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VARIETAL SCREENING OF GHERKINS IN SRI LANKA

by

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SUMMARY

Pickle type gherkins are produced in Sri Lanka for the export market, and this industry is popular in several agro-ecological regions ranging from low-country dry zone to mid-country intermediate zone. Although gherkins are grown in a wide range of soil and climatic conditions, growers by and large use only one commercial variety (Calypso). There are high yielding hybrid gherkin varieties available which are known to respond favourably to temperature, day-length, light intensity etc.. Therefore in order to determine the yield potential of different varieties under local conditions and to identify appropriate varieties for different environmental conditions, a collection of commercial gherkin varieties provided by ACDI (Agricultural Cooperative Development International) were screened at Hiripitiya (in the low country intermediate zone), Kalpitiya (lowcountry dry zone) and Mawathagama (mid country intermediate zone) during 1993 yala (May - August) season. Based on the results several promising varieties (Sunre 3536, Sunex 3528, Sunre 3539, Lafayette, Royal and Napoleon) were identified. However, further screening, in different seasons and locations may be needed before releasing these varieties to the growers.

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INTRODUCTION

Sri Lanka exported a mere 320 metric tons of gherkins in 1988. This rose to 6984 tons in 1991 with the total earnings of Rs. 189 million. This indicates that the gherkin production has been popularized in Sri Lanka in a very short period of time. Gherkins can be grown on a wide range of soil types and climatic conditions and in Sri Lanka the gherkin industry has expanded over several agro-ecological zones ranging from low country dry zone to mid country wet zone. Several private companies provide the necessary technical support and the market facilities to the growers. However, although the gherkin production has spread over different climatic and soil conditions in Sri Lanka, at present only one commercial variety (Calypso) is widely used in cultivation.

The high yielding hybrid varieties presently grown for gherkin production, predominately produce female flowers (gynoecious) which increase the potential for fruit development (Cartliffe, 1977). However it has been revealed that the environmental factors such as high temperature, length of light period, increased light intensity, high nitrogen and moisture can cause male flowers to develop on the gynoecious plants (Cartliffe, 1977). Also gherkin varieties vary widely in size, colour and disease resistance. Therefore it is important to identify appropriate varieties for different locations, seasons and market conditions in order to improve the productivity of the gherkin industry. Therefore, in this study several commercial varieties were screened

together with 'Calypso' as the standard variety at four contrasting locations during 1993 Yala (May to September) season, in order to study the performance of these varieties under local conditions.

METHODOLOGY

Eighteen commercial gherkin varieties were screened at four farmer locations in the north-western dry zone and intermediate zone during May - September, 1993.

Experimental plan: The Rational.

The experimental plan consisted of one replicated varietal screening trial and three non-replicated varietal screening trials at three different locations. The replicated varietal screening trial was conducted at Hiripitiya, in the mid-country intermediate zone to study the growth and yield performance of different varieties. This location was selected because the soil and climatic conditions in the area were favourable for gherkins and a considerable extent of land is presently under gherkin production. Non-replicated observational trials were conducted at Talawila and Kandakuliya within the Kalpitiya peninsula in the north western coastal belt and at Mawathagama in the mid-country wet zone. Both Kalpitiya and Mawathagama are conventional gherkin producing areas; whereas at Kalpitiya gherkins are produced on sandy soils under intensive irrigation and at Mawathagama on upland paddy fields under rain-fed conditions with supplementary irrigation. The chemical analysis of irrigation

water at different locations are as follows;

		Hiripitiya	Talawila	Kandakuliya
ec. dS/m	-	0.4	0.7	0.2
pH	-	8.1	7.6	7.9
Potassium (as K), mg/l	-	0.6	12.5	11.0
Nitrate (as N), mg/l	-	2.5	19.0	9.6
Chloride (as cl) mg/l	-	30.0	130.0	40.0

Area Background

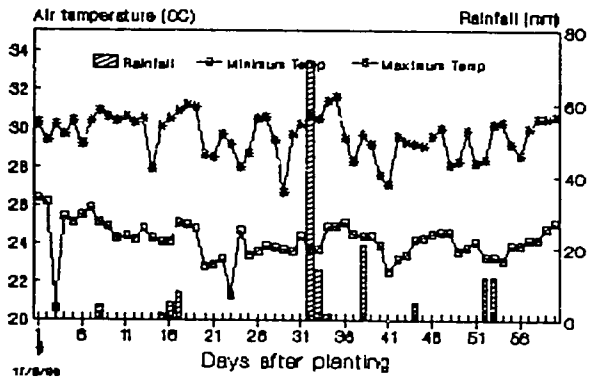
Hiripitiya:

Hiripitiya is situated in the low country intermediate zone with an elevation of 100 m AMSL. The air temperature recorded at Kurunegala (20 km south of Hiripitiya) and rainfall recorded at Hiripitiya site during the growth period are shown in Figure 1a. The soils at Hiripitiya are classified as Non Calsic Brown soils (De Alwis and Panabokke, 1973) and consist of about 8% clay, 3% silt and 88% sand, with pH of 7.5, available water capacity of 10% (by volume), infiltration rate of 20 cm per hour and bulk density of 1.69 g cm^{-1}.

Mawathagama:

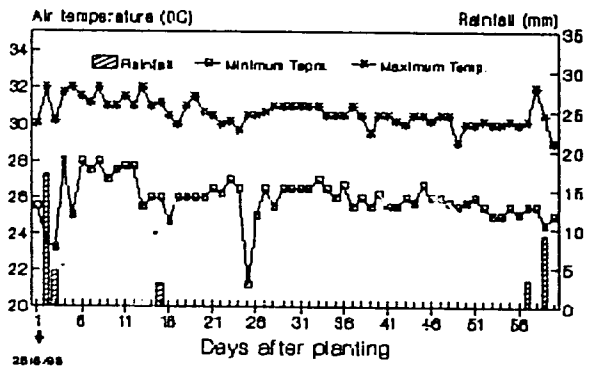
Mawathagama is situated in the mid-country intermediate zone with an elevation of 150 m AMSL. Soils at Mawathagama are classified as Reddish Brown Earths, (De Alwis and Panabokke,

Figure 1a. Rainfall and maximum & minimum air temperature during the growth period at Kurunegala.



Rainfall recorded at Hiriplitiya site

Figure 1a. Rainfall and maximum & minimum air temperature during the growth period at Kalpitiya



Air temperature and rainfall recorded at Kandakuliya

1973) containing 24% clay, 10% silt and 66% sand with available water capacity of 15% (by volume), bulk density of 1.69 g cm^{-3} and infiltration rate of 5 cm hr^{-1}.

Kalpitiya:

The Kalpitiya peninsula is situated in the north western coast of Sri Lanka, with an elevation of only 5 - 8 m AMSL. The climate of Kalpitiya is characterised by high temperatures (> 27^0 C) throughout the year, moderate to high wind velocities and a seasonally distributed rainfall. Average annual rainfall is about 1000 mm, 80% of which is received during the main monsoon 'Maha' (October to February). Rainfall and air temperature data recorded at Kandakuliya experimental site during the cropping period are presented in Figure 1b. The soil at Kalpitiya is classified as regosol (after De Alwis and Panabokke, 1973) and is extremely permeable, consisting of 98% sand with pH of 6.5, organic matter of 0.4%, P (Olsen) of 2.5 ppm, exchangeable K of 0.04 ppm, electrical conductivity of 0.01 dS m^{-1} , available water capacity of 7% (by volume) and bulk density of 1.56 g cm^{-3} .

Varieties

The following eighteen commercial varieties of different growth and yield characters were established in all four locations.

Variety	Source
1. SUNRE 3539	Sun seeds
2. LAFAYETTE	SUN seeds
3. ATLANTIS	Harris Moran
4. NEPTUNE	Harris Moran
5. ROYAL	Harris Moran
6. EARLIPIK	Northup
7. EXPRESS	Northup
8. ENDEAVOR	Northup
9. FANCIPAK	Asgrow
10. PREMIER	Asgrow
11. POSEIDON	Asgrow
12. NAPOLEON	Sun seeds
13. LAFAYETTE (L.V.)	Sun seeds
14. SUNEX 3528	Sun seeds
15. SUNRE 3512	Sun seeds
16. SUNRE 3536	Sun seeds
17. CALYPSO	Sun seeds
18. CALYPSO	Peto Seeds

Experimental design

At Hiripitiya, all 18 varieties were replicated three times in completely randomized design. Single rows of 100 plants per variety per replicate were used with the between row spacing of 100 cm. At Mawathagama, Talawila and Kandakuliya non-replicated single rows were established with 100 plants per variety per location.

Cultural practices

Sowing was done on 25-05-1993 at Kandakuliya and Talawila, on 17-06-1993 at Hiripitiya and on 03-07-1993 at Mawathagama. Seeds were sown 2 cm deep at a spacing of 100 cm between rows and 30 cm within rows (effective plant population was 30000 plants/ha, ie. leaving 10% of the area for allies and bunds). Sowing was done on flat beds at Kandakuliya and Talawila and on raised beds at Hiripitiya and Mawathagama. Inorganic fertilizer was applied at the rate 150:120:110 kg per ha of N, P_2O_5 and K_2O respectively in the form of V1 (pre-plant paddy mixture containing 16:40:12,N:P_2O_5:K_2O) and top dressing mixture (TDM) (containing 30:20, N:K_2O) as basal and three top dressings at 2 weeks interval. V1 mixture was used for the basal and the first top dressing whereas second and third top dressings were applied in the form of TDM mixture. At Talawila and Kandakuliya irrigation was practised daily with hand held hoses applying about 25 mm of water per irrigation. Furrow irrigation was practised at Hiripitiya and Mawathagama at 4 - 6 days interval whenever the rainfall was not sufficient.

Pest control

Leaf miner, aphids and thrips represent the highest threat to gherkin production in Sri Lanka. 'Curater' was applied at the rate of 10 kg/ha at planting, and 'Dimethoate' (@ 0.5 kg a.i./ha) and 'Monocrotophos' (@ 0.5 kg a.i./ha) were applied alternately commencing from 2 weeks after sowing (WAS) up to 6 WAS. However, as the leaf miner attack was severe at

Kalpitiya, especially at Talawila site, 'Dipterex' (@ 0.6 kg a.i./ha) was applied at 5th and 7th WAS.

Damping-off is normally a common disease of young seedlings and as a preventive measure against this , plants were drenched with 'Ridomil 2E' (@ 2 kg a.i./ha) at 1 WAS. The common foliar diseases of gherkin prevalent in the area are downy mildew and powdery mildew and 'Captan (@ 5 kg a.i./ha) and 'Topsin' (@ 0.25 kg a.i./ha) were sprayed alternately at 2 weeks interval commencing from 2 WAS in order to prevent the build up of these diseases.

Observations

Plant establishment and other growth parameters were monitored at regular intervals. Harvesting commenced at 30 days after sowing (DAS) and continued daily until crop senescence. The harvesting period varied considerably from one location to another depending on the environmental conditions. Harvesting was continued up to 78 DAS (48 days of harvesting) at Hiripitiya, 68 DAS (38 days of harvesting) at Kandakuliya, 65 DAS (35 days of harvesting) at Talawila and 45 DAS (15 days of harvesting) at Mawathagama. At Mawathagama, the experiment was abandoned at 45 DAS due to premature senescence of all varieties caused by excessive water stress.

At each harvest, fruits were graded in to following groups depending on the size and shape; and in each group fruit number and weights were recorded.

Pickle grades	Fruit length(cm)	Average weight (g)
Grade 1	< 5.00	3.0 - 6.2
Grade 2	5.00 - 6.25	6.2 - 12.5
Grade 3	6.25 - 8.12	12.5 - 25.0
Grade 4	8.12 - 12.5	25.0 - 200.0
Rejects	(curved, crooked, pointed, tapered)	

RESULTS AND DISCUSSION

Varietal screening trial, Hiripitiya.

Yield parameters:

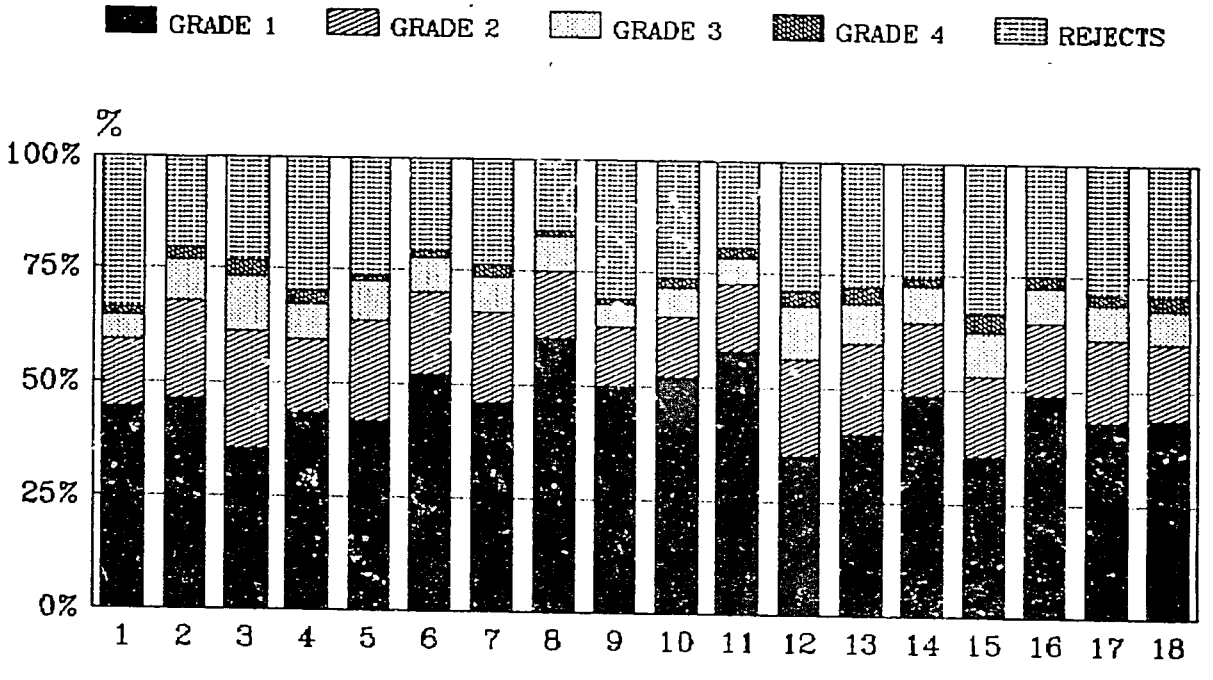
Harvesting was done daily commencing from 30 DAS, and at each harvest fruits were grouped according to the grades (given earlier) and number of fruits and fruit weights were recorded for each variety. Fruit yields of different varieties are given in Table 1. The control variety 'Calypso' marketed by both 'Peto Seed' and 'Sun Seed' companies have not shown significant difference in fruit yield. The total marketable yield of variety 'Calypso' (6.7 t/ha) was comparable with the farmer yields in the area using the same variety. About 70% (by weight) of the total fruits harvested were sorted as marketable and 40 - 60 % (by weight) of the total fruits were grouped as grade 1 depending on the variety (Figure 2). Grade 1 fruit yield ranged from 3.27 t/ha (Atlantis) to 7.50 t/ha (Sunre 3536). Both Sunre 3536 and Sunex 3528 have out yielded

Table 1. Fruit yield of different varieties (t/ha) at Hiripitiya.

Variety	Grade 1	Grade 2	Grade 3	Grade 4	Rejects
1. SUNRE 3539	4.97 ^{bcde}	1.61 ^{bcdefg}	0.67 ^{i}	0.21	3.74 ^{ab}
2. LAFAYETTE	5.25 ^{bc}	2.47 ^{a}	1.02 ^{de}	0.37	2.37 ^{cdefg}
3. ATLANTIS	3.27 ^{g}	2.32 ^{a}	1.16 ^{bc}	0.31	2.11 ^{cdefg}
4. NEPTUNE	4.40 ^{cdefg}	1.60 ^{cdefg}	0.88 ^{fg}	0.34	3.02 ^{abcd}
5. ROYAL	3.83 ^{efg}	2.00 ^{abcd}	0.88 ^{fg}	0.14	2.43 ^{cdefg}
6. EARLIPIK	3.57 ^{fg}	1.24 ^{fg}	0.50 ^{j}	0.07	1.42 ^{g}
7. EXPRESS	3.54 ^{fg}	1.56 ^{defg}	0.68 ^{hi}	0.26	1.89 ^{defg}
8. ENDEAVOR	5.36 ^{bc}	1.39 ^{efg}	0.76 ^{h}	0.14	1.47 ^{fg}
9. FANCIPACK	3.99 ^{defg}	1.07 ^{g}	0.46 ^{j}	0.15	2.41 ^{cdefg}
10.PREMIER	4.85 ^{bcde}	1.23 ^{g}	0.61 ^{i}	0.20	1.70 ^{efg}
11.POSEIDON	5.15 ^{bcd}	1.34 ^{cdefg}	0.57 ^{j}	0.17	2.76 ^{abcde}
12.NEPOLEON	3.39 ^{fg}	2.09 ^{abcd}	1.19 ^{ab}	0.32	3.14 ^{abc}
13.LAFOYETTE(L.V)	4.53 ^{cdef}	2.28 ^{ab}	1.09 ^{cd}	0.45	3.14 ^{abc}
14.SUNEX 3528	5.97 ^{b}	1.91 ^{abcdef}	1.06 ^{cd}	0.17	3.23 ^{abc}
15.SUNRE 3512	3.49 ^{fg}	1.71 ^{bcdefg}	0.92 ^{ef}	0.47	3.88 ^{a}
16.SUNRE 3536	7.50 ^{a}	2.47 ^{a}	1.29 ^{a}	0.43	2.68 ^{bcde}
17.CALYPSO (s.s)	3.99 ^{defg}	1.65 ^{bcdefg}	0.78 ^{gh}	0.21	2.61 ^{bcde}
18.CALYPSO (P.S)	4.29 ^{cdefg}	1.61 ^{cdefg}	0.74 ^{hi}	0.28	2.88 ^{abcde}
CV (5%)	14.1	19.6	26.6	50.0	23.5

- Means followed by the same letter are not significantly different at 5 % level using DMRT.

Figure 2. Percentage distribution of fruit weight in different grades at Hiripitiya



1. SUNRE 3539
2. LAFAYETTE
3. ATLANTIS
4. NEPTUNE
5. ROYAL
6. EARLIPIK
7. EXPRESS
8. ENDEAVOR
9. FANCIPACK
10. PREMIER
11. POSEIDON
12. NEPOLEON
13. LAFAYETTE(L.V.)
14. SUNEX 3528
15. SUNRE 3512
16. SUNRE 3536
17. CALYPSO(S.S)
18. CALYPSO(P.S)

all other varieties tested. Grade 1 fruit yield of Sunex 3528 (5.97 t/ha) and Sunre 3536 (7.50 t/ha) were significantly higher than the standard variety Calypso (4.20 t/ha). This trend was observed in all marketable grades, although the yield differences were not statistically significant in grade 4. The total rejected fruit yields were significantly higher in varieties Sunre 3512 and Sunre 3539. Varieties Endeavor and Earlipik yielded relatively lower proportions of 'rejects' and in most of the varieties tested about 25% of the fruits (by weight) were graded as 'rejects'.

The significantly higher fruit yield of the varieties Sunre 3536 and Sunex 3528 were attributed to their higher fruit number per plant. Sunre 3536 and Sunex 3528 produced 67 and 58 marketable fruits respectively per plant during the harvesting period (48 days) compared to 40 fruits per plant in Calypso. Most of the other varieties tested produced around 40 marketable fruits per plant during the harvesting period (Table 2).

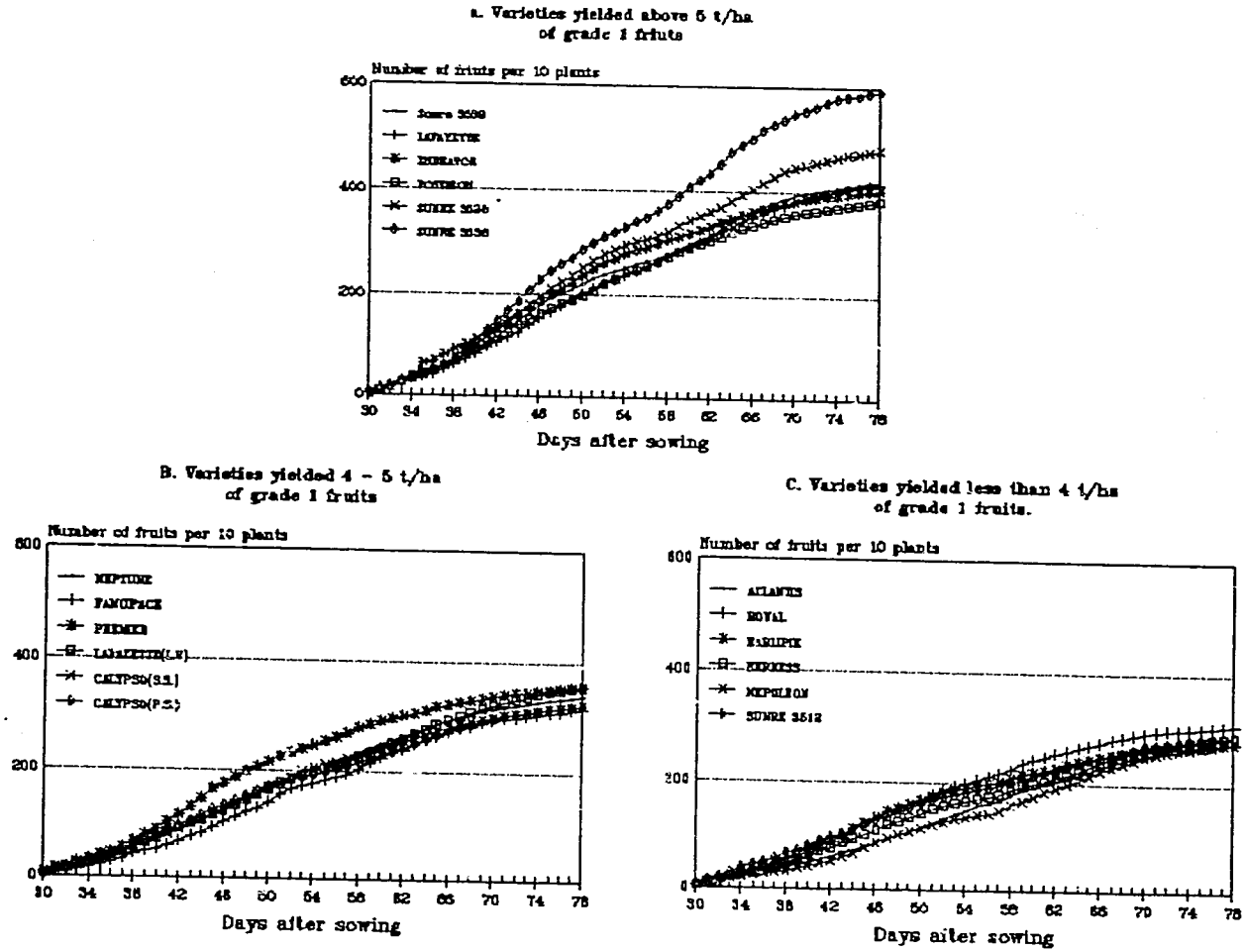
Although the marketable fruits are graded into four groups, the economically important group for the pickle industry is grade 1. Figure 3. shows the cumulative number of grade 1 fruits in different yield classes of the varieties tested. Fruit production increased at a increasing rate during the first 10 days of harvesting and reached a steady rate and then this steady rate was maintained for another 30 days of harvesting when the rate of fruit production started to decrease. This trend was common for almost all the varieties tested; however in high- yielding varieties the 'steady rate'

Table 2. Total number of fruits and average fruit weight of different varieties at Hiripitiya.

Variety	Total number of fruits per plant		Average weight of grade 1 fruits (g)
	grade 1	Total marketable	
1. SUNRE 3539	42.1 bc	48.0 bcd	5.46 bc
2. LAFAYETTE	41.5 bcd	50.2 bc	2.64 fg
3. ATLANTIS	27.7 f	40.5 cde	5.81 b
4. NEPTUNE	34.1 cdef	39.8 cde	3.47 defg
5. ROYAL	30.9 def	40.4 cde	3.87 cdefg
6. EARLIPIK	27.8 f	33.4 e	4.57 bcde
7. EXPRESS	28.8 f	38.6 cde	5.41 bc
8. ENDEAVOR	40.3 bcd	43.3 cde	3.31 efg
9. FANCIPACK	31.8 cdef	35.5 de	4.54 bcde
10.PREMIER	35.9 cdef	40.1 cde	5.08 bcd
11.POSEIDON	38.3 bcdef	43.0 cde	3.14 efg
12.NEPOLEON	27.8 f	38.7 cde	5.08 bcd
13.LAFOYETTE(L.V)	35.6 cdef	38.3 cde	5.05 bcd
14.SUNEX 3528	47.9 b	56.9 ab	2.39 g
15.SUNRE 3512	29.0 f	42.9 cde	7.54 a
16.SUNRE 3536	59.2 a	67.1 a	2.45 g
17.CALYPSO (s.s)	32.4 cdef	36.4 de	4.15 cdef
18.CALYPSO (P.S)	32.4 cdef	40.9 cde	4.22 cde
CV (5%)	15.4	15.4	18.7

- Means followed by the same letter are not significantly different at 5 % level using DMRT.

Figure 3. Cumulative number of grade 1 fruits at Hiripitiya



of fruit production was much higher than that of the low yielding varieties (Figure 3a,b and c).

Fruit length is the main criteria used in grading gherkins in Sri Lanka, and the prices are based on the weight. Therefore varieties with higher average fruit weights results comparatively higher returns. However, there was no significant difference in average fruit weight of the varieties tested and the average fruit weight ranged from 3.93 g (Sunre 3539 and Atlantis) to 4.48 g (Poseidon).

Growth parameters

Crop establishment was satisfactory in all varieties and was above 80% except in Calypso (P.S.). There was no difference among varieties in crop establishment (Table 3). Vine length at 30 DAS ranged from 54.1 cm (Sunre 3539) to 87.5 cm (Royal). Number of nodes in the main vine ranged from 10.9 (Sunre 3539) to 14.9 (Royal and Neptune) and there were 2 - 3 branches per plant in all varieties. There was no significant difference observed among varieties tested in any of the growth parameters measured.

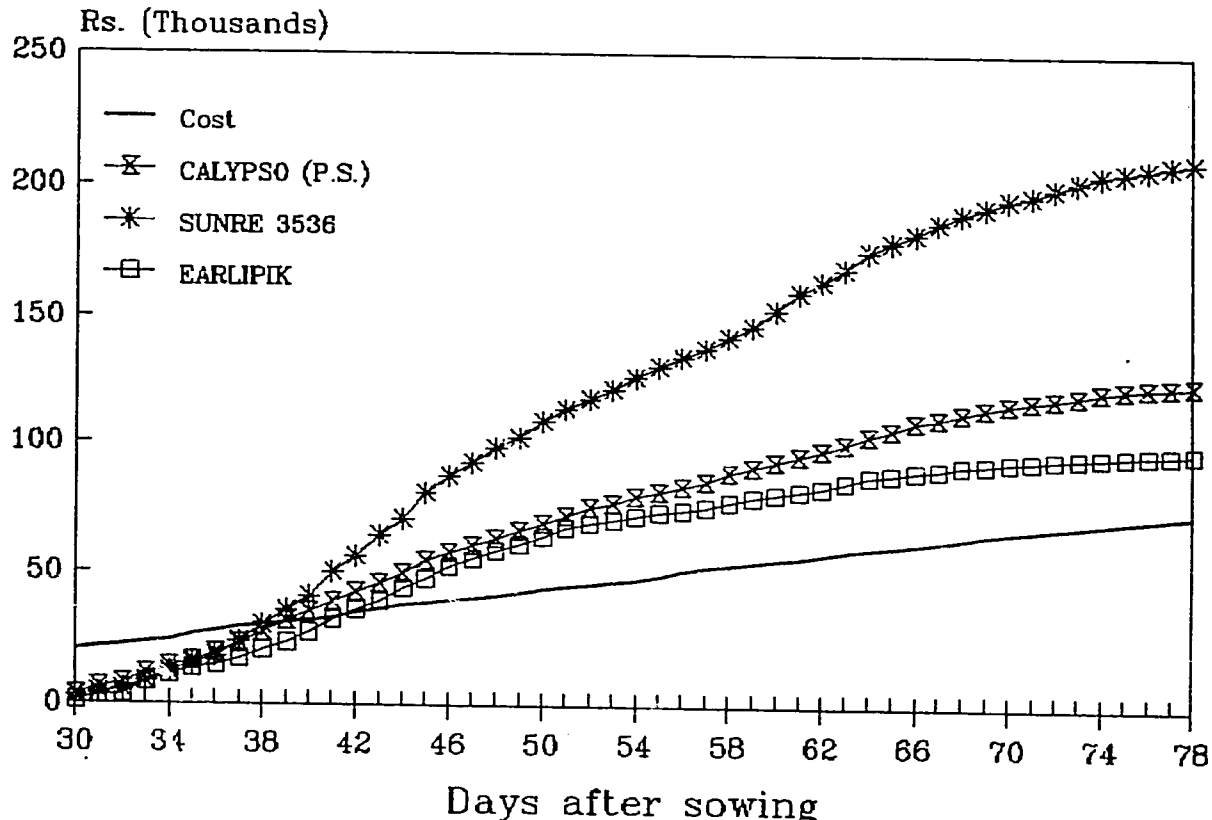
However, there were some differences among varieties in the number of male and female flowers produced per plant at 30 DAS (Table 3). Varieties, Sunre 3539, Lafayette and Earlipik produced higher number of female flowers whereas varieties Neptune, Fancipak, Poseidon and Napoleon produced higher number of male flowers at 30 DAS. In all other varieties number of male and female flowers per plant were similar.

Table 3. Some growth parameters of different gherkin varieties at Hiripitiya at 30 days after planting.

Variety	% estasblishment	Vine length (cm)	No. of Nodes/ main vine	No. of branches / plant	No. of flowers per plant	
					Male	Female
1. SUNRE 3539	88.3	54.1	10.9	3.0	3.5	10.5
2. LAFAYETTE	91.6	57.2	13.7	2.8	2.6	6.0
3. ATLANTIS	93.6	70.8	14.7	3.1	5.8	6.3
4. NEPTUNE	86.0	87.2	14.9	3.1	6.6	3.8
5. ROYAL	87.0	87.5	14.9	2.7	3.6	6.3
6. EARLIPIK	91.3	81.2	13.7	2.3	1.1	6.4
7. EXPRESS	86.0	74.7	13.3	2.9	3.1	4.5
8. ENDEAVOR	82.3	77.3	12.4	2.1	4.7	3.5
9. FANCIPACK	80.6	74.3	12.2	2.8	4.7	1.8
10.PREMIER	85.0	64.7	11.8	2.0	4.0	2.8
11.POSEIDON	78.6	69.8	13.9	3.3	8.1	2.3
12.NEPOLEON	89.6	44.4	11.8	3.0	6.0	3.6
13.LAFAYETTE(L.V.)	88.0	58.0	11.6	2.0	1.8	6.2
14.SUNEX 3528	86.6	60.1	12.9	2.2	3.0	5.6
15.SUNRE 3512	85.6	55.3	11.4	3.0	6.2	7.0
16.SUNRE 3536	90.6	64.4	12.0	2.2	4.1	5.5
17.CALYPSO (S.S.)	86.3	65.3	14.2	2.6	4.8	4.8
18.CALYPSO (P.S.)	76.3	66.8	11.2	2.3	4.1	4.2
CV %	15.3	27.7	14.7	24.8	51.9	48.1
	n.s	n.s	n.s	n.s	n.s	n.s

(Mean values of three replicates. * n.s - means not significant at 5% level)

Figure 4. Cost and returns of three gherkin varieties at Hiripitiya



(Returns based on the current prices of Pickle Packers Ltd. at Hiripitiya)

Cost and Returns

At Hiripitiya site all operations were recorded throughout the experiment, thus the operational cost was estimated. At Hiripitiya about 70 % of the total cost (excluding capital costs) of production was for labour. The cumulative operational cost of production at Hiripitiya is shown in Figure 4.

Present prices (Pickle Packers Ltd.) of different grades of gherkin at Hiripitiya are as follows.

		Rs. /kg
Grade 1	-	23.00
Grade 2	-	11.00
Grade 3	-	06.00
Grade 4	-	02.00

Based on these prices and the relative composition of different grades, an average base price was calculated for each variety (Table 4). This average price ranged from Rs. 18.77 /kg for Fancipak (70% of the marketable fruits were in grade 1) to Rs. 15.32 /kg for Atlantis (only 46% of the marketable fruits were in grade 1). Gross returns were estimated by multiplying daily marketable yields by the average base prices of the respective variety. Figure 4 shows the cumulative costs and returns for varieties Earlipik (total marketable yield 5.38 t/ha), Calypso (total marketable yield 6.12 t/ha) and Sunre 3536 (total marketable yield 11.69 t/ha). It is evident in Figure 4, that the 'net returns' started to

Table 4. Percentage distribution of different grades by fruit weight at Hiripitiya and average price of marketable fruits.

Variety	Grade 1	Grade 2	Grade 3	Grade 4	Average price Rs./kg
1. SUNRE 3539	67.2	21.7	9.0	2.8	17.89
2. LAFAYETTE	57.6	27.7	11.1	4.0	16.30
3. ATLANTIS	46.3	32.8	16.4	4.3	15.32
4. NEPTUNE	60.9	22.1	12.1	4.7	17.25
5. ROYAL	55.9	29.1	12.8	2.0	16.80
6. EARLIPIK	66.3	23.0	9.2	1.3	18.35
7. EXPRESS	58.6	25.8	11.2	4.3	17.07
8. ENDEAVOR	70.0	18.1	9.9	1.8	18.72
9. FANCIPACK	70.3	18.8	8.1	2.6	18.77
10.PREMIER	70.3	17.8	8.1	2.9	18.67
11.POSEIDON	71.2	16.8	7.1	2.1	18.26
12.NEPOLEON	48.4	29.8	17.0	4.5	15.52
13.LAFAYETTE(L.V.)	54.2	27.3	13.0	5.3	16.35
14.SUNEX 3528	65.5	20.9	11.6	1.8	18.09
15.SUNRE 3512	52.9	25.9	13.9	7.1	15.99
16.SUNRE 3536	64.1	21.1	11.0	3.6	17.79
17.CALYPSO (S.S.)	60.1	24.8	11.7	3.1	17.31
18.CALYPSO (P.S.)	61.9	23.2	10.6	4.0	17.50
Mean	61.3	23.8	11.4	3.5	17.33

(Mean values of three replicates.)

decline at about 60 DAS in Earlipik and 70 DAS in Calypso, whereas in variety Sunre 3536, the net returns may continue to increase even beyond 78 DAS. Therefore it is important to determine the economical period of harvesting for each variety. Figure 5 shows the net return from different gherkin varieties at 40, 60 and 80 DAS. At 40 DAS (10 days of harvesting) the returns compensated the operational cost in most of the varieties with the exception of Fancipak, Napoleon, Royal and Earlipik. The variety Sunre 3512 exceeded the operational cost and recorded a reasonable net return within the first 10 days of harvesting and the net returns were maximised by 60 DAS. Although the total returns were less than the standard variety tested, this type of early varieties may be useful under specific conditions. The check variety Calypso has recorded net returns of about Rs. 50,000.00 per ha during the 48 days of harvesting period. The varieties Sunre 3536, Sunex 3528, Lafayette, Lafayette (L.V.) and Royal recorded reasonably higher net returns than the standard variety Calypso under Hiripitiya conditions.

Effect of location on varietal performance

As climatic and soil factors can influence the performance of different gherkin varieties, these varieties were established in three other locations and yield data were recorded daily. The performance of different varieties in these locations are summarised in Table 5. The highest mean marketable yields were recorded at Kandakuliya. Although the soil and climatic conditions were very similar at Kandakuliya

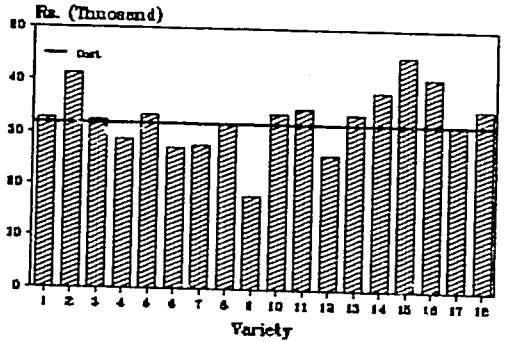
Table 5. Effect of location on the fruit yield (t/ha) of different varieties.

Variety	Hiripitiya		Kandakuliya		Talawila		Mawathagama	
	Mar.	Rej.	Mar.	Rej.	Mar.	Rej.	Mar.	Rej.
1. SUNRE 3539	7.46	3.74	13.38	1.32	4.60	3.87	2.56	0.86
2. LAFAYETTE	9.11	2.37	10.67	1.05	7.13	3.17	2.64	0.79
3. ATLANTIS	7.06	2.11	9.90	1.09	5.72	3.17	2.67	0.73
4. NEPTUNE	7.22	3.02	10.86	1.00	1.70	2.04	2.21	0.79
5. ROYAL	6.85	2.43	13.15	1.11	5.03	3.08	1.88	1.08
6. EARLIPIK	5.38	1.42	8.94	0.35	2.78	1.19	1.86	0.56
7. EXPRESS	6.04	1.89	8.20	0.64	1.92	1.54	1.81	0.67
8. ENDEAVOR	7.65	1.47	8.55	0.33	2.93	1.05	2.81	0.60
9. FANCIPACK	5.67	2.41	6.79	0.32	1.66	1.31	1.26	0.41
10.PREMIER	6.89	2.41	6.71	0.33	3.98	1.59	2.08	0.56
11.POSEIDON	7.23	1.70	7.64	0.17	3.05	2.80	2.50	0.99
12.NEPOLEON	6.99	2.76	8.77	0.85	6.81	3.05	1.78	0.85
13.LAFAYETTE(L.V.)	8.35	3.14	10.35	0.69	6.15	3.09	2.03	0.79
14.SUNEX 3528	9.11	3.14	9.26	0.34	5.40	3.10	1.96	0.76
15.SUNRE 3512	6.59	3.23	7.41	0.72	5.58	3.85	2.61	1.59
16.SUNRE 3536	11.69	3.88	10.38	0.60	6.11	2.16	1.94	0.55
17.CALYPSO (S.S.)	6.63	2.68	7.79	0.46	5.07	2.28	2.20	0.62
18.CALYPSO (P.S.)	6.92	2.88	8.96	0.39	6.08	3.97	2.36	0.66
Mean	7.54	2.59	9.31	0.65	4.53	2.57	2.17	0.77
Harvest period	48 days		45 days		38 days		18 days	

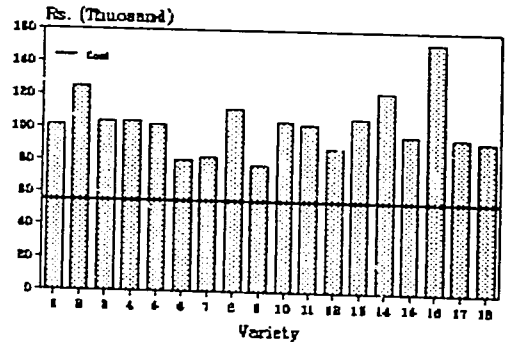
* Mar. - Total marketable fruits
* Rej. - Total rejected fruits

Figure 5. Net return from different gherkin varieties at Hiripitiya

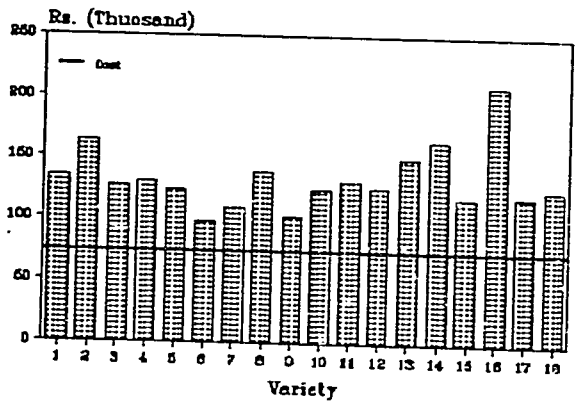
a. At 40 days after sowing



b. At 60 days after sowing



c. At 80 days after sowing

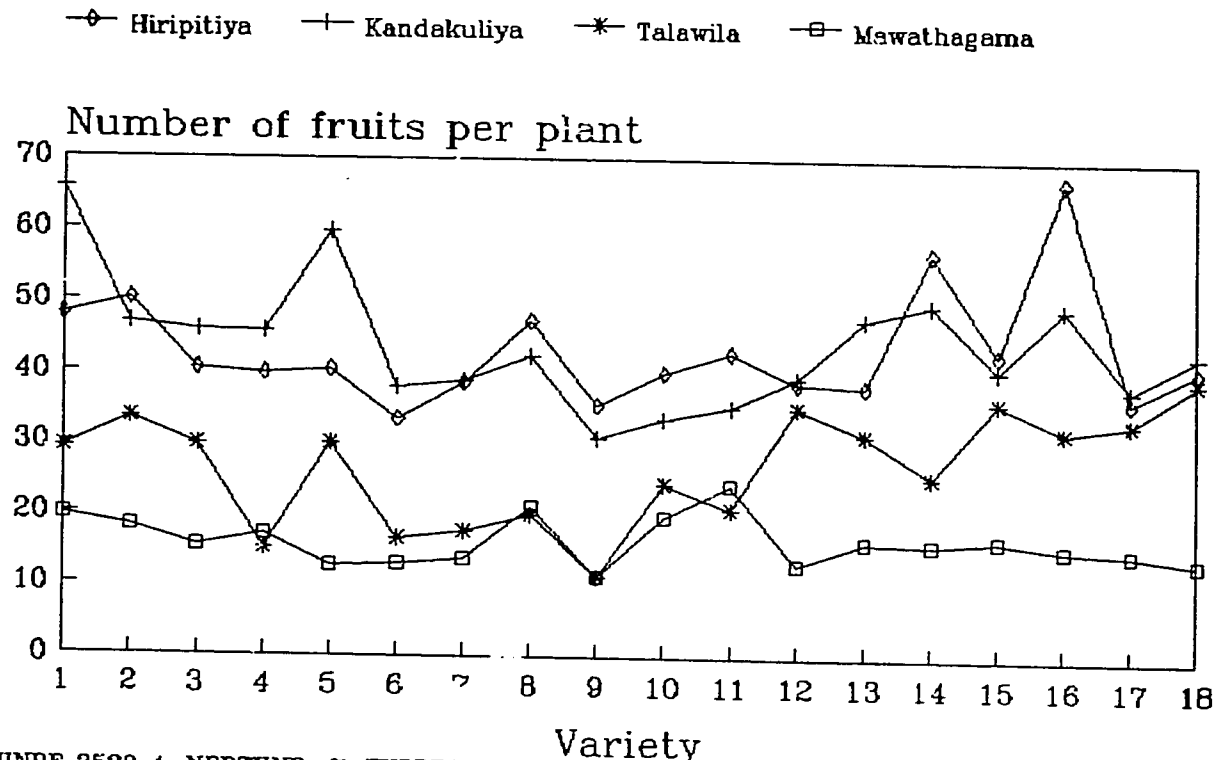


1.SUNRE 3539
2.LAFAYETTE
3.ATLANTIS
4.NEPTUNE
5.ROYAL
6.EARLIPIK
7.EXPRESS
8.ENDEAVOR
9.FANCIPACK
10.PREMIER
11.POSEIDON
12.NEPOLEON
13.LAFAYETTE(L.V.)
14.SUNEX 3528
15.SUNRE 3512
16.SUNRE 3536
17.CALYPSO(S.S.)
18.CALYPSO(P.S.)

and Talawila, Talawila mean yields were only about 50% of that at Kandakuliya. Several reasons could have been attributed to this difference. The differences in crop management may have been the main reason and this is further confirmed by the fact that at Talawila only 65% of the total yield were marketable whereas at Kandakuliya about 90% of the total yield was marketable. Talawila is one of the main agricultural areas in the Kalpitiya peninsula, and due to the heavy applications of pesticides the bee activities were limited in this area. The lack of pollinators may also have attributed to the high proportion of rejects at Talawila. As a result of the frequent application of inorganic fertilizers the chloride content of ground water (130 mg/l) at Talawila has increased considerably. The poor quality of the irrigation water may have resulted early senescence of the crop at Talawila.

Varieties, Sunre 3536, Sunex 3528, Sunre 3539, Lafayette, Lafayette (LV) and Royal have recorded higher yields over Calypso at Hiripitiya, Kandakuliya and Talawila. However, at Mawathagama, early varieties have given higher yields compared to Calypso. As the harvesting period was restricted to 18 days, Mawathagama yields can not be compared with other locations. The number of marketable fruits produced in each location is shown in Figure 6. Number of fruits produced per plant at Kandakuliya and Hiripitiya were similar for most of the varieties. Sunre 3539, Royal and Sunre 3536 were the only exceptions. Marketable fruit number per plant for variety Calypso were the same for Hiripitiya, Kandakuliya and Talawila. The effect of location on fruit yield is shown in

Figure 6. Total number of marketable fruits per plant at different locations.



1. SUNRE 3539
2. LAFAYETTE
3. ATLANTIS
4. NEPTUNE
5. ROYAL
6. EARLIPIK
7. EXPRESS
8. ENDEAVOR
9. FANCIPACK
10. PREMIER
11. POSEIDON
12. NEPOLEON
13. LAFAYETTE(L.V.)
14. SUNEX 3528
15. SUNRE 3512
16. SUNRE 3536
17. CALYPSO(S.S)
18. CALYPSO(P.S)

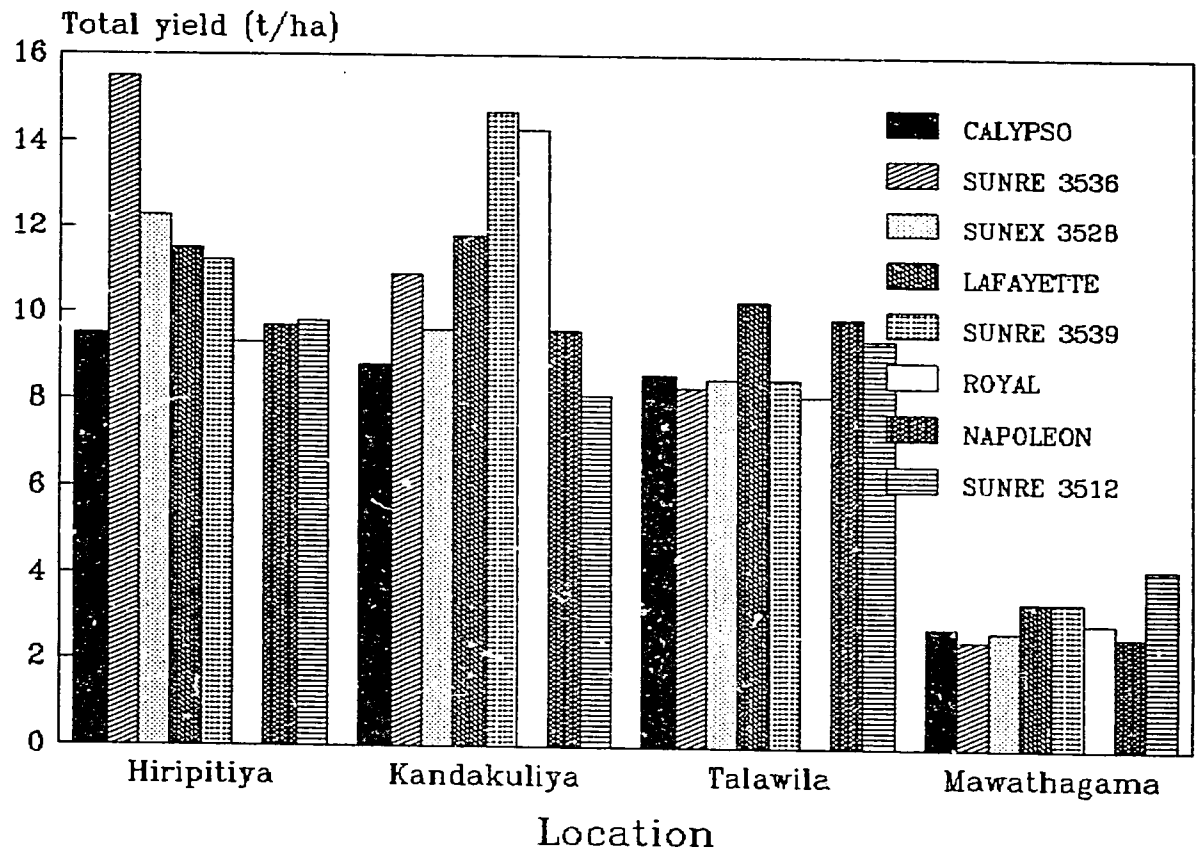
Figure 7. Fruit yields too followed the same pattern. Total yield of Calypso was very similar at Hiripitiya, Kandakuliya and Talawila. Six varieties, namely Sunre 3536, Sunex 3528, Lafayette, Sunre 3539, Royal and Napoleon have performed better than Calypso in all locations tested. However, among these varieties a clear interaction between variety and location was observed (Figure 7).

SUMMARY OF CONCLUSIONS

This study compared the performance of several commercial gherkin varieties with the check variety Calypso. There were clear differences in the performance of the varieties tested; however, as the study was limited to one season care should be taken in interpreting the results. The main observations of the study were;

- The growth characters such as vine length, number of branches and nodes were similar for all the varieties tested.
- Varieties Sunre 3536 and Sunex 3528 were superior to all other varieties at Hiripitiya, in terms of fruit yield.
- There was no significant difference in average fruit weight among varieties. Varieties Sunre 3512, Sunre 3539, Neptune and Napoleon recorded higher proportion of rejects.
- There were clear differences in the rate and the duration of fruit production among varieties; varieties Sunre 3539 and Sunre 3512 seemed to be early varieties.

Figure 7. Effect of location on the total fruit yield of different varieties



- There was a clear variety, location interaction, and varieties Sunre 3536, Sunex 3528, Lafayette, Royal, Sunre 3539 and Napoleon resulted higher yields than Calypso in all four locations tested.

RECOMMENDATIONS ON FUTURE RESEARCH

1. Time of planting studies

   As the weather conditions and pest and disease incidence may vary with the season, it is important to study the performance of these varieties in different seasons in order to ensure a year round production.

2. Multilocational studies

   As the varietal differences were observed at different location, it may be useful to test these promising varieties in a wider range of climatic and soil conditions in order to exploit their yield potentials.

3. Studies on trellising

   Study on cost effectiveness of trellising and pruning vines in trellis culture.

4. Fertilizer studies

   A common schedule of fertilizer application was followed in the study for all varieties and locations. As the response to fertilizer can vary for different varieties and soil types, it is important to conduct fertilizer response studies for different varieties. Also it is important to obtain a complete soil analysis before recommending fertilizers for different locations.

5. Pest and disease resistance

In this study a regular pest control programme was adopted in order to keep the experimental plots free of pest and diseases, and also as the experiments were conducted during the dry season the prevalence of common diseases such as 'mildew' were minimum during the growth period. However it is important to study the pest and disease resistance of these varieties, before recommending them for specific locations.

6. Irrigation studies

As some of the varieties may exhibit a certain degree of drought tolerance, it may be useful testing these varieties under different irrigation regimes in order to evaluate the feasibility of reducing irrigation costs. Also the spraying of irrigation water with high salt content direct on to the foliage may result some adverse effects on the fruit yields and quality. Therefore further studies may be needed in this aspect particularly in areas like Kalpitiya.

REFERENCE

Cartliffe, D., 1977. Sex expression in cucumbers, Factsheet, Ministry of Agriculture and Food, Ontario. 74-007.

De Alwis, K.A., Panabokke, C.R. ,1973. Hand Book of the soils of Sri Lanka, Soil Science Society of Ceylon Journal, 2, 24-34.

TALAWILA SITE, MR. ANTHONY

TALAWILA SITE AT 6 WEEKS

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TALAWILA SITE AT 8 WEEKS

TALAWILA SITE AT 10 WEEKS

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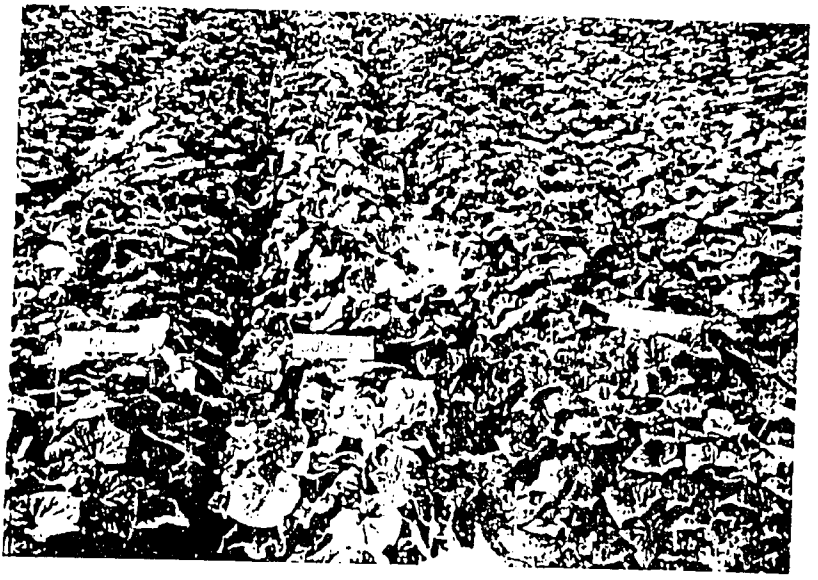

EARLY SENESCENCE OF SUNRE 3512 AT TALAWILA

HARVESTING AT TALAWILA

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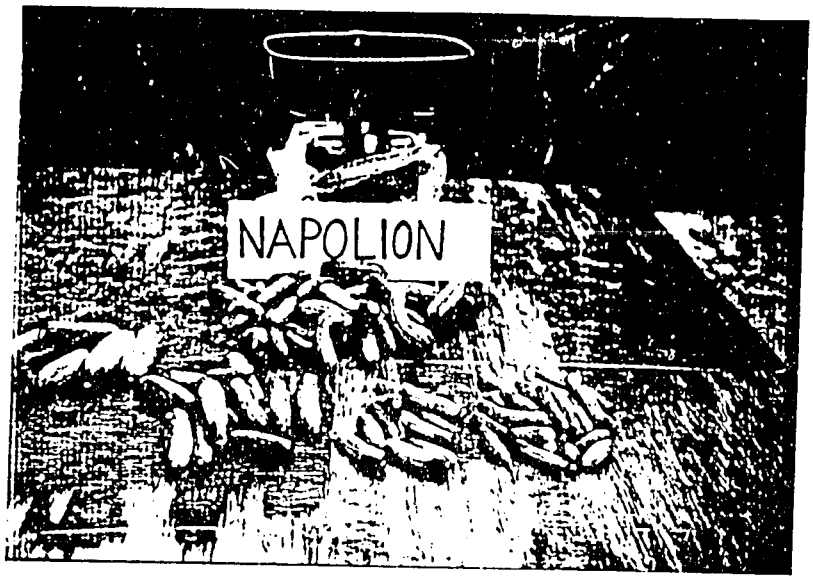

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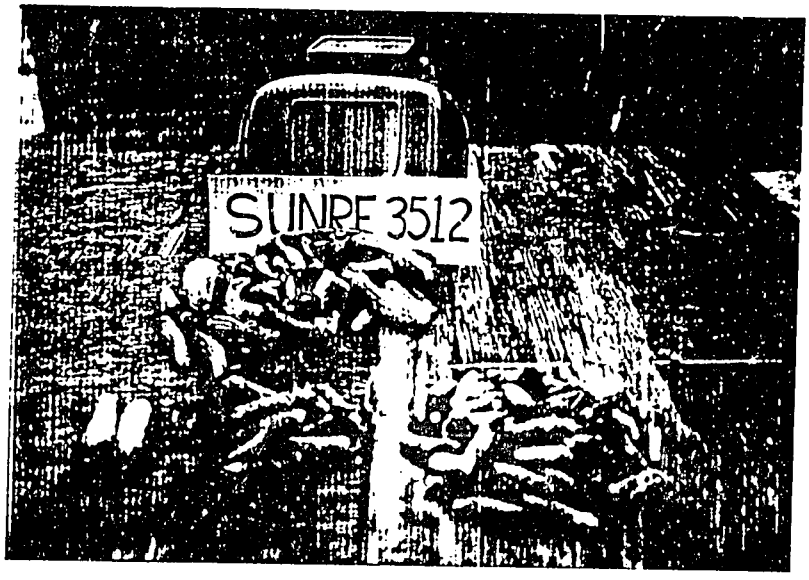

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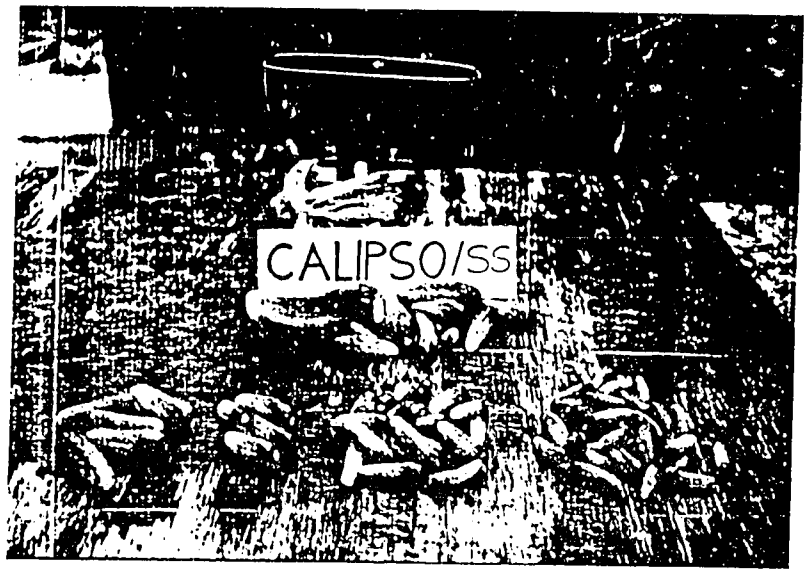

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KANDAKULIYA SITE, FARMER MR. MAGID

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KANDAKULIYA SITE AT 4 WEEKS

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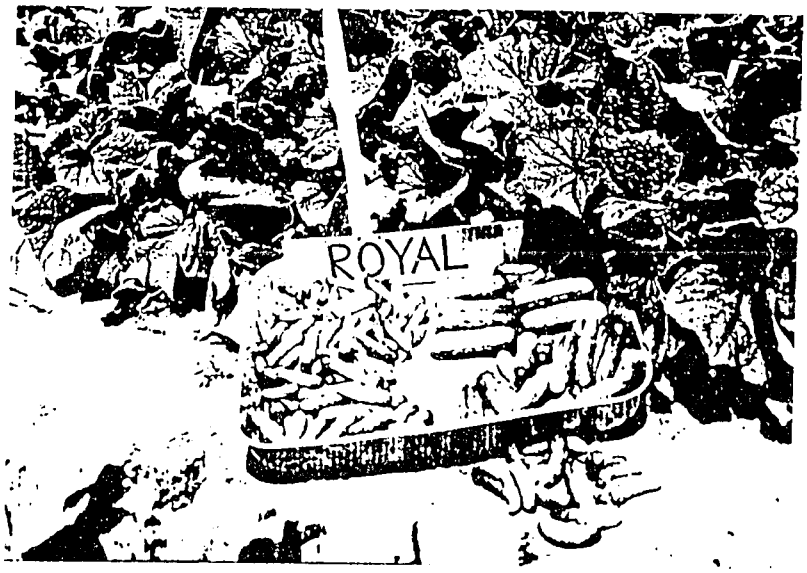
HARVESTING AT KANDAKULIYA SITE



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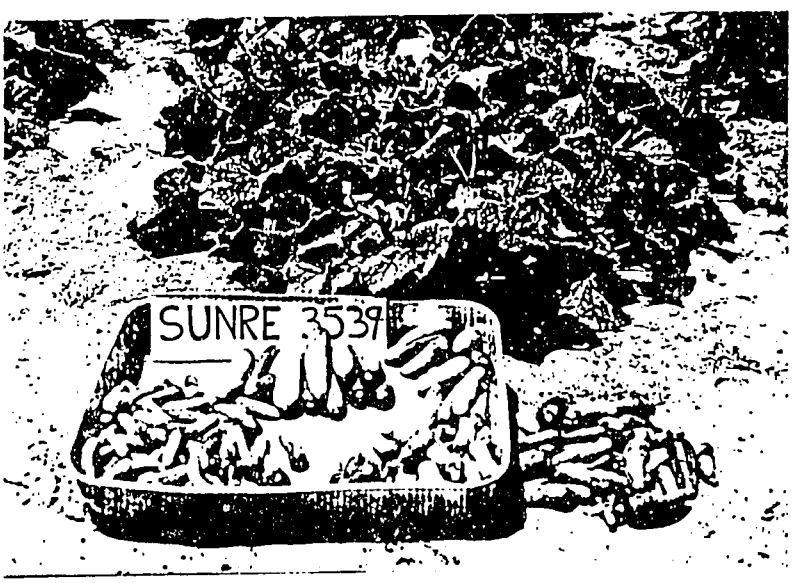

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HIRIPITAYA SITE, FARMER MR. KARUNASENA AND FAMILY

HIRIPITIYA SITE AT4 WEEKS

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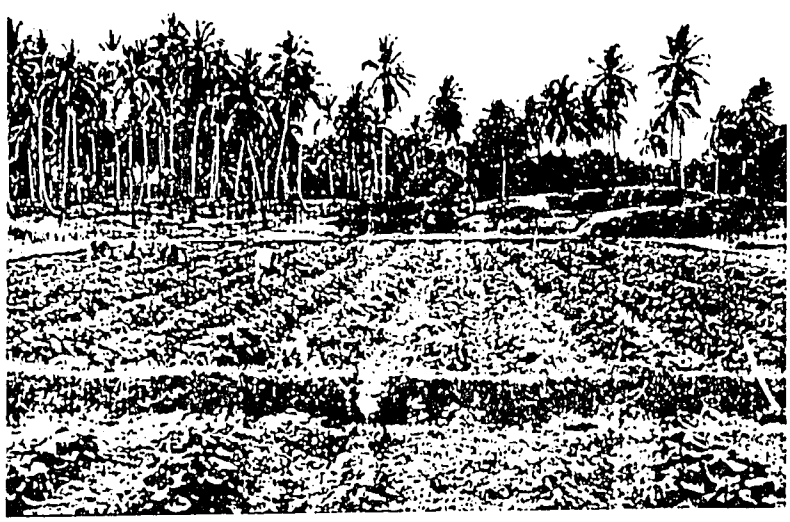

HIRIPITIYA SITE AT 6 WEEKS

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HIRIPITIYA SITE AT 11 WEEKS

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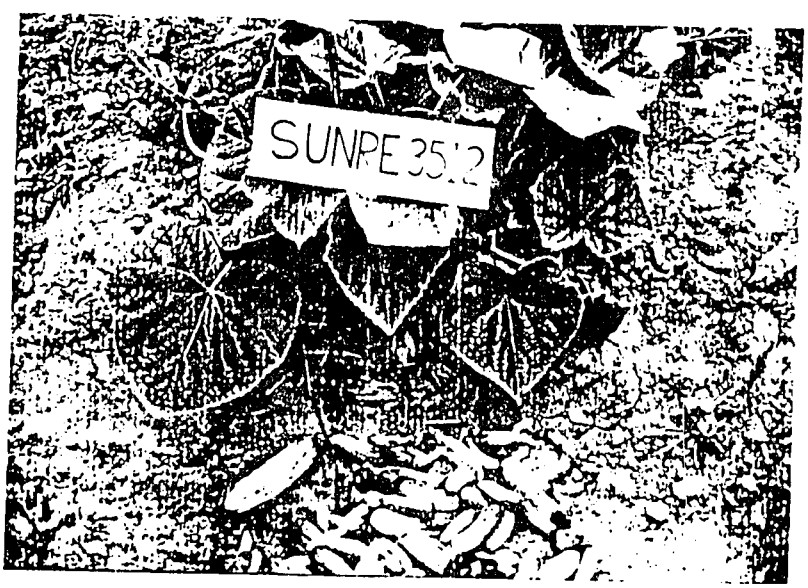
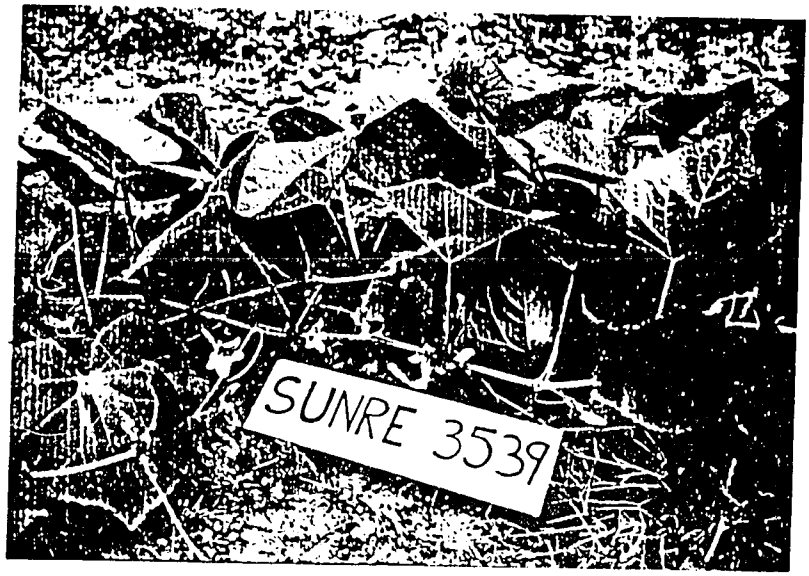


HIRIPITIYA SITE AT 10 WEEKS



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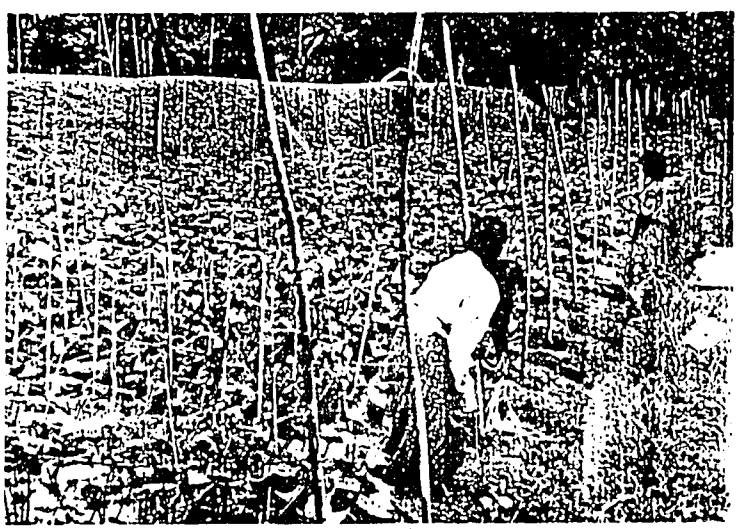
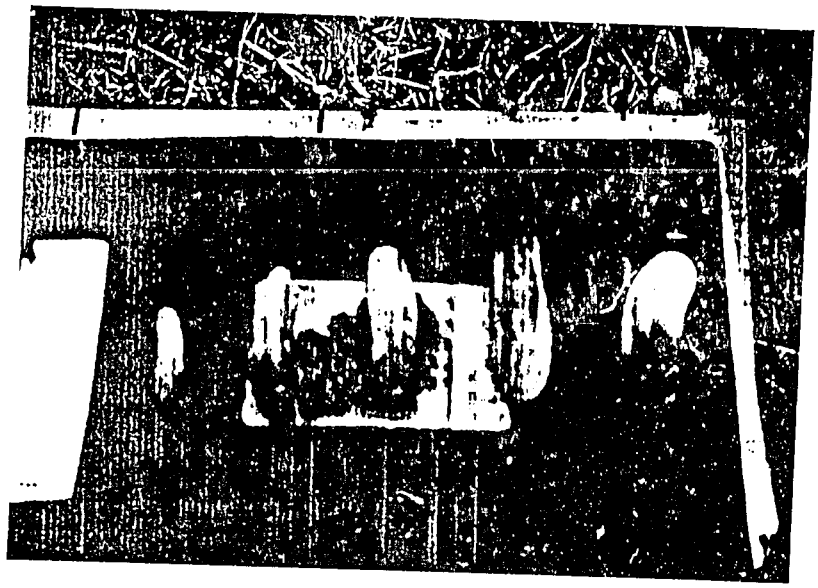


DATA RECORDING AT MAWATHAGAMA



GHERKIN GRADES

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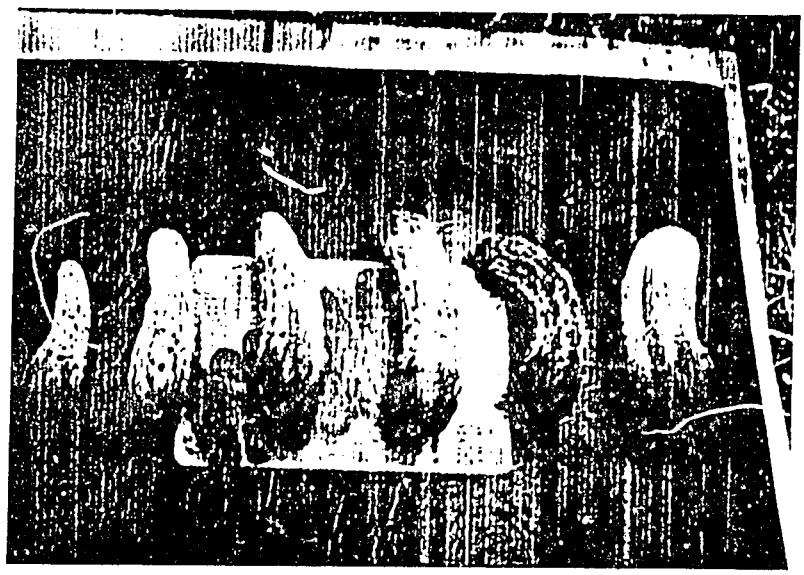

GHERKIN GRADES

GROWTH MEASUREMENTS

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TEAM OF GHERKIN FARMERS AND ACDI OFFICERS VISITING TALAWILA SITE

HAWATHAGAMA SITE AT 4 WEEKS

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GRADING AND DATA RECORDING

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MAWATHAGAMA SITE AT 6 WEEKS