

GROWTH OF CUTTINGS OF TEA (*CAMELLIA SINENSIS* L. O. KUNTZE) CLONES AT VARYING LEVELS OF FERTILIZER⁺

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The effects of different levels of T65 fertilizer mixture applied as equal and as progressively increasing doses at regular intervals to tea cuttings from the 10th week of planting on the growth of clones TRI 777, DT 1 and TRI 2025 which represented the slow medium and vigorous growers were studied in 2 experiments.

In the first experiment more deaths occurred at the F3 level (113.40g/100 plants). Clone TRI 777 showed best growth to F1 (28.35g/100 plants). Clones DT 1 and TRI 2025 responded best to F2 (56.70g/100 plants), the response shown by TRI 2025 being quicker and longer. In the second experiment the highest quantity of fertilizer used did not exceed F3 of experiment 1. Clone TRI 777 showed optimum response to treatment 2, DT 1 and TRI 2025 to treatment 4. The quantity of fertilizer used over the same period to obtain best growth was lower in experiment 2.

The results show that clones differ in their fertilizer requirements. The quantity applied should be related to the leaf area of the plant. It is advantageous to progressively increase the dose as the plants produce more foliage.

INTRODUCTION

Fertilizer is needed for vigorous growth of young tea in the nursery. Lack or an insufficient supply of nutrients, particularly nitrogen, increases dormancy resulting in poor growth (de Haan, 1941; Bond, 1945; Wight and Barua, 1955; Kulasegaram and Kathiravetpillai, 1972).

Fertilizer application normally commences at 10 - 12 weeks after planting of cuttings. Most good rooting clones start rooting at this stage while poor rooters may take a longer time. In Sri Lanka a widely used fertilizer mixture for young tea in the nursery is T 65, which was recommended by Tolhurst and Visser (1961) based on previous studies (Visser, Kehl and Tillekeratne, 1959; Visser and Kehl, 1961). However, there appears to be ambiguity in the recommendation regarding the amount to be applied and the time when it should be increased (Richards, 1967; Anon, 1973; Anon, 1975). Suggestions have been made that the quantities of fertilizer tolerated by vigorously growing clones may be excessive for slow growing ones (Pethiyagoda, 1970). However, there is no experimental evidence to support this view. The recommendation was followed irrespective of the vigour of the clone or the elevation at which the cuttings were propagated. This study was therefore undertaken to obtain information to clarify some of the above aspects.

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MATERIALS AND METHODS

Two experiments were conducted using uniform plants of clones TRI 777, DT 1 and TRI 2025, differing in vigour of growth, being slow, medium and vigorous growers respectively. The soil used for planting of cuttings was subsoil on which Guatemala grass (*Tripsacum laxum* Nash) had been grown for about 12 years. In both experiments, fertilizer treatments commenced when the plants were 10 weeks old. The experiments were conducted at St Coombs Estate, Tea Research Institute, Talawakele (1372 m amsl).

On each occasion, the desired quantity of fertilizer was dissolved in 4.5 l of water and 45 ml of this solution was poured to individual plants to ensure uniformity in manuring. This was repeated at fortnightly intervals. The recommendation provides for doubling the dose as growth becomes vigorous (Anon, 1975). However, this stage of growth will differ with clones and elevation and is not clearly defined. In the experiments reported the recommended rate of 28.35 g was used. In experiment 1, measurements commenced when the plants were 10 weeks old. In experiment 2, measurements commenced when the plants were 16 weeks old as the plants had not grown sufficiently well. In this experiment the first increase in height and difference in leaf number was measured from the 18th and 20th week from planting respectively.

Experiment 1

Different levels of fertilizer, were applied at commencement of fertilizer application as follows, per 100 plants:

1. F0 = no fertilizer application
2. F1 = 28.35 g (Recommended fertilizer for young tea in nurseries —T.65)
3. F2 = 56.70 g
4. F3 = 113.40 g

The total quantity of fertilizer applied per 100 plants at the end of the last application at 32 weeks was F1 340.20 g, F2 680.40 g and F3 1360.80 g. The layout was of the randomized split-plot design with 4 replicates, there being 120 plants in each treatment. An assessment was done when the plants were 34 weeks old.

Experiment 2

The dose of fertilizer was stepped up according to the following schedule:

Period at which fertilizer doses were increased (weeks)

Fertilizer treatments	10	16	24	32	Total applied (g)
	Period from first application (weeks)				
	0	6	14	22	
1	0	0	0	0	0
2 (T.65)	28.35	28.35	28.35	28.35	425.25
3	28.35	28.35	42.50	42.50	538.45
4	28.35	42.50	42.50	56.70	651.85
5	28.35	56.70	56.70	113.40	992.25

The layout was of the randomized split-plot design, replicated 3 times, there being 90 plants in each treatment. An assessment was carried out when the plants were 40 weeks old.

The components by weight of the recommended T 65 fertilizer mixture used in this study were:

- 15 parts of sulphate of ammonia (20.6% N),
- 20 parts of ammonium phosphate (20.0% N; 35.0% P₂O₅),
- 15 parts of potassium sulphate (48.0% K₂O), and
- 15 parts of Epsom salts (16.0% MgO).

This mixture provides approximately 10.9% N, 10.8% P₂O₅, 11.1% K₂O and 4% MgO (Tolhurst and Visser, 1961).

RESULTS

In figures vertical straight lines refer to Least Significant Differences at P=0.05.

Experiment 1

Plant mortality

The number of plants surviving at the end of 34 weeks is given in Table 1. The mean value averaged over the 3 clones showed greater plant mortality at the highest level of fertilizer F3 (113.40 g 100 plants fortnight). There was no difference between the other treatments.

TABLE 1 — *Effect of fertilizer levels on plant mortality. (Figures in parentheses indicate back-transformed numbers*)*

Fertilizer level	Clones			Mean
	TRI 777	DT 1	TRI 2025	
F0	3.04 (9.24)	3.16 (10.00)	3.16 (10.00)	3.12 (9.73)
F1	2.96 (8.76)	3.12 (9.73)	3.16 (10.00)	3.08 (9.49)
F2	2.73 (7.45)	3.12 (9.73)	3.16 (10.00)	3.00 (9.00)
F3	2.45 (6.00)	2.87 (8.24)	2.69 (7.25)	2.67 (7.13)
L.S.D. (P=0.05)	NS	NS	NS	0.13

*Analyses done on \sqrt{n} transformed data

Activity of terminal buds

In clone TRI 777 differences in the percentage of plants with active terminal buds among the fertilizer levels were not obvious. Generally more plants remained in an active condition at F1. In DT 1 and TRI 2025 more plants remained in an active condition at F2. TRI 2025 showed two peaks of activity at F2. In all clones a peak of activity was reached early at F3 but its effect disappeared with time.

Number and duration of active phases

The number and duration of active phases was greatest in TRI 777 at F1 and in both DT 1 and TRI 2025 at F2 (Table 2).

TABLE 2 — *Effect of levels of fertilizer on the mean number and duration of active phases per plant during 24 weeks.*

Clone	Fertilizer level	Number	Active phases per plant Duration (weeks)	% Duration
TRI 777	F0	1.41	5.40+0.39	23
	F1	2.06	8.11+0.27	34
	F2	1.83	7.33+0.71	31
	F3	1.63	6.75+0.54	28
DT 1	F0	1.82	9.28+0.45	39
	F1	2.12	11.28+0.47	47
	F2	2.51	13.18+0.31	55
	F3	2.06	12.73+0.44	51
TRI 2025	F0	2.00	5.15+0.17	21
	F1	2.47	6.95+0.11	29
	F2	2.85	8.48+0.13	35
	F3	2.13	7.30+0.31	30

Increase in height

All 3 clones did not show a response to any fertilizer level from 0-8 weeks from commencement of fertilizer application. In TRI 777 a response to F1 level was seen from 12-24 weeks (Fig. 1A). Responses were noted for F3 also at 10-12, 16 and 20-24 weeks compared to F0. At F2 and F4, plant height was reduced at the 14th and 18th weeks. In DT 1 a response to F1 was seen from 10-14 weeks and to F2 from 16-24 weeks. At F3 height was reduced at the 24th week (Fig. 1B). In TRI 2025 a response to F2 was seen earlier, from 10-20 weeks and at the 24th week (Fig. 1C). At F3 growth was reduced from 14-18 and from 22-24 weeks.

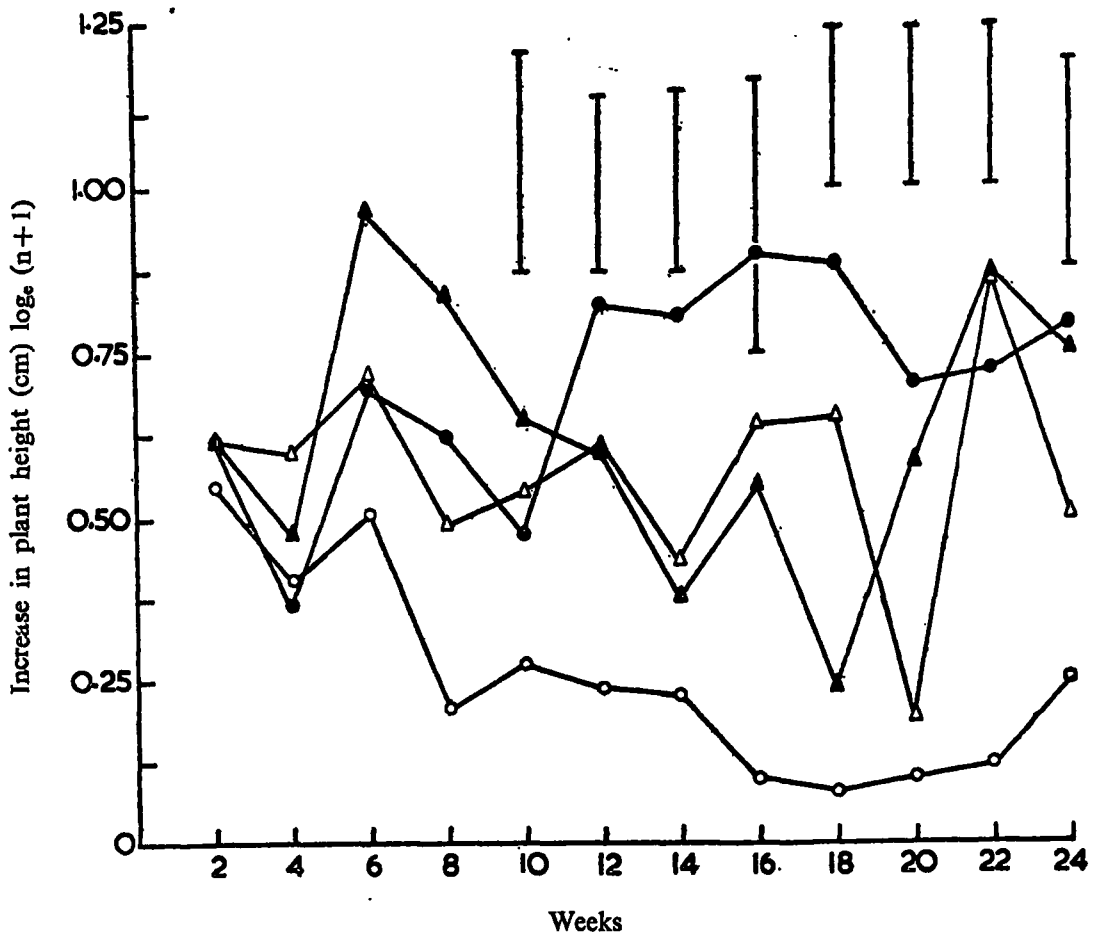


Fig. 1A.—*Effect of fertilizer levels on fortnightly increases in plant height of clone TRI 777 (Means of 120 plants). ○—F0, ●—F1, △—F2, ▲—F3*

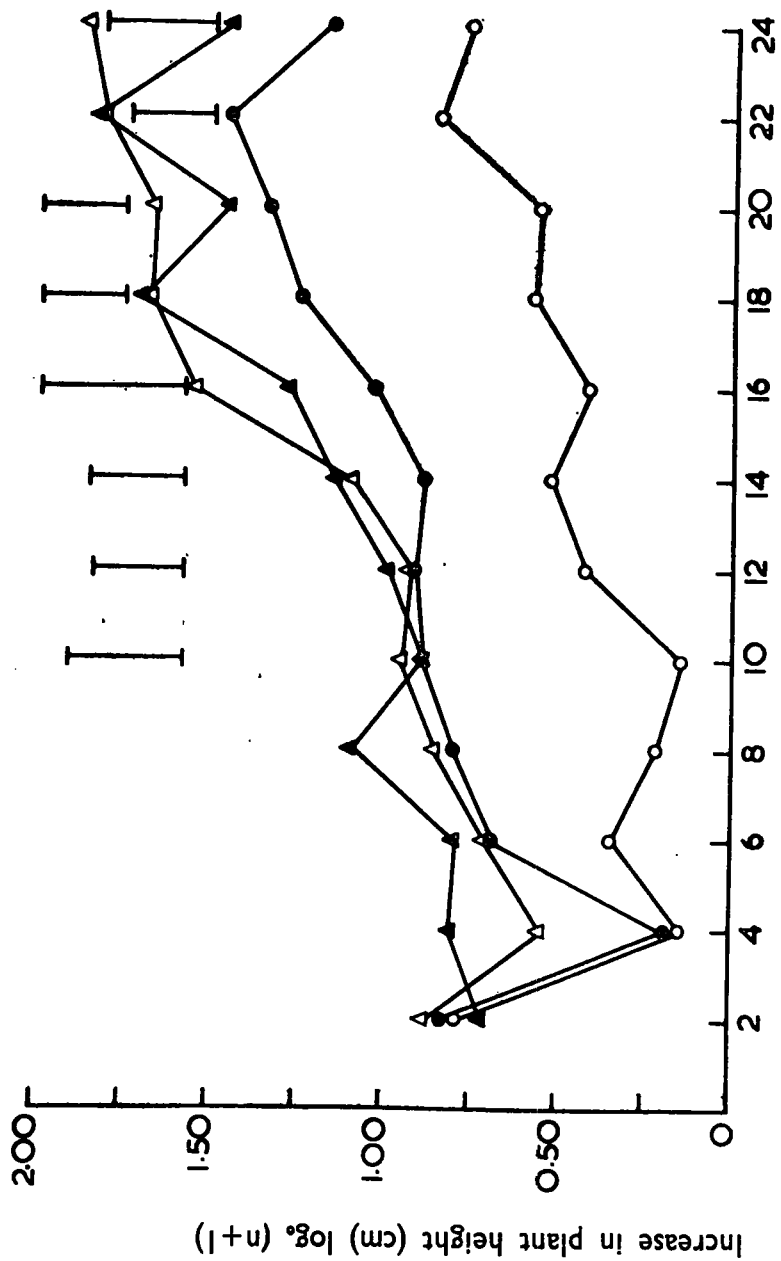


Fig. 1B.—Effect of fertilizer levels on fortnightly increases in plant height of clone TRI 2025 (Means of 120 plants). O = F0, ● = F1, △ = F2, ▲ = F3

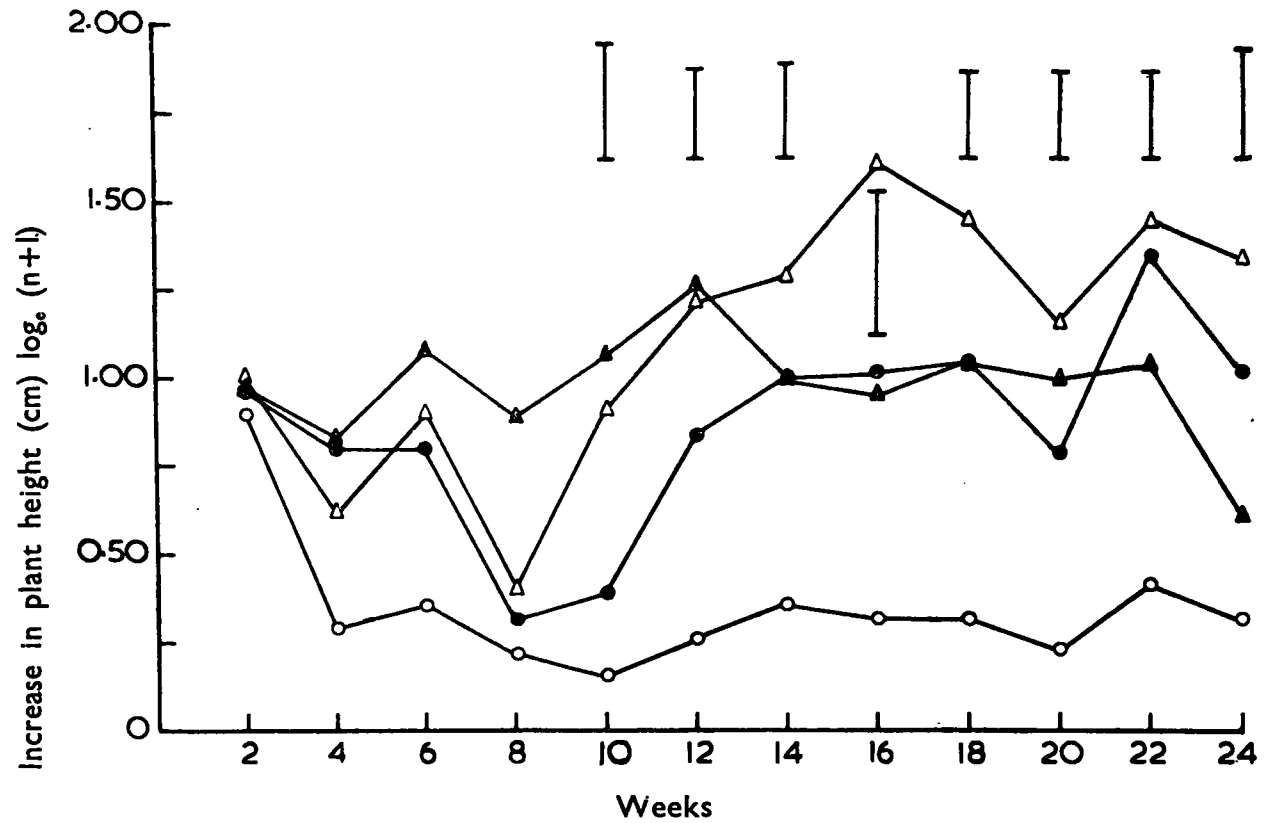


Fig. 1C.—Effect of fertilizer levels on fortnightly increases in plant height of clone TRI 2025 (Means of 120 plants) ○—F0, ●—F1, ■—F2, ▲—F3

Total number of leaves on the main axis

In TRI 777 and DT 1 no differences in leaf production were noted to any fertilizer level from 0-12 weeks from commencement of fertilizer application (Table 3). In TRI 777 a response to F1 was seen from 16-24 weeks. In DT 1 a response to F1 was seen at the 16th week and to F2 from 20-24 weeks. In TRI 2025 no response was seen to any fertilizer level from 0-8 weeks. A response to F1 was seen at the 12th week and to F2 from 16-24 weeks. At F3 leaf production was reduced at the 16th and 24th week.

TABLE 3 — *Effect of levels of fertilizer on monthly mean differences in total leaf number (including leaf scars) per plant on the main stem (means of 120 plants)**

Clone	Fertilizer level	Weeks					
		4	8	12	16	20	24
TRI 777	F0	1.79	2.02	1.48	1.17	1.21	1.41
	F1	1.76	2.13	1.68	1.49	1.50	1.78
	F2	1.77	2.23	1.57	1.39	1.48	1.85
	F3	1.79	2.34	1.69	1.58	1.29	2.01
DT 1	F0	1.55	1.75	1.60	1.48	1.54	1.60
	F1	1.64	2.26	1.74	1.77	1.88	2.00
	F2	1.77	2.22	1.63	1.97	2.22	2.49
	F3	1.77	2.49	1.55	2.08	2.10	2.28
TRI 2025	F0	2.07	1.77	1.25	1.34	1.36	1.37
	F1	2.18	1.82	1.78	1.66	1.69	1.95
	F2	2.16	1.80	1.90	2.09	2.03	2.36
	F3	2.18	2.10	1.82	1.65	2.15	2.03
L.S.D. (P=0.05)		NS	NS	0.25	0.24	0.26	0.23

*Analyses done on $\sqrt{n+1}$ transformed data

Growth and dry matter production and distribution

In TRI 777 the F1 level increased leaf production and the leaf and plant dry weight (Table 4). There were no further increases at higher levels. Both DT 1 and TRI 2025 responded markedly to F2 by producing more and longer side shoots having more leaves of larger leaf area resulting in increased dry matter of leaves, stems and roots (plant). In DT 1, F3 reduced the dry weight of roots and of plant while in TRI 2025 it reduced the leaf area and total dry weight of plant.

Experiment 2

Activity of terminal buds

In TRI 777 no clear differences were seen between the fertilizer treatments. In general, more plants remained active at treatment 3. In DT 1 and TRI 2025 more plants remained active at treatment 5 and the peaks of activity were seen earlier but its effect lasted only till the 12th week. A response to treatment 4 was seen only during the latter stages of the experiment.

TABLE 4 — *Effect of levels of fertilizer on growth and dry matter production (means of 120 plants). (Back-transformed numbers in parentheses)*

Clone	Fertilizer level	Side shoots		No. of leaves on main+side shoots†	Area of leaves on main+side shoots (cm ²)	Dry weight (g)			
		Number*	Length (cm)			Leaves	Stems	Roots	Plant
TRI 777	F0	1.01 (0.02)	0.12	2.74 (7.51)	18.30	0.17	0.18	0.13	0.48
	F1	1.24 (0.54)	2.52	4.48 (20.07)	34.89	0.73	0.73	0.15	1.61
	F2	1.14 (0.30)	0.62	4.23 (17.89)	24.73	0.52	0.28	0.16	0.96
	F3	1.14 (0.30)	1.51	3.90 (15.21)	18.93	0.49	0.30	0.20	0.99
DT 1	F0	1.13 (0.28)	0.65	3.50 (12.25)	67.63	0.63	0.61	0.60	1.84
	F1	1.59 (1.53)	5.22	5.79 (33.52)	141.98	1.52	0.91	1.00	3.43
	F2	1.89 (2.57)	10.06	6.49 (42.12)	228.40	2.27	2.04	1.70	6.01
	F3	1.93 (2.72)	11.77	6.66 (44.36)	217.57	1.98	1.93	0.95	4.86
TRI 2025	F0	1.34 (0.80)	1.18	3.52 (12.39)	100.75	1.06	0.76	1.14	2.96
	F1	1.65 (1.72)	6.91	5.86 (34.34)	224.36	2.25	1.51	1.95	5.71
	F2	2.02 (3.08)	11.15	6.50 (42.25)	340.65	3.36	2.41	2.75	8.52
	F3	1.86 (2.46)	9.13	6.40 (40.96)	146.73	1.43	1.15	0.98	3.56
L.S.D. (P=0.05)		0.27	4.09	0.54	70.01	0.51	0.73	0.51	1.00

*Analyses done on $\sqrt{n+1}$ transformed data †Analyses done on \sqrt{n} transformed data

Number and duration of active phases

The number and duration of active phases was greatest in TRI 777 at treatment 2 and in both DT 1 and TRI 2025 at treatment 4 (Table 5).

TABLE 5 — *Effect of increasing the level of fertilizer on the mean number and duration of active phases per plant during 24 weeks*

<i>Clone</i>	<i>Active phases per plant</i>			
	<i>Treatment</i>	<i>Number</i>	<i>Duration (weeks)</i>	<i>% Duration</i>
TRI 777	F1	1.52	6.08+0.37	25
	F2	1.80	10.08+0.71	42
	F3	1.70	9.64+0.45	40
	F4	1.65	6.33+0.73	26
	F5	1.59	6.62+0.33	28
DT 1	F1	1.54	3.67+0.17	15
	F2	2.30	10.27+0.46	43
	F3	2.31	11.28+0.47	47
	F4	2.41	11.78+0.42	49
	F5	2.29	10.76+0.40	45
TRI 2025	F1	1.63	3.83+0.16	16
	F2	2.57	8.00+0.14	33
	F3	2.77	9.27+0.16	39
	F4	2.83	9.98+0.15	42
	F5	2.62	8.94+0.26	37

Increase in height

In TRI 777 no response was seen to any fertilizer level from 0-8 weeks from commencement of fertilizer application (Fig. 2A). A response to treatment 2 was seen from 18-30 weeks. A response to treatment 4 was also noted at the 10th and 16th weeks and from 26-30 weeks compared to treatment 1. At treatment 4 plant height was reduced from 18-22 weeks. In DT 1 a response to treatment 2 was seen from 12-14 weeks and at the 18th week, to treatment 3 at the 20th week and to treatment 4 from 26-30 weeks (Fig. 2B). A response to treatment 5 was also noted at the 8th week and from 22-24 weeks. At treatment 4 plant height was reduced at the 12th week and at treatment 5 from 26-30 weeks. In TRI 2025 a response to treatment 2 was seen from 12-14 weeks, to treatment 4 from 26-30 weeks and to treatment 5 from 8-10 and 18-24 weeks (Fig. 2C). At treatment 5 growth was reduced at the 26th and 30th weeks.

Total number of leaves on the main axis

In all 3 clones no differences in leaf number were seen to any fertilizer level from 0-8 weeks (Table 6). In TRI 777 a response to treatment 2 was seen from 10-22 weeks and to treatment 3 from 26-30 weeks. At treatment 4 leaf production was depressed at the 26th week. In DT 1 a response to treatment 2 was seen from 10-18 weeks and to treatment 5 from 22-30 weeks. In TRI 2025 a response to treatment 2 was seen at the 10th week and to treatment 5 at 14th week and from 22-30 weeks.

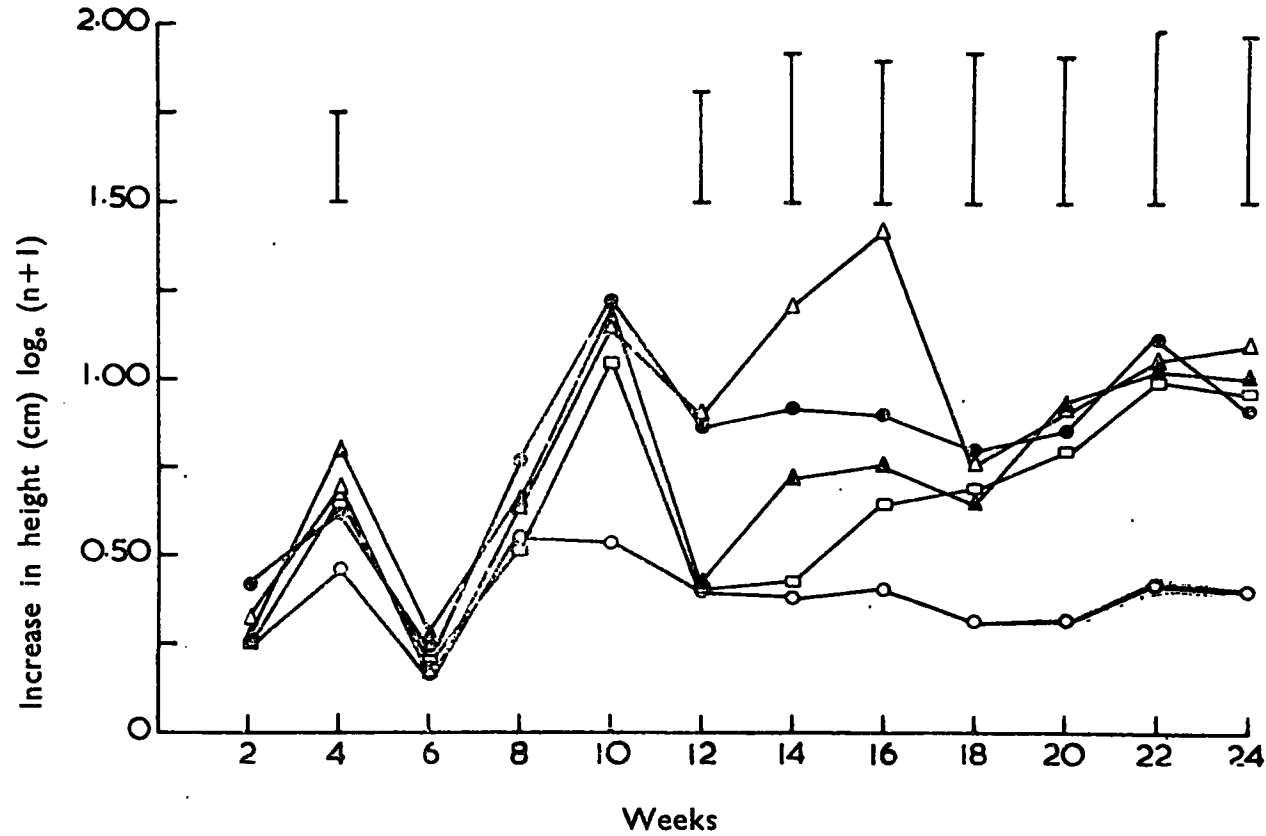


Fig. 2A.—Effect of fertilizer levels on fortnightly increases in plant height of clone TRI 777 (Means of 90 plants). ○—F1, ●—F2, △—F3, ▲—F4, □—F5

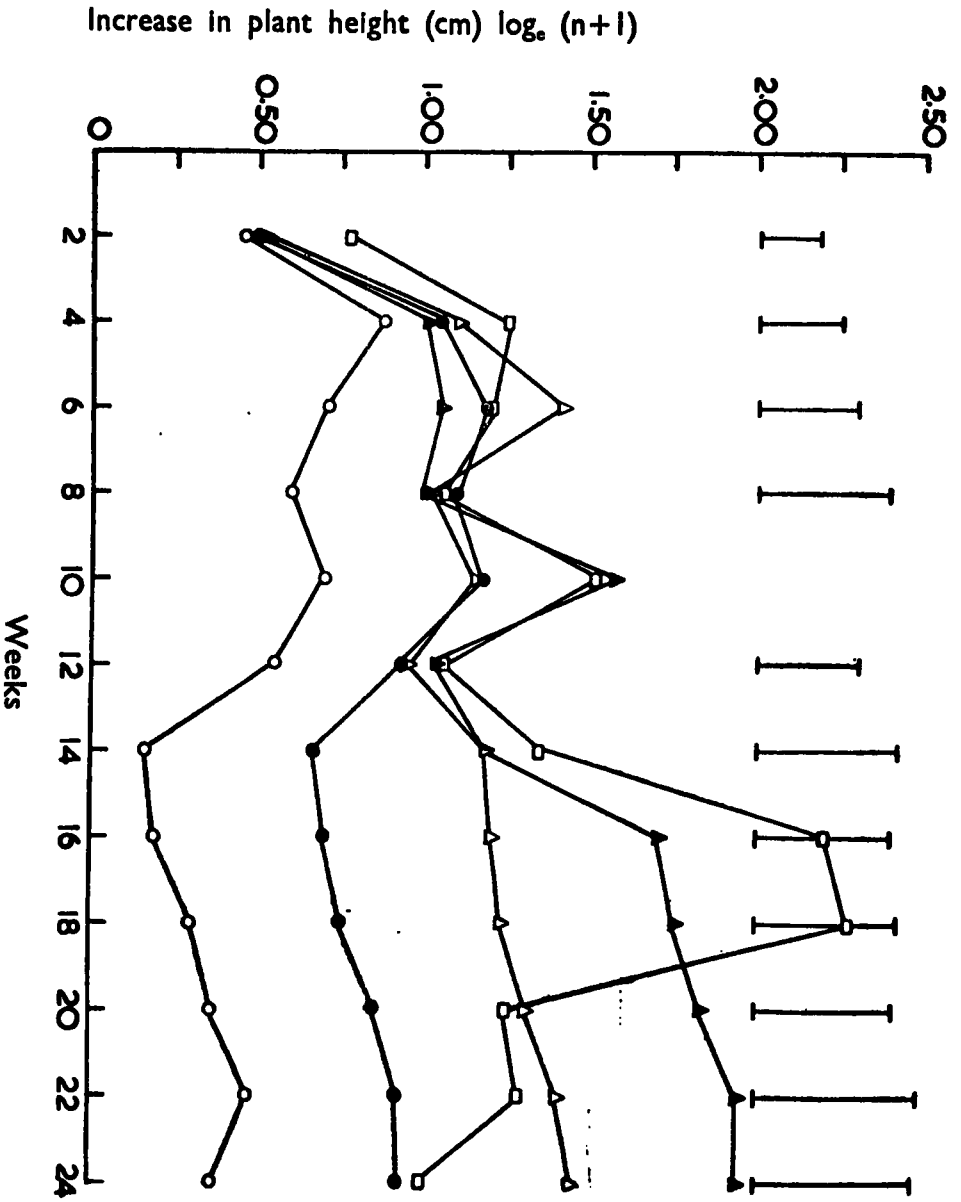


Fig. 2B.—Effect of fertilizer levels on fortnightly increases in plant height of clone DT 1 (Means of 90 plants). ○ = F1, ● = F2, △ = F3, ▲ = F4, □ = F5

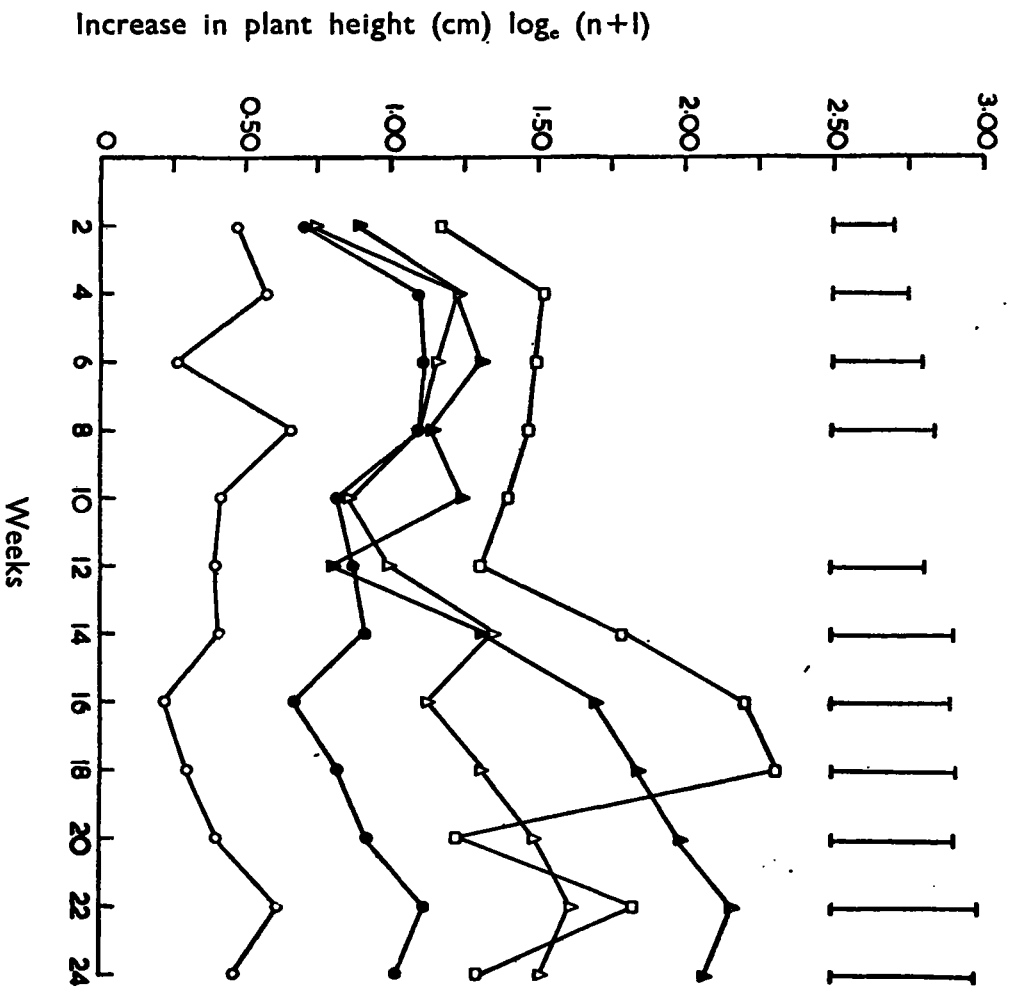


Fig. 2C.—Effect of fertilizer levels on fortnightly increases in plant height of clone TR1 2025 (Means of 90 plants). ○—F1, ●—F2, △—F3, ▲—F4, □—F5

TABLE 6 — *Effect of increasing the level of fertilizer on monthly mean differences in total leaf number (including leaf scars) per plant on the main stem (means of 90 plants).** (The first difference in leaf number is 10 weeks from commencement of fertilizer application).

Clone	Treatment	Weeks					
		4	8	12	16	20	24
TRI 777	F1	0.68	0.63	0.75	0.67	0.61	0.58
	F2	1.47	1.77	1.57	1.36	1.21	1.29
	F3	1.52	1.79	1.62	1.18	1.83	2.11
	F4	1.46	1.60	1.53	1.08	1.20	1.82
	F5	1.26	1.75	1.27	0.66	1.45	1.85
DT 1	F1	0.62	0.54	0.76	0.68	0.69	0.73
	F2	1.86	1.98	1.60	1.38	1.26	1.30
	F3	2.06	2.28	2.08	2.00	1.82	1.78
	F4	1.95	2.28	2.56	2.66	2.42	2.29
	F5	1.96	2.22	2.68	3.28	3.00	2.77
TRI 2025	F1	0.66	0.72	0.98	0.71	0.62	0.69
	F2	1.87	1.35	1.58	1.37	1.19	1.22
	F3	2.00	1.88	2.22	2.06	1.75	1.75
	F4	1.79	2.43	2.54	2.74	2.33	2.26
	F5	1.76	3.01	2.80	3.39	2.89	2.84
L.S.D. (P=0.05)		0.28	0.54	0.65	0.53	0.33	0.44

*Analyses done on \sqrt{n} transformed data

Growth and dry matter production and distribution

In TRI 777 treatment 2 produced more and longer side shoots, larger leaves and increased the dry weight of stems and roots while treatment 3 increased leaf production and the dry weight of leaves and of plant (Table 7). At treatment 5 leaf production was depressed. In DT 1, treatment 2 produced more side shoots and larger leaves, treatment 3 increased the length of side shoots and leaf production while treatment 4 increased the dry weight of leaves and of plant. At treatment 5 the dry weight of roots and of plant was reduced. In TRI 2025 treatment 4 produced more and longer side shoots, more leaves of larger leaf area and increased the total dry weight of plant. At treatment 5 leaf production and the dry weight of roots and of plant was depressed.

DISCUSSION

The results of this study have shown that the optimal fertilizer requirements of clones differ. Experiment 1 showed that the F3 level increased the casualties from 2.7% - 28.7%. Though the F3 level caused early bud-break with increase in height of the survivors, soon after fertilizer application, the effect lasted only for a short period followed by reduced growth and symptoms of scorch and premature defoliation leading to the ultimate death of some plants.

When the dose of fertilizer was progressively increased from 28.35 to 56.70 g (experiment 2) it was not detrimental to the plants when compared to applications of higher levels of fertilizer from commencement. This may be because when fertilizer levels are stepped up at intervals the plants having produced more foliage would be in a better position to utilize the added nutrients. However, when the fertilizer dose was stepped up to 113.40 g as in treatment 5, the responses were no longer sustained to any appreciable length of time. The responses seen to treatment 5 were those which occurred before the dose was stepped up to 113.40 g.

TABLE 7 — *Effect of increasing the level of fertilizer on growth and dry matter production (means of 90 plants). (Back-transformed numbers in parentheses).*

Clone	Treatment	Side shoots		No. of leaves on main+ side shoots*	Area of leaves on main+ side shoots (cm ²)	Dry weight (g)			
		Number*	Length (cm)			Leaves	Stems	Roots	Plant
TRI 777	F1	1.10 (1.21)	2.44	3.64 (13.25)	69.14	0.30	0.28	0.17	0.75
	F2	1.59 (2.53)	11.60	5.74 (32.95)	145.64	1.11	1.03	1.11	3.25
	F3	1.78 (3.17)	15.47	7.31 (53.44)	187.94	1.96	1.48	1.71	5.15
	F4	1.77 (3.13)	11.08	6.96 (48.44)	146.83	1.82	1.15	1.23	4.20
	F5	1.79 (3.20)	10.57	4.69 (22.00)	148.47	1.31	0.93	0.57	2.81
DT 1	F1	1.18 (1.39)	3.65	3.78 (14.29)	43.43	0.42	0.30	0.57	1.29
	F2	1.96 (3.84)	12.78	6.42 (41.22)	187.99	1.27	1.00	1.30	3.57
	F3	2.34 (5.48)	23.08	8.16 (66.59)	238.81	2.22	2.03	2.24	6.49
	F4	2.20 (4.84)	21.70	8.89 (79.03)	243.66	3.06	2.19	2.91	8.16
	F5	2.39 (5.71)	25.21	8.04 (64.64)	292.43	2.89	1.98	1.41	6.28
TRI 2025	F1	1.30 (1.69)	9.85	4.11 (16.89)	169.52	0.70	0.51	0.54	1.75
	F2	1.94 (3.76)	17.52	6.97 (48.58)	254.41	1.56	1.21	1.38	4.15
	F3	2.30 (5.29)	22.80	8.95 (80.10)	319.73	2.39	2.17	2.32	6.88
	F4	2.74 (7.51)	31.45	10.56 (111.51)	401.10	3.48	2.87	3.02	9.37
	F5	2.81 (7.90)	35.57	8.17 (66.75)	422.24	3.26	2.32	1.87	7.45
L.S.D. (P=0.05)		0.43	6.40	1.46	60.43	0.80	0.67	0.69	1.16

*Analyses done on \sqrt{n} transformed data

In both experiments clone TRI 777 showed the best overall response only to 28.35 g which caused earlier bud-break, induced a greater number of active phases of longer duration, increased plant height, leaf production and dry matter accumulation. In experiment 1 clones DT 1 and TRI 2025 showed a better response to F2. In experiment 2, in DT 1 and TRI 2025 more plants remained active only at the early stages of treatment 5. In both clones plant height was increased by treatment 4 much later (when stepped up to 56.70 g). When the dose was stepped up to 56.70 g at an early stage as in treatment 5, both clones responded at 8 weeks, the effect lasting for 2 weeks (DT 1) and 4 weeks (TRI 2025). Clone DT 1 responded again at 22 weeks which lasted for 4 weeks while TRI 2025 showed a response at 18 weeks lasting for 8 weeks. Clone DT 1 is a slow starter in the nursery but becomes vigorous during the later stages of its growth. This clone responded to a remarkable extent to the higher levels (56.70 g) only as growth progressed. Hence such clones will benefit from progressively increasing levels of fertilizer as the plants produce more foliage. Clone TRI 2025, being a vigorous clone responded early to higher levels (56.70 g) applied soon after rooting, the effect lasting over a longer duration. This confirms the previous conclusion that vigorous growers benefit from higher levels of fertilizer than used at present (Kulasegaram and Kathiravetpillai, 1972). In these clones, in general, the increase in leaf production caused by treatment 5, lasted over a longer period.

In both experiments all 3 clones had a greater percentage of dry matter in the roots at F0 than at the other levels. In experiment 1 in both DT 1 and TRI 2025 a greater percentage of dry matter was partitioned into the leaves and stems with increasing level of fertilizer. In experiment 2, in all 3 clones at the higher levels of fertilizer, the percentage distribution of dry matter in leaves was higher.

The quantity of fertilizer added per 100 plants at the end of 32 weeks in experiment 1 was F1 340.20 g, F2 680.40 g and F3 1360.80 g while in experiment 2 this quantity applied for the corresponding period for treatments 2, 3, 4 and 5 were 340.20 g, 410.95 g, 481.75 g and 652.05 g respectively. Since both experiments were conducted at almost the same period of time the variation due to environment could be regarded as minimal. The results show that a better response to growth can be obtained by progressively stepping up the dose thereby economising the use of fertilizer.

It has been shown that the response to fertilizer may be associated with the leaf area of the plant and it was recommended to separate out plants with more foliage and continue fertilizer application at progressively increasing rates for vigorous clones (Kulasegaram and Kathiravetpillai, 1971). In this study the vigorous clones with larger leaf area showed greater response to the higher levels of fertilizer (56.70 g) as their capacity to utilize fertilizer is greater than the slower growing clones with lesser leaf area. Leaf area increases rapidly as the plants grow and hence it would be desirable to progressively increase the quantity of fertilizer applied. As the leaf area increases an increase in the photosynthetic capacity of the leaves could be expected at least in the early stages, which in turn would increase the demand for nutrients.

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REFERENCES

- ANON, (1973). Tea Replanting Subsidy Scheme. *Tea Control Dept.*, pp. 72.
- ANON, (1975). Fertilizer Scheme for Tea Estates. Advisory leaflet. *Tea Control Dept.*, pp. 6 (Mimeographed).
- BOND, T. E. T. (1945). Studies in the vegetative growth and anatomy of the tea plant (*Camellia thea* Link) with special reference to the phloem, II. Further analysis of flushing behaviour. *Ann. Bot.* 9, 183-216.
- DE HAAN, I. (1941). Gebreevkschijnselen bij thee veroorzaakt door een tekort aan de belangrijkste minerale voedingsstoffen met uitzondering van kalium. *Archf. Theecult. Ned. Ind.*, 15, 1-32 (English summary).
- KULASEGARAM, S. & KATHIRAVETPILLAI, A. (1971). Studies on the dormancy of tea shoots. 3 - The effects of fertilizer levels and hormones. *Tea Q.* 42, 57-74.
- KULASEGARAM, S. & KATHIRAVETPILLAI, A. (1972). Effects of nutrition and hormones on growth and apical dominance in tea (*Camellia sinensis* (L) O. Kuntze). *J. hort. Sci.* 47, 11-24.
- PETHIYAGODA U. (1970). Fertilizer applications in the nursery - a cautionary note. *Tea Q.* 41, 69-70.
- RICHARDS, A. V. (1967). Vegetative propagation of tea. Advisory pamphlet 8/66, *Tea. Res. Inst. of Sri Lanka*, pp. 17.
- TOLHURST, J. A. H. & VISSER, T. (1961). Manuring of nurseries: 2 T.R.I. nursery manure: a completely soluble inorganic mixture. *Tea Q.* 32, 220-221.
- VISSER, T., KEHL, F. H. & TILLEKERATNE, L. M. DE W. (1959). Propagation of Tea Cuttings. 1. Soil and Nutrient Requirements. *Bull. Tea. Res. Inst. Ceylon N. S.* No. 1:1-15.
- VISSER, T. & KEHL, F. H. (1961). Manuring of nurseries: 1. Experiments on the frequency and methods of application of inorganic and organic mixtures. *Tea Q.* 32, 216-219.
- WIGHT, W. & BARUA, D. N. (1955). The nature of dormancy in the tea plant. *J. exp. Bot.* 6, 1-5.