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Evaluation of cucumber (*Cucumis sativus* L.) genotypes under Prayagraj agro-climatic conditions

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Abstract

An experiment was conducted at Horticulture Research Field, Department of Horticulture during the year 2020. Eight cucumber genotypes were evaluated at SHUATS, Prayagraj in randomized block design with three replications during rainy season 2020 for growth, yield and fruit quality traits. The genotype Sunny-85 gave maximum mean value for number of fruits per vine (15) and the number of female flowers per vine (28). Minimum value for the node number at which first female flower appears (8), minimum days to first fruit harvest (45.67), maximum number of fruit length (18.9 cm), fruit weight (221g) and fruit diameter (5.23 cm) was observed on the genotype Sunny-85. Minimum node number at which the first male flower appears (2.66) and minimum days to first appearance of female flower (8) was observed in the genotype Sunny-85 while minimum days to first appearance of male flower (29) was observed in genotype Pyramid. Maximum mean value for the number of branches per vine (3.73), maximum length of vine (281cm), maximum fruit yield per vine (3.51 kg) and fruit yield (90.87 t/ha) was observed in the genotype Surya 44. The mean maximum fruit diameter (5.67cm) and maximum number of flowers per vine (45.9) was found in genotype Legend. Surya 44 and Beit Alpha was found superior based on overall performance in terms of growth, yield, quality and economic returns. The highest cost-benefit ratio (7:1) was found in Sunny-85, under Prayagraj agro-climatic conditions.

Keywords: Cucumber, evaluation, genotypes

Introduction

In fiscal year 2019, the total production of vegetables was estimated to be approximately 185 million metric tonnes. As a leading producer of low-cost fruits and vegetables, India had an enormous export market. This quantity is less than the requirement of 200-250g/day for a balanced diet of a person. To achieve this target recommended by the National and World Health Organization, it is necessary to improve the production of vegetables. Cucurbits are most indigenous to India and are widely grown throughout India especially cucumbers. The total area of cucumber, growing in India is 78,000 hectares with an annual production of 11.42 lakh MT (National Horticulture Board 2016-17).

Growth, development and production of crops depends upon the genetic makeup and the environmental factor surrounding the crop plants. Soil, climate, nutrients, cultural practices, diseases and pests are the limiting factors of plants growth and development.

Since cucumber (*Cucumis sativus*) is an important crop and it has many health benefits as well as it is refreshing and a delicious vegetable that can be grown almost in all parts of the country, there are still problems concerning the marketable yield. Therefore, evaluation of genotypes is still needed to see their performance in Prayagraj agro-climatic conditions so suitable and high productivity genotypes can be identified.

Materials and Methods

The research was carried out during the month of July-September, 2020 at the vegetable research farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Prayagraj (U.P). The details of materials used, procedures followed and criteria adopted for evaluation of treatment during the course of investigation are presented here.

Geographical location of experimental site

The experimental site Department Research Field is situated at the Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) during the month of July-September 2020.

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Prayagraj is situated at elevation of 98 meters above mean sea level, lies between 25° 43'N latitude and 81° 84'E longitude in the Southern Zone of Uttar Pradesh.

The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C – 48 °C and seldom falls as low as 4 °C – 5 °C. The relative humidity ranges between 20 to 94 per cent. The average rainfalls in this area are around 1013.4 mm annually.

Prayagraj district comes under the south eastern part of of Uttar Pradesh. Average rainfall in this area is about 1100 mm per annum, most of which generally during the rainy season (June to October).

Results and Discussion

The research was carried out at the Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Prayagraj (U.P) in the year 2020, during the month of July-September.

Table 1: List of Genotypes

Genotypes	Name of genotypes	Source
1	Legend	Plant Seed Live
2	Beit Alpha	Plant Seed Live
3	Samber Sel	Plant Seed Live
4	Pyramid (Green Long)	Pyramid Seeds
5	Bravo	Plant Seed Live
6	Sunny-85	Gennext Seeds
7	Kohinoor	Gennext Seeds
8	Surya-44	Gennext Seeds

(A) Growth Parameters

1. Length of vine (cm) in different genotypes of cucumber (*Cucumis sativus* L.)

Significant differences in the length of vines were recorded in the different genotypes. Maximum vine length has been observed in Surya-44 (280.93 cm) followed by Sunny-85 (246.83cm) and Pyramid (232.67cm). The minimum vine length was observed in Bravo (191.07cm).

2. Number of branches per vine in different genotypes of cucumber (*Cucumis sativus* L.)

Observations shows significant differences among the different genotypes in the number of branches per vine. Maximum number of vines was observed in genotypes Sunny-85(8.67) and is on par with Beit Alpha (7.33), followed by Surya-44(6.67). Shortest number of branches per vine was observed in Bravo (3.33).

(B) Floral Parameters

1. Days to first appearance of male flower in different genotypes of cucumber (*Cucumis sativus* L.)

The different genotypes showed significant difference in the first appearance of male flowers. Minimum days were recorded for first appearance of male flower was observed in Pyramid (29 days) and Sunny-85 (29 days) and Surya-44 (29.33 days) was on par. The maximum number of days for first appearance of male flower was observed in Bravo (41.67 days).

2. Days to first appearance of female flower in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data, there was a significant difference in the first appearances of female flowers among the different

genotypes of cucumber. Minimum days were recorded for first appearance of female flower was observed in Sunny-85 (35.67 days) and is on par with Surya-44 (34.67 days), followed by the genotype Pyramid (40.33). The maximum number of days for first appearance of female flower was observed in Beit Alpha (53.33 days).

3. Node at which the first male flower appears in different genotypes of cucumber (*Cucumis sativus* L.)

There was a significant difference between the genotypes in the node at which the first male flower appears. Appearance of first male at a particular node is also important for high yields. Minimum node at which the first male flower appears was recorded in Sunny-85 (2.67), followed by Beit Alpha (3.33) and Samber Sel (3.67). Maximum node number at which first male flower appears was found in Legend (7.33).

4. Node number at which the first female flower appears in different genotypes of cucumber (*Cucumis sativus* L.)

There was a significant difference in the in the node number at which the first female flower appears among the different genotypes. Appearance of first female at a particular node is also important for high yielding cultivars. Minimum node at which the first male flower appears was recorded in Kohinoor (6.67), and is on par with Sunny-85 (8) and Samber Sel (8). Maximum node number at which first female flower appears was found in Legend (14.67).

5. Number of male flowers per vine in different genotypes of cucumber (*Cucumis sativus* L.)

The data showed significant differences in the number of male flowers between different genotypes of cucumber. Maximum number of male flowers per vine was observed in Sunny-85 (179) followed by Surya-44 (145.33) and Samber Sel(120.67). The minimum number of male flowers per vine was observed in Bravo (94.67).

6. Number of female flowers per vine in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data shown, there was a significant difference among the number of female flowers per vine. Maximum number of female flowers per vine was observed in Sunny 85 (28.33), followed by Beit Alpha (26.33) and Samber Sel (21.67). The minimum number of male flowers per vine was observed in Bravo (15).

(C) Yield Parameters

1. Number of fruits per vine in different genotypes of cucumber (*Cucumis sativus* L.)

The data shows significant differences in the number of fruits per vine of different genotypes. It has been observed that the genotype Sunny 85 (15) gives the maximum number of fruits followed by Beit Alpha (13) and Pyramid (12.67). The lowest number of fruits was observed in Bravo (8.3).

2. Fruit diameter (cm) in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data, the different types of genotypes show significant difference in the diameter of fruits. Maximum fruit diameter was found in Sunny-85 (5.23 cm) followed by Pyramid (4.93 cm) and Kohinoor (4.5 cm). Minimum fruit diameter was observed in Bravo (3.13 cm).

3. Fruit length (cm) in different genotypes of cucumber (*Cucumis sativus* L.)

The observations according to the data have shown significant difference in the fruit length of different genotypes of cucumber. Maximum fruit length was observed in the genotype Sunny-85 (18.9 cm) followed by Beit Alpha (17.9 cm) and Pyramid (17.43 cm). Minimum fruit length was observed in the genotype Bravo (9 cm).

4. Fruit weight (gm) in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data presented below, significant difference in fruit weight was recorded. The highest fruit weight was recorded in the genotype Sunny 85 (221.67 g) and followed by Beit Alpha (207.33 g) and Pyramid (198.33 g). The lowest fruit weight was recorded with Bravo (134.33 g).

5. Days to first fruit harvest in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data, there was a significant difference in the days to first fruit harvest among the different genotypes. The days to first fruit harvest was mostly influenced by initiation of flowering. The genotype Sunny-85 (45.67 days) has taken minimum to first fruit harvest followed by Legend (47 days) and Kohinoor (49 days). Pyramid (62.33 days) has taken the maximum time to first fruit harvest.

6. Fruit yield per vine (kg) in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data, there was a significant difference among the genotypes with regard to yield per vine. The maximum fruit yield per vine was found in the genotype Sunny-85 (3.32 kg) followed by Beit Alpha (2.69 kg) and Pyramid (2.51 kg). The lowest fruit yield was recorded in Bravo (1.11).

7. Fruit Yield (tonnes/hectare) in different genotypes of cucumber (*Cucumis sativus* L.)

According to the data, there was significant difference recorded amongst the genotypes with regard to yield (tonnes/hectare). The maximum yield (tonnes/hectare) was recorded in Sunny-85 (66.5 t/ha) followed by Beit Alpha (53.85 t/ha) and Pyramid (50.32 t/ha). Lowest yield was recorded in the genotype Bravo (22.44 t/ha).

(D) Quality Parameters

1. Total Soluble Solids (°Brix) in different genotypes of cucumber (*Cucumis sativus* L.)

The data observed showed that there are significant difference among the different genotypes of cucumber. The maximum TSS value was found in Sunny-85 (5.58) followed by Beit Alpha (5.12) and Pyramid (4.92). Minimum value was found in Kohinoor (4.10).

2. Vitamin 'C' mg/100g

According to the data, it showed that there was significant difference among the genotypes of cucumber. The maximum vitamin 'C' mg/100g recorded in Pyramid (7.03) and is on par with Sunny-85 (6.53) and Bravo (6.36). The lowest vitamin 'C' mg/100g was found with Surya 44 (5.73).

(E) Economic Analysis

Maximum gross return was obtained in the genotype Sunny-85 (Rs.6,65,000/ha) followed by Beit Alpha (Rs.538500/ha) and Pyramid (Rs.503200/ha) and the minimum was obtained in Bravo (Rs.224500/ha).

Maximum net return was obtained in the genotype Sunny-85 (Rs.5,70,032/ha) followed by Beit Alpha (Rs.4,43,532/ha) and Pyramid (Rs. 4,08,232/ha) and the minimum was obtained in Bravo (Rs.1,29,532/ha). Maximum Benefit: Cost Ratio was obtained in the genotype Sunny-85 (7:1) followed by Beit Alpha (5.67:1) and Pyramid (5.29:1) and the minimum was obtained in Bravo (2.36:1).

Table 2: Economic Analysis

No.	Hybrids	Days to first appearance of male flower	Days to first appearance of female flower	Node number at which first male flower appears	Node number at which first female flower appears	No. of male flowers per vine	No. of female flowers per vine	Vine length (cm)	Number of branches per vine	Number of fruits per vine	Fruit diameter (cm)	Fruit length (cm)	Fruit weight (g)	Days to first fruit harvest	Fruit yield per vine (kg)	Fruit yield (t ha ⁻¹)	Total soluble solid (°Brix)	Vitamin C (mg / 100 g)
1.	Legend	39.33	44	7.33	14.67	107.67	21	207.7	5.67	9	3.97	11.47	136.33	47	1.22	24.57	4.51	6.06
2.	Beit Alpha	37.33	53.33	3.33	8.33	151	26.33	199.57	7.33	13	4.33	17.9	207.33	62	2.6	53.85	5.12	5.9
3.	Samber Sel	31.67	50	3.67	8	120.67	21.67	224.1	5.67	9.33	4.23	10.63	170.67	56.33	1.54	31.87	4.13	6.53
4.	Pyramid	29	40.33	8.33	9.67	117.33	18.33	232.67	4	12.67	4.93	17.43	198.33	62.33	2.51	50.32	4.92	7.03
5.	Bravo	41.67	49.33	4	8	94.67	15	191.07	3.33	8.33	3.13	9	134.33	55.33	1.11	22.45	3.58	6.36
6.	Sunny-85	29.33	35.67	2.67	13	179	28.33	246.83	8.67	15	5.23	18.9	221.67	45.67	3.37	66.5	5.58	6.13
7.	Kohinoor	35.33	40.667	4.67	6.67	106.67	20.33	188.8	4.33	10.67	4.5	17	195	49	2.07	41.57	4.1	5.76
8.	Surya-44	29.33	34.67	5.33	10	145.33	25	280.93	6.67	11.67	4.13	11.67	201	59.67	2.34	46.84	4.18	5.73
	F.Test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	S. Ed	2.39	1.15	0.99	1.75	3.53	1.64	21.55	0.71	1.00	0.21	0.85	9.58	0.75	0.09	0.09	0.08	0.15
	C.D at 5%	5.12	2.47	2.12	3.76	7.57	3.51	46.22	1.52	2.14	0.45	1.83	20.55	1.60	0.19	0.19	0.18	0.31

Table 3: Economics of different genotypes and benefit cost ratio of Cucumber (*Cucumis sativus* L.)

T. No.	Hybrids	Fruit Yield (t/ha)	Gross Return Rs./ha	Cost of Cultivation (Rs./ha)	Net Return (Rs./ha)	Benefit Cost ratio
1	Legend	24.57	245700	94968	1,50,732	2.58:1
2	Beit Alpha	53.85	538500	94968	4,43,532	5.67:1
3	Samber Sel	31.87	318700	94968	2,23,732	3.35:1
4	Pyramid	50.32	503200	94968	4,08,232	5.29:1
5	Bravo	22.45	224500	94968	1,29,532	2.36:1
6	Sunny 85	66.5	665000	94968	5,70,032	7:1
7	Kohinoor	41.57	415700	94968	3,20,732	4.37:1
8	Surya 44	46.84	468400	94968	3,73,432	4.93:1

Conclusion

From the research it can be concluded that cucumber genotype Sunny-85 was found superior than other genotypes in terms of growth, yield and quality characters and is followed by the genotype Beit Alpha and Pyramid.

In the economics analysis of the genotypes, Sunny-85 again turn out to be highest in terms of the gross return (Rs.6,65,000/ha) and net return (Rs.5,70,032/ha). The highest benefit cost ratio was also seen in the genotype Sunny-85 (7:1) under Prayagraj agro-climate condition.

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