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Research Note

Evaluation of plus trees in cocoa (*Theobroma cacao* L.) for growth, flower, yield and yield contributing characters during the initial growth phase

K. Arunkumar*, V. Jegadeeswari[1], S. Balakrishnan[1] and P. Jeyakumar[2]
[1] Department of Spices and Plantation Crops, HC & RI, TNAU, Coimbatore
[2] Department of Crop Physiology, TNAU, Coimbatore
***E-Mail:** arunkru9791402135@gmail.com

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Abstract
The aim of this study was to evaluate the plus trees of cocoa for growth, flower, yield and yield contributing characters during the initial growth phase. Thirty five (35) plus trees in two different farmer's field were recorded for their growth, flower, yield and yield contributing traits. Among the 35 plus trees, first branching height was observed highest in Tc (Vedapatti) 41, maximum stem girth was recorded in Tc (Vedapatti) 64, maximum number of fan branches was noticed in Tc (Vedapatti) 1. Flower characters like maximum number of flowers per cushion, number of cushions per tree and number of flowers per tree was recorded in Tc (Vedapatti) 61, while highest pod set percentage was recorded in Tc (Vedapatti) 121. The yield parameters like pod length, pod girth, pod weight, fresh seed weight per pod, single fresh bean weight, bean length, single dry bean weight and dry bean weight per pod was found maximum in Tc (Vedapatti) 99, while number of pods per tree was recorded maximum in Tc (Vedapatti) 110. The maximum husk weight and husk thickness was recorded in Tc (Vedapatti) 31, while lowest pod value index was recorded in Tc (Vedapatti) 99. The maximum number of bold beans per pod, number of beans per pod was recorded in Tc (Vedapatti) 72, while highest number of flat beans per pod was recorded in Tc (Vedapatti) 15. Among the 35 plus trees husk to seed ratio was highest in Tc (Vedapatti) 111 and highest estimated dry bean yield per tree was recorded in Tc (Vedapatti) 91. This study showed the variability for growth, flower, yield and yield contributing characters during initial growth phase and the variability present in the plus trees can be used in future breeding program to identify a suitable type for yield or these identified plus trees can be effectively utilized as parents for hybridization programme.

Keywords
Cocoa, Plus trees, Growth, Flower, Yield

Cocoa (*Theobroma cacao* L.) is third most important beverage crop followed by tea and coffee. *Theobroma* literally means "Food of God" and it is a cash crop grown in throughout the humid tropics. Cocoa is self-incompatibility in nature belonging to the family Malvaceae. Amazon valley of South America is a origin of cocoa (Motamayor *et al.,* 2002). The basic chromosome number of cocoa is 2n=20 (Toxopeus, 1985). Cocoa is one of the major crops cultivated mainly in Ghana, Nigeria, Sierra Leone, Cameroon, Brazil, Ecuador, West Indies, India and Malaysia. Cocoa is an introduced crop in India during 1798 (Ratnam, 1961), is now cultivated as a commercial crop in four states like Kerala, Andhra Pradesh, Tamil Nadu and Karnataka. In India mostly cocoa is a mixed crop in arecanut and coconut gardens. The beans are mainly used for production of chocolate and various byproducts which are used in cosmetics, confectioneries, perfumeries, pharmaceuticals *etc*. It is a rich source of polyphenols and antioxidant properties.

Ivoiry coast is a leading cocoa producing country in the world. In India, Tamil Nadu has the highest area under cocoa (34%) while Kerala has the major share of production (42%).Cocoa is small evergreen perennial tree attain a height of 4 to 8 m and sometimes reaching up to height of 12-14 m. Most of the cultivated types are belong to Forastero group. Cocoa flowers are small (1-2 cm diameter), arising directly from the trunk or on stem portion (cauliflorous nature) called as cushions. Each cushion develops 40 to 50 flowers in one season but 1 to 5 percent of flowers only produce pods. Fruit is an indehiscent drupe commonly known as pod and to with 10 to 30 cm long Each pod contains 20 to 60 beans surrounded by sweet mucilage. This report is mainly focused to evaluate the plus trees of cocoa for growth, flower, yield and yield contributing characters during initial growth phase.

Evaluation of plus trees of age 7 years was undertaken during the year of June- October 2018 in cocoa fields located at Thondamuthur and Vedapatti region of Coimbatore district in Tamil Nadu where cocoa is intercropped with arecanut plantations. From 2000 populations available in 3 hectares of land, 35 plus trees have been identified. The plantation is planted with seedling progeny collected from open pollinated seeds. Totally, 35

plus trees were evaluated based on growth, flower and yield traits. The data on growth, flower, yield and yield contributing characters were recorded for the identified plus trees.
The growth parameters like first branching height, stem girth, number of fan branches were recorded. The height of the cocoa tree from the ground level up to first branching height (Jorquette) was measured and expressed in centimeter (cm). The girth of the tree was measured at 15 cm above the ground using a non-stretchable cloth tape and it was expressed in centimeter (cm). The fan branches arising from first jorquette was counted and expressed in numbers.

The flower characters like number of flowers per cushion, number of cushions per tree, number of flowers per tree and pod set percentage were recorded. The number of flowers per cushion, number of cushions per tree was counted in each plus trees and mean was calculated and expressed in numbers. The number of flowers per tree was counted by multiplying the number of flowers per cushion and number of cushions per tree and expressed in numbers. Pod set percentage was calculated and expressed in percentage.The pod characters like pod length, pod girth, pod weight, number of pods per tree, husk weight, fresh seed weight per pod, husk thickness, pod value index and husk to seed ratio were recorded. Length and girth of 5 pods selected from each plus trees was measured and expressed in centimeter (cm). Pod weight, husk weight, fresh seed weight per pod was calculated in 5 pods selected from each plus trees and average was worked out and expressed in grams (g). The total number of pods was recorded in each plus trees and expressed in numbers. Husk thickness was measured and expressed in centimeter (cm). The ratio of husk to seed weight was calculated.

The bean characters like number of bold beans per pod, number of flat beans per pod, number of beans per pod, single fresh bean weight, bean length, bean girth, single dry bean weight, dry bean weight per pod and estimated dry bean yield per tree were recorded. The number of bold beans, flat beans and total number of beans per pods from each plus trees was counted and expressed in numbers. Bean girth and bean length were measured from each plus tree and expressed in centimeter (cm). Single fresh bean was taken and expressed in grams (g). The beans extracted from these pods were also subjected to box method of fermentation for 6 to 7 days. After fermentation beans were dried under open sunlight for one week. The fermented dried beans of each tree were collected and weighed individually. The average of single dry bean weight, dry bean weight per pod, estimated dry bean yield per tree was calculated and expressed in grams (g).

Growth characters are furnished in Table 1. Among the 35 plus trees evaluated, highest first branching height (262.20 cm) was recorded in Tc (Vedapatti) 41 and lowest (62.00 cm) was found in Tc (Vedapatti) 15. The average first branching height was 132.43 cm with 31.23 % coefficient of variation. Maximum stem girth (45.70 cm) was recorded in Tc (Vedapatti) 64 and while minimum (19.15 cm) was recorded in Tc (Vedapatti) 121. Highest number of fan branches (7.0) was recorded in Tc (Vedapatti) 1 and lowest number of fan branches (3.0) was recorded in Tc (Vedapatti) 2, 15 and 90. The average number of fan branches in the plus trees was 4.51 with 20.38 % coefficient of variation.

Growth characters showed wide variation. Stem girth, number of fan branches, first branching height are responsible for the estimation of cocoa yield (Thondaiman *et al.,* 2013). Highest stem girth will allow more number of cushions and hence increase the yield. The variability can be attributed to genetic and environmental factors (Karthik Kumar, 2013).Flower characters are furnished in Table 1. Among the 35 plus trees evaluated, maximum number of flowers per cushion (14), number of cushions per tree (621), number of flowers per tree (8694) was reported in Tc (Vedapatti) 61. Highest pod set percentage (5.08 %) was recorded in Tc (Vedapatti) 121 and lowest (0.28 %) was recorded in Tc (Vedapatti) 61. The average pod set percentage was 2.61 % with coefficient of variation of 45.64 %.

Flowering in cocoa is mainly influenced by several factors like climate, environment, age of the tree, nutrient, spacing, moisture availability and genetic factors. Increased numbers of flowers and pod set are the possible reason for high yield and production (Valle *et al.,* 1987).Bean and pod characters are considered as yield contributing characters. The pod characters are furnished in Table 2. Among the 35 plus trees evaluated, higher pod length (22.92 cm), pod girth (28.40 cm), pod weight (574.41 g), fresh seed weight per pod (203.72 g) was recorded in Tc (Vedapatti) 99 while lowest pod length (14.84 cm), pod girth (22.19 cm), pod weight (178.30 g) were recorded in Tc (Vedapatti) 111. Maximum number of pods per tree (92) was recorded in Tc (Vedapatti) 110 and lowest (15) was recorded in Tc (Vedapatti) 99. Highest husk weight (434.42 g) and husk thickness (1.64 cm) was reported in Tc (Vedapatti) 31 and lowest pod value index (4.90) was recorded in Tc (Vedapatti) 99. Maximum husk to seed ratio (4.60) was recorded in Tc (Vedapatti) 48 and lowest

(1.47) was recorded in Tc (Vedapatti) 111. Average husk to seed ratio was 2.40 with coefficient of variation of 26.47 %.

The bean characters are furnished in Table 3. Among the 35 plus trees evaluated, maximum number of bold beans per pod (54.15), number of beans per pod (54.15) was recorded in Tc (Vedapatti) 72 and while minimum number of bold beans (29.44), number of beans per pod (29.44) was recorded in Tc (Vedapatti) 2. Maximum number of flat beans per pod (5) was recorded in Tc (Vedapatti) 15. Highest single fresh bean weight (4.98 g), bean length (2.63 cm), single dry bean weight (1.50 g) and dry bean weight per pod (62.80 g) was recorded in Tc (Vedapatti) 99. Bean length (4.02 cm) was highest recorded in Tc (Vedapatti) 111 and lowest (3.12 cm) was reported in Tc (Vedapatti) 40. Maximum estimated dry bean yield per tree (3173.56 g) was recorded in Tc (Vedapatti) 91 while the lowest (472.05 g) was reported in Tc (Vedapatti) 55.

The pod and bean characters showed wide variation. The variability in pod weight is highly influenced by genetic and environmental factors including soil moisture and nutrient status. Pods and beans are the most economic parts of cocoa. Lower pod value is responsible for higher bean yield (Karthik Kumar. 2013). Dry bean weight is used to increase the yield of cocoa. The pod weight is one of the most important traits for selecting a best cultivar from a population (Maharaj *et al*., 2011). Increased dry bean weight, dry bean yield, estimated dry bean yield per tree are most preferred characters which will be useful in selecting a particular promising genotypes from a base population. The results are in agreement with by Mallika *et al.* (1996), ElainApshara *et al.* (2008 and 2009), Thondaiman *et al.* (2013) in cocoa.

Among the 35 plus trees, wide variation was observed for growth, flower and yield contributing characters during the initial growth phase. Higher estimated dry bean yield per tree was recorded following in the ten plus trees namely Tc (Vedapatti) 91 (3173.56 g), Tc (Vedapatti) 66 (2982.42 g), Tc (Vedapatti) 110 (2784.84 g), Tc (Vedapatti) 78 (2603.44 g), Tc (Vedapatti) 88 (2260.20 g), Tc (Vedapatti) 72 (2249.50 g), Tc (Vedapatti) 1 (2235.72 g), Tc (Vedapatti) 76 (2222.55 g), Tc (Vedapatti) 94 (2086.10 g) andTc (Vedapatti) 63 (2001.48 g). The possible reason for the increased estimated yield could be due to the increased values on yield contributing characters like pod set percentage, number of pods per tree, single dry bean weight and number of beans per pod. Hence, the identified plus trees may be continuously evaluated for its stability and the plus trees may be utilized in future breeding programme as one of the parents in the hybridization programme.

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Table 1. Evaluation of plus trees in cocoa for growth and flower characters

S. No	Plus trees	First branching height (cm)	Stem girth (cm)	Number of fan branches	Number of flowers per cushion	Number of cushions per tree	Number of flowers per tree	Pod set percentage (%)
1	Tc (Vedapatti) 1	82.60	43.10	7	7	520	3640	1.70
2	Tc (Vedapatti) 2	122.80	23.40	3	4	379	1516	1.91
3	Tc (Vedapatti) 9	176.30	22.10	4	3	198	594	4.20
4	Tc (Vedapatti) 15	62.00	30.20	3	4	394	1576	3.10
5	Tc (Vedapatti) 18	85.80	23.80	4	5	354	1770	1.24
6	Tc (Vedapatti) 29	208.00	29.20	4	12	547	6564	0.47
7	Tc (Vedapatti) 31	178.30	27.00	4	3	325	975	3.28
8	Tc (Vedapatti) 33	108.50	19.60	5	6	342	2052	1.22
9	Tc (Vedapatti) 37	173.20	27.80	4	4	325	1300	2.00
10	Tc (Vedapatti) 40	115.20	34.00	4	4	274	1096	4.47
11	Tc (Vedapatti) 41	262.20	25.00	6	6	254	1524	1.90
12	Tc (Vedapatti) 42	132.00	27.00	5	4	274	1096	2.28
13	Tc (Vedapatti) 45	122.00	23.40	5	5	210	1050	2.48
14	Tc (Vedapatti) 48	116.80	34.30	6	4	272	1088	2.39
15	Tc (Vedapatti) 55	141.70	25.30	4	4	192	768	1.95
16	Tc (Vedapatti) 61	99.40	28.90	5	14	621	8694	0.28
17	Tc (Vedapatti) 63	145.10	37.40	4	5	423	2115	1.84
18	Tc (Vedapatti) 64	85.70	45.70	4	5	389	1945	2.42
19	Tc (Vedapatti) 66	210.40	28.40	4	3	514	1542	4.08
20	Tc (Vedapatti) 67	131.50	29.20	6	5	425	2125	2.54
21	Tc (Vedapatti) 68	153.80	29.40	5	6	321	1926	2.23
22	Tc (Vedapatti) 72	132.50	24.00	6	7	310	2170	2.53
23	Tc (Vedapatti) 75	130.40	25.20	5	5	282	1410	1.91
24	Tc (Vedapatti) 76	89.60	41.40	5	5	358	1790	2.51
25	Tc (Vedapatti) 78	140.10	23.60	5	6	347	2082	2.69
26	Tc (Vedapatti) 85	84.00	29.20	4	7	358	2506	1.52
27	Tc (Vedapatti) 86	142.20	25.10	4	3	302	906	4.08
28	Tc (Vedapatti) 88	164.50	26.20	5	6	271	1626	3.69
29	Tc (Vedapatti) 90	116.00	29.40	3	5	261	1305	3.29
30	Tc (Vedapatti) 91	87.20	34.40	4	5	275	1375	4.95
31	Tc (Vedapatti) 94	145.80	29.50	4	4	272	1088	4.23
32	Tc (Vedapatti) 99	110.50	30.20	4	4	310	1240	1.20
33	Tc (Vedapatti) 110	117.20	26.40	4	7	423	2961	3.10
34	Tc (Vedapatti) 111	143.50	29.20	5	6	290	1740	2.52
35	Tc (Thondamuthur) 121	118.10	19.15	4	4	187	748	5.08
	Mean	**132.43**	**28.78**	**4.51**	**5.34**	**337.11**	**1940.09**	**2.61**
	Maximum	**262.20**	**45.70**	**7.00**	**14.00**	**621.00**	**8694.00**	**5.08**
	Minimum	**62.00**	**19.15**	**3.00**	**3.00**	**187.00**	**594.00**	**0.28**
	SD	**41.35**	**6.06**	**0.92**	**2.26**	**100.85**	**1575.67**	**1.19**
	CV(%)	**31.23**	**21.04**	**20.38**	**42.33**	**29.92**	**81.22**	**45.64**

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Table 2. Evaluation of plus trees in cocoa for pod characters

S. No	Plus trees	Pod length (cm)	Pod girth (cm)	Pod weight (g)	Number of pods/tree	Husk weight (g)	Fresh seed weight/pod (g)	Husk thickness (cm)	Husk seed ratio	Pod value index
1	Tc (Vedapatti) 1	16.78	28.20	382.51	62	263.12	119.19	0.93	2.20	8.38
2	Tc (Vedapatti) 2	15.92	25.74	324.42	29	214.33	110.12	1.12	1.95	9.08
3	Tc (Vedapatti) 9	18.47	26.48	424.51	25	323.04	101.12	1.19	3.18	9.85
4	Tc (Vedapatti) 15	15.67	26.42	324.61	49	211.72	92.42	0.98	2.29	10.82
5	Tc (Vedapatti) 18	17.61	24.49	311.68	22	200.25	110.43	0.98	1.81	9.05
6	Tc (Vedapatti) 29	17.69	25.97	401.73	31	293.12	104.84	1.32	2.80	9.53
7	Tc (Vedapatti) 31	22.48	26.54	555.68	32	434.42	121.12	1.64	3.59	8.25
8	Tc (Vedapatti) 33	17.95	25.50	365.74	25	254.45	92.12	1.12	2.76	10.80
9	Tc (Vedapatti) 37	17.84	25.94	404.47	26	293.15	110.78	0.99	2.65	9.02
10	Tc (Vedapatti) 40	16.64	25.63	351.72	49	262.42	87.72	1.25	2.99	11.30
11	Tc (Vedapatti) 41	18.32	24.91	371.32	29	240.45	119.67	0.94	2.01	8.35
12	Tc (Vedapatti) 42	18.72	25.14	448.95	25	300.45	141.54	0.88	2.12	7.06
13	Tc (Vedapatti) 45	17.12	25.85	364.72	26	240.86	113.32	1.12	2.13	8.82
14	Tc (Vedapatti) 48	18.65	24.12	331.10	26	255.54	55.54	1.11	4.60	18.00
15	Tc (Vedapatti) 55	15.47	26.00	429.97	15	301.12	120.69	1.54	2.49	8.28
16	Tc (Vedapatti) 61	18.12	25.74	411.17	25	270.12	119.19	0.83	2.27	8.38
17	Tc (Vedapatti) 63	16.59	27.40	340.45	39	222.54	110.78	1.15	2.01	9.02
18	Tc (Vedapatti) 64	21.80	26.79	554.57	47	350.51	166.97	0.96	2.10	5.98
19	Tc (Vedapatti) 66	16.74	26.14	380.17	63	284.45	96.00	1.12	2.96	10.41
20	Tc (Vedapatti) 67	16.51	23.12	299.97	54	195.54	103.32	0.87	1.89	9.68
21	Tc (Vedapatti) 68	19.12	25.21	432.00	43	300.42	131.54	0.98	2.28	7.60
22	Tc (Vedapatti) 72	18.61	22.70	479.35	55	293.12	185.54	1.15	1.58	5.38
23	Tc (Vedapatti) 75	18.72	24.15	379.47	27	260.15	99.62	0.84	2.61	10.03
24	Tc (Vedapatti) 76	19.44	27.82	561.66	45	419.12	142.20	1.50	2.95	7.03
25	Tc (Vedapatti) 78	19.54	26.84	391.37	56	233.72	151.50	1.17	1.54	6.60
26	Tc (Vedapatti) 85	18.42	24.72	351.00	38	235.46	115.54	1.32	2.04	8.65
27	Tc (Vedapatti) 86	17.72	22.41	261.00	37	174.36	86.64	0.84	2.01	11.54
28	Tc (Vedapatti) 88	18.41	26.49	393.61	60	298.06	95.54	1.32	3.12	10.47
29	Tc (Vedapatti) 90	16.31	25.21	346.12	43	233.78	112.21	0.77	2.08	8.91
30	Tc (Vedapatti) 91	18.69	24.15	394.47	68	281.12	112.74	0.97	2.49	8.87
31	Tc (Vedapatti) 94	15.67	24.52	294.42	46	197.72	106.72	0.81	1.85	9.37
32	Tc (Vedapatti) 99	22.92	28.40	574.41	15	370.19	203.72	1.21	1.82	4.90
33	Tc (Vedapatti) 110	22.74	24.12	431.14	92	316.67	111.67	1.27	2.84	8.95
34	Tc (Vedapatti) 111	14.84	22.19	178.30	44	103.93	70.78	0.90	1.47	14.12
35	Tc (Thondamuthur) 121	17.41	25.84	351.68	38	248.62	102.12	1.10	2.43	9.79
	Mean	**18.10**	**25.45**	**388.56**	**40.17**	**267.94**	**114.99**	**1.09**	**2.40**	**9.21**
	Maximum	**22.92**	**28.40**	**574.41**	**92.00**	**434.42**	**203.72**	**1.64**	**4.60**	**18.00**
	Minimum	**14.84**	**22.19**	**178.30**	**15.00**	**103.93**	**55.54**	**0.77**	**1.47**	**4.90**
	SD	**1.99**	**1.51**	**84.72**	**16.73**	**65.07**	**28.98**	**0.21**	**0.63**	**2.35**
	CV(%)	**10.99**	**5.95**	**21.80**	**41.65**	**24.28**	**25.20**	**19.60**	**26.47**	**25.56**

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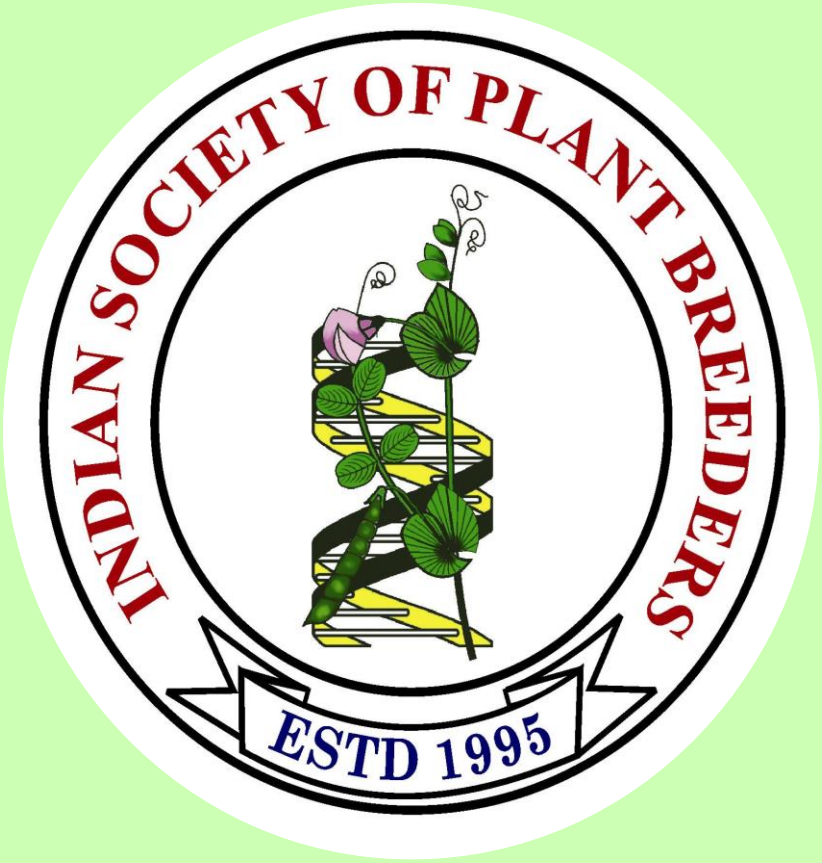
Table 3. Evaluation of plus trees in cocoa for bean characters

S. No	Plus trees	Number of bold beans/pod	Total number of flat beans/pod	Number of beans/pod	Single fresh bean weight (g)	Bean length (cm)	Bean girth (cm)	Single dry bean weight (g)	Dry bean weight per pod (g)	Estimated dry bean yield (g) / tree
1	Tc (Vedapatti) 1	38.44	0	38.44	3.72	2.32	3.48	0.93	36.06	2235.72
2	Tc (Vedapatti) 2	29.44	0	29.44	3.08	2.35	3.55	0.63	18.61	539.69
3	Tc (Vedapatti) 9	30.54	0	30.54	2.72	2.20	3.42	0.85	26.10	652.50
4	Tc (Vedapatti) 15	38.42	5	43.42	1.82	1.85	3.22	0.44	19.24	942.76
5	Tc (Vedapatti) 18	40.15	1	41.15	2.74	2.42	3.82	0.88	36.26	797.72
6	Tc (Vedapatti) 29	37.42	4	41.42	2.09	2.41	3.32	1.31	54.36	1685.16
7	Tc (Vedapatti) 31	44.12	0	44.12	2.57	2.10	3.52	0.84	37.12	1187.84
8	Tc (Vedapatti) 33	35.97	1	36.97	2.54	2.15	3.58	0.75	27.65	691.25
9	Tc (Vedapatti) 37	43.68	0	43.68	2.54	2.19	3.59	0.82	35.94	934.44
10	Tc (Vedapatti) 40	43.97	0	43.97	2.18	2.41	3.12	0.71	31.42	1539.58
11	Tc (Vedapatti) 41	44.15	0	44.15	2.58	2.48	3.47	1.17	51.86	1503.94
12	Tc (Vedapatti) 42	40.12	0	40.12	3.54	2.51	3.42	1.05	42.29	1057.25
13	Tc (Vedapatti) 45	36.12	2	38.12	2.82	2.27	3.34	0.78	29.79	774.54
14	Tc (Vedapatti) 48	30.91	0	30.91	2.74	2.18	3.18	0.67	20.79	540.54
15	Tc (Vedapatti) 55	31.54	0	31.54	3.28	2.19	3.27	0.99	31.47	472.05
16	Tc (Vedapatti) 61	30.32	1	31.32	3.69	2.23	3.83	1.10	34.30	857.50
17	Tc (Vedapatti) 63	33.72	1	34.72	3.21	2.62	3.98	1.48	51.32	2001.48
18	Tc (Vedapatti) 64	43.95	0	43.95	3.92	2.49	3.48	0.40	17.57	825.79
19	Tc (Vedapatti) 66	41.98	0	41.98	2.42	2.54	3.79	1.13	47.34	2982.42
20	Tc (Vedapatti) 67	33.65	0	33.65	2.81	2.16	3.39	0.98	32.83	1772.82
21	Tc (Vedapatti) 68	36.73	0	36.73	3.49	2.02	3.68	0.88	32.31	1389.33
22	Tc (Vedapatti) 72	54.15	0	54.15	3.75	2.58	3.42	1.20	40.90	2249.50
23	Tc (Vedapatti) 75	29.97	0	29.97	3.51	2.36	3.50	0.90	26.91	726.57
24	Tc (Vedapatti) 76	48.47	1	49.47	2.45	2.59	3.62	0.99	49.39	2222.55
25	Tc (Vedapatti) 78	46.13	0	46.13	3.29	2.32	3.87	1.00	46.49	2603.44
26	Tc (Vedapatti) 85	37.33	0	37.33	2.81	2.38	3.71	1.13	42.10	1599.80
27	Tc (Vedapatti) 86	30.47	0	30.47	2.92	2.27	3.38	0.97	29.62	1095.94
28	Tc (Vedapatti) 88	43.24	0	43.24	2.17	2.26	3.42	0.87	37.67	2260.20
29	Tc (Vedapatti) 90	37.50	0	37.50	2.98	2.42	3.59	1.17	43.96	1890.28
30	Tc (Vedapatti) 91	38.47	0	38.47	2.47	2.47	3.67	1.21	46.67	3173.56
31	Tc (Vedapatti) 94	45.45	0	45.45	2.17	2.17	3.37	0.99	45.35	2086.10
32	Tc (Vedapatti) 99	40.85	1	41.85	4.98	2.63	3.70	1.50	62.80	942.00
33	Tc (Vedapatti) 110	43.38	0	43.38	2.73	1.89	3.21	0.69	30.27	2784.84
34	Tc (Vedapatti) 111	32.47	1	33.47	2.82	2.32	4.02	1.07	35.89	1579.16
35	Tc (Thondamuthur) 121	42.89	0	42.89	2.69	2.51	3.69	0.93	39.81	1512.78
	Mean	**38.75**	**0.51**	**39.26**	**2.92**	**2.32**	**3.53**	**0.96**	**36.93**	**1488.89**
	Maximum	**54.15**	**5.00**	**54.15**	**4.98**	**2.63**	**4.02**	**1.50**	**62.80**	**3173.56**
	Minimum	**29.44**	**0.00**	**29.44**	**1.82**	**1.85**	**3.12**	**0.40**	**17.57**	**472.05**
	SD	**6.05**	**1.12**	**6.05**	**0.63**	**0.19**	**0.22**	**0.25**	**10.71**	**749.65**
	CV(%)	**15.61**	**218.02**	**15.41**	**21.66**	**8.33**	**6.35**	**25.65**	**28.99**	**50.35**



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