RESEARCH ARTICLE

EVALUATION OF DIFFERENT CUCUMBER STRAIN FOR VARIOUS HORTICULTURAL TRAITS UNDER VALLEY CONDITION OF GARHWAL HIMALAYA

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Abstract: The present research was undertaken with 14 different strains of cucumber for evaluating their ability for various quantitative and qualitative horticultural traits under Garhwal Himalaya Region. The analysis of varience reaveled highly significant for all the characters studied. The K-90 recorded highest vine length (310.59 cm), number and T.S.S (6.84 °Brix). Whereas HP-2 recorded minimum days taken to opening of 1st female flower (43.21) maximum % of fruit setting (93.40), number of fruits/vine (20.00), and carbohydrate (3.39). SPP-63 showed minimum number of nodes bearing first male flower (4.25) and days taken to opening of 1st male flower (40.23). The strain New Manipur-1 recorded maximum number of primary branches/plant (12.23), minimum sex ratio (10:1), average fruit weight (205.05 g), fruit diameter (6.59), fruit yield/vine (3.61 kg), fruit yield/plot (44.46 kg), fruit yield/ha. (49.42 t/ha.), vitamin C (7.63 mg/100g) and minimum number of nodes bearing first female flower (6.11) and Maximum strains used in this research work are superior in different characters, which could be use for the improvement programmes.

Keywords: Cucumber, Quantitative, Qualitative, Sex, Fruit, Yield

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is one of the important crops of cucurbitaceous vegetable group from their nutritional as well as economic point of view. It is an ideal summer vegetable crop mostly grown for its edible tender fruits, preferred as salad ingredient, pickles and as a cooked vegetable. Cucumber has got cooling effect, so in the eastern countries; fruits are often used as cooling vegetable. It is ideal for people suffering from jaundice and allied diseases and also very much useful in preventing constipation. Seeds contain oil, which is helpful for brain development and body smoothness. For quick symptomatic cooling of the head, hand and feet, cucumber paste when applied on the body part is very effective in bringing a refrigerator effect. It may further be mentioned that cucumber juice is commonly used for treating diseases of teeth and gums. Its juice is still useful for rheumatic conditions and healthy growing of hair (Khulakpam *et al.*, 2015). Hence, it is being used in Ayurvedic preparations (Decker-Walter, 1999). Besides this, the whole fruit is used in cosmetic and soap industries. Cucumber originated in Northern India and has been in cultivation for at least 3000 years. From India, it spread to China, Asia Minor, North Africa and Southern Europe. Now, it is extensively cultivated in tropics, sub-tropics and in middle region of temperate zone. Cucumber (*Cucumis sativus* L.) is one of the oldest amongst the cultivated vegetable crops and has been found in cultivation since 3000 to 4000 years. Biochemically the cucurbits are characterized by bitter principles, called cucurbitacins *i.e.* tetracyclic triterpenes (Jeffery, 1983). Majority of the cucurbits are either monoecious or andromonoecious (a few dioecious) with trailing habit and are pollinated by insects. It is one of quick maturing vine vegetables crops. However it can be grown in both summer and rainy season. India is being native place of cucumber possesses vast genetic variability for vegetative and fruit characters. Low fruiting ability and yield suppression due to its inherent fruiting habits are major factors limiting fruit yield in slicing and processing cucumber. The yield and quality of crop are very complex characteristics. Cucumber is a monoecious crops but its bear's hermaphrodite flowers also. Sex of cucumber is highly influence by climatic condition and nutritional level of soil. Cucumber produces male flower if the nutrition level of soil and temperature is high due to high vegetative growth. The temperature and nutrition level is low, plant producing maximum number of female flowers. So that characteristics of a cultivar as well as combination of traits differ according to climatic conditions of the localities. At present, urgent need of the farmers/ scientist is to develop early maturing and high yielding variety/ hybrid. Preliminary identification of early maturing genotypes can be done based on characters like days to opening of female flowers, node number to first female flowering and days to fruit picking. Collection and evaluation of germplasm is a pre-requisite for their utilization. Therefore, a trial for characterization and evaluation of presently available cucumber germplasm is carried out in order to identify the potential cultivar for different horticultural characters. The present investigation was designed for a comparative study of cucumber genotypes, which is suitable for valley condition of Garhwal Himalaya region.

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MATERIAL AND METHOD

The field trial was conducted at Horticultural Research Center, Chauras Campus, H.N.B Garhwal University, Srinagar (Garhwal), Uttarakhand during Zaid season, in 2014-2015. Srinagar (Garhwal) is located in the Alaknanda valley (78° 47' 30" E longitude and 30° 13' 0" N latitude and at an elevation of 540 m above msl), a semi-arid, subtropical climate with dry summer and rigorous winters. For present research work the research materials were collected from IIVR, Varanasi, Manipur and Uttarakhand *viz.* PB-Naveen, K-90, Swarna Purna, Seven Star, SPP-63, New Manipur-1, New Manipur-2, GP-1, HP-1, HP-2, Mandal, RAJ-1, RAJ-2 and Pusa Sanyog. The experimental plot was ploughed thrice and bought to fine tithe and then levelled. The experiment trial was carried out in Randomized Block Design with three replications. The whole area of experimental site was divided into three blocks of equal size and each block possessed 14 plots. Each plot measured 4.50 x 2.0 m^2 area. The seedling were transplanting at four leaf stage *i.e.,* 25-30 days after sowing. Transplanting of seedlings was done in evening hours in each experimental plot at the spacing of 1.50 X 0.50 cm, according to experimental model. After transplanting, a light irrigation was given for the proper establishment of the seedlings. Farmyard manure was applied at the rate of 25 tonnes/ ha and NPK fertilizer applied in the rate of 80:60:60 kg/ha respectively. Full does of phosphorus, potassium and half does of nitrogen were applied at the time of transplanting, remaining half does of nitrogen was applied at 35days after transplanting. All the cultural activities and plant protection measures recommended for the successful crop. Five plants were selected randomly from each plot for recording the data on the following observations *viz.,* vine length (cm), number of nodes/ plant, number of primary branch/ plant, leaf area (cm^3), days taken to opening of first male flower, days taken to opening of first female flower, number of nodes bearing first male flower, number of nodes bearing first female flower, sex ratio, percent of fruit setting, fruit length (cm), fruit diameter (cm), number of locules/fruit, yield/plant (kg), yield/plot (kg), fruit yield/ hectare (q), harvesting duration of crop, TSS (°Brix), carbohydrate (g/100g), Vit. A (mg/100g), Vit.C (mg/100g), phosphorus (mg/ 100g) and calcium (mg/100g). The obtained data were statistically analyzed according to the procedure of R.B.D. as stated by Panse and Sukhatme (1967). The significance of variation among the treatments was observed by applying ANOVA and critical difference at 1% level (CD) was calculated to compare the mean values of treatments for all the characters.

RESULT AND DISCUSSION

The analaysis of variance observed highly significant for all the quantitative and qualitaive traits under studied. The experimental results showed that the maximum strains were differences for quantitative and qualitative traits.

Growth characters

The experimental results as shown in table 1 observed that among all the strains, K-90 showed maximum vine length (310.59 cm) followed by SPP-63 (305.49 cm), HP-2 (303.48 cm) and minimum vine length was recorded in New Manipur-2 (192.39 cm). The variation in vine length might be due to genetic reasons of different strains, inherent properties, hormonal and enzymatic response of plants, environmental factors and nutritional properties of soil. Similar results have also been reported by Solanki and seth (1980) in cucumber. Maximum number of primary branches/vine was recorded in New Manipur-1 (12.23) followed by HP-2 (11.73) and Mandal (11.15) while, the minimum number of branches per vine was recorded in HP-1 (7.90). The variation in number of primary branches/ vine might have been due to vine length and number of nodes in plants, because the primary branches rise from nodes of plants and environmental factors play a key role in primary branches emergence which is confirming to reports of Sharma and Bhattarai (2006) in cucumber. Intermodal length play the main role in primary branches and flower appearances because each primary branches and flowers emergence near to internodes. The minimum intermodal length was recorded in RAJ-2 (4.94 cm) followed by HP-2 (5.30 cm) and Pusa Sanyog (5.61 cm) where as maximum intermodal length was observed in SPP-63 (8.49 cm). The flowering stage is one of the key factors that decides the earliness and lateness of crop production. Minimum days to first appearance of male flower was observed in SPP-63 (40.23 days) followed by HP-2 (41.28 days) and Seven Star (42.10 days). Maximum days to first appearance of male flower were found in K-90 (50.71 days). Minimum days taken to first female flower appearances were observed in HP-2 (43.21 days) followed by SPP-63 (44.15 days) and New Manipur-2 (44.50 days). Maximum days were recorded to first appearance of female flower in RAJ-1 (58.69 days). The number of days from first appearance of female flower is an important character that indicates earliness or lateness of the crop. The variation in first appearance of male and female flower might have been due to genetic nature of crop, hormonal balance, crop vigour, soil fertility and environmental factor. Similar results have been reported by Sahni *et al.,* 1987 in ridge gourd, Badgurjar and More (2004) and Bairagi *et al.* 2005 in cucumber. Minimum number of node at which first male flower appeared were observed in SPP-63 (4.25) followed by Pusa Sanyog

(4.33) and HP-2 (4.48). Maximum number of node at which first male flower was appeared in PB-Naveen and New Manipur-2 (6.50) respectively. Minimum number of node at which first female flower appeared was recorded in New Manipur-1 (6.11) followed by HP-1 (6.29) and SPP-63 (6.30). Maximum number of node at which first female flower appeared was in Pusa Sanyog (8.66). The variation in number of node at which first male and female flower appears might have been due to inherent properties of strains that's highly influences by environmental conditions. Similar results have been reported by Bairagi *et al.,* 2005 and Sharma and Bhattarai (2006) in cucumber.

Yield characters

Data presented in Table 2 revealed that the variation in sex ratios (number of male and female flowers) per vine was influence by genetic factors, high vegetative growth, hormonal balance and environmental factors. Minimum sex ratio was recorded in New Manipur-1 (10:1) followed by Mandal (12:1) and K-90 (13:1). The maximum sex ratio was observed in Pusa Sanyog (21:1). Similar results have been reported by Solanki and Seth (1980), Rastogi *et al.,* 1990 and Bairagi *et al.,* 2005 in cucumber. Highest percent of fruit setting was recorded in HP-2 (93.40 %) followed by RAJ-1 (91.24 %) and PB-Naveen and Swarna Purna (90.22%) respectively, whereas Pusa Sanyog (78.61 %) showed minimum fruit setting. The fruit setting is depends on the good pollination, favorable climatic conditions, genetic factors and soil fertility conditions. Minimum days to first fruit harvest was recorded in New Manipur-1 (52.43 days) followed by SPP-63 (55.85 days) and Seven Star (58.24 days). RAJ-2 (74.66 days) had taken very much time to first fruit harvesting. The variation in days to first fruit harvesting might have been due to genetic factor, environmental factor, hormonal factor and vigour of the crop. The average fruit weight and number of fruit/ plant were highly influences the fruit yield/ plot and fruit yield/ hectare. The maximum number of fruit/ vine was recorded in HP-2 (20.00 fruits) followed by RAJ-1 (19.35 fruits) and RAJ-2 and pusa Sanyog (18.79 fruits) respectively. The lowest number of fruit/ plant was recorded in SPP-63 (12.34 fruits). The number of fruits/ vine is one of the major factors for deciding the yield of the crop. The variation in number of fruits per vine might have been due to sex ratio, fruit set percentage, genetic nature and their response to varying environmental and soil conditions. Variation in number of fruits per vine was also reported by Nag *et al.,* 2012 in ivy gourd and Srivastava and Srivastava (1976) in bitter gourd. The maximum average fruit weight was recorded in New Manipur-1 (205.05 g) followed by HP-1 (200.32 g) and SPP-63 (195.44g). Minimum fruit weight was recorded in Seven Star (145.35 g). Maximum fruit length was recorded in Swarna Purna (20.93 cm) followed by GP-1 (19.62 cm) and PB-Naveen (18.81 cm). The minimum fruit length was recorded in New Manipur-1 (14.52 cm). Maximum fruit diameter was recorded in New Manipur-1 (6.59 cm) followed by RAJ-2 (5.94 cm) and Mandal (5.88 cm). The minimum fruit diameter was found in K-90 (3.90 cm). The yield is directly influences by the length and diameter of fruits. The variation in fruit length and diameter might have been due to genetic factors and environmental factor Ahamed *et al.,* 2004 and Rastogi *et al.,* 1990 have also reported similar findings in cucumber. Maximum locules/fruit was recorded in Pusa Sanyog (6.00) followed by GP-1 (5.89) and K-90 (5.60) whereas minimum number of locules were recorded in New Manipur-2 (3.00). The maximum fruit yield/vine was recorded in New Manipur-1 (3.61 Kg) followed by RAJ-1 (3.27 Kg) and RAJ-2 (3.24 Kg) while, minimum fruit yield/vine was recorded in PB-Naveen (2.06 Kg). The maximum yield/ plot was recorded in New Manipur-1 (44.46 Kg) followed by RAJ-1 (39.42 Kg) and RAJ-2 (38.51 Kg). Minimum yield/ plot were recorded in PB-Naveen (24.66 Kg). The maximum yield/ hectare was recorded in New Manipur-1 (49.42 t/ ha) followed by RAJ-1 (43.74 t/ ha) and HP-1 (42.64 t/ha). Minimum yield/ hectare were recorded in PB-Naveen (27.29 t/ha).

Quality characters

Maximum T.S.S. was found in K-90 (6.84 °Brix) followed by RAJ-2 (6.80 °Brix) and PB-Naveen and Swarna Purna (6.00 °Brix) respectively. The minimum TSS value was found in New Manipur-1 (4.23 °Brix). The higher TSS value may be due to its inherent characteristics. Maximum carbohydrates was recorded in GP-1 and HP-2 (3.39 g/100g) followed by New Manipur-2 (3.23 g/100g) and RAJ-1 (3.20 g/100g). The minimum carbohydrate was found in K-90 (2.58 g/100g). Maximum vitamin C was found in New Manipur-1 and HP-1 (7.63 mg/100g) followed by Pusa Sanyog (7.57 mg/100g) and K-90 (7.50 mg/100g). The lowest vitamin C was found in PB-Naveen (6.76 mg/100g). Maximum calcium content was observed in Pusa Sanyog (17.29 mg/100g) followed by New Manipur-1 (17.27 mg/100g) and K-90 (17.19 mg/ 100g). The lowest calcium content was found in PB-Naveen (9.25 mg/ 100g). Maximum phosphorus was recorded in SPP-63 (29.54 mg/100g) followed by Swarna Purna and HP-1 (29.40 mg/100g) and Seven Star (29.00 mg/100g). The lowest phosphorus was found in Pusa Sanyog (21.14 mg/100g). All quality characters are mainly governed by inheritance of parents; they are not influence by environmental factor and soil conditions.

Table 1. Performance of fourteen Cucumber (*Cucumis sativus* L.) strain for growth characters.

Treatment	Plant height (cm)	No. primary branch/vine	Internodal length (cm)	Number of nodes bearing first male flower	Number of nodes bearing first female flower	Days taken to opening of 1st male flower	Days taken to opening of 1st female flower
T_1 (PB-Naveen)	297.49	10.18	6.50	6.50	8.00	50.43	55.24
T_2 (K-90)	310.59	8.54	6.75	5.73	8.58	50.71	54.62
T_3 (Swarna Purna)	270.44	8.64	5.68	5.93	7.96	42.61	47.69
T_4 (Seven Star)	265.42	10.32	8.28	6.01	8.54	42.10	47.20
T_5 (SPP-63)	305.49	9.82	8.49	4.25	6.30	40.23	44.15
T_6 (New Manipur-1)	300.49	12.23	7.62	6.00	6.11	44.85	47.34
T_7 (New Manipur-2)	192.39	9.97	5.92	6.50	8.50	42.61	44.50
T_8 (GP-1)	285.69	10.22	6.58	6.49	6.80	50.00	55.74
T_9 (HP-1)	298.32	7.90	7.55	6.30	6.29	43.66	47.57
T_{10} (HP-2)	303.48	11.73	5.30	4.48	6.96	41.28	43.21
T_{11} (Mandal)	301.64	11.15	7.01	6.21	7.13	44.17	50.72
T_{12} (RAJ-1)	198.45	7.93	8.35	5.41	7.46	49.53	58.69
T_{13} (RAJ-2)	195.47	8.29	4.94	5.78	7.32	49.28	58.24
T_{14} (Pusa Sanyog)	267.40	9.20	5.61	4.33	8.66	49.30	57.36
Sem±	0.664	0.024	0.201	0.074	0.028	0.314	0.044
CD 1%	1.942	0.070	0.587	0.218	0.082	0.918	0.130

Table 2. Performance of fourteen Cucumber (*Cucumis sativus* L.) strain for yield characters.

Treatment	Sex ratio	% of fruit setting	Days taken to 1st fruit harvesting	No. of fruits/ vine	Average fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	No. of locules/ fruit	Fruit yield/vine (kg)	Fruit yield/plot (Kg)	Fruit yield/ha. (t/ha)
T_1 (PB-Naveen)	15:1	90.22	73.62	13.81	150.34	18.81	4.18	5.00	2.06	24.66	27.29
T_2 (K-90)	13:1	79.52	74.29	13.88	168.56	16.19	3.90	5.60	2.40	28.16	31.54
T_3 (Swarna Purna)	17:1	90.22	59.72	14.58	180.64	20.93	4.80	4.00	2.65	31.59	35.07
T_4 (Seven Star)	15:1	79.40	58.24	14.37	145.35	15.43	5.62	5.20	2.08	25.07	27.82
T_5 (SPP-63)	20:1	90.18	55.85	12.34	195.44	18.30	4.85	5.25	2.42	28.84	32.05
T_6 (New Manipur-1)	10:1	89.52	52.43	18.52	205.05	14.52	6.59	4.00	3.61	44.46	49.42
T_7 (New Manipur-2)	15:1	86.20	60.50	13.18	189.31	15.34	5.35	3.00	2.46	29.71	32.74
T_8 (GP-1)	18:1	83.54	71.52	15.85	175.48	19.62	5.87	5.89	2.77	33.38	37.03
T_9 (HP-1)	16:1	80.76	60.28	15.61	200.32	18.09	5.13	5.45	3.17	38.42	42.64
T_{10} (HP-2)	14:1	93.40	59.25	20.00	150.52	18.55	4.45	5.00	3.03	36.13	40.12
T_{11} (Mandal)	12:1	80.21	60.67	16.33	175.33	16.41	5.88	3.25	2.83	33.88	37.60
T_{12} (RAJ-1)	19:1	91.24	73.45	19.35	170.21	17.61	4.37	5.00	3.27	39.42	43.74
T_{13} (RAJ-2)	20:1	85.62	74.66	18.79	170.83	15.42	5.94	4.00	3.24	38.51	37.23
T_{14} (Pusa Sanyog)	21:1	78.61	73.35	18.79	160.23	17.38	4.54	6.00	2.75	33.05	36.62
Sem±	0.038	0.036	0.087	0.035	0.548	0.101	0.035	0.519	0.024	0.070	0.084
CD 1%	0.124	0.106	0.255	0.102	0.249	0.296	0.102	1.517	0.069	0.204	0.246

Table 3. Performance of fourteen Cucumber (*Cucumis sativus* L.) strain for quality characters.

Treatment	TSS (°Brix)	Carbohydrate (g/100g)	Vitamin C (mg/100g)	Calcium (mg/100g)	Phosphorus (mg/100g)
T_1 (PB-Naveen)	6.00	2.81	6.76	9.25	21.27

T_2 (K-90)	6.84	2.58	7.50	17.19	22.63
T_3 (Swarna Purna)	6.00	2.74	7.31	15.74	29.40
T_4 (Seven Star)	5.79	2.88	7.07	13.82	29.00
T_5 (SPP-63)	5.51	2.59	6.89	9.45	29.54
T_6 (New Manipur-1)	4.23	3.10	7.63	17.27	28.20
T_7 (New Manipur-2)	4.65	3.23	7.35	10.18	21.28
T_8 (GP-1)	5.50	3.39	7.33	12.57	27.35
T_9 (HP-1)	4.89	3.16	7.63	9.57	29.40
T_{10} (HP-2)	5.89	3.39	7.21	16.84	21.52
T_{11} (Mandal)	5.50	2.91	6.89	14.57	23.61
T_{12} (RAJ-1)	5.56	3.20	6.87	13.20	24.81
T_{13} (RAJ-2)	6.80	2.99	6.83	12.64	25.56
T_{14} (Pusa Sanyog)	4.33	3.14	7.57	17.29	21.14
Sem±	0.119	0.108	0.077	0.026	0.065
CD 1%	0.348	0.315	0.225	0.077	0.191

CONCLUSION

From the above studies it may be concluded that different strain showed different good quantitative and qualitative traits. So, HP-2 showed superior for days taken to opening of 1st female flower, percent of fruit setting, number of fruits/vine and carbohydrate. And the strain New Manipur-1 was found superior for number of primary branch/vine, number of nodes bearing first female flower, sex ratio, average fruit weight, fruit diameter, fruit yield/vine, fruit yield/plot, fruit yield/ha. and vitamin C respectively. The strain New Manipur-1 and other strains could be used in future improvement programmes.

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