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Physico and biochemical properties of different parthenocarpic cucumber (*Cucumis sativus* L.) hybrids under shade net house

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Abstract

An experiment was carried out to evaluate performances of 18 parthenocarpic cucumber hybrids harvested from shade net house at Vegetable Research Block, Department of Vegetable Science, College of Horticulture, Kolar during 2017-2018 for physico and biochemical characters (total soluble solids, physiological loss in weight, dry weight of fruit, ash content titrable acidity and ascorbic acid). The results indicated a significant difference in all the quality parameters studied. The highest TSS content was documented in Defense (4.50 °B). After one week of storage, the minimum physiological loss in weight was recorded in the hybrid Sargon (15.85 %). The maximum dry weight of fruit was observed in Defense (5.76 g). The highest titrable acidity and ascorbic acid content were noticed in the hybrid Borja (0.31 mg/100g, 2.00 mg/100g, respectively).

Keywords: cucumber, parthenocarpic, shade net, physico and biochemical properties

Introduction

Cucumber (*Cucumis sativus* L.) is an important cucurbitaceous vegetable belongs to cucurbitaceous family. It is the second most widely cultivated cucurbit after watermelon and ranks fourth among the economic vegetables in Asia after tomato, cabbage and onion (Tatlioglu 1993) [1]. Parthenocarpic cucumbers are seedless because the fruit is produced without being pollinated. This type is often grown in protected structures (Relf and McDaniel, 2000) [8]. Parthenocarpic cucumbers usually are more productive and produce fruits with smoother skins (Marr, 1995 and Hochmuth, 2001) [5, 2].

Cucumber is a primary source of vitamins and minerals for human body but its caloric and nutritional value is very low (Keopraparl, 1997) [4]. Considering the importance of this crop, there is an urgent need for identification of varieties/hybrids suitable for protected conditions. A number of hybrids have been recently developed in this crop but little effort has been made so far to evaluate them for quality parameters. In this view, the present study was undertaken to evaluate the performance of 18 parthenocarpic cucumber hybrids for physico and biochemical traits under shade net house condition.

Materials and Methods

The present study was conducted with experimental materials comprised of 18 parthenocarpic cucumber hybrids under shade net house of 302.4 m² (325) at Department of Vegetable Science, College of Horticulture, Kolar during the year 2017-18. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Observations were recorded on five randomly selected plants in each reach replication for six characters viz., Total soluble solids, physiological loss in weight, dry weight of fruit, ash content, treatable acidity and ascorbic acid content. Total soluble solids (TSS) content of the squeezed fruit juice taken from the centre of the fruit was measured by hand refract meter and expressed in °Brix. The Physiological loss in weight was obtained by taking difference between the weight of fruits prior to storage and weight after one week under ambient condition. Dry weight of fruit was obtained by taking matured fruits from five labeled plants were collected and chopped into small pieces. The pieces were oven dried at 60⁰ C ± 1 until the pieces attained constant weight. The dry weight was recorded as grams per 100 g fresh weight. The ascorbic acid content in the

fruit was determined by the volumetric method as suggested by Sadasivam and Manickam (2009) ^[9] using 2,6-dichloro phenol-indophenol dye.

Titration acidity was estimated by titrating the fruit juice with 0.1N sodium hydroxide (NaOH) using phenolphthalein as indicator and expressed as per cent acidity and ash content in fruit was estimated by taking two gram of the sample was placed on a silica dish. It was first heated over bunsen flame. The dish was then transferred to a temperature controlled muffle furnace. Temperature of the muffle was maintained at about 550°C until all the carbon had ceased to glow. The ashing was completed by maintaining this temperature for 5 – 7 hours. The ash obtained was weighed and per cent value was calculated. Statistical analysis of data was done to estimate *per se* values and degree of significance of various traits (Panse and Sukhatme, 1978) ^[6].

Results and Discussion

Among quality parameters, TSS is an important trait in cucumber. It signifies the amount of sugars present in the fruit juice. Hence, high TSS content is desirable for processed products and also for salad preparation. All hybrids registered significantly with respect to TSS content of fruits and the range was varied from 4.50 °B (Defense) to 3.15 °B (Multistar) with an overall mean of 3.84 °B (Table 1). The maximum TSS content was recorded in the hybrid Defense (4.5 °B) and it was on par with Deltastar (4.47 °B), Valleystar (4.16 °B), Sargon (4.12 °B), Sunstar (4.09 °B) and Borja (4.08 °B). Whereas, the minimum TSS content of fruit was recorded in Multistar (3.15 °B). This might be due to genetic makeup of plant and its inherent characteristics of a hybrid. These

results are in conformity with the findings of Pragathi (2014) ^[7] and Antonieta and Braz (2001) ^[11] in cucumber.

The storage studies revealed that after one week of storage, a significant loss in weight was noticed among eighteen parthenocarpic cucumber hybrids. All the hybrids lose sheen (glossy) near to stem end and shrivel appearance was recorded. In the present investigation, after one week of storage, the minimum physiological loss in weight was noticed in the hybrid Sargon (15.85 %). However, the hybrid Shinefit (29.92 %) recorded maximum physiological loss in weight (Table 1). This might be due to higher rate of transpiration loss in room temperature indicated by increasing ethylene production and thus, increases physiological loss in weight and other metabolic processes in the fruit. These results were accordance with the findings of Hochmuth and Leon (2004) ^[3] in cucumber.

A significant difference was documented with respect to dry weight of fruit among different hybrids in the present study. The maximum dry weight of fruit was observed in the hybrid Defense (5.76g). While, minimum dry weight of fruit was noted in Deltastar (2.33 g) (Table 1). The variations in the dry weight might be due to the inherent characteristics of a hybrid and favorable weather conditions, especially temperature and light irradiance in comparison with open field and also shading affects on cucumber by reducing distribution of photosynthates to the fruit, resulting in a strong decrease in fresh and dry weight of the fruit and the increasing potassium concentration of nutrient can markedly increase fresh and dry weight of cucumber. These results are in accordance with the findings of Zahra *et al.* (2016) ^[13] in cucumber.

Table 1: Total soluble solids (°Brix), physiological loss in weight (%) and dry weight (g) of fruit of parthenocarpic cucumber hybrids under shade net house

S. No.	Hybrids	Total soluble solids (°Brix)	Physiological loss in weight (%)	Dry weight of fruit (g)
1	Apsara	3.58	23.31	3.51
2	Deltastar	4.47	24.73	2.33
3	Borja	4.08	19.61	4.02
4	Defense	4.50	26.71	5.76
5	KUK-64	3.47	27.10	4.44
6	Shinefit	3.32	29.92	3.28
7	Valleystar	4.16	23.73	5.43
8	Sargon	4.12	15.85	4.42
9	Fadia	3.97	22.90	3.44
10	Silyon	3.31	21.70	3.64
11	Menfis	3.71	21.31	4.68
12	Kafka	3.90	21.79	3.55
13	Multistar	3.15	22.93	4.41
14	Alexios	3.58	27.59	5.40
15	Corinto	4.02	20.97	3.56
16	KUK-53	4.06	21.74	5.10
17	Sunstar	4.09	22.10	4.78
18	KPCH-1	3.66	21.60	4.70
	Mean	3.84	23.09	4.25
	S Em ±	0.14	0.95	0.11
	CD (p = 0.05)	0.42	2.72	0.32
	CV (%)	6.52	7.10	4.53

Highly significance differences were observed with respect to ash content of fruit among different hybrids in the present study. They range varied from 19.30% (Kafka) to 4.23 % (Borja) with total mean of 13.39 % (Table 2). Among hybrids, Kafka (19.30%) recorded highest ash content followed by Corinto (16.61 %) and Menfis (15.50 %). While, the lowest ash content was recorded in the hybrid Borja (4.23 %). This might be due to the mineral content in the hybrids. These

findings are in line with Uthpala and Marapana (2017) ^[12] in cucumber.

The titrable acidity content showed significant difference among parthenocarpic cucumber hybrids (Table 2). The range varied from 0.31mg/100g (Borja) to 0.10 mg/100g (Apsara and Menfis). The titrable acidity was found to be highest in Borja (0.31mg/100g) which was on par with KUK-53 (0.27 mg/100g) and Shinefit (0.24 mg/100g). While, the lowest

titrable acidity was found in Apsara and Menfis (0.10 mg/100g). The acidity of the fruits grown in the protected environment may be a result of the photosynthetic activity of the plant and carbohydrate accumulation in the fruits. Earlier, similar estimates for this character were found by Sujatha (2017) ^[10] and Antonieta and Braz (2001) ^[1] in cucumber.

Generally, high ascorbic acid content would increase the nutritive value of cucumbers, which would help in better retention of colour and flavour. The ascorbic acid content showed significant difference among different hybrids of cucumber. The range varied from 0.68 mg/100g to 2.00 mg/100g fresh weight. The highest content of ascorbic acid was noticed in Borja (2.00 mg/100g) (Table 2). While, lowest ascorbic acid content was recorded in Alexios (0.68 mg/100g). It might be due to ascorbic acid biosynthesis can be strongly influenced by environmental conditions with light intensity affecting the content of ascorbic acid and genetic makeup of hybrid. These findings are in conformity with the results of Sujatha (2017) ^[10] in parthenocarpic cucumber and Pragathi (2014) ^[7] in cucumber.

Table 2: Ash content (%), titrable acidity (mg/100g) and ascorbic acid (mg/100g) of parthenocarpic cucumber hybrids under shade net house

S. No.	Hybrids	Ash content (%)	Titrable acidity (mg/100g)	Ascorbic acid (mg/100g)
1	Apsara	13.05	0.10	1.42
2	Deltastar	14.52	0.11	1.41
3	Borja	4.23	0.31	2.00
4	Defense	12.47	0.13	1.71
5	KUK-64	13.52	0.11	0.92
6	Shinefit	14.86	0.24	1.16
7	Valleystar	13.07	0.12	1.35
8	Sargon	14.40	0.17	1.61
9	Fadia	14.78	0.15	1.02
10	Silyon	13.88	0.16	1.30
11	Menfis	15.50	0.10	1.22
12	Kafka	19.30	0.16	1.08
13	Multistar	7.83	0.11	1.62
14	Alexios	13.27	0.12	0.68
15	Corinto	16.61	0.14	1.33
16	KUK-53	13.30	0.27	1.45
17	Sunstar	12.44	0.14	1.07
18	KPCH-1	14.01	0.21	1.23
	Mean	13.39	0.15	1.31
	S Em ±	0.34	0.01	0.09
	CD (p = 0.05)	0.98	0.03	0.25
	CV (%)	4.43	11.89	11.67

Conclusion

Among the hybrids, Defense revealed the maximum TSS (4.50 OB) and dry weight of fruit (5.76 g). With respect to ash content Kafka (19.30 %) recorded highest as compared to other hybrids. The highest titrable acidity and ascorbic acid content were noticed in the hybrid Borja (0.31 mg/100g, 2.00 mg/100g, respectively).

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