EVALUATION OF CUCUMBER (*Cucumis sativus* L.) HYBRIDS UNDER POLYHOUSE CONDITION COMPARED WITH OPEN FIELD CONDITION

By

Pramod Kumar Pandey
(Reg. No.20101)

A Thesis submitted to the
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722, DIST.AHMEDNAGAR,
MAHARASHTRA, INDIA

in partial fulfilment of the requirements for the degree
of

MASTER OF SCIENCE (AGRICULTURE)

in

HORTICULTURE

DEPARTMENT OF HORTICULTURE

POST GRADUATE INSTITUTE
MAHATMA PHULE KRISHI VIDYAPEETH,
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APPROVED BY

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Committee Member

DEPARTMENT OF HORTICULTURE
POST GRADUATE INSTITUTE
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722
2002

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part thereof has not been submitted by me or other person to any other University or Institute for a Degree or Diploma

30/05/2002

Place : MPKV, Rahuri (Pramod Kumar Pandey)

Dated : / /2002.

Dr. M.T. Patil
Professor,
Department of Horticulture,
College of Agriculture, Pune-5,
Maharashtra State (INDIA)

CERTIFICATE

This is to certify that the thesis entitled, **"EVALUATION OF CUCUMBER (*Cucumis sativus* L.) HYBRIDS UNDER POLYHOUSE CONDITION COMPARED WITH OPEN FIELD CONDITION"**, submitted to the Mahatma Phule Krishi Vidyapeeth, Rahuri for the award of the degree of **MASTER OF SCIENCE** (AGRICULTURE) in **HORTICULTURE**, embodies the results of a *bona fide* research carried out by **MR. PRAMOD KUMAR PANDEY** under my guidance and supervision and that no part of the thesis has been submitted for any other Degree or Diploma.

The assistance and help received during the course of this investigation have been acknowledged.

Place : MPKV, Rahuri (M.T. Patil)

Dated : / /2002. Research Guide

Dr. D.M. Sawant
Associate Dean,
Post Graduate Institute,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra State (INDIA)

CERTIFICATE

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Place : MPKV, Rahuri

Dated : 27 / 06 /2002.

(D.M. Sawant)

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30/05/2002

Place : MPKV, Rahuri (P.K. Pandey)

Date : / /2002

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LIST OF ABBREVIATIONS

@	:	At the rate of
C.D. (5 %)	:	Critical difference
cm	:	Centimeter (S)
FYM	:	Farm yard manure
g	:	Gram (s)
ha	:	Hectare
kg	:	Kilogram (s)
K	:	Potassium
m	:	Meter (s)
N	:	Nitrogen
NS	:	Non-significant
%	:	Per cent
q	:	Quintal (s)
S.E. $\pm$	:	Standard error
i.e.	:	That is
t	:	Tonne (s)
viz.,	:	Namely
/	:	Per
lb	:	Pound (s)

ABSTRACT

EVALUATION OF CUCUMBER (*Cucumis sativus* L.) HYBRIDS UNDER POLYHOUSE CONDITION COMPARED WITH OPEN FIELD CONDITION

By
Pramod Kumar Pandey

MASTER OF SCIENCE (AGRICULTURE)

in

HORTICULTURE

Mahatma Phule Krishi Vidyapeeth,

Rahuri - 413 722

2002

Research Guide	:	Dr. M.T. Patil
Department	:	Horticulture

The present investigation was carried out during the year 2000-2001 at the Instructional-Cum-Research-Orchard of Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri with a view to study comparative performance of two newly developed tropical gynoecious cucumber hybrids in two different growing seasons i.e. *Kharif* and *Rabi*.

The experiment was laid out in FRBD with 5 replications and 16 treatments. Eight plants were selected as experimental plants in each treatment for recording the observations.

Abstract contd..... **Pramod Kumar Pandey**

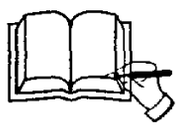
The vegetative growth of plants as assessed by mean length of main vine, number of lateral branches were significantly influenced by conditions. The highest vegetative growth had registered under polyhouse condition in the cultivar Phule Prachi. The appearance of male and female flower significantly at lower node observed during *Rabi* season crop compared to *Kharif*. The earlier appearance of male and female was observed in polyhouse condition in the cultivar Phule Shubhangi. Appearance of male and female flower at lower node was observed in open field condition in the cultivar Himangi. Fruit characters such as diameter of fruit, weight of fruit and length of fruit were observed significantly maximum observed in polyhouse condition in the cultivar Phule Shubhangi. The maximum number of fruits per vine, yield per vine and yield per hectare were recorded in polyhouse condition, during *rabi* season in the cultivar Phule Prachi.

The results obtained in the present investigation indicated that Phule Prachi showed over all excellent performance in all the conditions and seasons over rest of varieties showing its superiority for higher yield all the year round.

Therefore the Phule Prachi gynoecious cucumber can be recommended for maximum production in polyhouse condition.

Pages 1 to 75

INTRODUCTION



1. INTRODUCTION

Vegetables are rich in and are comparatively cheaper source of vitamins, minerals and salts required for maintenance of human health. Besides this, some are important source of carbohydrate, proteins and provide fair amount of fibers and these are currently identified as beneficial in protecting against some degenerative diseases. The cucumber fruit contain 96.3 % moisture 0.49 g protein, 0.1 g calcium, 25 g phosphorus, 1.5 g iron, 0.03 mg thiamine, 0.2 mg niacin 7mg vitamin C per 100 gm edible portion (Nadkarni 1927 and Gopalan *et al.*, 1982).

India is the second major producer of vegetables next to China. India produces 1106.20 lakh tones of vegetables annually of which cucumber contribute 1,15,000 MT (Anon, 2000).

In India, the total area under vegetables cultivation in 2000-01 was 62.40 lakh ha with the total production of 98.50 million tonnes (Anonymous 2001-2002). In Maharashtra the total area under vegetables in 1997-98 was reported to be 2.37 lakh hectare with the total production of 2.95 million tonnes. Out of the total area under vegetables in India the area under this crop is 16,208 ha which produced 1.15 lakh tonnes of cucumber fruits. In Maharashtra, it is cultivated over 16.4 lakh ha area which produced 24,060 tonnes of cucumber fruits (Anon 1999).

Cucumber (*Cucumis Sativus* L.) is one of the important vegetable crops grown all over the world. It is one of the most popularly grown cucurbitaceous vegetable. Cucumber is believed to be native of Tropical region of Africa and Tropical America. Some authorities claim that it was originated in India from where it spread to Asia, Africa and Europe. India, especially the South-East Himalyas is an important region of Asiatic group. In India it is said to be cultivated for over 3000 years. It is one of the oldest cultivated vegetable crops and has been found in cultivation for 3000-4000 years (Decandolle, 1982).

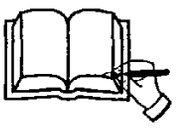
Cucumber is warm season crop and grown mostly during *Kharif* and Summer seasons in all parts of the country including hilly parts of North India. It has wide adaptability to varying soils and climatic conditions both in tropical and sub tropical regions. The cucumber is short duration crop which need critically for input supply.

The gynoecious cucumber hybrids were developed at Mahatma Phule Krishi Vidyapeeth, Rahuri by Dr. T.A. More. These gynoecious hybrids are having high yield potential due to production of more female flowers. These hybrids are Phule Prachi (H-41) and H-42. Their performance under polyhouse and open field conditions is not evaluated so far. Similarly, to have round the year production cultivators are producing cucumber all the year round. The performance of these hybrids is not studied so far. Hence it was felt

necessary to evalute the performance of these gynoecious line along with two check varieties such as Phule Shubhangi and Himangi in different growing conditions (i.e. Polyhouse and open field) as well as different seasons. The present investigation was therefore undertaken with following objectives.

1. To evaluate the growth, yield and quality performance of different cucumber hybrids alongwith check varieties under polyhouse conditions compared with open field condition.
2. To study comparative performance of two tropical gynoecious cucumber hybrids in two different growing seasons i.e. *Kharif* and *Rabi*.

REVIEW OF LITERATURE



2. REVIEW OF LITERATURE

Balanced nutrition and proper spacing are the two factors very essential for proper growth, development and maximum productivity of any crop. The researchers all over the world have devoted considerable attention to the nutrition of plants, since nutrient supply is generally considered to be the most important factor limiting growth and productivity. A good deal of literature is available on judicious manuring practices in cucumber. Gynoecy has phenomenally increased the production because the pistillate flower is produced at everynode and these pistillate female flowers produce the fruits.

Recently tropical gynoecious lines and hybrids are developed in the state (More, 1993; More and Seshadri, 1986, 1998). They promoted the cucumber hybrid technology in India (More, 1998). The yield potential of hybrids depends upon the spacing requirement of crop which usually varies according to morphological characters of the plant, genotype, soil type availability of land and growing season. The nutrition requirement also varies according to the fertility of soil, availability of irrigation.

2.1 Effect of spacing

Nicklow (1966) reported that for high plant population (1,95,000 plants/acre) of pickling cucumber needed 120 lb N, 120 lb P_2O_5 and 240 lb K_2O per acre for higher yields.

Lesic (1977) reported that hybrid pickling cucumber can be grown at 4.6 times higher plant density than normal one. He also found that higher plant density did not affect the length of main vine but decreased the length of auxiliary shoots. The best results were obtained with plant population 2,00,000 plants/ha.

Moreman (1985) conducted a trial on plant spacing cum - substrate in cucumber. The experiment was conducted where cucumber was planted on rock wool at the spacing of 40, 46, 55 and 67 cm in 6 m long gully. It was observed that at the first harvest the highest yields were obtained at spacing of 46 cm, however, subsequently the closest spacing (40 cm) gave the best result.

Bakker *et al.* (1986) studied the effect of plant densities and training system on greenhouse cucumber. They obtained the highest yields from the plants trained on 'v' system with close spacing. They also observed that the mean fruit weight decreased as the spacing between two plant is decreased.

Kasrawi (1990) studied the response of parthenocarpic cucumber plants to the varying plant densities. The plants were grown to densities at 2.4, 3.6, 4.0 and 5.4 plants/m^2 with various row

arrangement in plastic greenhouse. It was observed that the yield per unit area increased linearly with increase in plant density and the highest yields were obtained in two arrangement with 5.5 plants/m^2.

Silva *et al.* (1990) recorded the highest commercial yield of 15.6 to 15.8 tonnes/ha when sown in September and with 80,000 plants/ha in pickling cucumber.

Suchkova *et al.* (1990) while working with hybrid cucumber for seed production recorded the best results with plant density 2.2-2.3 plants/m^2.

Hanna *et al.* (1991) reported that spacing plants at 9-12 inches apart in the row produced the best yields of good quality cucumber. They also found that planting at both the sides of row generally produced higher yields than planting on either side alone.

Girimstad (1992) recorded the highest commercial yields 30.5 kg/m^2 area when plants were spaced at 0.4 m. Also reported that fruit quality increased with increase in spacing.

Wann (1995) tested various gynoecious cucumber cultivars to determine the effect of plant density and found that the 65,000-67,000 plants/acre with row x plant spacing of 15 x 4 inches gave the best results.

Bade (1999) reported fertilizer dose of 200 : 125 : 125 kg NPK and spacing 1.00 x 0.45 m gave the highest yield of better quality fruits of tropical gynoecious hybrid (H-41) under open field conditions.

More (2000) reported that plant spacing of 60 cm x 60 cm with pruning of primary branches above 2 node gave the highest yield (190 t/ha) under plastic greenhouse conditions in winter season at IARI, New Delhi.

Madane *et al.* (2000) observed that the application of 150 : 90 : 90 kg NPK per ha through fertigation of hybrid Phule Prachi (H-41) was found to be optimum for better growth yield and for better utilization of fertilizers.

2.2 Effect of fertilizer

Shear *et al.* (1948) stressed the importance of nutrient element balance adequate and timely application of manures and fertilizers was very essential for the higher production and quality of vegetable. The literature regarding the effect of nitrogen, phosphorus and potassium on growth yield and quality of cucurbitaceous crops is reviewed hereby. Choudhury (1967) reported application 50-60 tonnes of FYM or compost per hectare for cucurbits. Mc Collum and Miller (1971) reported that the total N,P and K uptake was 90, 12 and 145 1b per acre respectively and nutrient removed by the harvested fruit was estimated at 40 lb N, 6 lb P and 55 lb K per acre.

Stolyarov (1973) reported that mineral fertilizer application increased cucumber yields by 25-30 per cent and improved the fruit quality. He further reported that ammonium

sulphate was more suitable and potassium chloride was the better source of K.

Prem Nath (1976) reported that for cucumber crop a dose of 37-49 tonnes FYM and 24-35 kg nitrogen per hectare was sufficient. Yawalkar (1980) advocated the application of 35-50 tonnes of FYM as a basal dose and 1.5-2 quintal of ammonium sulphate as top dressing in two split doses for cucumber.

Katyal (1980) recommended 35-45 tonnes of FYM, 50 kg ammonium sulphate 100 kg super phosphate and 55 kg potassium sulphate per hectare as top dressing in two split doses for cucumber.

2.2.1 Nitrogen

Nitrogen is a constituent of protein and therefore a constituent of every living cell. Nitrogen as a plant food affects growth attribute to a marked degree. Nitrogen deficiency results in a heavy reduction in growth and yield. Majority of Indian soils are deficient in nitrogen and as such the crop growth on them responds very favourably to the application.

2.2.1.1 Effect of nitrogen on growth

The growth of most of the vegetable crops is influenced by nitrogen supply. It tends to encourage the development of vegetative, above ground portion of the plant and imparts a deep green colour to leaves. Nitrogen tends to produce succulence, a quality of great importance in many vegetables.

Flocker *et al.* (1965) reported that the nitrogen fertilization to cantaloupes resulted in increased vine growth and succulence yield response to fertilization was by increase in fruit.

Choudhary (1967) reported that 50 to 60 tonnes of FYM or compost was used for cucurbits. He further recommended to apply 50 kg N/ha to bottle gourd.

Kadam (1983) reported that optimum dose of N, P, K for better growth and quality of cucumber cv. Poona Khira was 79 : 32 : 32 NPK kg/ha.

Singh and Chhonkar (1986) observed that in muskmelon application of 100 kg N 60 kg P and 50 kg K/ha gave the best vegetative growth, fruit weight and yield.

Patil (1993) concluded that fertilization of bottle gourd with 135 : 50 : 58 kg NPK/ha gave best plant growth and yield of crop.

2.2.1.2 Effect of nitrogen on flowering

Nitrogen plays important role in sex impression in cucurbits

Grozdova (1970) reported that cucurbits required higher N dose from the time of flower bud formation till the end of growth.

Parikh and Chandra (1970) concluded that cv. Long Green of cucumber produced most female flowers at 80 kg N/ha. However, higher level of nitrogen application delayed the appearance of the first female flower.

Pandey and Singh (1973) reported that application of nitrogen alone increased the number of pistillate and staminate flowers fruits and yield per plant over the control in bottle gourd. There was practically no difference in number of pistillate flowers, fruits and yield per plant beyond 100 kg ha^{-1}.

2.2.1.3 Effect of nitrogen on fruiting

Nitrogen not only affects the production of staminate and pistillate flowers but it also plays a role in fruit setting.

Brantely (1958) observed increased fruit set with increase of nitrogen in watermelon and muskmelon but the increase was only slight at rates above 100 lb of nitrogen per acre. The beneficial effects of nitrogen on fruit set were not observed by Brantley and Warren (1961) in muskmelon when nitrogen was applied upto the level of 100 lb/acre. However, the higher dose of 250 lb N per acre had an adverse effect of showed significant reduction in percentage fruit set.

2.2.1.4 Effect of nitrogen on yield

Funamato and Masuda (1965) working with cucumbers found that highest yield was obtained when the fertilizer was given in five split application, of the same, total amount of fertilizer at the planting showed the poor results.

Kadam (1983) reported that attributing characters viz. number of flowers, fruit set, size, weight and volume of fruit were favourably increased by both the levels i.e. 50 and 100 kg N ha^{-1} and

low level (30 kg each) of phosphorus and potassium in cucumber cv. Poon Khira.

Deswal and Patil (1984) found that incase of watermelon the weight of fruit was influenced significantly by nitrogen application. The highest yields (467 q ha^{-1}) were obtained with 70 : 70 : 50 kg NPK ha^{-1}.

V'yukov (1984) analysed effect of fertilizers on yield and quality of irrigated cucumbers. He concluded that sub soil application of fertilizers resulted in better plant development with the dose of 20 : 16 : 10 NPK kg/ha fertilizer combination.

Shukla and Prabhakar (1987) observed that 190 kg N ha^{-1} gave highest yield in bottle gourd.

Vendito (1988) observed favourable effect of fertilizers on yield and quality on cucumber hybrid. He further observed that application of fertilizer increased the cucumber yield without considerable change in the fruit quality but nitrogen and ash content of fruit was found to be increased.

2.2.1.5 Effect of nitrogen on availability of nutrient in plant

The application of nitrogen at various levels also reflects the nitrogen content of the leaves. Kateyal (1965) reported that the application of N fertilizer increased N percentage and total N content of different plant parts in cucumber. Mausi *et al.* (1960) reported that increasing the amount of N reduced the Ca, Mg and K content of whole muskmelon plant.

2.2.2 Phosphorus

Phosphorus is another important element required in larger quantities of crop production. It is essential constituent of many vital compounds like nucleotide lecithin and most enzymes.

2.2.2.1 Effect of phosphorus of growth

Lingel and Wight (1960) reported that phosphate fertilization was also necessary to give the possible maturity in cantaloup.

Gomi (1962) reported that the effect of P nutrition was greatest in cucumber during the first 20-30 days after germination and gradually decreased thereafter. The supply of P until at least 10-15 days after the germination caused by severe reduction in growth rate. Plants supplied with P during later stages of development yielded poorly.

Grozdova (1970) recorded that the need of P was increased during flower bud formation, decreased slightly during flowering and increased again during cropping of cucumber.

Largzki (1971) reported that the improvement in fruit quality of cucumber due to application of phosphorus. According to Pettiet (1971) P favour yield early growth and hastened the maturity of pickling cucumber.

2.2.2.2 Effect of phosphorus on yield

Gomi (1962) reported that cucumber plants supplied with P during later stages of development yielded poorly.

Malik (1965) concluded that in bottle gourd application of phosphorus and potash at 25 lb/ acre level proved uneconomical.

Arora and Siyag (1988) reported that in sponge gourd early and total yields and longest fruits were obtained in rainy season with 50 kg N and 20 kg P kg ha^{-1}.

Patil (1993) observed that application of phosphate as low level (50 kg ha^{-1}) significantly increased growth of vine as well as yield attributing characters in bottle gourd.

2.2.2.3 Effect of phosphorus on fruit characters

The improvement in fruit quality due to phosphorus has been reported by Largzskii (1971) in cucumber.

2.2.2.4 Effect of phosphorus on availability of nutrient in plant

Mausi (1960) reported that increasing P level the total amount of N, P and K in plants, were increased in muskmelon.

2.2.3 Potassium

Potassium plays an important role in crop growth, yield and quality of final product.

Grozodova (1970) reported that K was readily absorbed during early growth period and declined during flower bud formation but again rose in fruit development stage in cucumber.

Pettiet (1971) noticed that the application of K greater than 80 lb/acre delayed the maturity in cucumber. Further he observed that pack of K did not inhibit early growth but its addition was found to be beneficial to growth and cropping in cucumber.

Kadam (1983) reported that maturity period was slightly reduced with 60 kg P and K per hectare respectively, low levels (30 kg of each) of P and K significantly increased growth of vine.

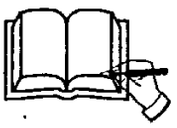
Pak and Kato (1983) reported an influence of nitrogen on lateral shoot development in cucumber. He found that development of lateral shoot was enhanced with increase in nitrogen application.

Deswal and Patil (1984) noticed that application of 50 kg/ha along with 70 kg each of N and P recorded the highest yield in watermelon cv. Asahi Yamato.

Patil (1993) observed in bottle gourd that maximum yield of 49.853 t ha^{-1} was recorded when N, P, K were applied in combination of 150 : 50 : 50 kg ha^{-1} respectively. Maturity period was increased with higher dose of nitrogen while it was slightly reduced with higher levels of phosphorus and potassium application (100 kg ha^{-1}).

Yoo *et al.* (1987) found that uptake nutrients increased with increase in soil moisture.

MATERIAL AND METHODS



3. MATERIAL AND METHODS

The present investigation entitled "Evalution of cucumber (*Cucumis sativus,* L.) hybrids under polyhouse conditions compared with open field condition" was carried out for newly developed tropical gynoecious hybrids along with two checks at Instructional-cum-Research orchard Department of Horticulture, M.P.K.V., Rahuri in *kharif* 2001 and *Rabi* 2001-02 seasons. The material used and methods applied for this trial are presented in this chapter under appropriate headings and sub-headings.

3.1 MATERIAL

3.1.1 Experimental site

An experiment was laid out at the Instructional-cum-Research orchard, Department of Horticulture, M.P.K.V., Rahuri during *Kharif* 2001 and *Rabi* 2001-2002 seasons. The source of irrigation was well with ridge and furrow methods.

The site selected for the experiment was uniform and well leveled.

3.1.2 Soil

The soil of experimental field was clay loam of homogenous texture in both condition (i.e. polyhouse and openfield). The depth of soil was 60 cm with murum substrata.

3.1.3 Climatic conditions

Geographically, the central campus of Mahatma Phule Krishi Vidyapeeth, Rahuri is located between 19^0 47′ and 19^0 57′ North latitude and between 74^0 82′ and 74^0 39′ east. The average altitude varies from 495 to 565 meter above mean sea level. The area is classified under grain shadow area.

3.1.4 Meteorological observations

The data related to period of experimentation are presented in Appendix I. The total rainfall received during crop span was 16.60 mm. The weekly mean Temperature ranged between maximum and minimum temperature range is given below Table 1 in both conditions i.e. polyhouse (B_1) and open field (B_2).

Table 1 Maximum and minimum range of weekly mean temperature and humidity

	B_1		B_2	
	Maximum	Minimum	Maximum	Minimum
Temperature	33.3-35.8	15.5-22.5	27.1-31.9	7.5-22.5
Humidity	84-98	35-72	79-97	30-82

3.1.5 Details of application of fertilizer treatment

The quantity of fertilizer for both seasons applied to polyhouse and open field grown crop in same quantity. 50 per cent nitrogen and full dose of phosphorus and potash was applied through Suphla (20 : 20 : 20) NPK kg/ha at the time of sowing and

remaining 50 per cent nitrogen was applied through urea in spilt dose every 50 days interval.

The fertilizers were applied at surrounding of root zone and were thoroughly mixed in the soil.

3.1.6 Preparation of experimental plot

Field preparation and layout were carried out as per the need.

3.1.7 Seed treatment and sowing

Seeds of gynoecious cucumber hybrid Phule Prachi (H-41) hybrid 42 and two other variety Phule Shubhangi and Himangi as check used were procured from ICAR, Network Research Project on "Promotion of hybrids research vegetable crops" Horticulture Department, M.P.K.V., Rahuri.

The seeds were soaked in luke warm water for 4 hrs before sowing to enhance germination. Seeds were also treated with fungicide Bavistin @ 2 g/kg seed.

The distance between two rows and plants were 60 cm and 3-4 seeds were sown per hill. When the plants were 5 true leaf stage, thining of seedlings were carried out and a single healthy plant was allowed to grow per hill.

Seedings were also grown in polythene bag so as to fill the gap. Cultural practices such as irrigation weeding and plant protection were carried out as and when required.

3.2 METHODS

Variety

Two tropical gynoecious hybrids Phule Prachi (H-41), H-42 and two recommended varieties Phule Shubhangi and Himangi as a checks were used for both the growing conditions i.e. Polyhouse (B_1) and open field (B_2) in both the *Kharif* (S_1) and *Rabi* (S_2) seasons.

3.2.1 Detail of layout and experimental design

The object of this investigation was to study the performance of cucumber hybrids alongwith check varieties under polyhouse conditions as well as under open field in *Kharif* and *Rabi* seasons. The detail of treatments and symbols used are presented in Table a. The plan of layout of experiment is given in Fig. 1.

The experimental details are as follows.

1.	Design -	Factorial Randomized Block Design (FRBD)
2.	Total no. of Treatments -	16
3.	Number of Replications -	5
4.	Total number of plots -	20
5.	Field size -	12.6 x 7.8 m = 98.28 m^2
6.	Plot size -	
	Gross	3.60 x 1.20 m
	Net	2.40 x 1.20 m
7.	Number of plants in a net plot -	12

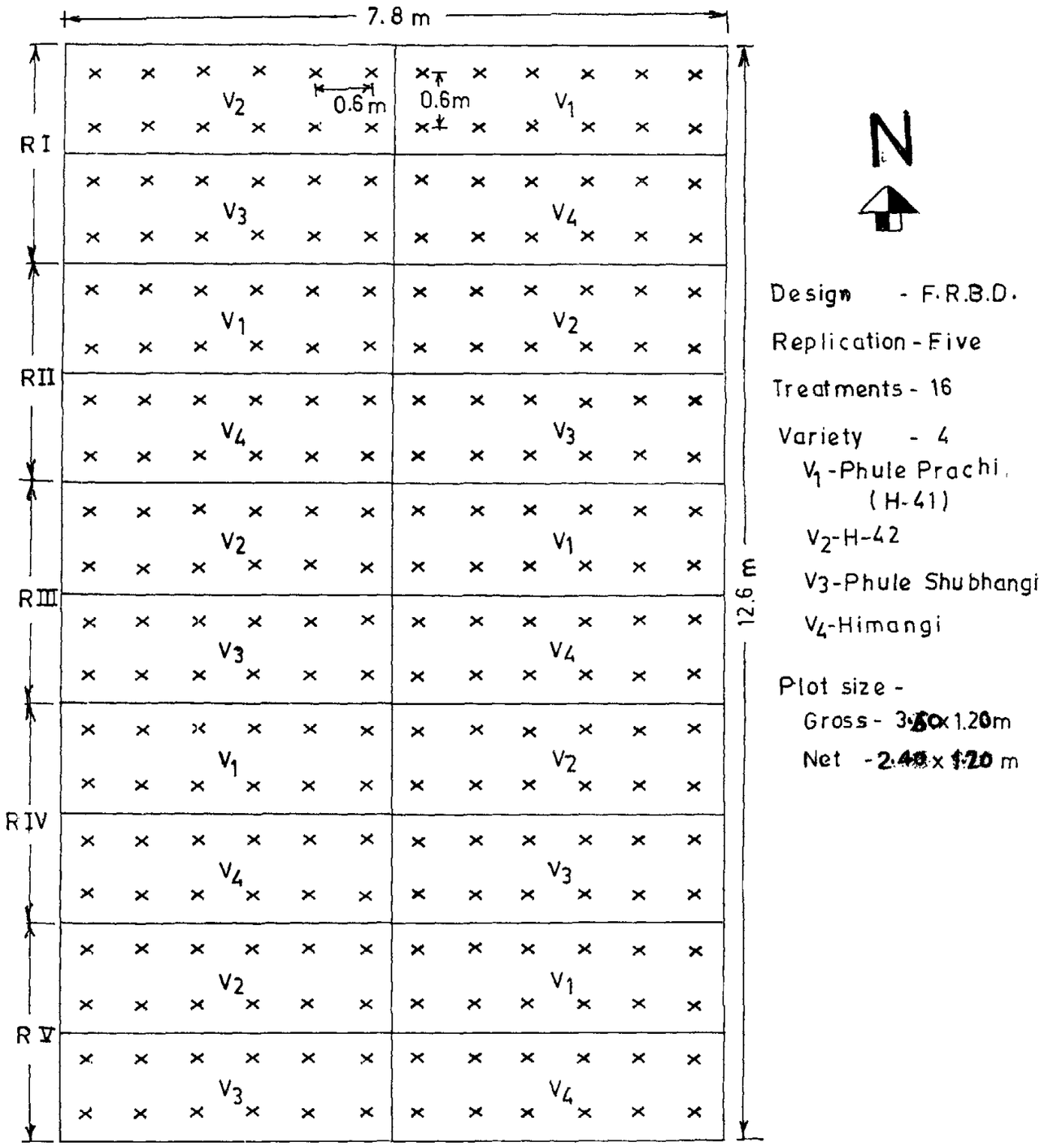


Fig. 1 Plan of layout (Polyhouse & Open field)

Detail treatments and their interaction

T_1	:	$V_1B_1S_1$	T_9	:	$V_3B_1S_1$
T_2	:	$V_1B_1S_2$	T_{10}	:	$V_3B_1S_2$
T_3	:	$V_1B_2S_1$	T_{11}	:	$V_3B_2S_1$
T_4	:	$V_1B_2S_1$	T_{12}	:	$V_3B_2S_2$
T_5	:	$V_2B_1S_1$	T_{13}	:	$V_4B_1S_1$
T_6	:	$V_2B_1S_2$	T_{14}	:	$V_4B_1S_2$
T_7	:	$V_2B_2S_1$	T_{15}	:	$V_4B_2S_1$
T_8	:	$V_2B_2S_2$	T_{16}	:	$V_4B_2S_2$
B_1	:	Polyhouse condition	S_1	:	*Kharif* season
B_2	:	Open field condition	S_2	:	*Rabi* season

V_1 : Gynoecious hybrid Phule Prachi (H-41)

V_2 : Gynoecious H-42

V_3 : Phule Shubangi

V_4 : Himangi

Table (b) Sowing detail

	Seasons	Date of sowing	Spacing (cm)
1.	***Kharif* 2001**		
	June 2001 (B_1)	10/06/2001	60 x 60 cm
	June 2001 (B_2)	10/06/2001	60 x 60 cm
2.	***Rabi* 2001-02**		
	Nov. 2001-02 (B_1)	10/11/2001	60 x 60 cm
	Nov. 2001-02 (B_2)	10/11/2001	60 x 60 cm

B_1 Polyhouse condition
B_2 Open field condition

Schedule of irrigation method

Irrigation method employed was furrow system scheduled at 60 % CPE water was carried out to plot with the help of 4.5 cm PVC and the furrow was fully filled up with water 95 and 45 when needed.

3.2.2 Observations

Randomly eight plants from each plot were selected and they were properly labeled to record the observations. The observations on following objects were recorded from each plot. The observations on growth, flowering, fruit characters and yield were recorded.

A. Growth

1. Length of main vine (m)

The length of main vine of each observation plant was measured form the base upto the growing tip after final harvesting and mean length of main vine was worked out.

2. Number of branches

The number of branches for each vine were counted at the time of final harvesting and average number of branches per vine was computed.

B. Flowering

3. Days to first male flower

The days required for appearance of first male flower was noted for each observational vine and the average period in days was worked out.

4. Days to first female flower

The days required for appearance of first female flower was noted for each observational vine and the average period in days was worked out.

5. Node of first male flower

The node number of main vine at which the first male flower appeared was counted for each observational vine. The average was calculated later on.

6. Node of first female flower

The node number of main vine at which the first female flower appeared was counted for each observational vine and later on. The average was computed.

C. Physical characters

7. Length of fruit (cm)

Length of fruit form observational plants were measured form stalk end to styler end in centimeter. Later on average was calculated.

8. Diameter of fruit (cm)

Average diameter of fruit was recorded of the same fruits which were used for measuring the fruit length with the help of Vernier Caliperse. The average diameter was worked out.

9. Weight of fruit (g)

Weight of fruit was recorded of the same fruits which were used for measuring length and diameter of fruit. The average weight was worked out.

D. Yield characters

10. Number of fruits per vine

The number of fruits harvested form each observational vine at each harvesting was counted and average number of fruits per vine harvested during the season was worked out. Mean number of fruits per vine was calculated later on.

11. Yield per vine (kg)

The weight of fruit harvested from the observational vine at different pickings were recorded in kg and average yield of fruits per vine was calculated.

12. Total yield per ha (tonnes/ha)

Total yield per hectare was worked out by using total yield per vine and number vines those could be accommodated in per hectare.

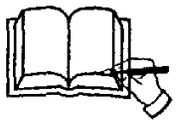
3.2.2.5 Statistical analysis

The statistical analysis of data obtained from field experiment was carried out by Factorial Randomized Block Design (FRBD) considering 16 treatments and five replications.

The statistical analysis of data was carried out by analysis of variance by employing the formulae given by Panse and Sukhatme (1967).

Standard Error (S.E.) of the means were worked out for each factor. Their interactions were also worked out wherever the results were significant, Critical Difference (C.D.) at 5 % level of probability of was worked out and presented. Similarly the significant interactions have been given and discussed.

RESULTS



4. RESULTS

The present investigation entitled "Evaluation of cucumber (*Cucumis sativus,* L.) hybrids under polyhouse condition compared with open field condition" was conducted at Instructional-cum-Research Orchard, Department of Horticulture, M.P.K.V., Rahuri in *kharif* 2001 and *rabi* 2001-02 seasons.

The periodical effects of polyhouse condition and open field condition in two seasons (i.e. *kharif* and *rabi*) on growth, flowering, fruit characters and yield were recorded and same were analysed statistically.

The data obtained for various characters as influenced by various treatments have been presented in this chapter under appropriate headings and sub-headings.

4.1 Growth

4.1.1 Mean length of main vine (m)

The data on mean length of main vine as influenced by various treatments are presented in Table 3.

Perusal of data revealed that there were significant influences of varieties, conditions on mean length of main vine.

Phule Prachi (V_1) produced maximum (3.61 m) mean length of main vine, which was significantly higher than other varieties. Minimum (2.08 m) mean length of main vine was recorded by Himangi (V_4). Maximum (3.81 m) mean length of main vine was recorded under polyhouse condition which was statistically

Table 3. Effects of various treatments on mean length of main vine (m)

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	4.33	4.41	4.37	2.68	3.02	2.85	3.50	3.71	3.61
V_2	3.70	3.75	3.72	2.67	2.45	2.56	2.18	3.10	3.14
V_3	3.42	3.50	3.46	3.60	2.64	2.62	3.01	3.07	3.04
V_4	3.63	3.67	3.65	2.45	2.60	2.52	3.04	3.13	2.08
Mean (S)	3.77	3.83		2.60	2.67		3.18	3.25	
Mean (B)	3.80			2.63					3.21

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.119	0.084	0.084	0.168	0.168	0.119	0.238
C.D. (0.05 %)	0.336	0.230	-	-	-	-	-
	**	**	NS	NS	NS	NS	NS

B_1 Polyhouse condition

B_2 Open field condition

S_1 *Kharif* season

S_2 *Rabi* seaon

highly significant difference than the open field condition. Maximum (3.25 m) mean length of main vine was recorded in *rabi* season but statistically found non-significant.

Interactions V x B (varieites x conditions), V x S (varieties x seasons), B x S (conditions x seasons) and V x B x S (varieties x conditions x seasons) were statistically non-significant.

4.2 Mean number of lateral branches per vine

The data regarding mean number of lateral branches per vine as influenced by varieties, conditions, seasons and their interactions are presented in Table 4.

Perusal of data revealed that significant influence of varieties was observed on the mean number of lateral branches per vine.

Himangi (V_4) produced maximum (5.13) mean number of lateral branches per vine which was significantly higher than other varieties. The minimum number of lateral branches was recorded by Phule Prachi (V_1).

Maximum number of lateral branches per vine was noticed under polyhouse condition. The difference was observed statistically non-significant.

Kharif season was found favourable during which the maximum (4.23) number of lateral branches was produced but it was found non-significant.

Table 4. Effects of various treatments on mean number of lateral branches

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	4.10	4.28	4.19	3.70	3.46	3.58	3.90	3.87	3.88
V_2	3.50	4.06	3.78	4.25	4.12	4.18	3.87	4.09	3.98
V_3	4.00	4.10	4.05	3.90	3.60	3.75	3.95	3.85	3.90
V_4	5.20	5.22	5.21	5.20	4.90	5.05	5.20	5.06	5.13
Mean (S)	4.20	4.41		4.26	4.02		4.23	4.21	
Mean (B)	4.30			4.14					4.22

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.278	0.197	0.197	0.394	0.394	0.278	0.57
C.D. (0.05 %)	0.787	-	-	-	-	-	-
	**	NS	NS	NS	NS	NS	NS

Interactions *viz.*, V x B (varieties x conditions), V x S (varieties x seasons), B x S (conditions x seasons) and V x B x S (varieties x conditions x seasons) were recorded statistically non-significant.

4.2 Flowering

4.2.1 Days to first male flower

The data related to days to first male flower are presented in Table 5.

Perusal of data revealed that there were significant influences of varieties, conditions and interaction *viz.*, B x S (conditions x seasons) for days to first male flower.

Phule Shubhangi (V_3) recorded earlier for days to first male flower (34.74 days). Phule Prachi (V_1) recorded more days for the appearance of the first male flower (36.35 days). Himangi was at par with Phule Shubhangi.

Under polyhouse condition the crop recorded earlier for days to first male flower (34.08 days) compared to open field condition (36.04 days).

Kharif season was found favourable for days to first male flower (34.40 days) which produced male flower significantly earlier than the *rabi* season. *Rabi* season recorded 38.49 days for days to first male flower.

Interaction *viz.*, B_2 x S_1 (open field condition x *kharif* season) crop recorded earlier for days to first male flower (33.69

Table 5. Mean number of days to first male flower appear as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	35.60	35.75	35.76	35.66	38.40	37.03	35.63	37.07	36.35
V_2	34.91	35.76	35.33	33.35	38.93	36.14	34.13	37.34	35.73
V_3	34.14	34.08	34.11	32.88	37.86	35.37	33.51	35.93	34.74
V_4	35.06	33.79	34.42	33.70	37.44	35.57	34.38	35.61	34.99
Mean (S)	34.92	34.84		33.89	38.15		34.40	38.49	
Mean (B)	34.08			38.52					35.45

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.320	0.226	0.226	0.453	0.453	0.320	0.640
C.D. (0.05 %)	0.905	0.640	0.640	-	-	0.905	-
	**	**	**	NS	NS	**	NS

days) which was found significantly earlier than other interactions, conditions x seasons.

Interactions *viz.*, V x B (varieties x conditions), V x S (varieties x seasons) and V x B x S (varieties x conditions x seasons) were recorded statistically non-significant.

4.2.2 Days to first female flower

The data regarding days to first female flower are presented in Table 6.

Perusal of data revealed that there were significant influences of varieties, conditions and interactions B x S (conditions x seasons), V x S (varieties x seasons) and V x B x S (varieties x conditions x seasons) for days to first female flower.

Phule Shubhangi (V_3) noticed earlier for days to first female flower (37.48 days) which was highly significant compare to other varieties.

Under polyhouse condition crop recorded earlier for days to first female flower (39.41 days) which was statistically highly significant over the open field condition.

Rabi season was found favourable for earlier flowering (39.83 days) for days to first female flower appearance compared to *kharif* season but it was statistically non-significant.

Interaction B_1 x S_2 (polyhouse condition x *rabi* season) recorded earlier for days to first female flower (38.37 days) which was highly significant compared to other interactions.

Table 6. Mean number of days to first female flower appear as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	41.20	43.80	42.50	44.16	42.71	43.43	41.18	43.25	42.96
V_2	41.00	42.18	41.59	40.59	43.03	42.21	40.79	43.00	41.90
V_3	39.80	33.78	36.79	37.50	38.85	38.17	38.65	36.31	37.48
V_4	39.80	33.75	36.77	37.75	39.80	38.77	38.77	36.77	37.77
Mean (S)	40.45	38.37		40.00	41.29		40.22	39.83	
Mean (B)	39.41			40.64					40.02

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.373	0.263	0.263	0.527	0.527	0.373	0.745
C.D. (0.05 %)	1.054	0.745	-	-	1.490	1.054	2.107
	**	*	NS	NS	**	**	**

Interaction V_3 x B_1 x S_2 (Phule Shubhangi x open field x *rabi* season) recorded earliest for days to first female flower (33.78 days) which was highly significant compared to other interactions of V x B x S (varieties x conditions x seasons). Interaction V_1 x B_2 x S_1 (Phule Prachi x open field condition x *kharif* season) recorded more days to first female flower (44.16 days).

Interaction *viz.*, V x B (varieties x conditions) was noticed statistically non-significant.

4.2.3 Node number at which first male flower appeared

Mean node number at which first male flower appeared as influenced by various treatments are presented in Table 7.

The perusal of data revealed that significant influence of varieties, seasons and interaction of V x S (varieties x season). Effects were found to be significant while interactions V x S (condition x interaction) of B x S (conditions x seasons) and V x B x S (varieties x conditions x seasons) were found to be non-significant.

Himangi (V_4) produced first male flower at lower (2.98) node than other varieties, which was highly significant compared to other varieties. Phule Prachi (V_1) produced first male flower on upper (3.91) node.

Under polyhouse condition crop recorded first male flower at lower (3.44 node) node compared to open field condition but it was non-significant.

Table 7. Mean node number at which the first male flower appeared as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	5.00	3.16	4.08	4.90	2.60	3.75	**4.95**	2.88	3.91
V_2	3.50	3.42	3.46	4.40	3.30	3.85	3.95	3.36	3.65
V_3	3.58	2.62	3.10	3.82	2.82	3.32	3.70	2.72	3.21
V_4	3.71	2.48	3.09	3.20	2.47	2.08	3.45	2.47	2.98
Mean (S)	3.94	2.92		4.08	2.79		4.01		
Mean (B)	3.43			3.43					3.43

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.129	0.091	0.091	0.182	0.182	0.129	0.257
C.D. (0.05 %)	0.364	-	0.257	-	0.514	-	-
	**	NS	**	NS	**	NS	NS

In *rabi* season crop first male flower appeared at lower (2.86) node compared to *kharif* season (4.01 node) which was noticed statistically highly significant over the *kharif* season.

Interactions *viz.*, V_4 x S_2 (Himangi x *rabi* season) recorded first male flower at lower (2.47) node which was highly significant over the other interaction *viz.*, Vx S (varieties x seasons).

Interactions of V x B (varieties x conditions), B x S (conditions x seasons) and V x B x S (varieties x conditions x seasons) were noticed statistically non-significant.

4.2.4 Node number at which first female flower appeared

Mean node number at which first female flower appeared as influenced by various treatments are presented in Table 8.

The perusal of data revealed that significant influence of varieties, conditions, seasons and their interactions was noticed, while varieties x seasons, varieties x conditions, conditions x seasons and varieties x conditions x seasons were found to be non-significant on mean node number at which first female flower appeared.

Variety Himangi (V_4) produced first female flower at lower (3.31) node which was highly significant over the other varieties. Phule Prachi (V_1) produced first female flower at upper (4.37) node.

Under open field condition crop produced first female flower at lower (3.69) node but it was non-significant over the polyhouse condition.

Table 8. Mean node number at which the first male flower appeared as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	5.10	3.60	4.35	4.80	3.75	4.27	4.95	3.67	4.37
V_2	3.76	3.96	3.86	3.70	3.90	3.80	3.73	3.93	3.83
V_3	3.62	3.00	3.31	4.00	3.14	3.57	3.81	3.07	3.44
V_4	3.51	3.45	3.48	3.50	2.80	3.15	3.50	3.12	3.31
Mean (S)	3.99	3.50		4.00	3.39		3.99	3.44	
Mean (B)	3.74			3.69					3.72

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.155	0.109	0.109	0.219	0.219	0.155	0.309
C.D. (0.05 %)	0.437	-	-	-	-	-	-
	**	NS	NS	NS	NS	NS	NS

In *rabi* season crop produced first female flower at lower (3.44) node but it was found to be non-significant over the *kharif* season.

Interactions *viz.*, V x B (varieties x conditions), V x S (varieties x seasons), B x S (conditions x seasons) and V x B x S (varieties x conditions x seasons) were recorded non-significant.

4.3 Fruit characters

4.3.1 Length of fruit (cm)

Length of fruit as influenced by various treatments is presented in Table 9.

The perusal of data revealed that there was significant influence of varieties, conditions and interaction *viz.*, V x B (varieties x conditions) while the interactions *viz.*, V x S (varieties x seasons) and V x B x S (varieties x conditions x seasons) on fruit length were found to be non-significant.

Phule Shubhangi (V_3) produced maximum (16.37 cm) mean length of fruit which was highly significant over the rest varieties. Himangi (V_4) produced minimum (14.81 cm) length of fruit.

Under polyhouse condition crop produced significantly maximum (15.70 cm) mean length of fruit which was noticed highly significant compared to open field condition.

Kharif season crop produced longer (15.41 cm) mean length of fruit but it was noticed non-significant over the *rabi* season crop.

Table 9. Effect of various treatments on mean length of fruit (cm)

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	15.55	15.58	15.56	15.25	15.25	15.25	15.40	15.41	15.40
V_2	15.54	15.35	15.44	14.67	14.87	14.77	15.10	15.11	15.10
V_3	16.62	16.72	16.67	16.16	16.00	16.08	16.39	16.36	16.37
V_4	15.16	15.18	15.17	14.36	14.55	14.45	14.76	14.86	14.81
Mean (S)	15.71	15.70		15.11	15.16		15.41	15.43	
Mean (B)	15.70			15.13					15.42

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.051	0.036	0.036	0.072	0.072	0.051	0.102
C.D. (0.05 %)	0.144	0.102	-	0.203	-	-	-
	**	**	NS	*	NS	NS	NS

Interactions *viz.*, B_1 x V_3 (polyhouse condition x Phule Shubhangi) produced significantly maximum (16.67 cm) mean length of fruit except V_3 x B_2 (Phule Shubhangi x open field condition) which was noticed at par with interaction B_1 x V_3 (Polyhouse conditions x Phule Shubhangi).

Interactions V x S (Varieties x Seasons), B x S (Condition x seasons) and V x B x S (varieties x conditions x seasons) were noticed statistically non-significant.

4.3.2 Fruit diameter (cm)

The data on mean diameter of fruit as influenced by various treatments are presented in Table 10.

Perusal of data revealed that significant influence was observed for varieties, conditions and interactions, V x B (varieties x conditions), B x S (conditions x seasons) except interactions V x S (varieties x seasons) and V x B x S (varieties x condition x seasons) on mean diameter of fruit.

Phule Shubhangi (V_3) had significantly maximum (4.61 cm) diameter of fruit which was highly significant compared to other varieties. H-42 recorded minimum (3.59 cm) diameter of fruit out of four varieties.

Maximum (3.95 cm) mean diameter of fruit was produced under polyhouse condition which was noticed highly significant over the open field condition.

Table 10. Effect of various treatments on mean diameter of fruit (cm)

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	3.77	3.77	3.77	3.63	3.49	3.56	.370	3.63	3.66
V_2	3.62	3.69	3.65	3.56	3.50	3.53	3.59	3.59	3.59
V_3	4.71	4.73	4.72	4.53	4.48	4.50	4.62	4.60	4.61
V_4	3.62	3.70	3.66	3.65	3.60	3.62	3.63	3.65	3.64
Mean (S)	3.93	3.97		3.84	3.51		3.88	3.74	
Mean (B)	3.95			3.67					3.84

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.018	0.013	0.013	0.026	0.026	0.018	0.037
C.D. (0.05 %)	0.052	0.037	-	0.074	-	0.052	-
	**	**	NS	**	NS	**	NS

Maximum (3.88 cm) mean diameter of fruit recorded in *kharif* season crop but it was non-significant compared to *rabi* season crop.

Interaction V_3 x B_1 (Phule Shubhangi x Polyhouse condition) crop recorded significantly maximum (4.72 cm) diameter of fruit compared to other interactions V x B (varieties x conditions) except interaction V_3 x B_2 (Phule Shubhangi x open field condition) which was found at par with V_3 x B_1 (Phule Shumbhangi x polyhouse condition).

Interaction B_1 x S_2 (Polyhouse condition x *rabi* season) crop provided significantly maximum (3.97 cm) diameter of fruit over the other interaction viz. B x S (conditions x seasons).

The interactions *viz.*, V x S (varieties x seasons) and V x B x S (varieties x conditions x seasons) recorded statistically non-significant effect.

4.3.3 Weight of fruit (g)

The data on average fruit weight as influenced by different treatments are presented in Table 11.

Perusal of data indicated significant influence of varieties, conditions and interaction of V x B (varieties x conditions).

Phule Shubhangi (V_3) noticed significantly maximum (166.52 g) average fruit weight which was found highly significant over the other varieties. Himangi (V_4) recorded minimum fruit weight out of four varieties.

Table 11. Effect of various treatments on mean weight of fruit (g)

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	135.20	135.16	135.18	121.00	115.32	118.16	128.10	125.24	126.67
V_2	125.00	130.20	127.60	115.00	110.04	112.52	120.00	120.12	120.06
V_3	175.00	174.84	174.92	160.04	156.21	158.12	167.52	165.52	166.52
V_4	120.00	125.20	122.60	111.00	190.38	110.19	115.50	117.29	116.39
Mean (S)	138.80	141.35		126.76	122.73		132.78	132.04	
Mean (B)	140.07			124.74					132.41

Factor	V	B	S	VB	VS	BS	VBS
S.E. $\pm$	0.717	0.507	0.507	1.015	1.015	0.717	1.435
C.D. (0.05 %)	2.029	1.435	-	-	-	2.029	-
	**	**	NS	NS	NS	**	NS

Maximum (140.07 g) average fruit weight obtained by polyhouse condition which was highly significant over the open field condition.

Under *rabi* season, crop produced maximum (132.78 g) average fruit weight but it was non-significant over the *kharif* season.

Interaction B_1 x S_2 (Polyhouse condition x *rabi* season) crop recorded significantly maximum (141.35 g) average fruit weight which was highly significant over the other interaction B x S (conditions x seasons).

Interaction B_2 x S_2 (open field condition x *rabi* season) crop recorded minimum (122.73 g) average fruit weight.

The interactions *viz.*, V x S (varieties x season) and V x B x S (varieties x conditions x seasons) were recorded statistically non-significant.

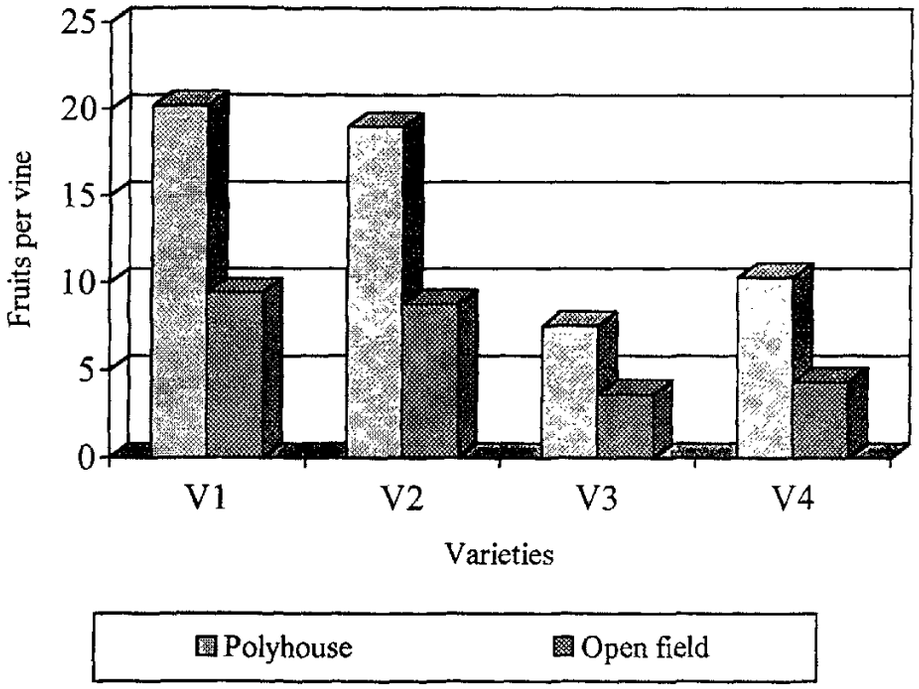
4.4 Yield

4.4.1 Number of fruits per vine

The data in Table 12 revealed that there was significant influence of various treatments on number of fruits per vine.

The influence of varieties, conditions and interaction of V x B (varieties x condition), V x S (varieties x seasons), B x S (conditions x seasons) and V x C x S (varieties x conditions x seasons) except season recorded significant number of fruits per vine.

Phule Prachi (V_1) yielded significantly maximum (14.81) number of fruit per vine which was noticed highly significant



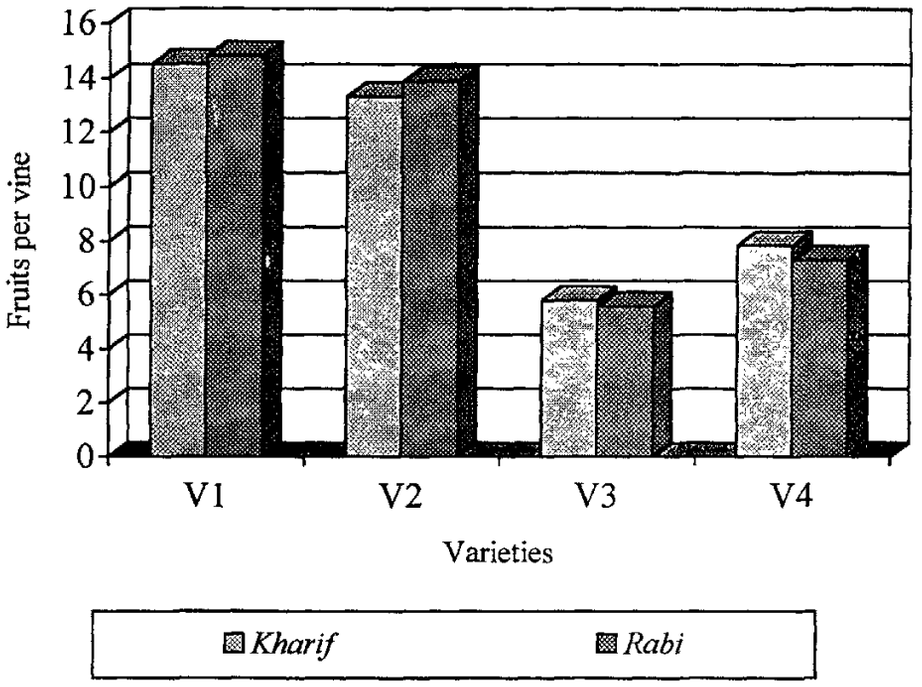


Fig. 2 Cucumber yield number of fruits per vine

Table 12. Mean number of fruits per vine as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	18.63	21.82	20.22	10.41	8.41	9.41	14.52	15.11	14.81
V_2	17.28	20.73	19.00	9.39	8.17	8.78	13.33	14.45	13.89
V_3	7.42	7.66	7.54	4.18	3.07	3.62	5.80	5.36	5.58
V_4	10.50	10.14	10.32	5.22	3.38	4.30	7.86	6.76	7.31
Mean (S)	13.45	15.08		7.30	5.75		10.37	10.41	
Mean (B)	14.26			6.52					10.39

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.139	0.098	0.098	0.196	0.196	0.139	0.277
C.D. (0.05 %)	0.392	0.277	-	0.554	0.554	0.392	0.784
	**	**	NS	**	**	**	**

over the other varieties. Phule Shubhangi (V_3) yielded minimum (5.58) number of fruits per vie.

Mean number of fruits per vine was obtained 10.39.

Under polyhouse condition crop recorded significantly maximum (14.26) number of fruits per vine which was noticed highly significant over the open field condition.

In *rabi* season crop recorded maximum (10.41) number of fruits per vine but it was found non-significant over the *kharif* season.

Interaction V_1 x B_1 (Phule Prachi x Polyhouse condition) crop recorded maximum (20.22) number of fruits per vine which was highly significant compare to rest interactions V x S (varieties x seasons).

Interaction B_1 x S_2 (Polyhouse condition x *rabi* season) crop yielded maximum (15.08) number of fruits per vine which was highly significant over the other interactions B x S (conditions x seasons).

Interaction V_1 x S_2 (Phule Prachi x *rabi* season) crop yielded significantly maximum (15.11) number of fruits per vine, which was highly significant compared to other interaction V x S (varieties x seasons).

Interaction, V_3 x S_2 (Phule Shubhangi x *rabi* season) crop yielded minimum (5.36) number of fruits per vine.

In the interaction V_1 x B_1 x S_2 (Phule Prachi x Polyhouse condition x *rabi* season) yielded significantly maximum

(21.82) number of fruits per vine which was noticed highly significant compare to other Interaction $V_3 \times B_2 \times S_2$. (Phule Shubhangi x open field condition x *rabi* season) yielded lowest (3.07) number of fruits per vine.

4.4.2 Yield per vine (kg)

The data pertaining to the average yield per vine are computed in Table 13.

It is revealed that influence of varieties, condition and their all possible interactions on average yield per vine recorded significant influence except the season.

The mean yield of fruits per vine was noticed 1.35 kg.

Phule Prachi (V_1) yielded significantly maximum yield (1.92 kg) per vine which was noticed highly significant over the other varieties.

Maximum (1.91 kg) yield per vine was recorded under polyhouse condition which was highly significant over the open field condition.

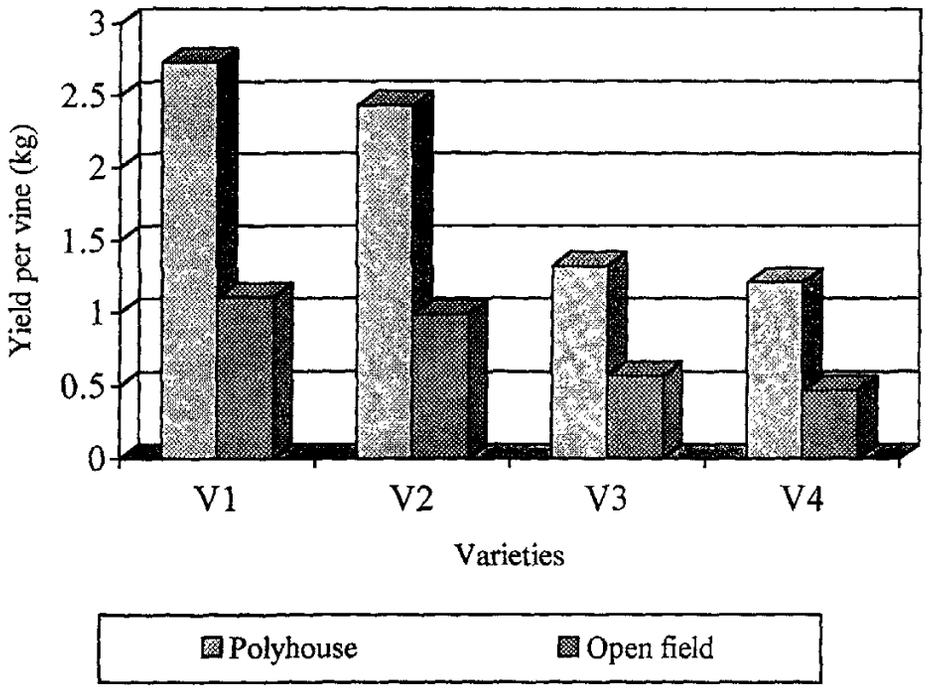
In *rabi* season, crop recorded maximum (1.40 kg) yield per vine but it was non-significant over the *kharif* season crop.

Interaction $V_1 \times B_1$ (Phule Prachi x Polyhouse condition) crop recorded significantly maximum (2.73 kg) yield per vine which was noticed highly significant compared to other interaction *viz.*, varieties x conditions.

Table 13. Mean yield of fruits (kg) per vine as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	2.52	2.95	2.73	1.26	0.97	1.11	1.89	1.96	1.92
V_2	2.16	2.70	2.43	1.08	0.90	0.99	1.62	1.80	1.71
V_3	1.30	1.34	1.32	0.67	0.48	0.57	0.98	0.90	0.94
V_4	1.16	1.27	1.21	0.58	0.37	0.47	0.87	0.81	0.84
Mean (S)	1.78	2.05		0.89	0.75		1.33	1.40	
Mean (B)	1.91			0.82					1.35

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.052	0.037	0.037	0.073	0.073	0.052	0.104
C.D. (0.05 %)	0.147	0.104	-	0.208	0.208	0.147	0.294
	**	**	NS	**	**	**	**



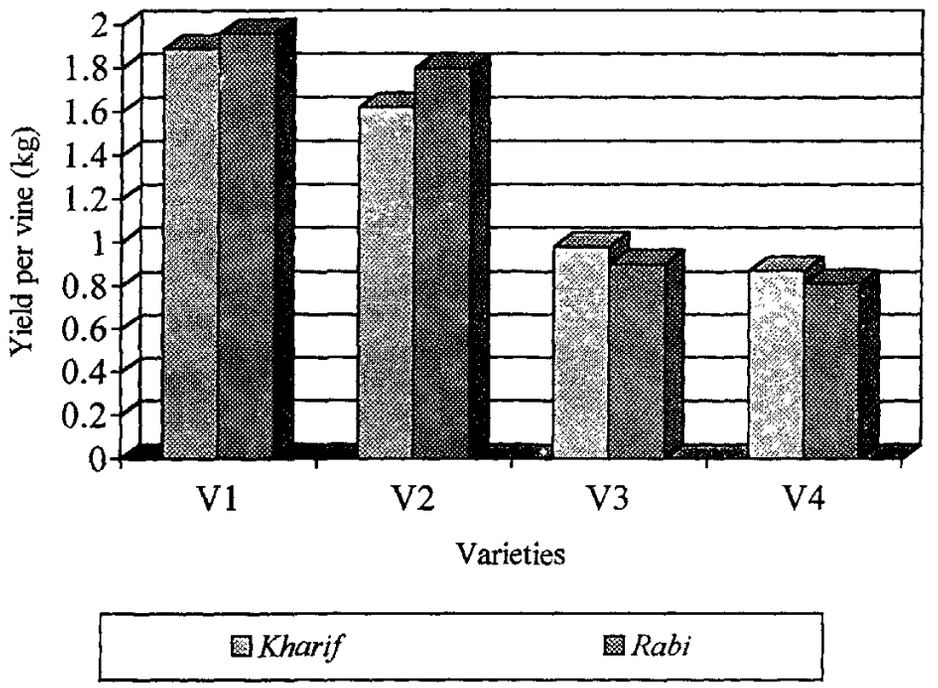


Fig.3 Yield per vine (kg)

Interaction V_1 x S_2 (Phule Prachi x *rabi* season) recorded maximum (1.96 kg) yield per vine which was noticed highly significant compare to other interaction.

Interaction B_1 x S_2 (Polyhouse condition x *rabi* season) recorded maximum (2.05 kg) yield per vine which was noticed statistically highly significant compared to other interaction.

In interaction V_1 x B_1 x S_2 (Phule Prachi x Polyhouse condition x *rabi* season) crop yielded significantly maximum (2.95 kg) yield per vine which was highly significant over the other treatments.

Interaction V_4 x B_2 x S_2 (Himangi x open field x *rabi* season) produced minimum (0.378 kg) yield per vine.

4.4.3 Total yield per ha (tonnes/ha)

The data related to the total yield per hectare as influenced by different treatments are presented in Table 14.

From the data it is observed that influence of varieties, conditions, seasons and their all possible interactions on total yield per hectare of crop was found to be highly significant.

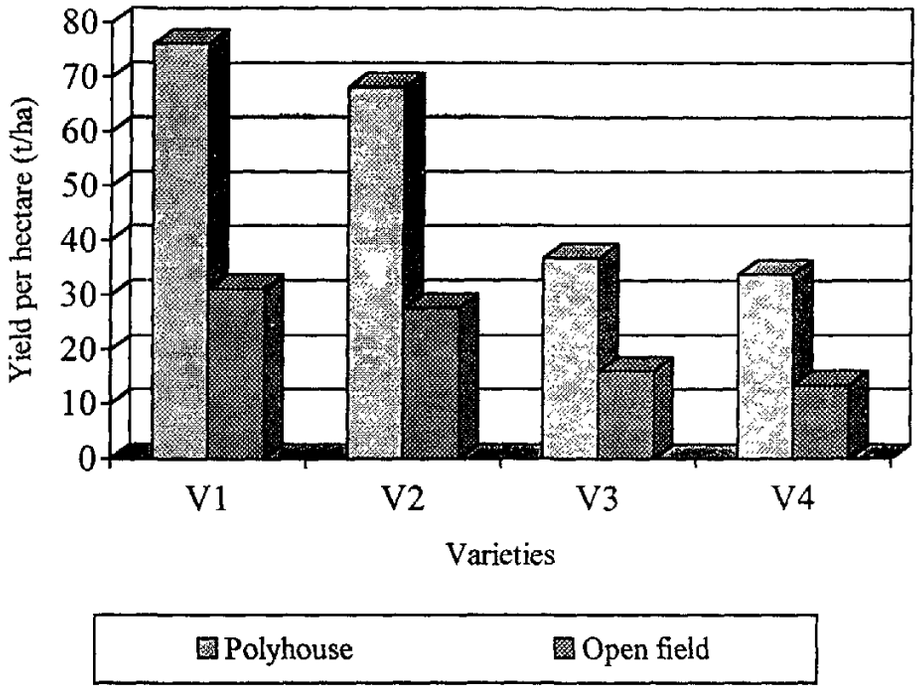
Phule Prachi (V_1) produced significantly maximum (53.59 tonnes/ha) yield which was noticed statistically highly significant over the other varieties. Minimum (23.60 tonnes/ha) yield of was obtained by Himangi (V_4).

Mean total yield was noticed to 37.79 tonnes/ha.

Table 14. Mean total yield hectare (tonnes/ha) as influenced by various treatments

Varieties	Condition season						Mean		
	B_1			B_2					
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	V
V_1	70.03	82.17	76.10	35.08	27.10	31.09	52.55	54.63	53.59
V_2	60.10	75.17	68.13	30.08	25.20	27.64	45.09	50.18	47.88
V_3	36.13	37.34	36.73	18.65	13.39	16.02	27.39	25.36	26.37
V_4	32.21	35.41	33.81	16.28	10.52	13.40	24.24	22.96	23.60
Mean (S)	49.61	57.52		25.02	19.05		37.33	38.28	
Mean (B)	53.56			22.03					37.79

Factor	V	B	S	VB	VS	BS	VBS
S.E. ±	0.070	0.049	0.098	0.098	0.070	0.139	0.640
C.D. (0.05 %)	0.197	0.139	0.139	0.278	0.278	0.197	0.394
	**	**	**	**	**	**	**



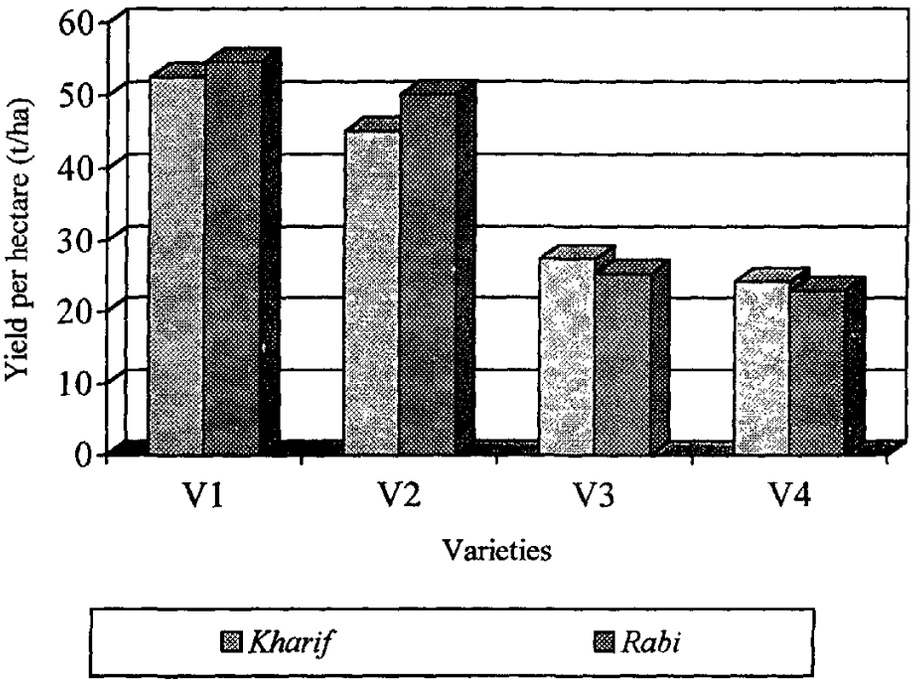


Fig. 4 Total yield per hectare (t/ha)

Under polyhouse condition crop recorded significantly maximum (53.56 tonnes/ha) yield which was noticed highly significant over the open field crop (22.03 tonnes/ha).

In *rabi* season, crop recorded significantly maximum (38.28 tonnes/ha) yield which was noticed highly significant over the *kharif* season crop.

Interaction V_1 x B_1 (Phule Prachi x Polyhouse condition) crop recorded significantly maximum (76.10 tonnes/ha) yield of which was noticed highly significant over the other interaction varieties x conditions. Minimum (13.40 tonnes/ha) yield was produced by the interaction of V_4 x B_2 (Himangi x open field condition).

Interaction, V_1 x S_2 1 (Phule Prachi x *rabi* season) crop produced significantly maximum yield (54.63 t/ha) which was noticed statistically highly significant compare to other interaction (varieties x seasons). Minimum yield obtained by interaction Himangi x *rabi* season (22.96 t/ha).

Interaction, B_1 x S_2 (Polyhouse x *rabi* season) crop recorded significantly maximum (57.52 tonnes/ha) yield of which was noticed statistically highly significant over the other interactions *viz.*, (conditions x season).

Interaction V_1 x B_1 x S_2 (Phule Prachi x Polyhouse condition x *rabi* season) recorded significantly maximum (82.17 tonnes/ha) yield which was noticed highly significant over the other interactions. Minimum (10.52 tonnes/ha) yield recorded by interactions V_4 x B_2 x S_2 (Himangi x open field condition x *rabi* season).

Table 15. Mean of observable characters

Treatment	Characters											
	Length of vine (m)	No. of branches	Days to 1st male appear	Days to 1st female appear	Node No. 1st male appear	Node No. of female appear	Length of fruit (cm)	Diameter fruit (cm)	Weight of fruits (g)	No. of fruit/ vine	Yield of fruit/ vine (kg)	Total yield (t/ha)
T_1	4.334	4.10	35.602	41.20	4.940	5.100	15.550	3.778	135.200	18.630	2.516	70.030
T_2	4.410	4.28	35.756	43.780	3.160	3.600	15.580	3.778	135.160	21.820	3.028	82.176
T_3	2.680	3.70	35.658	44.160	4.900	4.800	15.254	3.630	121.000	10.410	1.258	35.080
T_4	2.020	3.46	38.400	42.710	2.600	3.750	15.250	3.494	115.320	8.410	0.972	27.100
T_5	3.702	3.50	34.918	41.000	3.580	3.760	15.540	3.620	125.000	17.280	1.758	60.100
T_6	3.750	4.06	35.766	42.100	3.420	3.960	15.350	3.690	130.200	20.730	2.704	75.176
T_7	2.678	4.25	33.352	40.590	4.400	3.700	14.670	3.568	115.000	9.390	1.076	30.082
T_8	2.450	4.12	38.932	43.830	3.300	3.900	14.870	3.504	110.040	8.170	0.902	25.200
T_9	3.426	4.00	34.148	39.800	3.500	3.620	16.620	4.710	175.000	7.420	1.296	36.130
T_{10}	3.500	4.10	34.082	33.784	2.620	3.000	16.720	4.734	174.840	7.660	1.344	37.342
T_{11}	2.604	3.90	32.880	37.600	3.820	4.000	16.166	4.530	160.040	4.180	0.656	18.650
T_{12}	2.640	3.60	38.024	38.850	2.820	3.140	16.880	4.482	156.210	3.070	0.476	13.390
T_{13}	3.632	5.20	35.060	39.800	3.710	3.510	16.160	3.626	120.000	10.500	1.260	32.216
T_{14}	3.670	5.22	33.798	37.740	2.480	3.450	15.180	3.700	125.200	10.140	1.276	35.410
T_{15}	2.450	5.20	33.700	37.750	3.200	3.500	14.360	3.656	111.000	5.220	0.582	16.280
T_{16}	2.602	4.90	37.442	39.800	2.452	2.800	14.550	3.600	109.380	3.380	0.378	10.526

Table 16. Analysis of variance (ANOVA table for different characters)

SV	DF	Length vine (cm)	Number of branches	Days to Ist male flower appear	Days to Ist female flower appear	No. of Ist male flower appear	No. of Node Ist female flower appear	Length of fruit	Diameter of Fruit	Weight of fruit	No. of fruits per vine	Yield of fruit/ vine	Total yield t/ha
Rep	4	2.560	8.457	18.977	23.359	2.376	1.246	0.184	0.052	295.125	4.259	0.244	1.078
A	3	4.146**	23.89**	30.930**	395.500**	10.992**	12.339**	27.629**	14.376**	32112.130**	1317.115	16.237**	13564.480**
B	1	27.028**	0.639	26.758**	11.289*	-0.000NS	0.190NS	6.553**	0.0430**	4697.875**	1225.160	24.653**	19887.930**
C	1	0.090NS	0.052	89.047**	0.203NS	26.900**	1.200NS	0.006NS	0.006NS	10.075NS	0.504	0.144NS	18.852**
A x B	3	1.170NS	1.882	1.016NS	5.359NS	1.667NS	1.085NS	0.494*	0.114**	68.250NS	173.033	2.735**	2470.305**
A x C	3	0.227NS	0.044	13.000NS	54.195**	5.585**	3.137NS	0.057NS	0.118NS	66.250NS	16.578	0.731**	131.398**
B x C	3	0.001NS	0.553	96.102**	27.633**	0.324NS	0.231NS	0.025NS	0.69**	216.000**	54.769	1.749**	962.648**
A x B x C	3	0.199NS	0.033	5.500NS	85.086**	1.411NS	0.170NS	0.291NS	0.004NS	27.375NS	18.954	0.740**	194.039**
Error	60	19.968	93.006	122.867	166.508	19.830	28.656	3.096	0.408	617.750	3.043	3.235	5.813
Total	79	52.390	128.556	404.195	769.133	69.084	48.254	38.334	15.477	38111.630	2833.443	50.469	37226.540
CV (%)		16.59	29.17 %	4.03 %	4.14 %	16.73 %	17.85 %	1.47 %	2.13 %	2.42 %	5.93 %	17.29 %	0.82 %
Mean		3.222	4.268	35.470	40.286	3.436	3.873	15.426	3.881	132.412	10.444	1.343	37.805

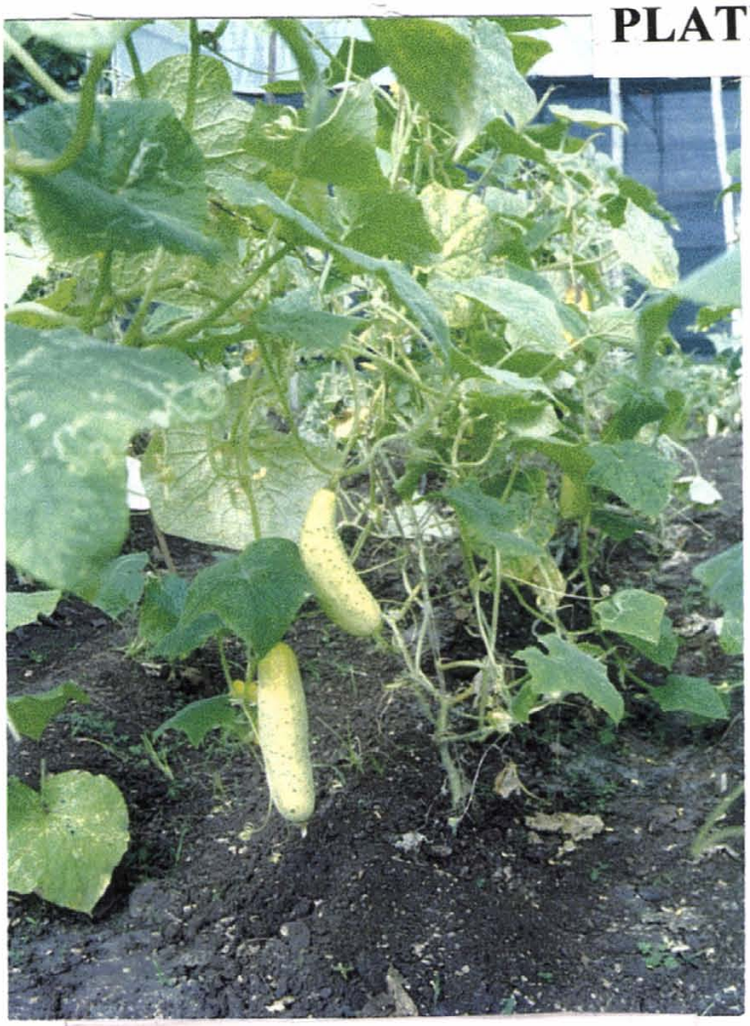
* Highly significant
** Significant
NS Non significant

PLATE-1

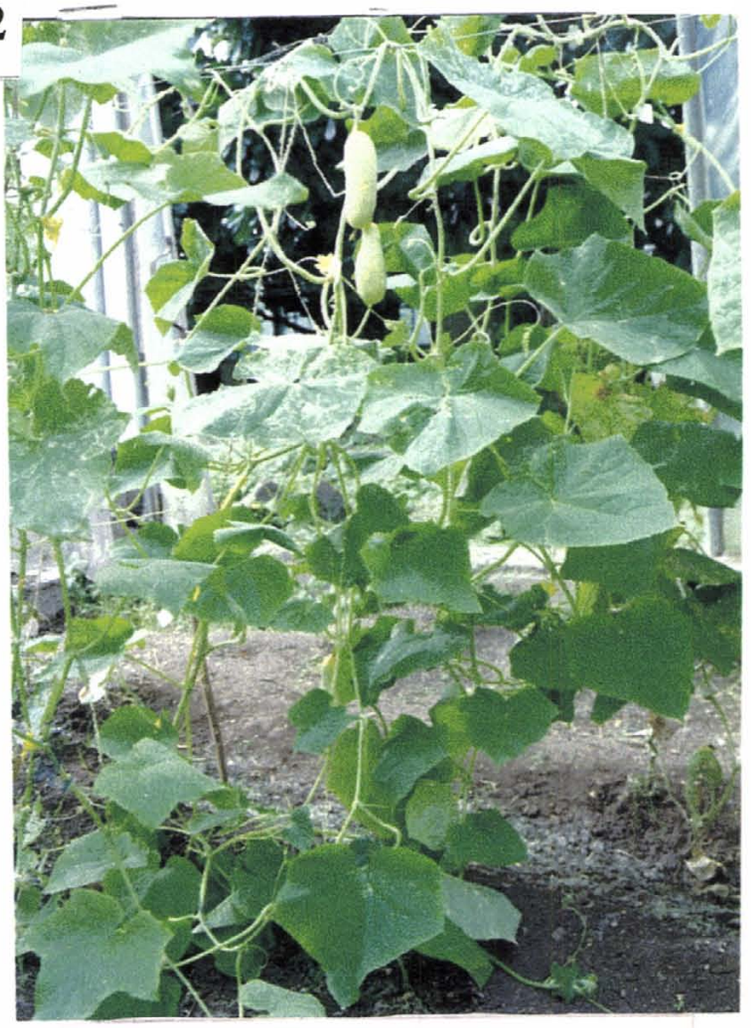
General view of plot in Polyhouse

General view of plot in open field

PLATE-2



Phule Prachi (H- 41) in open field

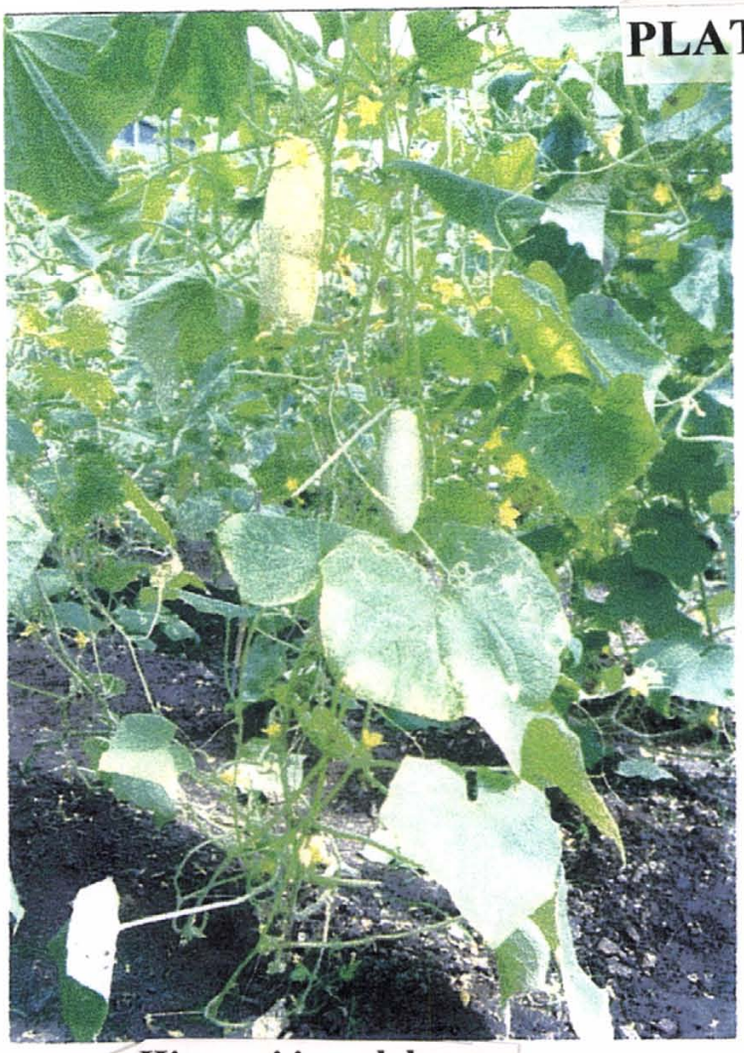


Phule Prachi (H- 41) in polyhouse

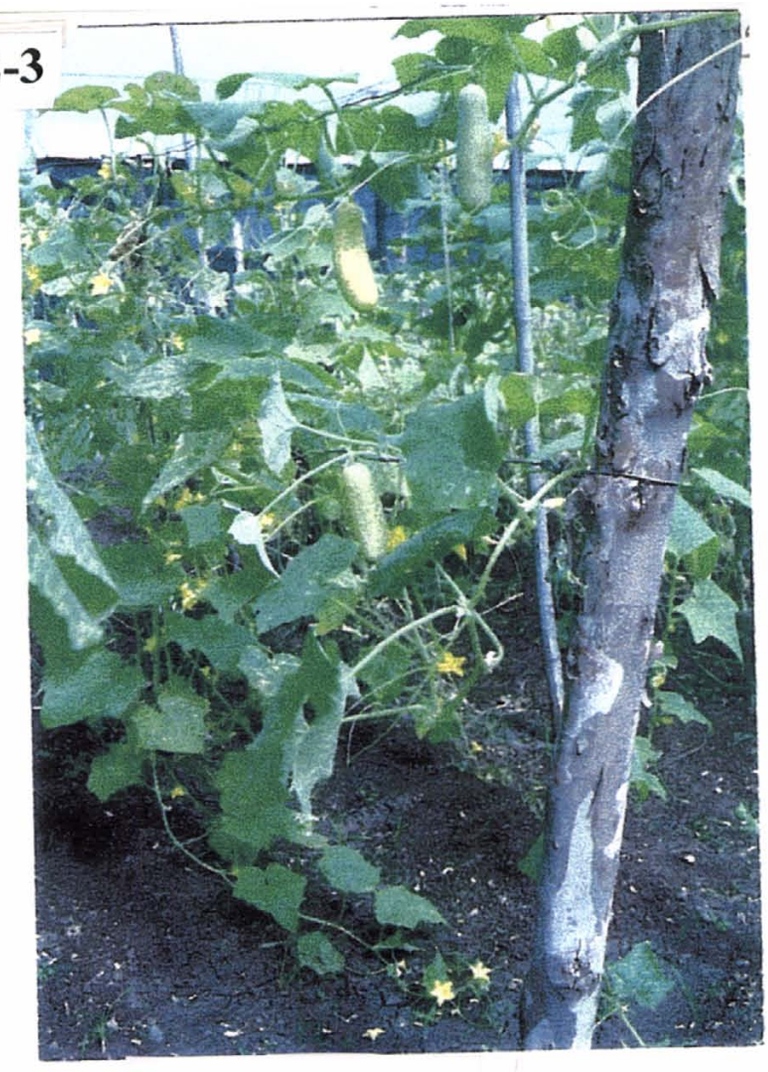
Hybrid (H-42) in polyhouse

Hybrid (H-42) in open field

PLATE-3



Himangi in polyhouse

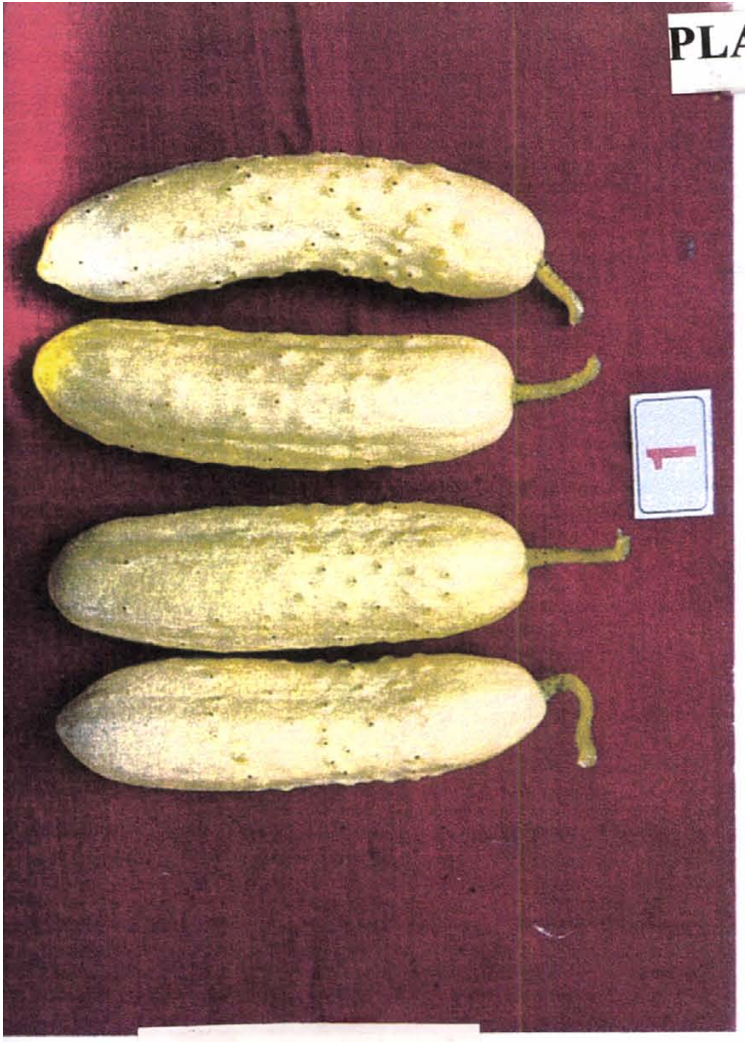


Himangi in open field

Phule Shubhangi in polyhouse

Phule Shubhangi in open

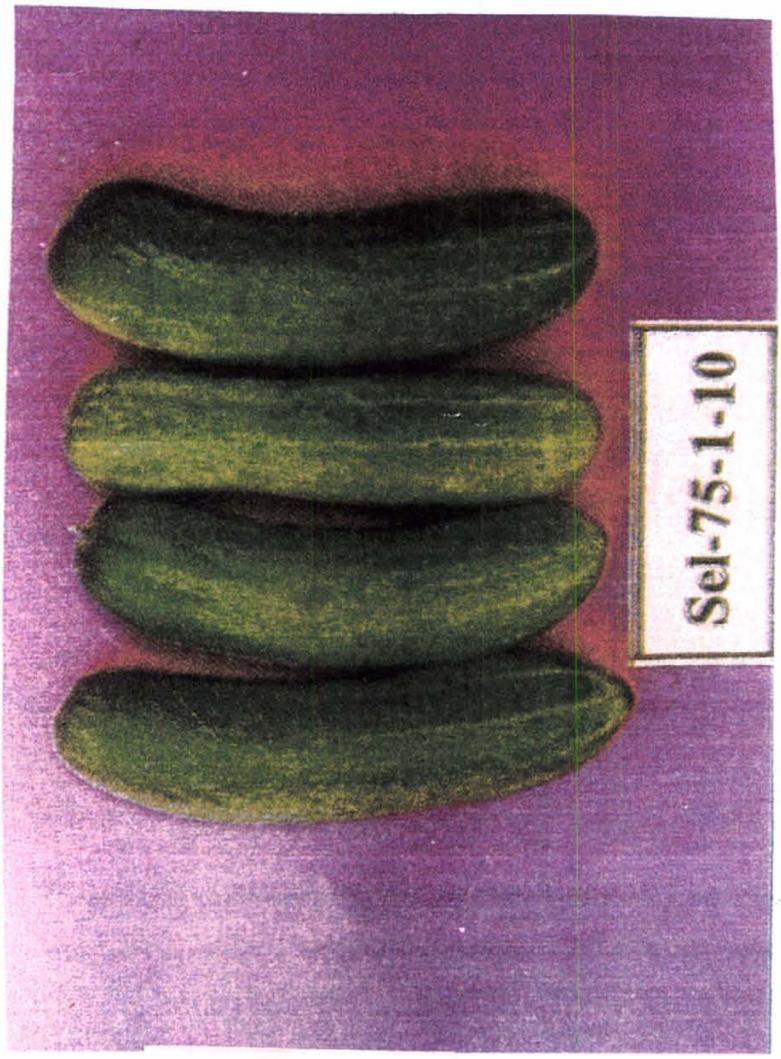
PLATE-4



Phule Prachi (H-41)

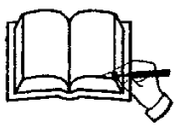
Himangi

Hybrid (H-42)



Phule Shubhangi

DISCUSSION



5. DISCUSSION

The present investigation entitled, "Evaluation of cucumber (*Cucumis sativus*, L.) hybrids under polyhouse condition compared with open field condition was carried out during the year 2001-02 at Instructional cum Research orchard, Department of Horticulture, M.P.K.V., Rahuri. The results in respect of growth characters, flowering characters, fruit characters and yield attributing characters as influenced by various treatments are discussed in this chapter. The discussion with their interactions and supporting references are mentioned in following lines with appropriate headings and sub-headings.

5.1 Effect of condition

A well known vigorous and productive plant is a function of many factors. Availability of sufficient land surface to plant is one of the factor which influence the growth of plant and it's productivity. Productivity of crop plant depends upon water requirements, nutritional requirements and environmental requirements such as sunlight for photosynthesis. For commercial purpose, the crop performance needs to be studied under suitable conditions. The yield potential needs to be studied by providing suitable conditions. For this goal, horticultural scientists and agriculturists are studying the crop requirements since the age of augment of agriculture. Efforts have been made to increase crop

productivity. For achievement of this goal, various methods are recommended from time to time. It includes development of new desirable cultivar, finding out the optimum requirement of various practices to newly developed cultivars or hybrids etc.

In present investigation, tropical gynoecious cucumber hybrids (No-41 and No-42) along with two checks (Phule Shubhangi and Himangi) were taken. In the present study, two type of conditions taken viz. Polyhouse condition and open field condition. By adopting these conditions, the yield potential is studied. Conditions under which crops are grown plays important role on different attributes such as growth, flowering, fruit character and yield attributes. Polyhouse and open field condition also determine the humidity and temperature. For the best yield both parameters are necessary at optimum level.

5.1.1 Effect of conditions (Polyhouse and open field) on growth characters

It was observed in the present studies that the growth characters viz. mean length of main vine and number of lateral branches were highly significant in the crop grown under polyhouse condition. In case of mean length of vine polyhouse condition was found highly significant compare to open field condition while in case of lateral number of branches the results were non-significant.

Minimum mean length of main vine and mean number of lateral branches were recorded in open field condition.

Similar results in respect of growth characters under different conditions were recorded by Badgujar (1999), Hormuzdi and More (1989a) and Vijaykumar *et al.* (1991).

5.1.2 Effect of condition on flowering characters

Early flowering and fruitfulness, flowering at lower node are some of the important aspects from commercial point of view of crop. In the present investigation, though gynoecious cucumber hybrids were taken, first 2 male flowers were appeared but they dropped down soon. The characters such as number of days for appearance of first male and female flower were significantly influenced by condition but incase of node number at which first male and female flower appear was non-significant.

The results obtained indicate that under polyhouse condition crop produced early initiation of flowering, similarly, the appearance of first male and female flower were also noted from the lower most node in the polyhouse condition. This indicate that for earliness of cropping in tropical gynoecious hybrids and two other check varieties of cucumber polyhouse condition is additive giving beneficial effects.

Regarding present investigation resemblence of that experiment was recorded by Badgujar (1999). Similar findings were also pointed out earlier by More and Mungar (1987).

5.1.3 Effect of conditions on fruit characters

The different conditions adopted had significant influence on fruit characters *viz.*, fruit length, fruit diameter and fruit weight recorded maximum under polyhouse condition compare to open field, which was highly significant.

Similar results regarding fruit character in different condition was found and reported by Badgujar (1999).

5.1.4 Effect of conditions on yield attributing characters

The results obtained regarding the yield characters such as number of fruits per vine, yield of fruits per vine and per hectare, indicated significant influence of different conditions. The total number of fruits varied form 6.52 to 14.26, yield per vine 0.82 to 1.91 kg with open field condition and polyhouse condition respectively.

The yield per hectare was lowest (22.03 tonnes/ha) under open field condition and it was the highest (53.56 tonnes/ha) under polyhouse condition.

This indicate that for getting higher yields per hectare of gynoecious cucumber hybrids the polyhouse condition is good and also in other aspect of yield such as number of fruits per vine, yield per vine etc.

The results are in close agreement with those reported by More et al. (1992). The similar results were also recorded by Bdgujar (1999).

5.2 Effect of season

Cucumber is commonly grown in *kharif* and summer season in Maharashtra. The attempt was made to grow it all the year round by providing the polyhouse conditions especially in *Rabi* season. The perusal of data presented in the previour chapter indicates positive response to this attempt. The same is summerised here under.

5.2.1 Effect of season on growth characters

It was observed in the present investigation that the growth characters viz. mean length of main vine and number of lateral branches were non-significant influenced by season. Main vine length was highest in the crop grown in *Rabi* season, while incase of number of lateral branches was highest in *kharif* season. For both growth characters season was found non-significant.

Present findings are in close agreement with those reported by Badgujar (1999).

5.2.2 Effect of season on flowering characters

Flowering characters such as number of days for the appearance of first male flower and node number at which the first male flower appeared was significant while incase of appearance of first female flower and node number at which first female flower appeared was non-significant.

The results obtained indicated that *Rabi* season produced early initiation of female flowering while male flowering in *kharif* season. The appearance of first male and female flower were noted from lower most node in *Rabi* season.

Present findings were also pointed out earlier by More and Munger (1987) and Badgujar (1999).

5.2.3 Effect of season on fruit character

Influence of season on fruit characters viz. fruit length, fruit diameter and fruit weight was found non-significant. Maximum fruit diameter and fruit weight were obtained in *Rabi* season whereas maximum fruit length recorded in *kharif* season. Similar findings were also recorded by Badgujar (1999).

5.2.4 Effect of season on yield attributing characters

The results obtained regarding the yield characters such as number of fruits per vine and yield of fruits per vine influence was non-significant but incase of yield of fruits per hectare was significant on season.

Maximum number of fruits per vine, yield of fruits per vine and per hectare was recorded in *Rabi* season crop.

The total number of fruits varied from 10.37 to 10.41, yield per vine varied from 1.33 to 1.40 kg in *kharif* and *Rabi* season respectively.

The yield per hectare was the lowest (37.33 tonnes) in *kharif* season and it was the highest 38.28 tonnes in *Rabi* season crop.

Similar findings were recorded by Badgujar (1999) similar type of results were also recorded by Vijayakumari et al. (1991) in tropical gynoecious Hybrids H-106 (304 x RKS 296) for yield and H-105 (304 x RKS 300) for fruit number.

5.3 Effect of varieties

Cucumber is monoecious in nature producing first male flowers and later on female flowers thus lot of food energy is wasted in development of female flowers. Recently, it is overcame by development of the gynoecious varieties by the breeders. Phule Prachi (H-41) and H-42 are the latest gynoecious varieties released by M.P.K.V., Rahuri. It was felt necessary to standardize the package of practices of these newly evolved varieties. Therefore, the present investigation was undertaken to come up with past information regarding seasonal, varietal and growing conditional influence on their growth by comparing the same with the earlier released popular varieties.

5.3.1 Effect of varieties on growth characters

It was observed in the present investigation that the growth characters viz. mean length of main vine and number of lateral branches were significantly more. Maximum mean length of main vine recorded by Phule Prachi and minimum by Phule Shubhangi. Incase of number of lateral branches maximum and minimum number of lateral branches obtained by Himangi and Phule Prachirespectively.

Similar results were observed by Badgujar (1999).

5.3.2 Effect of varieties on flowering characters

Flowering characters such as number of days for the appearance of first male and female flower, node number at which the first male and female flower appeared were significantly influenced by varieties.

The variety Phule Shubhangi produced the earliest flowering whereas Phule Prachi recorded more days to the appearance of flowering. In the appearance of flowering Phule Shubhangi was noticed highly significant. The appearance of first male and female flower noted from lower most node by Himangi.

Similar results were observed by Badgujar (1999).

5.3.3 Effect of varieties on fruit characters

The different varieties tried in the present investigation had significant influence on fruit characters *viz.,* fruit length, fruit diameter and fruit weight.

Maximum fruit diameter, length and weight recorded by Phule Shubhangi. Minimum fruit length and weight recorded by Himangi while minimum fruit diameter recorded by H-42.

5.3.4 Effect of varieties on yield attributing characters

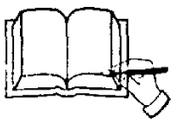
The results obtained regarding the yield characters such as number of fruits per vine, yield of fruits per vine and per hectare indicated significant influence of different varieties. Maximum and minimum yield of fruit per vine and per hectare 1.92 to 0.84 kg and

53.59 to 23.60tonnes/harecorded byPhule Prachi and Himangi, respectively.

The yield per hectare was lowest 23.60 t/ha recorded by Himangi and it was the highest 53.59 ton/ha recorded by Phule Prachi.

Similar results were observed by Badgujar (1999).

SUMMARY AND CONCLUSIONS



6. SUMMARY AND CONCLUSION

The present investigation entitled "Evaluation of cucumber (*Cucumis Sativus,* L.) was carried out during the year 2001-02 at Instruction-cum-Research Orchard of Department of Horticulture, M.P.K.V., Rahuri in *Kharif* 2001 and *Rabi* 2001-02 seasons.

The experiment was laid out in FRBD with 16 treatments and five replications. Eight plants were selected as experimental plants in each treatment.

The growth observation regarding mean length of main vine, number of lateral branches were recorded. The fruit diameter, fruit length and fruit weight were also recorded. The yield parameters such as number of fruits per vine and total weight of fruit were computed.

The results obtained in respect of growth, flowering, fruit character and yield as influenced by various treatments are summarized below.

6.1 Effect of condition

6.1.1 Growth characters

The growth of plant is represented by number of lateral branches and mean length of main vine. Maximum mean length of main vine was recorded under polyhouse condition.

6.1.2 Flowering characters

Flowering characters viz. number of days required for the appearance of first male and female flower, node number at which first male and female flower appeared. Earlier appearance of male and female flower was observed under polyhouse condition. Appearance of male and female flower at lower node was observed under open field condition.

6.1.3 Fruit characters

Fruit characters *viz.*, fruit length, fruit diameter and fruit weight were significantly influenced by condition. Maximum length of fruit, weight of fruit and diameter of fruit were observed under polyhouse condition.

6.1.4 Yield attributing characters

The yield attributing characters such as number of fruits per vine, yield per vine and yield per hectare were favourably influenced by condition. Yield per vine, yield per hectare were highest recorded under polyhouse condition.

6.2 Effect of season

6.2.1 Growth characters

The length of main vine and length of lateral branches were non-significantly influenced by season. The highest length of main vine and lateral branches was recorded in *Rabi* season crop.

6.2.2 Flowering characters

Flowering characters such as number of days required for the appearance of the first male and female flower node, number at

which the first male and female flower appeared. The effect of season on appearance of first male flower, node number at which the first male flower appeared was found to be significant. Earlier appearance of male and female flower at lower node was observed in *Rabi* season crop.

6.2.3 Fruit characters

Fruit characters such as diameter of fruit, weight of fruit and length of fruit was found non-significant. Maximum fruit weight and fruit diameter was found under *Rabi* season.

6.2.4 Yield

Yield per hectare was significantly influenced by season. The non-significant influence of season was found on number of fruits and yield of fruits per vine. Highest yield was recorded in *Rabi* season.

6.3 Effect of varieties

6.3.1 Growth characters

The mean length of main vine and number of lateral branches were significantly influenced by varieties. Maximum mean length of main vine and number of lateral branches recorded by Phule Prachi and Himangi, respectively.

6.3.2 Flowering characters

Flowering characters such as number of days required for the appearance of first male and female flower and node number of which the first male and female flower appeared were found

significantly influenced by varieties. Earlier appearance of male and female flower observed by Phule Shubhangi. The appearance of first male and female flower noted from lower most node by Himangi.

6.3.3 Fruit characters

Fruit characters *viz.,* fruit length, fruit diameter and fruit weight. The influence of varieties was significant on fruit characters. Maximum fruit length, fruit diameter and fruit weight recorded by Phule Shubhangi.

6.3.4 Yield

The yield contributing characters such as number of fruits per vine, yield per vine, yield per plot and yield per hectare.

Maximum yield of fruits per vine, yield per plot and yield per hectare recorded Phule Prachi. The highest yield was recorded by Phule Prachi.

Conclusions

To summerise the forgoing results which were discussed earlier indicates that there was a positive response of growth, flowering attribute and yield contributing characters when the cultivars taken under *kharif.* With open field and *Rabi* with polyhouse condition. The variety Phule Prachi showed overall excellent performance in all the conditions and seasons over rest of cultivars, showing its superiority for higher all the year round.

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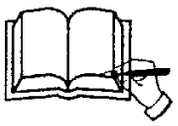

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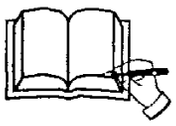
APPENDIX



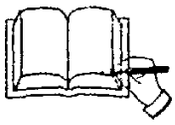
8. APPENDIX

Meterological data

Meteoro logical week	Temperature				Humidity				Rainfall (mm)	Rainy days
	Open field		Polyhouse		Open field		Polyhouse			
	Maximum	Minimum	Maximum	Minimum	Morning	Evening	Morning	Evening		
24	29.0	21.8	34.3	24.1	84	69	88	72	53.7	3
25	30.2	28.5	35.2	24.5	80	56	86	63	8.6	-
26	31.9	21.9	35.5	24.3	79	52	84	58	0.0	-
27	30.3	21.8	34.5	24.1	83	61	89	65	2.2	-
28	30.5	21.9	35.1	24.3	81	57	87	62	3.0	1
29	29.1	21.3	33.2	23.5	84	66	87	70	2.6	1
30	31.4	21.7	34.5	24.1	82	54	89	60	0.0	-
31	31.4	21.3	35.1	24.2	82	58	88	62	16.8	2
32	27.9	21.3	33.5	24.1	94	82	96	97	69.8	4
33	29.2	20.8	33.6	23.7	88	67	92	70	7.8	1
34	29.8	20.4	33.8	24.1	89	58	94	65	4.5	1
35	31.0	20.9	35.1	25.4	83	53	87	58	0.0	-
36	31.6	19.9	34.2	25.5	88	56	94	60	19	2
37	31.7	20.1	34.3	25.7	89	51	95	54	3.2	1
38	31.0	20.3	35.5	24.5	92	65	95	68	69.7	3
40	31.1	21.0	35.3	24.1	95	64	97	67	24.2	2
41	29.7	20.6	34.5	23.5	97	69	98	71	97.5	4

Meteoro logical week	Temperature				Humidity				Rainfall (mm)	Rainy days
	Open field		Polyhouse		Open field		Polyhouse			
	Maximum	Minimum	Maximum	Minimum	Morning	Evening	Morning	Evening		
42	31.1	18.2	34.7	22.8	90	48	94	52	7.7	1
43	31.3	12.5	35.3	18.5	90	33	94	45	0.0	-
44	31.9	11.9	35.5	17.5	86	30	90	35	0.0	-
45	31.1	12.2	35.5	18.2	83	36	86	40	0.0	-
46	30.1	13.3	34.7	18.5	84	40	88	42	0.0	-
47	30.3	10.8	33.5	15.5	87	33	89	38	0.0	-
48	28.7	9.1	33.3	16.1	89	34	92	39	0.0	-
49	30.6	9.2	34.9	15.8	89	32	92	36	0.0	-
50	31.1	10.3	35.7	18.7	87	31	93	35	0.0	-
21	28.4	7.5	34.2	16.5	90	33	95	40	0.0	-

VITA



9. VITA

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