

# A Low Cost Micropropagation Technique for Accelerating Breeding Program of Tea

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What do growers expect  
from a good cultivar?



- ✓ High yield
- ✓ High quality
- ✓ Resistance to pest & diseases
- ✓ Drought tolerance

Crop improvement program  
(Tea breeding)

## Tea breeding

### Objectives of tea breeding program

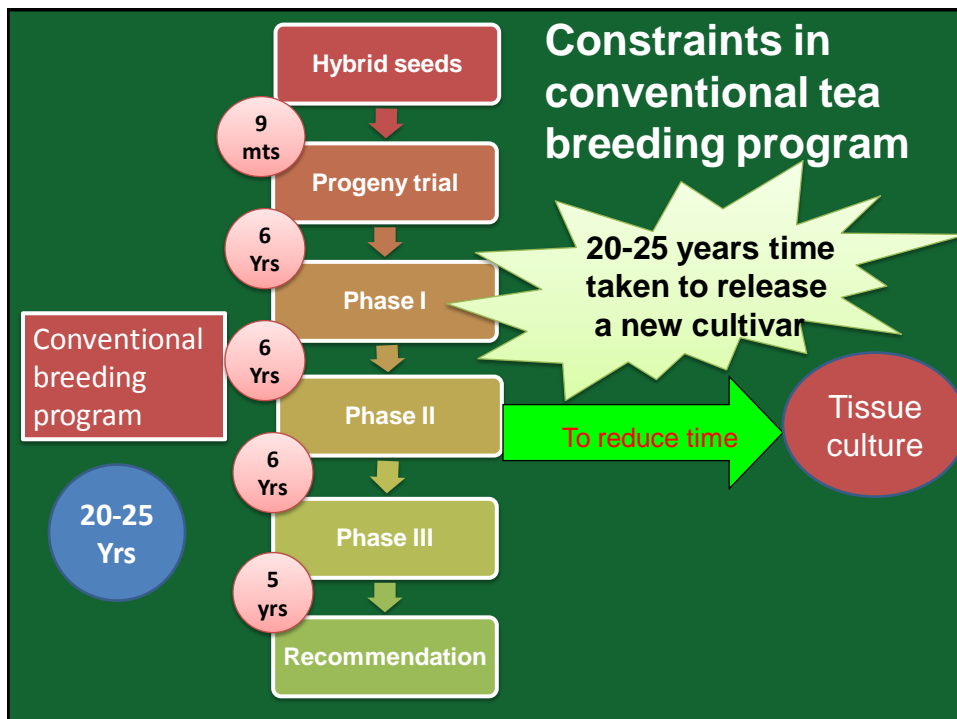


High yield  
Quality  
Resistance to pest & diseases  
Drought tolerance



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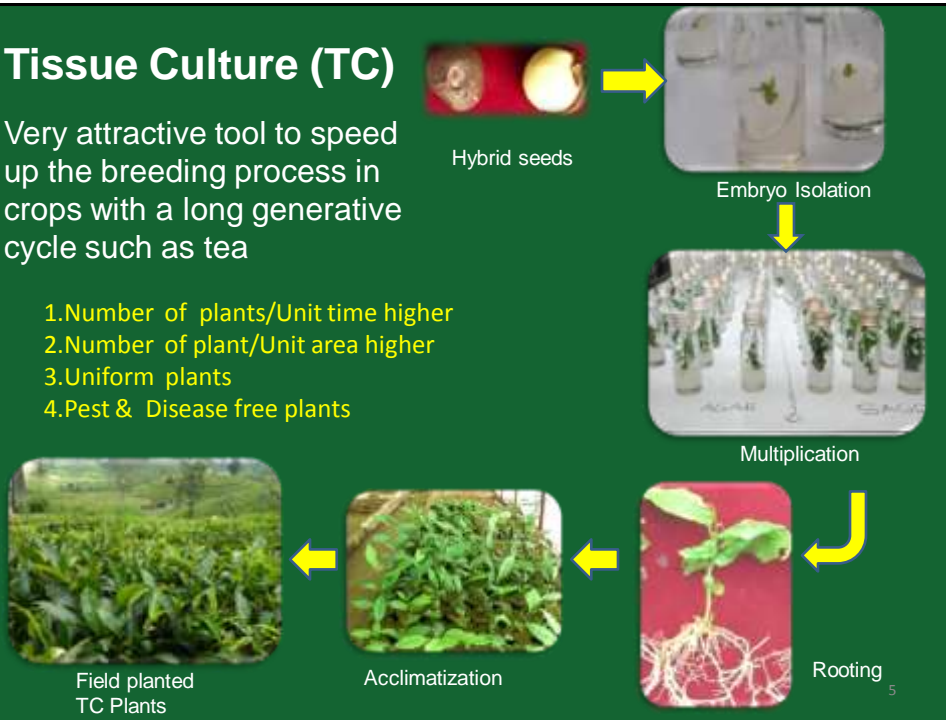
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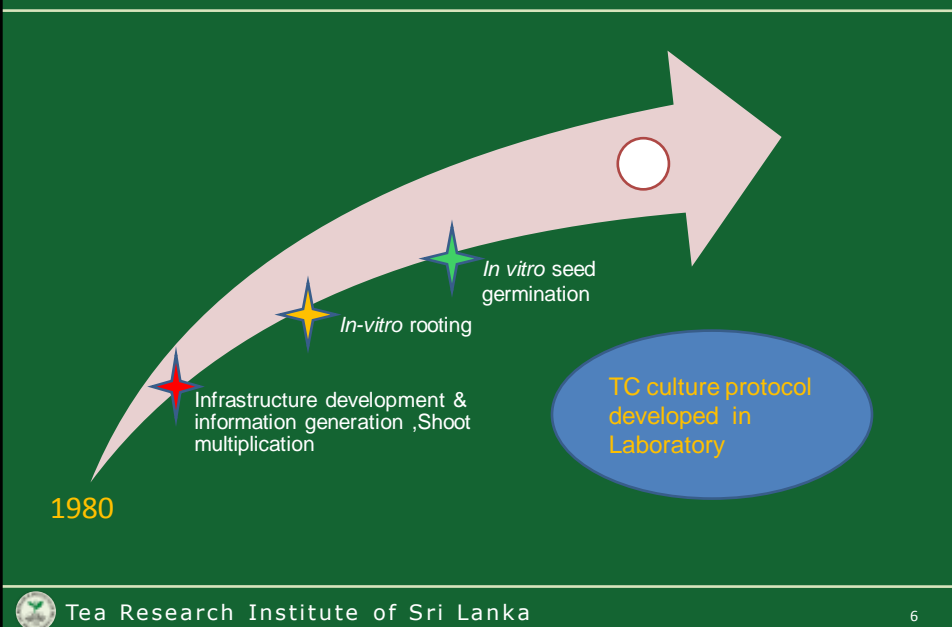
## Tissue Culture (TC)

Very attractive tool to speed up the breeding process in crops with a long generative cycle such as tea

1. Number of plants/Unit time higher
2. Number of plant/Unit area higher
3. Uniform plants
4. Pest & Disease free plants



## History of Tissue culture in TRI



## Limitations in the tissue culture protocol

### 1. High cost of production - **Rs 39 / Plant**

- ✓ Technical expertise
- ✓ Electricity (Energy)
- ✓ Laboratory chemicals
- ✓ Laboratory equipment

### 2. Rooting and Acclimatization

**Critical stages**

### 3. Low success rate



## Objectives

### General objective

Development of **cost effective micropropagation** method to integrate successfully into the conventional breeding program to increase its efficiency

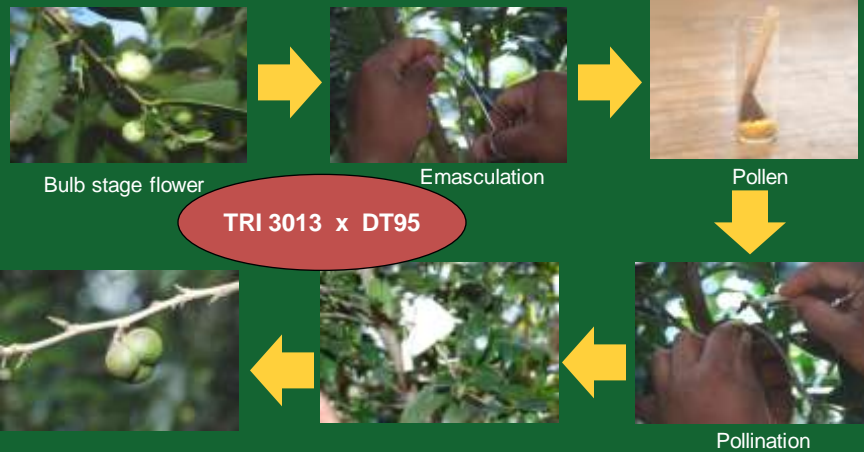
### Specific objectives

1. Identification of low cost alternative TC media for micropropagation of tea.
2. Development of *Ex-vitro* rooting protocol for microshoots of tea.
3. Cost benefit analysis of production of field plantable TC plants and conventionally propagated plants.



## Research Approach

### 1. Production of hybrid seeds

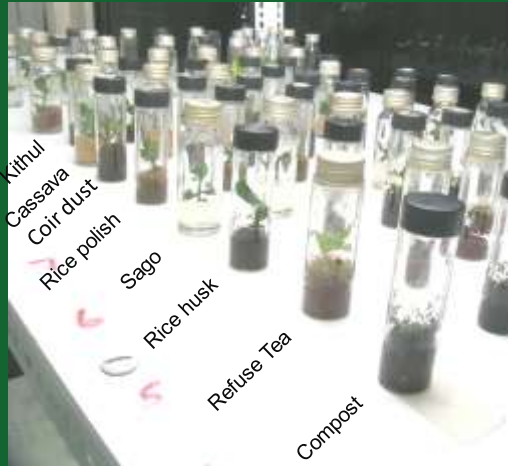


### 2. Production of Microshoots from Hybrid Seeds



## Identification of Low Cost Alternative medium substrate for agar

- T1 - Coir dust
- T2 - Sand
- T3 - Sand + coir dust
- T4 - Refuse Tea
- T5 - Sago
- T6 - Cassava flour
- T7 - Rice polish
- T8 - Compost
- T9 - Kithul flour
- T10 - Half burnt Rice husk
- T11 - Agar (control)



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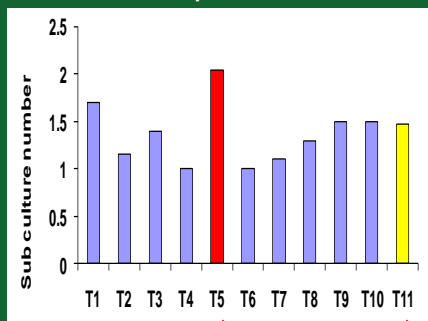
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## Effect of alternative medium substrate for agar

Effect on **multiplication** and **growth** of microshoots



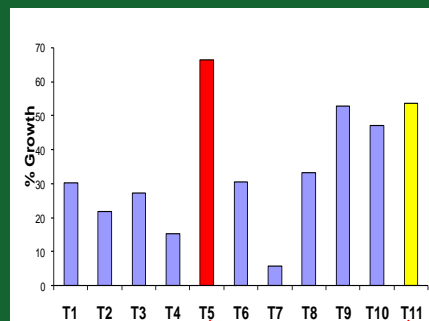
Multiplication



sago


Agar

Growth



sago

Agar



Agar cost  
Rs 9/Plant

Sago cost  
25 Cents/ Plant

Shoot multiplication on locally available low cost substitutes

Kithul

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## Identification of *Ex-vitro* Rooting medium for Microshoots



*Ex vitro* Rooting & acclimatization of microshoots inside the propagator

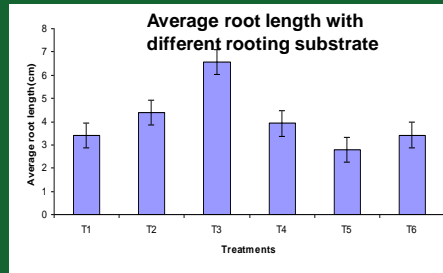
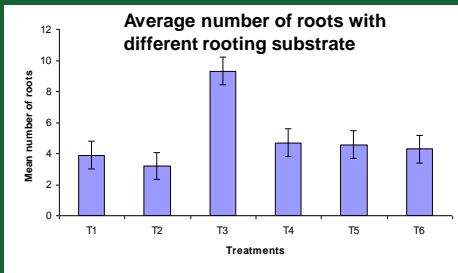
RH >90%  
Temperature 30C $\pm$ 2

Treatments	Coir dust	Top soil	Sand
1	0.5	1	0.5
2	1	1	0.5
3	1	1	1
4	1	0.5	1
5	1	0	0
6	0	1	0

Different ratios of rooting substrates

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## Effect of rooting medium on number and length of roots



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## Simultaneous rooting & acclimatization

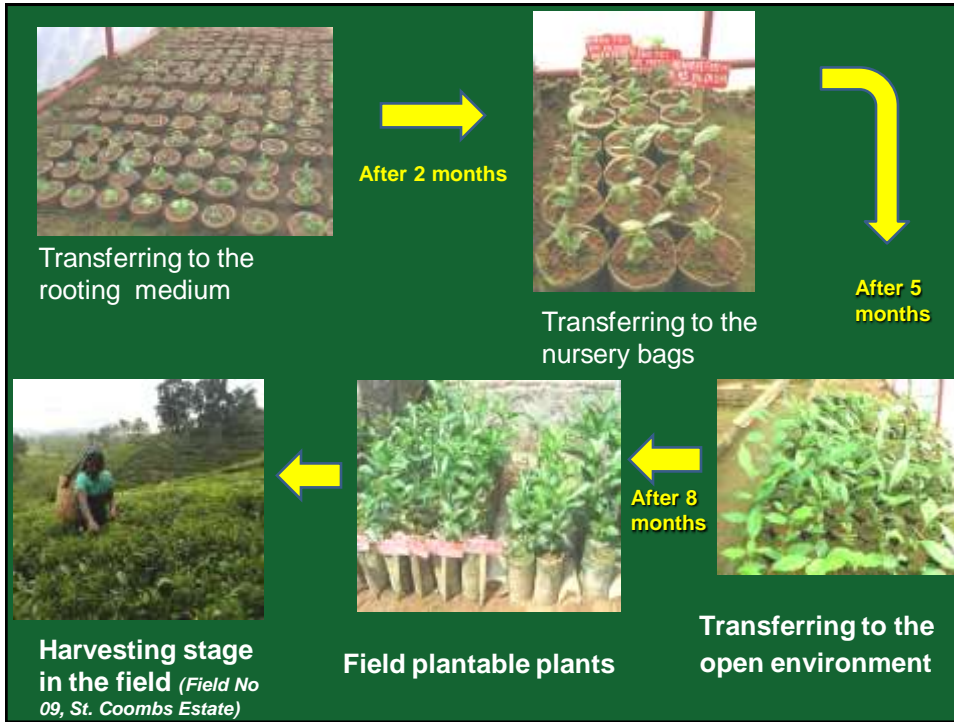
Rooted plants



Simultaneous rooting & acclimatization – cutting down material cost & time as well as enhance rate of survival

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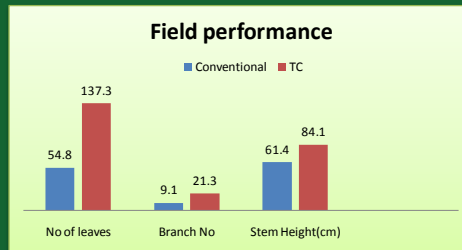
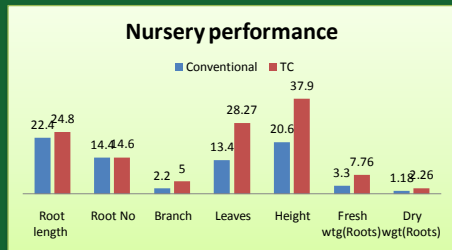
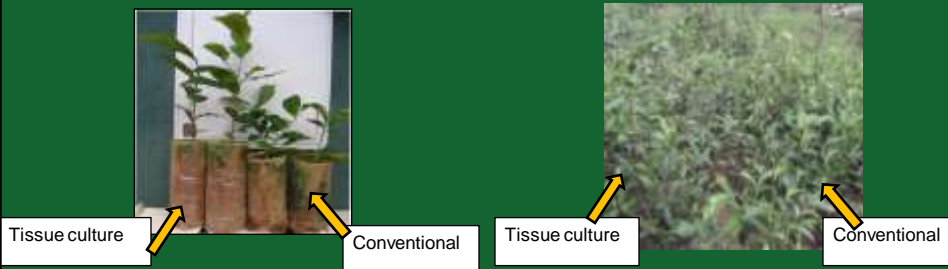




## Nursery and Field Evaluation of Micropropagated Plants

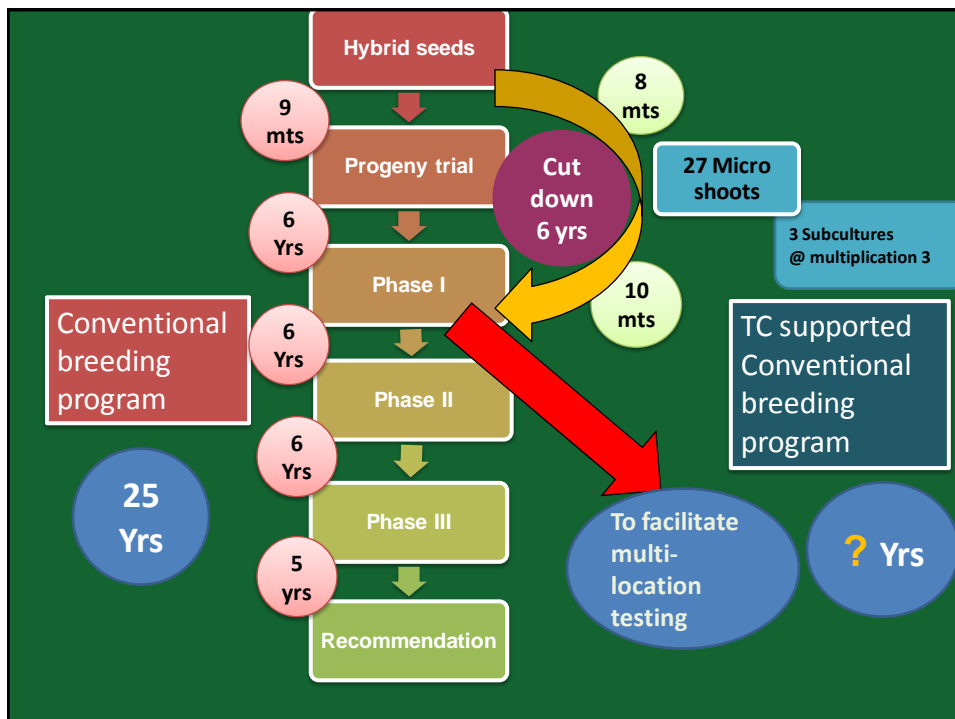
### Nursery Evaluation

### Field Evaluation



## Cost benefit analysis

Items required for Production of 1000 plants	Conventional TC method	Low cost TC method	Conventional Propagation Method	Percentage
a) Labour	8160.00	2040.00	12560.70	55%
b) Supplies	6684.58	1591.70	664.34	2.91%
c) Materials	11155.00	113.54	2404.34	10.53%
d) Transport	-	-	800.00	3.5%
e) Mother bush maintenance	-	-	6400.00	28%
f) Equipment & Buildings	4068.48	2084.25	-	
g) Building & Installation	1722.80	861.40	-	
h) Electricity	6021.00	3405.00	-	
i) Maintenance of Building & Equipment	15.00	7.00	-	
j) Interest @15% Annual	963.63	277.58	-	
Total cost	38916.49	10721.00	22830.00	100%
<b>UNIT COST (Rs)</b>	<b>39.00</b>	<b>10.72</b>	<b>22.83</b>	





## Outcomes

The method perfected in the present study can be recommended as

- Cost effective
- Time saving and
- Practical feasible

Micropropagation method

Hence, it can be concluded as this method is the most appropriate method for production of field plantable tea plants for the cultivar development program of tea



## Future Directions

- ✓ Cultivar development, through tissue culture supported conventional breeding program (**in progress**).
- ✓ Mass propagation through tissue culture technique using stem nodal cuttings (**in progress**).



*Thank you*