erect	Semi Erect	Semi Erect
2	Young leaf colour	Yellow Green	Yellow Green	Yellow Green	Yellow Green	Dark Green
3	Mature leaf colour	Dark Green	Dark Green	Yellow Green	Yellow Green	Dark Green
4	Petiole: Anthrocyanin pigmentation	Absent	Absent	Absent	Absent	Absent
5	Leaf shape	Lanceolate	Lanceolate	Elliptic	Elliptic	Lanceolate
6	Leaf size (Lenght & Breadth ratio)	Small(2.60cm)	Small	Small(2.67)	Small	Small(2.3)
7	Leaf upper surface: Bullation	Absent	Present	Present	Present	Present
8	Leaf apex	Acuminate	Acuminate	Acuminate	Acute	Acuminate
9	Leaf base	Attenuate	Attenuate	Attenuate	Obtuse	Attenuate
10	Leaf margin	Serrete	Serrete	Serrete	Serrete	Serrete
11	Leaf blade attitude	Erect	Erect	Semi Erect	Erect	Erect
12	Leaf pubescence: Density	Medium	Medium	Medium	Dense	Dense
13	Position of stigma in relation to stamen	Extrose	Extrose	Extrose	Co-planner	Introse
14	Position of Stylesplitting	United	United	United	United	Geniculate
15	Flower colour of inner petals	white	white	white	White	White
16	Flower diameter	Large	Large	Medium	Small	Medium
17	Flushing behaviour	Medium	Early	Prolong	Early	Late
18	Leaf blade: shape in cross section	Flat	Flat	Flat	Flat	Flat
19	Branch Zigzaging	Present	Present	Present	Present	Present
20	Leaf blade: undulation of leaf edges	Absent	Medium	Medium	Medium	Medium

Sl.No	Characteristics	TV23	TV26	TV31
1	Growth Habit	Semi Erect	Semi Erect	Erect
2	Young leaf colour	Dark Green	Dark Green	Purple Green
3	Mature leaf colour	Yellow Green	Yellow Green	Yellow Green
4	Petiole: Anthrocyanin pigmentation	Absent	Absent	Absent
5	Leaf shape	Elliptic	Elliptic	Elliptic
6	Leaf size (Lenght & Breadth ratio)	Small(2.45)	Small	Small
7	Leaf upper surface: Bullation	Absent	Absent	Present
8	Leaf apex	Acuminate	Acuminate	Acuminate
9	Leaf base	Attenuate	Attenuate	Obtuse
10	Leaf margin	Biserrete	Serrete	Serrete
11	Leaf blade attitude	Erect	Erect	Erect
12	Leaf pubescence: Density	Sparse	Medium	Dense
13	Position of stigma in relation to stamen	Introse	Extrose	Co-planner
14	Position of Stylesplitting	United	United	United
15	Flower colour of inner petals	White	White	White
16	Flower diameter	Medium	Medium	Medium
17	Flushing behaviour	Late	Medium	Medium
18	Leaf blade: shape in cross section	Folded Upward	Flat	Flat
19	Branch Zigzaging	Present	Present	Present

Sl.No	Characteristics	S3A3	P126
1	Growth Habit	Erect	Erect
2	Young leaf colour	Yellow Green	Dark Green
3	Mature leaf colour	Yellow Green	Dark Green
4	Petiole: Anthrocyanin pigmentation	Absent	Absent
5	Leaf shape	Ovate	Lanceolate
6	Leaf size (Lenght & Breadth ratio)	Small	Small
7	Leaf upper surface: Bullation	Present	Present
8	Leaf apex	Acuminate	Acuminate
9	Leaf base	Attenuate	Attenuate
10	Leaf margin	Serrete	Serrete
11	Leaf blade attitude	Erect	Erect
12	Leaf pubescence: Density	Medium	Dense
13	Position of stigma in relation to stamen	Extrose	Co-planner
14	Position of Stylesplitting	United	Ascending
15	Flower colour of inner petals	White	White
16	Flower diameter	Large	Medium
17	Flushing behaviour		
18	Leaf blade: shape in cross section	Flat	Folded Upward
19	Branch Zigzaging	Present	Present
20	Leaf blade: undulation of leaf edges	Medium	Medium

Objective 2

Manufacturing of Green Tea from selected clones and their evaluation by the professional Tea Taster. The small two leaf and a bud were harvested from the tea field and immediately after harvesting it was deactivated by immersing in a hot water for 2 to 3 minutes and then dried and rolled and dried in a drier. The manufactured green tea was tasted by a panel of Tea Tasters in the department of TP & MA of TRA.

The China hybrid TV-7, AC hybrid (Assam X China) TV-1, TV-17, TV-31, Assam type TV-21, Cambod type TV-9, TV-23, TV-26, Industry released clones S3A3 and P 126 were manufactured for Green Tea and were tasted by Professional Tea Taster.

CONCLUSION AND RECOMMENDATIONS

The investigation on 10 different clones of N.E.India has shown that the chemical composition have varied composition some have exhibited higher Total catechin and some have higher Theanine which implies that the clones with lower Total Catechin to Theanine ratio would have lesser bitterness and astringency and thus suitable for Green Tea processing. Individually each assayed tea exhibited a unique combination of biochemical compounds which will uniquely affect the taste of the made teas this is subject for assessment through sensory evaluation. Green tea products generally cost much more than black tea products.

***Recommended clones for green tea*:** TV-7, TV-17, S3A3. P126

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