

Growth and Yield Performance of Six Cucumber (*Cucumis sativus* L.) Cultivars Under Agro-Climatic Conditions of Rawalakot, Azad Jammu and Kashmir

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ABSTRACT

Performance of different exotic and indigenous cultivars of cucumber (*Cucumis sativus* L.) namely; Market More, Poinsett-76, Electron, Konkurent, Yadenctva and Punjab Local was evaluated for their growth and yield characteristics under agro-climatic conditions of Rawalakot (AJK). Maximum seed germination (100%) was recorded for the cultivars Market More and Poinsett-76 and the minimum (48.6%) for the cultivar Konkurent. The maximum vegetative growth in terms of vine length and leaf number per plant was recorded in the cultivar Punjab Local and the minimum in cultivar Yadenctva. Data on flowering and fruit setting indicated that the maximum time to start flowering, fruit initiation and to reach edible maturity was taken by the cultivar Konkurent. The cultivars Market More and Poinsett-76 took minimum time to start flowering and fruit setting, while the cultivar Electron took minimum time to reach edible maturity. Data on male and female flowers ratio showed that the cultivar Market More produced maximum female flowers and minimum male flowers. The cultivar Market More also produced maximum number of fruit per plant with greater fruit length, followed by the cultivar Poinsett-76 and these two cultivars stood statistically at par. However, the cultivar Punjab Local produced fruit having the maximum diameter (4.59 cm). Maximum fruit yield/plant and per hectare was obtained from the cultivar Market More followed by the cultivar Poinsett-76, which could be attributed to more number of fruits per plant and greater fruit length.

Key Words: Cucumber; *Cucumis sativus*; Cultivars; Growth; Sex ratio; Fruit yield

INTRODUCTION

The cucumber (*Cucumis sativus* L.) is an important and big group of vegetables belonging to the family cucurbitaceae. Cucumber has tremendous economic and dietic importance. The mature fruits are eaten raw as salad; the immature fruits are used in pickles. Cucumber is a coarse prostrate, annual vining plant with stiff hairs or spines on leaves and stems. Unbranched lateral tendrils developed at the leaf axils. As the lateral branches are developed, flower clusters appear at leaf axils. In conventional cultivars, the first cluster always consists of male flowers in response to photoperiod in exceeding of 14 hrs. Female flowers normally do not appear until the day length begins to decline. The flowers are monoecious and flowering start normally 40-45 days after sowing depending on the weather conditions. Under long days and high light intensities male (staminate) flowers predominate, whereas under short days and low light intensities female (pistillate) flowers predominate (George, 1985). In a typical monoecious sex form, the number of staminate flowers are produced in far greater proportion than pistillate flowers from 25-30 : 1-15. The condition with greater number of pistillate flowers per plant is advantageous and economical as it results in higher fruit set and yield. Sex ratio is highly sensitive to environmental conditions. High N, long days and high

temperature generally promote the greater number of male flowers. The proportion of male and female flowers affects the yield and the cultivars having more pistillate flowers will set more fruits resulting in higher yields. Although cucumber is grown throughout the world, evaluations of different cultivars have been conducted in various countries. Shetty and Wehner (1998) studied 18 cucumber cultivars on trellis and flat beds. They concluded the best cultivars for marketable yield were Summer Top and Rusty Blight, while best overall cultivars on flat beds were Poinsett-76 and Spring-440. Resende (1999) conducted a trial on ten cultivars of cucumber and observed that Indaial, Score, Colonia and Ginga AG-77 gave the highest yield, best growth performance with longest fruits and highest commercial value. Sharma *et al.* (2000) studied the performance of various cucumber cultivars under field and greenhouse conditions. The yield under field condition was higher than greenhouse conditions and cultivars Poinsett-76 and K-75 had higher yields than other cultivars, which could be attributed to greater fruit length, weight and yield per plant. Hamid *et al.* (2002) performed a field trial on six cucumber cultivars under agro-climatic conditions of Swat and found that cultivar PARC-1 was the best among all the cultivars studied. The literature indicates that the performance of the cultivars varies depending upon the climatic conditions. The present research work was

conducted in order to find out the high yielding and better-adopted cucumber cultivars for hilly areas under the agro-climatic conditions of Rawalakot, Azad Jammu and Kashmir.

MATERIALS AND METHODS

The present research studies were carried out at the Experimental Farm of University College of Agriculture, Rawalakot during the year 2002. The Rawalakot valley is situated at the elevation of 1700 m above sea level and temperate type of climate prevails in the region. The material used for research work consists of six cultivars of cucumber namely; Market More, Poinsett-76, Electron, Yadenctva, Konkurent and Punjab Local. The experiment was laid out in accordance with Randomized Complete Block Design (RCBD) comprising of six treatments and three replications. There were 18 plots and total area under the experiment was 486 m². The net plot size was 4.5 x 6.0 m². The seeds were sown in rows 120 cm apart keeping plant to plant distance of 45 cm. All the cultural practices were same for all the cultivars used. Data on following parameters were collected during the course of time.

The data collected were analyzed statistically using Fisher's analysis of variance technique. The means of the cultivars were compared using least significant difference (LSD) test at 5% probability (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Seed germination. It is evident from the results presented in Table I that Market More and Poinsett-76 attained the superiority over all other cultivars and showed maximum germination percentage i.e., 100%. The cultivar Punjab Local attained the second position with 63% germination and was statistically non-significant with Electron, Yadenctva and Konkurent. This variation in seed germination could be possibly due to genetic make up of the cultivars, which responded differently to the environmental

conditions. These results are in accordance with the finding of Hamid *et al.* (2002) who reported that maximum germination percentage was observed in PARC-1 and minimum in Albeit i.e., 72.3 and 48.2%, respectively.

Vine length. A perusal of Table I showed that the plants of the cultivar Punjab Local and Electron attained maximum vine length i.e., 200 and 181 cm, respectively. Market More obtained plant height of 160 cm and all these cultivars behaved statistically alike. On the other hand, Yadenctva gained minimum plant height of 108 cm. Great genetic differences were observed among the cultivars in term of vine length. The greatest length attained by the local cultivar (Punjab Local) indicated that vine length was boosted under these climatic conditions, which may not be so favorable for better yield. The vine length of two exotic cultivars Market More and Poinsett-76 remained intermediate and it is desirable for good yield because of climbing nature of plants. Amongst non-adopted exotic cultivars Electron attained the greatest height, which was 9.5% less than the local cultivar. The wide variation for plant height might be due to their genetic nature. Shetty and Wehner (1998) stated that in their trial Poinsett-76 and Sprint-440 performed the best.

Number of leaves per plant. It is evident from the data that the cultivar Punjab Local produced maximum number of leaves per plant followed by the Market More with same level of significance. The cultivar Yadenctva occupied lowest position with minimum number of leaves per plant (Table I). The leaf formation is associated with the length of plant. The more will be vine length the greater will be leaf number. The more number of leaves in Punjab Local were formed because of greater vine length and same proportion was observed in other cultivars, except Electron where number of leaves per plant was formed comparatively less. It might be due to the genetic nature of plants or environmental changes.

Days taken to first flowering. The cultivar Konkurent took longer time (68 days) to start flowering. The minimum days to flowering were taken by the cultivars Market More and

Table I. Growth and yield characteristics of different cucumber cultivars

S.#	Characteristic	Market More	Poinsett-76	Electron	Yadenctva	Konkurent	Punjab Local
1	Seed germination (%)	100.00 a*	100.00 a	51.00 b	50.60 b	48.60 b	63.00 b
2	Vine length (cm)	160 ab	148 bc	181 a	108 c	134 bc	200 a
3	Number of leaves per plant	61.46 ab	50.00 bc	48.33 bc	30.80 c	47.86 bc	72.11 a
4	Days taken to first flowering	49.00 c	50.90 c	62.00 ab	61.30 b	68.00 a	61.00 b
5	Days taken to fruit initiation	53.00 c	54.30 c	65.60 ab	64.60 b	71.30 a	64.30 b
6	Days taken to edible maturity	73.60 bc	74.60 b	71.00 c	74.00 bc	79.30 a	78.00 a
7	Male/female flowers (ratio)	1.82 c	1.88 c	3.07 a	2.59 b	3.15 a	3.01 a
8	Number of fruits per plant	13.00 a	12.50 a	8.10 bc	6.30 cd	4.80 d	9.20 b
9	Average length of fruits (cm)	16.23 a	15.50 a	13.66 b	11.33 c	11.00 c	14.50 b
10	Av. diameter of fruits (cm)	3.42 bc	3.34 c	4.24 ab	3.75 bc	4.00 abc	4.59 a
11	Fruit water content (%)	95.00 a	94.90 a	94.00 a	94.00 a	94.00 a	94.53 a
12	Fruit yield per plant (g)	2165 a	1941 ab	1407 c	803 d	634 d	1837 b
13	Fruit yield per hectare (tons)	32.47 a	29.12 ab	21.11 c	12.05 d	9.50 d	27.55 b

*Means sharing the same letters in a row are statistically non-significant at 5% probability

Poinsett-76 (Table I). The two cultivars, Poinsett-76 and Market More stood statistically at par to enter the flowering stage. However, these cultivars showed statistically significant differences with all other cultivars and took 25 and 27% shorter time, respectively than Konkurent to start flowering. It can be noted that Market More and Poinsett-76 possess the early flowering character, which is desired for early maturity and marketing of the crop. These results are similar with the results of Hamid *et al.* (2002) who stated that in their experiment the cultivar Baby Long took minimum time (40 days) to start flowering.

Days taken to fruit initiation. It is evident from data that the cultivar Konkurent took longer time to start fruit initiation followed by the cultivar Electron and these two cultivars stood statistically at par with each other. To initiate fruit set, Market More took only 53 days followed by the cultivar Poinsett-76 in which after 54.3 days of sowing fruit formation started, occupying the lowest positions. The difference between these two cultivars was statistically non-significant (Table I). After flower initiation the fruit formation in all cultivars started within 3.3 to 3.6 days except in Market More where fruit development was observed after four days of flower initiation. The process of fruit development started with the same proportion in all cultivars as flower initiation took place. The difference in various cultivars may be due to the visit difference of pollinating agents. Normally after pollination the process of fertilization is completed within 24 to 36 hours. These results are in confirmation with Hamid *et al.* (2002), who reported that the cv. Albeit took maximum time 46 days to initiate fruit setting as compared to other cultivars.

Days taken to edible maturity. It is obvious from the data presented in Table I that the cultivar Konkurent took longer time from sowing to reach the edible maturity stage as compared to other cultivars studied. Punjab Local attained 2nd position for this parameter; however, the difference between these two cultivars was statistically non-significant. The shortest time to reach edible maturity was taken by the cultivar Electron. It was noted that the cultivars Electron, Konkurent, Yadenctva and Punjab Local took longer time for flower initiation and fruit development. However, the fruit of these cultivars attained edible maturity in shorter duration 6, 8, 10 and 14 days, respectively after the fruit initiation. In contrast to this, Market More and Poinsett-76 took shorter time to initiate flowering and fruits formation but longer time to reach edible maturity of fruits, i.e. 20.3 and 20 days, respectively after fruit initiation. In spite of longer time required for attaining the fruit maturity by the cultivars Market More and Poinsett-76, the overall length of time duration was not increased. The results are similar with those of Resende (1999), who stated that cultivars Indaial, Colonia, Ginga AG-77, Score and Tamor had a cycle between 76 to 82 days from sowing to last harvest.

Male/female flowers (ratio). As for as male and female flowers (ratio) are concerned, the cultivar Konkurent obtained the maximum ratio (Table I) and the minimum

flower ratio was found in Market More. The male flowers are essential for pollination and female flowers for fruit development. It is evident from Table I regarding male/female flowers ratio that the cultivar Konkurent had maximum number of male flowers. The cultivars Electron and Punjab Local stood statistically at par with each other, while Market More and Poinsett-76 produced maximum number of female flowers and were non-significant to each other. These results can be compared with Ananthan and Pappiah (1997), who reported that 20 F1 genotypes were evaluated for yield and yield component and got significant results for first male and female flowering and sex ratio.

Number of fruits per plant. It is evident from the Table I that the cultivar Market More produced greater number of fruits per plant as compared to other cultivars followed by the cultivar Poinsett-76, which is statistically non-significant with Market More. The cultivar Yadenctva gave 6.3 fruits per plant while Konkurent produced only 4.8 fruits per plant resulting in poor performance. Usually, higher number of female flowers results in more fruits per plant. In case of Market More and Poinsett-76, there were maximum female flower and as a result greater number of fruits was produced (Table I). The variation in male and female flowers ratio in various cultivars might be due their response to varying environmental conditions. These results are similar to the results of Resende (1999), who found that in case of number of fruits per plant cultivars Indaial, Colonia, Ginga AG-77, Score and Tamor showed the best performance by producing more number of fruits per plant as compared to other cultivars.

Average length of fruits. A perusal of Table I revealed that the cultivar Market More produced the longest fruits followed by the cultivar Poinsett-76. The fruits of the cultivar Konkurent gained minimum fruit length followed by that of the cultivar Yadenctva, which is lesser than all other cultivars. The cultivars Yadenctva and Konkurent showed non-significant difference with each other but statistically significant with other cultivars. These results are in accordance with the findings of Resende (1999), who stated Indaial, Colonia, Ginga AG-77, Score and Tamor had longer fruits with high commercial value. In another study, Habben (1980) found that the cultivar Pandorex produced the longest fruit.

Average diameter of fruits. The results indicated that the maximum fruit diameter was recorded in cultivar Punjab Local, while the minimum diameter was attained by fruits of the cultivar Poinsett-76 (Table I). The locally adopted exotic cultivar (Poinsett-76) attained smaller size as compare to local and newly introduced cultivars. The non-significant differences of Poinsett-76, Market More, Yadenctva and Konkurent indicated that these cultivars performed equally for this parameter. These results are similar to the findings of Tokatli *et al.* (1999), who stated that pickling cucumbers grown on wires differed in fruit diameter.

Fruit water content. The data presented in Table I depicted non-significant differences among the cultivars studied. This

indicates that the fruits of all the cultivars studied had same amount of water content.

Fruit yield per plant. It is clear from the data presented in Table I that the cultivar Market More gave the highest fruit yield per plant followed by the cultivar Poinsett-76, and these two cultivars were statistically alike. The cultivars Konkurent and Yadenctva gave minimum fruit yield per plant. These two cultivars were also statistically at par. The maximum weight of fruit was due to the more length of fruits. The fruits of Market More and Poinsett-76 had greater fruit lengths i.e., 16.23 and 15.5 cm, respectively. As the number of fruits per plant also plays a vital role in case of fruit yield. The more will be the number of fruits; greater will be the fruit yield. The cultivars Market More and Poinsett-76 also produced the maximum number of fruits per plant, due to which the fruit yield per plant was higher. These results can be compared with those of Stolk and Cools (1980), who reported that the cultivar Bright had a high average fruit weight but the cultivar K-8499 produce many small fruits. In another trial, Sharma *et al.* (2000) found that the cultivars Poinsett-76 and K-75 gave higher yield than other cultivars.

Fruit yield per hectare. As fruit yield per hectare was calculated from the fruit yield per plant by multiplying with number of plants per hectare, therefore, the results followed the same pattern of significance and presented the similar picture as fruit yield per plant (Table I).

CONCLUSION

From the results of the present study, it is evident that the cultivars Market More and Poinsett-76 performed well. Punjab Local also stood at par with Poinsett-76. Therefore,

it was concluded that these two cultivars (Market More and Poinsett-76) could be successfully grown on the hilly areas of District Rawalakot, Azad Jammu and Kashmir.

REFERENCES

- Ananthan, M. and C.M. Pappiah, 1997. Combining ability and correlation studies in cucumber (*Cucumis sativus* L.). *South Indian Hort.*, 45: 75–58
- Baloch, A.F., 1994. Vegetable crops. In: *Horticulture*. pp: 517–8. M.N. Malik, (ed.). National Book Foundation, Islamabad
- George, R.A.T., 1985. *Vegetable Seed Production*. Pitman Press, Bath, U.K
- Habben, 1980. Cucumber varieties for cultivation under glass. *Gemuse*, 16: 237–8 [*Hort. Abst.*, 51 (5): 2573; 1981]
- Hamid, A., J.D. Bloch and K. Naemullah, 2002. Performance studies on six cucumber genotypes under local conditions of Swat. *Int. J. Agri. Biol.*, 4: 491–2
- Resende, G.M.de, 1999. Yield of pickling cucumber in the north of Minas Gerais State, Brazil. *Hort. Brasil.*, 17: 57–60
- Sharma, A.K., Goel, K. Rajiner and R. Kumar, 2000. Performance of cucumber cultivar under protected cultivation. *Himachal. J. Agric. Res.*, 26: 175–7
- Shetty, N.V. and T.C. Wehner, 1998. Evaluation of oriental trellis cucumbers for production in North Carolina. *Hort. Sci.*, 33: 5, 891–6
- Steel, R.G.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics. A Biometrical Approach 2nd ed.* McGraw Hill Book Co. Inc. New York, USA
- Stolk, J.H. and M.H. Cools, 1980. Cucumber varieties for the hothouse crop. *Groenten en Fruit*, 36: 34–5. [*Hort. Abst.*, 51 (6): 5448; 1981]
- Tokatli, N., M. Ozgur, K. Abak and S. Buyukalaca, 1999. The effect of vertical training on wires on yield and quality in growing of pickling cucumber. Proc. 1st Int. Symp. on Cucurbits, Adana, Turkey, 20–30 May 1997. *Acta. Hort.*, 492: 221–5

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