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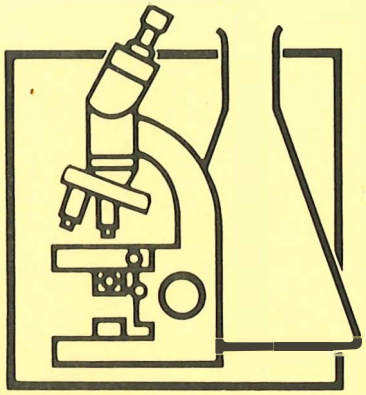

Miscellaneous Bulletin 3

Biological and Chemical Research Institute

A survey of leaf emergence rates observed in 17 AAA genome banana varieties in Australia, South Africa and Ivory Coast

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Summary. A total of 841 leaf emergence rate estimates were assembled in standardised format for 17 AAA genome banana varieties (Musa sp.). These came from published and previously unpublished data obtained over the last 20 years at Alstonville (New South Wales), Innisfail (Queensland), Burgershall (South Africa), and Azaguie (Ivory Coast).

Associated meteorological and crop data were also assembled and these included mean monthly minimum and maximum air temperatures, mean monthly daylength, plant density, varietal stature and age of planting. The banana varieties ranged in stature from 0.88 to 4.15 m, were planted at densities of 1111 to 2222 mats/ha, and leaf emergence rates were observed between 48 and 1361 days after planting.

INTRODUCTION

Mutants of AAA genome bananas (*Musa* sp.) are used throughout the world for fruit production and ornamental purposes (Simmonds, 1966). Although some varieties grow to a height of more than 4 m before producing a terminal inflorescence, many commercial varieties have been selected for dwarfness and grow to only 2.5 m, or less (Turner and Hunt, 1984).

The number of new leaves that develop in unit time, or leaf emergence rate (LER), is an index of vegetative growth rate (Kuhne, 1975). It is used to interpret seasonal fluctuations in growth (Kuhne, 1975; Robinson and Nel, 1985), to estimate critical times of events related to the fruit abnormality, November-dump (Robinson, 1982) and to the virus disease, banana bunchy top (Allen, 1978) and for timing control measures for leaf diseases (Allen, 1981). LER appears to be diurnally related to air temperature (Barker 1969; Turner 1970; Ganry 1973) but also correlated with plantation age (Turner, 1972; Kuhne, 1975; Robinson and Nel, 1985), variety (Turner and Hunt, 1984), density (Robinson and Nel, 1986), and climatic indices correlated with air temperature (Turner, 1971).

Considerable LER data have accumulated over the last 20 years from tropical North Queensland (Australia) and the Ivory Coast Republic, and from sub-tropical New South Wales (Australia) and the Republic of South Africa. Much of these data either remain unpublished or have been presented in various forms.

This bulletin presents a comprehensive survey of LER data from the above production areas, using a standardised format. It also presents associated crop and meteorological data, in anticipation of an estimation method for LER, based on easily measured co-variates.

MATERIALS AND METHODS

Mean daily LER were estimated over successive calender months from at least 40 days after planting when suckers had produced at least 4 leaves. At earlier times the suckers do not have an established root system (Turner, 1972), nor have they entered the grand period of growth (Barker, 1969; Lassoudiere, 1978).

When necessary, cumulative leaf production was plotted against time of year, and the number of leaves produced for each month was derived graphically, assuming linearity for each month. Plantation age was measured as days between planting and the mid-point of the month used to derive LER.

Mean monthly temperatures were derived as a simple average of mean monthly minima and maxima (Tmin and Tmax) recorded daily in Stevenson screens. Stature of each variety was taken as the mean height at bunching for the first three cycles, as given in Turner and Hunt (1984). Density of each planting was obtained from the literature or personal correspondence with authors.

Mean daylength for each month and location was estimated from

$$L = 24/\pi \cdot \arccos\left(-\tan(ql)\tan(d) \right) \qquad (1)$$

(List, 1963) where $q = 2\pi/360$, l is the latitude in degrees and d is the declination of the sun as defined by

$$d = -23.45\ q \cdot \cos\left(2\pi(j+11)/365.25 \right) \qquad (2)$$

and j is the day number of the year (day 1 = January 1). Daylight

hours were estimated for each day of the year and averaged for each calender month (Table 1).

RESULTS

Two sets of leaf production and associated crop and meteorological data were assembled. The first, data set "A" (Table 2), concerned 17 AAA genome banana varieties planted at Alstonville, New South Wales (latitude 28°51'S), on 18 November 1976 (Turner and Hunt, 1984). These varieties were representative of the three recognised sub-groups of AAA genome banana, namely, Gros Michel (1 variety), Cavendish (14 varieties) and Red/Green-red (2 varieties). Planting density was 1111 mats/ha, and the bananas received supplementary irrigation to a minimum precipitation of 25 mm/week. Leaf counts were made on five plants per variety at monthly intervals from February 1977 until January 1980. There were 612 estimates of LER in all.

Data set "B" involved 229 observations from four locations and various conditions (Tables 3, 4, 5). There were 20 sub-sets of data independent of data set "A", involving four varieties of the Cavendish sub-group, namely, Williams at Alstonville and Burgershall, Mons Mari (Innisfail), Robusta (syn. Poyo) (Azaguie) and Dwarf Cavendish (Burgershall). All bananas were grown under commercial conditions with high natural rainfall and humidity, while some received supplementary irrigation. Plantation ages varied from 48 to 1361 days, while plant densities varied from 1167 to 2222 mats/ha and mean monthly temperatures from 13.6 to 27.9°C.

DISCUSSION

This work provides a comprehensive survey of LER in bananas. Some revision of published data has been necessary after examination of original data. For example, the data of Turner (1971) were found to be 15 days out of phase with the observations.

Data sets "A" and "B" provide a basis for mathematical modelling to develop an estimation method for LER . The meteorological variables of temperature and daylength would be important parameters, as could be the crop factors of density, stature, and age of planting.

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Table 1. Monthly daylight hours per day at four locations relevant to data sets "A" and "B".

Month	Location/Latitude			
	Alstonville (28°51'S)	Burgershall (25°07'S)	Innisfail (17°32'S)	Azaguie (5°39'N)
January	13.6	13.4	12.9	11.7
February	13.0	12.8	12.6	11.8
March	12.2	12.1	12.1	12.0
April	11.3	11.4	11.6	12.1
May	10.5	10.8	11.2	12.3
June	10.2	10.5	11.0	12.3
July	10.4	10.6	11.1	12.3
August	11.0	11.2	11.4	12.2
September	11.9	11.9	11.9	12.0
October	12.8	12.6	12.4	11.9
November	13.5	13.3	12.8	11.7
December	13.8	13.5	13.0	11.7

Table 2. Crop and meteorological information on 17 AAA genome banana varieties in data set "A", including month of observation, plantation age (days since planting on 18 November, 1976), mean monthly Stevenson screen maximum and minimum air temperatures (^{o}C), stature (m) and leaf emergence rates (LER, leaves/day).

Varieties are as in Turner and Hunt (1984): (1) Dwarf Parfitt, (2) Dwarf Cavendish, (3) New Guinea Cavendish, (4) Chinese Cavendish, (5) Cavendish-C, (6) Cavendish-S, (7) Cavendish-N, (8) Hochuchu, (9) Viemama, (10) Mons Mari, (11) Williams, (12) Williams (pubescent), (13) Pisang masak hijau, (14) Robusta, (15) Red, (16) Green red, (17) Highgate.

Stature is the mean height of plants at bunching over the first three crops (Turner and Hunt, 1984).

Month obs.	Plant age	Tmax	Tmin	LER(#1) cv(1)	LER cv(2)	LER cv(3)	LER cv(4)	LER cv(5)	LER cv(6)	LER cv(7)	LER cv(8)	LER cv(9)	LER cv(10)	LER cv(11)	LER cv(12)	LER cv(13)	LER cv(14)	LER cv(15)	LER cv(16)	LER cv(17)
Varietal stature				0.88	1.68	2.32	2.24	2.27	1.92	2.33	2.47	2.54	2.57	2.45	2.29	3.27	2.86	4.15	4.15	2.33
Feb,77	88	26.6	19.6	0.1875	0.1750	0.1625	0.1583	0.1688	0.1563	0.1729	0.1542	0.1667	0.2042	0.1625	0.1607	0.1708	0.2042	0.1429	0.1321	0.1792
Mar,77	117	26.1	18.7	0.1726	0.1645	0.1613	0.1516	0.1613	0.1484	0.1629	0.1629	0.1581	0.1677	0.1516	0.1565	0.1387	0.1452	0.1290	0.1323	0.1645
Apr,77	148	24.0	16.3	0.1333	0.1350	0.1267	0.1117	0.0680	0.1117	0.1283	0.1097	0.1200	0.1200	0.1300	0.1067	0.1300	0.1000	0.1033	0.1067	0.1167
May,77	178	21.3	13.8	0.0903	0.0855	0.0855	0.0887	0.0855	0.0694	0.0871	0.0726	0.0742	0.0774	0.0710	0.0726	0.0806	0.0774	0.0613	0.0645	0.0806
Jun,77	209	18.5	9.6	0.0317	0.0350	0.0500	0.0417	0.0600	0.0517	0.0500	0.0517	0.0600	0.0550	0.0500	0.0350	0.0600	0.0533	0.0533	0.0467	0.0533
Jul,77	239	17.8	8.7	0.0387	0.0323	0.0323	0.0306	0.0355	0.0339	0.0387	0.0355	0.0339	0.0306	0.0452	0.0387	0.0339	0.0339	0.0194	0.0323	0.0226
Aug,77	270	20.3	10.3	0.0548	0.0532	0.0435	0.0484	0.0532	0.0419	0.0484	0.0371	0.0597	0.0516	0.0387	0.0497	0.0419	0.0435	0.0452	0.0323	0.0355
Sep,77	301	21.3	11.7	0.0667	0.0550	0.0600	0.0683	0.0433	0.0667	0.0550	0.0517	0.0617	0.0645	0.0567	0.0533	0.0550	0.0583	0.0433	0.0600	0.0533
Oct,77	331	24.3	15.1	0.1000	0.0806	0.0903	0.0710	0.0839	0.0661	0.0806	0.0935	0.0726	0.0867	0.0903	0.0823	0.0774	0.0758	0.0871	0.0742	0.0774
Nov,77	362	25.2	17.7	0.1150	0.0967	0.1100	0.1000	0.0867	0.0733	0.0967	0.1000	0.1133	0.1017	0.0933	0.1067	0.0933	0.0933	0.0867	0.0867	0.0900
Dec,77	392	26.7	18.6	0.1371	0.1258	0.1032	0.1355	0.1113	0.1097	0.1161	0.1258	0.1258	0.1000	0.1194	0.1161	0.0968	0.0903	0.0903	0.0903	0.1161
Jan,78	423	27.3	20.4	0.1419	0.1113	0.1306	0.1323	0.1145	0.1290	0.1210	0.1242	0.1323	0.1081	0.1194	0.1371	0.1065	0.1000	0.0806	0.0903	0.0903
Feb,78	453	27.2	19.8	0.1464	0.1304	0.1375	0.1161	0.1143	0.1250	0.1089	0.1214	0.1125	0.1071	0.1179	0.1196	0.0839	0.1089	0.0964	0.0857	0.1179
Mar,78	482	26.2	19.2	0.1306	0.1000	0.1016	0.1032	0.0839	0.0952	0.0823	0.1000	0.0903	0.1065	0.1000	0.1065	0.0839	0.0984	0.0774	0.0839	0.0903
Apr,78	513	24.1	15.8	0.0833	0.0883	0.0717	0.0717	0.0700	0.0617	0.0700	0.0750	0.0767	0.0717	0.0700	0.0633	0.0450	0.0617	0.0533	0.0467	0.0567
May,78	543	20.9	12.6	0.0629	0.0565	0.0613	0.0468	0.0452	0.0403	0.0478	0.0387	0.0484	0.0371	0.0452	0.0468	0.0387	0.0387	0.0355	0.0548	0.0258
Jun,78	574	18.5	10.1	0.0183	0.0167	0.0267	0.0200	0.0200	0.0250	0.0267	0.0283	0.0200	0.0250	0.0233	0.0267	0.0233	0.0317	0.0233	0.0233	0.0133
Jul,78	604	18.1	9.0	0.0274	0.0290	0.0226	0.0194	0.0210	0.0258	0.0258	0.0258	0.0242	0.0242	0.0194	0.0290	0.0258	0.0258	0.0161	0.0129	0.0065
Aug,78	635	17.7	9.7	0.0468	0.0387	0.0323	0.0274	0.0306	0.0274	0.0210	0.0355	0.0290	0.0306	0.0323	0.0274	0.0177	0.0290	0.0194	0.0129	0.0129
Sep,78	666	20.7	12.1	0.0550	0.0683	0.0450	0.0450	0.0500	0.0417	0.0417	0.0500	0.0667	0.0400	0.0467	0.0483	0.0350	0.0417	0.0400	0.0167	0.0300
Oct,78	696	21.5	13.4	0.0548	0.0774	0.0677	0.0710	0.0597	0.0677	0.0597	0.0694	0.0565	0.0677	0.0581	0.0645	0.0419	0.0629	0.0355	0.0487	0.0548
Nov,78	727	23.6	15.9	0.0933	0.1117	0.1183	0.1017	0.1033	0.0583	0.0900	0.0967	0.1000	0.0850	0.0867	0.1050	0.0933	0.1117	0.0900	0.0900	0.0967
Dec,78	757	26.1	18.2	0.0968	0.1306	0.1161	0.1129	0.1032	0.1032	0.1032	0.1129	0.1145	0.1081	0.1161	0.1194	0.1081	0.1129	0.0871	0.0871	0.1032
Jan,79	788	26.2	19.5	0.1371	0.1290	0.1081	0.1161	0.1129	0.0871	0.1210	0.1210	0.1129	0.1242	0.1194	0.1242	0.1000	0.1177	0.0710	0.0710	0.1226
Feb,79	818	26.1	19.1	0.1232	0.1393	0.1321	0.1250	0.1339	0.0982	0.1140	0.1036	0.1000	0.1143	0.1393	0.1161	0.0839	0.0875	0.0929	0.0714	0.1214
Mar,79	847	25.5	17.7	0.0968	0.1161	0.1177	0.1016	0.0871	0.1000	0.0887	0.0952	0.0919	0.0887	0.1129	0.1048	0.0806	0.1016	0.0806	0.0613	0.0645
Apr,79	878	24.7	16.2	0.0790	0.0867	0.0767	0.0800	0.0883	0.0750	0.0833	0.0750	0.0867	0.0883	0.0800	0.0683	0.0683	0.0633	0.0600	0.0500	0 0633
May,79	908	20.2	12.1	0.0419	0.0242	0.0468	0.0403	0.0645	0.0403	0.0323	0.0274	0.0355	0.0323	0.0355	0.0387	0.0274	0.0323	0.0226	0.0387	0.0258
Jun,79	939	18.9	11.9	0.0600	0.0533	0.0267	0.0317	0.0667	0.0300	0.0200	0.0217	0.0183	0.0333	0.0267	0.0300	0.0333	0.0267	0.0200	0.0133	0.0100
Jul,79	969	18.3	9.1	0.0371	0.0097	0.0258	0.0210	0.0290	0.0306	0.0065	0.0258	0.0242	0.0274	0.0290	0.0226	0.0145	0.0339	0.0258	0.0226	0.0065
Aug,79	1000	19.4	9.9	0.0387	0.0371	0.0177	0.0387	0.0290	0.0242	0.0387	0.0339	0.0387	0.0339	0.0258	0.0226	0.0226	0.0274	0.0194	0.0355	0.0226
Sep,79	1031	21.5	12.3	0.0750	0.0533	0.0483	0.0450	0.0450	0.0533	0.0433	0.0467	0.0433	0.0517	0.0500	0.0467	0.0417	0.0417	0.0333	0.0367	0.0133
Oct,79	1061	23.3	13.9	0.0839	0.0806	0.0823	0.0823	0.0742	0.0677	0.0919	0.0710	0.0742	0.0806	0.0774	0.0565	0.0645	0.0742	0.0613	0.0581	0.0484
Nov,79	1092	25.6	17.3	0.1067	0.1150	0.1217	0.1150	0.1117	0.1233	0.1017	0.1000	0.1117	0.0983	0.1100	0.1100	0.0850	0.1117	0.0933	0.0867	0.1033
Dec,79	1122	28.9	19.4	0.1242	0.1452	0.1355	0.1290	0.1339	0.1419	0.1306	0.1548	0.1419	0.1323	0.1484	0.1113	0.1290	0.1274	0.1000	0.0968	0.1323
Jan,80	1153	28.4	20.0	0.1484	0.1581	0.1339	0.1177	0.1194	0.1323	0.0903	0.1645	0.1500	0.1419	0.1387	0.1516	0.1161	0.1113	0.0935	0.0968	0.1355

Table 3. Crop and meteorological information on bananas in data set "B", sub-sets NSW1-NSW5 for Alstonville, New South Wales. Each data sub-set is from a separate planting of bananas and includes horticultural characteristics, month of observation, plantation age, mean monthly Stevenson screen maximum and minimum air temperatures, and leaf emergence rates.

Sub-set	Variety; density; irrigation; reference.	Date observed	Plant age (days)	Tmax (^oC)	Tmin (^oC)	Leaf emergence rate (LER) (leaves/day)
NSW1	Williams;	Jun,63	196	18.7	10.0	0.0430
	1814 mats/ha;	Jul,63	227	18.6	8.5	0.0379
	no irrig.;	Aug,63	258	19.8	10.8	0.0641
	Turner(1971)	Sep,63	288	26.8	8.9	0.0765
		Oct,63	319	28.2	10.8	0.0865
		Nov,63	349	23.4	15.6	0.1005
		Dec,63	380	25.4	16.9	0.1224
		Jan,64	411	28.1	19.8	0.1286
		Feb,64	440	26.3	18.8	0.1007
		Mar,64	471	25.7	18.4	0.0776
		Apr,64	501	23.6	16.3	0.0650
		May,64	532	21.0	13.3	0.0400
		Jun,64	562	22.6	8.5	0.0333
		Jul,64	593	23.5	7.2	0.0565
		Aug,64	624	21.2	10.1	0.0539
		Sep,64	654	22.6	12.7	0.0518
		Oct,64	685	24.2	12.8	0.0632
NSW2	Williams;	Dec,67	48	22.5	16.1	0.1452
	1698 mats/ha;	Jan,68	80	26.8	19.0	0.1194
	25 mm/wk;	Feb,68	113	26.3	18.0	0.1069
	Turner(1972)					
NSW3	Williams;	Jan,80	671	28.9	19.4	0.1054
	1634 mats/ha;	Feb,80	701	28.4	20.0	0.1022
	25 mm/wk;	Mar,80	731	26.0	19.7	0.0919
	Turner(unpub.)	Apr,80	762	26.7	17.6	0.0644
		May,80	792	21.3	14.3	0.0452
		Jun,80	823	19.0	11.0	0.0241
		Jul,80	853	18.0	9.2	0.0208
		Aug,80	884	19.8	11.2	0.0301
		Sep,80	915	23.8	13.3	0.0615
		Oct,80	945	24.3	15.8	0.0945
		Nov,80	976	26.1	17.1	0.1057
		Dec,80	1006	25.8	18.0	0.1077
		Jan,81	1037	26.2	19.3	0.1125
		Feb,81	1067	26.9	21.0	0.1095
		Mar,81	1096	26.0	16.8	0.0903
NSW4	Williams;	Mar,79	485	26.1	19.1	0.1102
	1167 mats/ha;	Apr,79	516	25.5	17.7	0.0757
	25 mm/wk;	May,79	546	24.7	16.2	0.0493
	Turner(unpub.)	Jun,79	577	20.2	12.1	0.0314
		Jul,79	607	18.9	11.9	0.0262
		Aug,79	638	18.3	9.1	0.0302
		Sep,79	669	19.4	9.9	0.0658
		Oct,79	699	21.5	12.3	0.0911
		Nov,79	730	23.3	13.9	0.1252
		Dec,79	760	25.6	17.3	0.1406
		Jan,80	791	28.9	19.4	0.1355
		Feb,80	821	28.4	20.0	0.1130
		Mar,80	851	26.0	19.7	0.1157
		Apr,80	882	26.7	17.6	0.0767
NSW5	Williams;	Mar,79	439	26.1	19.1	0.0911
	1167 mats/ha;	Apr,79	470	25.5	17.7	0.0983
	25 mm/wk;	May,79	500	24.7	16.2	0.0459
	Turner(unpub.)	Jun,79	531	20.2	12.1	0.0274
		Jul,79	561	18.9	11.9	0.0254
		Aug,79	592	18.3	9.1	0.0355
		Sep,79	623	19.4	9.9	0.0441
		Oct,79	653	21.5	12.3	0.0971
		Nov,79	684	23.3	13.9	0.1373
		Dec,79	714	25.6	17.3	0.1442
		Jan,80	745	28.9	19.4	0.1352
		Feb,80	775	28.4	20.0	0.1234
		Mar,80	805	26.0	19.7	0.1071
		Apr,80	836	26.7	17.6	0.0793

Table 4. Crop and meteorological information on bananas in data set "B", sub-sets RSA1-RSA4 for Burgershall, Republic of South Africa. Each data sub-set is from a separate planting of bananas and includes horticultural characteristics, month of observation, plantation age, mean monthly Stevenson screen maximum and minimum air temperatures, and leaf emergence rates. Temperature data for RSA1 and RSA3 are estimates derived by correlation with data from nearby meteorological station at Hazyview.

Sub-set	Variety; density; irrigation; reference.	Date observed	Plant age (days)	Tmax (°C)	Tmin (°C)	Leaf emergence rate (LER) (leaves/day)
RSA1	Dwarf	Mar,70	120	27.2	16.8	0.1387
	Cavendish;	Apr,70	151	26.5	14.3	0.1553
	1792 mats/ha;	May,70	181	24.6	12.8	0.0871
	25mm/week;	Jun,70	212	21.7	10.7	0.0767
	Kuhne(1975)	Jul,70	242	22.2	10.8	0.0323
		Aug,70	273	24.6	12.6	0.0677
		Sep,70	304	26.9	13.9	0.0733
		Oct,70	334	26.6	14.7	0.0935
		Nov,70	365	27.5	17.5	0.0933
		Dec,70	395	27.7	18.1	0.1097
		Jan,71	426	26.7	18.0	0.0935
		Feb,71	456	26.1	17.8	0.1250
		Mar,71	485	27.4	17.5	0.0839
		Apr,71	516	25.2	16.2	0.0800
		May,71	546	21.5	12.6	0.0548
		Jun,71	577	20.6	10.7	0.0200
		Jul,71	607	22.1	10.3	0.0226
		Aug,71	638	24.1	11.4	0.0355
		Sep,71	669	25.7	14.0	0.0567
		Oct,71	699	24.9	15.2	0.0742
		Nov,71	730	23.6	16.0	0.0733
		Dec,71	760	26.2	17.4	0.0806
RSA2	Dwarf	Jul,82	595	22.7	11.3	0.0102
	Cavendish;	Aug,82	626	25.2	13.0	0.0223
	1666 mats/ha;	Sep,82	656	25.4	12.9	0.0526
	25 mm/wk;	Oct,82	687	26.2	14.5	0.0720
	Robinson and	Nov,82	717	26.6	15.7	0.0999
	Nel (1985)	Dec,82	748	30.3	18.1	0.1068
		Jan,83	779	29.6	18.8	0.1207
		Feb,83	807	29.0	18.3	0.1477
		Mar,83	838	27.4	17.6	0.0960
		Apr,83	868	27.6	16.4	0.0907
		May,83	899	24.3	13.3	0.0630
		Jun,83	929	23.2	11.9	0.0520
RSA3	Williams;	Aug,75	323	23.3	11.5	0.0516
	1200 mats/ha;	Sep,75	354	24.9	14.5	0.1100
	25mm/wk;	Oct,75	385	24.9	14.8	0.1065
	Robinson(198[illegible]	Nov,75	416	26.2	16.5	0.1167
		Dec,75	446	25.3	17.3	0.1355
		Jan,76	477	25.2	17.9	0.1032
		Feb,76	507	26.1	17.7	0.1214
RSA3	Continued	Mar,76	536	25.4	17.4	0.1032
		Apr,76	567	24.3	15.2	0.0933
		May,76	598	21.2	12.5	0.0387
		Jun,76	629	22.1	10.8	0.0367
		Jul,76	660	22.9	9.9	0.0226
		Aug,76	691	22.7	10.8	0.0194
		Sep,76	722	26.1	13.5	0.0767
		Oct,76	752	25.4	15.4	0.0742
		Nov,76	783	27.4	16.8	0.1133
		Dec,76	813	28.4	17.6	0.0903
		Jan,77	844	30.1	19.0	0.1000
		Feb,77	874	27.4	18.8	0.1107
		Mar,77	903	24.3	16.8	0.1032
		Apr,77	934	25.8	15.9	0.0767
		May,77	964	25.0	12.6	0.0452
		Jun,77	995	24.0	11.3	0.0233
		Jul,77	1026	22.6	9.8	0.0065
		Aug,77	1057	23.3	11.4	0.0161
		Sep,77	1088	25.6	14.6	0.0600
		Oct,77	1118	27.1	16.4	0.0742
		Nov,77	1149	28.1	16.4	0.1133
		Dec,77	1179	28.8	19.0	0.1065
		Jan,78	1210	25.8	17.8	0.0903
		Feb,78	1240	27.0	18.7	0.1379
		Mar,78	1269	26.8	18.9	0.0935
		Apr,78	1299	25.0	14.9	0.0548
		May,78	1330	24.9	13.7	0.0548
		Jun,78	1361	21.4	9.8	0.0300
RSA4	Williams;	Jul,82	595	22.7	11.3	0.0027
	1666 mats/ha;	Aug,82	626	25.2	13.0	0.0158
	25 mm/wk;	Sep,82	656	25.4	12.9	0.0467
	Robinson and	Oct,82	687	26.2	14.5	0.0585
	Nel(1985)	Nov,82	717	26.6	15.7	0.0876
		Dec,82	748	30.3	18.1	0.0867
		Jan,83	779	29.6	18.8	0.1040
		Feb,83	807	29.0	18.3	0.1341
		Mar,83	838	27.4	17.6	0.0862
		Apr,83	868	27.6	16.4	0.0889
		May.83	899	24.3	13.3	0.0544
		Jun,83	929	23.2	11.9	0.0404

Table 5. Crop and meteorological information on bananas in data set "B", sub-sets QLD1 to QLD7 for Innisfail, Queensland (Daniells, pers. comm.), and sub-sets RIC1 to RIC4 for Azagule, Republic of the Ivory Coast (Lassoudiere, 1978). Data include month of observation, plantation age, mean monthly Stevenson screen maximum and minimum air temperatures, and leaf emergence rates.

Each data sub-set is from a separate planting of bananas. Sub-sets QLD1-QLD6 concern Mons Mari bananas at 2222 mats/ha, sub-set QLD7 is Mons Mari at 1923 mats/ha, all with supplementary irrigation to 20 mm/wk. Sub-sets RIC1-RIC4 are Robusta bananas at 2000 mats/ha without supplementary irrigation.

Sub-set	Date observed	Plant age (days)	Tmax (°C)	Tmin (°C)	Leaf emergence rate (LER) (leaves/day)
QLD1	Apr,83	80	28.9	22.0	0.1600
	May,83	110	26.1	20.2	0.1500
	Jun,83	141	24.0	16.2	0.1033
	Jul,83	171	23.6	14.3	0.0774
	Aug,83	202	24.1	15.6	0.0930
	Sep,83	233	28.3	17.7	0.0967
	Oct,83	263	29.7	20.1	0.1000
QLD2	May,83	58	26.1	20.2	0.1565
	Jun,83	89	24.0	16.2	0.1167
	Jul,83	119	23.6	14.3	0.1065
	Aug,83	150	24.1	15.6	0.1129
	Sep,83	181	28.3	17.7	0.1217
	Oct,83	211	29.7	20.1	0.1258
	Nov,83	242	30.6	21.5	0.1200
	Dec,83	272	30.6	22.1	0.0978
QLD3	Aug,83	66	25.0	15.6	0.0971
	Sep,83	97	28.3	17.7	0.1550
	Oct,83	127	29.7	20.1	0.1742
	Nov,83	158	30.6	21.5	0.1617
	Dec,83	188	30.6	22.1	0.1403
QLD4	Oct,83	72	29.7	20.1	0.1710
	Nov,83	103	30.6	21.5	0.2150
	Dec,83	133	30.6	21.9	0.1532
	Jan,84	164	31.2	22.6	0.1355
	Feb,84	194	28.3	22.7	0.1209
QLD5	Dec,83	79	30.6	21.9	0.1919
	Jan,84	110	31.2	22.6	0.1613
	Feb,84	140	28.3	22.7	0.1155
	Mar,84	170	29.8	21.6	0.0835
QLD6	Feb,84	76	28.3	22.7	0.1724
	Mar,84	106	29.8	21.6	0.1645
	Apr,84	137	28.1	20.4	0.1217
	May,84	167	26.1	19.1	0.0935
	Jun,84	198	23.9	16.8	0.0717
	Jul,84	228	23.7	14.3	0.1016
	Aug,84	259	25.7	15.1	0.0565
	Sep,84	290	28.3	17.5	0.0452
QLD7	Oct,84	92	28.3	18.6	0.1806
	Nov,84	123	30.3	21.5	0.1967
	Dec,84	153	32.3	23.2	0.1823
	Jan,85	184	31.7	22.6	0.1335
RIC1	Jul,71	69	28.2	20.3	0.1290
	Aug,71	100	27.1	20.3	0.1419
	Sep,71	131	28.1	21.0	0.1767
	Oct,71	161	29.6	21.5	0.1452
	Jan,72	253	30.7	21.2	0.1032
	Feb,72	283	31.6	22.0	0.0276
	Mar,72	313	31.9	21.7	0.0677
	Apr,72	344	31.1	21.8	0.1133
	May,72	374	30.4	22.2	0.1194
	Jun,72	405	29.2	21.8	0.1200
	Jul,72	435	27.4	21.6	0.1129
	Aug,72	466	26.6	21.0	0.0581
RIC2	Oct,71	70	29.6	21.5	0.1548
	Nov,71	101	30.3	20.9	0.1833
	Dec,71	131	29.4	20.2	0.1452
	Jan,72	162	30.7	21.2	0.1452
	Feb,72	192	31.6	22.0	0.1000
	Jun,72	314	29.2	21.8	0.0733
RIC2 cont	Jul,72	344	27.4	21.6	0.0903
	Aug,72	375	26.6	21.0	0.0871
	Sep,72	406	28.2	21.2	0.0967
	Oct,72	436	30.0	22.0	0.1355
	Nov,72	467	30.7	21.9	0.1033
	Dec,72	497	30.6	21.4	0.0906
RIC3	Jan,72	68	30.7	21.2	0.1628
	Feb,72	98	31.6	22.0	0.1552
	Mar,72	128	31.9	21.7	0.1548
	Apr,72	159	31.1	21.8	0.1300
	Aug,72	281	26.6	21.0	0.0355
	Sep,72	312	28.2	21.2	0.0433
	Oct,72	342	30.0	22.0	0.1097
	Nov,72	373	30.7	21.9	0.1233
	Dec,72	403	30.6	21.4	0.1032
	Jan,73	434	31.7	21.5	0.1000
	Feb,73	464	32.9	22.8	0.0679
	Jun,73	585	29.5	21.9	0.0700
	Jul,73	615	28.6	21.2	0.0871
RIC4	Apr,72	63	31.1	21.8	0.1500
	May,72	93	30.4	22.8	0.1710
	Jun,72	124	29.2	21.8	0.1400
	Nov,72	277	30.7	21.9	0.1233
	Dec,72	307	30.6	21.4	0.1194
	Jan,73	338	31.7	21.5	0.1258
	Feb,73	368	32.9	22.8	0.0286