

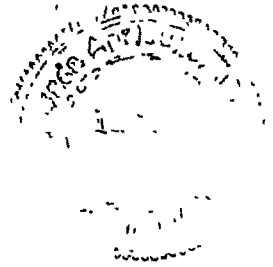
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**“WATER REQUIRMENT OF BASRAI ‘BANANA’
(Musa paradisiaca L.)”**

BY

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M. Sc. (Agri.)

T 1850



Thesis

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for the Degree of

Doctor of Philosophy

IN

Horticulture

DEPARTMENT OF HORTICULTURE
MARATHWADA AGRICULTURAL UNIVERSITY
PARBHANI

1990

DEDICATED TO THE
BANANA GROWERS

CANDIDATE'S DECLARATION

I hereby declare that the thesis or part
thereof has not been previously
submitted by me for a
degree of any
University.

PARBHANI

DATED: 9th March 1990


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CERTIFICATE-I

Shri Jayprakash Bhimrao Desai has satisfactorily prosecuted his course of research for a period of not less than five semesters and that the thesis entitled "WATER REQUIREMENT OF 'BASRAI' BANANA (Musa paradisiaca L.)" submitted by him is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any University.

PARBHANI

DATED: 9th MARCH, 1990


(V.K. Patil)
Guide

CERTIFICATE-II

This is to certify that the thesis entitled
"WATER REQUIREMENT OF 'BASRAI' BANANA (Musa paradisiaca L.)"
submitted by Shri Jayprakash Bhimrao Desai to the
Marathwada Agricultural University in partial fulfilment
of the requirements for the degree of DOCTOR OF PHILOSOPHY
in the subject of Horticulture has been approved by the
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Chapter 1

INTRODUCTION

Banana (Musa paradisiaca) is one of the most important tropical fruits, and one of the oldest fruits of the world, also called as "Adam's fig", "Apple of paradise." It is a common man's fruit. It ranks above any other crop in its yield in terms of both harvest weight and calories (6.9-13.8 million calories/hectare). It produces 70-100 tonnes of fruits per hectare, whereas the best cereals (rice, wheat, etc.) can hardly reach up to 12 tonnes per hectare (Mishra and Mishra, 1981).

Banana is cultivated over a wide area from 30°N to 30°S of the equator. World produces 45 million tonnes of bananas each year. Some 15 per cent of this constitutes the international banana trade and the remainder is consumed locally (FAO, 1979). In India it is cultivated in almost all states and it ranks second as plantation crop in area and production, of which Maharashtra occupies an area of about 53,500 hectare with annual production of 11,58,100 tonnes of banana fruits (Ministry of Agriculture, India, 1987). In Marathwada region, banana cultivation is concentrated in Parbhani district with an area of 3,100 hectare and the annual production is 54,900 tonnes of banana fruits (Ministry of Agriculture, India, 1987). The area is bound to increase manifold on completion of the irrigation canal network of Jayakwadi Project. Banana being a short

duration fruit crop farmers prefer it over other fruit crops having long duration. Although about 40 per cent more bananas are produced than citrus, research effort on citrus has been five to six times greater as judged by the number of articles abstracted in Horticultural Abstracts in recent years (Turner, 1981).

The banana plant has a reputation for needing a plentiful supply of water for high production (Champion, 1963; Simmonds, 1966). Limited studies have been made of the factors affecting its water use or responses to water deficits. The works carried out by the scientists to determine water requirement were based on soil moisture depletion and days interval (Manica et al., 1975; Sivanappan et al., 1976; Krishnan and Shanumgavelu, 1979 and 1980; Lahav and Kalmar, 1980; Mahatma Phule Krishi Vidyapeeth, Rahuri, India, 1981). There were no approaches based on meteorological factors, as pointed out by Turner (1981), who emphasized on meteorological parameters which largely govern the leaf diffusion resistance (R_L) as expressed in his module. The work all over the world has now revealed that meteorological factors are primarily responsible for governing the water need of the crop. Evapotranspiration by plant species is a physical process which involves conversion of water into vapour which requires energy. The meteorological parameters can be conveniently measured in an integrated

way with the help of an open pan evaporimeter. Evaporimeter is one of the valuable tools for scheduling irrigation. Among the various types of evaporimeters; Sunken screen pan evaporimeter is simple, quick, cheap, useful and reliable for assessing potential evapotranspiration by crop plants (Dastane, 1969). It is now increasingly recognised that under field conditions, soil water does not necessarily equal to evapotranspiration by crop and in addition water is lost by deep drainage between irrigations (Miller and Aarstad, 1974). One way of timing irrigation could, therefore, be to adjust the amount of irrigation water (IW)-equal to some suitable fraction/multiple of cumulative pan evaporation (CPE). The major advantage of this approach is that the farmers need not change the amount of irrigation water from one irrigation to another. Where the evaporation does not vary appreciably from year to year, the IW/CPE approach permits the formulation of irrigation time table for irrigating trees. Hence it was considered worthwhile to find out appropriate IW/CPE ratio for banana which could be conveniently translated in terms to number of irrigations and its frequency for the use of irrigators, canal authorities as well as horticulturists working with banana.

Banana crop has variable responses to water in its season of growth as well as the plant growth and

production phase (Doorenbos and Kassam, 1981). A few workers have made some efforts on the use of anti-transpirants and mulches to reduce the water requirement. (Gale et al., 1964; Gale and Hagan, 1966; Mahatma Phule Krishi Vidyapeeth, Rahuri, India, 1981).

Systematic studies focussing on water relations, antitranspirants and mulches for June as well as February planted banana under given ecosystem was a long felt research gap.

Experiments were therefore, laid out to find out:

- 1) number of irrigations needed to produce the optimum yield in two major planting seasons (June and February) based on meteorological approach,
- 2) water requirement in vegetative and reproductive developmental stages,
- 3) the effect of antitranspirants and mulches in reducing the water requirement and
- 4) the effect of differential water regimes, anti-transpirants and mulches on the quality of banana.

...

Chapter 2

REVIEW OF LITERATURE

The cultivated banana is believed to have originated in the low land, humid tropics in southeast Asia and is mostly grown between 30°N and S of the equator. A mean temperature of about 27 °C is optimal for growth. Minimum temperature for adequate growth is about 16 °C, below which growth is checked and shooting delayed. Temperatures below 8 °C for long periods cause serious damage. Maximum temperatures for adequate growth is about 38 °C, depending on humidity and the radiation intensity. Bananas are dayneutral in their response to day length. A humidity of at least 60 per cent or more is preferable. The development of the banana plant can be divided into three periods: vegetative, flowering and yield formation. The time from planting to shooting (vegetative) of Musa spp. is about 7 to 9 months, but with lower temperatures at higher altitudes or in the subtropics, up to 18 months. The time from shooting to harvest (flowering and yield formation) is about 90 days (Doorenbos and Kassam, 1979).

2.1 Stages of fruit development

Developmental stages are influenced by insolation, moisture, nutrition and other management practices. The adverse effect of insolation was aggravated by an excess of moisture, this combination could result in arrested growth (Lassoudiere, 1974). A moisture deficit was particularly harmful if it occurred at the time of floral

differentiation or the start of fruiting. The potential number of female hands is determined early in the life of the bunch but the actual number may be influenced during the 4 to 6 weeks before emergence (Summerville, 1944; Simmonds, 1966 and Turner, 1981). Thus yields can be increased by proper treatment both before and after floral initiation (Alexandrowics, 1965).

Arcott et al. (1965) in their irrigation investigations on "Giant Cavendish" banana in the upper Augan Valley, Honduras reported that the banana plants whose grand period of growth coincided with cool mean daily temperatures (21 °C) and high RH (86 %) experienced a reduction in growth rate with a corresponding increase in the time between flower emergence and fruit harvesting. Plants whose grand period of growth did not fall in the cool moist season of the year produced fruits earlier after flower emergence, due to a more rapid and constant rate of growth. Plants which produced fruit during the hot (28 °C) relatively dry season (63% RH) suffered from a dessicated leaf condition due to long diurnal periods of transient wilting. This resulted in bunches of harvested fruit ripening at harvesting calibrations which were considered relatively low. Reducing the harvesting calibration resulted in a substantial drop in the incidence of ripe fruit, but also in lower average bunch weight.

Lassoudiere and Maubert (1971) worked with "Poyo" banana under Ivory Coast conditions and found that the length and diameter increased rapidly for the first 30 days after the emergence. Mean daily increments of 4 mm in length and 0.3 mm in diameter were recorded. This was followed by a slower growth stage during which length increased by 0.5 mm daily until the 90th day, and diameter by 0.15 mm until the 82nd day. There was no further increase in fruit length until picking at 108 days, but diameter continued to increase by 0.19 mm/day.

2.2 Planting season

The general time for banana planting in Maharashtra is at the onset of monsoon. In Konkan region planting is done throughout the year, but in interior places like Khandesh and Marathwada it commensurates with monsoon. According to Phadnis and Gopalkrishna (1957) February planting for banana in Maharashtra gave better yield than June planting. Land is occupied for short duration and is available for a subsequent kharif crop. The fruit season is reduced. The produce is harvested in fair weather, which facilitates transit for marketing. The fruits are available in off season and thereby fetch good profits to the farmers. February planting has to undergo two summers and June planting has to undergo only one summer, thus June planting becomes more convenient to the farmers as far as water application is considered.

However, in the recent past, farmers have also taken up to off seasonal planting of bananas to catch up off season market. "Basrai" banana in Maharashtra when planted in March/April made better growth and gave higher yields than those planted later, up to December (Nagpal et al., 1958).

"Poyo" bananas planted under Ivory Coast conditions established and floral differentiation took place earlier in May plantings followed by October to November. Highest yields were obtained from the May and November planting and the lowest from the August planting (Lassoudiere, 1974). In Cameroon, planting made at the end of the rains increased yield higher to that made at the start of the rains (Melin and Marseault, 1972).

2.3 Irrigation

Water requirement of banana varies according to topography, soil, climate, variety and type of culture. The soil in banana plantation should not be allowed to dry completely.

In Parbhani District about 48 to 66 irrigations are given in the entire crop duration depending on canal, lift and well irrigation systems (Hundi, 1988). In inland areas banana requires 40 to 50 irrigations from the time of planting to harvesting. In north Gujarat and Khandesh even more may be required.

In West Bengal, during dry periods the "Cavendish" banana plants are irrigated at an interval of 10 to 15 days. In Bihar, irrigation is given every 10 days from December to June. According to Krishnan and Shanmugavelu (1980), "Robusta" banana maintain soil in the range of 60 to 80 per cent of ASM was optimum for economic production of banana yields.

Jagirdar et al. (1963) conducted an experiment with "Basrai" banana in Pakistan adopting three intervals between irrigations (6,10,14 days) and concluded that plants irrigated at an interval of 6 days, produced mature fruits 83 days earlier than plants irrigated at 14 days interval. According to Chen (1971) the most suitable soil moisture content for banana was 50-60 per cent in Taiwan. At Alstonville on "Giant Cavendish", Trochoulias (1971) recorded increased yields over natural rainfall plots (average 1.52-1.78 m) by 117, 111, 84 and 5 per cent for the 90, 80, 60 and 30 per cent available water capacity treatments, respectively. Increased yield in banana through sprinkler irrigation in Cameroon was reported by Malin and Marseault (1972). Beneficial effects of irrigation were achieved by Trochoulias (1973) at Alstonville. From an irrigation experiment on the "Valery" banana in Honduras. Ghavami (1974) obtained significantly greater bunch weight at a rate of 44 mm water per week. He further recorded the highest fruit yield at a soil moisture tension of

30-40 centibars. Manica et al. (1975) irrigated "Cavendish" banana var. "Nanicao" when available soil water fell to 75, 50, 25 per cent along with no irrigation treatment as control. Number of hands and fruits/bunch and yield/ha increased linearly from no irrigation to 75 per cent available soil moisture. Doorenbos and Kassam (1979) reviewed that the water requirements per year varied between 1200 mm in humid and 2200 mm in dry tropics. In Israel, Lahav and Kalmer (1980) recorded that the usual commercial practice of applying 660 m^3 per 1000 m^2 at an interval of 3 days gave the maximum yield. Irrigation given at 10 per cent soil moisture depletion increased yield as compared to 40 or 75 per cent. Soil moisture depletion on the latosols of the north west dry zone of Sri Lanka (Kuruppuarachchi and Pain, 1981). In Israel, Lahav and Kalmer (1986) used class A pan evaporation factors of 0.8, 1.0, 1.2 or 1.4, equivalent to 8450 to $14500 \text{ m}^3/\text{ha}$ annually and concluded that higher factors led to greater sucker height, earlier flowering, more fruit/bunch and a small increase in average bunch weight.

Consumptive use of water (evapotranspiration) varied from 100-150 mm in January-March to about 475 mm in September in Jordan Valley with "Cavendish" banana (Daghistani, 1958). In Lebanon, Bovee (1975) studied ET for banana in Lysimeter and noted ET of 1200 mm per year.

The ratio ET/Class A pan evaporation was 0.82 for the irrigation season and 0.78 for the whole year, with a maximum of 1 in the period of peak transpiration (July-September). In banana growing regions of the world the water utilization efficiency for harvested yield of fruits, was 2.5 to 4 kg/m³ for the plant crop and 3.5 to 6 kg/m³ for ratoon crop (Doorenbos and Kassam, 1979).

Application of irrigation water up to 65 mm per week produced 27 to 32 kg bunch and was almost equal when water was applied at 140 mm per week at Aguan Valley, Honduras for "Giant Cavendish" banana (Arscott et al., 1965). By virtue of better water distribution, more regular water application and more total water applications up to 90 mm per week, banana production in the under tree irrigated areas exceeded production in the overhead irrigation areas. Krishnan and Shanmugavelu (1979) conducted trials with "Robusta" banana and concluded that the height and girth of the pseudostem, total leaf area, the number of leaves at shooting and bunch weight significantly increased with a increase in the soil moisture level.. The shooting to harvest interval was shortened with frequent irrigations. Water stress delayed bunch emergence by one month in "Williams" variety. Water stress after bunch emergence lengthened the fruit filling period by 12 to 22 days (Dasniells and Wetson, 1984). Over irrigation to "Robusta" bananas at Winban led to

reduction in the harvested fruit yield, pseudostem height and girth. The time to bunch emergence and harvesting also delayed (Holder and Gumbs, 1983).

Teawtia et al. (1971) worked on Musa cavandishii and concluded that height, number of fingers and yield per plant increased with the higher levels of irrigation (7.5 ha cm). Irrigation at 2.5 ha cm gave 20.8 per cent TSS; 16.76 per cent total sugar and 0.148 per cent acidity.

Arcscott et al. (1965) have worked on consumption of water and derived a regression equation for determining the amount and frequency of supplementary irrigation where banana was irrigated when soil moisture level fell to 2/3 of the total available moisture:

$$U = 1.660 + 0.015769 T + 0.00317 H,$$

Where,

U = water use per day,

T = average of mean daily temperatures on the plantation in °F and

H = average mean daily RH percentage on the plantation

Ghavami (1972) studied water requirement of bananas in Honduras by using non-weighing type lysimeter and derived two regressions:

Canopy level : $ET = 0.10 + 1.081 E \text{ pan}$; and

Ground level : $ET = 0.70 + 1.20 E \text{ pan}$. The total actual ET was 2150 mm per year.

Turner (1981) attempted to express evaporation from a crop as follows:

$$E = (eQ_n R_a) / (p(q' - q) + (1 + e) R_a + R_L) \quad (7)$$

Where,

$e = 1.515 \, d e_s / dT$ (slope of saturation vapour pressure curve);

$p =$ density of air;

$q =$ the specific humidity;

$Q_n =$ net radiation received by the crop;

$R_a =$ boundary layer resistance to water vapour diffusion and

$R_L =$ leaf diffusion resistance for the whole plant.

2.4 Antitranspirants and mulches

In Israel, plastic emulsion antitranspirants treated banana plants removed 21-44 per cent less water than untreated plants (Gale, 1964). Further, Gale and Hagan (1966) suggested approaches to reduce transpiration by use of materials causing stomatal closure like PMA (phenyl mercuric acetate); materials forming thin films like hexadecanol, tallow alcohol, silicone; materials forming relatively thick films like non-phytotoxic emulsions, wax emulsions; and others like Phosphon-D (2,4-dichloro benzyl tributyl phosphonium chloride) growth retardant. At Basti, polythene mulch showed superior effects on plant growth and yield; and equally effective and cheaper as a form of weed control.

(Teaotia et al., 1969). Trials carried out at Mahatma Phule Agricultural University, Rahuri (1981) on "Basrai" banana, showed no significant effect on yield, total number of fruits, etc. by Kaoline and mulch treatments. However trials conducted at Banana Research Station, Yawal (1982) with mulch and 8 per cent Kaoline spray during summer months showed reduction in irrigation water requirement. Bhattacharyya and Rao (1985) worked on "Robusta" banana by using soil cover such as black polythene, 10 t/ha of banana thrash or 15 t/ha of sugarcane leaf thrash which considerably reduced consumptive use of water, number of irrigations needed through the period of crop growth.

CU ranged from 1024 mm under polythylene cover at 60 per cent depletion of ASM to 1560 mm under no cover treatment at 20 per cent depletion. There was a perceptible increase in WUE under soil covers at low available soil moisture depletion levels.

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Chapter 3

MATERIAL AND METHODS

3.1 Experimental site

In order to assess the water requirement of banana planted in February and June, separate experiments were conducted. February planting experiment was conducted at Agriculture School Farm, Parbhani and the planting was done on 21-2-1982. June planting experiment was conducted at Department of Horticulture Farm, Parbhani and the planting was done on 1-6-1983.

3.2 Soils

The topography of the plot was fairly levelled. The soil was medium black and about 100 cm deep. Soil samples were taken from 0 to 30 cm and 30 to 60 cm depth from 20 different spots randomly selected covering the experimental area, before actual start of the experiment. A composite sample of about 2 kg per zone and for each experimental site was taken and analysed for physical properties and moisture constants. The data obtained are presented in Table 1.

Table 1: Physical properties and moisture constants of the soil

Sr. No.	Particulars	Results of analysis			
		February planting		June planting	
<u>Physical properties</u>					
1	Coarse sand (%)	8.37		8.50	
2	Fine sand (%)	10.32		10.22	
3	Silt (%)	27.50		24.00	
4	Clay (%)	51.81		50.54	
5	Textural class	Clayey		Clayey	
<u>Moisture constants</u>					
		<u>0-30cm</u>	<u>30-60cm</u>	<u>0-30cm</u>	<u>30-60cm</u>
1	Field capacity (%)	31.82	32.03	32.28	32.93
2	Permanent wilting point (%)	18.00	18.60	18.90	19.08
3	Bulk density (g/cc)	1.28	1.36	1.30	1.38
4	Available soil moisture holding capacity (mm in 30 cm)	53.07	54.79	52.18	57.34

3.3 Climate and weather

Parbhani is situated at 19° 08'N latitude and 76°50'E longitude and at an elevation of 410 m above M.S.L. The climate is semi-arid with dry hot summer, followed by humid monsoon and subsequent short cold winter. The average annual precipitation is 900 mm in 70 days, mostly during

June to September. The mean daily maximum temperature varies from 29 °C in December to 41.5 °C in May. Parbhani falls under assured rainfall zone.

The weekly weather data recorded at Agricultural Meteorological Observatory, Parbhani during the period of experimentation are given in Appendix-I and depicted in Figure 1.

Sr. No.	Meteorological parameter	February planting	June planting
1	Temperature °C		
	a) Maximum (Range)	28.5-43.6	26.5-43.5
	b) Minimum (Range)	6.0-28.3	8.9-28.3
2	Relative humidity (%)		
	a) Morning (Range)	34.7-92.0	27.0-95.0
	b) Evening (Range)	12.7-66.0	6.7-76.0
3	Total rainfall (mm)	895	1849.3
4	Number of rainy days	81	108
5	USA pan evaporation (mm) (Range)	3.9-20.4	3.2-19.9
6	Sunken screen pan evaporation(mm) (Range)	<u>1.5-9.9</u>	0.9-9.9
7	Wind velocity (km/hr)(Range)	2.7-19.3	2.8-19.9
8	Bright sunshine (hr)(Range)	1.7-12.0	2.2-13.1

The sunken screen pan evaporimeter was installed in situ.

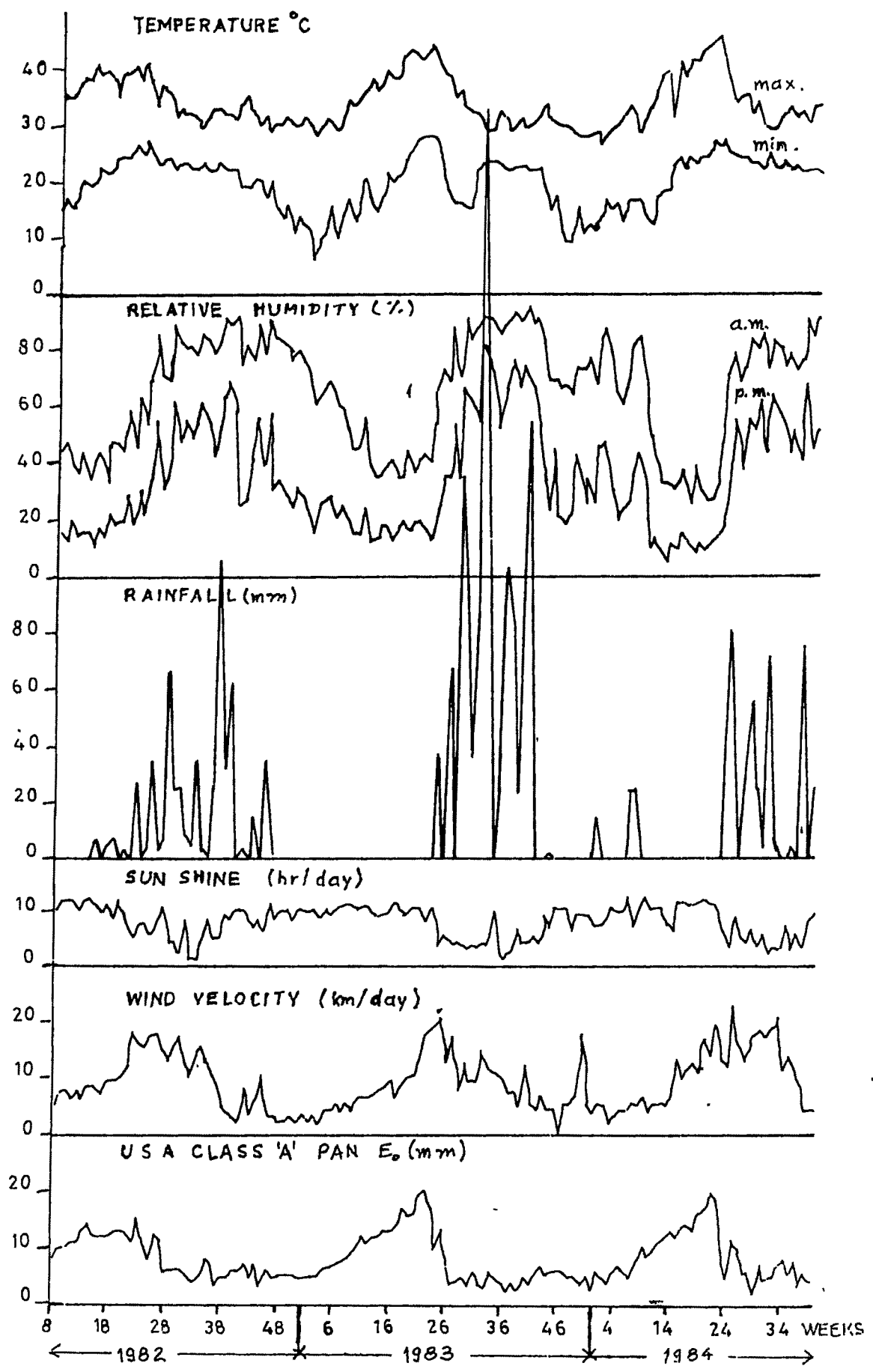


FIG.1 METEOROLOGICAL DATA.

3.4 Experimental details

3.4.1 Design and treatment details for February planting

Design	:	Factorial Randomized Block
Spacing	:	1.5 m x 1.5 m
Plot size	:	6 m x 6 m
Replications	:	Three
Treatments	:	3 x 4 x 2 = 24

Treatment details:

A) Irrigation ratios (IW/CPE)

$I_1 = 1.0$ IW/CPE ratio (Irrigation given at 60 mm evaporation)

$I_2 = 0.8$ IW/CPE ratio (Irrigation given at 75 mm evaporation)

$I_3 = 0.6$ IW/CPE ratio (Irrigation given at 100 mm evaporation)

B) Irrigation ratios increased at different stages by 0.2 IW/CPE ratio and kept constant during the rest of the period.

$S_0 =$ constant throughout the life period

$S_1 =$ increased from fruit bud differentiation to flowering

$S_2 =$ increased from flowering to maturity

$S_3 =$ increased from fruit bud differentiation to maturity

C) Antitranspirants

C = without Kaoline

**K = Kaoline @ 8% every 15 days up to flowering and
if needed or washed away by rains**

The depth of irrigation water applied was 60 mm.

3.4.2 Design and treatment details for June planting

Design	:	Split plot
Spacing	:	1.5 m x 1.5 m
Plot size Main	:	18.0 m x 6.0 m
Sub	:	3.0 m x 3.0 m
Replications	:	Two
Treatments Main	:	Eight
Sub	:	Five
Main x Sub	:	Forty

Treatment details:

A) Main-plot treatments

**I₁ = irrigation given at 1.0 IW/CPE ratio throughout
the life**

**I₂ = irrigation given at 1.4 IW/CPE ratio throughout
the life**

**I₃ = irrigation given at 1.0 IW/CPE ratio and increased
from flower bud differentiation to flowering at
1.4 IW/CPE ratio**

I_4 = irrigation given at 1.4 IW/CPE ratio and increased from fruit bud differentiation to flowering at 1.8 IW/CPE ratio

I_5 = irrigation given at 1.0 IW/CPE ratio and increased from flowering to maturity at 1.4 IW/CPE ratio

I_6 = irrigation given at 1.4 IW/CPE ratio and increased from flowering to maturity at 1.8 IW/CPE ratio

I_7 = irrigation given at 1.0 IW/CPE ratio and increased from fruit bud differentiation to maturity at 1.4 IW/CPE ratio

I_8 = irrigation given at 1.4 IW/CPE ratio and increased from fruit bud differentiation to maturity at 1.8 IW/CPE ratio

B) Sub-plot treatments:

C = control (no spraying and no mulch)

PMA= PMA @ 25 ppm at monthly interval

Kao= Kaoline @ 8% suspension every 15 days up to flowering and if needed or washed away by rains

Pm = Polythene mulch

Sm = Paddy straw mulch @ 1 kg/m² (dry weight)

The depth of irrigation water applied was 60 mm (however initial eight irrigations were of 30 mm depth for both the experiments i.e. for crop establishing period).

The IW/CPE ratios were increased by 0.4 IW/CPE in June planting after observing that the 0.2 IW/CPE range was very narrow during February planting to give sufficient variations.

The cumulative pan evaporation corresponding to each IW/CPE ratio after which irrigation was applied was worked out as:

$$\frac{\text{IW}}{\text{Water use factor}} = \text{mm CPE}$$

Where,

IW = depth of irrigation water applied

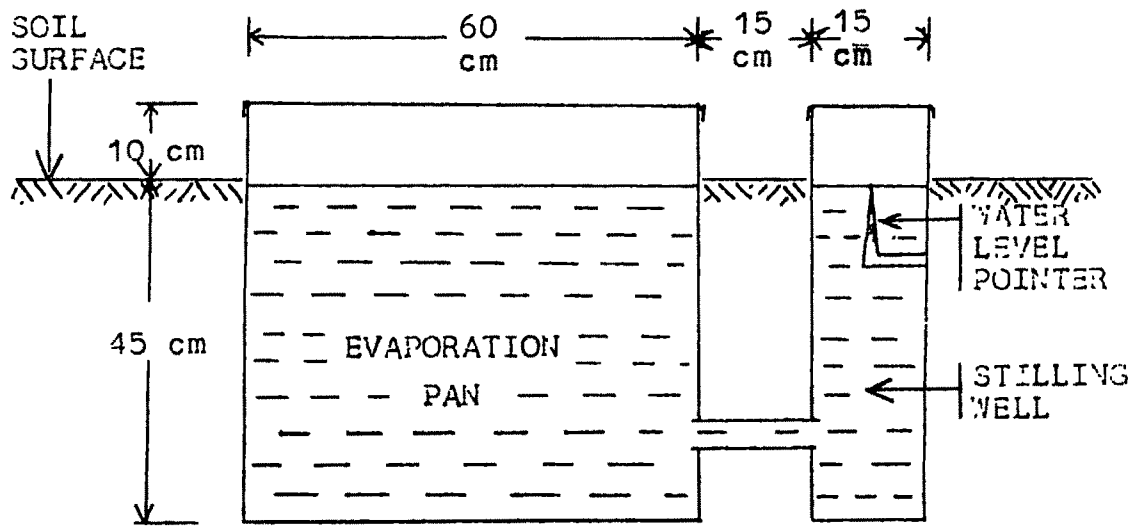
Water use factor = $\frac{\text{IW}}{\text{CPE}}$ ratio

CPE = cumulative pan evaporation

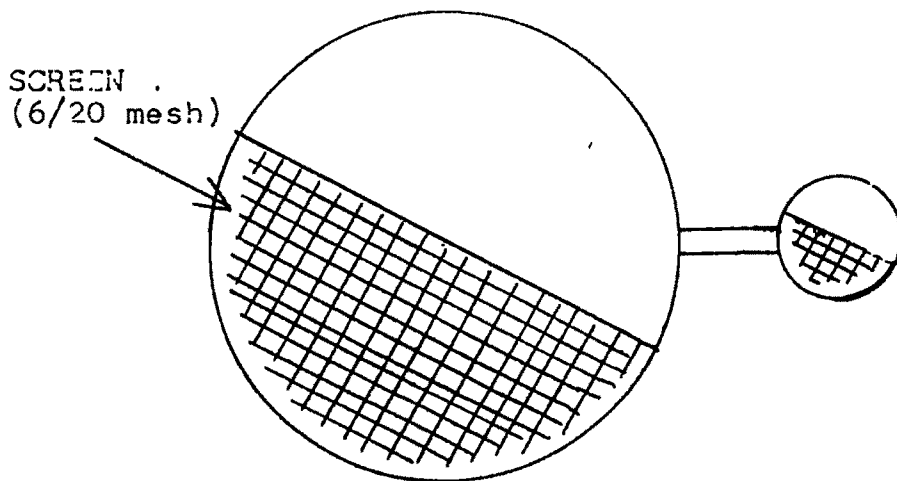
The cumulative pan evaporation values for different ratios tried were:

<u>IW/CPE</u> ratio	0.6	0.8	1.0	1.2	1.4	1.8
Cumulative pan evaporation since previous irrigation (mm)	100	75	60	50	42.86	33.33

In the present experiment the sunken screen open pan evaporimeter (Fig. 2) was used for measuring cumulative pan evaporation (CPE) in mm.



CROSS SECTION



P L A N

Fig. 2 SUNKEN SCREEN OPEN PAN EVAPORIMETER

Data on daily evaporation (mm) from sunken screen pan evaporimeter are presented in Appendix II for February planting and in Appendix III for June planting.

3.5 Plan of layout

The sunken screen pan evaporimeter was installed on eastern side of February 1982 experiment, whereas it was installed on southern side of June 1983 experiment. The experiments were laid out on well cultivated land. However, the land was not under any crop during previous season. The plan of layout is shown in Fig.3 and Fig.4 for February 1982 and June 1983 experiments, respectively.

3.6 Management

3.6.1 Land preparation

Land was ploughed, clod breaking was undertaken and two harrowings were done criss-cross. Ridges and furrows were opened at 1.5 m spacing. Copious irrigation was given before planting of banana was undertaken.

3.6.2 Planting

Uniform sized rhizomes of "Basrai" banana were planted on 21st February 1982 and 1st June 1983 for two experiments. Planting was done in the middle of the furrow by digging a small pit.

After establishment of crop i.e. sprouting of two to three leaves the experimental plot were prepared.

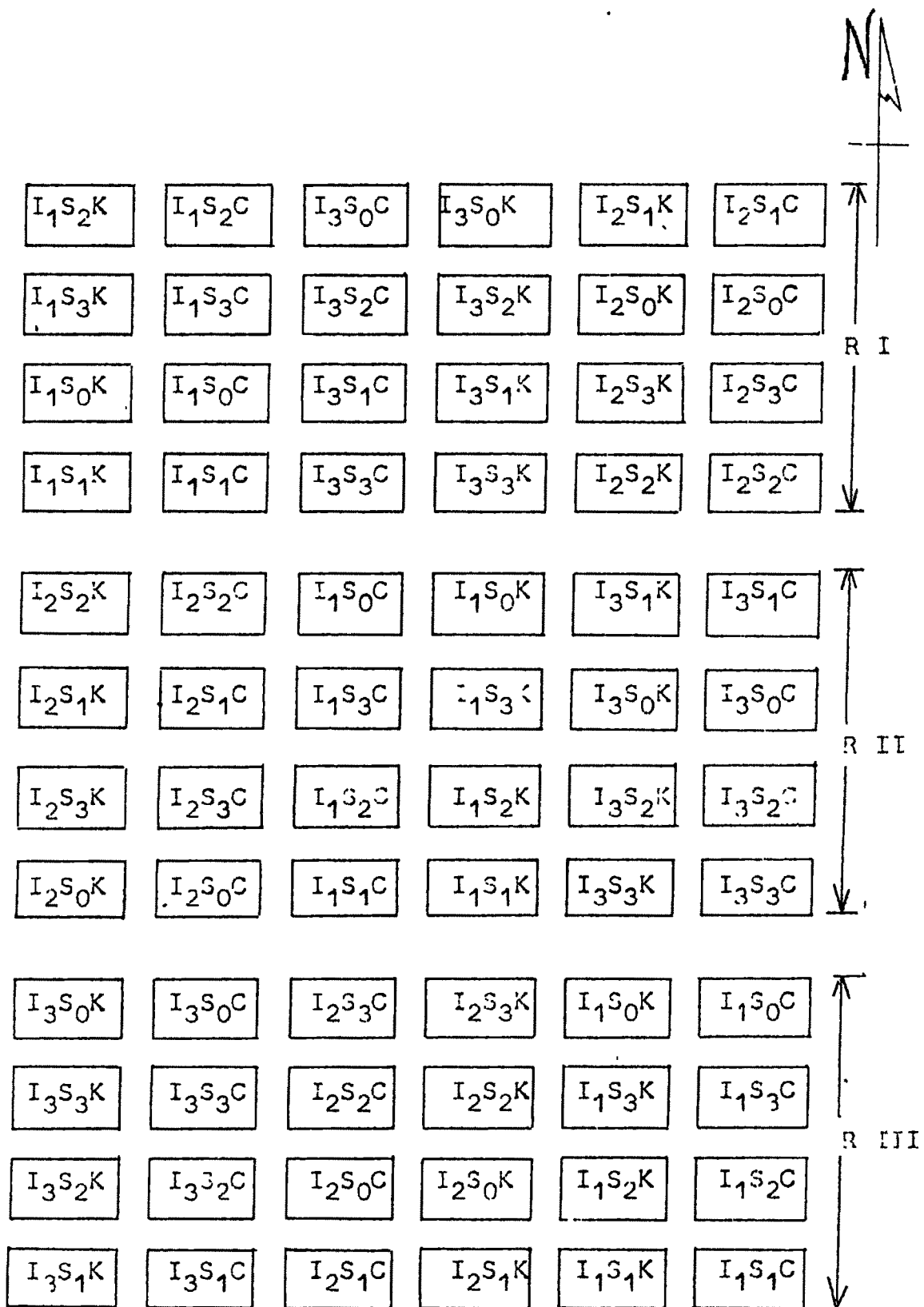


Fig. 3 PLAN OF LAYOUT FEBRUARY PLANTING

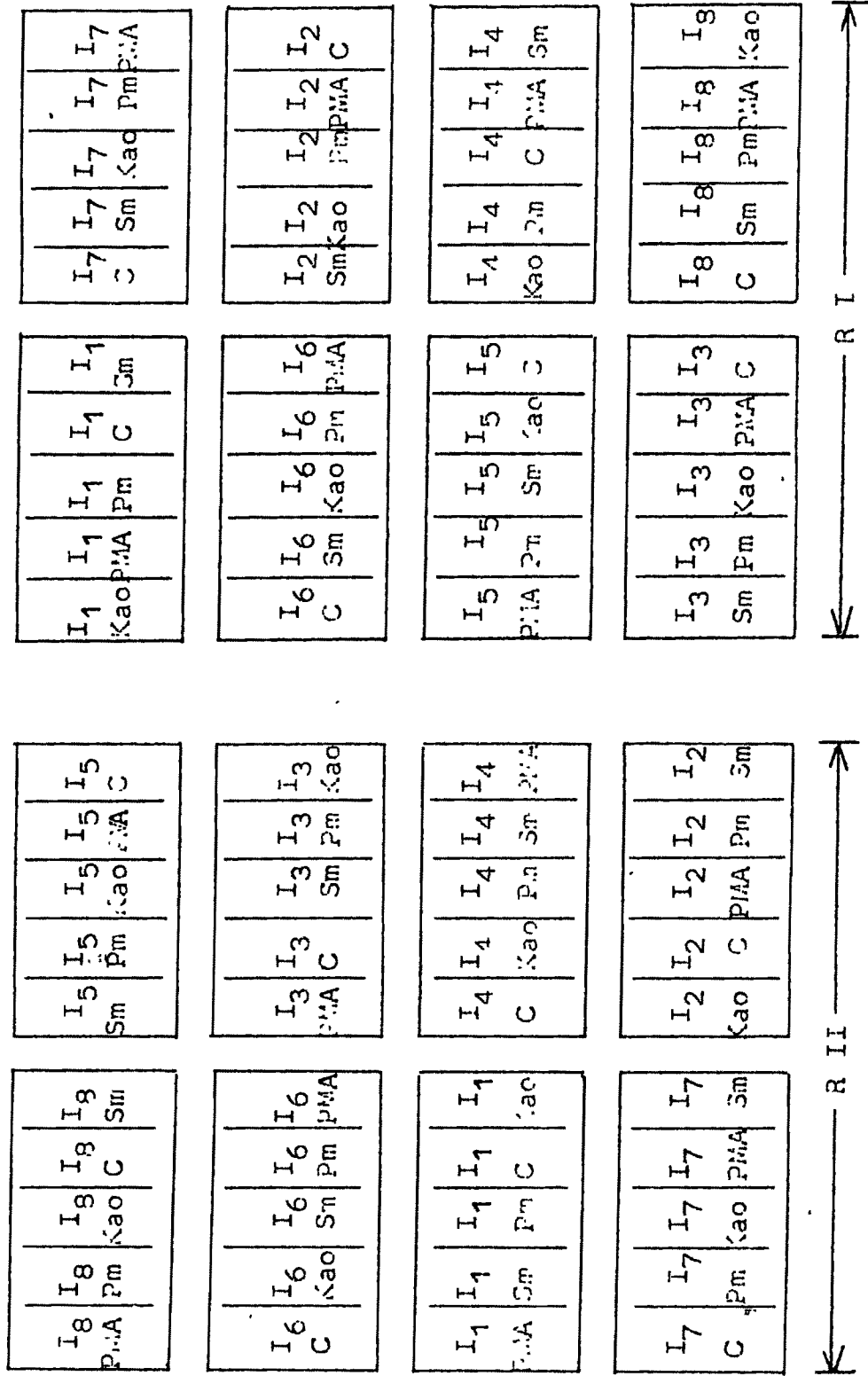
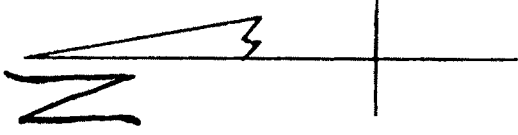


FIG. 4 PLAN OF LAYOUT JUNE PLANTING

3.6.3 Fertilizer application

The recommended dose of 40 cart-loads per hectare of well decomposed FYM was added during land preparation. The recommended dose of fertilizers (200 g N; 40 g P_2O_5 and 200 g K_2O per plant) were applied (Banana Research Station, Yawal, India, 1982). The dose of N fertilizer was split into three, one-third N, full P_2O_5 and K_2O were applied at the time of land preparation. Second and third dose of N were given after 2nd and 4th month of planting, respectively.

3.6.4 Irrigation

Immediately after planting was over one irrigation was given. Thereafter 8 irrigations of 30 mm each were given till the crop was established. This was followed by 60 mm of irrigation every time as per the treatment. The schedules of irrigation for the experimental periods are given in Table 2 and Table 3.

In each plot of February planting 60 mm water (2,160 liters per plot per irrigation) was applied in furrow. In June planting 60 mm water (6,480 litres per main plot per irrigation) was applied in furrow. The quantity of irrigation water was measured with water meter (50 mm size). The source of irrigation water was a well situated near the experimental field.

Table 2. Irrigation schedule as per the treatments during experimental period for February planting.

Treatments Irrigation Number	100		110		120		130		200		210		220		230		300		310		320		330			
	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	
1	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8	21.2.82	8
2	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8	1.3.82	8
3	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8	9	8
4	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15	6 15
5	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22	7 22
6	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28	6 28
7	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5	2.4.82	5
8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8	6 8
9	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12	4 12
10	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20	8 20
11	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30
12	8 5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8	8.5.82	8
13	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17	9 17
14	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26	9 26
15	10 5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10	5.6.82	10
16	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12	7 12
17	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22	10 22
18	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30	8 30
19	12 7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12	7.82	12
20	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17	15 17
21	10 8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14	10.8.82	14
22	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28	18 28
23	14 9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17	14.9.82	17
24	3 10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18	3.10.82	18
25	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18	20 18
26	17 11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25	17.11.82	25
27	9 12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22	9.12.82	22
28	23 1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23	1.83	23
29	1.2.83	20	23	19	9.2.83	17	23	19	9.2.83	17	23	19	9.2.83	17	23	19	9.2.83	17	23	19	9.2.83	17	23	19	9.2.83	17
30	2.3.83	18	12.2.83	20	25	16	9.2.83	13	25	16	9.2.83	13	25	16	9.2.83	13	25	16	9.2.83	13	25	16	9.2.83	13	25	16
31	16	13	16	14	21	11	10.3.83	13	22	11	10.3.83	13	22	11	10.3.83	13	22	11	10.3.83	13	22	11	10.3.83	13	22	11
32	11.4.83	13	29	13	1.4.83	11	21	11	3.5.83	9	11	3.5.83	9	11	3.5.83	9	11	3.5.83	9	11	3.5.83	9	11	3.5.83	9	11
33	11.4.83	11	11.4.83	13	11	10	1.4.83	11	10	1.4.83	11	10	1.4.83	11	10	1.4.83	11	10	1.4.83	11	10	1.4.83	11	10	1.4.83	11
34	2.5.83	10	22.4.83	11	21.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10	11.4.83	10
35																										

Note : I/I = Irrigation Interval In days.

Table 3. Irrigation schedule as per the treatments during experimental period for June planting.

Treatments Irrigation number	I ₁		I ₂		I ₃		I ₄		I ₅		I ₆		I ₇		I ₈	
	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I	Date	I/I
0	1.6.83	-	1.6.83	-	1.6.83	-	1.6.83	-	1.6.83	-	1.6.83	-	1.6.83	-	1.6.83	-
1	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4
2	8	3	8	3	8	3	9	3	8	3	8	3	8	3	9	3
3	11	3	11	3	11	3	11	3	11	3	11	3	11	3	11	3
4	14	3	14	3	14	3	14	3	14	3	14	3	14	3	14	3
5	17	3	17	3	17	3	17	3	17	3	17	3	17	3	17	3
6	21	4	21	4	21	4	21	4	21	4	21	4	21	4	21	4
7	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4
8	30	5	30	5	30	5	30	5	30	5	30	5	30	5	30	5
9	18.7.83	18	14.7.83	14	18.7.83	18	14.7.83	14	18.7.83	18	14.7.83	14	18.7.83	18	14.7.83	14
10	16.8.83	29	1.8.83	18	16.8.83	29	1.8.83	18	16.8.83	29	1.8.83	18	16.8.83	29	1.8.83	18
11	30	14	20	19	30	14	20	19	30	14	20	19	30	14	20	19
12	22.9.83	23	29	9	22.9.83	23	29	9	22.9.83	23	29	9	22.9.83	23	29	9
13	21.10.83	29	12.9.83	14	21.10.83	29	12.9.83	14	21.10.83	29	12.9.83	14	21.10.83	29	12.9.83	14
14	13.11.83	23	28	16	13.11.83	23	28	16	13.11.83	23	28	16	13.11.83	23	28	16
15	30	17	21.10.83	23	30	17	21.10.83	23	30	17	21.10.83	23	30	17	21.10.83	23
16	15.12.83	15	7.11.83	17	15.12.83	15	7.11.83	17	15.12.83	15	7.11.83	17	15.12.83	15	7.11.83	17
17	4.1.84	20	20	13	4.1.84	20	20	13	4.1.84	20	20	13	4.1.84	20	20	13
18	2.2.84	29	3.12.83	13	27	23	3.12.83	13	2.2.84	29	3.12.83	13	27	23	3.12.83	13
19	17	15	13	10	8.2.84	12	13	10	17	15	13	10	8.4.84	12	13	10
20	27	10	24	11	19	11	24	11	27	10	24	11	19	11	24	11
21	12.3.84	14	16.1.84	23	26	7	11.1.84	18	12.3.84	14	16.1.84	23	26	7	11.1.84	18
22	24	12	3.2.84	18	5.3.84	8	26	15	24	12	3.2.84	18	5.3.84	8	26	15
23	4.4.84	11	13	10	16	11	6.2.84	11	4.4.84	11	13	10	16	11	6.2.84	11
24	14	10	22	9	24	8	14	8	14	10	22	9	24	8	14	8
25	22	8	29	7	2.4.84	9	21	7	22	8	29	7	2.4.84	9	21	7
26	29	7	10.3.84	10	9	7	26	5	29	7	10.3.84	10	9	7	26	5
27	6.5.84	7	19	9	16	7	3.3.84	6	6.5.84	7	19	9	16	7	3.3.84	6
28	12	6	28	9	21	5	12	9	12	6	28	9	21	5	12	9
29	19	7	5.4.84	8	26	5	19	7	19	7	5.4.84	8	26	5	19	7
30	24	5	12	7	1.5.84	5	25	6	24	5	12	7	1.5.84	5	25	6
31	29	5	19	7	6	5	1.4.84	7	29	5	19	7	6	5	1.4.84	7
32	2.6.84	4	23	4	11	5	6	5	2.6.84	4	23	4	11	5	6	5
33	11	9	29	6	15	4	12	6	11	9	29	6	15	4	12	6
34	22	11	3.5.84	4	20	5	18	6	22	11	3.5.84	4	20	5	18	6
35	28	6	8	5	24	4	21	3	28	6	8	5	24	4	21	3
36	17.7.84	19	13	5	28	4	25	4	30	5	13	5	27	3	25	4
37	29	12	17	4	2.6.84	5	29	4	11.7.84	11	17	4	30	3	29	4
38	14.8.84	16	22	5	10	8	2.5.84	3	23	12	21	4	2.1.84	3	2.5.84	3
39	26	12	25	3	22	12	6	4	4.8.84	12	24	3	9	7	6	4
40	7.9.84	12	29	4	28	6	11	5	15	11	26	2	19	10	10	4
41	23	16	1.6.84	3	11.7.84	13	15	4	24	9	29	3	24	5	13	3
42		4		3	28	17	21	6	1.9.84	8	31	2	28	4	16	3
43		14	10	13.8.84	16	24	3	9	8	3.6.84	3	9.7.84	11	21	5	
44		21	7	25	12	27	3	22	13	8	5	20	14	21	2	
45		25	4	6.9.84	12	30	3		16	8	30	10	26	3		
46		2.7.84	7		2.6.84	3			21	5	12.8.84	13	28	2		
47		17	15		9	7			24	3	21	9	31	3		
48		24	7		19	10			27	3	29	8	2.6.84	2		
49		5.8.84	12		24	5			4.7.84	7		7	5			
50		16	11		28	4			12	8		14	7			
51		24	8		9.7.84	11			22	10		20	6			
52		2.9.84	9		20	11			30	8		24	4			
53					30	10			8.9.84	9		27	3			
54									16	8		3.7.84	6			
55												11	8			
56												21	10			
57												29	8			

Note : I/I = irrigation interval in days.

3.8 Reproductive growth studies

Crop duration, number of days required for shooting, and fruit development were averaged.

Number of fingers per hand and per bunch as well as number of hands per bunch were counted after complete emergence of pistillate flowers.

Growth of individual fingers was noted by cutting two fingers per bunch from the centre of the bunch and hand at 3 weeks interval till harvest.

3.8.1 Weight of finger

Fresh weight and oven dry weight of fingers were taken at 3 weeks interval.

3.8.2 Length of finger (cm)

Length of fresh finger was taken from the base to the apex of the finger with the help of thread and scale.

3.8.3 Volume of finger (cm³)

Sample fingers (fresh) were used to determine volume. Volume was measured by immersing the finger in a measuring cylinder and by noting the displaced water.

3.8.4 Absolute growth rate

AGR was computed for fresh and dry weight separately by using the following formula:

$$\text{AGR} = \frac{W_2 - W_1}{t_2 - t_1} = \frac{\text{Present weight} - \text{previous weight}}{\text{time interval between present and past observation in days}}$$

3.8.5 Relative growth rate

RGR was computed for fresh and dry weight of fingers as noted from previous observation as follows:

$$\text{RGR} = \frac{\log_e W_2 - \log_e W_1}{t_2 - t_1} = \frac{\log_e \text{ of present weight} - \log_e \text{ of past weight}}{\text{time interval between present and past observation in days}}$$

3.8.6 Yield

Yield per plant (in kg) was computed considering the number of total fingers on a bunch, average weight of individual finger and stalk weight. Similarly the yield per hectare (in tonnes) was also estimated.

3.8.7 Fruit quality

Reducing and non-reducing sugars were analysed from riped banana fruits. The individual fingers were given a 5000 ppm Ethrel dip for 1 minute and then kept for 2 days (Singh *et al.*, 1977). The soft pulp was analysed for sugars (Lane and Eynon, 1923).

3.9 Soil moisture studies

Soil moisture studies were started right from the first irrigation given at the time of planting till the end of the experiment. The soil moisture contents of respective treatments were determined 24 hours before irrigation and 48 hours after irrigation from 0 to 30 cm and 30 to 60 cm soil layer.

3.9.1 Sampling technique

Soil samples for moisture studies were taken with the help of screw auger. In each treatment, soil samples were taken from one spot selected at random in the centre of the plot. The samples were then transferred immediately to aluminium boxes and covered over with polythene sheet to avoid moisture loss. Care was taken to avoid sub-sampling and contamination of the soil from different layers during insertion or withdrawal of auger. The aluminium boxes with sample were transported to laboratory for weighing and drying the samples.

3.9.2 Weighing and drying of samples

The soil samples from respective depths were weighed immediately (W_1) and then transported to electrically heated oven with thermostat control. The samples were dried at a temperature of $105\text{ }^\circ\text{C} \pm 5\text{ }^\circ\text{C}$ for 8 to 12 hours till constant weight was obtained (W_2). The loss in soil moisture was expressed in percentage on oven dry weight basis.

$$\text{Moisture percentage (oven dry weight basis)} = \frac{W_1}{W_2} - 1 \times 100$$

3.9.3 Soil moisture depletion (extraction pattern)

Soil moisture depletion pattern in each treatment was determined. The soil moisture depletion in mm extraction of moisture from different soil layer for the period between each successive irrigation in each treatment were calculated



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by summing up the values of depletion of soil moisture from different layers during the entire period of experimentation (1982-1984). The values of potential evapotranspiration for 48 hours after irrigation were added to depletion of first layer and total loss of moisture in each layer was calculated on percentage basis. The ground water table in the experimental field remained beyond 5 m indicating no possibility of ground water contribution. Contribution of effective rainfall was calculated by the procedure given by Kakde (1985).

3.9.4 Consumptive use of water

The field consumptive use of water by banana in mm was computed by formula:

$$CU = \sum_{k=1}^n E_0 + \sum_{j=1}^n V_j$$

Where,

CU = consumptive use of water in mm

E_0 = evaporation from sunken screen pan evaporimeter for the period between irrigation and soil sampling after irrigation in mm

n = number of time interval

$$V_j = \sum_{n=1}^n \frac{M_{1i} - M_{2i}}{100} \times ASI \times DI + EFR = GWC$$

Where,

- n = number of soil layer in root zone
- M_{1i} = moisture on oven dry weight basis at first sampling in the i^{th} layer (per cent)
- M_{2i} = moisture on oven dry weight basis at the second sampling in the i^{th} layer (per cent)
- ASI = bulk density (g/cc)
- DI = depth of the soil in the i^{th} layer (mm)
- EFR = effective rainfall (mm)
- GWC = ground water contribution (mm)

Detail data are presented in Appendices IV and V.

3.9.5 Consumptive water use efficiency

Consumptive water use efficiency i.e. kg of fruit produced per mm of water per plant in each treatment was worked out by the formula:

$$WUE = \frac{Y}{CU}$$

Where,

- WUE = consumptive water use efficiency
(kg of fruit/mm/plant)
- Y = fruit yield in kg/plant
- CU = total consumptive use of water (mm/crop)

3.9.6 Evapotranspiration ratio (ETR)

ETR refers to the amount of water consumptively

used (mm) for producing unit amount of fruit yield (kg).

It was calculated by the formula:

$$\text{ETR} \begin{matrix} \text{(mm/t/ha)} \\ \text{(mm/t/ha)} \end{matrix} = \frac{\text{Consumptive use of water in mm}}{\text{Fruit yield in t/ha}}$$

3.10 Statistical analysis and interpretation of data

Data obtained on various variables were analysed by the analysis of variance method (Panse and Sukhatme, 1967). The total variance (S^2) and d.f. ($n-1$) were partitioned into different possible sources. The variance due to irrigation ratios was compared with error variance for finding out 'F' value and ultimately for testing the significance at P (0.05). The standard error for treatment based on error variance was calculated. Whenever, the result was significant, critical difference was calculated for comparison of treatment mean at 5 per cent level of significance (CD at P = 0.05).

3.11 Simple correlation and regression coefficient studies

Simple correlation coefficient, 'r' values were computed between banana fruit yield in kg per plant (y) and yield contributing characters (X) of the plant viz.:

X_1 - Pseudostem height (cm)

X_2 - Pseudostem girth (cm)

X_3 - Number of leaves

X_4 - Leaf area (m^2)

- X_5 - Number of fingers per plant
- X_6 - Number of hands per plant
- X_7 - Number of fingers per hand
- X_8 - Fresh weight of finger (g)
- X_9 - Volume per finger (cm^3)
- X_{10} - Length of finger (cm)

Simple correlation (r) and regression (b) coefficient were computed and the ' r ' and ' b ' values obtained were tested for their significance as per the procedure described by Snedecor and Cochran (1967).

3.12 Marginal analysis

Marginal analysis was worked out for IW/CPE ratios and increased IW/CPE during various phases combinations of both plantings. Procedure adopted was on the lines of Shinde and Pawar (1982).

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Chapter 4

RESULTS

The results obtained are presented below under separate heads.

4.1 February planting

4.1.1 Vegetative growth

4.1.1.1 Pseudostem girth

Data on periodic measurement of pseudostem girth are presented in Table 4 and depicted in Fig.5. The irrigation ratios showed significance, but increased IW/CPE ratio during various phases and Kaoline treatments showed no significance during the entire course of investigation. Treatments 1.0 and 0.8 IW/CPE ratio showed similar effect. However, 1.0 IW/CPE induced more pseudostem girth compared to that induced by 0.6 IW/CPE. All interactions were non-significant.

4.1.1.2 Pseudostem height

Data on periodic measurement of pseudostem height are presented in Table 5 and depicted in Fig.6. The irrigation ratios showed significance, but increased IW/CPE ratios during various phases and Kaoline treatments at various stages showed no significance during the entire course of investigation. Treatments 1.0 and 0.8 IW/CPE showed similar effect. However, 1.0 IW/CPE induced more pseudostem height compared to that induced by 0.6 IW/CPE. All interactions were non-significant.

Table 4: Pseudostem girth (cm)

Days Treat- ments	76	135	195	260	321	380
IW/CPE						
I ₁	14.16	16.68	28.57	43.91	51.05	57.86
I ₂	15.10	17.17	27.00	42.60	51.14	55.53
I ₃	13.39	14.69	23.87	40.15	48.83	51.83
SE ±	0.28	0.43	0.58	1.05	1.68	1.25
CD at 5%	0.79	1.20	1.83	2.91	4.66	3.48
S ₀	13.87	15.91	26.63	42.29	53.37	55.50
S ₁	14.18	16.20	26.37	42.41	50.91	53.74
S ₂	14.18	15.62	25.36	40.25	52.06	55.93
S ₃	14.64	16.99	27.55	43.81	50.29	55.13
SE ±	0.33	0.55	0.68	1.22	1.94	1.45
CD at 5%	NS	NS	NS	NS	NS	NS
C	14.15	16.42	26.38	42.76	50.89	54.36
K	14.28	15.94	26.07	41.68	52.87	55.79
SE ±	0.23	0.35	0.48	0.86	1.37	1.02
CD at 5%	NS	NS	NS	NS	NS	NS
IxS SE ±	0.57	0.86	1.17	2.12	3.44	2.51
CD at 5%	NS	NS	NS	NS	NS	NS
IxK SE ±	0.40	0.61	0.63	1.50	2.43	1.77
CD at 5%	NS	NS	NS	NS	NS	NS
SxK SE ±	0.46	0.70	0.96	1.73	2.81	2.05
CD at 5%	NS	NS	NS	NS	NS	NS
IxSxK SE ±	0.80	1.22	1.86	3.00	4.87	3.55
CD at 5%	NS	NS	NS	NS	NS	NS

Table 3: Pseudostem height (cm)

Days	76	135	195	260	321	380
Treatments						
I_1	26.81	33.32	73.81	106.71	118.56	122.72
I_2	25.57	31.74	69.28	100.16	115.48	118.32
I_3	22.15	25.17	58.63	84.76	103.35	111.15
SE \pm	0.83	1.33	1.94	2.80	2.86	2.90
CD at 5%	2.30	3.69	5.40	7.80	7.94	8.05
S_0	24.72	29.38	65.50	94.69	113.45	117.66
S_1	24.41	30.28	67.46	97.53	108.29	112.63
S_2	24.96	29.67	65.35	94.48	113.07	118.42
S_3	25.27	30.24	70.66	102.15	115.05	120.87
SE \pm	0.96	1.53	2.24	3.23	3.31	3.35
CD at 5%	NS	NS	NS	NS	NS	NS
K_0	24.55	30.40	68.60	99.17	111.74	114.32
K_1	25.13	29.75	65.89	95.26	113.19	120.47
SE \pm	0.67	1.08	1.59	2.29	2.34	2.37
CD at 5%	NS	NS	NS	NS	NS	NS
I x S SE \pm	1.66	2.66	3.89	5.60	5.73	5.81
CD at 5%	NS	NS	NS	NS	NS	NS
I x K SE \pm	1.77	1.88	2.75	3.96	4.05	4.11
CD at 5%	NS	NS	NS	NS	NS	NS
S x K SE \pm	1.35	2.17	3.18	4.58	4.68	4.74
CD at 5%	NS	NS	NS	NS	NS	NS
I x S x K SE \pm	2.35	3.74	5.51	7.93	8.10	8.22
CD at 5%	NS	NS	NS	NS	NS	NS

Kaoline sprayed plants were shorter than non-sprayed plants during 135 to 260 days period and thereafter sprayed plants grew taller than non-sprayed plants.

4.1.1.3 Number of leaves per plant

Data on periodic number of leaves per plant are presented in Table 6 and depicted in Fig.7. The irrigation ratios showed significance from 195 days onward. Increased IW/CPE ratio during various phases and Kaoline treatments at various stages showed no significance during the entire course of investigation. Treatments 1.0 and 0.8 IW/CPE showed similar effect. However, 1.0 IW/CPE induced more number of leaves per plant compared to that induced by 0.6 IW/CPE. All interactions were non-significant.

Number of leaves per plant were maximum during 260 and 321 days period, and thereafter showed a sharp decline.

4.1.1.4 Leaf area per plant

Data on periodic leaf area per plant are presented in Table 7 and depicted in Fig.8. The irrigation ratios showed significance from 135 days onwards. Increased IW/CPE ratio during various phases and Kaoline treatments at various stages showed no significance during the entire course of investigation. Treatments 1.0 and 0.8 IW/CPE showed similar effect and induced more leaf area per plant compared to that induced by 0.6 IW/CPE at 135, 195, 260 and 321 days after planting. When plants were 380 days old

Table 6: Number of leaves per plant

	Days	76	135	195	260	321	380
Treatments							
I ₁		5.07	10.01	12.71	15.89	16.26	10.95
I ₂		5.21	10.38	12.63	15.35	15.23	9.74
I ₃		5.05	9.66	11.99	14.54	13.90	10.09
SE \pm		0.15	0.34	0.18	0.28	0.43	0.30
CD at 5%		NS	NS	0.51	0.81	1.19	0.83
S ₀		4.83	9.98	12.40	15.46	15.34	10.52
S ₁		5.13	9.76	12.61	15.13	14.81	9.97
S ₂		5.04	9.82	12.12	14.97	14.93	10.38
S ₃		5.44	10.51	12.64	15.48	15.44	10.16
SE \pm		0.17	0.39	0.21	0.31	0.49	0.34
CD at 5%		NS	NS	NS	NS	NS	NS
K ₀		5.12	10.04	12.55	15.30	15.19	9.99
K ₁		5.10	10.00	12.33	15.22	15.08	10.52
SE \pm		0.12	0.28	0.15	0.22	0.35	0.24
CD at 5%		NS	NS	NS	NS	NS	NS
IxS SE \pm		0.30	0.69	0.56	0.53	0.86	0.60
CD at 5%		NS	NS	NS	NS	NS	NS
IxK SE \pm		0.21	0.48	0.26	0.38	0.61	0.42
CD at 5%		NS	NS	NS	NS	NS	NS
SxK SE \pm		0.24	0.56	0.30	0.44	0.70	0.49
CD at 5%		NS	NS	NS	NS	NS	NS
IxSxK SE \pm		0.42	0.97	0.52	0.76	1.22	0.85
CD at 5%		NS	NS	NS	NS	NS	NS

Table 7: Leaf area per plant (m^2)

Treat- ments	Days	76	135	195	260	321	380
I ₁		0.22	0.64	2.63	7.21	8.98	7.54
I ₂		0.27	0.71	2.48	6.63	7.90	5.41
I ₃		0.23	0.54	1.79	5.46	6.52	5.12
SE \pm		0.01	0.03	0.11	0.32	0.42	0.72
CD at 5%		NS	0.10	0.31	0.89	1.18	2.08
S ₀		0.21	0.63	2.33	6.68	7.69	7.43
S ₁		0.24	0.61	2.41	6.29	7.53	5.24
S ₂		0.25	0.59	2.03	5.98	7.66	6.03
S ₃		0.25	0.69	2.42	6.79	8.30	5.39
SE \pm		0.01	0.04	0.13	0.36	0.49	0.84
CD at 5%		NS	NS	NS	NS	NS	NS
K ₀		0.24	0.65	2.38	6.43	7.78	6.14
K ₁		0.23	0.61	2.22	6.45	7.82	5.91
SE \pm		0.01	0.03	0.09	0.25	0.34	0.59
CD at 5%		NS	NS	NS	NS	NS	NS
IxS SE \pm		0.02	0.07	0.22	0.64	0.85	1.45
CD at 5%		NS	NS	NS	NS	NS	NS
IxK SE \pm		0.02	0.05	0.16	0.45	0.60	1.03
CD at 5%		NS	NS	NS	NS	NS	NS
SxK SE \pm		0.02	0.06	0.18	0.52	0.69	1.19
CD at 5%		NS	NS	NS	NS	NS	NS
IxSxK SE \pm		0.04	0.10	0.32	0.92	1.20	2.06
CD at 5%		NS	NS	NS	NS	NS	NS

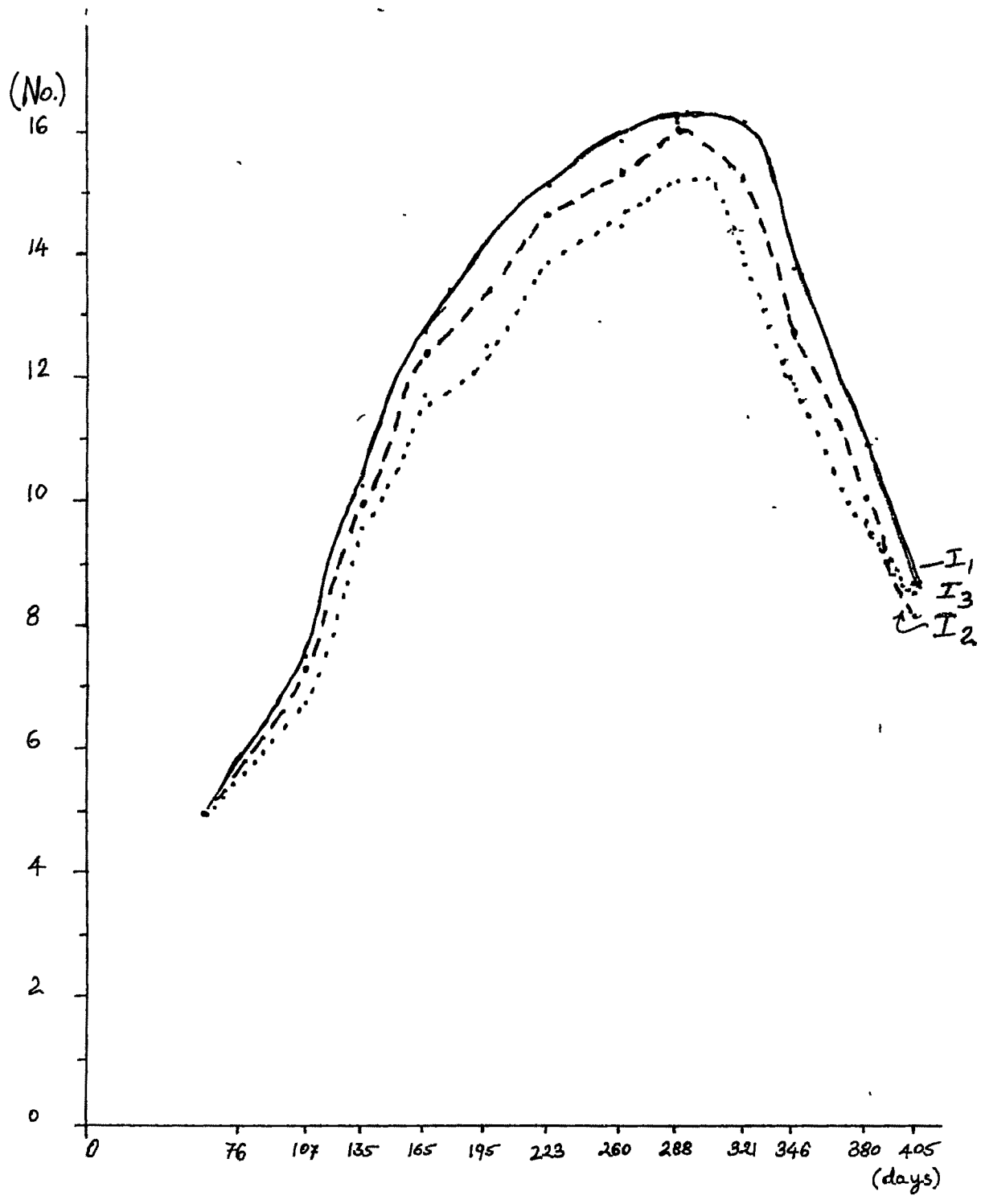


FIG. 7 NUMBER OF LEAVES/PLANT.

Table 8: Absolute growth rate of pseudostem girth (cm/day)

Day interval Treat- ments	0to76	77to135	136to 195	196 to 260	261 to 321	322 to 380
I ₁	0.1863	0.0427	0.1982	0.2360	0.1171	0.1154
I ₂	0.1987	0.0351	0.1638	0.2400	0.1400	0.0744
I ₃	0.1762	0.0220	0.1530	0.2504	0.1423	0.0508
S ₀	0.1825	0.0346	0.1787	0.2409	0.1816	0.0361
S ₁	0.1866	0.0342	0.1695	0.2468	0.1393	0.0480
S ₂	0.1866	0.0244	0.1623	0.2291	0.1936	0.0656
S ₃	0.1926	0.0398	0.1760	0.2502	0.1062	0.0820
K ₀	0.1862	0.0385	0.1660	0.2520	0.1333	0.0588
K ₁	0.1879	0.0281	0.1688	0.2402	0.1834	0.0495

Table 9: Absolute growth rate of pseudostem height (cm/day)

Day interval Treat- ments	0to76	77to135	136 to 195	196 to 260	261 to 321	322 to 380
I ₁	0.3528	0.1103	0.6748	0.5062	0.1943	0.0705
I ₂	0.3364	0.1046	0.6257	0.4751	0.2511	0.0481
I ₃	0.2914	0.0512	0.5577	0.4020	0.3048	0.1322
S ₀	0.3253	0.0790	0.6020	0.4491	0.3075	0.0714
S ₁	0.3212	0.0995	0.6197	0.4626	0.1764	0.0736
S ₂	0.3284	0.0802	0.5947	0.4482	0.3048	0.0907
S ₃	0.3325	0.0842	0.6737	0.4845	0.2115	0.0986
K ₀	0.3230	0.0991	0.6367	0.4703	0.2061	0.0437
K ₁	0.3307	0.0783	0.6023	0.4518	0.2939	0.1234

4.1.2 Developmental study

4.1.2.1 Days required for flowering, fruit development and crop duration

Data on number of days required for flowering, fruit development and crop duration are presented in Table 10. The irrigation ratios, increased IW/CPE ratio during various phases and Kaoline treatments showed significance.

Treatments 1.0 IW/CPE flowered earlier than 0.8 and 0.6 IW/CPE. Days to flower were reduced when the plants received increased IW/CPE ratio during FBD to harvest. Increased IW/CPE ratio during FBD to flowering and flowering to harvest required similar period to flower. Irrigation ratio kept constant during the entire crop period delayed flowering Kaoline sprayed plants flowered earlier as compared to non-sprayed plants.

Plants receiving irrigation at 1.0 IW/CPE ratio in combination with increased IW/CPE during FBD to harvest required least number of days to flower (Table 10a).

I_1S_0 , I_1S_1 , I_2S_2 and I_2S_3 required similar number of days but higher than that compared to I_1S_3 . Maximum number of days were required for flowering in 0.6 IW/CPE ratio kept constant during the entire crop duration.

Fruit development period was reduced as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio. Increased

Table 10: Number of days required to flower, fruit development and Crop Duration

Treatments	Number of days required to flower	Number of days required for fruit development	Crop duration
I ₁	328.00	98.75	427.33
I ₂	346.92	108.50	455.37
I ₃	379.08	114.37	493.54
SE ±	0.91	1.12	1.69
CD at 5%	2.53	3.12	4.69
S ₀ _F	363.11	109.72	472.94
S ₁ (100-Flow)	352.06	108.72	450.80
S ₂	349.78	107.50	457.94
S ₃	340.39	102.88	443.22
SE ±	1.05	1.30	1.95
CD at 5%	2.92	3.60	5.42
K ₀	354.61	108.94	463.55
K ₁	348.06	105.47	453.94
SE ±	0.75	0.92	1.38
CD at 5%	2.07	2.55	3.83
IxS SE ±	1.83	2.25	3.38
CD at 5%	5.07	NS	9.39
IxK SE ±	1.29	1.59	2.39
CD at 5%	NS	NS	NS
SxK SE ±	1.49	1.84	2.76
CD at 5%	NS	NS	NS
IxSxK SE ±	2.58	3.18	4.79
CD at 5%	NS	NS	NS

Table 10a: Number of days required to flower IxS interaction

Treatments	I ₁ ^{a,10}	I ₂ ^{b,8}	I ₃ ^{oib}
S ₀	332.50	355.34	401.50
S ₁	329.00	349.33	377.83
S ₂	328.50	345.50	375.34
S ₃	322.00	337.50	361.67

SE ± 1.83 CD at 5% 5.07

Table 10b: Crop duration IxS interaction

Treatments	I ₁	I ₂	I ₃
S ₀	436.17	465.83	516.83
S ₁	427.66	459.16	495.83
S ₂	428.50	454.17	491.17
S ₃	417.00	442.33	470.33

SE ± 3.38 CD at 5% 9.39

IW/CPE ratio from FBD to harvest reduced fruit development period as compared to increased IW/CPE ratio during FBD to flowering, flowering to harvest and not increased, which required similar number of days to develop fruit. Kaoline sprayed plants required less days for fruit development as compared to non-sprayed plants.

Crop duration was reduced as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio. Increased IW/CPE ratio from FBD to harvest reduced crop duration compared to that increased IW/CPE ratio from FBD to flowering, flowering to harvest and not increased. Kaoline sprayed plants reduced crop duration as compared to non-sprayed plants.

Plants receiving irrigation at 1.0 IW/CPE ratio in combination with the increased IW/CPE during FBD to harvest required least crop duration (Table 10b). I_1S_2 , I_1S_1 , I_1S_0 and I_2S_3 required similar crop duration but higher than that in I_1S_3 . Maximum crop duration was required by plants receiving irrigation at 0.6 IW/CPE ratio kept constant during the entire crop duration.

4.1.2.2 Number of hands per bunch, fingers per hand and fingers per bunch

Data on number of hands per bunch, fingers per hand and fingers per bunch are presented in Table 11. Irrigation ratios showed significance. Increased IW/CPE ratio during various phases showed significance for

Table 11: Number of hands per bunch, fingers per hand, and fingers per bunch

Treatments	Number of hands per bunch	Number of fingers per hand	Number of fingers per bunch
$I_{1^{a,b}}$	7.64	13.63	105.41
$I_{2^{a,b}}$	7.23	13.22	96.32
$I_{3^{a,b}}$	7.12	11.96	86.35
SE \pm	0.11	0.22	2.55
CD at 5%	0.30	0.61	7.08
S_0	7.35	12.27	93.52
S_1	7.25	13.21	95.81
S_2	7.19	13.20	95.65
S_3	7.53	13.06	99.13
SE \pm	0.12	0.25	2.95
CD at 5%	NS	0.71	NS
K_0	7.28	12.89	96.15
K_1	7.38	12.98	95.90
SE \pm	0.09	0.18	2.08
CD at 5%	NS	NS	NS
IxS SE \pm	0.22	0.44	5.11
CD at 5%	0.61	NS	14.17
IxK SE \pm	0.15	0.31	3.61
CD at 5%	NS	0.86	10.02
SxK SE \pm	0.18	0.36	4.17
CD at 5%	NS	1.00	NS
IxSxK SE \pm	0.31	0.62	7.23
CD at 5%	NS	1.73	NS

fingers per hand only. Kaoline treatments showed no significance.

Treatments 0.8 and 0.6 IW/CPE produced similar number of hands per bunch. Treatment 1.0 IW/CPE induced more number of hands per bunch as compared to that induced by 0.8 and 0.6 IW/CPE ratio. Plants receiving irrigation at 1.0 IW/CPE in combination with increased IW/CPE during FBD to flowering and 0.6 IW/CPE in combination with increased IW/CPE during FBD to harvest produced similar and least number of hands per bunch as compared to other combinations which produced similar and more number of hands per bunch (Table 11a).

Treatments 1.0 and 0.8 IW/CPE ratio showed similar effect and induced more number of fingers per hand compared to that induced by 0.6 IW/CPE ratio. Increased IW/CPE ratio during various stages showed similar effect and induced more fingers per hand compared to that IW/CPE ratio kept constant during the entire crop duration:

Treatment combinations K_1S_1 , K_0S_2 , K_1S_3 showed similar effect and induced more number of fingers per hand compared to K_1S_0 (Table 11b). Treatment combinations K_1I_3 induced least number of fingers per hand compared to K_0I_2 , K_0I_2 , K_0I_1 , K_1I_2 and K_1I_1 (Table 11b).

Treatment combinations $I_3S_0K_1$ induced least number of fingers per hand. $I_2S_1K_1$, $I_1S_3K_1$, $I_1S_2K_0$, $I_1S_0K_1$,

Table 11a: Number of hands per bunch IxS interaction

Treatments	I ₁	I ₂	I ₃
S ₀	7.63	7.25	7.18
S ₁	6.93	7.33	7.50
S ₂	8.15	7.18	6.25
S ₃	7.84	7.16	7.58
SE ±	0.22	CD at 5%	0.61

Table 11b: Number of fingers per hand IxK and SxK interaction

Treatments	K ₀	K ₁	
S ₀	12.68	11.86	SE ± 0.31
S ₁	12.57	14.07	CDat5% 0.86
S ₂	13.52	12.88	
S ₃	12.82	13.31	
I ₁	13.06	14.21	SE ± 0.36
I ₂	12.66	13.78	CDat5% 1.00
I ₃	12.97	11.10	

$I_2S_2K_1$, $I_1S_1K_1$ and $I_3S_0K_0$ showed similar effect and induced more number of fingers per hand compared to $I_3S_2K_1$ and $I_3S_3K_1$ (Table 11c).

Number of fingers per bunch increased as irrigation ratios increased from 0.6 to 1.0 IW/CPE. Treatment combinations I_1S_2 , I_1S_3 , I_1S_0 and I_2S_1 showed similar effect and induced more number of fingers per bunch compared to that induced by I_3S_0 and I_3S_2 (Table 11d). Treatment combinations I_1K_1 induced more number of fingers per bunch compared to I_1K_0 , I_2K_0 , I_2K_1 and I_3K_0 , and I_3K_1 induced the least number of fingers per bunch.

4.1.2.3 Fruit development

4.1.2.3.1 Fresh weight of finger

Irrigation ratios showed significance at all stages of development, but increased IW/CPE ratio during various phases and Kaoline treatments showed significance at 84 days and harvest (Table 12). Treatments 0.8 and 0.6 IW/CPE ratio showed similar effect and induced less fresh weight compared to that induced by 1.0 IW/CPE ratio at harvest. Similar trend was observed at flowering 63 and 84 days, but at 21 and 42 days fresh weight of finger was noted to be increased as irrigation ratios increased from 0.6 to 1.0 IW/CPE.

Increased IW/CPE ratio during flowering to harvest lowered the fresh weight compared to increased IW/CPE ratio

Table 11c: Number of fingers per hand IxSxK interaction

Treatments	I ₁	I ₂	I ₃
S ₀ K ₀	12.08	12.97	13.59
S ₀ K ₁	14.35	12.53	8.70
S ₁ K ₀	12.18	12.61	12.90
S ₁ K ₁	14.09	15.30	12.30
S ₂ K ₀	14.85	13.25	12.48
S ₂ K ₁	13.40	14.15	11.18
S ₃ K ₀	13.06	12.49	12.96
S ₃ K ₁	15.05	13.27	11.67

SE ± 0.62

CD at 5% 1.73

Table 11d: Number of fingers per bunch IxS and IxK interaction

Treatments	I ₁	I ₂	I ₃
S ₀	102.50	94.70	83.38
S ₁	93.33	100.37	93.75
S ₂	113.97	98.12	74.86
S ₃	111.86	92.13	93.40
K ₀	98.47	94.14	95.86
K ₁	112.38	98.52	76.84

SE± 5.11

CD at5% 14.17

SE± 3.61

CD at5% 10.02

Table 12: Fresh weight of finger (g)

Treat- ments	Days					
	0	21	42	63	84	Harvest
I ₁	8.83	19.20	32.62	38.37	46.39	73.98
I ₂	7.70	13.86	21.97	28.74	35.06	57.06
I ₃	7.08	12.38	18.83	26.24	36.60	57.00
SE ±	0.298	0.492	0.808	1.003	1.231	1.845
CD at 5%	0.85	1.41	2.31	2.87	3.52	5.27
S ₀	7.55	15.74	23.84	31.01	41.45	65.53
S ₁	7.77	14.89	24.95	32.57	41.23	65.23
S ₂	8.53	14.19	22.98	30.09	34.76	55.68
S ₃	7.63	15.76	26.11	30.80	39.97	64.31
SE ±	0.344	0.568	0.933	1.159	1.421	2.13
CD at 5%	NS	NS	NS	NS	4.06	6.09
K ₀	7.99	15.13	25.23	32.18	41.07	65.75
K ₁	7.75	15.16	23.71	30.06	37.64	59.61
SE ±	0.243	0.402	0.66	0.82	1.005	1.506
CD at 5%	NS	NS	NS	NS	2.87	4.30
IxS SE ±	0.595	0.984	1.616	2.008	2.462	3.689
CD at 5%	NS	NS	NS	5.74	7.04	10.54
IxK SE ±	0.421	0.696	1.143	1.420	1.741	2.609
CD at 5%	NS	NS	NS	NS	NS	NS
SxK SE ±	0.486	0.645	1.32	1.639	2.01	3.012
CD at 5%	NS	1.84	NS	NS	NS	NS
IxSxK SE ±	0.842	1.392	2.286	2.839	3.482	5.217
CD at 5%	NS	3.98	6.53	NS	NS	NS

4.1.2.3.2 Dry weight of finger

Irrigation ratios and increased IW/CPE ratio showed significance at all stages of development, but Kaoline treatment showed significance at 42, 63, 84 and harvest (Table 13).

Dry weight of finger increased as the irrigation ratio increased from 0.6 to 1.0 IW/CPE during the entire fruit developmental stages.

Irrigation ratios kept constant during the entire crop duration produced highest dry weight of finger compared to that produced by increased IW/CPE ratio during FBD to harvest and FBD to flowering. Least dry weight was produced by plants receiving increase IW/CPE ratio during flowering to harvest. Similar trend was observed at other stages of fruit development.

Kaoline sprayed plants induced higher dry weight as compared to non-sprayed plants at 42, 63, 84 and harvest stages.

Plants receiving irrigation at 1.0 IW/CPE ratio and increased during FBD to flowering induced highest dry weight compared to that irrigated at 1.0 IW/CPE and ratio kept constant during the entire crop duration (Table 13a). Least dry weight was induced by plants receiving irrigation at 0.6 IW/CPE and increased IW/CPE during FBD to flowering.

Table 13: Dry weight of finger (g)

Treat- ments	Days					
	0	21	42	63	84	Harvest
I ₁	0.73	1.77	2.97	4.75	9.36	14.55
I ₂	0.56	1.27	2.19	3.29	5.54	11.33
I ₃	0.49	1.05	1.82	2.78	4.55	9.90
SE ±	0.012	0.012	0.021	0.057	0.027	0.054
CD at 5%	0.03	0.03	0.06	0.16	0.08	0.15
S ₀	0.65	1.46	2.38	3.73	6.72	12.62
S ₁	0.62	1.41	2.41	3.72	6.38	11.96
S ₂	0.54	1.25	2.17	3.34	6.03	11.23
S ₃	0.56	1.34	2.34	3.64	6.81	11.91
SE ±	0.014	0.018	0.024	0.066	0.031	0.063
CD at 5%	0.04	0.05	0.07	0.19	0.09	0.18
K ₀	0.58	1.36	2.29	3.48	6.09	11.62
K ₁	0.61	1.37	2.36	3.74	6.88	12.24
SE ±	0.01	0.013	0.017	0.047	0.022	0.044
CD at 5%	NS	NS	0.05	0.13	0.06	0.13
IxS SE ±	0.024	0.032	0.042	0.114	0.053	0.109
CD at 5%	0.07	0.09	0.12	0.33	0.15	0.31
IxK SE ±	0.017	0.022	0.03	0.081	0.037	0.077
CD at 5%	0.05	0.06	0.09	0.23	0.11	0.22
SxK SE ±	0.019	0.026	0.034	0.093	0.043	0.089
CD at 5%	NS	0.07	0.10	0.27	0.12	0.25
IxSxK SE ±	0.034	0.045	0.059	0.161	0.075	0.154
CD at 5%	0.097	0.13	0.17	0.46	0.22	0.44

Irrigation given at 1.0 IW/CPE ratio and sprayed and non-sprayed plants with Kaoline induced higher dry weight of finger, compared to that irrigated at 0.8 IW/CPE and non-sprayed with Kaoline (Table 13a). Least dry weight was induced in plants receiving irrigation at 0.6 IW/CPE and not sprayed with Kaoline.

Keeping irrigation ratios constant and spraying with Kaoline induced highest dry weight and increasing IW/CPE ratio during flowering to harvest and not sprayed with Kaoline (Table 13a).

Treatment combination of 1.0 IW/CPE increased during FBD to flowering and Kaoline spraying induced highest dry weight followed by 1.0 IW/CPE kept constant during the entire crop duration and not sprayed with Kaoline (Table 13b). Irrigation at 0.8 IW/CPE increased during FBD to flowering and Kaoline sprayed induced least dry weight compared to that induced by 0.6 IW/CPE increased during FBD to harvest and not sprayed with Kaoline, treatment combinations.

4.1.2.3.3 Length of finger

Irrigation ratios showed significance at all stages of development. Increased IW/CPE ratio during various phases showed significance at all stages except at flowering. Kaoline treatment showed no significance (Table 14).

Table 13a: Dry weight of finger, (g) IxS, IxK and SxK
Interaction at harvest

Treatments	I ₁	I ₂	I ₃	K ₀	K ₁
S ₀	15.32	13.38	9.15	12.23	13.00
S ₁	16.02	11.52	8.33	12.03	11.88
S ₂	13.67	8.67	11.37	10.24	12.22
S ₃	13.20	11.77	10.77	11.97	11.86
K ₀	14.62	11.93	8.32		
K ₁	14.48	10.74	11.49		

	IxS	IxK	SxK
SE ±	0.109	0.077	0.089
CD at 5%	0.31	0.22	0.25

Table 13b: Dry weight of finger (g) IxKxS interaction
at harvest.

Treatments	I ₁	I ₂	I ₃
S ₀ K ₀	16.40	13.83	6.47
S ₀ K ₁	14.20	12.93	11.83
S ₁ K ₀	14.67	14.30	7.13
S ₁ K ₁	17.37	8.73	9.53
S ₂ K ₀	12.83	7.57	10.33
S ₂ K ₁	14.50	9.77	12.40
S ₃ K ₀	14.57	12.00	9.33
S ₃ K ₁	11.83	11.53	12.20

SE ±	0.154	CD at 5%	0.44
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Table 14: Length of finger (cm)

Treatments	Days 0	21	42	63	84	Harvest
I ₁	7.54	9.33	11.56	12.96	14.21	14.38
I ₂	7.15	7.79	9.35	11.00	12.65	13.10
I ₃	5.94	6.98	8.27	9.44	10.00	10.48
SE ±	0.362	0.057	0.071	0.078	0.065	0.063
CD at 5%	1.04	0.16	0.20	0.22	0.19	0.18
S ₀	7.81	8.08	9.56	10.72	12.17	12.56
S ₁	7.00	8.14	9.75	11.17	12.31	12.69
S ₂	6.36	7.94	9.67	11.14	12.08	12.39
S ₃	6.33	7.83	9.94	11.50	12.58	12.97
SE ±	0.418	0.066	0.082	0.090	0.075	0.073
CD at 5%	NS	0.19	0.23	0.26	0.21	0.21
K ₀	7.08	7.97	9.65	11.10	12.29	12.64
K ₁	6.67	8.03	9.80	11.17	12.28	12.67
SE ±	0.296	0.046	0.058	0.64	0.053	0.052
CD at 5%	NS	NS	NS	NS	NS	NS
IxS SE ±	0.734	0.114	0.143	0.156	0.129	0.126
CD at 5%	NS	0.33	0.41	0.45	0.37	0.36
IxK SE ±	0.512	0.08	0.101	0.110	0.091	0.089
CD at 5%	NS	NS	NS	0.31	0.26	0.25
SxK SE ±	0.591	0.093	0.116	0.127	0.129	0.103
CD at 5%	NS	NS	NS	NS	0.37	NS
IxSxK SE ±	1.024	0.161	0.202	0.221	0.183	0.179
CD at 5%	NS	NS	0.58	NS	NS	NS

Irrigation ratio 1.0 IW/CPE induced longer fruits compared to 0.8 IW/CPE and followed by 0.6 IW/CPE. This trend was similar at all fruit developmental stages.

Increased IW/CPE during FBD to harvest induced longer fruits compared to increased IW/CPE during FBD to flowering and flowering to harvest and IW/CPE kept constant, which induced similar effect at harvest. At 21 days stage longer fruits were induced by increased IW/CPE during FBD to flowering compared to that induced by increased IW/CPE during flowering to harvest, and similar effect was induced by IW/CPE ratio kept constant.

Irrigation ratio 1.0 and IW/CPE increased during FBD to flowering and FBD to harvest showed similar effect and induced longer fruits compared to that induced by 1.0 IW/CPE and increased during flowering to harvest and kept constant, which showed similar effect (Table 14a).

Table 14a: Length of finger (cm) IxS and IxK interaction at harvest

Treatments	I ₁	I ₂	I ₃		
S ₀	14.08	13.33	10.25		
S ₁	14.67	13.00	10.42	SE +	0.126
S ₂	14.08	13.00	10.08	CD at 5%	0.360
S ₃	14.67	13.08	11.17		
K ₀	14.58	13.13	10.21	SE ±	0.089
K ₁	14.17	13.08	10.75	CD at 5%	0.250

Irrigation ratio 0.6 and IW/CPE kept constant, increased during flowering to harvest and FBD to flowering, induced shortest fingers compared to that induced by 0.6 IW/CPE ratio increased during FBD to harvest.

Irrigation ratio 1.0 and not sprayed with Kaoline induced longer fingers compared to that induced by 1.0 IW/CPE ratio and Kaoline sprayed treatments (Table 14a). Irrigation ratio 0.6 and not sprayed with Kaoline induced shortest fingers compared to that induced by 0.6 IW/CPE ratio and sprayed with Kaoline.

4.12.3.4 Volume of finger

Irrigation ratios, increased IW/CPE ratios during various phases and Kaoline treatments showed significance at all fruit developmental stages (Table 15).

Volume of finger was increased as irrigation ratios increased from 0.6 to 1.0 IW/CPE and fruit developmental stages advanced till harvest. Largest fruits were induced by 1.0 IW/CPE ratio followed by 0.8 and 0.6 IW/CPE ratios, respectively.

Irrigation ratios kept constant induced larger fruits compared to increased IW/CPE during FBD to flowering, followed by increased IW/CPE during FBD to harvest and flowering to harvest at harvest stage. At 84 days S_3 induced larger fingers followed by S_0 , S_1 and S_2 in decreasing order. At 63 days S_1 induced larger fingers

Table 15: Volume of finger (cm³)

Treat- ments	Days					Harvest
	0	21	42	63	84	
I ₁	10.48	21.54	32.57	45.30	76.19	89.73
I ₂	7.85	16.34	25.07	32.15	45.22	69.45
I ₃	6.67	12.84	20.15	26.85	36.93	60.21
SE ±	0.071	0.114	0.721	0.251	0.18	0.334
CD at 5%	0.200	0.330	2.060	0.720	0.510	0.960
S ₀	9.26	17.78	26.82	35.14	54.51	76.66
S ₁	8.56	17.61	27.58	36.22	52.61	74.36
S ₂	7.60	15.39	24.61	32.76	48.99	68.29
S ₃	7.92	16.86	24.71	34.95	55.02	73.22
SE ±	0.082	0.132	0.833	0.290	0.208	0.386
CD at 5%	0.230	0.380	2.380	0.830	0.590	1.100
K ₀	8.16	16.77	25.06	33.78	49.58	71.28
K ₁	8.51	17.04	26.79	35.76	55.98	74.98
SE ±	0.058	0.093	0.589	0.205	0.147	0.273
CD at 5%	0.170	0.270	1.680	0.590	0.420	0.780
IxS SE ±	0.142	0.228	1.443	0.502	0.360	0.669
CD at 5%	0.41	0.65	4.12	1.44	1.03	1.91
IxK SE ±	0.10	0.162	1.02	0.355	0.255	0.473
CD at 5%	0.29	0.46	2.92	1.02	0.73	1.35
SxK SE ±	0.116	0.187	1.178	0.41	0.294	0.546
CD at 5%	0.33	0.53	NS	1.17	0.84	1.56
IxSxK SE ±	0.20	0.323	2.040	0.709	0.509	0.946
CD at 5%	0.57	0.92	5.83	2.03	1.46	2.70

followed by S_0 , S_3 and S_2 in decreasing order. At 42 days S_1 induced larger fingers compared to S_2 treatments. At 21 days S_0 and S_1 induced similar effect and larger fingers compared to S_3 and S_2 in decreasing order. At flowering S_0 induced larger fingers followed by S_1 , S_3 and S_2 in decreasing order.

Kaoline sprayed plants induced larger fruits at harvest compared to that induced by non-sprayed Kaoline plants. Similar trend was noted during the entire fruit development stages.

Irrigation ratio 1.0 and increased during FBD to flowering treatment combination induced largest fruits compared to that induced by 1.0 IW/CPE ratio kept constant. Irrigation ratio 0.6 and increased during FBD to flowering induced smallest fruits compared to 0.6 IW/CPE ratio kept constant (Table 15a).

Irrigation ratio 1.0 and not sprayed and sprayed with Kaoline treatment combinations showed similar effects and induced largest fruits compared to that produced by 0.8 IW/CPE ratio and not sprayed with Kaoline (Table 15a). Smallest fruits were induced by 0.6 IW/CPE ratio not sprayed with Kaoline compared with 0.6 IW/CPE ratio and Kaoline sprayed treatment combinations.

Irrigation ratios kept constant and sprayed with Kaoline treatment combination induced largest fruits

Table 15a: Volume of finger (cm^3) IxS, IxK and KxS interaction at harvest

Treatments	I ₁	I ₂	I ₃	K ₀	K ₁
S ₀	93.95	81.62	54.40	74.42	78.89
S ₁	99.23	72.18	51.65	74.99	73.72
S ₂	83.67	52.67	68.53	62.46	74.12
S ₃	83.07	71.33	66.25	73.23	73.20
K ₀	90.36	72.47	51.00		
K ₁	89.10	66.43	69.42		

	IxS	IxK	SxK
SE \pm	0.669	0.473	0.546
CD at 5%	1.910	1.350	1.560

Table 15b: Volume of finger (cm^3) IxSxK interaction at harvest

Treatments	I ₁	I ₂	I ₃
S ₀ K ₀	100.57	83.70	29.00
S ₀ K ₁	87.33	79.53	69.80
S ₁ K ₀	92.10	88.07	45.13
S ₁ K ₁	106.37	56.63	58.17
S ₂ K ₀	78.03	46.83	62.50
S ₂ K ₁	89.30	58.50	74.57
S ₃ K ₀	90.73	71.60	57.37
S ₃ K ₁	73.40	71.07	75.13
SE \pm	0.946	CD at 5%	2.70

compared to that induced by IW/CPE kept constant and not sprayed with Kaoline, IW/CPE increased during FBD to flowering and not sprayed with Kaoline and IW/CPE increased during flowering to harvest and sprayed with Kaoline treatment combinations (Table 15a). Smallest fruits were induced by IW/CPE increased during flowering to harvest and not sprayed with Kaoline treatment combinations.

Treatment combination 1.0 IW/CPE increased during FBD to flowering and Kaoline sprayed induced largest fruit followed by 1.0 IW/CPE ratio kept constant and not sprayed with Kaoline treatment combination (Table 15b). Smallest fruit was produced by treatment combination 0.6 IW/CPE ratio kept constant and not sprayed with Kaoline.

4.1.2.3.5 Absolute growth rate of fresh weight of finger (AGR_f)

AGR_f was highest during 85 to harvest interval and 1.0 IW/CPE ratio recorded highest amongst the irrigation ratios followed by 0.8 and 0.6 IW/CPE ratios. The lowest AGR_f values were during 43 to 63 days interval and 1.0 IW/CPE recorded the lowest value followed by increase in 0.6 and 0.8 IW/CPE ratio respectively in increasing order (Table 16).

Amongst increased IW/CPE ratio during various phases higher values were observed during last phase of development i.e. 85 to harvest interval. IW/CPE increased during FBD to

harvest recorded highest AGR_f value followed by IW/CPE increased during FBD to flowering, IW/CPE kept constant and IW/CPE increased during flowering to harvest. Lowest values were recorded during 43 to 63 days interval. IW/CPE increased during FBD to harvest recorded lowest value and increase was followed by IW/CPE kept constant, IW/CPE increased during flowering to harvest and IW/CPE increased during FBD to flowering.

Table 16: Absolute growth rate of fresh fruit (g/day/plant)

Days interval	0 to 21	22 to 42	43 to 63	64 to 84	85 to harvest
Treatments					
I ₁	52.05	67.35	28.86	40.25	197.16
I ₂	28.25	37.18	31.04	28.98	86.48
I ₃	21.78	26.51	30.46	42.59	58.00
S ₀	45.37	36.07	31.92	46.48	87.55
S ₁	32.47	45.89	34.75	39.50	93.01
S ₂	25.77	40.02	32.37	21.26	85.14
S ₃	38.37	48.85	22.13	43.28	127.78
K ₀	32.69	46.23	31.81	40.70	95.14
K ₁	33.83	38.99	28.99	35.07	98.12

Kaoline sprayed plants recorded higher AGR_f value at harvest. However Kaoline sprayed values were lower during 22 to 84 days interval period.

4.1.2.3.6 Absolute growth rate of dry weight of finger
(AGR_d)

AGR_d values were observed to be highest during 85 to harvest interval and lowest values were observed during flowering to 21 days interval (Table 17). Irrigation ratios showed constant increase in AGR_d values right from flowering till harvest. 1.0 IW/CPE ratio kept higher trend followed by 0.8 and 0.6 IW/CPE ratios in lower values respectively.

Table 17: Absolute growth rate of dry finger (g/day/plant)

Days interval	0 to 21	22 to 42	43 to 63	64 to 84	85 to harvest
Treatments					
I ₁	5.21	6.01	8.92	23.13	37.08
I ₂	3.25	4.21	5.03	10.31	22.76
I ₃	2.29	3.16	3.94	7.27	15.20
S ₀	3.60	4.09	6.00	13.30	21.44
S ₁	3.60	4.56	5.96	12.12	21.62
S ₂	3.23	4.18	5.32	12.24	21.15
S ₃	3.67	4.71	6.13	14.95	26.77
K ₀	3.56	4.24	5.44	11.94	21.31
K ₁	3.50	4.51	6.30	14.33	23.93

Increased IW/CPE ratio increased during FBD to harvest showed higher AGR_d values followed by IW/CPE increased during FBD to flowering, flowering to harvest and kept

constant and were clubbed till the end of the fruit developmental period.

Kaoline sprayed plants recorded higher AGR_d values during the entire fruit developmental stages.

4.1.2.3.7 Relative growth rate of fresh weight of finger (AGR_f)

RGR_f was maximum during initial stage of fruit development i.e. flowering to 21 days. Minimum RGR_f was during 64 to 84 days period and thereafter it raised (Table 18).

Table 18: Relative growth rate of fresh fruit (g/g/day/plant)

Day interval	0 to 21	22 to 42	43 to 63	64 to 84	85 to harvest
Treatments					
I_1	0.0369	0.0252	0.0077	0.0090	0.0316
I_2	0.0279	0.0219	0.0127	0.0094	0.0198
I_3	0.0266	0.0199	0.0158	0.0015	0.0145
S_0	0.0406	0.0197	0.0125	0.0138	0.0178
S_1	0.0309	0.0245	0.0126	0.0112	0.0185
S_2	0.0242	0.0229	0.0128	0.0068	0.0200
S_3	0.0345	0.0240	0.0078	0.0124	0.0251
K_0	0.0304	0.0243	0.0115	0.0116	0.0188
K_1	0.0319	0.0212	0.0112	0.0108	0.0214

Irrigation ratio 1.0 showed maximum RGR_f during early and late stages of development and remained low during 43 to 84 days period.

Increased IW/CPE during FBD to harvest showed higher RGR_f value at last fruit developmental stage. During initial stage constant IW/CPE treatment showed higher RGR_f value.

Kaoline sprayed plants showed higher values at initial and last stages of fruit development, but at other stages remained lower than non-sprayed plants.

4.1.2.3.8 Relative growth rate of dry weight of finger (RGR_d)

Irrigation ratio 1.0 showed higher RGR_d values than 0.8 and 0.6 IW/CPE during entire fruit development period except during 22 to 42 days stage (Table 19).

Table 19: Relative growth rate of dry fruit (g/g/day/plant)

Day interval	0 to 21	22 to 42	43 to 63	64 to 84	85 to harvest
Treatments					
I_1	0.0421	0.0246	0.0223	0.0323	0.0299
I_2	0.0389	0.0259	0.0193	0.0248	0.0292
I_3	0.0362	0.0261	0.0201	0.0234	0.0255
S_0	0.0385	0.0232	0.0213	0.0280	0.0245
S_1	0.0391	0.0255	0.0206	0.0256	0.0254
S_2	0.0399	0.0262	0.0205	0.0281	0.0264
S_3	0.0415	0.0265	0.0210	0.0298	0.0296
K_0	0.0405	0.0245	0.0199	0.0266	0.0259
K_1	0.0393	0.0258	0.0219	0.0290	0.0268

Increased I_w/CPE during FBD to harvest showed higher values of RGR_d during entire fruit development except during 43 to 63 days stage it was less than the value given by I_w/CPE kept constant.

Kaoline sprayed plants showed lower RGR_d values during initial stage i.e. flowering to 21 days and thereafter showed higher values compared to that shown by non-sprayed plants during rest of the fruit developmental period.

4.1.3 Yield per plant

Data on yield per plant and tonnes per hectare are presented in Table 20 and 20a and depicted in Fig.9.

Irrigation ratios, increased I_w/CPE ratios during various phases and Kaoline treatments showed significance. All interactions showed significance except increased I_w/CPE ratios and Kaoline combination.

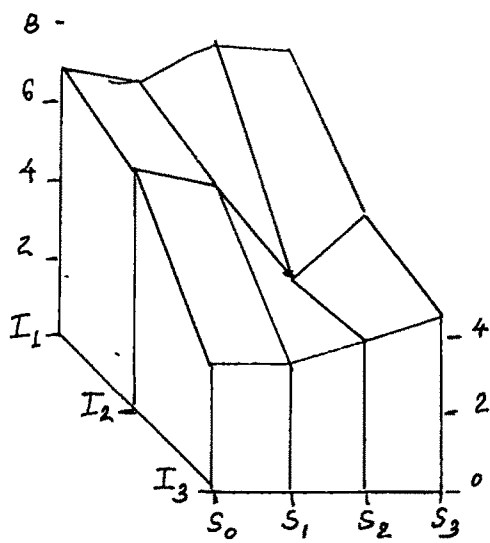
Yield per plant increased as irrigation ratios increased from 0.6 to 1.0 I_w/CPE . Increased I_w/CPE ratio during flowering to harvest induced lowest yield per plant compared to that induced by increased I_w/CPE during FBD to flowering and FBD to harvesting. Irrigation ratio kept constant during the entire crop duration yielded more compared to that increased I_w/CPE ratio during FBD to flowering but the yield was similar to that of increased I_w/CPE ratio during FBD to harvest. Kaoline sprayed

Table 20: Yield in kg/plant (tonne/ha) IxS and IxK interaction

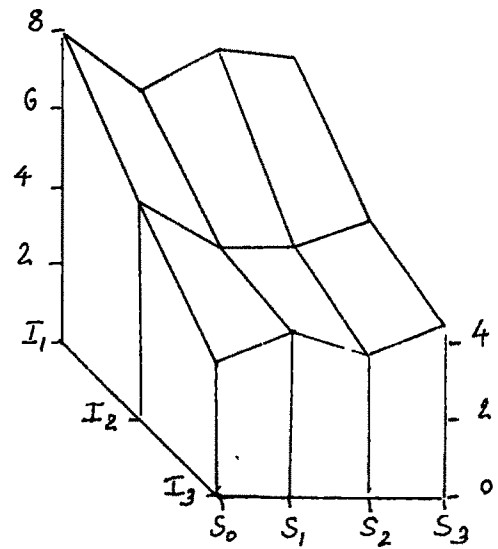
Treatments	I ₁	I ₂	I ₃	Mean		
S ₀	8.40 (37.34)	6.87 (30.51)	3.78 (16.87)	6.85 (28.23)		
S ₁	8.61 (38.27)	5.99 (26.67)	4.31 (19.14)	6.31 (28.03)		
S ₂	8.49 (37.75)	4.58 (20.35)	4.59 (20.39)	5.89 (26.16)		
S ₃	8.14 (36.09)	5.90 (26.21)	5.43 (24.03)	6.48 (28.81)		
K ₀	8.02 (35.62)	5.95 (26.43)	4.26 (18.91)	6.08 (27.00)		
K ₁	8.79 (39.10)	5.73 (25.44)	4.79 (21.30)	6.43 (28.61)		
	I	S	K	IxS	IxK	SxK
SE ±	0.121 (0.54)	0.14 (0.62)	0.099 (0.44)	0.242 (1.08)	0.171 (0.76)	0.198 (0.88)
CD at 5%	0.34 (1.50)	0.39 (1.73)	0.27 (1.22)	0.67 (2.99)	0.48 (2.12)	NS (NS)

Table 20a: Yield in kg/plant (tonne/ha) IxSxK interaction

Treatments	I ₁	I ₂	I ₃
S ₀ K ₀	7.82 (34.80)	7.12(31.68)	3.71(16.51)
S ₀ K ₁	8.97 (39.92)	6.60(29.37)	3.86(17.18)
S ₁ K ₀	7.43 (33.06)	6.83(30.39)	3.75(16.69)
S ₁ K ₁	9.79 (43.57)	5.17(23.01)	4.86(21.63)
S ₂ K ₀	8.43 (37.51)	3.99(17.76)	4.47(19.89)
S ₂ K ₁	8.56 (38.09)	5.17(23.01)	4.71(18.56)
S ₃ K ₀	8.39 (37.34)	5.85(26.03)	5.13(22.83)
S ₃ K ₁	7.84 (34.89)	5.95(26.48)	5.17(23.01)
Mean	8.40 (37.36)	5.83(25.93)	4.53(20.13)
SE ±	0.343 (1.53)	CD at 5% 0.95 (4.23)	



CONTROL



KAOLINE

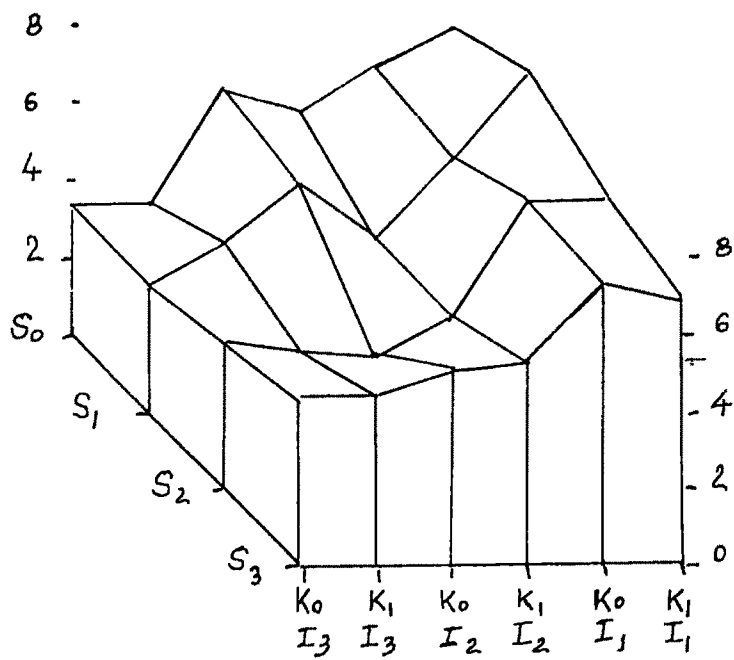


FIG. 9 YIELD (Kg/PLANT) FEBRUARY Plt.

plants yielded more compared to non-sprayed plants.

Irrigation ratio 1.0 and all increased IW/CPE ratio combination showed similar yield and induced more yield compared to that induced by 0.8 IW/CPE ratio kept constant during entire crop duration. Irrigation ratio 0.6 kept constant yielded least compared to all combinations except 0.6 IW/CPE ratio increased during FBD to flowering combination.

Irrigation ratio 1.0 and Kaoline sprayed plants combination yielded highest compared to all combinations, and 0.6 IW/CPE ratio and not-sprayed plants yielded least compared to all combinations.

Irrigation ratio 1.0 increased during FBD to flowering and Kaoline sprayed plants yielded highest compared to all combinations except 1.0 IW/CPE ratio kept constant and sprayed with Kaoline treatment combination. Irrigation ratio 0.6 kept constant and not sprayed with Kaoline yielded least compared to all treatment combinations except 0.6 IW/CPE increased during FBD to flowering and Kaoline sprayed, 0.6 IW/CPE ratio kept constant and not sprayed with Kaoline, 0.8 IW/CPE ratio increased during flowering to harvest and not sprayed with Kaoline, and 0.6 IW/CPE ratio increased during flowering to harvest and not sprayed with Kaoline treatment combinations.

4.1.4 Reducing, non-reducing and total sugars per cent in fruits

Data on reducing, non-reducing and total sugars per cent in fruits are presented in Table 21. Irrigation ratios and increased IW/CPE ratio during various phases showed significance, but Kaoline treatments showed significance for non-reducing sugars per cent only.

Irrigation ratio 0.8 induced maximum reducing sugar per cent compared to that induced by 0.6 IW/CPE. 1.0 IW/CPE induced least reducing sugar per cent. Irrigation ratio kept constant induced more reducing sugar per cent compared to IW/CPE increased during flowering to harvest and FBD to harvesting periods. Irrigation ratio kept constant and IW/CPE increased during FBD to flowering showed similar effect.

Non-reducing sugars per cent reduced as the IW/CPE ratio increased from 0.6 to 1.0 IW/CPE. Irrigation ratio kept constant during entire crop duration increased non-reducing sugars per cent compared to that when IW/CPE ratios were increased during various stages of development, which remained similar in their effects. Kaoline sprayed plants induced lower non-reducing sugars per cent compared to non-sprayed plants.

Total sugars per cent reduced as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio. Irrigation ratio

**Table 21: Reducing, non-reducing and total sugars
per cent in fruits**

Treatments	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)
I ₁	9.16	8.18	17.33
I ₂	9.70	8.34	18.05
I ₃	9.55	8.97	18.53
SE ±	0.05	0.04	0.07
CD at 5%	0.13	0.10	0.20
S ₀	9.61	8.67	18.26
S ₁	9.50	8.54	18.07
S ₂	9.43	8.44	17.87
S ₃	9.33	8.34	17.68
SE ±	0.05	0.04	0.09
CD at 5%	0.14	0.11	0.26
K ₀	9.50	8.54	18.06
K ₁	9.44	8.45	17.89
SE ±	0.04	0.03	0.06
CD at 5%	NS	0.09	NS
IxS SE ±	0.09	0.07	0.15
CD at 5%	NS	NS	NS
IxK SE ±	0.06	0.05	0.11
CD at 5%	NS	NS	NS
SxK SE ±	0.08	0.06	0.13
CD at 5%	NS	NS	NS
IxSxK SE ±	0.13	0.10	0.22
CD at 5%	NS	NS	NS

kept constant and increased IW/CPE during FBD to flowering showed similar effect, as well as increased IW/CPE ratio during flowering to harvest and FBD to harvest showed similar effects. Irrigation ratio kept constant induced higher total sugars per cent compared to that induced by increased IW/CPE ratio during flowering to harvest and FBD to harvest treatments.

4.1.5 Moisture studies

4.1.5.1 Total and daily soil moisture depletion layer-wise, irrigation frequency, number and average interval

Soil moisture depletion (SMD) increased as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio (Table 22). Total and daily SMD in 0 to 30 cm, 30 to 60 cm and 0 to 60 cm layers also showed similar trend. SMD was greater from 0 to 30 cm layer compared to that depleted from 30 to 60 cm layer.

Total SMD range between all the increased IW/CPE ratio was very narrow. Daily SMD in IW/CPE ratio kept constant was lowest in both the layers and it differed very narrowly amongst increased IW/CPE ratio during FBD to flowering, flowering to harvest and FBD to harvest treatments.

Total and daily SMD varied very narrowly amongst the Kaoline treatments.

Table 22: Soil moisture depletion, total and daily layer-wise (mm), irrigation frequency, irrigation number and average number of days per irrigation

Treatments	Total Soil Moisture Depletion			Daily Soil Moisture Depletion		Irrigation		Average days/irrigation
	0-30cm	30-60cm	0-60cm	0-30cm	30-60cm	Frequ-ency	Number	
I ₁	736.10	433.74	1169.84	1.72	1.02	7-25	8+27	14
I ₂	697.89	402.51	1100.40	1.53	0.88	5-30	8+25	16
I ₃	664.59	322.85	987.45	1.35	0.65	8-38	8+22	20
S ₀	701.56	381.89	1083.44	1.48	0.81	7-38	8+25	17
S ₁	700.56	383.46	1084.02	1.55	0.85	7-30	8+25	16
S ₂	708.55	392.55	1101.09	1.55	0.86	5-38	8+25	16
S ₃	687.44	387.58	1075.02	1.59	0.89	7-30	8+25	16
K ₀	704.83	393.21	1098.04	1.52	0.85			
K ₁	694.22	379.52	1073.74	1.53	0.84			

Irrigation frequency increased as irrigation ratio decreased from 1.0 to 0.6 IW/CPE ratio (Table 22).

Irrigation frequency was similar when plots received increased IW/CPE ratio during FBD to flowering and FBD to harvest. Irrigation ratio kept constant had irrigation frequency of 7 to 38 days, whereas increased IW/CPE ratio during flowering to harvest had 5 to 38 days frequency.

Irrigation number increased as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio. Increased IW/CPE ratio treatments had no variations in total number of irrigations given.

Irrigation interval was narrow under 1.0 IW/CPE ratio treatment and widest under 0.6 IW/CPE ratio treatment. Irrigation ratio kept constant required wider interval and increased IW/CPE ratio at various stages had similar interval of irrigations.

4.1.5.2 Total and daily consumptive use, water used, consumptive use efficiency and evapotranspiration ratio

Total consumptive use (CU) was more under 1.0 IW/CPE ratio treatment and less under 0.6 IW/CPE ratio treatment (Table 23). Total CU was more when plots received irrigation at constant IW/CPE ratio and it was lowest under increased IW/CPE ratio during FBD to harvest. Kaoline sprayed plants reduced total CU compared to that with non-sprayed plants.

Table 23: Consumptive use total and daily (mm), water used (mm), consumptive use efficiency (kg/mm), evapotranspiration ratio (mm/tonne/ha)

Treatments	Total CU (mm)	Daily CU (mm)	Water used (mm)	CUE (kg/mm)	ETR (mm/t/ha)
I ₁	1775.55	4.15	1622.6	21.04	47.54
I ₂	1686.11	3.70	1531.2	15.38	65.03
I ₃	1585.89	3.21	1345.7	12.69	79.24
S ₀	1703.16	3.60	1468.3	16.58	60.36
S ₁	1675.26	3.72	1508.1	16.73	59.94
S ₂	1700.93	3.71	1531.5	15.38	65.16
S ₃	1650.72	3.81	1491.4	17.45	58.37
K ₀	1695.31	3.66	1499.8	15.93	62.79
K ₁	1669.73	3.68	1499.8	17.13	58.36

Daily CU was more under 1.0 IW/CPE ratio treatment and less under 0.6 IW/CPE ratio treatment. Daily CU was maximum under increased IW/CPE ratio during FBD to harvest and minimum under IW/CPE ratio kept constant during entire crop duration. Daily CU did not vary when IW/CPE ratios were increased during either FBD to flowering or flowering to harvest stages. Kaoline treatments had very narrow effect on daily CU.

Water used (WU) was increased as irrigation ratio increased from 0.6 to 1.0 IW/CPE ratio treatments.

Increased IW/CPE ratio during flowering to harvest treatment required maximum water and IW/CPE ratio kept constant treatment used minimum water. Kaoline treatments showed no variation in used water.

Consumptive use efficiency (CUE) was maximum under 1.0 IW/CPE ratio treatment and minimum under 0.6 IW/CPE ratio treatment. CUE was maximum when plots were irrigated with increased IW/CPE ratio during FBD to harvest and it was minimum when plots were irrigated with increased IW/CPE ratio during flowering to harvest. Kaoline sprayed plants improved CUE compared to non-sprayed plants.

Evapotranspiration ratio (ETR) was narrower under 1.0 IW/CPE ratio treatment and wider under 0.6 IW/CPE ratio treatment. Increased IW/CPE ratio during FBD to harvest treatment gave narrower ETR and increased IW/CPE ratio during flowering to harvest gave widest ETR. Kaoline sprayed plants had narrow ETR compared to that of non-sprayed plants.

4.1.6 Correlation and regression

In general the association between yield contributing characters viz. pseudostem height, pseudostem girth, number of leaves per plant, leaf area per plant, number of fingers per plant, number of hands per plant, number of fingers per hand, fresh weight of finger, volume of finger, length of finger and yield are significant and positive (Table 24).

Table 24: Correlation and regression

Character	'r'	'b'	'a'
Yield/pseudostem height (cm)	0.669*	0.1735	-1.0852
Yield/pseudostem girth (cm)	0.671*	0.3219	-17.9440
Yield/number of leaves per plant	0.563*	1.0382	-16.6640
Yield/leaf area per plant (m ²)	0.664*	0.8735	-6.8847
Yield/number of fingers/plant	0.515*	0.0666	-6.3986
Yield/number of hands/plant	0.432*	1.5279	-11.2000
Yield/number of fingers/hand	0.399*	0.5261	-6.8268
Yield/fresh weight of finger(g)	0.728*	0.1082	-6.7816
Yield/volume per finger (cm ³)	0.864*	0.0899	-6.5794
Yield/length of finger (cm)	0.843*	0.9011	-11.3820

* Significant at 5 per cent.

4.1.7 Marginal analysis

Average return per Re spent on irrigation water increased as water application increased from 0.6 IW/CPE ratio kept constant during entire crop duration to 1.0 IW/CPE ratio treatments (Table 25). Though the water applied was same for 1.0 IW/CPE ratio and increased IW/CPE ratio treatment combinations the returns per Re spent on irrigation water were maximum with 1.0 IW/CPE ratio increased during FBD to flowering treatment, whereas 1.0 IW/CPE ratio increased during FBD to harvest treatments gave lower returns.

Table 25: Marginal analysis

Treatments	Inputs (water) (mm)	Yield increase (t/ha)	Value of yield increase (Rs'000)	Cost of added water (Rs)	Returns above irrig. cost (Rs'000)	Return per Re on last level of irrig. (Rs)	Total irrig. applied (mm)	Total irrig. cost (Rs)	Total yield increase (t/ha)	Total yield increase value (Rs'000)	Total return to irrig. water (Rs'000)	Average return per Re. spent on irrig. water (Rs)
I ₀ S ₀	1236.1	16.87	15.75	618.05	15.13	25.47	1236.1	618.05	16.87	15.75	15.13	25.47
I ₃ S ₁	1355.5	2.27	2.12	59.70	2.06	35.49	1355.5	677.75	19.14	17.86	17.19	26.35
I ₃ S ₃	1365.6	4.89	4.56	5.05	4.56	903.76	1365.6	682.80	24.03	22.43	21.74	32.85
I ₃ S ₂	1425.6	-3.64	3.40	30.00	3.37	113.23	1425.6	712.80	20.39	19.03	18.32	26.70
I ₂ S ₃	1486.2	5.82	5.43	33.30	5.40	163.12	1486.2	743.10	26.21	24.46	23.72	32.92
I ₂ S ₂	1546.2	-5.86	5.47	30.00	5.44	182.30	1546.2	773.10	20.35	18.99	18.22	24.57
I ₂ S ₁	1546.2	6.32	5.90	30.00	5.90	196.60	1546.2	773.10	26.67	24.89	24.12	32.20
I ₂ S ₀	1546.2	3.84	3.59	30.00	3.59	119.50	1546.2	773.10	30.51	28.48	27.70	36.83
I ₁ S ₃	1622.6	5.50	5.13	38.20	5.09	134.37	1622.6	811.30	36.01	33.61	32.80	41.43
I ₁ S ₀	1622.6	1.33	1.24	38.20	1.24	32.49	1622.6	811.30	37.34	34.85	34.04	42.96
I ₁ S ₂	1622.6	0.41	0.38	38.20	0.38	10.03	1622.6	811.30	37.75	35.23	34.42	43.43
I ₁ S ₁	1622.6	0.52	0.49	38.20	0.49	12.70	1622.6	811.30	38.27	35.72	34.91	44.02

4.2 June planting

4.2.1 Vegetative growth

4.2.1.1 Pseudostem girth

Data on periodic measurement of pseudostem girth are presented in Table 26 and depicted in Fig. 10. The irrigation treatments showed significance at all growth stages. Antitranspirant and mulch treatments showed significance only after 150 days of growth. Treatment interactions were significant after 215 days of planting.

Treatments 1.4 IW/CPE ratio increased during FBD to harvest and 1.4 IW/CPE ratio increased during FBD to flowering showed similar effect, and induced maximum pseudostem girth. Minimum pseudostem girth was induced by 1.0 IW/CPE ratio kept constant and increased during FBD to flowering treatments, which also showed similar effect. During initial stages 1.4 IW/CPE ratio treatments induced higher pseudostem girth compared to that induced by 1.0 IW/CPE ratio treatments.

Polythene mulch treatment induced maximum pseudostem girth compared to that induced by straw mulch treatment. Kaoline treatment induced more pseudostem girth compared to that induced by PMA treatment. Mulch treatments induced more pseudostem girth than antitranspirant treatments. Similar trend was noted during early growth stages.

Table 26: Pseudostem girth (cm)

Treat- ments	Days				
	80	150	215	300	376
I ₁	14.02	22.06	37.58	45.50	50.26
I ₂	15.06	23.46	42.38	51.02	54.20
I ₃	14.20	22.38	38.26	45.58	50.36
I ₄	14.95	24.00	42.10	52.42	55.16
I ₅	13.96	23.08	37.84	46.74	51.98
I ₆	14.84	24.60	44.22	52.54	54.40
I ₇	13.78	22.48	37.72	47.88	52.44
I ₈	14.88	24.65	45.18	52.78	55.40
SE \pm	0.10	0.21	0.37	0.17	0.12
CD at 5%	0.34	0.71	1.25	0.58	0.38
Control	14.36	22.58	38.36	44.74	46.80
PMA	14.44	22.80	38.88	45.70	47.65
Kaoline	14.49	23.01	38.96	46.31	48.18
Poly.mulch	14.55	24.34	43.98	55.70	62.29
Straw mulch	14.45	23.98	43.13	54.09	60.21
SE \pm	0.11	0.11	0.21	0.11	0.15
CD at 5%	NS	0.31	0.61	0.32	0.45
Interaction					
SE \pm	0.32	0.30	0.59	0.31	0.44
CD at 5%	NS	NS	1.72	0.90	1.26

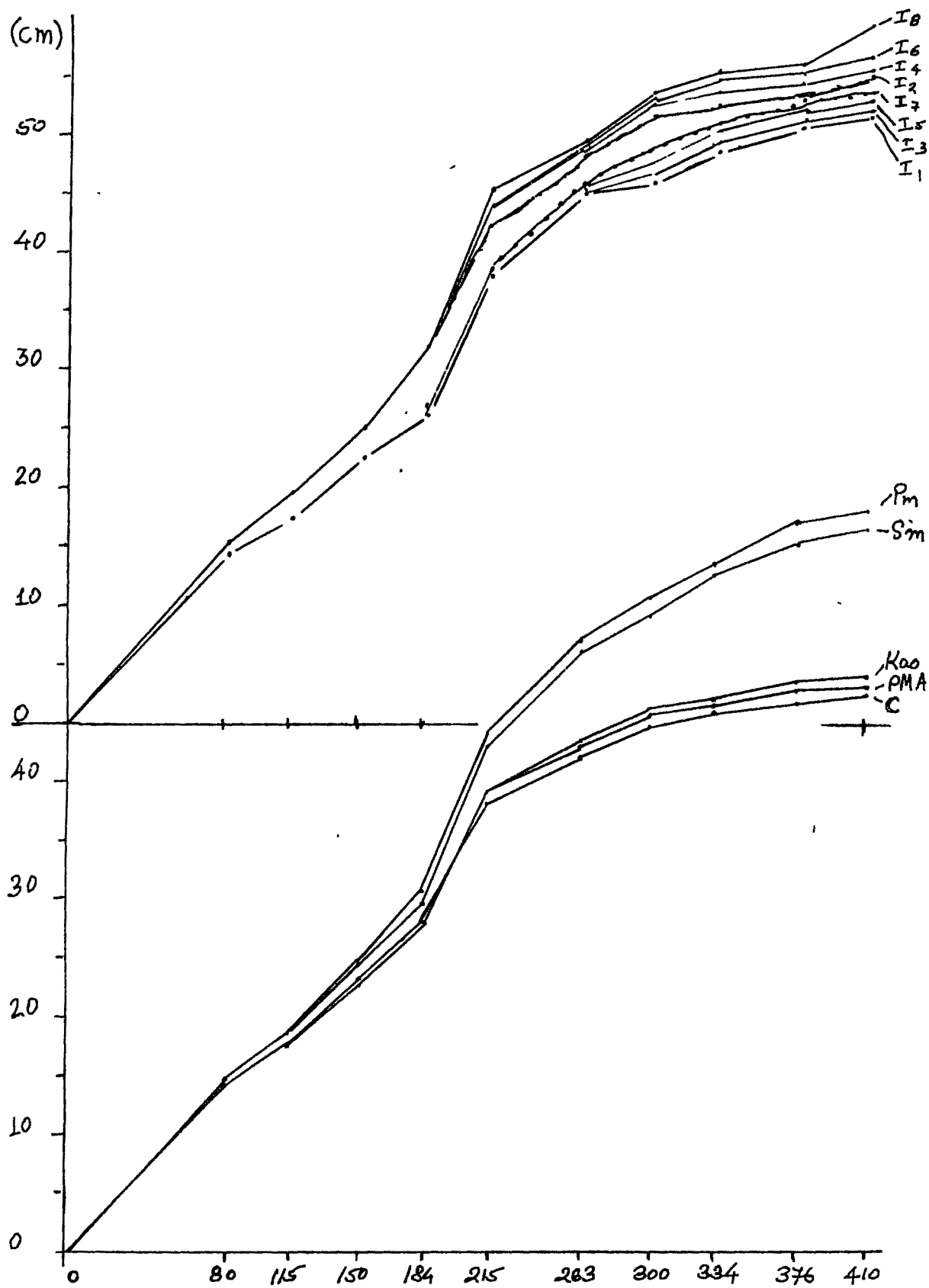


FIG.10 PSEUDOSTEM GIRTH (cm).^m (days)

Treatment combination 1.4 IW/CPE ratio increased during FBD to harvest and polythene mulch induced more pseudostem girth compared to all other interaction combinations except 1.4 IW/CPE ratio increased during FBD to flowering which showed similar effect during 376 days growth stage (Table 26a).

Table 26a: Pseudostem girth (cm) IxAM interaction
376 days after planting

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	45.5	47.5	45.9	47.2	47.0	46.5	47.8	47.0
PMA	46.6	48.0	46.5	47.5	47.6	48.6	48.3	48.1
Kaoline	47.5	49.0	46.5	40.2	47.4	49.1	49.4	48.3
Poly.mulch	56.3	64.0	57.2	67.3	60.5	64.6	60.1	68.3
Straw mulch	55.4	62.5	55.7	65.6	57.4	63.2	56.6	65.3
SE ±	0.44		CD at 5%		1.26			

4.2.1.2 Pseudostem height

The irrigation treatments, antitranspirants and mulch treatments and their interactions showed significance throughout the crop growth stages (Table 27 and Fig.11).

Treatment 1.4 IW/CPE increased during FBD to harvest induced more height compared to all other treatments. However, shortest plants were induced by 1.0 IW/CPE kept

Table 27: Pseudostem height (cm)

Treat- ments	Days 80	150	215	300	376
I ₁	25.36	50.38	81.72	98.78	111.50
I ₂	25.82	51.88	85.66	104.16	121.94
I ₃	25.80	50.44	83.52	103.36	117.88
I ₄	26.10	53.00	88.10	114.26	124.10
I ₅	25.34	51.46	83.70	102.64	114.52
I ₆	26.10	54.18	87.94	112.06	125.14
I ₇	25.98	51.98	85.40	105.52	120.68
I ₈	26.48	54.68	89.20	116.44	126.34
SE ±	0.09	0.28	0.16	0.27	0.29
CD at 5%	0.29	0.92	0.53	0.91	0.96
Control	25.58	50.58	83.86	102.09	117.04
PMA	25.78	51.26	84.14	101.96	118.33
Kaoline	25.63	51.35	84.38	102.74	118.73
Poly.mulch	26.34	54.65	88.44	115.85	124.34
Straw mulch	26.05	53.41	87.46	113.13	122.89
SE ±	0.07	0.13	0.14	0.22	0.18
CD at 5%	0.21	0.38	0.40	0.63	0.50
Interaction					
SE ±	0.20	0.37	0.39	0.62	0.49
CD at 5%	0.59	1.06	1.12	1.79	1.43

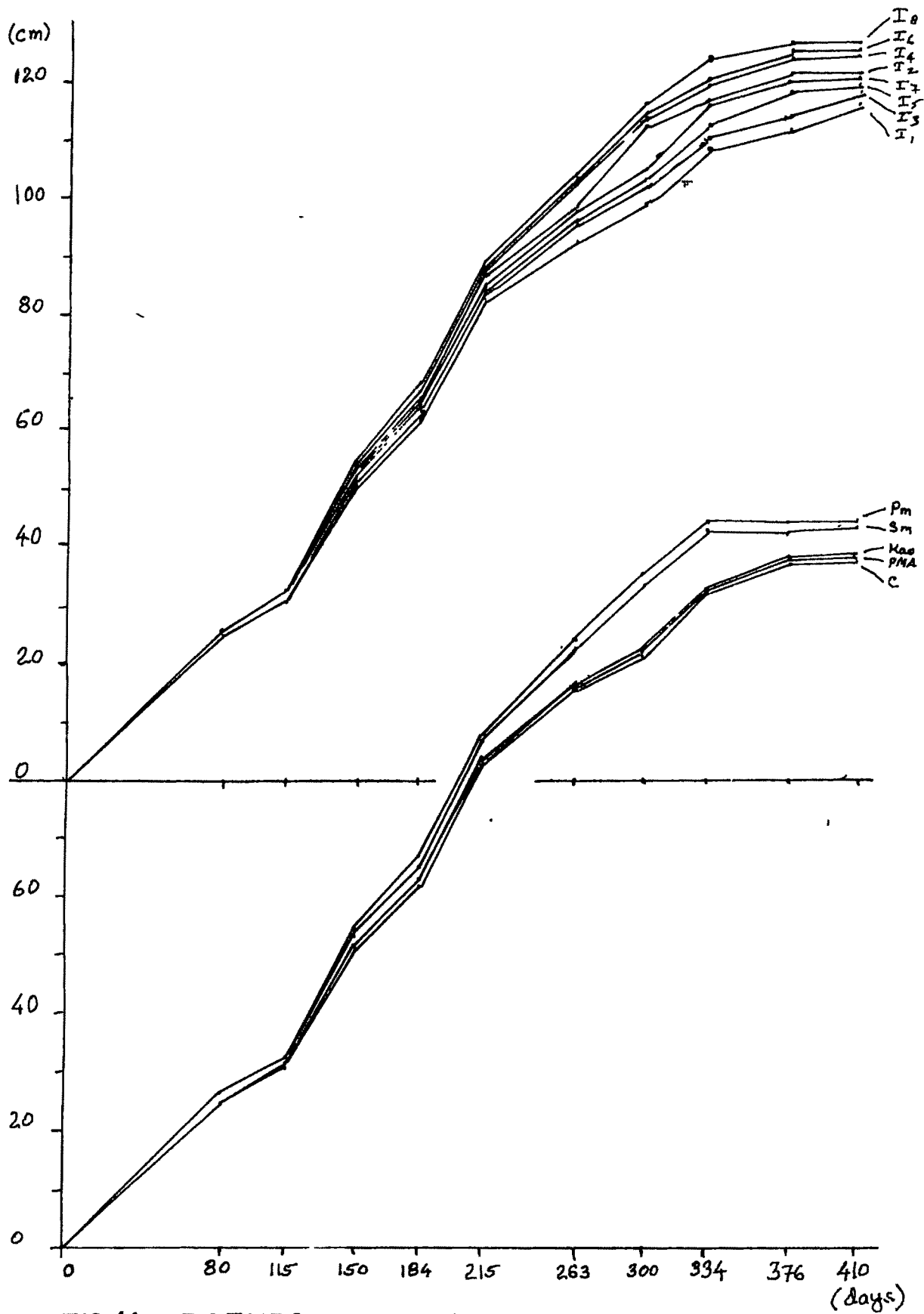


FIG.11 PSEUDOSTEM HIGHT (cm).

constant during the entire crop duration. Until FBD 1.4 IW/CPE treatments showed more growth compared to that shown by 1.0 IW/CPE treatments. During rest of the period the trend remained similar to that set at 376 days.

Polythene mulch treatment induced more pseudostem height compared to that induced by straw mulch treatment. Antitranspirant treatments PMA and Kaoline showed similar effects at 376 days, but induced more pseudostem height compared to that induced by control treatments. Similar trend was observed at all stages of growth

Treatment combination 1.4 IW/CPE increased during FBD to harvest and polythene mulch induced maximum pseudostem height compared to all other interaction combinations except 1.4 IW/CPE increased during flowering to harvest and polythene mulch which showed similar effect during 376 days growth stage (Table 27a).

Table 27a: Pseudostem height (cm) IxAM interaction
376 days after planting

Treatment	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	106.7	119.5	115.3	121.1	109.5	122.7	117.8	123.7
PMA	107.4	120.7	116.8	122.3	110.5	123.6	119.7	125.6
Kaoline	108.0	120.7	117.5	122.7	111.1	124.2	119.9	125.7
Poly.mulch	118.4	125.1	120.5	127.5	120.9	128.8	123.7	129.8
Straw mulch	117.0	123.7	119.3	126.9	120.6	126.4	122.3	126.9

SE \pm 0.49

CD at 5% 1.43

4.2.1.3 Number of leaves per plant

The irrigation treatments, antitranspirant and mulch treatments and their interactions showed significance throughout the crop growth stages (Table 28 and Fig.12). Number of leaves per plant increased rapidly till 215 days and than reduced gradually until 376 days.

Treatment 1.4 IW/CPE increased during FBD to harvest induced more number of leaves compared to that induced by all irrigation treatments at 215 days growth stage, and less number of leaves were produced by 1.0 IW/CPE kept constant during the entire course of investigation. During earlier stages of growth 1.4 IW/CPE treatments produced more number of leaves per plant compared to 1.0 IW/CPE treatments clubbed together. However, during later stages the same trend set at 215 days was not observed and irrigation treatments showed non-significance at 376 days growth stage.

Polythene mulch treatment induced maximum number of leaves during 215 days compared to that induced by straw mulch treatment. Antitranspirant treatments PMA and Kaoline showed similar effects and induced less number of leaves per plant compared to mulch treatments. Control treatment induced least number of leaves per plant. Similar trend was observed during 150 and 300 days growth stage. At 376 days antitranspirants had more leaves than mulch treated plants. Minimum number of leaves was in

Table 28: Number of leaves per plant

Treat- ments	Days				
	80	150	215	300	376
I ₁	4.32	11.36	19.34	19.72	18.16
I ₂	5.04	12.26	20.24	20.10	18.76
I ₃	4.44	12.62	19.52	18.90	17.78
I ₄	5.44	12.38	20.72	20.24	18.04
I ₅	4.38	13.22	19.72	19.62	17.94
I ₆	5.38	12.56	21.42	20.74	18.90
I ₇	4.88	12.28	20.42	20.56	18.28
I ₈	5.52	13.04	21.90	21.36	18.84
SE \pm	0.06	0.07	0.05	0.26	0.24
CD at 5%	0.19	0.23	0.17	0.87	NS
Control	4.83	12.18	19.44	19.56	18.39
PMA	4.86	12.46	20.06	19.80	18.83
Kaoline	5.00	12.53	20.06	19.84	18.74
Poly.mulch	4.95	12.89	21.69	21.15	18.19
Straw mulch	4.99	12.28	20.73	20.43	17.55
SE \pm	0.02	0.04	0.01	0.09	0.16
CD at 5%	0.06	0.12	0.04	0.26	0.45
Interaction					
SE \pm	0.06	0.11	0.01	0.25	0.44
CD at 5%	0.17	0.33	0.04	0.73	1.26

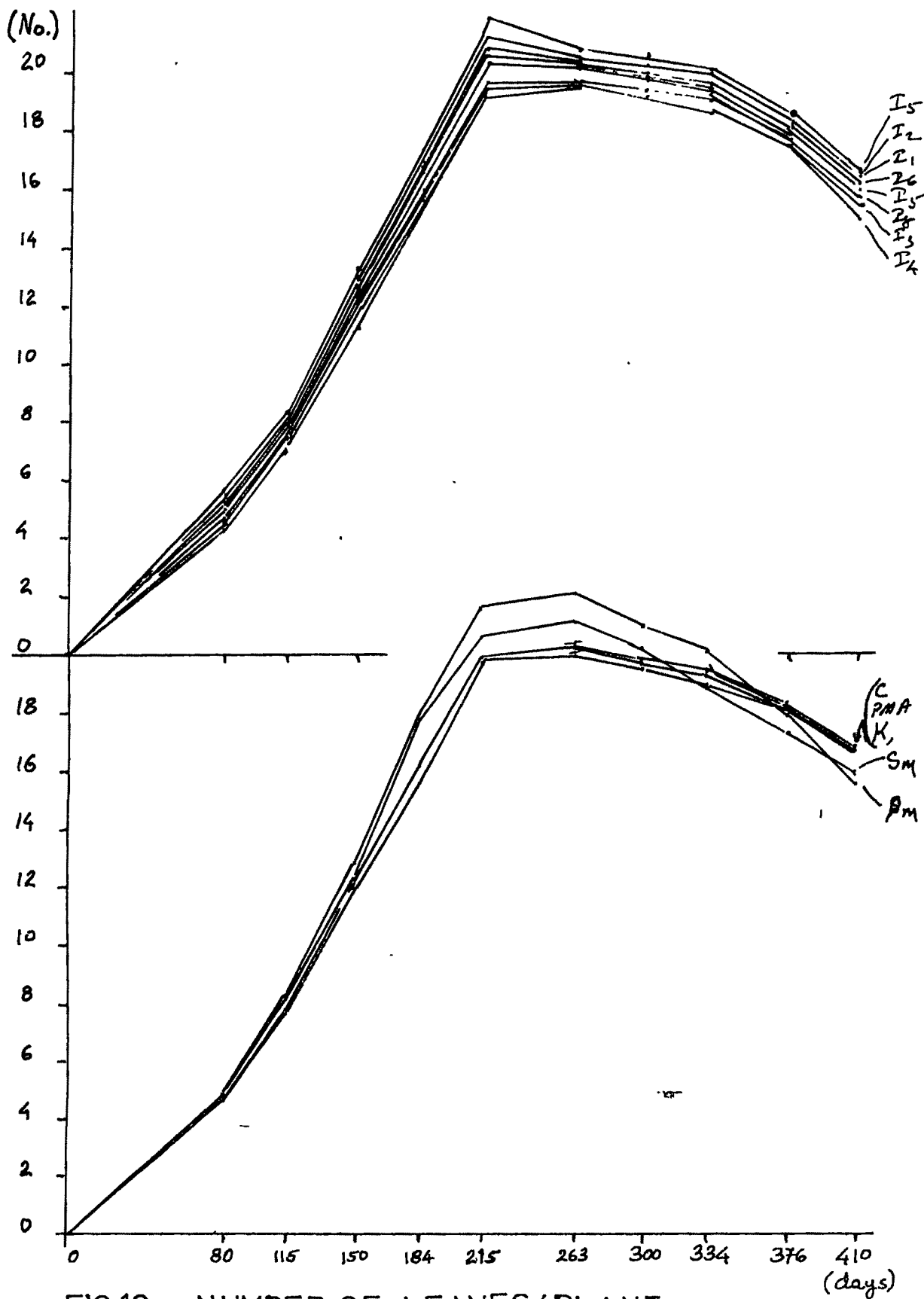


FIG.12 NUMBER OF LEAVES/PLANT.

straw mulch treated plants.

Treatment combination 1.4 IW/CPE increased during FBD to harvest and PMA sprayed induced maximum number of leaves per plant at 376 days compared to all other treatment combinations except 1.4 IW/CPE increased during FBD to harvest and Kaoline sprayed and 1.4 IW/CPE increased during flowering to harvest and Kaoline sprayed treatments which showed similar effects (Table 28a).

Table 28a: Number of leaves per plant IxAM interaction 376 days after planting

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	18.3	18.5	18.7	18.5	17.9	19.0	18.5	17.7
PMA	18.5	18.8	17.4	18.8	18.2	19.4	18.6	20.9
Kaoline	18.5	19.0	17.0	18.9	18.0	19.7	18.9	19.9
Poly.mulch	18.1	19.1	18.2	17.1	18.1	18.5	18.2	18.2
Straw mulch	17.4	18.4	17.6	16.9	17.5	17.9	17.2	17.5

SE \pm 0.44

CD at 5% 1.26

4.2.1.4 Leaf area per plant

Irrigation treatments and antitranspirant and mulch treatments showed significance in leaf area per plant at all growth stages (Table 29 and Fig.13). However, treatment combinations showed significance after 215 days of growth. Maximum leaf area per plant was during 300 days of growth.

Table 29: Leaf area per plant (m²)

Treat- ments	Days 80	150	215	300	376
I ₁	0.22	2.16	5.67	6.90	7.67
I ₂	0.30	2.45	6.73	8.07	8.33
I ₃	0.28	2.19	5.72	7.07	7.70
I ₄	0.24	2.50	6.62	8.20	7.81
I ₅	0.34	2.20	5.73	6.85	7.70
I ₆	0.26	2.48	6.76	8.19	8.25
I ₇	0.35	2.23	5.68	7.29	7.99
I ₈	0.29	2.53	6.73	8.45	8.06
SE ±	0.002	0.03	0.04	0.07	0.09
CD at 5%	0.007	0.09	0.13	0.24	0.29
Control	0.27	2.30	5.72	6.88	7.53
PMA	0.28	2.31	6.07	7.29	8.04
Kaoline	0.29	2.33	6.17	7.30	8.12
Poly.mulch	0.30	2.36	6.79	8.79	8.15
Straw mulch	0.29	2.36	6.29	7.90	7.86
SE ±	0.002	0.01	0.02	0.05	0.03
CD at 5%	0.005	0.03	0.05	0.14	0.07
Interaction					
SE ±	0.005	0.03	0.05	0.13	0.07
CD at 5%	NS	NS	0.15	0.38	0.20

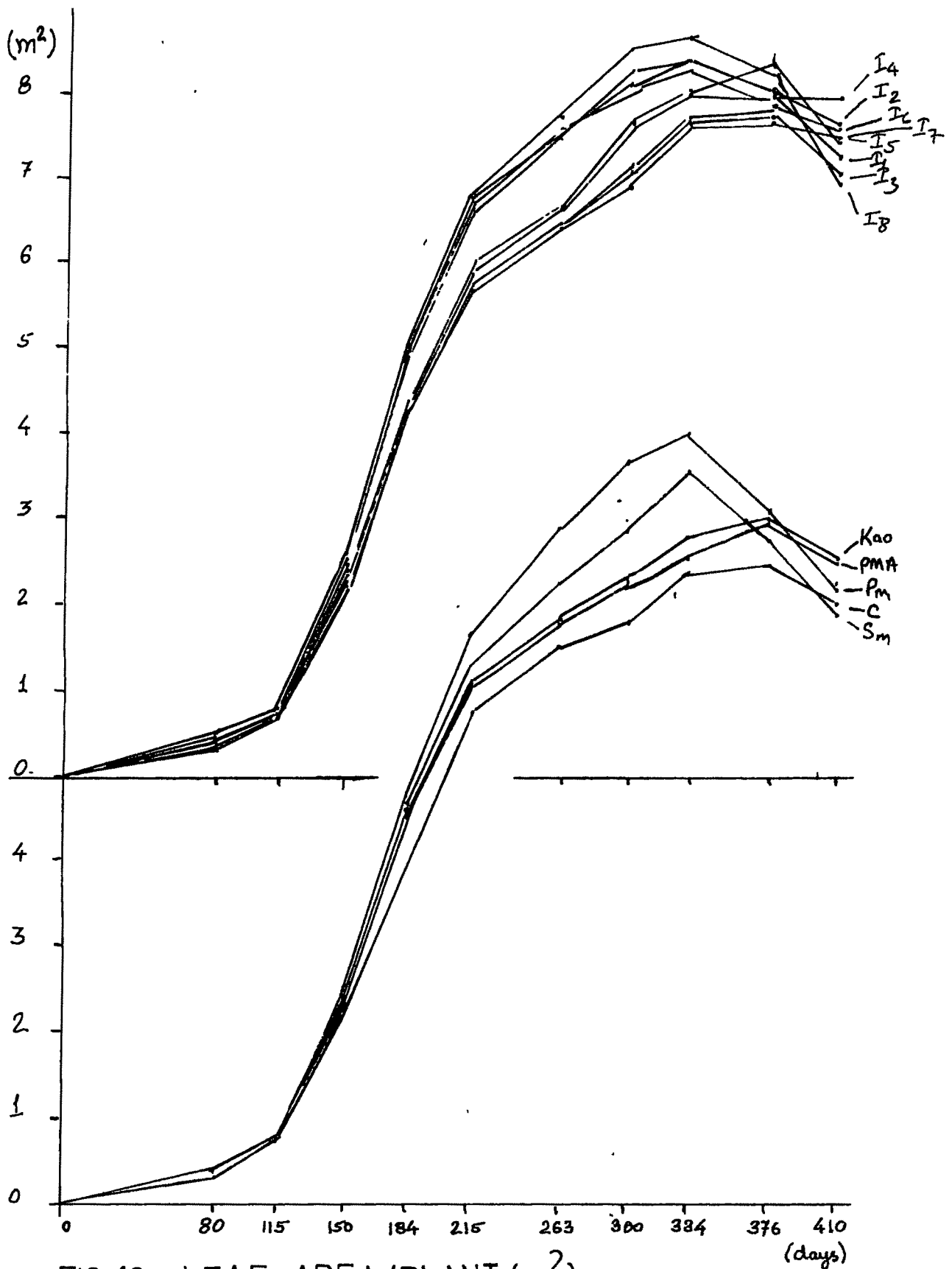


FIG.13 LEAF AREA/PLANT (m^2).

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest induced highest leaf area at 300 days compared to all other treatments. During early stages 1.4 IW/CPE treatments induced more leaf area compared to that induced by 1.0 IW/CPE treatments when clubbed together, so was the trend during 376 days of growth.

Polythene mulch treatment induced maximum leaf area per plant compared to straw mulch treatment at 300 days of growth. Antitranspirants PMA and Kaoline showed similar effects at 150 and 300 days of growth. In general, mulch induced more leaf area than antitranspirants, and control treatment had the least leaf area.

Treatment combination 1.4 IW/CPE kept constant during the entire course of investigation and polythene mulch induced more leaf area compared to that induced by all other treatment combinations, except 1.4 IW/CPE kept constant and straw mulch treatment which showed similar effect (Table 29a).

Table 29a: Leaf area per plant (m^2) IxAM interaction
376 days after planting

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	7.04	7.61	7.52	7.98	7.05	7.87	7.68	7.45
PMA	7.46	7.27	7.75	8.34	7.42	8.52	8.04	8.51
Kaoline	7.63	8.34	7.99	8.43	7.41	8.48	8.13	8.53
Poly.mulch	8.15	8.80	7.72	7.53	8.38	8.04	8.55	8.00
Straw mulch	8.06	8.62	7.50	6.76	8.26	8.34	7.53	7.80
SE ±	0.07		CD at 5%		0.20			

4.2.1.5 Absolute growth rate of pseudostem girth (AGR_g)

Absolute growth rate of pseudostem girth (AGR_g) was reduced in second stage (81 to 150 days of growth), then raised to maximum during 151 to 215 days of growth and later on fell gradually till 376 days of growth (Table 30).

Table 30: Absolute growth rate of pseudostem girth (cm/day)

Days interval Treatments	Days interval				
	0 to 80	81 to 150	151 to 215	216 to 300	301 to 376
I ₁	0.1752	0.1149	0.2388	0.0932	0.0626
I ₂	0.1882	0.1200	0.2911	0.1016	0.0418
I ₃	0.1775	0.1169	0.2443	0.0861	0.0629
I ₄	0.1869	0.1293	0.2785	0.1214	0.0361
I ₅	0.1745	0.1303	0.2271	0.1047	0.0689
I ₆	0.1855	0.1394	0.3018	0.0979	0.0244
I ₇	0.1723	0.1243	0.2345	0.1195	0.0600
I ₈	0.1860	0.1391	0.3163	0.0894	0.0345
Control	0.1795	0.1174	0.2428	0.0751	0.0271
PMA	0.1805	0.1194	0.2474	0.0802	0.0257
Kaoline	0.1811	0.1217	0.2454	0.0865	0.0246
Poly.mulch	0.1819	0.1399	0.3022	0.1379	0.0867
Straw mulch	0.1806	0.1361	0.2946	0.1289	0.0805

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest recorded highest AGR_g during 151 to 215 days of growth period. 1.4 IW/CPE treatments clubbed together recorded higher AGR_g compared to that recorded by 1.0 IW/CPE treatments during entire growth period.

Polythene mulch treatment induced highest AGR_g during 151 to 215 days of growth period. Mulch treatments induced higher AGR_g compared to that induced by antitranspirant treatments. Similar trend was during the entire growth period.

4.2.1.26 Absolute growth rate of pseudostem height (AGR_h)

Absolute growth rate of pseudostem height (AGR_h) was maximum during 151 to 215 days of growth later on it reduced till 376 days of growth (Table 31).

Table 31: Absolute growth rate of pseudostem height (cm/day)

Days interval Treat- ments	0 to 80	81 to 150	151 to 215	216 to 300	301 to 376
I_1	0.3170	0.3574	0.4822	0.2007	0.1674
I_2	0.3227	0.3723	0.5197	0.2176	0.2339
I_3	0.3225	0.3520	0.5089	0.2334	0.1911
I_4	0.3263	0.3843	0.5400	0.3078	0.1295
I_5	0.3167	0.3731	0.4960	0.2228	0.1563
I_6	0.3263	0.4011	0.5194	0.2838	0.1721
I_7	0.3248	0.3714	0.5142	0.2367	0.1995
I_8	0.3310	0.4029	0.5311	0.3205	0.1303
Control	0.3198	0.3571	0.5120	0.2145	0.1967
PMA	0.3222	0.3640	0.5058	0.2096	0.2154
Kaoline	0.3204	0.3674	0.5081	0.2160	0.2104
Poly.mulch	0.3293	0.4044	0.5198	0.3225	0.1117
Straw mulch	0.3256	0.3909	0.5238	0.3020	0.1284

Irrigation treatment 1.4 IW/CPE increased during FBD to flowering recorded highest AGR_h during 151 to 215 days. However, 1.4 IW/CPE increased during FBD to harvest induced more AGR_h during planting to 300 days of growth. When 1.4 IW/CPE treatments clubbed together showed higher AGR_h compared to that induced by 1.0 IW/CPE treatments.

Straw mulch treatment induced highest AGR_h during 151 to 215 days of growth period. Mulch treatments induced higher AGR height compared to that induced by antitranspirants during the entire growth period.

4.2.2 Developmental study

4.2.2.1 Days required for flowering, fruit development and crop duration

Data on number of days required for flowering, fruit development and crop duration are presented in Table 32. Irrigation treatments and antitranspirant and mulch treatments showed significance. The fruit development and crop duration interaction showed significance.

Irrigation treatments 1.4 IW/CPE increased during different stages of development required minimum number of days to flower compared to that required by 1.0 IW/CPE treatments and 1.4 IW/CPE kept constant treatments.

Polythene mulch treatment induced early flowering compared to that induced by straw mulch treatment. Anti-transpirant treatments PMA and Kaoline and control treatment induced similar effect.

Table 32: Number of days required to flower, fruit development and Crop Duration

Treatments	Number of days to flower	Number of days required for fruit development	Crop duration
I ₁	370.0	113.4	483.6
I ₂	359.6	99.6	452.0
I ₃	360.2	112.0	472.2
I ₄	340.0	97.0	437.0
I ₅	373.4	110.4	483.8
I ₆	351.8	94.4	446.0
I ₇	357.6	103.8	461.2
I ₈	340.8	90.2	431.0
SE \pm	3.68	0.37	1.30
CD at 5%	12.30	1.23	4.34
Control	380.50	117.50	498.13
PMA	378.86	107.63	486.50
Kaoline	375.75	108.63	484.38
Poly. mulch	318.63	87.75	406.25
Straw mulch	329.63	91.50	416.50
SE \pm	2.71	0.34	0.72
CD at 5%	7.83	0.97	2.07
Interaction			
SE \pm	7.67	0.95	2.02
CD at 5%	NS	2.75	5.84

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest required minimum fruit development and crop duration compared to that required by other treatments (Table 32). 1.4 IW/CPE treatments clubbed together required less fruit development and crop duration compared to that required by 1.0 IW/CPE treatments.

Polythene mulch treatment induced earliness in fruit maturity and crop duration compared to that of straw mulch treatment. Mulch treatments required less period for fruit development and crop duration compared to that required by antitranspirant treatments. Control treatment required maximum time to develop fruit and crop maturity.

Treatment combination 1.4 IW/CPE increased during flowering to harvest and polythene mulch induced earliness in fruit development compared to all other treatment combinations, except 1.4 IW/CPE increased during FBD to flowering and polythene mulch treatment which showed similar effect (Table 32a). Maximum number of days to develop fruits was required by treatment combination 1.0 IW/CPE kept constant and control.

Treatment combination 1.4 IW/CPE increased during FBD to harvest induced early crop harvest compared to all other treatment combinations (Table 32b). Maximum crop duration was required by 1.0 IW/CPE kept constant and control treatment combination.

**Table 32a: Number of days required for fruit development
IxAM interaction**

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	128	118	125	114	123	109	121	102
PMA	120	102	118	98	120	100	105	98
Kaoline	117	102	121	109	116	100	110	94
Poly.mulch	100	85	96	81	94	80	90	76
Straw mulch	102	91	100	83	99	83	93	81
SE ±	0.95				CD at 5%		2.75	

Table 32b: Crop duration IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	531	497	510	476	525	482	504	460
PMA	513	476	499	457	524	475	487	461
Kaoline	506	472	487	462	514	478	483	463
Poly.mulch	431	403	423	389	422	392	412	378
Straw mulch	437	412	432	401	434	403	420	393
SE ±	2.02				CD at 5%		5.84	

4.2.2.2 Number of hands per bunch, fingers per hand
and fingers per bunch

Data on number of hands per bunch, fingers per hand and fingers per bunch are depicted in Table 33. Irrigation treatments, antitranspirant and mulch treatments and their interactions show significance.

Irrigation treatments 1.4 IW/CPE increased during different stages of development induced similar effect and induced more number of hands per bunch compared to that induced by 1.0 IW/CPE treatments and 1.4 IW/CPE kept constant.

Polythene mulch treatment induced more number of hands per bunch compared to that induced by straw mulch treatment. Kaoline sprayed plants induced more hands per bunch compared to PMA sprayed plants. Control and PMA treatments showed similar effects.

Treatment combinations 1.4 IW/CPE increased during FBD to flowering, flowering to harvest and FBD to harvest and polythene mulch had similar effect and induced maximum number of hands per bunch compared to that induced by all other treatments (Table 33a).

Irrigation treatment 1.4 IW/CPE kept constant induced more number of fingers per hand compared to that induced by 1.0 IW/CPE kept constant, 1.0 IW/CPE increased during FBD to flowering and 1.4 IW/CPE increased during

Table 33: Number of hands per bunch, fingers per hand and fingers per bunch

Treatments	Number of hands per bunch	Number of fingers per hand	Number of fingers per bunch
I ₁	6.95	13.00	89.80
I ₂	7.60	14.54	111.10
I ₃	7.25	12.96	94.10
I ₄	8.15	13.53	111.30
I ₅	7.00	14.29	99.60
I ₆	8.00	13.75	111.20
I ₇	7.45	14.80	109.70
I ₈	8.15	14.08	116.70
SE \pm	0.11	0.25	1.41
CD at 5%	0.36	0.82	4.72
Control	6.78	12.63	85.56
PMA	6.88	13.46	92.00
Kaoline	7.16	14.15	100.50
Poly. mulch	8.75	15.34	134.81
Straw mulch	8.28	13.76	114.31
SE \pm	0.05	0.13	0.74
CD at 5%	0.14	0.38	2.15
Interaction			
SE \pm	0.14	0.37	2.10
CD at 5%	0.40	1.06	6.07

FBD to flowering. However, 1.4 IW/CPE kept constant, 1.4 and 1.0 IW/CPE increased during flowering to harvest and FBD to harvest showed similar effect.

Polythene mulch treatment induced more number of fingers per hand compared to Kaoline treatment. PMA treatment and straw mulch treatment showed similar effect, but induced more number of fingers per hand compared to control treatment.

Treatment combinations 1.4 IW/CPE increased during FBD to harvest and polythene and straw mulch treatments showed similar effect. 1.4 IW/CPE increased during FBD to harvest and polythene treatment combination induced maximum number of fingers per hand compared to all other treatments (Table 33b).

Irrigation treatments 1.4 IW/CPE clubbed together showed similar effect and induced more number of fingers per bunch compared to that induced by 1.0 IW/CPE increased during FBD to harvest and other treatments.

Polythene mulch treatment induced more number of fingers per bunch compared to straw mulch treatment. Kaoline treatment induced more fingers per bunch compared to PMA treatment. Mulch treatments induced more number of fingers per bunch compared to antitranspirant treatments. Control treatment induced least number of fingers per bunch.

Table 33a: Number of hands per bunch IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	6.25	6.75	6.25	7.50	6.25	7.25	6.75	7.25
PMA	6.25	7.00	6.75	7.25	6.25	7.25	6.50	7.75
Kaoline	6.00	7.25	7.25	8.00	6.50	7.50	7.00	7.75
Poly.mulch	8.25	8.75	8.25	9.25	8.25	9.25	8.75	9.25
Straw mulch	8.00	8.25	7.75	8.75	7.75	8.75	8.25	8.75

SE \pm 0.14

CD at 5% 0.40

Table 33b: Number of fingers per hand IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	12.25	13.60	12.65	11.93	13.29	11.64	13.58	12.13
PMA	12.98	14.14	12.91	12.83	15.13	12.61	15.66	11.40
Kaoline	15.00	15.04	12.49	12.50	15.54	13.78	16.68	12.18
Poly.mulch	13.09	16.75	13.88	16.55	14.05	16.22	14.34	17.84
Straw mulch	11.69	13.15	12.85	13.83	13.42	14.51	13.76	16.86

SE \pm 0.37

CD at 5% 1.06

Table 33c: Number of fingers per bunch IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	76.5	92.5	79.0	89.5	83.5	84.5	91.5	88.0
PMA	81.0	99.0	87.0	93.0	94.5	91.5	101.5	88.5
Kaoline	90.0	109.0	90.5	100.0	100.5	103.0	116.5	94.5
Poly.mulch	108.0	146.5	114.5	153.0	116.0	150.0	125.5	165.0
Straw mulch	93.5	108.5	99.5	121.0	104.0	127.0	113.5	147.5

SE \pm 2.10

CD at 5% 6.07

Treatment combination 1.4 IW/CPE increased during FBD to harvest and polythene mulch induced maximum number of fingers per bunch compared to all other treatment combinations (Table 33c). Minimum number of fingers per bunch were induced by 1.0 IW/CPE kept constant and PMA and constant treatment combinations.

4.2.2.3 Fruit development

4.2.2.3.1 Fresh weight of finger

Irrigation treatments, antitranspirant and mulch treatments and their interactions showed significance (Table 34). The fresh weight of finger increased till the time of harvest.

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest induced higher fresh weight of finger compared to all other irrigation treatments. Lowest weight was recorded by 1.0 IW/CPE kept constant treatment at harvest. Similar trend was observed at other time interval of fruit development.

Straw mulch treatment induced heavier fruits compared to control treatments. Polythene mulch, Kaoline, PMA treatments induced lower fresh weight of finger compared to control treatment at harvest. During 63 and 84 days time intervals straw mulch treatment dominated polythene mulch treatment, whereas during 21 and 42 days time interval straw and polythene mulch treatments showed similar effects.

Table 34: Fresh weight of finger (g)

Treat- ments	Days					
	0	21	42	63	84	Harvest
I ₁	7.18	16.08	27.78	38.08	55.38	76.00
I ₂	7.84	18.94	34.88	48.42	75.86	85.20
I ₃	7.38	16.54	29.30	40.26	58.10	79.40
I ₄	8.14	18.86	33.94	47.10	78.26	87.14
I ₅	7.82	17.72	30.02	41.00	59.70	80.80
I ₆	8.56	21.28	37.20	51.80	90.42	90.42
I ₇	8.12	18.56	32.90	43.26	67.40	82.66
I ₈	8.62	22.94	42.02	56.48	94.98	94.98
SE \pm	0.02	0.24	0.61	0.31	0.69	0.56
CD at 5%	0.07	0.81	2.02	1.03	2.31	1.86
Control	6.93	16.80	27.95	38.53	56.38	87.06
PMA	7.56	17.43	28.54	39.18	69.89	82.83
Kaoline	7.16	16.31	26.70	36.55	61.54	78.21
Poly.mulch	8.76	22.40	42.18	56.14	84.49	84.49
Straw mulch	9.38	21.40	42.16	58.63	90.28	90.28
SE \pm	0.02	0.13	0.24	0.28	0.39	0.49
CD at 5%	0.05	0.38	0.69	0.81	1.14	1.41
Interaction						
SE \pm	0.05	0.37	0.67	0.79	1.12	1.38
CD at 5%	0.15	1.07	1.94	2.29	3.22	3.98

Treatment combination 1.4 IW/CPE increased during FBD to harvest and PMA spraying induced highest fresh weight of finger at harvest compared to all other treatment combinations (Table 34a). However, 1.4 IW/CPE increased during FBD to harvest and PMA spraying and 1.4 IW/CPE increased during FBD to harvest and control treatment combinations showed similar effects.

Table 34a: Fresh weight of finger (g) IxAM interaction at harvest

Treatment	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	70.3	90.0	75.9	92.8	79.0	100.3	85.9	102.4
PMA	69.0	86.4	71.2	89.0	70.3	98.6	73.2	104.9
Kaoline	65.8	80.6	70.0	86.6	66.8	87.4	69.5	99.0
Poly.mulch	85.2	76.8	87.6	79.1	93.6	80.8	90.0	82.8
Straw mulch	89.7	92.2	92.3	88.2	94.3	85.0	94.7	85.8

SE \pm 1.38

CD at 5% 3.98

4.2.2.3.2 Dry weight of finger

Irrigation treatments, antitranspirant and mulch treatments and their interactions showed significance (Table 35). The dry weight of finger increased till the time of harvest.

Table 35: Dry weight of finger (g)

Treat- ments	Days 0	21	42	63	84	Harvest
I ₁	0.57	2.45	5.17	7.44	11.63	15.29
I ₂	0.58	2.70	5.70	8.36	14.66	16.42
I ₃	0.58	2.43	5.21	7.34	11.81	15.86
I ₄	0.60	2.61	5.82	8.21	14.75	16.52
I ₅	0.58	2.63	5.29	7.48	11.99	15.54
I ₆	0.58	2.87	6.41	9.07	16.25	16.25
I ₇	0.60	2.72	5.56	8.04	13.18	15.72
I ₈	0.59	2.96	6.63	9.29	17.33	17.33
SE \pm	0.003	0.010	0.03	0.03	0.09	0.07
CD at 5%	0.01	0.04	0.09	0.11	0.31	0.25
Control	0.51	2.58	5.18	7.34	10.97	16.55
PMA	0.56	2.59	5.63	8.04	13.44	15.79
Kaoline	0.53	2.50	5.29	7.29	11.96	14.87
Poly. mulch	0.64	2.79	5.96	8.78	16.20	16.20
Straw mulch	0.69	2.90	6.56	9.32	17.18	17.18
SE \pm	0.003	0.02	0.02	0.03	0.07	0.07
CD at 5%	0.007	0.05	0.05	0.08	0.20	0.21
Interaction						
SE \pm	0.007	0.05	0.05	0.08	0.20	0.21
CD at 5%	0.02	0.15	0.14	0.22	0.57	0.59

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest induced more dry weight of finger compared to other irrigation treatments. Irrigation treatments 1.4 IW/CPE clubbed together induced more dry weight of finger compared to that induced by 1.0 IW/CPE irrigation treatments during the entire fruit development period.

Straw mulch treatment induced higher dry weight of fruit compared to that induced by control treatment. Polythene mulch, PMA and Kaoline treatments induced less dry weight of finger compared to control treatment at harvest. However, during other time interval of fruit development straw mulch dominated polythene mulch treatment, PMA dominated Kaoline treatment and mulches dominated antitranspirants treatment. Control treatment remained low in dry weight of finger production till 84 days.

Treatment combination 1.4 IW/CPE increased during FBD to harvest and PMA sprayed induced highest dry weight of finger at harvest compared to that induced by all other treatment combinations (Table 35a). However, 1.4 IW/CPE increased during FBD to harvest and PMA, 1.4 IW/CPE increased during FBD to harvest and control; 1.4 IW/CPE increased during FBD to flowering and PMA and 1.0 IW/CPE increased during flowering to harvest showed similar effects.

Table 35a: Dry weight of finger (g) IxAM interaction at harvest

Treatment	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	14.65	17.20	15.05	17.70	15.00	18.30	15.60	18.90
PMA	14.00	16.65	14.25	18.80	13.50	17.65	14.25	19.20
Kaoline	13.20	15.85	14.05	16.25	12.35	15.95	13.15	18.15
Poly.mulch	16.85	14.70	17.45	15.30	18.65	14.20	17.30	15.15
Straw mulch	17.75	17.70	18.50	16.55	18.20	15.15	18.30	15.25

SE \pm 0.21

CD at 5% 0.59

4.2.2.3.3 Length of finger

Irrigation treatments, antitranspirant and mulch treatments and their interaction showed significance at all time interval of fruit development (Table 36). The length of finger kept on increasing constantly till the time of harvest.

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest induced longer fruits compared to that induced by all other irrigation treatments. Shortest fruits were induced by 1.0 IW/CPE kept constant, at harvest. 1.4 IW/CPE treatments clubbed together induced longer fruits compared to 1.0 IW/CPE treatments. Similar trend was noted at all time interval of fruit development.

Table 36: Length of finger (cm)

Treat- ments	Days	0	21	42	63	84	Harvest
I ₁		6.00	7.40	8.88	10.24	11.76	12.52
I ₂		6.86	8.04	10.16	11.84	13.62	13.88
I ₃		6.30	7.40	8.92	10.30	11.88	12.89
I ₄		6.96	8.40	10.32	11.89	13.94	14.26
I ₅		6.46	7.98	9.52	10.84	12.18	13.22
I ₆		7.22	8.24	10.02	12.38	14.60	14.60
I ₇		6.74	8.16	9.80	11.28	12.94	13.61
I ₈		7.42	9.04	10.96	12.78	14.82	14.82
SE \pm		0.03	0.05	0.03	0.07	0.06	0.04
CD at 5%		0.11	0.17	0.10	0.23	0.20	0.13
Control		5.64	6.66	8.34	9.76	11.26	12.39
PMA		5.90	7.25	9.05	10.86	12.85	13.44
Kaoline		6.11	7.64	9.34	11.01	12.99	13.81
Poly.mulch		8.18	9.50	11.34	12.97	14.73	14.72
Straw mulch		7.90	9.36	11.05	12.61	14.26	14.25
SE \pm		0.02	0.02	0.02	0.03	0.03	0.03
CD at 5%		0.05	0.06	0.07	0.08	0.08	0.09
Interaction							
SE \pm		0.05	0.05	0.07	0.08	0.08	0.09
CD at 5%		0.14	0.16	0.20	0.23	0.23	0.27

Polythene mulch treatment induced longer fruits compared to straw mulch treatment. Kaoline induced longer fruits than PMA. Control treatment induced shortest fruits. Mulches induced longer fruits compared to that induced by antitranspirants. Similar trend was noted at all time interval of fruit development.

Treatment combination 1.4 IW/CPE increased during FBD to harvest and polythene mulch induced longest fruits compared to all other treatment combinations (Table 36a). Shortest fruits were induced by 1.0 IW/CPE kept constant and control treatment combination.

Table 36a: Length of finger (cm) IxAM interaction at harvest

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	11.10	12.55	11.40	13.00	11.95	13.35	12.41	13.40
PMA	12.40	14.50	12.75	13.90	13.05	14.15	13.45	14.35
Kaoline	12.65	14.10	12.95	14.35	13.10	14.70	13.65	15.00
Poly.mulch	13.50	14.80	14.05	15.15	14.30	15.55	14.50	15.90
Straw mulch	12.95	14.45	13.30	14.90	13.70	15.05	14.05	15.60

SE \pm 0.09

CD at 5% 0.27

4.2.2.3.4 Volume of finger

Irrigation treatments, antitranspirant and mulch treatments and their interaction showed significance at all time interval of fruit development (Table 37). Increase in volume of finger was constant till the time of harvest.

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest induced larger fruits compared to that induced by other irrigation treatments. 1.0 IW/CPE kept constant induced smaller fruits. 1.4 IW/CPE treatments together induced larger fruits compared to that induced by 1.0 IW/CPE treatments. Similar effect was noted at all time interval of fruit development.

Straw mulch treatment induced larger fruits compared to that induced by control treatment. Polythene mulch, PMA, Kaoline treatments induced smaller fruits compared to that induced by control treatment. During entire fruit development straw mulch treatment remained higher followed by polythene mulch, PMA, Kaoline and control treatments till 84 days.

Treatment combination 1.4 IW/CPE increased during FBD to harvest and PMA induced largest fruits compared to that produced by all other treatment combinations, except 1.4 IW/CPE increased during FBD to harvest and control treatment combination which showed similar effect (Table 37a). Treatment combination 1.0 IW/CPE kept

Table 37: Volume of finger (cm³)

Treat- ments	Days 0	21	42	63	84	Harvest
I ₁	7.50	21.48	41.48	58.16	75.94	84.78
I ₂	8.36	27.14	50.18	71.74	93.98	98.14
I ₃	7.64	24.54	41.68	60.50	78.68	87.59
I ₄	8.70	28.98	51.42	73.86	95.28	99.48
I ₅	8.46	25.76	44.68	64.66	84.12	93.21
I ₆	9.34	31.54	57.46	81.88	106.72	106.72
I ₇	8.72	26.78	48.58	68.30	88.12	94.89
I ₈	9.54	33.50	60.16	86.72	112.94	112.94
SE ±	0.03	0.57	1.34	0.40	0.34	0.28
CD at 5%	0.10	1.90	4.47	1.33	1.13	0.93
Control	7.41	25.68	46.69	67.00	87.48	100.48
PMA	8.20	26.90	48.31	69.40	89.91	95.88
Kaoline	7.65	25.05	44.65	63.78	82.84	90.11
Poly.mulch	9.39	28.50	51.84	74.01	96.65	96.65
Straw mulch	10.01	31.20	55.79	79.45	102.99	102.99
SE ±	0.02	0.22	0.88	0.26	0.31	0.32
CD at 5%	0.05	0.63	2.55	0.75	0.91	0.92
Interaction						
SE ±	0.05	0.62	2.50	0.74	0.89	0.90
CD at 5%	0.15	1.78	7.22	2.13	2.57	2.60

constant and control, increased during FBD to flowering and control, showed similar effect and induced smallest fruits.

Table 37a: Volume of finger (cm^3) IxAM interaction at harvest

Treatment	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	81.45	103.15	83.45	107.20	91.40	119.70	94.35	123.15
PMA	77.40	99.65	79.40	101.65	82.40	116.50	85.65	124.35
Kaoline	73.00	95.40	77.20	97.30	75.90	102.65	81.00	118.45
Poly. mulch	94.00	88.00	96.45	91.25	106.95	94.45	104.05	97.60
Straw mulch	98.05	104.50	101.45	100.00	109.40	100.15	109.40	100.80

SE \pm 0.90

CD at 5% 2.60

4.2.2.3.5 Absolute growth rate of fresh weight of finger (AGR_f)

Absolute growth rate fresh weight of finger (AGR_f) was highest during 64 to 84 days of fruit development (Table 38). Irrigation treatment 1.4 IW/CPE increased during FBD to harvest recorded highest AGR_f compared to all other irrigation treatments. 1.4 IW/CPE treatments showed higher AGR_f compared to that of 1.0 IW/CPE treatments when clubbed together at all time intervals of fruit development.

Table 38: Absolute growth rate of fresh fruit
(g/day/plant)

Day interval	0 to 21	22 to 42	43 to 63	64 to 84	85 to harvest
Treatments					
I ₁	38.05	50.02	44.03	73.97	62.97
I ₂	58.71	84.32	71.62	145.16	66.51
I ₃	41.03	57.17	49.11	79.93	71.58
I ₄	56.80	79.91	69.74	165.14	76.01
I ₅	46.95	58.33	52.07	88.68	79.60
I ₆	67.35	84.28	77.30	204.49	0.00
I ₇	54.53	74.90	54.11	159.01	84.54
I ₈	79.57	106.02	79.90	213.91	0.00
Control	40.21	45.42	43.10	72.72	78.35
PMA	43.24	48.66	46.61	134.53	50.37
Kaoline	43.78	49.71	47.13	119.59	68.01
Poly. mulch	87.55	126.97	89.60	181.99	0.00
Straw mulch	65.41	112.99	89.64	172.27	0.00

Polythene mulch treatment showed highest AGR_f compared to that showed by straw mulch treatment. PMA treatment showed higher AGR_f than Kaoline treatment control treatment values remained lowest.

4.2.2.3.6 Absolute growth rate of dry weight of
finger (AGR_d)

Absolute growth rate dry weight of finger (AGR_d) was maximum during 64 to 84 days period of fruit development (Table 39).

Table 39: Absolute growth rate of dry fruit (g/day/plant)

Day interval Treat- ments	0 to 21	22 to 42	43 to 63	64to84	85 to harvest
I ₁	8.03	11.62	9.69	17.91	11.17
I ₂	11.20	15.86	14.06	33.33	12.53
I ₃	8.28	12.44	9.54	20.02	13.60
I ₄	10.65	17.00	12.66	34.65	15.14
I ₅	9.72	12.60	10.37	21.38	13.38
I ₆	12.12	18.73	14.07	38.01	0.00
I ₇	11.06	14.83	12.94	26.84	14.06
I ₈	13.16	20.38	14.77	44.67	0.00
Control	8.42	10.59	13.92	14.78	14.25
PMA	8.88	13.31	10.55	23.65	9.14
Kaoline	9.42	13.34	9.56	22.49	11.86
Poly.mulch	13.79	20.34	18.09	47.62	0.00
Straw mulch	12.02	19.91	15.02	42.77	0.00

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest showed highest AGR_d and lowest values were showed by 1.0 IW/CPE kept constant treatment during 64 to 84 days. 1.4 IW/CPE treatments showed higher AGR_d compared to 1.0 IW/CPE treatments during all fruit development time intervals.

Polythene mulch showed higher AGR_d than straw mulch treatment. PMA showed higher values than Kaoline at 64 to 84 days and vice versa at 0 to 21 and 22 to 42 days.

4.2.2.3.7 Relative growth rate of fresh weight of finger (RGR_f)

Relative growth rate of fresh weight of finger (RGR_f) was noted to be higher during first stage 0 to 21, than it lowered till 63 days and raised during 64 to 84 days and fell till harvest (Table 40). Irrigation treatment 1.4 IW/CPE increased during FBD to harvest recorded higher values during 0 to 42 days, but thereafter 1.4 IW/CPE increased during flowering to harvest recorded higher values till 84 days of fruit development. 1.4 IW/CPE treatments gave high RGR_f compared to 1.0 IW/CPE treatments clubbed together.

Polythene mulch showed high RGR_f during 0 to 21 days, than straw mulch showed high RGR_f till 63 days and thereafter PMA treatment showed high RGR_f till 84 days. Mulch and antitranspirant treatments showed

different trends and mulch RGR_f were high initially and later on lowered to that of antitranspirants.

Table 40: Relative growth rate of fresh fruit (g/g/day/plant)

Days interval Treat- ments	0 to 21	22 to 42	43 to 63	64 to 84	85 to Harvest
I ₁	0.0383	0.0260	0.0150	0.0178	0.0107
I ₂	0.0420	0.0290	0.0156	0.0213	0.0074
I ₃	0.0384	0.0272	0.0151	0.0174	0.0111
I ₄	0.0400	0.0279	0.0156	0.0241	0.0082
I ₅	0.0389	0.0251	0.0148	0.0178	0.0114
I ₆	0.0433	0.0265	0.0157	0.0265	0.0000
I ₇	0.0393	0.0272	0.0130	0.0211	0.0103
I ₈	0.0466	0.0288	0.0140	0.0247	0.0000
Control	0.0421	0.0242	0.0152	0.0181	0.0129
PMA	0.0397	0.0234	0.0126	0.0275	0.0071
Kaoline	0.0392	0.0234	0.0149	0.0248	0.0097
Poly.mulch	0.0447	0.0301	0.0136	0.0194	0.0000
Straw mulch	0.0392	0.0322	0.0157	0.0205	0.0000

4.2.2.3.8 Relative growth rate of dry weight of finger
(RGR_d)

Relative growth rate of dry weight of finger (RGR_d) was noted to be high during initial stage 0 to 21 days, than it lowered till 63 days and raised during 64 to 84 days and fell till harvest (Table 41).

Table 41: Relative growth rate of dry fruit (g/g/day/plant)

Days interval Treat- ments	0to21	22to42	43to63	64to84	85 to harvest
I ₁	0.0694	0.0355	0.0178	0.0212	0.0093
I ₂	0.0732	0.0355	0.0182	0.0267	0.0072
I ₃	0.0682	0.0363	0.0183	0.0226	0.0105
I ₄	0.0700	0.0381	0.0163	0.0278	0.0087
I ₅	0.0719	0.0332	0.0164	0.0224	0.0098
I ₆	0.0761	0.0382	0.0165	0.0277	0.0000
I ₇	0.0719	0.0340	0.0175	0.0235	0.0089
I ₈	0.0768	0.0384	0.0160	0.0298	0.0000
Control	0.0771	0.0331	0.0165	0.0191	0.0568
PMA	0.0729	0.0369	0.0169	0.0244	0.0068
Kaoline	0.0738	0.0356	0.0152	0.0235	0.0088
Poly.mulch	0.0701	0.0361	0.0184	0.0291	0.0000
Straw mulch	0.0683	0.0388	0.0167	0.0291	0.0000

Irrigation treatment 1.4 IW/CPE increased during FBD to harvest showed high RGR_d during 0 to 42 days and 64 to 84 days periods. 1.0 IW/CPE increased during

FBD to flowering treatment showed high RGR_d during 43 to 63 days period. 1.4 IW/CPE treatments showed higher RGR_d compared to 1.0 IW/CPE treatments clubbed together.

Initially antitranspirant treatments RGR_d values surfaced (0 to 21 days) but later on mulch treatments RGR_d kept high till 84 days. Control treatment showed lower RGR_d during 22 to 84 days period.

4.2.3 Yield per plant

Data on yield per plant is depicted in Table 42 and depicted in Fig.14. Irrigation treatments, anti-transpirant and mulch treatments and their interactions showed significance.

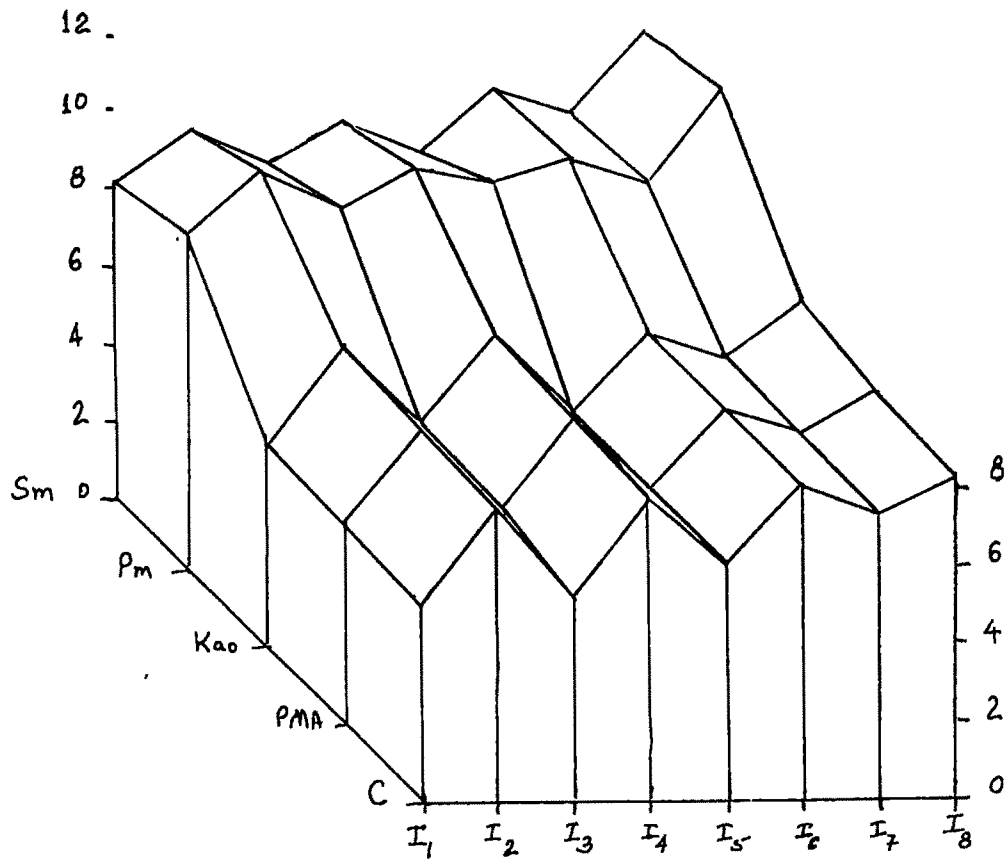
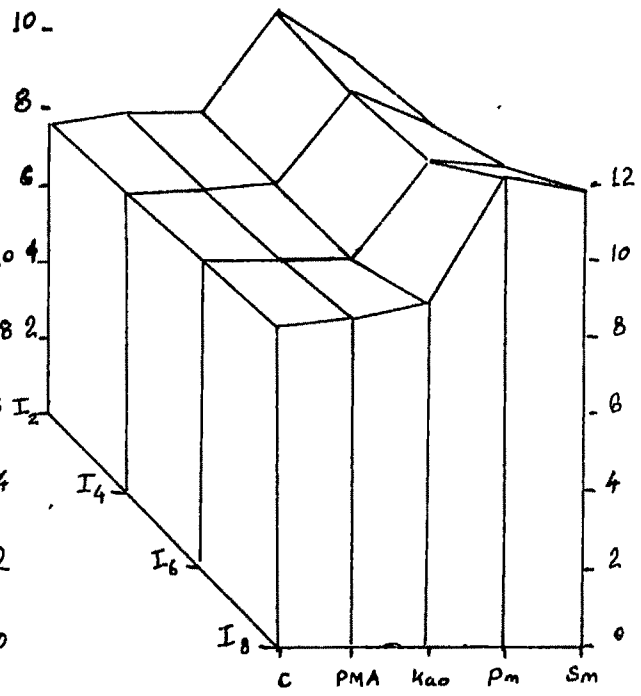
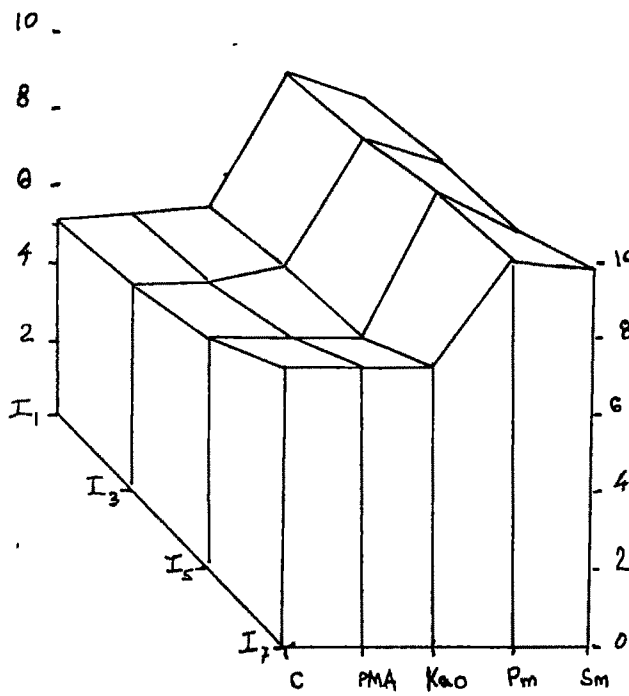
Irrigation treatments 1.4 IW/CPE increased during FBD to harvest induced high yield compared to other irrigation treatments. Lowest yield was recorded by 1.0 IW/CPE kept constant, and its effects were similar to 1.0 IW/CPE increased during FBD to flowering and flowering to harvest treatments. 1.4 IW/CPE ratio yielded higher compared to that of 1.0 IW/CPE ratio treatments.

Polythene mulch treatment yielded highest compared to straw mulch treatment. Effects of control, PMA and Kaoline treatments were similar and lower to that of straw mulch treatment.

Table 42: Yield in kg/plant (tonne/ha) and IxAM Interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈	Mean
Control	5.91 (26.30)	8.82 (39.25)	6.25 (27.81)	9.03 (40.18)	6.89 (30.66)	9.15 (40.72)	8.23 (36.62)	9.52 (42.36)	7.98 (35.49)
PMA	6.18 (27.19)	8.91 (29.65)	6.37 (28.35)	8.93 (39.74)	6.93 (30.84)	9.30 (41.39)	8.28 (36.85)	9.73 (43.30)	8.07 (35.91)
Kaoline	6.32 (28.12)	8.99 (40.01)	6.83 (30.39)	9.16 (40.76)	7.02 (31.24)	9.31 (41.43)	8.33 (37.07)	10.03 (44.63)	8.25 (36.71)
Poly. mulch	10.04 (44.68)	11.82 (52.60)	10.61 (47.21)	11.95 (53.18)	11.33 (50.42)	12.13 (53.98)	11.55 (51.40)	13.84 (61.59)	11.66 (51.88)
Straw mulch	9.33 (41.52)	10.53 (46.86)	9.81 (43.65)	11.03 (49.08)	10.02 (44.59)	11.81 (52.55)	11.21 (49.88)	13.26 (59.01)	10.88 (48.39)
Mean	7.54 (33.56)	9.81 (43.67)	7.97 (35.48)	10.02 (44.59)	8.44 (37.55)	10.34 (46.01)	9.52 (42.36)	11.28 (50.18)	9.37 (41.68)

	I	AM	Interaction
SE ±	0.15 (0.68)	0.11 (0.47)	0.30 (1.33)
CU at 5%	0.51 (2.27)	0.30 (1.35)	0.86 (3.83)



Treatment combination 1.0 IW/CPE kept constant and control induced highest reducing sugar per cent, compared to that induced by all other treatment combinations (Table 43a). Lowest reducing sugar per cent was induced by 1.4 IW/CPE increased during FBD to harvest and straw mulch treatment combination which also had similar effect with polythene mulch and Kaoline along with same irrigation treatment combinations.

Table 43a: Reducing sugars per cent IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	9.84	8.50	9.23	8.25	9.18	7.94	8.91	7.64
PMA	9.39	8.23	9.26	7.90	8.94	7.76	8.76	7.57
Kaoline	9.27	8.12	9.21	7.84	8.90	7.69	8.57	7.30
Poly. mulch	8.75	7.76	8.02	7.49	7.90	7.36	8.98	7.19
Straw mulch	9.08	7.88	8.36	7.61	8.57	7.39	8.10	7.18
SE ±	0.06		CD at 5%		0.19			

Irrigation treatment 1.0 IW/CPE kept constant induced highest non-reducing sugar per cent and 1.4 IW/CPE increased during FBD to harvest induced lowest non-reducing sugar per cent amongst the irrigation treatments.

Control treatment induced high non-reducing sugar per cent and polythene mulch induced lowest non-reducing

sugar per cent. PMA and Kaoline showed similar effects and lower non-reducing sugar per cent compared to control treatment.

Treatment combination 1.0 IW/CPE kept constant and control induced highest non-reducing sugar per cent, whereas 1.4 IW/CPE increased during FBD to harvest and straw mulch treatment combination induced lowest non-reducing sugar per cent (Table 43b). Treatment combinations 1.4 IW/CPE increased during FBD to harvest and straw mulch, polythene mulch and Kaoline showed similar effect.

Table 43b: Non-reducing sugars per cent IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	9.03	7.80	8.47	7.47	8.24	7.11	7.91	6.79
PMA	8.62	7.56	8.50	7.16	8.01	6.94	7.79	6.72
Kaoline	8.50	7.45	8.45	7.84	7.87	6.81	7.62	6.49
Poly.mulch	8.02	7.13	7.36	6.80	7.09	6.59	7.09	6.40
Straw mulch	8.33	7.23	8.13	6.89	7.68	6.62	7.20	6.38

SE \pm 0.06

CD at 5% 0.17

High total sugars per cent was induced by 1.0 IW/CPE kept constant and low by 1.4 IW/CPE increased during FBD to harvest treatments.

Control treatment induced high total sugar per cent and polythene mulch induced low total sugar per cent.

Treatment combination 1.0 IW/CPE kept constant and control induced highest total sugar per cent compared to all other treatment combinations (Table 43c). Treatment combination 1.4 IW/CPE increased during FBD to harvest and straw mulch induced lowest total sugar per cent and these effects were similar to that of 1.4 IW/CPE increased during FBD to harvest and polythene mulch and Kaoline treatment combination.

Table 43c: Total sugar per cent IxAM interaction

Treatments	I ₁	I ₂	I ₃	I ₄	I ₅	I ₆	I ₇	I ₈
Control	18.86	16.29	17.70	15.72	17.42	15.04	16.82	14.43
PMA	18.01	15.79	17.75	15.05	16.95	14.70	16.55	14.29
Kaoline	17.77	15.57	17.66	14.95	16.87	14.40	16.19	13.78
Poly.mulch	16.77	14.89	15.38	14.29	14.99	13.95	15.07	13.59
Straw mulch	17.40	15.10	16.99	14.50	16.24	14.01	15.29	13.56

SE \pm 0.12

CD at 5% 0.35

4.2.5 Moisture studies

4.2.5.1 Total and daily soil moisture depletion layer-wise, irrigation frequency, number and average interval

Soil moisture depletion (SMD) total and daily layer-wise are presented in Table 44. Total SMD ranged from 1200 mm to 1562 mm in irrigation treatments and from 1317 mm to 1444 mm in antitranspirant and mulch treatments. Daily SMD ranged from 2.48 mm to 3.63 mm in irrigation treatments and from 2.90 mm to 3.28 mm in antitranspirant and mulch treatments. 1.4 IW/CPE treatments showed higher total and daily SMD compared to that shown by 1.0 IW/CPE treatments. However, total SMD was more amongst antitranspirant treatments compared to mulch treatments and daily SMD was vice versa. 0 to 30 cm layer showed higher SMD total and daily compared to that of 30 cm to 60 cm layer.

Irrigation frequency ranged from 2-23 to 4-29 days per irrigation. Irrigation treatment 1.4 IW/CPE increased during FBD to harvest and flowering to harvest required frequent irrigations and 1.0 IW/CPE kept constant, increased during FBD to flowering and flowering to harvest required wider irrigation intervals.

Irrigation number ranged from 8+33 to 8+49. 1.4 IW/CPE increased during FBD to harvest required maximum number of irrigations and 1.0 IW/CPE kept

Table 44: Soil moisture depletion total and daily layer-wise (mm), irrigation frequency, irrigation number and average number of days per irrigation

Treatments	Total Soil Moisture Depletion (mm)		Daily Soil Moisture Depletion (mm)		Irrigation		Average days/irrigations
	0-30cm	30-60cm	0-60cm	0-30cm	Frequency	Number	
I ₁	1821.44	379.28	1200.72	1.70	4-29	8+33	14
I ₂	1018.94	459.60	1478.54	2.25	3-23	8+44	10
I ₃	884.76	401.89	1286.65	1.87	4-29	8+37	12
I ₄	1015.56	443.98	1459.54	2.32	3-23	8+45	9
I ₅	877.98	405.01	1282.99	1.81	4-29	8+36	13
I ₆	1047.75	465.49	1513.24	2.35	2-23	8+46	9
I ₇	935.62	418.73	1354.35	2.03	3-29	8+40	11
I ₈	1088.30	473.95	1562.25	2.53	2-23	8+49	8
Control	997.51	446.92	1444.46	2.00			
PMA	972.99	436.65	1409.64	2.00			
Kaoline	983.74	440.45	1424.19	2.03			
Poly.mulch	909.19	407.94	1317.05	2.24			
Straw mulch	943.11	423.00	1366.11	2.26			

constant required least number of irrigations. 1.4 IW/CPE treatments required more irrigations compared to 1.0 IW/CPE treatments.

Average irrigation interval ranged from 8 to 14 days. Smaller irrigation interval was required for 1.4 IW/CPE increased during FBD to harvest and longer irrigation interval was required for 1.0 IW/CPE kept constant treatment.

4.2.5.2 Total and daily consumptive use, water use, consumptive use efficiency and evapotranspiration ratio

Total consumptive use (CU) was more under 1.4 IW/CPE increased during FBD to harvest treatment and less under 1.0 IW/CPE kept constant treatment. 1.4 IW/CPE treatments increased total CU and 1.0 IW/CPE treatments lowered total CU. Polythene mulch reduced total CU compared to straw mulch. Kaoline and PMA influenced total CU very narrowly but reduced in comparison to control treatment (Table 45).

Daily CU was influenced similarly like total CU under irrigation treatments, but it reversed for anti-transpirant and mulch treatments. Polythene mulch increased daily CU and antitranspirants reduced it.

Water use (WU) and consumptive use efficiency (CUE) was maximum for 1.4 IW/CPE increased during FBD to harvest

Table 45: Consumptive use total and daily (mm), water used (mm), consumptive use efficiency (kg/mm), evapotranspiration ratio (mm/tonne/ha)

Treatments	Total CU (mm)	Daily CU (mm)	Water used (mm)	CUE (kg/mm)	ETR (mm/t/ha)
I ₁	2388.32	4.94	1769.7	14.05	71.17
I ₂	2744.40	6.07	2411.5	15.91	62.84
I ₃	2466.65	5.22	2144.8	14.38	69.52
I ₄	2746.14	6.28	2492.9	16.24	61.59
I ₅	2503.34	5.17	1949.7	15.00	66.67
I ₆	2834.43	6.36	2531.9	16.23	61.60
I ₇	2624.06	5.69	2210.6	16.14	61.95
I ₈	2917.25	6.77	2732.2	17.20	58.14
Control	2705.68	5.43	2280.43	13.12	76.24
PMA	2670.89	5.49	2280.43	13.45	74.38
Kaoline	2685.44	5.54	2280.43	13.67	73.15
Poly.mulch	2578.30	6.35	2280.43	20.12	49.70
Straw mulch	2624.86	6.30	2280.43	18.44	54.24

treatment and lowest for 1.0 IW/CPE kept constant treatment. 1.4 IW/CPE treatments required more water and CUE increased but it lowered with 1.0 IW/CPE treatments. WU was same for all antitranspirant and mulch treatments. CUE was maximum for polythene mulch treatment compared to straw mulch. CUE varied narrowly for control, Kaoline and PMA treatments.

ETR was wider for 1.0 IW/CPE kept constant and narrow for 1.4 IW/CPE increased during FBD to harvest. ETR was narrow under polythene mulch treatment compared to straw mulch treatment. ETR combined to be wider as treatments changed from Kaoline to PMA to control.

4.2.6 Correlation and regression

In general, the association between yield contributing characters viz. pseudostem height, pseudostem girth, number of leaves per plant, leaf area per plant, number of fingers per plant, number of hands per plant, number of fingers per hand, fresh weight of finger, volume per finger, length of finger and yield were significant and positive (Table 46).

Table 46: Correlation and regression

Character	'r'	'b'	'a'
Yield/pseudostem height (cm)	0.870*	0.4283	-4.0115
Yield/pseudostem girth (cm)	0.868*	0.2364	-12.6860
Yield/number of leaves/plant	0.894*	1.5522	-32.3670
Yield/leaf area/plant (m ²)	0.904*	2.7636	-23.3030
Yield/number of fingers/plant	0.845*	0.0780	-8.2287
Yield/number of hands/plant	0.937*	2.0033	-15.1620
Yield/number of fingers/hand	0.423*	0.5216	-7.2340
Yield/fresh weight of finger(g)	0.491*	0.0973	-8.2778
Yield/volume per finger (cm ³)	0.516*	0.0788	-7.6612
Yield/length of finger (cm)	0.879*	1.5902	-21.8230

4.2.7 Marginal analysis

Average return per Re. spent on irrigation water increased as water application increased from 1.0 LW/CPE increased during FBD to flowering treatment to 1.0 LW/CPE increased during flowering to harvest treatment (Table 47).

4.3 February versus June planting

February versus June planting is compared from common treatment observations and depicted in Table 48.

Table 47: Marginal analysis

Treat- ments	Inputs (water)	Yield incr- ease	Value of yield incr- ease	Cost of added water	Returns above irrig. cost	Return per Re. on last level of irrig.	Total irrig. applied		Total yield increase	Value (t/ha)(Rs'000)	Total return to irrig. water (Rs'000)	Average return per Re. spent on irrig. water (Rs)
							(mm)	Cost (Rs)				
I ₁	1769.7	33.56	32.03	884.85	31.15	36.20	1769.7	884.85	33.56	32.03	31.15	36.20
I ₂	1949.7	3.99	3.81	90.00	3.72	42.31	1949.7	974.85	37.55	35.84	34.87	36.77
I ₃	2144.8	-2.07	-1.98	97.55	1.88	20.26	2144.8	1072.40	35.48	33.87	32.79	31.58
I ₇	2210.6	6.88	6.57	32.90	6.53	199.61	2210.6	1105.30	42.36	40.43	39.33	36.58
I ₂	2411.5	1.31	1.25	100.45	1.15	12.44	2411.5	1205.75	43.67	41.68	40.48	34.57
I ₄	2492.9	0.92	0.88	40.70	0.84	21.57	2492.9	1246.45	44.59	42.56	41.32	34.15
I ₆	2531.9	1.42	1.36	19.50	1.34	69.49	2531.9	1265.95	46.01	43.92	42.65	34.69
I ₈	2732.7	4.17	3.98	100.40	3.88	39.64	2732.7	1366.35	50.18	47.90	46.53	35.05

Girth and height of pseudostem were more under February planting. Number of leaves and leaf area were more in June planting. Period for flowering, fruit development and crop duration were less under February planting.

Number of hands per bunch, fingers per hand and fingers per plant were higher under February planting.

Fresh and dry weight, fruit length and volume were more under February planting receiving irrigation at constant ratios. However increased ratios during developmental stages have increased the fresh and dry weight, fruit length and volume under June planting.

Yield was more in February planting. Reducing, non-reducing and total sugars per cent was more in June planting, but increased IW/CPE during FBD to harvest have reduced it compared to that in February planting.

Total SMD from 0-30 cm layer was more in June planting and 30-60 cm layer was less, compared to February planting. However 0-60 cm layer total SMD was more in June planting.

Daily SMD was more in February planting, from 30-60 cm and 0-60 cm layers. However 0-30 cm layer daily SMD was more in June planting.

Table 48: February versus June planting

Sr. No.	Observation	plt.	S_0	S_1^*	S_2^*	S_3^*	K_0	K_1
1	2	3	4	5	6	7	8	9
1	Girth	F	58.58	56.92	57.75	58.17	57.94	57.77
		J	45.50	45.90	47.00	47.80	46.55	47.70
2	Height	F	129.11	119.09	121.37	121.34	122.50	122.95
		J	106.70	115.30	109.50	117.80	112.33	114.13
3		F	11.26	10.23	11.09	11.21	10.28	11.61
		J	18.30	18.70	17.90	18.50	18.35	18.10
4	Leaf area	F	6.72	5.79	6.83	6.37	6.13	6.87
		J	7.04	7.52	7.05	7.68	7.32	7.79
5	Flower	F	332.50	329.00	328.50	322.00	330.00	326.00
		J	403.00	385.00	401.00	383.00	393.00	384.00
6	Fruit dev.	F	103.70	98.30	98.00	95.00	101.00	96.50
		J	128.00	125.00	123.00	121.00	124.25	116.00
7	Crop duration	F	436.20	427.70	428.50	417.00	431.00	423.70
		J	521.00	510.00	525.00	504.00	517.50	500.00
8	Hands/plant	F	7.63	6.93	8.15	7.84	7.41	7.87
		J	6.25	6.25	6.25	6.75	6.38	6.69
9	Fingers/hand	F	13.23	13.15	14.11	14.05	13.06	14.21
		J	12.25	12.65	13.29	13.58	12.94	14.93
10	Fingers/plant	F	102.50	93.33	113.97	111.86	98.47	112.38
		J	76.50	79.00	83.00	91.50	82.50	99.38

* Irrigation ratio 1.0 was increased during various phases by 0.2 and 0.4 in February and June planting; respectively.

Continued

Table 48 (continued)

1	2	3	4	5	6	7	8	9
11	Fresh weight	F	74.53	87.68	64.92	68.78	77.60	70.36
		J	70.30	75.90	79.00	85.90	77.78	68.03
12	Dry weight	F	15.32	16.02	13.66	13.00	14.62	14.48
		J	14.65	15.05	15.00	15.60	15.08	13.19
13	Fruit length	F	14.08	14.67	14.08	14.67	14.58	14.12
		J	11.10	11.40	11.95	12.40	11.71	13.09
14	Volume	F	93.95	99.23	83.67	82.07	90.36	89.10
		J	81.45	83.45	91.50	94.35	87.66	76.78
15	Yield (kg/plant)	F	8.40	8.61	8.49	8.14	8.02	8.79
		J	5.91	6.25	6.89	8.23	6.82	7.13
16	Yield/t/ha	F	37.34	38.27	37.75	36.09	35.62	39.10
		J	26.30	27.81	30.66	36.62	30.35	31.68
17	Reducing sugar (%)	F	9.17	9.20	9.19	9.08	9.16	9.15
		J	9.84	9.23	9.18	8.91	9.29	8.99
18	Non-reducing sugar (%)	F	8.36	8.17	8.14	8.04	8.24	8.11
		J	9.03	8.47	8.24	7.91	8.41	8.14
19	Total sugar (%)	F	17.53	17.37	17.33	17.12	17.40	17.26
		J	18.86	17.70	17.42	16.82	17.70	17.12
20	Total SMD 0-30 cm	F	737.03	742.23	734.00	731.14	740.73	731.10
		J	858.90	924.88	917.30	975.68	991.19	901.02
21	Total SMD 30-60 cm	F	442.16	432.92	428.06	431.84	439.97	427.51
		J	396.39	420.09	423.36	436.15	419.00	409.73
22	Total SMD 0-60 cm	F	1179.19	1175.16	1162.06	1162.98	1180.70	1158.98
		J	1255.29	1344.97	1340.66	1411.83	1338.19	1310.75
23	Daily SMD 0-30 cm	F	1.69	1.74	1.71	1.75	1.72	1.73
		J	1.62	1.81	1.75	1.94	1.78	1.80

Continued

Table 48 (continued)

1	2	3	4	5	6	7	8	9
24	Daily SMD 30-60 cm	F	1.01	1.01	1.00	1.04	1.02	1.01
		J	0.75	0.82	0.81	0.87	0.81	0.82
25	Daily SMD 0-60 cm	F	2.70	2.75	2.71	2.79	2.74	2.74
		J	2.37	2.63	2.56	2.81	2.59	2.62
26	Irrig. frequency	F	7-25	7-21	8-25	7-21		
		J	4-29	4-29	4-29	3-29		
27	Irrig. number	F	8+27	8+27	8+27	8+27		
		J	8+33	8+37	8+36	8+40		
28	Average irrig. interval	F	14	14	14	13		
		J	15	13	14	12		
29	Total CU	F	1790.2	1777.9	1769.9	1764.2	1786.2	1764.9
		J	2442.9	2525.0	2561.0	2686.5	2553.8	2525.2
30	Daily CU	F	4.10	4.16	4.13	4.23	4.14	4.17
		J	4.60	4.95	4.88	5.33	4.93	5.05
31	WU	F	1622.6	1622.6	1622.6	1622.6	1622.6	1622.6
		J	1769.7	2144.8	1949.7	2210.6	2018.7	1018.7
32	ETR	F	47.94	46.46	46.89	48.88	50.14	45.14
		J	92.89	90.79	83.53	73.36	84.15	79.71
33	CUE	F	20.86	21.53	21.33	20.46	19.94	22.15
		J	10.77	11.01	11.97	13.63	11.88	12.55
34	Marginal analysis	F	42.96	44.02	43.43	41.43		
		J	36.02	31.58	36.77	36.58		

February planting irrigation frequency ranged from 7-25 days and in June planting it ranged from 4-29 days. Number of irrigations were less in February planting. Irrigation interval was more in June than in February planting.

Total and daily CU, WU and ETR were more in June planting and CUE was less compared to that in February planting.

Returns per Re. spent on irrigation were higher in February planting than that in June planting.

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Chapter 5

DISCUSSION

Results obtained are discussed in this chapter.

Soil of the experimental area was clayey. The moisture holding capacity of soil was quite high. The mean weekly maximum and minimum temperatures were more during February planting compared to that during June planting. Morning relative humidity was high during February planting and evening relative humidity was more during June planting. The USA class 'A' pan and sunken screen pan evaporation were high during February planting. Wind velocity and bright sunshine hours were more during June planting. These meteorological parameters were within the optimum and tolerance limit of the banana crop as suggested by Doorenbos and Kassam, 1979.

Banana was planted during February and June. During February planting three IW/CPE ratios (0.6, 0.8 and 1.0) were tested by keeping them constant throughout the crop duration and by supplementing them by 0.2 IW/CPE during the three productive phases (from FBD to flowering, flowering to harvest and FBD to harvest). Kaoline a antitranspirant was tried against control. Supplemental irrigation during productive phases was given as water requirement during these phases was reported to have been more (Doorenbos and Kassam, 1979). On the basis of the results of the February planting, only two IW/CPE ratios

(1.0 and 1.4) were selected for the studies in the second planting. Besides keeping these two ratios constant throughout the crop duration period, these were supplemented by 0.4 IW/CPE during the three phases (from FBD to flowering, from flowering to harvest and from FBD to harvest). The increased IW/CPE ratio was made 0.4 in June planting, because during February planting the increased 0.2 IW/CPE ratio was not found to be very conspicuous in terms of water application and the effect. Antitranspirants viz. Kaoline and PMA, mulches viz. polythene and straw were also tried against control in the June planting.

5.1 Vegetative growth

The pseudostem girth and height, number of leaves per plant and leaf area per plant increased with higher IW/CPE ratio. Irrigation ratio increased during FBD to harvest also showed increase in these growth characters. FBD is a very active phase (210 days of crop duration) of the banana plant development and increased water application during this phase enhances the growth characteristics during the transition phase from vegetative to reproductive. Lahav and Kalmer (1986) have reported that higher class 'A' pan evaporation factors led to greater pseudostem height. Increase in the soil moisture level cause increase in growth characters (Krishnan and Shanmugavelu, 1979).

Polythene mulch induced more growth attributes compared to straw mulch and Kaoline or PMA. It is well known that the effects of polythene mulch are very positive, as they effectively control weeds, stop evaporation from ground, improve soil temperatures and microbial activities which collectively led to beneficial increase in growth characters (Bhattacharyya and Rao, 1985).

February planting induced more of pseudostem girth and height but less number of leaves and leaf area per plant compared to June planting. This may be due to high insolation in summer in February planting which may be helpful for good initial crop growth (establishment). The June planted crop establishes during lower insolation and high RH per cent which may be the cause for thinner and shorter pseudostem development.

Higher irrigation levels and growth characters appear to be coexistent and growth characters have shown positive correlation to yield. These results are supported by various workers viz. Jagirdar et al. (1963), Chen (1971), Melin and Marseault (1972), Doorenbos and Kassam (1979) and Holder and Gumbs (1983).

Maximum AGR_g and AGR_h were observed during FBD period in both plantings. Increased irrigation levels increased the AGR_g and AGR_h . Polythene mulch helped to

improve AGR_g and AGR_h . It is thus clear that banana crop required higher levels of irrigation to meet its water requirement during peak growth period.

5.2 Developmental study

Irrigation at higher IW/CPE ratios induced precocity in flowering, fruit filling and short crop duration. Similarly increased IW/CPE ratios during various productive phases also induced precocity. Polythene mulch induced early flowering harvesting and short duration. Water governs the major physiological role in plant development. It affects nutrient uptake, it helps in plant temperature regulation during unfavourable conditions etc. Any deficit in water would cause serious disturbances in the physiology of the plant, the deficit during floral differentiation, in particular was detrimental (Simmonds, 1966 and Turner, 1981).

February planting induced precocity in flowering, fruit filling and short crop duration as compared to June planting. Plants whose grand period of growth did not fall in the cool moist season of the year produced fruits earlier after flower emergence, due to a more rapid and constant rate of growth (Arscott et al., 1965). Phadnis and Gopalkrishna (1957) also recommended February planting as it gave early crop by reduction in developmental phases. 'Poyo' bananas under Ivory Coast conditions planted in May

established and floral differentiation took place earlier compared to October-November planted ones (Lassoudiere, 1974).

Number of hands per bunch, fingers per hand and fingers per bunch increased as irrigation ratio increased. Increasing the irrigation ratios during productive phases increased finger numbers. Polythene mulch also showed increase in the fruit number. Polythene mulch has manifold effects like control of weeds, moisture conservation etc. which help increase the nutrient availability to the plants and this in turn might have given more fruit production.

Fruits were influenced by irrigation ratios and their increase during various productive phases. Fresh and dry weight, length and volume increased as irrigation increased. Straw mulch induced heavier, longer and larger fruits compared to these induced by polythene mulch. This may be due to the ASM level increased to detrimental level under polythene mulch plus higher irrigation levels. February planting fruits were heavier, longer and larger compared to those produced in June planting. This may be related to the more sunshine hours available to the plants grown in February planting which help the plants to accumulate more photosynthate.

AGR_f and AGR_d were more during the later stage of fruit development i.e. 64 days onwards. Higher IW/CPE ratio induced higher AGR_f and AGR_d . Irrigation ratio increased during FBD to harvest recorded highest AGR_f and AGR_d . Polythene mulch treatment improved AGR. This may be due to the fact that higher moisture levels during early reproductive phase (from FBD to flowering) sets in a faster growth rate which on flowering continues to be higher during the entire fruit filling phase also.

RGR_f and RGR_d were initially higher than lowered and again increased in both plantings. Polythene mulch treatment improved RGR. Lassoudiere and Maubert (1971) working with 'Poyo' banana under Ivory Coast conditions recorded rapid increase in length and diameter of fruit during the first 30 days followed by slower growth till 90 days and thereafter length stopped to increase and diameter continued to increase.

5.3 Yield

Increase in yield was directly proportional to the increase in available soil moisture (ASM). ASM was increased by higher IW/CPE ratio, increased IW/CPE ratio during various productive phases and polythene mulch. Moreover all yield contributing attributes showed positive correlation with yield in the experiment. Similar observations were made by various workers viz.

Arscott et al. (1965), Teotia et al. (1971), Trochoulis (1971), Melin and Marscault (1972), Ghavami (1974), Manica et al. (1975), Kuruppnarechchi and Pain (1981) and Lahav and Kalmer (1980 and 1986).

February planting yielded higher than June planting when yields under 1.0 IW/CPE ratio in both the experiments were compared. This may be ascribed to the season effects i.e. February planting got summer for establishment, followed by humid and warmer rainy season and fruits developed during winter and matured at the commencement of summer. But June planting was established during rainy season, fruit bud formation occurred during winter, winter season caused delayed emergence and fruit developed during summer and matured in rainy season. Thus as pointed out by Phadnis and Gopalkrishna (1957), February was found to be better planting season. The works of Nagpal et al. (1958), Melin and Marseault (1972) and Lassoudiere (1974) also noted the similar seasonal effects.

5.4 Sugars in fruit

Reducing sugars were more than non-reducing sugars. Sugars depleted as available soil moisture (ASM) increased. ASM was increased by higher IW/CPE ratio, increasing IW/CPE ratio during FBD to harvest and polythene mulch treatments. Lower sugars noted under high irrigation levels may be due to high water absorption by plants, thereby

maintains high plant moisture content, so also the fruits. Hence more sugars per fruit but in a diluted form. Teatota et al. (1971) working on Musa cavendishii noted that 7.5 ha cm irrigation gave higher yield whereas 2.5 ha cm irrigation gave higher sugar (16.76 %), acidity (0.148 %) and TSS (20.8 %).

5.5 Moisture study

Total and daily SMD were more in 1.0 IW/CPE ratio treatment as well as in increased IW/CPE ratio during FBD to harvest treatment. Polythene mulch increased total SMD compared to straw mulch. Mulches depleted more soil moisture compared to antitranspirants. Daily SMD was high with straw mulch treatment. In February planting total SMD was high, while it was low in June planting. Layer-wise total and daily SMD showed varying trend. In February planting, the upper layer (0-30 cm) depleted 63 per cent moisture and lower layer (30-60 cm) depleted 37 per cent moisture, but in June planting the upper layer depleted 68 per cent moisture and lower layer depleted 32 per cent moisture. This layer-wise SMD per cent difference in two seasons may be due to the differential root system developed under the two seasons. It is well known that Kharif crops gave shallower and rabi crop gave deeper root system depending on moisture availability. In February the crop established in summer which might have

caused deeper and well distributed root development, but in June the higher SMD from upper layer may be due to more root activity in that layer which might have depleted more moisture from upper layer.

Total CU was high with higher levels of irrigation (1.0 and 1.4 IW/CPE) and were 1777.86 mm and 2840.93 mm for February and June plantings, respectively. According to Doorenbos and Kassam (1979) water requirement varied from 1200 mm in humids to 2200 mm in dry tropics per year. In the present investigation WU was 1622.6 mm in February and 2732.2 mm in June for entire crop duration. Lahav and Kalmar (1986) used class 'A' pan evaporation factors of 0.8, 1.0, 1.2 or 1.4, equivalent to 8450 to 14500 m³/ha annually and concluded that 1.4 factor led to greater pseudostem height, early flowering, more fruits per bunch and a small increase in bunch weight. CU ranged from 1024 mm under polythene cover at 60 per cent ASM depletion to 1560 mm under no cover treatment at 20 per cent ASM depletion (Bhattacharyya and Rao, 1985).

Consumptive use efficiency (CUE) was increased with increase in levels of irrigation i.e. higher IW/CPE ratio in combination with increased ratio during FBD to harvest and polythene mulch treatment. Thus CUE increased as the IW/CPE ratio increased. CUE was also increased under polythene mulch compared to straw mulch. WUE was reported

to be 2.5 to 4.0 kg/m³ for plant crop and 3.5 to 6 kg/m³ for ratoon crop in the banana growing regions of the world (Doorenbos and Kassam, 1979). According to Bhattacharyya and Rao (1985) WUE under soil covers (polythene) at low ASM depletion levels was increased.

Evapotranspiration ratio (ETR) was narrow under the 1.4 IW/CPE ratio and increased ratio during FBD to harvest and polythene mulch treatment combination. June planting showed narrower ETR compared to February planting.

Total number of irrigation required for February planting were 35 under the 1.0 IW/CPE ratio increased during FBD to harvest and for June planting were 57 under 1.4 IW/CPE ratio increased during FBD to harvest. Extrapolation of the results of February planting from 1 to 1.4 IW/CPE ratio indicated the total requirement of 49 irrigations. Hundi (1988) worked out in all 48 to 66 irrigations for the entire crop duration under Parbhani conditions depending on survey data of canal, lift and well irrigation.

Irrigation interval varied from 7 to 21 days in February planting and 2 to 23 days in June planting depending upon the season. In an irrigation trial in Pakistan, irrigation interval of 6 days was better compared to 10 and 14 days for 'Basrai' banana (Jagirdar et al., 1963).

Chapter 6

SUMMARY

The experiment "Water requirement of 'Basrai' banana (Musa paradisiaca L.) " was undertaken in two planting seasons viz. February and June. February planting was done on 21st February 1982 at the Agriculture School Farm, Parbhani. June planting was done on 1st June 1983 at the Department of Horticulture Farm, Parbhani.

February planted experiment was laid out in factorial randomized block design with three replications. The three IW/CPE ratios (0.6, 0.8 and 1.0) were tested by keeping them constant throughout the crop duration and by supplementing them by 0.2 IW/CPE during the three productive phases (from FBD to flowering, from flowering to harvest and from FBD to harvest). Kaoline a antitranspirant was tried against control. Thus in all 24 treatment combinations were tried.

June planted experiment was laid out in split-plot design. On the basis of the results of the first experiment, only two IW/CPE ratios (1.0 and 1.4) were selected. Besides keeping these two ratios constant throughout the crop duration period, these were supplemented by 0.4 IW/CPE during the three productive phase (from FBD to flowering, from flowering to harvest

and from FBD to harvest). Thus in all 8 treatment combinations were tried in the main plot. Anti-transpirants viz. PMA and Kaoline, and mulches viz. polythene and straw were compared with control in sub-plots.

Initial 8 irrigations of 30 mm depth (crop establishment period) were given and thereafter each irrigation was of 60 mm depth.

Summary of the results of experiments are as below.

In February planting, 1.0 IW/CPE ratio gave maximum pseudostem girth and height, number of leaves and leaf area per plant, AGR_g and AGR_h . Flowering, fruit filling and crop harvesting were earlier in 1.0 IW/CPE ratio. More number of hands per bunch, fingers per hand and fingers per bunch were induced by 1.0 IW/CPE ratio. Heavier, longer and larger fruits were recorded in 1.0 IW/CPE ratio. AGR_f , AGR_d , RGR_f and RGR_d were high under 1.0 IW/CPE ratio. Yield was maximum under 1.0 IW/CPE ratio. Reducing, non-reducing and total sugars per cent were low under 1.0 IW/CPE ratio and high under 0.6 IW/CPE ratio. Layer-wise total and daily SMD were more in 1.0 IW/CPE ratio. Treatment 1.0 IW/CPE required more number of irrigations.

Increased IW/CPE ratio during FBD to harvest showed precocity in flowering, fruit filling and crop duration. Number of fingers were more in treatments receiving increased IW/CPE ratio during various productive phases. Heavier and larger fruits were induced by IW/CPE ratio kept constant during the entire crop duration. Longer fruits were induced by IW/CPE ratio increased during FBD to harvest. IW/CPE ratio kept constant during the entire crop duration gave maximum yield, increased reducing, non-reducing and total sugars and increased total CU. Total and daily SMD, daily CU, water used and CUE were high and ETR was narrow under IW/CPE ratio increased during FBD to harvest.

Kaoline treatment induced precocity in flowering, fruit filling and short crop duration. Fresh weight of fruit was reduced but dry weight and volume of fruit were increased by Kaoline treatment. Yield was improved by Kaoline application. Total SMD and total CU were reduced, daily CU, CUE were increased and ETR was narrow under Kaoline treatment.

The highest yield (9.79 kg per plant or 43.57 tonnes ✓ per hectare) was obtained when plants received 1.0 IW/CPE ratio and the increased ratio (0.4 IW/CPE) during FBD to flowering and Kaoline treatment. This treatment

combination required 35 irrigations at 7 to 21 days interval depending upon the season. The total CU, daily CU, WU, CUE and ETR were 1777.86 mm, 4.15 mm, 1622.6 mm, 21.53 kg/mm and 46.46 mm/tonne/ha, respectively. Return of Rs 44.02 per Re. spent on irrigation water was obtained.

In June planting the 1.4 IW/CPE ratio increased during FBD to harvest induced maximum pseudostem girth and height, number of leaves and leaf area per plant and AGR_g . AGR_h was more under the 1.4 IW/CPE ratio increased during FBD to flowering treatment. Precocity in flowering, fruit filling and short crop duration were induced by 1.4 IW/CPE ratio increased during FBD to harvest treatment. Number of hands per bunch, fingers per hand and fingers per bunch were more under the 1.4 IW/CPE ratio increased during FBD to harvest treatment. Heavier, longer and larger fruits were induced by the 1.4 IW/CPE ratio increased during FBD to harvest treatment, similarly higher values of AGR_f , AGR_d , RGR_f and RGR_d were noted by the same treatment combination. The 1.4 IW/CPE ratio increased during FBD to harvest recorded highest yield, lower reducing, non-reducing and total sugars, higher total and daily SMD, more number of irrigations at shorter intervals, high total CU, daily CU, WU and CUE and narrow ETR.

Polythene mulch treatment induced more pseudostem girth and height, number of leaves and leaf area per plant, and AGR_g . AGR_h was more under straw mulch treatment. Polythene mulch induced precocity in flowering, fruit filling and short crop duration. Number of hands per bunch, fingers per hand and fingers per bunch were more under polythene mulch treatment. Straw mulch treatment produced heavier and larger fruits but polythene mulch treatment gave longer fruits. AGR_f , AGR_d , RGR_f and RGR_d were high under polythene mulch treatment. Increased yield was recorded in polythene mulch treatment. Reducing, non-reducing and total sugars were high under control and low under polythene mulch treatment. Polythene mulch treatment showed reduction in total SMD and total CU, but daily SMD and daily CU, CUE remained high and ETR narrow under polythene mulch.

The highest yield (13.84 kg per plant or 61.59 tonnes per hectare) was obtained in treatment combination of the 1.4 IW/CPE ratio increased during FBD to harvest and the polythene mulch. Same treatment required 57 number of irrigations at 2 to 23 days interval depending upon season. The total CU, daily CU, WU, CUE and ETR were 2840.93 mm, 7.52 mm, 2732.2 mm, 21.68 kg/mm and 46.13 mm/tonne/ha, respectively. Return of Rs 35.05 per Re. spent on irrigation water was obtained.

February planting induced thicker and taller pseudostems; less number of leaves, leaf area per plant and crop duration ; precocity in flowering and fruit filling; more number of hands per bunch, fingers per hand and fingers per bunch; heavier, longer and thicker fruits with lower reducing, non-reducing and total sugars; higher yield per plant; lower total SMD and higher daily SMD; less number of irrigations; low CU and WU; high CUE and narrow ETR; and higher returns per Re. spent on irrigation water compared to that induced by June planting.

Findings of this experimentation are concluded below:

- 1) February was a better season than June as it gave higher yield, flowered earlier, crop duration was less and its required less number of irrigations and total water.
- 2) 1.4 IW/CPE ratio was most beneficial.
- 3) Increased IW/CPE during FBD to harvest improved S₂ yield and fruit size.
- 4) Polythene mulch was superior to straw mulch; mulches were better than antitranspirants in conserving soil moisture and reducing CU.

- 5) For June planting 57 irrigations were required at 2 to 23 days interval and for February planting 35 irrigations were required at 7 to 21 days interval (these requirements were at different IW/CPE ratios i.e. 1.4 in June and 1.0 in February). Water requirement was 1622.6 mm for February planting and 2732.2 mm for June planting.

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Appendix I Mean weekly Meteorological data for the experimental period
(8th week of 1982 to 39th week of 1984)

Meteorological week, year	Temperature °C		Relative humidity per cent		USA Class A pan E ₀ (mm)		Sunken screen open pan E ₀ (mm)	Wind velocity (Km/hr)	Bright sun shine (hr/day)	Precep- itation (mm)	Rainy days
	Maximum	Minimum	A.M.	P.M.	A.M.	P.M.					
1	2	3	4	5	6	7	8	9	10	11	
8 1982	34.2	15.3	47.3	17.5	7.9	3.4	6.5	10.8	-	-	
9	35.1	16.8	48.9	15.1	9.7	4.1	7.4	11.6	-	-	
10	34.9	14.6	39.0	20.4	9.7	4.1	8.3	11.5	-	-	
11	36.9	17.0	37.3	15.1	10.7	4.6	7.2	11.6	-	-	
12	38.4	20.4	41.7	15.1	10.6	4.6	9.1	10.6	-	-	
13	38.2	19.0	36.0	15.1	12.5	5.4	7.5	11.7	-	-	
14	40.2	20.3	41.0	12.7	13.6	5.8	9.2	12.0	-	-	
15	39.5	22.2	44.0	18.0	12.4	6.7	9.0	11.2	7.0	1	
16	38.6	21.5	34.4	15.5	12.2	7.2	8.4	10.2	-	-	
17	38.1	21.6	49.1	21.9	12.4	6.2	10.0	10.9	6.3	1	
18	34.5	24.5	47.5	19.0	12.6	6.8	10.3	9.7	8.2	1	
19	39.5	23.9	45.2	19.1	13.3	7.6	10.5	11.9	-	-	
20	39.4	23.9	59.7	29.5	12.8	6.3	10.8	10.9	3.5	2	
21	40.2	26.3	46.7	19.7	12.5	6.8	12.7	7.9	-	-	
22	38.1	24.8	63.0	32.4	11.4	5.7	18.5	5.6	28.2	1	
23	40.4	27.2	54.0	24.1	15.2	8.3	17.2	8.1	-	-	
24	37.5	25.3	69.0	37.0	11.2	6.5	16.4	8.5	3.2	2	
25	33.0	23.2	86.0	57.0	7.6	6.2	18.1	6.9	37.6	4	
26	36.7	23.8	71.0	32.0	12.3	8.0	18.1	8.9	4.8	1	
27	36.1	24.0	70.3	36.0	11.3	5.9	15.6	11.2	7.8	2	

Cont....

	1	2	3	4	5	6	7	8	9	10	11
28	1982	31.7	22.3	89.7	61.8	5.5	3.3	13.7	5.4	67.1	6
29		32.8	23.1	83.7	50.2	5.7	4.0	16.4	5.0	26.4	4
30		32.6	23.0	82.0	55.2	5.9	4.1	17.8	3.2	25.9	3
31		32.4	22.6	82.0	50.3	6.1	3.8	13.6	7.8	9.2	2
32		31.9	22.7	79.8	53.7	4.8	4.1	11.2	2.0	7.5	3
33		30.2	23.0	87.0	62.0	4.4	3.6	15.1	1.7	35.4	5
34		30.7	22.1	84.7	55.0	5.4	2.7	15.9	5.1	4.0	3
35		32.7	21.9	80.0	43.4	7.8	3.6	14.1	8.2	-	-
36		32.9	22.9	81.0	51.0	7.3	4.4	12.9	4.9	28.4	2
37		32.2	22.2	92.0	64.0	4.0	2.5	9.5	4.9	105.5	6
38		31.6	22.5	89.0	70.0	4.6	2.7	5.5	8.9	34.1	3
39		31.2	21.7	91.0	59.0	4.9	3.4	4.9	8.7	61.8	1
40		34.4	18.7	75.0	26.0	6.1	4.0	4.4	11.3	-	-
41		35.1	18.3	80.0	27.0	6.3	2.7	3.6	10.8	3.1	2
42		32.0	19.9	78.0	41.0	7.0	3.2	8.5	8.6	-	-
43		30.7	20.2	89.0	57.0	4.6	1.7	4.9	7.2	15.6	2
44		31.6	17.6	80.0	39.0	6.6	3.3	7.0	8.7	-	-
45		29.1	20.5	92.0	58.0	3.9	1.5	11.4	5.9	36.4	4
46		30.5	15.0	85.0	32.1	5.6	3.2	4.6	11.6	-	-
47		30.3	13.7	83.0	33.0	5.4	2.4	4.3	9.5	-	-
48		30.8	15.1	81.0	29.0	4.7	2.6	3.2	10.6	-	-
49		30.3	11.0	78.0	26.0	5.2	2.8	3.3	10.9	-	-
50		30.0	13.5	79.0	31.0	5.2	2.8	3.6	8.7	-	-
51		30.7	12.1	80.0	29.0	4.9	2.6	2.8	10.5	-	-
52		30.1	11.2	73.0	25.0	5.1	2.7	4.3	10.7	-	-
1	1983	28.5	6.0	62.0	16.0	4.9	2.7	2.7	10.9	-	-
2		30.5	9.7	63.0	26.0	5.0	2.8	3.6	10.5	-	-
3		31.1	10.9	68.0	25.0	5.4	2.5	3.0	10.8	-	-
4		30.9	15.1	70.0	28.0	6.3	2.5	5.1	9.4	-	-

cont....

1	2	3	4	5	6	7	8	9	10	11
5	1983	29.8	10.0	61.0	21.0	6.6	3.1	5.1	10.9	-
6		30.5	14.1	60.0	25.0	6.8	3.0	5.8	10.5	-
7		34.2	16.2	54.0	21.0	7.7	3.0	5.1	11.0	-
8		33.6	13.1	45.0	16.0	8.3	3.6	5.6	11.5	-
9		34.6	14.9	44.0	16.0	9.0	3.7	5.2	11.4	-
10		36.2	20.0	57.0	24.0	9.9	3.9	6.9	11.1	-
11		37.9	17.7	40.0	13.0	11.6	4.6	7.0	11.4	-
12		35.9	15.4	37.0	14.0	11.2	4.5	7.6	11.6	-
13		37.5	17.3	34.7	17.0	11.6	4.7	7.6	11.4	-
14		38.8	21.2	39.0	18.0	12.3	4.6	7.8	10.7	-
15		38.5	20.0	41.0	14.0	13.3	5.3	8.4	10.1	-
16		38.6	21.3	36.0	18.0	13.4	5.2	9.7	10.0	-
17		42.1	22.9	35.0	19.0	14.1	6.3	7.5	12.0	-
18		42.9	24.8	43.4	18.7	17.3	9.0	8.7	11.9	-
19		42.2	26.8	38.5	19.1	15.9	8.7	10.8	9.9	-
20		41.5	28.2	41.5	20.4	15.8	7.9	11.1	11.3	-
21		42.8	28.3	44.2	18.7	18.7	9.0	13.5	11.0	-
22		43.6	29.3	42.0	13.8	20.4	8.8	18.4	11.4	-
23		40.9	26.3	65.5	24.4	17.6	9.5	19.3	9.3	-
24		39.8	21.1	73.0	35.0	10.0	8.9	11.3	11.3	3
25		37.6	18.1	70.3	35.0	13.1	7.5	20.9	4.3	1
26		34.8	16.4	88.0	54.0	6.8	5.2	14.4	6.2	4
27		36.2	16.1	72.0	36.0	4.3	4.4	17.7	5.2	-
28		33.0	15.0	92.0	66.0	4.3	2.3	9.2	4.5	6
29		32.0	15.0	87.0	62.0	4.6	3.8	13.5	4.5	6
30		32.2	21.9	89.0	57.0	4.3	0.9	9.5	3.5	4
31		30.7	22.6	91.0	64.1	6.2	1.1	9.6	3.8	5
32		29.3	22.5	91.2	32.7	3.8	2.1	14.5	3.8	6
33		29.2	22.5	89.4	72.1	3.5	3.3	13.6	4.2	6

Cont.....

1	2	3	4	5	6	7	8	9	10	11
34	1983	32.1	23.3	87.0	52.0	6.3	4.3	11.3	10.3	-
35		31.1	22.6	88.0	66.0	5.1	4.8	10.6	3.4	5
36		29.2	22.0	92.0	71.1	3.8	2.4	10.2	2.2	4
37		29.8	22.0	94.0	76.0	3.4	2.2	8.0	3.3	4
38		30.6	22.6	92.0	68.0	4.4	3.0	7.8	6.9	2
39		29.7	21.8	95.0	75.0	3.2	2.3	6.1	4.6	6
40		29.9	21.5	90.0	67.0	5.4	2.2	12.8	4.6	4
41		30.9	21.5	91.0	53.0	4.3	2.0	6.1	6.2	-
42		31.8	18.5	84.0	39.0	5.5	1.5	5.0	4.9	-
43		30.7	15.1	69.0	26.0	7.3	2.3	6.7	10.4	-
44		30.2	17.7	70.0	45.0	6.0	1.7	5.4	8.8	1
45		30.2	11.3	68.0	22.0	6.3	3.9	4.9	11.2	-
46		29.2	8.9	67.0	19.0	5.8	3.7	1.2	11.2	-
47		29.7	9.3	65.0	21.0	5.8	3.3	5.5	11.1	-
48		23.4	14.8	73.0	42.7	4.7	3.2	6.0	6.9	-
49		27.6	10.6	73.8	27.0	5.1	3.6	6.7	10.1	-
50		28.3	12.2	79.0	36.0	4.4	4.4	18.2	9.8	-
51		28.6	11.2	70.4	27.2	5.2	4.2	5.9	9.7	-
52		26.5	13.6	84.3	45.8	3.3	2.7	5.1	8.4	1
1	1984	28.0	16.3	88.5	47.2	6.2	1.2	6.0	8.2	-
2		29.4	15.2	83.0	32.0	5.3	1.8	5.5	9.3	-
3		30.0	15.5	66.5	22.7	4.5	2.3	2.8	10.8	-
4		31.5	12.9	61.0	24.8	5.7	2.1	3.5	10.6	-
5		33.0	16.6	68.0	26.2	7.1	3.0	5.3	10.7	-
6		31.8	16.6	82.0	35.0	5.6	4.5	5.0	13.2	3
7		23.8	16.6	83.0	43.7	4.8	4.0	6.0	7.8	2
8		31.4	13.5	62.0	26.5	7.9	6.2	5.5	11.1	-
9		32.7	11.6	43.5	12.1	10.0	5.5	7.3	13.1	-
10		36.2	17.6	41.2	14.4	8.8	3.7	5.3	10.7	-

Cont....

	1	2	3	4	5	6	7	8	9	10	11
11	38.5	18.7	34.1	10.0	9.8	4.6	5.4	10.9	-	-	-
12	38.8	18.5	32.7	6.7	11.0	4.9	6.0	11.0	-	-	-
13	30.8	23.1	31.6	13.3	11.6	4.9	5.8	8.1	-	-	-
14	41.3	24.2	33.2	12.0	13.0	6.4	6.6	7.2	-	-	-
15	37.8	21.9	38.0	16.0	11.8	5.8	13.0	12.0	-	-	-
16	41.2	23.6	25.8	12.0	13.7	8.2	11.1	12.1	-	-	-
17	40.9	22.7	39.0	10.0	14.0	8.5	12.0	11.6	-	-	-
18	42.2	24.2	32.0	13.0	13.1	9.3	13.1	12.1	-	-	-
19	43.5	24.4	27.1	10.0	15.5	9.2	12.3	12.5	-	-	-
20	44.2	26.6	27.0	11.0	16.8	8.3	17.4	12.5	-	-	-
21	44.7	26.3	34.0	13.0	19.9	9.0	15.3	12.0	-	-	-
22	42.0	27.3	46.0	18.0	19.0	9.9	19.9	10.5	-	-	-
23	38.8	25.1	72.4	38.8	8.1	6.0	13.5	5.6	28.4	4	4
24	34.0	24.6	80.0	55.0	5.0	3.2	12.7	3.8	80.4	4	4
25	35.4	24.4	69.0	38.0	11.4	8.9	23.2	9.0	-	-	-
26	35.0	24.0	73.0	45.0	10.3	7.3	17.5	6.3	14.8	2	2
27	32.3	22.9	83.1	55.9	5.7	3.7	13.6	5.1	28.0	3	3
28	34.1	23.1	82.1	53.0	5.8	5.1	10.6	6.7	55.0	4	4
29	29.9	22.4	86.0	61.0	3.7	2.6	13.3	4.0	26.2	4	4
30	33.7	25.5	76.5	46.2	6.9	4.3	13.8	5.7	5.4	1	1
31	29.4	22.3	83.0	64.0	4.5	3.2	13.2	3.0	71.9	3	3
32	31.1	22.0	82.0	57.0	5.4	3.8	14.3	4.3	6.8	2	2
33	32.0	23.6	77.0	54.0	6.7	4.7	16.2	3.5	-	-	-
34	33.1	22.2	78.0	44.0	7.7	5.4	11.8	7.6	-	-	-
35	31.4	22.5	73.0	52.0	5.6	4.9	13.6	3.7	3.4	1	1
36	32.2	21.5	75.0	40.0	8.2	6.4	11.1	6.3	-	-	-
37	30.7	21.5	91.0	7.0	3.6	2.5	9.3	4.3	74.6	6	6
38	33.5	21.5	85.0	45.0	5.4	3.8	5.2	8.1	-	-	-
39	33.0	21.2	91.0	52.0	4.7	3.3	5.3	9.5	25.2	3	3

Appendix II Daily Cumulative pan evaporation (CPE) and total cumulative pan evaporation measured from Sunken screen pan evaporimeter (E_0) during experimental period of February planting.

Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0
1.3.82	4.3	29.9	1.4.82	5.0	174.0	1.5.82	7.6	369.7	2	6.1	375.8
2	4.4	34.3	2	6.3	180.3	3	4.9	380.7	3	6.4	397.1
3	4.7	39.0	3	5.8	186.1	4	8.2	395.3	4	7.9	403.2
4	4.1	43.1	4	6.0	191.5	5	7.9	411.1	5	7.8	418.9 ^{MT}
5	4.1	47.2	5	5.5	203.0	6	7.3	426.2	6	7.1	433.3
6	3.8	51.0	6	5.8	208.8	7	7.2	440.5	7	7.3	447.8
7	2.8	53.8	7	5.8	214.6	8	8.6	456.4	8	7.9	464.3
8	4.0	57.8	8	5.8	220.9	9	7.1	471.4	9	6.8	478.2
9	4.7	62.5	9	6.3	227.3	10	6.6	484.8	10	2.4	487.2
10	4.8	67.3	10	6.4	234.5	11	6.6	493.8	11	6.6	493.8
11	4.5	71.8	11	7.2	241.4	12	6.5	500.3	12	6.5	506.7
12	4.6	76.4	12	6.9	248.9	13	6.4	513.6	13	6.9	513.6
13	4.9	81.3	13	7.5	253.1	14	8.1	521.7	14	8.1	521.7
14	5.5	86.8	14	4.2	259.9	15	7.0	528.7	15	7.0	528.7
15	4.1	90.9	15	8.4	261.5	16	3.6	532.3	16	3.6	532.3
16	4.5	95.4	16	8.4	269.9	17	7.9	540.2	17	7.9	540.2
17	4.2	99.6	17	9.1	278.0	18	7.8	548.0	18	7.8	548.0
18	4.4	104.0	18	9.2	286.2	19	7.3	555.3	19	7.3	555.3
19	4.5	108.5	19	8.4	294.6	20	5.5	563.8	20	5.5	563.8
20	4.4	112.9	20	7.1	301.7	21	2.2	563.0	21	2.2	563.0
21.2.82	0	117.5	21	6.4	308.1	22	3.6	566.6	22	3.6	566.6
22	3.6	121.7	22	3.9	312.0	23	3.6	570.2	23	3.6	570.2
23	3.8	126.7	23	4.1	316.1	24	3.7	573.9	24	3.7	573.9
24	3.6	131.4	24	4.2	320.3	25	4.0	577.9	25	4.0	577.9
25	3.4	136.2	25	3.0	323.3	26	4.0	581.9	26	4.0	581.9
26	3.7	141.1	26	7.1	335.4	27	4.0	585.9	27	4.0	585.9
27	3.7	145.9	27	6.6	342.0	28	4.0	589.9	28	4.0	589.9
28	4.0	151.3	28	7.0	349.0	29	4.0	593.9	29	4.0	593.9
29	5.9	157.2	29	6.6	355.6	30	4.0	597.9	30	4.0	597.9
30	6.1	163.3	30	6.5	362.1	31	4.0	601.9	31	4.0	601.9
31	5.7	169.0	31	6.5	368.6						

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Date	Daily E_0	Total E_0	Data	Daily E_0	Total E_0
1.6.83	9.6	2129.8	1.7.83	4.1	2372.4
2	9.0	2137.8	2	4.0	2376.4
3	9.8	2147.6	3	4.0	2380.4
4	10.0	2157.6	4	4.0	2384.4
5	10.0	2167.6	5	5.5	2389.9
6	10.3	2177.9	6	5.6	2395.5
7	10.2	2188.1	7	5.6	2401.1
8	9.0	2197.1	8	1.9	2403.0
9	8.5	2205.6	9	1.8	2404.8
10	9.4	2214.0	10	1.8	2406.6
11	10.0	2224.00	11	1.8	2408.4
12	10.5	2234.5	12	1.0	2409.4
13	9.0	2243.5	13	0.9	2410.3
14	9.0	2252.5	14	4.9	2415.2
15	9.3	2261.8	15	4.2	2419.4
16	10.8	2272.6	16	2.5	2421.9
17	10.3	2283.5	17	4.5	2426.4
18	8.2	2291.7	18	5.0	2431.4
19	7.0	2298.7	19	5.0	2436.4
20	7.2	2305.9	20	4.1	2440.5
21	7.4	2313.3	21	3.6	2444.1
22	8.1	2321.4	22	2.0	2446.1
23	8.0	2329.4	23	1.0	2447.1
24	6.5	2335.9	24	0.8	2447.9
25	7.0	2342.9	25	0.9	2448.8
26	6.2	2349.1	26	0.6	2449.4
27	5.1	2354.2	27	0.9	2450.3
28	5.4	2359.6	28	0.9	2451.2
29	4.2	2363.8	29	1.0	2452.2
30	4.5	2368.3	30	1.0	2453.2
			31	1.0	2454.2

Appendix III Daily Cumulative pan evaporation (CPE) and total Cumulative pan evaporation measured from Sunken screen pan evaporimeter (E_0) during experimental period of June planting.

Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0	Date	Daily E_0	Total E_0
1.6.83	0	0	1.7.83	4.1	243.6	1.8.83	1.0	326.4	1.9.83	1.4	430.9
2	9.0	9.0	2	4.0	247.6	2	1.1	327.5	2	1.4	432.3
3	9.8	18.8	3	4.0	251.6	3	1.2	328.7	3	1.4	433.7
4	10.0	28.8	4	4.0	255.6	4	1.2	329.9	4	1.4	435.1
5	10.0	38.8	5	5.5	261.1	5	0.9	330.8	5	2.4	437.5
6	10.3	49.1	6	5.6	266.7	6	1.6	332.4	6	3.1	440.6
7	10.2	59.3	7	5.6	272.3	7	1.1	333.5	7	3.2	443.8
8	9.0	69.3	8	1.9	274.2	8	1.0	334.5	8	2.1	445.9
9	8.5	76.8	9	1.8	276.0	9	3.4	337.9	9	3.1	449.0
10	8.4	85.2	10	1.8	277.8	10	4.1	342.0	10	2.8	451.8
11	10.0	95.2	11	1.8	279.6	11	2.8	344.8	11	3.	454.8
12	10.5	105.7	12	1.0	280.6	12	0.8	345.6	12	3.1	457.9
13	9.0	114.7	13	0.9	281.5	13	2.8	348.4	13	1.0	458.9
14	9.0	123.7	14	4.9	286.4	14	3.3	351.7	14	1.5	460.4
15	9.3	133.0	15	4.2	290.6	15	4.5	356.2	15	2.7	463.1
16	10.8	143.8	16	2.5	293.1	16	4.1	360.3	16	1.2	464.3
17	10.9	154.7	17	4.5	297.6	17	3.3	363.6	17	1.9	466.2
18	8.2	162.9	18	5.0	302.6	18	2.0	365.6	18	2.2	468.4
19	7.0	169.9	19	5.0	307.6	19	3.2	368.8	19	1.0	469.4
20	7.2	177.1	20	4.1	311.7	20	3.1	371.9	20	4.1	473.5
21	7.4	184.5	21	3.6	315.3	21	3.7	375.6	21	4.5	478.0
22	8.1	192.6	22	2.0	317.3	22	4.5	380.1	22	4.2	482.2
23	9.0	200.6	23	1.0	319.3	23	4.4	394.5	23	3.0	485.2
24	6.5	207.1	24	0.8	319.1	24	4.5	389.0	24	2.8	488.0
25	7.0	214.1	25	0.9	320.0	25	4.9	393.9	25	3.0	491.0
26	6.2	220.3	26	0.6	320.6	26	4.9	399.8	26	3.1	494.1
27	5.1	225.4	27	0.9	321.5	27	5.3	404.1	27	3.5	497.6 ^{approx}
28	5.4	230.8	28	0.9	322.4	28	6.6	410.7	28	1.0	498.6
29	4.2	235.0	29	1.0	323.4	29	6.8	417.5	29	1.4	500.0
30	4.5	239.5	30	1.5	324.4	30	6.9	424.4	30	1.2	501.2
			31	1.5	325.4	31	5.1	429.5			

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Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀
1.10.83	3.3	504.5	1.11.83	1.0	563.1	1.12.83	3.3	664.4	1.1.84	1.6	777.0
2	2.0	506.5	2	1.2	564.3	2	3.5	667.9	2	1.1	779.1
3	1.8	508.3	3	1.1	565.4	3	3.2	671.1	3	1.1	779.2
4	3.3	511.6	4	4.3	569.7	4	3.4	674.5	4	1.1	780.3
5	2.1	513.7	5	4.9	574.5	5	3.2	677.7	5	1.1	781.4
6	1.9	515.6	6	4.9	579.4	6	3.3	681.0	6	1.1	782.5
7	1.1	516.7	7	4.9	584.2	7	3.4	684.4	7	1.2	783.7
8	1.0	517.7	8	4.2	588.4	8	4.0	688.4	8	0.8	784.5
9	1.8	519.5	9	2.9	591.3	9	4.9	693.3	9	0.8	785.3
10	2.3	522.3	10	2.7	594.0	10	5.2	698.5	10	2.2	787.5
11	2.2	524.5	11	2.8	596.8	11	5.5	704.0	11	2.2	789.7
12	2.2	526.7	12	2.8	599.6	12	5.7	709.7	12	2.1	791.9
13	2.1	528.8	13	2.3	601.9	13	3.8	713.5	13	2.2	794.1
14	2.0	530.8	14	3.5	605.4	14	2.9	716.4	14	2.2	796.3
15	1.2	532.0	15	3.9	609.3	15	3.8	720.2	15	2.2	798.5
16	1.2	533.2	16	4.5	613.8	16	3.9	724.1	16	2.2	800.7
17	1.2	534.4	17	4.4	618.2	17	4.2	728.3	17	2.2	802.9
18	1.5	535.9	18	4.2	622.4	18	4.8	733.1	18	2.5	805.4
19	1.5	537.4	19	4.0	626.4	19	3.8	736.9	19	2.6	808.0
20	1.9	539.3	20	3.2	629.6	20	3.8	740.7	20	2.2	810.2
21	2.1	541.4	21	3.0	632.6	21	4.6	745.3	21	2.2	812.4
22	2.5	543.9	22	2.8	635.4	22	3.6	748.9	22	2.3	814.7
23	2.7	546.6	23	3.0	638.4	23	4.6	753.5	23	2.3	817.0
24	2.8	549.4	24	3.4	541.8	24	3.7	757.2	24	1.8	818.8
25	2.7	552.1	25	3.6	645.4	25	3.8	761.0	25	1.8	820.6
26	2.1	554.2	26	3.0	648.4	26	1.6	762.6	26	1.8	822.4
27	2.0	556.2	27	3.0	651.4	27	1.8	764.4	27	1.8	824.2
28	1.6	557.8	28	3.0	654.4	28	3.1	767.5	28	2.6	826.8
29	1.6	559.4	29	3.4	657.8	29	2.7	770.2	29	2.6	829.4
30	1.4	560.8	30	3.3	661.1	30	2.5	772.7	30	2.6	832.0
31	1.3	562.1	31			31	2.7	775.4	31	2.6	834.6

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Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀
1.2.84	3.2	837.8	1.3.94	4.6	982.1	1.4.94	6.2	1120.1	1.5.	10.0	1342.5
2	3.2	841.0	2	3.3	985.9	2	6.2	1126.3	2	10.0	1352.5
3	3.2	844.2	3	3.9	999.9	3	6.6	1132.9	3	8.0	1360.5
4	3.5	847.5	4	4.0	993.8	4	7.0	1137.9	4	8.6	1369.1
5	5.7	853.4	5	4.0	997.8	5	6.6	1146.5	5	8.6	1377.7
6	4.9	858.3	6	3.8	1001.6	6	7.6	1154.1	6	10.0	1387.7
7	6.1	864.4	7	3.8	1005.4	7	5.5	1159.6	7	10.0	1397.7
8	4.0	868.4	8	3.7	1.09.1	8	5.5	1165.1	8	8.0	1405.7
9	4.1	872.5	9	3.4	1012.5	9	5.0	1170.1	9	9.3	1415.0
10	3.5	876.0	10	3.4	1015.9	10	5.0	1175.1	10	9.3	1424.3
11	2.9	879.9	11	3.5	1019.4	11	6.6	1181.7	11	9.3	1433.6
12	4.0	892.9	12	3.8	1023.2	12	6.3	1188.0	12	9.3	1442.9
13	4.2	887.1	13	3.8	1027.0	13	5.6	1193.6	13	9.3	1452.2
14	1.8	888.9	14	4.6	1031.6	14	6.6	1200.2	14	9.3	1461.5
15	3.3	892.2	15	5.0	1036.6	15	5.7	1205.9	15	10.0	1471.5
16	4.5	896.7	16	4.8	1042.4	16	5.8	1211.7	16	10.0	1481.5
17	4.6	901.3	17	5.3	1046.7	17	5.7	1217.4	17	9.3	1490.8
18	5.3	906.6	18	5.0	1051.7	18	7.3	1224.7	18	6.6	1497.4
19	5.4	912.0	19	5.1	1056.8	19	8.6	1233.3	19	6.6	1504.0
20	6.4	919.4	20	4.8	1061.6	20	10.0	1243.3	20	6.6	1510.6
21	5.9	924.3	21	4.8	1066.4	21	10.0	1253.3	21	10.9	1521.5
22	6.1	930.4	22	5.1	1071.5	22	10.0	1263.3	22	13.0	1534.5
23	6.6	937.0	23	5.1	1076.6	23	10.0	1273.3	23	13.9	1548.4
24	6.8	943.8	24	4.5	1081.1	24	7.6	1280.9	24	12.9	1561.3
25	6.4	950.2	25	5.0	1086.1	25	7.3	1289.2	25	13.0	1574.3
26	6.5	956.7	26	5.1	1091.2	26	8.0	1296.2	26	13.0	1587.3
27	6.5	963.2	27	5.1	1096.3	27	8.0	1304.2	27	12.9	1600.2
28	7.2	970.4	28	5.1	1101.4	28	9.3	1312.5	28	13.8	1614.0
29	7.1	977.5	29	3.6	1105.0	29	10.0	1322.5	29	15.4	1629.4
			30	3.6	1109.6	30	10.0	1332.5	30	15.3	1644.7
			31	5.3	1113.9				31	12.9	1657.6

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Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀	Date	Daily E ₀	Total E ₀
1.6.84	13.3	1670.9	1.7.84	1.7	1871.5	1.8.84	3.1	1994.6	1.9.84	5.9	2130.1
2	13.1	1634.0	2	3.2	1874.7	2	1.4	1996.0	2	5.2	2135.3
3	10.2	1694.2	3	4.1	1878.8	3	1.1	1997.1	3	6.3	2141.6
4	8.4	1702.6	4	4.9	1883.7	4	2.8	1999.9	4	5.6	2147.2
5	4.9	1707.5	5	2.9	1886.6	5	3.5	2003.4	5	6.3	2153.5
6	4.9	1712.4	6	0.4	1887.0	6	4.8	2008.2	6	3.8	2157.3
7	4.9	1717.3	7	4.5	1891.5	7	4.9	2013.1	7	6.1	2163.4
8	5.8	1724.1	8	5.8	1897.3	8	2.5	2015.6	8	6.1	2169.5
9	5.2	1729.3	9	5.6	1902.9	9	1.4	2017.0	9	6.6	2176.1
10	6.3	1736.1	10	5.9	1903.8	10	3.8	2020.8	10	4.9	2181.0
11	3.8	1739.9	11	6.1	1914.9	11	4.1	2024.9	11	1.0	2182.0
12	3.5	1743.4	12	7.0	1921.9	12	5.3	2030.2	12	3.2	2185.2
13	1.5	1744.9	13	3.9	1925.8	13	4.6	2034.8	13	1.0	2186.2
14	2.3	1747.2	14	4.6	1930.4	14	5.4	2040.2	14	1.4	2187.6
15	1.2	1743.4	15	2.1	1932.5	15	4.9	2045.1	15	2.5	2190.1
16	5.5	1753.9	16	2.4	1934.9	16	5.1	2050.2	16	3.7	2193.8
17	4.9	1758.8	17	1.4	1936.3	17	3.2	2053.4	17	2.8	2196.6
18	6.8	1765.6	18	1.7	1938.0	18	5.7	2059.1	18	4.2	2200.8
19	3.0	1773.6	19	2.8	1940.8	19	4.1	2063.2	19	4.4	2205.2
20	7.2	1790.8	20	3.0	1943.8	20	4.8	2068.0	20	3.8	2209.0
21	10.1	1790.9	21	3.5	1947.3	21	5.1	2073.1	21	4.2	2213.2
22	9.5	1800.4	22	3.5	1950.8	22	5.8	2078.9	22	2.5	2215.7
23	10.5	1810.9	23	4.2	1955.0	23	4.9	2083.8	23	4.4	2220.1
24	10.0	1820.9	24	4.5	1959.5	24	6.5	2090.3	24	3.1	2223.2
25	10.5	1831.4	25	4.2	1963.7	25	5.1	2095.4	25	3.4	2226.6
26	10.5	1841.9	26	3.6	1967.3	26	5.9	2101.3	26	4.1	2230.7
27	9.1	1851.0	27	3.0	1970.3	27	5.6	2106.9	27	2.1	2232.8
28	7.8	1860.8	28	5.9	1976.2	28	4.2	2111.1	28	1.5	2234.3
29	6.3	1867.1	29	4.6	1990.8	29	3.4	2114.5	29	4.1	2238.4
30	2.7	1869.8	30	6.1	1986.9	30	4.5	2115.0	30	4.9	2243.3
			31	4.6	1991.5	31	5.2	2124.2			

APPENDIX IV: Soil moisture depletion from various layers (mm), total consumptive use (mm) and daily consumptive use (mm) during February planting

Irri- ga- tion num- ber	In- ter- val (days)	Layerwise SMD(mm)		Total SMD from 0-60 cm (mm)	PET (mm)	EFR (mm)	Total CU (mm)	Daily CU (mm)	Water appl- ied (mm)
		0-30 (cm)	30-60 (cm)						
1	2	3	4	5	6	7	8	9	10
Treatment: 1.0 IW/CPE kept constant									
1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	44.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	8	23.12	16.01	39.13	13.5	-	52.63	6.58	60.0
10	10	23.22	16.19	39.41	14.1	-	53.51	5.35	60.0
11	8	22.98	16.05	39.03	15.1	8.2	62.33	7.79	51.8
12	9	23.16	16.25	39.41	13.9	-	53.31	5.92	60.0
13	9	23.19	16.31	39.50	15.7	-	55.20	6.13	60.0
14	10	22.00	15.89	37.89	18.3	28.2	84.39	8.44	31.8
15	7	23.15	16.26	39.41	15.7	-	55.11	7.87	60.0
16	10	23.39	16.37	39.76	15.5	-	55.26	5.53	60.0
17	8	23.03	16.02	39.05	21.5	8.6	69.15	8.64	51.4
18	12	22.04	15.68	37.72	8.0	19.6	65.32	5.44	40.4
19	15	23.76	16.87	40.63	7.7	-	48.33	3.22	60.0
20	14	23.11	16.00	39.11	6.6	19.7	65.41	4.67	40.3
21	18	22.03	15.54	37.57	6.7	14.1	58.37	3.24	45.9
22	17	20.03	12.36	32.39	5.1	43.9	81.39	4.79	16.1
23	18	19.31	12.13	31.44	7.8	70.0	109.24	6.07	-
24	20	23.26	16.17	39.43	3.8	-	43.23	2.16	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
25	25	23.10	16.03	39.13	6.5	28.1	73.73	2.95	31.9
26	22	23.59	16.48	40.07	4.7	-	44.77	2.04	60.0
27	22	24.00	17.23	41.23	5.8	-	47.03	2.14	60.0
28	23	23.98	17.34	41.32	4.6	-	45.92	2.00	60.0
29	20	24.10	17.68	41.78	5.8	-	47.58	2.38	60.0
30	18	24.33	17.91	42.24	7.0	-	49.24	2.74	60.0
31	14	24.31	17.92	42.23	9.1	-	51.33	3.67	60.0
32	13	24.00	17.23	41.23	8.9	-	50.13	3.86	60.0
33	13	23.93	17.13	41.06	10.0	-	51.06	3.93	60.0
34	11	23.91	17.04	40.95	12.1	-	53.05	4.82	60.0
35	10	23.80	16.70	40.50	14.2	-	54.70	5.47	60.0
		741.66	448.79	1190.45	363.6	247.4	1801.45		1622.6

Treatment: IW/CPE increased during FBD to flowering

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	8	24.12	15.01	39.13	13.5	-	52.63	6.58	60.0
10	10	23.22	15.19	38.41	14.1	-	52.51	5.35	60.0
11	8	23.98	16.05	40.03	15.1	8.2	63.33	7.79	51.8
12	9	23.16	16.25	39.41	13.9	-	53.31	5.92	60.0
13	9	23.19	16.31	39.50	15.7	-	55.20	6.13	60.0
14	10	22.00	15.89	37.89	18.3	28.2	84.39	8.44	31.8
15	7	23.15	16.26	39.41	15.7	-	55.11	7.87	60.0
16	10	23.39	16.37	39.76	15.5	-	55.26	5.53	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
17	8	23.03	16.02	39.05	21.5	8.6	69.15	8.64	51.4
18	12	22.04	15.68	37.72	8.0	19.6	65.32	5.44	40.4
19	15	23.76	16.87	40.63	7.7	-	48.33	3.22	60.0
20	14	23.11	16.00	39.11	6.6	19.7	65.41	4.67	40.3
21	18	22.03	15.54	37.57	6.7	14.1	58.37	3.21	45.9
22	17	20.03	12.36	32.39	5.1	43.9	81.39	4.79	16.1
23	18	19.31	12.13	31.44	7.8	70.0	109.24	6.07	-
24	15	22.81	17.61	40.42	6.7	-	47.12	3.14	60.0
25	21	22.00	16.27	38.27	3.0	28.1	69.37	3.30	31.9
26	21	22.39	17.06	39.45	5.5	-	44.95	2.14	60.0
27	17	22.74	17.31	40.05	6.1	-	46.15	2.71	60.0
28	19	22.89	17.21	40.10	5.4	-	45.50	2.39	60.0
29	19	22.12	16.71	38.83	4.6	-	43.43	2.29	60.0
30	20	24.11	17.72	41.83	5.8	-	47.63	2.38	60.0
31	18	24.71	19.37	44.08	7.0	-	57.08	2.34	60.0
32	14	24.05	17.23	41.28	9.1	-	50.38	3.60	60.0
33	13	23.99	17.19	41.18	8.9	-	50.08	3.85	60.0
34	13	23.94	17.10	41.04	10.0	-	51.04	3.93	60.0
35	11	23.81	16.72	40.53	12.1	-	52.63	4.78	60.0
		746.91	439.43	1186.34	355.3	247.4	1789.04		1622.6

Treatment: 1.0 lw/CPE increased during flowering to harvest

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	8	23.12	16.01	39.13	13.5	-	52.63	6.58	60.0
10	10	23.22	16.19	39.41	14.1	-	53.51	5.35	60.0
11	8	22.98	16.05	39.03	15.1	8.2	62.33	7.79	51.8
12	9	23.16	16.25	39.41	13.9	-	53.31	55.92	60.0
13	9	23.19	16.31	39.50	15.7	-	55.20	6.13	60.0
14	10	22.00	15.89	37.89	18.3	28.2	84.39	8.44	31.8
15	7	23.15	16.26	39.41	15.7	-	55.11	7.87	60.0
16	10	23.39	16.37	39.76	15.5	-	55.26	5.53	60.0
17	8	23.03	16.02	39.05	21.5	8.6	69.15	8.64	51.4
18	12	22.04	15.68	37.72	8.0	19.6	65.32	5.44	40.4
19	15	23.76	16.87	40.63	7.7	-	48.33	3.22	60.0
20	14	23.11	16.00	39.11	6.6	19.7	65.41	4.67	40.3
21	18	22.03	15.54	37.57	6.7	14.1	58.37	3.24	45.9
22	17	20.03	12.36	32.39	5.1	43.9	81.39	4.79	16.1
23	18	19.31	12.13	31.44	7.8	70.0	109.24	6.07	-
24	20	23.26	16.17	39.43	3.8	-	43.23	2.16	60.0
25	25	23.10	16.03	39.13	6.5	28.1	73.73	2.95	31.9
26	22	23.59	16.48	40.07	4.7	-	44.77	2.04	60.0
27	22	24.00	17.23	41.23	5.8	-	47.03	2.14	60.0
28	23	23.98	17.34	41.32	4.6	-	45.92	2.00	60.0
29	17	22.26	16.81	39.07	6.1	-	45.17	2.66	60.0
30	16	22.33	16.92	39.25	9.3	-	48.55	3.03	60.0
31	13	22.31	16.90	39.21	8.6	-	47.81	3.68	60.0
32	11	22.30	16.80	39.10	10.0	-	49.10	4.46	60.0
33	11	22.11	16.71	38.82	8.4	-	47.22	4.29	60.0
34	10	22.00	16.65	38.65	10.0	-	48.65	4.87	60.0
35	10	22.03	16.60	38.63	11.6	-	50.23	5.02	60.0
		738.62	434.57	1173.19	360.5	247.4	1781.09	1622.6	

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
Treatment: 1.0 IW/CPE increased during FBD to harvest									
1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	8	24.12	15.01	39.13	13.5	-	52.63	6.58	60.0
10	10	23.22	15.19	38.41	14.1	-	52.51	5.35	60.0
11	8	23.98	16.05	40.03	15.1	8.2	63.33	7.79	51.8
12	9	23.16	16.25	39.41	13.9	-	53.31	5.92	60.0
13	9	23.19	16.31	39.50	15.7	-	55.20	6.13	60.0
14	10	22.00	15.89	37.89	18.3	28.2	84.39	8.44	31.8
15	7	23.15	16.26	39.41	15.7	-	55.11	7.89	60.0
16	10	23.39	16.37	39.76	15.5	-	55.26	5.53	60.0
17	8	23.03	16.02	39.05	21.5	8.6	69.15	8.64	51.4
18	12	22.04	15.68	37.72	8.0	19.6	65.32	5.44	40.4
19	15	23.76	16.87	40.63	7.7	-	48.33	3.22	60.0
20	14	23.11	16.00	39.11	6.6	19.7	65.41	4.67	40.3
21	18	22.03	15.54	37.57	6.7	14.1	58.37	3.24	45.9
22	17	20.03	12.36	32.39	5.1	43.9	81.39	4.79	16.1
23	18	19.31	12.13	31.44	7.8	70.0	109.24	6.07	-
24	15	22.81	17.61	40.42	6.7	-	47.12	3.14	60.0
25	21	22.00	16.27	38.27	3.0	28.1	69.37	3.30	31.9
26	21	22.39	17.06	39.45	5.5	-	44.95	2.14	60.0
27	17	22.74	17.31	40.05	6.1	-	46.15	2.71	60.0
28	19	22.89	17.21	40.10	5.4	-	45.50	2.39	60.0
29	19	22.12	16.71	38.83	4.6	-	43.43	2.29	60.0
30	17	22.28	16.92	39.20	6.1	-	45.30	2.66	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
15	12	23.03	16.20	39.23	20.6	8.6	68.43	5.70	61.4
16	13	22.33	15.76	38.09	8.0	19.6	65.69	5.05	40.4
17	18	22.41	15.92	38.33	7.6	17.2	63.13	3.51	42.8
18	18	23.03	16.13	39.16	5.6	10.0	54.76	3.04	50.0
19	22	23.25	16.52	39.77	6.6	6.6	52.97	2.41	53.4
20	25	20.23	13.01	33.24	7.8	106.4	147.44	5.90	-
21	20	23.28	16.26	39.54	3.8	-	43.34	2.17	60.0
22	25	23.12	16.06	39.18	6.5	28.1	73.78	2.95	31.9
23	22	23.63	16.51	40.14	4.7	-	44.84	2.04	60.0
24	22	23.92	16.73	40.65	5.8	-	46.45	2.11	60.0
25	23	24.01	17.92	41.93	4.6	-	46.53	2.02	60.0
26	20	23.99	17.26	41.25	5.8	-	47.05	2.35	60.0
27	22	23.60	17.25	40.85	7.5	-	48.35	2.20	60.0
28	17	23.63	17.30	40.93	7.7	-	48.63	2.86	60.0
29	16	23.80	17.40	41.20	10.1	-	51.30	3.21	60.0
30	14	23.70	17.30	41.00	12.1	-	53.10	3.79	60.0
31	12	23.55	17.21	40.76	22.0	-	62.76	5.23	60.0
32	7	23.45	17.10	40.55	15.4	-	55.95	7.99	60.0
33	10	23.30	16.93	40.23	17.8	-	58.03	5.80	60.0
		709.44	413.2	1122.64	349.7	240.2	1712.54		1546.2

Treatment: 1.0 IW/CPE increased during flowering to harvest

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	11	23.01	16.89	39.90	8.3	-	48.20	4.38	60.0
10	12	22.71	15.29	38.00	16.1	8.2	62.30	5.19	51.8
11	9	23.89	16.33	40.22	15.0	-	55.22	6.14	60.0
12	12	23.71	16.13	39.84	15.7	-	55.54	4.63	60.0
13	11	23.11	16.90	40.01	17.5	28.5	86.01	7.82	31.5
14	11	23.92	16.89	40.81	11.2	-	52.01	4.73	60.0
15	12	23.03	16.20	39.23	20.6	8.6	68.43	5.70	51.4
16	13	22.33	15.76	38.09	8.0	19.6	65.69	5.05	40.4
17	18	22.41	15.92	38.33	7.6	17.2	63.13	3.51	42.8
18	18	23.03	16.13	39.16	5.6	10.0	54.76	3.04	50.0
19	22	23.25	16.52	39.77	6.6	6.6	52.97	2.41	53.4
20	25	20.23	13.01	33.24	7.8	106.4	147.44	5.90	-
21	27	21.36	14.69	36.05	5.7	7.8	49.55	1.84	52.2
22	30	21.03	14.31	35.34	5.5	20.3	61.14	2.04	39.7
23	27	23.33	16.82	40.15	5.7	-	45.85	1.70	60.0
24	28	23.36	16.91	40.27	4.6	-	44.87	1.60	60.0
25	25	23.39	16.99	40.38	4.4	-	44.78	1.79	60.0
26	17	24.12	17.72	41.84	7.5	-	49.34	2.90	60.0
27	13	24.35	17.89	42.34	10.0	-	52.34	4.03	60.0
28	14	24.35	17.98	42.33	7.8	-	50.13	3.58	60.0
29	12	24.30	17.79	42.09	11.8	-	53.89	4.49	60.0
30	11	24.21	17.60	41.81	12.3	-	54.11	4.92	60.0
31	9	24.05	17.33	41.38	22.0	-	63.38	7.04	60.0
32	5	23.92	17.09	41.01	16.5	-	57.51	11.50	60.0
33	8	23.81	16.82	40.63	15.9	-	56.53	7.07	60.0
		708.04	412.01	1120.05	355.6	240.2	1715.85	1546.2	

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
Treatment: 0.8 Iw/CPE increased during FBD to harvest									
1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	11	23.01	16.89	39.90	8.3	-	48.20	4.38	60.0
10	12	22.71	15.29	38.00	16.1	8.2	62.30	5.19	51.8
11	9	23.89	16.33	40.22	15.0	-	55.22	6.14	60.0
12	12	23.71	16.13	39.84	15.7	-	55.54	4.63	60.0
13	11	23.11	16.90	40.01	17.5	28.5	86.01	7.82	31.5
14	11	23.92	16.89	40.81	11.2	-	52.01	4.73	60.0
15	12	23.03	16.20	39.23	20.6	8.6	68.43	5.70	51.4
16	13	22.33	15.76	38.09	8.0	19.6	65.69	5.05	40.4
17	18	22.41	15.92	38.33	7.6	17.2	63.13	3.51	42.8
18	18	23.03	16.13	39.16	5.6	10.0	54.76	3.04	50.0
19	22	23.25	16.52	39.77	6.6	6.6	52.97	2.41	53.4
20	25	20.23	13.01	33.24	7.8	106.4	147.44	5.90	-
21	20	23.28	16.26	39.54	3.8	-	43.34	2.17	60.0
22	25	23.12	16.06	39.18	6.5	28.1	73.78	2.95	31.9
23	22	23.63	16.51	40.14	4.7	-	44.84	2.04	60.0
24	22	23.92	16.73	40.65	5.8	-	46.45	2.11	60.0
25	23	24.01	17.92	41.93	4.6	-	46.53	2.02	60.0
26	20	23.99	17.26	41.25	5.8	-	47.05	2.35	60.9
27	18	24.05	17.63	41.68	7.0	-	48.68	2.70	60.0
28	14	24.25	17.91	42.16	9.1	-	51.26	3.66	60.0
29	13	24.36	17.95	42.31	8.9	-	51.21	3.94	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
30	13	24.01	17.62	41.63	10.0	-	51.63	3.97	60.0
31	11	23.78	17.03	40.81	12.1	-	52.91	4.81	60.0
32	10	23.60	16.59	40.19	14.2	-	54.39	5.44	60.0
		688.46	397.44	1085.90	318.4	240.2	1644.50		1486.2

Treatment: 0.6 IW/CP± kept constant

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	15	25.25	14.71	39.96	13.6	-	53.56	3.57	60.0
10	14	24.71	14.21	38.92	14.5	8.2	61.62	4.40	51.8
11	15	25.27	14.82	40.09	15.7	-	55.79	3.72	60.0
12	14	24.20	13.61	37.81	15.8	28.5	82.11	5.87	31.5
13	16	24.38	13.50	37.88	11.3	8.6	57.78	3.61	51.4
14	17	24.63	13.12	37.75	8.0	19.6	65.35	3.84	40.4
15	25	24.83	13.69	38.52	8.0	19.7	66.22	2.65	40.3
16	28	25.11	14.10	39.21	10.0	14.1	63.31	2.26	45.3
17	30	22.38	11.51	33.89	7.8	99.8	141.49	4.72	-
18	36	23.98	13.21	37.19	3.0	28.1	68.29	1.90	31.9
19	38	25.22	14.28	39.50	6.1	-	45.60	1.20	60.0
20	38	25.25	14.39	39.64	4.6	-	44.24	1.16	60.0
21	33	25.31	14.51	39.82	9.3	-	49.12	1.49	60.0
22	24	25.61	14.89	40.50	10.0	-	50.50	2.10	60.0
23	21	25.85	14.93	40.78	10.0	-	50.78	2.42	60.0
24	18	25.92	15.12	41.04	14.1	-	55.14	3.06	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
25	11	26.00	15.35	41.35	15.8	-	57.15	5.20	60.0
26	12	25.95	15.10	41.05	18.0	-	59.05	4.92	60.0
27	12	25.81	15.00	40.81	19.8	-	60.61	5.05	60.0
28	10	25.00	14.11	39.11	18.0	4.1	61.21	6.12	55.9
29	12	24.11	13.33	37.44	13.2	6.0	56.64	4.72	54.0
30	25	20.11	8.22	28.33	7.7	65.7	101.73	4.07	-
		672.71	305.71	978.42	340.2	309.4	1628.02		1236.1

Treatment: 0.6 IN/CPE increased during RBD to flowering

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	15	25.25	14.71	39.96	13.6	-	53.56	3.57	60.0
10	14	24.71	14.21	38.92	14.5	8.2	61.62	4.40	51.2
11	15	25.27	14.82	40.09	15.7	-	55.79	3.72	60.0
12	14	24.20	13.61	37.81	15.8	28.5	82.11	5.87	31.5
13	16	24.38	13.50	37.88	11.3	8.6	57.78	3.61	51.4
14	17	24.63	13.12	37.75	8.0	19.6	65.35	3.84	40.4
15	25	24.83	13.69	38.52	8.0	19.7	66.22	2.65	40.3
16	28	25.11	14.10	39.21	10.0	14.1	63.31	2.26	45.9
17	30	22.38	11.51	33.89	7.8	99.8	141.49	4.72	-
18	27	21.30	14.51	35.81	5.7	7.8	49.31	1.83	52.2
19	30	21.00	14.30	35.30	5.5	20.3	61.10	2.04	39.7
20	27	23.30	16.80	40.10	5.7	-	45.80	1.70	60.0

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
21	28	23.31	16.82	40.13	4.6	-	44.73	1.60	60.0
22	25	23.30	16.69	39.99	6.4	-	46.39	1.86	60.0
23	21	23.21	16.83	40.04	8.6	-	48.64	2.32	60.0
24	22	25.81	15.01	40.82	8.4	-	49.22	2.24	60.0
25	20	25.85	14.89	40.74	11.6	-	52.34	2.62	60.0
26	14	25.98	15.03	41.01	23.8	-	64.81	4.63	60.0
27	11	25.61	14.72	40.33	16.3	-	56.63	5.15	60.0
28	12	25.50	14.32	39.82	17.5	-	57.32	4.78	60.0
29	11	25.41	14.22	39.63	17.5	-	57.13	5.19	60.0
30	10	24.00	13.21	37.21	15.2	10.1	62.51	6.25	49.9
		662.17	320.62	982.79	337.4	243.7	1563.89		1355.5

Treatment: 0.6 IW/CPE increased during flowering to harvest

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	15	25.25	14.71	39.96	13.6	-	53.56	3.57	60.0
10	14	24.71	14.21	38.92	14.5	8.2	61.62	4.40	51.2
11	15	25.27	14.82	40.09	15.7	-	55.79	3.72	60.0
12	14	24.20	13.61	37.81	15.8	28.5	82.11	5.87	31.5
13	16	24.38	13.50	37.88	11.3	8.6	57.78	3.61	51.4
14	17	24.63	13.12	37.75	8.0	19.6	65.35	3.84	40.4
15	25	24.83	13.69	38.52	8.0	19.7	66.22	2.65	40.3
16	28	25.11	14.10	39.21	10.0	14.1	63.31	2.26	45.9
17	30	22.38	11.51	33.89	7.8	99.8	141.49	4.72	-

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
18	36	23.98	13.21	37.19	3.0	28.1	68.29	1.90	31.9
19	38	25.22	14.28	39.50	6.1	-	45.60	1.20	60.0
20	38	25.25	14.39	39.64	4.6	-	44.24	1.16	60.0
21	33	25.31	14.51	39.82	9.3	-	49.12	1.49	60.0
22	24	25.61	14.89	40.50	10.0	-	50.50	2.10	60.0
23	16	24.90	18.10	43.00	11.1	-	54.10	3.38	60.0
24	15	24.91	18.05	42.96	11.6	-	54.56	3.64	60.0
25	11	24.86	18.17	43.03	14.2	-	57.23	5.21	60.0
26	8	24.72	18.13	42.85	15.8	-	58.65	7.33	60.0
27	9	24.62	18.00	42.62	15.5	-	58.12	6.46	60.0
28	9	24.58	17.81	42.39	17.5	-	59.89	6.65	60.0
29	8	24.53	17.39	41.92	18.8	-	60.72	7.59	60.0
30	8	24.50	13.21	41.71	18.0	-	59.71	7.46	60.0
31	9	24.31	17.21	41.52	16.1	-	57.62	6.40	60.0
		695.89	354.62	1050.51	362.2	233.6	1646.31		1425.6

Treatment: 0.6 IW/CPE increased during FBD to harvest

1	8	14.65	-	14.65	8.7	-	23.35	2.92	30.0
2	8	14.13	-	14.13	9.5	-	23.63	2.95	30.0
3	6	15.88	-	15.88	8.6	-	24.48	4.08	30.0
4	7	17.46	-	17.46	9.2	-	26.66	3.81	30.0
5	6	16.11	-	16.11	11.3	-	27.41	4.57	30.0
6	5	18.37	-	18.37	12.1	-	30.47	6.09	30.0
7	6	18.81	-	18.81	12.1	-	30.91	5.15	30.0
8	4	12.42	-	12.42	14.4	7.0	33.82	8.46	23.0
9	15	25.25	14.71	39.96	13.6	-	53.56	3.57	60.0
10	14	24.71	14.21	38.92	14.5	8.2	61.62	4.40	51.2
11	15	25.27	14.82	40.09	15.7	-	55.79	3.72	60.0
12	14	24.20	13.61	37.81	15.8	28.5	82.11	5.87	31.5
13	16	24.38	13.50	37.88	11.3	8.6	57.78	3.61	51.4

Continued

APPENDIX IV (continued)

1	2	3	4	5	6	7	8	9	10
14	17	24.63	13.12	37.75	8.0	19.6	65.35	3.84	40.4
15	25	24.83	13.69	38.52	8.0	19.7	66.22	2.65	40.3
16	28	25.11	14.10	39.21	10.0	14.1	63.31	2.26	45.9
17	30	22.38	11.51	33.89	7.8	99.8	141.49	4.72	-
18	27	21.30	14.51	35.81	5.7	7.8	49.31	1.83	52.2
19	30	21.00	14.30	35.30	5.5	20.3	61.10	2.04	39.7
20	27	23.30	16.80	40.10	5.7	-	45.80	1.70	60.0
21	28	23.31	16.82	40.13	4.6	-	44.73	1.60	60.0
22	25	23.30	16.69	39.99	6.4	-	46.39	1.86	60.0
23	21	23.21	16.83	40.04	8.6	-	48.64	2.32	60.0
24	16	24.61	18.13	42.74	10.0	-	52.74	3.30	60.0
25	16	24.72	18.21	42.93	10.0	-	52.93	3.31	60.0
26	14	24.81	18.25	43.06	12.3	-	55.36	3.95	60.0
27	10	24.62	18.11	42.73	23.8	-	66.53	6.65	60.0
28	8	24.45	17.92	42.37	15.5	-	57.87	7.23	60.0
29	9	24.21	17.52	41.73	18.0	-	59.73	6.64	60.0
30	9	24.00	17.39	41.39	17.0	-	58.39	6.49	60.0
		654.43	345.75	1000.18	333.7	233.6	1567.48		1365.6

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APPENDIX IV: Soil moisture depletion from various layers(mm), total consumptive use (mm) and daily consumptive use (mm) during June planting

Irrigation number	Int-er- val (days)	Layerwise SMD (mm)		Total SMD from 0-60 cm	PET (mm)	EFR (mm)	Total CU (mm)	Daily CU (mm)	Water applied (mm)
		0-30 (cm)	30-60 (cm)						
1	2	3	4	5	6	7	8	9	10

Treatment: 1.0 lw/CPE kept constant

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	18	20.17	9.89	30.06	10.0	65.7	105.76	5.88	-
10	29	16.91	6.13	23.04	7.4	144.7	175.14	6.04	-
11	14	22.45	12.16	34.61	12.0	20.4	67.01	4.79	39.6
12	23	20.39	9.98	30.37	7.2	66.9	104.47	4.54	-
13	29	16.31	5.68	21.99	4.6	160.4	186.99	6.45	-
14	23	23.21	12.73	35.94	5.8	-	41.74	1.82	60.0
15	17	23.34	12.82	36.16	6.6	-	42.76	2.52	60.0
16	15	23.38	12.95	36.33	9.5	-	45.83	3.06	60.0
17	20	23.12	12.02	35.14	2.2	12.8	50.14	2.51	47.2
18	29	23.42	12.90	36.32	6.4	-	42.72	1.47	60.0
19	15	21.01	10.63	31.64	9.9	45.0	86.54	5.77	15.0
20	10	23.52	13.11	36.63	12.7	-	49.33	4.93	60.0
21	14	23.69	13.09	36.78	8.4	-	45.18	3.23	60.0
22	12	23.93	13.21	37.14	9.5	-	46.64	3.89	60.0
23	11	23.51	13.31	36.82	13.6	-	60.42	4.58	60.0
24	10	23.32	12.68	36.00	12.3	-	48.30	4.83	60.0

Continued



APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
25	8	23.83	13.38	37.21	20.0	-	57.21	7.15	60.0
26	7	23.61	13.02	36.63	20.0	-	56.63	8.09	60.0
27	7	23.11	12.81	35.92	20.0	-	55.92	7.99	60.0
28	6	23.73	13.21	36.94	18.6	-	55.54	9.26	60.0
29	7	23.84	13.34	37.18	13.2	-	50.38	7.20	60.0
30	5	23.29	12.77	36.06	25.9	-	61.96	12.39	60.0
31	5	23.31	12.82	36.13	30.7	-	66.83	13.37	60.0
32	4	23.61	13.15	36.76	23.3	-	60.06	15.02	60.0
33	9	22.81	12.19	35.00	7.3	6.0	48.30	5.37	54.0
34	11	21.32	11.05	32.37	20.0	22.9	75.27	6.84	37.1
35	6	23.69	13.17	36.86	16.1	-	52.96	8.83	60.0
36	19	21.13	10.92	32.05	3.1	32.8	67.95	3.58	27.2
37	12	23.72	13.16	36.88	10.7	-	47.58	3.97	60.0
38	16	21.30	11.02	32.32	10.3	21.2	63.82	3.99	38.8
39	12	23.63	13.03	36.66	11.5	-	48.16	4.01	60.0
40	12	23.74	13.08	36.82	12.2	-	49.02	4.09	60.0
41	16	21.32	10.98	32.30	7.5	21.1	60.90	3.81	38.9
		858.9	396.39	1255.29	539.6	648.0	2442.89	1769.7	

Treatment: 1.4 IW/CPE kept constant

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	14	20.11	9.68	29.79	9.1	37.2	76.09	5.44	28.8
10	18	19.36	7.87	27.23	2.1	41.3	70.63	3.93	18.7

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
11	19	15.39	5.07	20.46	6.8	134.3	161.56	8.50	-
12	9	21.65	10.89	32.54	13.7	-	46.24	5.14	60.0
13	14	19.22	8.79	28.01	4.1	41.2	73.31	5.24	18.8
14	16	18.11	7.74	25.85	2.4	64.0	92.25	5.77	-
15	23	15.01	4.92	19.93	4.6	122.1	146.63	6.38	-
16	17	21.78	11.32	33.10	9.0	-	42.10	2.48	60.0
17	13	21.92	11.41	33.33	6.2	-	39.53	3.04	60.0
18	13	21.69	11.01	32.70	6.6	-	39.30	3.02	60.0
19	10	21.87	11.13	33.00	9.5	-	42.50	4.25	60.0
20	11	21.93	11.31	33.24	7.5	-	40.74	3.70	60.0
21	23	20.11	9.73	39.84	4.4	12.8	47.04	2.05	47.2
22	18	21.51	11.10	32.61	6.7	-	39.31	2.18	60.0
23	10	18.04	7.78	25.82	6.0	45.0	76.82	7.68	15.0
24	9	21.31	11.01	32.32	12.7	-	45.02	5.00	60.0
25	7	21.22	11.00	32.22	11.7	-	43.92	6.27	60.0
26	10	21.49	10.83	32.32	6.9	-	39.22	3.92	60.0
27	9	21.51	10.91	32.42	9.9	-	42.32	4.70	60.0
28	9	21.58	11.04	32.62	8.7	-	41.32	4.59	60.0
29	8	21.63	11.10	32.73	14.2	-	46.93	5.87	60.0
30	7	21.34	11.21	32.55	11.9	-	44.45	6.35	60.0
31	7	21.72	11.35	33.07	18.6	-	51.67	7.38	60.0
32	4	21.73	11.22	32.95	17.6	-	50.55	12.64	60.0
33	6	21.85	11.13	32.98	20.0	-	52.98	8.83	60.0
34	4	22.03	11.56	33.59	16.6	-	50.19	12.55	60.0
35	5	22.09	11.50	33.59	17.3	-	50.89	10.18	60.0
36	5	22.31	11.55	33.86	18.6	-	52.46	10.49	60.0
37	4	22.42	11.69	34.11	15.9	-	50.01	12.50	60.0
38	5	22.13	11.80	33.93	26.9	-	61.83	12.37	60.0
39	3	22.16	11.93	34.19	26.0	-	60.19	20.06	60.0
40	4	22.10	11.89	33.99	30.7	-	64.69	16.17	60.0
41	3	22.17	11.93	34.10	26.4	-	60.50	20.17	60.0
42	3	22.27	11.82	34.09	13.3	-	47.39	15.80	60.0

Continued

APPENDIX V. (continued)

1	2	3	4	5	6	7	8	9	10
43	10	22.00	11.08	33.08	3.5	24.6	61.18	6.12	35.4
44	7	22.61	11.98	34.59	19.6	4.3	58.49	8.36	55.7
45	4	22.83	12.13	34.96	21.0	-	55.96	13.99	60.0
46	7	22.31	12.13	34.44	7.3	3.4	45.14	6.45	56.6
47	15	21.91	11.31	33.22	3.1	29.4	65.72	4.38	30.6
48	7	22.38	11.92	34.30	8.7	-	43.00	6.14	60.0
49	12	21.33	10.21	31.54	8.3	21.2	61.04	5.09	38.8
50	11	22.42	11.98	34.40	8.3	-	42.70	3.88	60.0
51	8	22.53	11.90	34.43	11.6	-	46.03	5.75	60.0
52	9	22.33	12.05	34.38	11.5	-	45.88	5.10	60.0
		1051.74	472.91	1524.65	656.6	608.9	2790.15		2411.5

Treatment: 1.0 IW/CPE increased during FBD to harvest

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.69	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	18	20.17	9.89	30.06	10.0	65.7	105.76	5.88	-
10	29	16.91	6.13	23.04	7.4	144.7	175.14	6.04	-
11	14	22.45	12.16	34.61	12.0	20.4	67.01	4.79	39.6
12	23	20.39	9.98	30.37	7.2	66.9	104.47	4.54	-
13	29	16.31	5.68	21.99	4.6	160.4	186.99	6.45	-
14	23	23.21	12.73	35.94	5.8	-	41.74	1.82	60.0
15	17	23.34	12.82	36.16	6.6	-	42.76	2.52	60.0
16	15	23.38	12.95	36.33	9.5	-	45.83	3.06	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
17	20.	23.12	12.02	35.14	2.2	12.8	50.14	2.51	47.2
18	23	21.61	11.18	32.79	4.4	-	37.19	1.62	60.0
19	12	20.29	9.92	30.21	8.1	11.0	49.31	4.11	49.0
20	11	18.33	8.01	26.34	11.8	34.0	72.14	6.56	26.0
21	7	21.82	11.23	33.05	13.0	-	46.05	6.58	60.0
22	8	21.95	11.21	33.16	7.8	-	40.96	5.12	60.0
23	11	21.80	11.12	32.92	10.1	-	43.02	3.91	60.0
24	8	21.73	11.11	32.84	9.5	-	42.34	5.29	60.0
25	9	21.13	10.71	31.84	12.8	-	44.64	4.96	60.0
26	7	21.27	11.02	32.29	10.0	-	42.29	6.04	60.0
27	7	21.59	11.21	32.80	11.5	-	44.30	6.33	60.0
28	5	21.93	11.54	33.47	20.0	-	53.47	10.69	60.0
29	5	22.01	11.43	33.44	16.0	-	49.44	9.89	60.0
30	5	22.03	11.50	33.53	20.0	-	53.53	10.71	60.0
31	5	22.13	11.66	33.79	20.0	-	53.79	10.76	60.0
32	5	22.09	11.63	33.72	18.6	-	52.32	10.46	60.0
33	4	22.21	11.75	33.96	20.0	-	53.96	13.49	60.0
34	5	22.32	11.82	34.12	17.5	-	51.62	10.32	60.0
35	4	22.02	11.33	33.35	25.9	-	59.25	14.81	60.0
36	4	23.51	13.17	36.68	29.2	-	65.88	16.47	60.0
37	5	23.56	13.21	36.77	23.3	-	60.07	12.01	60.0
38	8	22.39	11.68	34.07	10.6	6.0	50.67	6.33	54.0
39	12	21.09	10.86	31.95	20.0	22.9	74.85	6.24	37.1
40	6	23.31	12.86	36.13	16.1	-	52.23	8.71	60.0
41	13	23.35	12.80	36.15	13.1	-	49.25	3.79	60.0
42	17	23.36	12.91	36.27	10.5	-	46.77	2.75	60.0
43	16	23.33	12.95	36.28	10.0	-	46.28	2.89	60.0
44	12	23.63	12.92	36.55	11.0	-	47.55	3.96	60.0
45	12	23.60	13.03	36.63	9.9	-	46.53	3.88	60.0
		924.88	420.09	1344.97	607.1	572.9	2524.97	2144.8	

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
Treatment: 1.4 IW/CPE increased during flowering to harvest									
1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.62	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	14	20.11	9.68	29.79	9.1	37.2	76.09	5.44	22.8
10	18	19.36	7.87	27.23	2.1	41.3	70.63	3.93	18.7
11	19	15.39	5.07	20.46	6.8	134.3	161.56	8.50	-
12	9	21.65	10.89	32.54	13.7	-	46.24	5.14	60.0
13	14	19.22	8.79	28.01	4.1	41.2	73.31	5.24	18.8
14	16	18.11	7.74	25.85	2.4	64.0	92.25	5.72	-
15	23	15.01	4.92	19.93	4.6	122.1	146.63	6.38	-
16	17	21.78	11.32	33.10	9.0	-	42.10	2.48	60.0
17	13	21.92	11.41	33.33	6.2	-	39.53	3.04	60.0
18	13	21.69	11.01	32.70	6.6	-	39.30	3.02	60.0
19	10	21.87	11.13	33.00	9.5	-	42.50	4.25	60.0
20	11	21.93	11.31	33.24	7.5	-	40.74	3.70	60.0
21	18	18.31	8.02	26.33	4.4	12.8	43.53	2.42	47.2
22	15	20.38	10.13	30.51	3.6	-	34.11	2.27	60.0
23	11	20.54	10.21	30.75	11.0	-	41.75	3.80	60.0
24	8	16.22	5.93	22.15	5.1	45.0	72.25	9.03	15.0
25	7	20.33	9.86	30.19	12.0	-	42.19	6.03	60.0
26	5	20.35	9.98	30.33	13.0	-	43.33	8.67	60.0
27	6	20.22	9.93	30.05	7.9	-	37.95	6.33	60.0
28	9	20.12	9.61	29.73	7.6	-	37.33	4.15	60.0
29	7	20.01	9.36	29.37	9.9	-	39.27	5.61	60.0
30	6	20.62	10.13	30.75	10.1	-	40.85	6.81	60.0
31	7	20.21	10.04	30.25	12.4	-	42.65	6.09	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
32	5	20.83	10.24	31.07	13.1	-	44.17	8.83	60.0
33	6	20.93	10.33	31.26	11.9	-	43.16	7.19	60.0
34	6	20.96	10.54	31.50	15.9	-	47.40	7.90	60.0
35	3	21.24	10.50	31.74	20.0	-	57.74	17.25	60.0
36	4	21.29	10.63	31.92	15.3	-	47.22	11.81	60.0
37	4	21.31	10.72	32.63	20.0	-	52.03	13.01	60.0
38	3	21.39	10.62	32.01	18.0	-	50.01	16.67	60.0
39	4	21.49	10.85	32.34	20.0	-	52.34	13.09	60.0
40	5	22.27	11.89	34.16	18.6	-	52.76	10.55	60.0
41	4	22.30	11.93	34.23	20.0	-	54.23	13.56	60.0
42	6	22.13	11.69	33.82	23.9	-	57.72	9.62	60.0
43	3	22.01	11.53	33.54	25.9	-	59.44	19.81	60.0
44	3	22.17	11.50	33.67	26.6	-	60.27	20.09	60.0
45	3	22.18	11.59	33.77	28.2	-	61.97	20.66	60.0
46	3	22.31	11.92	34.23	23.3	-	57.53	19.18	60.0
47	7	22.00	11.53	23.50	12.0	6.0	51.57	7.36	54.0
48	10	20.30	9.71	30.01	15.2	22.9	68.11	6.81	37.1
49	5	22.35	11.69	34.04	20.4	-	54.54	10.91	60.0
50	4	22.34	11.95	34.34	16.1	-	50.44	12.61	60.0
51	11	21.21	10.34	31.55	11.5	10.7	53.75	4.89	49.3
52	11	20.51	9.82	30.33	6.5	22.1	58.93	5.36	37.9
53	10	22.51	11.62	34.13	10.7	-	44.83	4.48	60.0
		1047.66	457.35	1505.01	702.9	587.7	2795.6	2492.9	

Treatment: 1.0 IW/CPE increased during flowering to harvest

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	18	20.17	9.89	30.06	10.0	65.7	105.76	5.88	-
10	29	16.91	6.13	23.04	7.4	144.7	175.14	6.04	-
11	14	22.45	12.16	34.61	12.0	20.4	67.01	4.79	39.6
12	23	20.39	9.98	30.37	7.2	66.9	104.47	4.59	-
13	29	16.31	5.68	21.99	4.6	160.4	186.99	6.45	-
14	23	23.21	12.73	35.94	5.8	-	41.74	1.82	60.0
15	17	23.34	12.82	36.16	6.6	-	42.76	2.52	60.0
16	15	23.38	12.95	36.33	9.5	-	45.83	3.06	60.0
17	20	23.12	12.02	35.14	2.2	12.8	50.14	2.51	47.2
18	29	23.42	12.90	36.32	6.4	-	42.72	1.47	60.0
19	15	21.01	10.63	31.64	9.9	45.0	86.54	5.77	15.0
20	10	23.52	13.11	36.63	12.7	-	49.33	4.93	60.0
21	14	23.69	13.09	36.78	8.4	-	45.18	3.23	60.0
22	12	23.93	13.21	37.14	9.5	-	46.64	3.89	60.0
23	11	23.51	13.31	36.82	13.6	-	50.42	4.58	60.0
24	10	23.32	12.68	36.00	12.3	-	48.30	4.83	60.0
25	8	23.83	13.38	37.21	20.0	-	57.21	7.15	60.0
26	7	23.61	13.02	36.63	20.0	-	56.63	8.09	60.0
27	7	23.11	12.81	35.92	20.0	-	55.92	7.99	60.0
28	6	23.73	13.21	36.94	18.6	-	55.54	9.26	60.0
29	7	23.84	13.34	37.18	13.2	-	50.38	7.20	60.0
30	5	23.29	12.77	36.06	25.9	-	61.96	12.39	60.0
31	5	23.31	12.82	36.13	30.7	-	66.83	13.37	60.0
32	4	23.61	13.15	36.76	23.3	-	60.06	15.02	60.0
33	9	22.81	12.19	35.00	7.3	6.0	48.30	5.37	54.0
34	10	20.32	9.97	30.29	19.6	22.9	72.79	7.28	37.1
35	4	22.52	12.18	34.70	21.0	-	45.70	11.43	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
36	5	22.03	11.98	34.01	4.4	3.4	41.81	8.36	56.6
37	11	22.00	11.83	33.83	13.1	7.3	54.23	4.93	52.7
38	12	20.22	9.62	29.84	8.7	22.1	60.64	5.05	37.9
39	12	20.20	9.53	29.73	6.3	21.2	57.23	4.77	38.8
40	11	22.39	12.10	34.49	10.0	-	44.49	4.04	60.0
41	9	22.30	12.00	34.30	11.6	-	45.90	5.10	60.0
42	8	22.13	11.53	33.66	11.1	-	44.76	5.60	60.0
43	8	22.11	11.37	33.48	11.5	-	44.98	5.62	60.0
44	13	22.03	11.31	33.34	6.9	21.1	61.34	4.72	38.9
		917.30	423.36	1340.66	572.4	648.0	2561.06	1949.7	

Treatment: 1.4 LW/CPE increased during flowering to harvest

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	14	20.11	9.68	29.79	9.1	37.2	76.09	5.44	28.8
10	18	19.36	7.87	27.23	2.1	41.3	70.63	3.93	18.7
11	19	15.39	5.07	20.46	6.8	134.3	161.56	8.50	-
12	9	21.65	10.89	32.54	13.7	-	46.24	5.14	60.0
13	14	19.22	8.79	28.01	4.1	41.2	73.31	5.24	18.8
14	16	18.11	7.74	25.85	2.0	64.0	92.25	5.77	-
15	23	15.01	4.92	19.93	4.6	122.1	146.63	6.38	-
16	17	21.78	11.32	33.10	9.0	-	42.10	2.48	60.0
17	13	21.92	11.41	33.33	6.2	-	39.53	3.04	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
18	13	21.69	11.01	32.70	6.6	-	39.30	3.02	60.0
19	10	21.87	11.13	33.00	9.5	-	42.50	4.25	60.0
20	11	21.93	11.31	33.24	7.5	-	40.74	3.70	60.0
21	23	20.11	9.73	39.84	4.4	12.8	47.04	2.05	47.2
22	18	21.51	11.10	32.61	6.7	-	39.31	2.18	60.0
23	10	18.04	7.78	25.82	6.0	45.0	76.82	7.68	15.0
24	9	21.31	11.01	32.32	12.7	-	45.02	5.00	60.0
25	7	21.22	11.00	32.22	11.7	-	43.92	6.27	60.0
26	10	21.49	10.83	32.32	6.9	-	39.22	3.92	60.0
27	9	21.51	10.91	32.42	9.9	-	42.32	4.70	60.0
28	9	21.58	11.04	32.62	8.7	-	41.32	4.59	60.0
29	8	21.63	11.10	32.73	14.2	-	46.93	5.82	60.0
30	7	21.34	11.21	32.55	11.9	-	44.45	6.35	60.0
31	7	21.72	11.35	33.07	18.6	-	51.67	7.38	60.0
32	4	21.73	11.22	32.95	17.6	-	50.55	12.64	60.0
33	6	21.85	11.13	32.98	20.0	-	52.98	8.83	60.0
34	4	22.03	11.56	33.59	16.6	-	50.19	12.55	60.0
35	5	22.09	11.50	33.59	17.3	-	50.89	10.18	60.0
36	5	22.31	11.55	33.86	18.6	-	52.46	10.49	60.0
37	4	22.42	11.69	34.11	15.9	-	50.01	12.50	60.0
38	4	21.21	10.83	32.04	23.9	-	55.94	13.99	60.0
39	3	21.33	10.72	32.05	25.9	-	57.95	19.32	60.0
40	2	21.93	11.17	33.10	25.9	-	59.00	29.50	60.0
41	3	21.82	11.03	32.85	30.7	-	63.55	21.18	60.0
42	2	21.93	11.22	33.15	26.2	-	59.35	29.68	60.0
43	3	21.82	11.31	33.13	18.6	-	51.73	17.24	60.0
44	5	21.08	10.48	31.56	12.0	6.0	49.56	9.91	59.0
45	8	20.31	9.62	29.93	10.4	22.9	63.23	7.90	37.1
46	5	21.62	11.30	32.92	19.6	-	52.52	10.50	60.0
47	3	21.75	11.33	33.08	20.5	-	53.58	17.86	60.0
48	3	21.82	11.35	33.17	18.9	-	52.07	17.36	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
49	7	21.21	10.62	31.83	7.8	3.4	43.03	6.15	56.6
50	8	21.20	10.53	31.73	10.9	7.3	49.93	6.24	52.7
51	10	20.12	9.56	29.68	7.7	22.1	59.48	5.95	37.9
52	8	21.85	11.42	33.27	10.7	-	43.97	5.50	60.0
53	9	20.34	9.69	30.03	3.9	21.2	55.13	6.13	38.8
54	8	21.62	11.21	32.83	8.3	-	41.13	5.14	60.0
		1081.07	480.20	1561.36	712.3	608.9	2882.56		2531.5

Treatment: 1.0 IW/CPE increased during FBD to harvest

1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.69	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	18	20.17	9.89	30.06	10.0	65.7	105.76	5.88	-
10	29	16.91	6.13	23.04	7.4	144.7	175.14	6.04	-
11	14	22.45	12.16	34.61	12.0	20.4	67.01	4.79	39.6
12	23	20.39	9.98	30.37	7.2	66.9	104.47	4.54	-
13	29	16.31	5.68	21.99	4.6	160.4	186.99	6.45	-
14	23	23.21	12.73	35.94	5.8	-	41.74	1.82	60.0
15	17	23.34	12.82	36.16	6.6	-	42.76	2.52	60.0
16	15	23.38	12.95	36.33	9.5	-	45.83	3.06	60.0
17	20	23.12	12.02	35.14	2.2	12.8	50.14	2.51	47.2
18	23	21.61	11.18	32.79	4.4	-	37.19	1.62	60.0
19	12	20.29	9.92	30.21	8.1	11.0	49.31	4.11	49.0
20	11	18.33	8.01	26.34	11.8	34.0	72.14	6.56	26.0
21	7	21.82	11.23	33.05	13.0	-	46.05	6.58	60.0
22	8	21.95	11.21	33.16	7.8	-	40.96	5.12	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
23	11	21.80	11.12	32.92	10.1	-	43.02	3.91	60.0
24	8	21.73	11.11	32.84	9.5	-	42.34	5.29	60.0
25	9	21.13	10.71	31.84	12.8	-	44.64	4.96	60.0
26	7	21.27	11.02	32.29	10.0	-	42.29	6.04	60.0
27	7	21.59	11.21	32.80	11.5	-	44.30	6.33	60.0
28	5	21.93	11.54	33.47	20.0	-	53.47	10.69	60.0
29	5	22.01	11.43	33.44	16.0	-	49.44	9.89	60.0
30	5	22.03	11.50	33.53	20.0	-	53.53	10.71	60.0
31	5	22.13	11.66	33.79	20.0	-	53.79	10.76	60.0
32	5	22.09	11.63	33.72	18.6	-	52.32	10.46	60.0
33	4	22.21	11.75	33.96	20.0	-	53.96	13.49	60.0
34	5	22.30	11.82	34.12	17.5	-	51.62	10.32	60.0
35	4	22.02	11.33	33.35	25.9	-	59.25	14.81	60.0
36	3	22.21	11.30	33.51	26.7	-	60.21	20.07	60.0
37	3	22.27	11.32	33.59	18.2	-	51.79	17.26	60.0
38	3	22.33	11.37	33.70	23.3	-	57.00	19.00	60.0
39	7	22.03	11.21	33.24	12.0	6.0	51.24	7.32	54.0
40	10	20.34	9.62	29.96	15.2	22.9	68.06	6.81	37.1
41	5	22.28	11.65	33.93	20.5	-	54.43	10.89	60.0
42	4	22.35	11.72	34.07	16.1	-	50.17	12.54	60.0
43	11	21.38	10.85	32.23	11.5	10.7	54.43	4.95	49.3
44	11	20.39	9.83	30.22	6.5	22.1	58.82	5.35	37.9
45	10	22.13	11.53	33.66	10.7	-	44.36	4.44	60.0
46	13	20.21	9.62	29.83	9.9	21.2	60.93	4.69	38.8
47	9	22.08	11.31	33.39	10.9	-	44.29	4.92	60.0
48	8	21.93	11.08	33.01	7.9	-	40.91	5.11	60.0
		975.68	436.15	1411.83	642.8	626.9	2681.53	2210.6	

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
Treatment: 1.4 IW/CPE increased during FBU to harvest									
1	4	15.02	-	15.02	20.3	-	35.32	8.83	30.0
2	3	14.51	-	14.51	17.5	-	32.01	10.67	30.0
3	3	14.62	-	14.62	20.5	-	35.12	11.71	30.0
4	3	14.22	-	14.22	18.3	10.1	42.62	14.21	19.9
5	3	14.59	-	14.59	19.1	-	33.69	11.23	30.0
6	4	15.11	-	15.11	15.5	-	30.61	7.65	30.0
7	4	15.05	-	15.05	11.3	-	26.35	6.59	30.0
8	5	13.11	-	13.11	8.6	18.0	39.71	7.94	12.0
9	14	20.11	9.68	29.79	9.1	37.2	76.09	5.44	22.8
10	18	19.36	7.87	27.23	2.1	41.3	70.63	3.93	18.7
11	19	15.39	5.07	20.49	6.8	134.3	161.56	8.50	-
12	9	21.65	10.89	32.54	13.7	-	46.24	5.14	60.0
13	14	19.22	8.79	28.01	4.1	41.2	73.31	5.24	18.8
14	16	18.11	7.74	25.85	2.4	64.0	92.25	5.77	-
15	23	15.01	4.92	19.93	4.6	122.1	146.63	6.38	-
16	17	21.78	11.32	33.10	9.0	-	42.10	2.48	60.0
17	13	21.92	11.41	33.33	6.2	-	39.53	3.04	60.0
18	13	21.69	11.01	32.70	6.6	-	39.30	3.02	60.0
19	10	21.87	11.13	33.00	9.5	-	42.50	4.25	60.0
20	11	21.93	11.31	33.24	7.5	-	40.74	3.70	60.0
21	18	18.31	8.02	26.33	4.4	12.8	43.53	2.42	47.2
22	15	20.38	10.13	30.51	3.6	-	34.11	2.27	60.0
23	11	20.54	10.21	30.75	11.0	-	41.75	3.80	60.0
24	8	16.22	5.93	22.15	5.1	45.0	72.25	9.03	15.0
25	7	20.33	9.86	30.19	12.0	-	42.19	6.03	60.0
26	5	20.35	9.98	30.33	13.0	-	43.33	8.67	60.0
27	6	20.22	9.93	30.05	7.9	-	37.95	6.33	60.0
28	9	20.12	9.61	29.73	7.6	-	37.33	4.15	60.0
29	7	20.01	9.36	29.37	9.9	-	39.27	5.61	60.0
30	6	20.62	10.13	30.75	10.1	-	40.85	6.81	60.0

Continued

APPENDIX V (continued)

1	2	3	4	5	6	7	8	9	10
31	7	20.21	10.04	30.25	12.4	-	42.65	6.09	60.0
32	5	20.83	10.24	31.07	13.1	-	44.17	8.83	60.0
33	6	20.93	10.33	31.26	11.9	-	43.16	7.19	60.0
34	6	20.96	10.54	31.50	15.9	-	47.40	7.90	60.0
35	3	21.24	10.50	31.79	20.0	-	51.74	17.25	60.0
36	4	21.29	10.63	31.92	15.3	-	47.22	11.81	60.0
37	4	21.31	10.72	32.03	20.0	-	52.03	13.01	60.0
38	3	21.39	10.62	32.01	18.0	-	50.01	16.67	60.0
39	4	21.49	10.85	32.34	20.0	-	52.34	13.09	60.0
40	4	21.43	10.90	32.33	18.6	-	50.93	12.73	60.0
41	3	21.41	10.95	32.36	18.6	-	50.96	16.99	60.0
42	3	21.56	10.82	32.38	19.3	-	51.68	17.23	60.0
43	5	21.52	10.91	32.43	23.9	-	56.33	11.27	60.0
44	3	21.13	10.38	31.51	26.7	-	58.21	19.40	60.0
45	2	21.56	10.98	32.54	25.9	-	58.44	29.22	60.0
46	3	21.63	11.05	32.68	29.2	-	61.88	20.63	60.0
47	3	21.73	11.03	32.76	26.2	-	58.96	19.65	60.0
48	2	21.72	11.21	32.93	23.3	-	56.23	28.12	60.0
49	5	21.16	10.82	31.98	11.7	6.0	49.68	9.94	54.0
50	7	20.68	10.04	30.72	3.5	18.6	52.82	7.55	41.4
51	6	21.50	11.08	32.58	17.3	4.3	54.18	9.03	55.7
52	4	21.62	10.83	32.45	20.5	-	52.95	13.24	60.0
53	3	21.69	10.93	32.62	18.9	-	51.52	17.17	60.0
54	6	21.31	10.54	31.85	9.0	3.4	44.25	7.38	86.6
55	8	20.21	9.62	29.83	13.1	7.3	50.23	6.28	52.7
56	10	19.63	8.26	27.89	7.0	22.1	56.99	5.70	37.9
57	8	20.31	9.83	30.14	10.7	-	40.84	5.11	60.0
		1122.82	488.85	1611.67	767.3	587.7	2966.67	2732.7	

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