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EFFECT OF GROWTH SUBSTANCES ON ROOTING OF SLOW ROOTING TEA CLONES

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Effects of some growth substances on the growth of tea cuttings were studied. Rooting and plant growth was improved when cuttings of a slow rooting clone TRI 777 were given a quick dip in rootone, IBA (6000 ppm) and in IBA + NAA (4000 and 6000 ppm); steeped for 18 hours in solutions of IBA (80 ppm) and IBA + NAA (40 and 80 ppm); immersed to a depth of 1.5 cm from the basal end in rootone. Dipping the basal ends of cuttings of clone TRI 777 in Fermate or Benlate did not improve rooting.

INTRODUCTION

An important factor in the selection of tea clones is their rooting ability. Most of the quality clones are slow rooters requiring more time and attention in the nursery before they can be put out in the field. In view of this it was felt that the effect of growth hormones on rooting should be studied in some detail in order to see whether early rooting could be induced in some shy rooting clones.

Visser (1958) noted somewhat favourable effects with the quick dip method when he tried the quick dip and dilute solution soak methods using IAA, NAA and GA on cuttings of two clones. Venkataramani (1959) who tried IAA, IBA and NAA in India found that different growth substances affected differently not only the quality but also the quantity of roots produced. Richards (1964) reported promising results with "Fermate" dust. However, in a subsequent trial (1965) using NAA, IAA, IBA + NAA, Seradix B (2) and Fermate 76% he did not observe any difference between the control and the hormone treatments.

In this study an attempt was made to determine the effect of IBA, NAA, singly and in combination, rootone, Fermate and Benlate on the rooting of tea cuttings.

MATERIALS AND METHODS

The study was carried out at St Coombs Estate, Talawakele (1372 m AMSL) from May to August 1980. The clone used in these experiments was TRI 777 and assessments including counts of deaths were carried out at the end of 12 weeks from commencement of treatments.

Effects of quick dip in growth substances on rooting of cuttings:

The treatments comprised the following:

1. Control (50% alcohol)

2. Rootone* powder ('Rootone F' an auxin preparation with added fungicide from Amchem Products Inc.)
3. Indole butyric acid (IBA) — 4 mg/ml (4000 ppm)
4. IBA — 6 mg/ml (6000 ppm)
5. Napthalene acetic acid (NAA) — 4 mg/ml (4000 ppm)
6. NAA — 6 mg/ml
7. IBA + NAA — 4 mg/ml
8. IBA + NAA — 6 mg/ml

In the treatments involving liquid formulations the basal 1-2 cm of cuttings were dipped in the solution for 30 seconds before planting. With the powder formulation the cuttings were dipped momentarily and gently tapped to remove the excess powder and planted in the bags. The layout was of the completely randomised block design with treatments replicated four times.

Effect of steeping in solutions of growth substances on rooting of cuttings:

In this experiment the cuttings were steeped in the solutions for 18 hours before planting.

The treatments were:

1. Control (50% alcohol)
2. IBA — 0.04 mg/ml
3. IBA — 0.08 mg/ml
4. NAA — 0.04 mg/ml
5. NAA — 0.08 mg/ml
6. IBA + NAA — 0.04 mg/ml
7. IBA + NAA — 0.08 mg/ml

The layout was of the completely randomised block design with treatments replicated four times.

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*Active ingredients:

Naphthylacetamide	...	...	...	0.067%
2-methyl-1-napthyl acetic acid	...	...	...	0.033%
2-methyl-1-napthylacetamide	...	...	...	0.013%
Indol-3-butyric acid	...	...	...	0.057%
Ingredient active as fungicide:				
Thiram (tetramethylthiuramdisulfide)	...	...	...	4.00%
Inert ingredients	...	...	...	95.83%

Effect of depth of immersion on rooting of cuttings:

Cuttings were immersed in Rootone powder at the following depths:

1. Basal ends only
2. Up to 1.5 cm from base
3. Whole length of internode (3.2 cm)

The excess powder was gently tapped out on each occasion before planting out. The experiment was of the completely randomised block type with treatments replicated nine times.

RESULTS

Effect of quick dip in growth substances on rooting of cuttings:

No difference was seen in the number of deaths, number of cuttings rooted and the dry weight of plant between any of the treatments (Table 1).

TABLE 1 — *Effect of quick dip in different growth substances on the growth of cuttings (means of 40)*

	Treatments								
	Control	*Rootone*	*IBA*		*NAA*		*IBA + NAA*		*LSD*
			4000	*6000*	*4000*	*6000*	*4000*	*6000*	*(P=0.05)*
			(ppm)		*(ppm)*		*(ppm)*		
No. of deaths*	2.41	1.10	2.41	1.31	1.31	1.29	1.10	1.39	NS
No. of cuttings rooted	7.50	9.25	8.25	8.50	8.00	7.75	8.50	9.00	NS
Root number	5.98	11.55	8.17	14.62	8.56	9.07	13.94	13.57	5.00
Length (cm) of roots	29.84	64.68	30.40	58.64	38.37	37.46	46.82	53.94	17.80
Dry weights (g)									
Roots	0.06	0.11	0.08	0.12	0.08	0.07	0.10	0.13	0.04
Plant**	0.54	0.60	0.56	0.56	0.51	0.51	0.53	0.57	NS

* Analyses done on $\sqrt{n+1}$ transformed data.
** Plant dry weight includes the dry weights of original cutting and mother leaf.

Cuttings dipped in rootone, IBA (6000 ppm) and IBA + NAA (6000 ppm) had more and longer roots and greater dry weight of roots. Cuttings dipped in IBA + NAA (4000 ppm) had more roots and greater dry weight of roots. The effect of a quick dip in growth substances on the rooting of cuttings is shown in fig. 1.

Effect of steeping cuttings in solutions of growth substances on rooting of cuttings

No differences were noted in cuttings steeped in any of the solutions in respect of the number of deaths, number of cuttings rooted, length of roots and dry weight of plant (Table 2).

TABLE 2 — *Effect of steeping in solutions of different growth substances on growth of cuttings (mean of 40)*

	Treatments							
	Control	*IBA*		*NAA*		*IBA + NAA*		*LSD*
		40 ppm	*80 ppm*	*40 ppm*	*80 ppm*	*40 ppm*	*80 ppm*	*(P=0.05)*
No. of deaths*	1.10	1.00	1.00	2.41	1.00	1.10	1.29	NS
No. of cuttings rooted	7.25	7.00	9. 00	7.25	8.00	8.50	7.50	NS
Root number	5.98	8.33	14.03	7.78	8.40	10.94	10.62	3.36
Length (cm) of roots	33.54	37.28	65.33	39.13	40.05	52.02	45.99	NS
Dry weights (g)								
Roots	0.06	0.08	0.13	0.06	0.07	0.09	0.12	0.02
Plant**	0.57	0.58	0.58	0.51	0.58	0.60	0.61	NS

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

** Plant dry weight includes the dry weight of original cutting and mother leaf.

Cuttings steeped in IBA (80 ppm), IBA + NAA (40 ppm) and IBA + NAA (80 ppm) had more roots and greater dry weight of roots. Cuttings steeped in IBA (40 ppm) had greater dry weight of roots. Fig. 2 shows the effect of steeping cuttings in growth substances on the rooting of cuttings.

Effect of depth of immersion of cuttings :

Cuttings dipped up to 1.5 cm from the basal end as well as the entire internode (3.2 cm) showed more rooting, root number and dry weight of roots (Table 3).

TABLE 3 — *Effect of depth of immersion of cuttings in Rootone on growth (means of 90)*

	Depth of immersion			
	Basal end	*1.5 cm*	*3.2 cm*	*LSD (P=0.05)*
No. of cuttings rooted	7.22	8.67	8.89	1.27
Root number	6.68	9.13	8.86	1.71
Length (cm) of roots	34.40	52.89	43.87	13.65
Dry weights (g)				
Roots	0.08	0.10	0.09	0.02
Plant*	0.58	0.59	0.59	NS

* Plant dry weight includes the dry weights of original cutting and mother leaf.

In addition, the cuttings dipped up to 1.5 cm from the basal end had longer roots. No difference was seen between the treatments in respect of the dry weight of the plant. Fig. 3 shows the effect of depth of immersion of cuttings in rootone on the rooting of cuttings.

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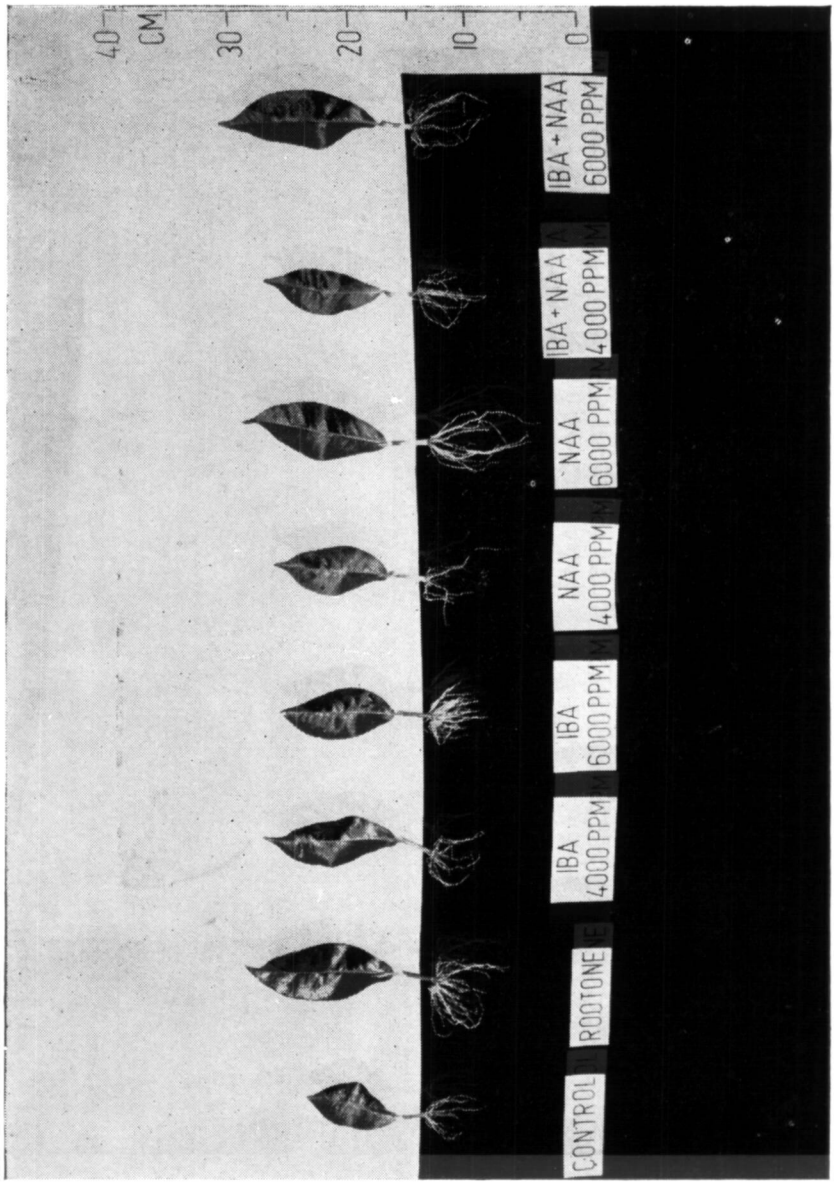

Fig. 1. — Effect of quick dip of cuttings in growth substances on rooting of cuttings.

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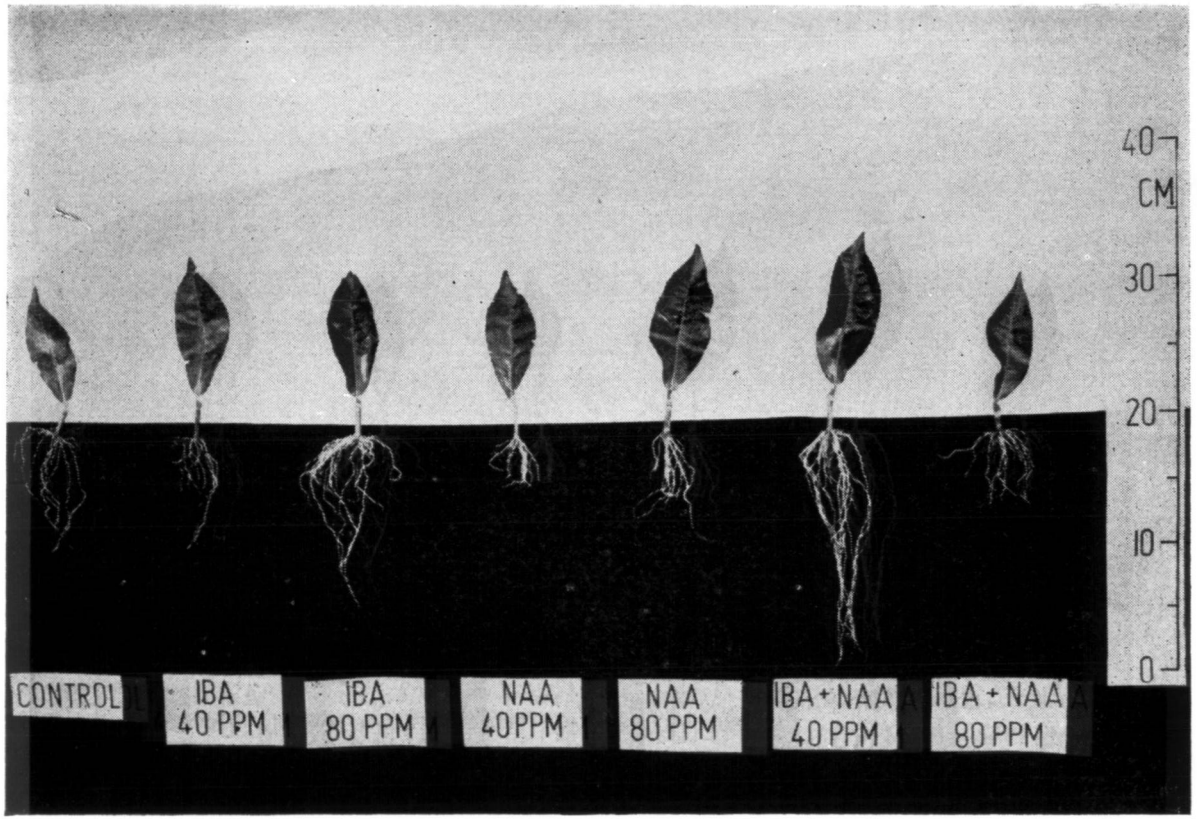

Fig. 2.—Effect of steeping in solutions of growth substances on rooting of cuttings.

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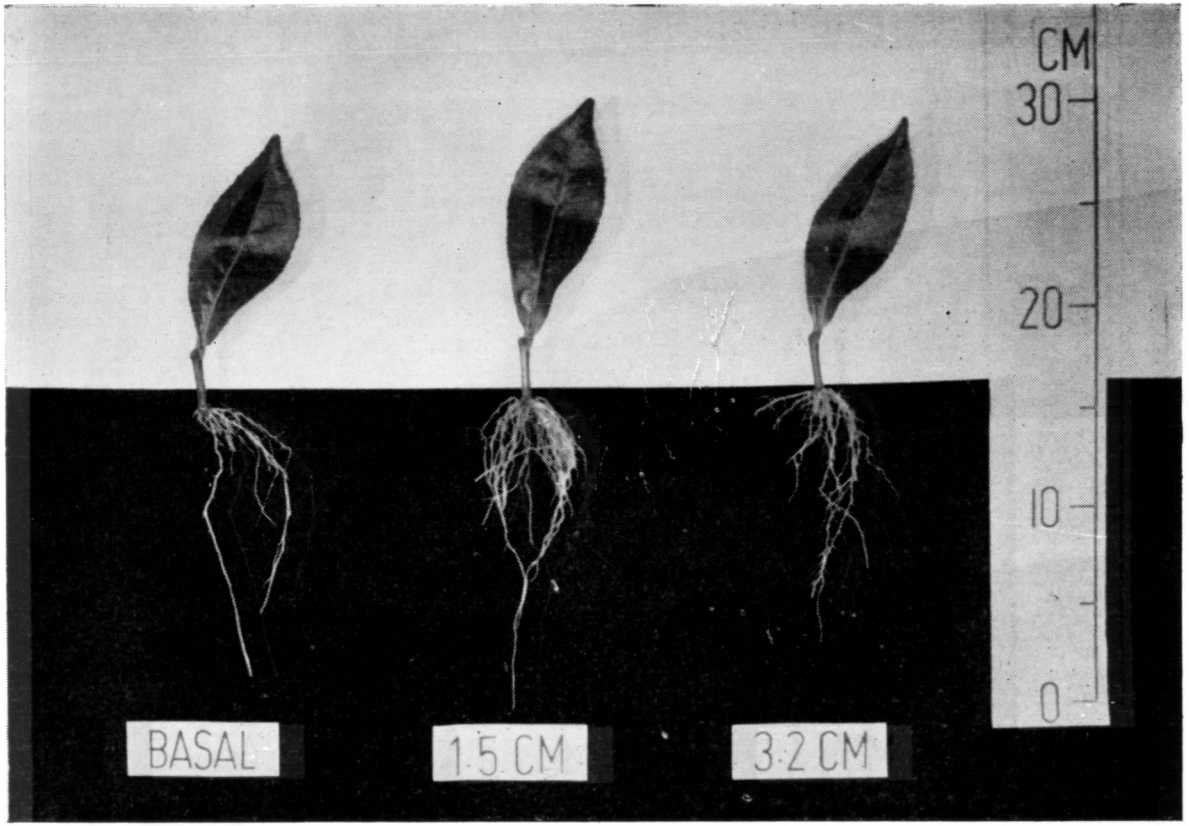

Fig. 3.—Effect of depth of immersion of cuttings in rootone on rooting of cuttings.

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Effect of dipping basal ends of cuttings in Fermate and Benlate:

Cuttings dipped in Fermate and Benlate showed less dry weight of roots (Table 4). Cuttings dipped in Benlate had less plant dry weight.

TABLE 4 — *Effect of dipping cuttings in Fermate and Benlate on growth (means of 90)*

	Treatments			*LSD*
	Control	*Fermate*	*Benlate*	*(P=0.05)*
Dry weights (g)				
Roots	0.06	0.04	0.04	0.01
Plant*	0.47	0.49	0.38	0.07

* Plant dry weight includes the dry weights of original cutting and mother leaf.

DISCUSSION

The experiments involving the use of growth substances have showed that better rooting of cuttings and hence of plant growth was obtained by a quick dip in rootone, IBA at 6000 ppm and in combination of IBA + NAA (Table 1, Fig. 1). When cuttings were steeped in solutions of different growth substances for 18 hrs, IBA and combinations of IBA + NAA promoted rooting and better plant growth (Table 2, Fig. 2). Rooting and plant growth were improved when cuttings were immersed up to 1.5 cm or more from the basal end in rootone (Table 3, Fig. 3). Both Fermate and Benlate did not improve the rooting of cuttings (Table 4).

The rooting ability of tea cuttings is an inherent clonal character and good and poor rooters are known. It has generally been observed that most of the quality clones are poor rooters. TRI 777 which is an excellent quality clone shows slow rooting. In this study an attempt was made to see whether rooting of cuttings of clone TRI 777 could be improved by growth substances. The improved rooting of cuttings treated with rootone powder could be due to the effects of the two auxins in the powder. However, Eden (1953) did not find any improvement in rooting after using eleven growth substances. Visser (1958) obtained a favourable effect when he used the quick dip method as compared to the dilute solution soak method using IAA, IBA, NAA and GA. Venkataramani (1959) using IBA, IAA and NAA found that different growth substances affected not only the quality but also the quantity of roots produced. Further, Venkataramani (1961) has also showed that a quick dip of tea cuttings in IBA 5000 ppm markedly increased rooting of cuttings. The results of this series of studies have clearly shown that rooting and plant growth could be markedly improved in slow rooting clones by the use of growth substances.

Richards (1964) reported promising results with Fermate dust only in one series of experiments while in a subsequent trial (1965) he did not observe any difference between the control and the hormone treatments. However, under the conditions under which this experiment was conducted no response was seen either to Fermate or Benlate.

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