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Effect of different Planting Dates and Genotypes on Flowering, Fruiting and Fruit Quality of Cape Gooseberry (*Physalis peruviana* L.) under Sub-tropical Region

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ABSTRACT: In view of fluctuation of seasonal temperatures suitable date of plantings play a pivotal role in enhancing the flowering fruiting, yield and quality of crop. Hence, an attempt has been made to counter the adverse conditions. The experiment was conducted to assess the effect of different planting dates and genotypes under sub-tropical region in Lucknow. Planting dates *viz*., 15th June, 15th July, 15th August and 15th September and had genotypes Lucknow, Banaras, CITH CGB Sel.02, CITH CGB Sel.03 and CITH CGB Sel.05. Accordingly, planting dates and data were recorded on flowering, fruiting and quality attributes of Cape gooseberry genotypes. The results revealed that the minimum (66.84) days to first flower and days to first harvest (85.91) were obtained on15th September(D_4) as well as days to fruit set (5.8) were found at 15th August (D_3). The maximum (123) number of flowers/plant, number of fruit per plant (90.0 and 88.57), fruit weight (10.66g), cheek diameter (2.46cm) and juice (63.89%), TSS (14.94°Brix) and pH (3.8) were observed under CITH CGB Sel.02.

Keywords: Sowing date, germplasm, *Physalis peruviana* L., Cape gooseberry, planting date.

INTRODUCTION

The Cape gooseberry (*Physalis peruviana* L.) belong to Solanaceae family having chromosomes number 2n=24, 48 (Menzel, 1951; Nohra *et al*., 2006). There are several species, but only few have commercial value *P. ixocarpa* and *P. pubescence***.** It is native to the South American Andes (Fischer and Melarejo 2014) including Peru, Chile, Brazil, Egypt, Kenya, South Africa, Australia, India, Bangladesh, China and Colombia. Cape gooseberry or Golden berry is grown effectively in tropical to temperate climates worldwide (Novoa *et al*., 2006). Aguaymanto in Peru, Cape gooseberry in South Africa, Rasbhari in India, Poha berry in Hawaii (Gupta and Roy 1980; Erkaya *et al*., 2012). The plant grows indeterminately as a semi-herbaceous, soft-woody, upright, short-lived perennial or annual. Hairy leaves with heart-shaped pubescence, hermaphrodite flowers with yellowish purple flecks (Nocetti *et al*., 2020) and fruit coated in a papery husk, with small yellowish seeds within that resemble a Chinese lantern (Tapia and Fries 2007). *Physalis* complete their life cycle 254 days and grow up-to a height 1-1.5m. The importance of Cape gooseberry is not less than other major fruit crops. Fruit has high nutraceutical value, 11.5% carbohydrate, 1.8% protein, 0.2% fat, 3.2% fiber, 0.6% minerals, 0.9% pectin vitamin A (2380IU), 10mg/100g vitamin C, 60mg/100g phosphorous,18 mg/100g iron. Despite this, the fruit is frequently utilized in the food sector to manufacture raisins, sauces, syrup, marmalades, and tasty jam (Majumdar, 1979; Puente *et al*., 2011). Colombia is the world's biggest producer, exporter, and consumer of exotic fruits. It has grown effectively in India due to its diverse nature in states such as Uttar Pradesh, Bihar, West Bengal, Haryana, Madhya Pradesh, Punjab, Nillgiri Hills, and other regions of the country. To maintain optimal growth and development, yield of crops is based on climate, sowing time, and genotypes. Leaf, blossom, and fruit are highly appearance indicators of climate change (Rodrigues *et al*., 2013; Sandoval *et al*., 2018). Furthermore, in order to get high yields, planting dates have a substantial impact on crop productivity. Planting dates have enhanced the changes in morphological characteristics of the plants at various phases of flowering buds and fruit maturity, as well as dry matter contents such as total sugar, ascorbic acid and antioxidant plant grown by increasing their numbers and biological activities. Keeping in view a comprehensive study was carried out to evaluate the influence of different planting dates on the ecotypes of Cape gooseberry genotypes, as well as to determine the optimal period of sowing and planting dates for Cape gooseberry.

MATERIALS AND METHODS

The experiment was conducted at Horticulture Research Farm-I, Department of Horticulture, School of

Agriculture Sciences and Technology, Babashaeb Bhimrao Ambedkar University, Lucknow (U.P.) over two consecutive cropping seasons during 2019-20 and 2020-21 in the kharif season. The experiment site is located under subtropical climate at 26°55′N latitude and 80°59′E longitude having the altitude of 123 meters of M.S.L. The soil at the experimental site ranged from sandy clay loam to slightly alkaline with a pH of 8.2 and a low organic matter content (Dwivedi *et al*., 2012). The experiment was set up in a R.B.D. (Split plot design) three replication with two factors: the main plot had four planting dates (15^{th} June, 15^{th} July, 15^{th} August and 15^{th} September) while the sub-plots had five genotypes (Lucknow, Banaras, CITH CGB Sel.02, CITH CGB Sel.03, CITH CGB Sel.05). The required experimental field area was marked and the proper layout was done and all standard cultural practices were adopted on a regular basis with recommended doses of manures and fertilizers administered (Chattopadhyay, 1996). The phonological growth characteristics such as days to first flower, days to fruit set, number of flowers/plant, number of fruits/plant, days to first harvest were determined on a regular interval after dates of planting were recorded and days to first flower to first harvest and yield/plot were recorded. However, fruit weight (g) was determined using a digital balance, and cheek diameter (cm) was determined by using a digital Vernier-caliper. The T.S.S was determined using a digital hand refractomete; pH was also determined by using a digital pH meter. The recorded data were analyzed using the usual procedure (Panse and Sukhatme's 1985) and the mean values were compared at the 5% level of significance.

RESULTS

A. Effect of different dates of planting planting on days to first flower and number of flower/ plant in Cape gooseberry (Physalis peruviana L.) genotypes

It is clear from the pooled value as given in Table 1 that different planting dates and genotypes were found significant to each other. The number of days took for the first flowering to flower (108.01 DAT) following planting. When planting was done on July,15^{th} (D_2) followed by June, 15^{th} (D_1) among five genotypes, Banaras (G_2) took the maximum days to produce its first flower (102.53 and 101.14) in 2019-20 and 2020-21, respectively compared to CITH CGB Sel.05(G_5) (80.02 and 74.61) in both years. The interaction impact of planting dates and genotypes on days to first flower was found to be statistically significant. D_2×G_2 (July,15^{th} × Banaras) had the maximum (120.44 & 123.54) number of days to first flower in both years followed by D_1 × G_1 (June,15^{th} × Lucknow) and D_4×G_5 (September,15^{th} × CITH CGB Sel.05) had the minimum (68.62 & 64.53) days to produce first flower in year 2019-20 and 2020-2021.

The number of flowers per plant was also affected by the planting dates and genotypes. The plants that had been moderately transplanted on July, 15^{th} had the maximum (123.03) number of flower followed by D_1 (June,15^{th}). The genotype Lucknow (G_1) produced the maximum (110.50& 108.50) flowers/plant in year 2019-20 and 2020-21, followed by the genotype Banaras (G_2) (105.67&103.17) in two years. The interaction effect of planting dates and genotypes was found to have a statistically significant effect on the quantity of flowers/plant. However, the treatment combination D_1xG_3 (June, 15^{th} × CITH CGB Sel.02) produced the maximum (132.33&129.33) flowers/plants in both years, followed by D_2 × G_4 (131.33 in first year), (July,15^{th} × CITH CGB Sel.03) and D_2×G_2 (July, 15^{th} × Banaras) in second year. In contrast, the minimum (62.33 & 61.33) number of flowers/plant was recorded in D_4 × G_3 (September, 15^{th} ×CITH CGB Sel.03) in both years.

B. Effect of different dates of planting on days to fruit-set and number of fruits/plants in Cape gooseberry (Physalis peruviana L.) genotypes

Days to fruit set were significantly influenced by genotypes and different planting dates mention in Table 2. The moderately planting dates take than the early and late planting. However, D_3 (August,15^{th}) had the minimum (5.8) days to required for fruit set, followed by D_2 (July,15^{th}) and D_4 (September,15^{th}). The days to fruit set were strongly influenced by Cape gooseberry genotypes. The genotype CITH CGB Sel.03 takes maximum (5.0 & 5.4) days to set fruit (G_4) in both years, followed by G_3 (5.5 & 5.7) in both years respectively. The genotypes and planting dates, interaction effect was found to have a statistically significant impact on days to fruit-set. However, D_3xG_4 (August, 15^{th} ×CITH CGB Sel.03) and D_4xG_4 (September,15^{th} × CITH CGB Sel.03) were planted to have the minimum (4.7 & 4.8) days to fruit set in both years. While, D_1×G_2 (June,15^{th} × Banaras) had maximum (7.4 & 7.6) days to fruit set in year 2019-20 and 2020-21, respectively.

The number of fruit/plant was significantly influenced by genotypes and planting dates. The maximum number of fruit/plant was counted on D_2 July, 15^{th}. Which were followed by D_1 June, 15^{th} (90.0 & 88.57) in both years. Whereas, genotype G_1 Lucknow produced the maximum (69.43 and 66.02) fruit in both years followed by genotypes G_4 CITH CGB Sel.03 and G_2 Banaras. The number of fruit/plant was statistically influenced by the interaction effect of the planting dates and genotypes. The maximum (96.0 & 92.67) fruit/plant was produced in D_2 x G_3 (July, 15^{th} × CITH CGB Sel.02) in both years. While, D_4xG_5 (September, 15^{th} × CITHCGB Sel.05) had the minimum (24.0 & 22.67) fruit/plant in year 2019-20 and 2020-21, respectively.

C. Effect of different dates of planting on days to first harvest in Cape gooseberry (Physalis peruviana L.) genotypes

The days to first harvest in both the year were significantly impacted by genotypes and different planting dates. Additionally, the modest planting dates D_1 June, 15^{th} were recorded the maximum (129.0) days to first harvest followed by D_2 July,15^{th} and D_3 August, 15^{th}. While, the genotype G_3 CITH CGB Sel.02 demonstrated the maximum (115.42 and 111.92) days to first harvest in both years followed by CITH CGB

Sel.03 G_4 (115.14 and 111.78) in two years. Days to first harvest were statistically influenced by the interaction impact of planting dates and genotypes too the maximum (134.11) days to first harvest in year 2019-20 were noted. While, $D_4 \times G_2$ (September, 15th × Banaras) had the minimum (67.22 & 65.89) number of days to first fruit harvest in both years.

D. Effect of different dates of planting on fruit weight (g) and Cheek diameter (cm) in Cape gooseberry (Physalis peruviana L.) genotypes

The findings for identifying the physical characteristics of Cape gooseberry are summarized in Table 4. There was statistically significant variation in fruit quality and yield between genotypes and planting dates. As of July, 15th D_2 had the maximum (10.66g) fruit weight followed by D_1 (9.74g). Higher fruit weight was obtained by the genotype G_3CITH CGB Sel. 02 (10.66 and 11.25g) in both years. Planting dates and genotypes both had a significant impact as a result of the interaction effect on $D_2 \times G_3$ (July, 15th × CITH CGB Sel.02) and D_2xG_4 (July, 15th × CITH CGB Sel.03) had the maximum (12.43 & 13.43g) fruit weight in both years. Whereas, D_4xG_1 (September, 15th × Lucknow) had the minimum (5.11 & 5.34g) fruit weight in years 2019-20 and 2020-21.

Fruit cheek diameter was also affected by different planting dates and genotypes. D_2 July, 15th has the maximum (2.63cm) cheek diameter followed by G_1 June, 15th. While, genotype CITH CGB Sel. 02 G_2 had the maximum (2.70 & 2.81cm) cheek diameter in 2019-20 & 2020-21, genotype CITH CGB Sel.03 G_4 had the minimum (2.44 & 2.55cm) cheek diameter in both years. Both planting dates and genotypes showed a strong interaction effect on each other. $D_2 \times G_3$ (July,15th× CITH CGB Sel.02) had the maximum (2.89&3.02cm) cheek diameter followed by $D_3 \times G_4$ (August,15th x CITH CGB Sel.03). In contrast, the $D_4 \times G_1$ (September,15th × Lucknow) had the minimum (1.85 & 1.98cm) cheek diameter in year 2019-20 and 2020-21.

E. Effect of different date of planting on total soluble solids, juice% and pH in Cape gooseberry (Physalis peruviana L.) genotypes

It is obvious from Table 5 summarized the findings for determining the chemical properties of Cape gooseberry. There was statistically significant variation in fruit quality across planting dates and genotypes. D_2 had the highest juice percentage (63.89%) as of July, 15th followed by D_3 (62.07%). In both years, the genotypes CITH CGB Sel.03 generated more fruit juice (62.37% & 62.87%) respectively. Both planting dates and genotypes showed a strong interaction effect on each other. $D_2 \times G_4$ (July, 15th× CITH CGB Sel.03) had the maximum juice percent (65.79 & 66.65%) in both years, followed by $D_2 \times G_3$ (July,15th × CITH CGB Sel.02). Whereas, $D_4 \times G_2$ (September, 15th × Banaras) had the minimum fruit juice content (53.05 & 53.59%) in 2019-20 and 2020-21. While D_2 (as of July15) had the maximum (4.10) pH G_4 (September, 15th) had the lowest. Whereas, genotypes CITH CGB Sel. 05 G_4 had the highest fruit pH (4.40 & 4.43 in 2019-20 & 2020-21), genotypes CITH CGB Sel.02 G_3 had the lowest (4.0 & 4.09) in both years. Both planting dates and genotypes showed a strong interaction effect on each other. $D_4 \times G_3$ (September, 15th × CITH CGB Sel.02) had the lowest fruit pH (3.30 & 3.53) in year 2019-20 and 2020-21. However, the highest fruit T.S.S (14.94) was found in D_3 (as of August, 15th) followed by D_1. In contrast, both years the genotype G_4 CITH CGB Sel.03 (17.25 & 17.60) in year 2019-20 and 2020-21 was preceded by CITH CGB Sel.02. Thus, the interaction effect of planting dates and genotypes on fruit T.S.S. is considerable. The minimum fruit T.S.S. (12.37 & 12.63) was recorded on $D_4 \times G_2$ (September, 15th × Banaras) in both of the years.

DISCUSSION

The flowering, fruiting and quality parameters were found to differ significantly between genotypes. According to data orientation, early transplanting on July, 15th took longer to start the first flower, maximum number of flowers, days to fruit set and increased the number of fruit set/plant, as well as increased fruit weight (g), cheek diameter (cm). While, late planting dates on September 15th, early flowering reduced the number of flowers/plant, the number of fruits set/plant, the days to first harvest, fruit weight (g) and cheek diameter (cm). During early planting dates, increased rainfall resulted in better root development, which has a negative influence on nitrogen uptake and hence has an impact on overall growth and development of the Cape gooseberry plants. As a result, variations in flowering and fruiting times may be attributed to the synthesis of plant hormones and depend on numerous physiological phenomena in different genotypes**.** These findings corroborated with the results of Dwivedi *et al*. (2015); Kour and Bakshi (2006); Gond *et al*. (2018); Panayotov and Pova (2014); Singh and Dwivedi (2014) ; Sharma *et al*. (2019).

During planting date on D_2 (July, 15th) as per pooled value evaluation, the fruit juice% content raised in the genotype (CITH CGB Sel.03). T.S.S. increased for the August, 15th planting dates and the lowest pH was found on D_4 (for the September, 15th) planting dates. Physico-chemical variation might be responsible for plant hormone synthesis and it also depends on environmental change or genetic nature, changing the chemical composition of fruit. Lopez *et al*. (2013); Silva (2013) both indicated the average (6.5°Brix) T.S.S; Kaur *et al.* (2017) discovered a comparable results in juice% and pH disclosed by Verma *et al*. (2017).

Table 1: Effect of different planting dates on days to first flower and number of flower/plant in Cape gooseberry (*Physalis peruviana* L.) genotypes.

Days to first flowering													
Treatment	Year (2019-20)						Year (2020-21)						
	G1	G2	G3	G4	G5	Mean A	G1	G2	G3	G4	G5	Mean A	Pooled
15th June	106.21	104.33	95.55	95.00	94.89	**99.20**	109.33	111.21	93.22	91.33	90.89	99.20	**99.20**
15th July	116.88	120.44	105.22	104.22	103.63	**110.08**	121.78	123.54	97.26	94.44	92.66	105.94	**108.01**
15th August	97.00	96.89	71.67	68.78	65.78	**80.02**	91.98	93.11	70.29	67.96	63.34	77.34	**78.68**
15thSeptember	86.00	88.45	56.22	56.67	55.78	**68.62**	81.48	82.26	53.59	52.85	51.56	64.35	**66.48**
Mean B	**101.52**	**102.53**	**82.17**	**81.17**	**80.02**		**101.14**	**102.53**	**78.59**	**76.65**	**74.61**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**1.94**	**0.55**					**1.03**	**0.29**		
(G)				**1.27**	**0.44**					**1.25**	**0.43**		
(G)at same level of A				**2.72**	**1.23**					**2.57**	**0.65**		
(D)at same level of G				**2.97**	**0.96**					**2.45**	**0.83**		
Number of flower/plant													
Treatment	**G1**	**G2**	**G3**	**G4**	**G5**	**Mean A**	**G1**	**G2**	**G3**	**G4**	**G5**	**Mean A**	**Pooled**
15th June	120.00	128.67	132.33	121.33	119.67	**124.40**	118.00	119.33	129.33	120.00	118.00	120.93	**122.67**
15th July	127.33	121.67	125.33	131.33	117.67	**124.67**	125.33	117.00	121.00	128.00	115.67	121.40	**123.03**
15th August	111.00	105.00	101.00	102.33	89.67	**101.80**	108.00	101.67	99.33	97.33	86.67	98.60	**100.20**
15thSeptember	83.67	67.33	62.33	70.00	68.00	**70.27**	82.67	65.33	61.33	67.33	65.00	68.33	**69.30**
Mean B	**110.50**	**105.67**	**105.25**	**106.25**	**98.75**		**108.50**	**100.83**	**102.75**	**103.17**	**96.33**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**7.71**	**2.19**					**4.15**	**1.18**		
(G)				**5.23**	**1.81**					**3.51**	**1.21**		
(G)at same level of A				**11.17**	**4.89**					**7.36**	**2.63**		
(D)at same level of G				**12.06**	**3.90**					**7.49**	**2.47**		

Table 2: Effect of different dates of planting on days to fruit-set and number of fruits/plants on Cape gooseberry (*Physalis peruviana* L.) genotypes.

Days to fruit-set													
Treatment	Year (2019-20)						Year (2020-21)						
	G_1	G_2	G_3	G_4	G_5	Mean A	G_1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	6.7	7.4	5.4	5.3	6.7	**6.3**	6.6	7.6	6.0	5.7	7.0	**6.6**	**6.3**
15th July	6.0	7.1	5.3	5.3	6.6	**6.1**	6.2	7.3	5.6	6.0	6.9	**6.4**	**6.1**
15th August	5.8	6.7	5.2	4.7	6.6	**5.8**	5.8	6.8	5.6	4.8	6.8	**6.0**	**5.8**
15thSeptember	7.0	6.2	5.9	4.7	6.6	**6.1**	6.4	6.6	5.8	5.0	6.6	**6.1**	**6.1**
Mean B	**6.4**	**6.9**	**5.5**	**5.0**	**6.6**		**6.3**	**7.1**	**5.7**	**5.4**	**6.8**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**N/A**	**0.16**					**0.25**	**0.07**		
(G)				**0.41**	**0.14**					**0.39**	**0.13**		
(G)at same level of D				**N/A**	**0.36**					**N/A**	**0.16**		
(D)at same level of G				**N/A**	**0.30**					**N/A**	**0.25**		
Number of fruit-set /plant													
	G_1	**G_2**	**G_3**	**G_4**	**G_5**	**Mean A**	**G1**	**G2**	**G3**	**G4**	**G5**	**Mean A**	**Pooled**
15th June	84.00	78.00	91.00	95.00	88.33	**87.27**	77.33	76.00	88.00	87.00	78.00	**81.27**	**84.27**
15th July	94.00	78.33	96.00	92.67	89.00	**90.00**	90.00	77.00	92.67	90.33	85.67	**87.13**	**88.57**
15th August	62.06	64.17	44.00	46.27	41.00	**51.50**	59.73	62.17	42.67	44.27	39.67	**49.70**	**50.60**
15thSeptember	37.67	39.67	22.33	31.00	24.00	**30.93**	37.00	37.67	20.00	29.67	22.67	**29.40**	**30.17**
Mean B	**69.43**	**65.04**	**63.33**	**66.24**	**60.58**		**66.02**	**63.21**	**60.83**	**62.82**	**56.50**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**1.54**	**0.44**					**1.68**	**0.48**		
(G)				**2.11**	**0.73**					**1.86**	**0.64**		
(G)at same level of D				**4.30**	**0.98**					**3.84**	**1.07**		
(D)at same level of G				**4.06**	**0.44**					**3.72**	**1.25**		

Table 3: Effect of different dates of planting on days to first harvest on Cape gooseberry (*Physalis peruviana* L.) genotypes.

Days to first harvest													
Treatment	Year (2019-20)						Year (2020-21)						
	G_1	G_2	G_3	G_4	G_5	Mean A	G_1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	235.00	227.00	230.00	230.00	228.33	**230.07**	231.67	223.00	226.33	228.67	226.00	**227.13**	**228.60**
15th July	222.33	220.33	222.00	218.00	218.33	**220.20**	219.00	218.67	219.33	215.67	212.67	**217.07**	**218.63**
15th August	188.00	187.33	184.00	182.67	183.67	**185.13**	186.00	183.33	182.00	176.00	179.33	**181.33**	**183.23**
15thSeptember	155.33	155.67	154.00	155.33	154.00	**154.87**	151.00	152.67	150.00	152.00	147.67	**150.67**	**152.77**
Mean B	**200.17**	**197.58**	**197.50**	**196.50**	**196.08**		**196.92**	**194.42**	**194.42**	**193.08**	**191.42**		
Factors				**C.D.**	**SE(m±)**				**C.D.**	**SE(m±)**			
(D)				**2.59**	**0.74**				**1.25**	**0.35**			
(G)				**1.48**	**0.51**				**1.95**	**0.67**			
(G) at same level of D				**3.21**	**1.64**				**3.96**	**0.79**			
(D) at same level of G				**3.68**	**1.17**				**3.69**	**1.26**			

Table 4: Effect of different dates of planting on fruit weight (g) and cheek diameter (cm) on Cape gooseberry (*Physalis peruviana* L.,) genotypes.

Fruit weight (g)													
Treatment	Year (2019-20)						Year (2020-21)						
	G_1	G_2	G_3	G_4	G_5	Mean A	G_1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	6.47	8.27	11.97	11.18	9.83	**9.54**	7.03	8.57	12.20	11.61	10.29	**9.94**	**9.74**
15th July	7.67	8.57	12.43	11.70	10.33	**10.14**	8.33	9.03	13.43	12.70	12.43	**11.19**	**10.66**
15th August	5.94	7.53	9.97	9.73	9.47	**8.53**	6.28	8.20	10.47	10.19	9.34	**8.89**	**8.71**
15thSeptember	5.11	5.40	8.27	8.67	9.07	**7.30**	5.34	6.39	8.90	9.04	10.16	**7.97**	**7.63**
Mean B	**6.30**	**7.44**	**10.66**	**10.32**	**9.68**		**6.74**	**8.05**	**11.25**	**10.88**	**10.56**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**0.45**	**0.13**					**0.19**	**0.05**		
(G)				**0.30**	**0.10**					**0.40**	**0.14**		
(G)at same level of D				**0.65**	**0.28**					**0.82**	**0.12**		
(D)at same level of G				**0.70**	**0.23**					**0.75**	**0.26**		
Cheek diameter (cm)													
	G_1	G_2	G_3	G_4	G_5	Mean A	G_1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	2.03	2.13	2.71	2.44	2.31	**2.32**	2.11	2.72	2.85	2.50	2.40	**2.44**	**2.38**
15th July	2.15	2.24	2.89	2.67	2.40	**2.47**	2.23	2.72	3.02	2.96	2.51	**2.63**	**2.55**
15th August	1.94	2.10	2.67	2.40	2.27	**2.28**	1.96	2.58	2.91	2.48	2.37	**2.41**	**2.35**
15thSeptember	1.85	1.88	2.54	2.25	2.25	**2.16**	1.92	2.52	2.45	2.27	2.29	**2.21**	**2.18**
Mean B	**1.99**	**2.09**	**2.70**	**2.44**	**2.31**		**2.06**	**2.63**	**2.81**	**2.55**	**2.39**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**0.68**	**0.19**					**0.29**	**0.08**		
(G)				**0.72**	**0.25**					**0.32**	**0.11**		
(G)at same level of D				**N/A**	**0.43**					**0.67**	**0.18**		
(D)at same level of G				**N/A**	**0.48**					**0.64**	**0.22**		

Table 5: Effect of different dates of planting on juice (%) and T.S.S on Cape gooseberry (*Physalis peruviana* L.,) genotypes.

Juice (%)													
Treatment	Year (2019-20)						Year (2020-21)						
	G_1	G_2	G_3	G4	G_5	Mean A	G1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	59.27	60.53	61.05	62.10	60.09	**60.61**	60.24	61.33	62.08	62.43	60.55	**61.33**	**60.97**
15th July	62.43	63.20	63.40	65.79	61.92	**63.35**	63.85	64.50	64.94	66.65	62.25	**64.44**	**63.89**
15th August	62.62	62.59	61.64	62.81	59.62	**61.86**	62.89	62.85	62.00	63.05	60.62	**62.28**	**62.07**
15thSeptember	56.17	53.05	48.41	58.78	45.07	**52.30**	56.51	53.59	49.25	59.32	46.17	**52.97**	**52.63**
Mean B	**60.12**	**59.84**	**58.62**	**62.37**	**56.68**		**60.87**	**60.57**	**59.57**	**62.86**	**57.40**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**0.52**	**0.15**					**0.36**	**0.10**		
(G)				**0.45**	**0.15**					**0.35**	**0.12**		
(G)at same level of D				**0.94**	**0.33**					**0.73**	**0.23**		
(D)at same level of G				**0.95**	**0.31**					**0.72**	**0.24**		
T.S.S													
Treatment	G_1	G_2	G_3	G_4	G_5	Mean A	G_1	G_2	G_3	G_4	G_5	Mean A	Pooled
15th June	12.87	12.63	13.93	17.27	13.80	**14.10**	13.20	12.73	14.27	17.50	14.80	**14.50**	**14.30**
15th July	13.07	13.43	14.13	17.50	13.30	**14.29**	13.40	13.77	14.47	17.83	13.57	**14.61**	**14.45**
15th August	13.07	13.13	14.90	17.43	15.10	**14.73**	13.43	13.33	15.17	17.93	15.87	**15.15**	**14.94**
15thSeptember	12.70	12.37	16.90	16.80	13.17	**14.39**	13.20	12.63	17.30	17.13	13.40	**14.73**	**14.56**
Mean B	**12.93**	**12.89**	**14.97**	**17.25**	**13.84**		**13.31**	**13.12**	**15.30**	**17.60**	**14.41**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**0.34**	**0.10**					**N/A**	**0.21**		
(G)				**0.38**	**0.13**					**0.80**	**0.28**		
(G)at same level of D				**0.78**	**0.22**					**1.65**	**0.48**		
(D)at same level of G				**0.75**	**0.25**					**1.61**	**0.54**		

Table 5.1: Effect of different dates of planting on pH of Cape gooseberry (*Physalis peruviana* L.,) genotypes.

pH of fruit													
Treatment	**Year (2019-20)**						**Year (2020-21)**						
	G1	**G2**	**G3**	**G4**	**G5**	**Mean A**	**G1**	**G2**	**G3**	**G4**	**G5**	**Mean A**	**Pooled**
15th June	3.6	3.4	4.0	4.0	4.5	**3.9**	3.9	3.6	4.2	3.9	4.3	**4.0**	**3.9**
15th July	3.6	3.5	4.5	4.2	4.6	**4.1**	3.8	3.7	4.3	4.0	4.5	**4.1**	**4.1**
15th August	3.6	3.5	4.2	4.1	4.4	**4.0**	3.8	3.7	4.4	4.2	4.6	**4.1**	**4.0**
15thSeptember	4.0	3.6	3.3	3.7	4.0	**3.7**	4.3	3.7	3.5	3.9	4.2	**3.9**	**3.8**
Mean B	**3.7**	**3.5**	**4.0**	**4.0**	**4.4**		**3.9**	**3.7**	**4.1**	**4.0**	**4.4**		
Factors				**C.D.**	**SE(m±)**					**C.D.**	**SE(m±)**		
(D)				**0.17**	**0.05**					**0.13**	**0.04**		
(G)				**0.13**	**0.04**					**0.12**	**0.04**		
(G) at same level of D				**0.27**	**0.11**					**0.25**	**0.08**		
(D) at same level of G				**0.29**	**0.09**					**0.25**	**0.08**		

CONCLUSIONS

According to the findings of the present investigation fruit weight, cheek diameter, number of flowers/plan, number of fruits set/ plant, and juice percentage were all documented on or around July, 15thplanting dates. On the other hand, minimum fruit pH was recorded on genotype Banaras on September 15th and minimum days taken to first harvest on genotype CITH CGB Sel.05. Days to first flower were showed the minimal days to needed CITH CGB Sel.05. While, on August 15th, genotype CITH CGB Sel.03 showed the maximum T.S.S. Furthermore, CITH CGB Sel.02 provided the best phonological growth and enhanced economical yield of Cape gooseberry. The combination of the various genotypes and planting dates revealed that CITH CGB Sel.05 seems to be promising in terms of the flowering and fruiting attributing features.

FUTURE SCOPE

Since adaptation has resulted in 'Promising of species' sequences of physiological process (i.e. life cycle) to fit in with the basic seasonal fluctuation of the environment. So called climate change due to variation in rainfall, temperature, drought, cyclone etc. Hence it is the need of the hour to cope with such situation. Therefore, it advocated that comprehensive efforts are needed to find out the suitable date of plantings and genotypes of Cape gooseberry for achieving the production and productivity of crop under prevailing conditions.

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Conflict of Interest. None.

REFERENCES

Chattopadhyay, T. K. (1996). A text book of pomology, vol. 2nd *Kalyani Publishers*, New Delhi.

Dwivedi, D. H., Lata, R., Ram, R. B. and Babu, M. (2012). Effect of bio-fertilizer and organic manure on yield and quality of 'Red Fleshed' Guava. *Acta Hort., 933*, 239-244.

Dwivedi, D. H., Yadav, A. K. and Kumar, P. (2014). Integrated nutrient management in Cape gooseberry (*Physalis peruviana* L.) for peri-urban horticulture. *Indian J. Appl. Res., 4*(12), 274-275.

Dwivedi, D. H., Rao, S., Gautam, S. K. and Kumar, P. (2015). Effect of sowing time and spacing on the performance of Cape gooseberry (*Physalis peruviana* L.) in central Uttar Pradesh, *Hort Flora Research Spectrum*, *4*(1), 67-69.

Erkaya, T., Dagdemir, E. and Sengul, M. (2012). Influence of cape gooseberry (*Physalis peruviana* L.) addition on the chemical and sensory characteristic and mineral concentrations of ice crem. *Food R., 45*(1), 331-335.

Fischer, G. and Melgarejo, L.M (2014). Ecofisiología de la uchuva (*Physalis peruviana* L.). 31-47.

Gupta, S. K. and Roy, S. K. (1980). Multipurpose Cape gooseberry. *Indian J. Hort*, *24*(4), 11.

Gond, M., Dwivedi, D. H. and Maji, S. (2018). Flowering and fruiting in Cape gooseberry (*Physalis peruviana* L.) as influenced by organic manures and spacing. *International Journal of Minor Fruits, Medicinal and Aromatic Plants*, *4*(2), 07-12.

Kour, K. and Bakshi, P. (2006). Comparative performance of some gooseberry strains under Amritsar condition. *Haryana J. Hort. Sci*., *35*(3-4), 263-264.

Kaur, A. and Singh M. (2017). Effect of organic and inorganic fertilizers on vegetative growth, yield and fruit characteristics in cape-gooseberry *(Physalis peruviana* L.). *Int. Jour. of Current Adv. Res*., *06*(6), 4414-4417.

López, J., Gálvez, A. V., Torres, M. J., Mondaca, R. L., Fuentes, I. Q., Scala, K. (2013). Effect of dehydration temperature on physico-chemical properties and antioxidant capacity of goldenberry (*Physalis peruviana* L.). *Chil J Agric Res.*, *73*(3), 293-300.

Menzel, M. Y. (1951). The cytotaxonomy and genetic of *Physalis*. Proceeding of the American Philosophical society, *95*(2), 132-183.

Majumdar, B. C. (1979). Cape gooseberry. The jam of fruit of India. *World Crops*, *31*(1), 19-23.

Nohra, C., Rodriguez, C. and Bueno, A. (2006). Study of cytogenetic diversity of *Physalis peruviana* L. (Solanaceae) *Acta boil Colomb*, *11*(2), 75-85.

Novoa, R., M. Bojaca., J, Galvis and G. Fischer. (2006). La madurez del fruto y el secado del cáliz influyen en el comportamiento postcosecha de la uchuva, almacenada a 12°C (*Physalis peruviana* L.). *Agron. Colomb*., *24*(1), 77-86.

Nocetti, D., H Núñez, L., Puente, A., Espinose and Romera, F. (2020). Composition and biological effects of golden berry byproducts: an overview *J. Sci. Food Agri*., *100*(12), 4335-4346.

Panse, V. G. and Sukhatme, P. V. (1985). Statistical Methods for Agricultural Workers. *Indian Council of Agricultural Research*, Published by ICAR New Delhi.

Puente, L. A., Pinto-Muñoz, C. A., Castro, E. S., & Cortés, M. (2011). Physalis peruviana Linnaeus, the multiple properties of a highly functional fruit: A review. *Food Research International*, *44*(7), 1733-1740.

Panayotov, N. and Popova, A. (2014). Vegetative and productive behaviors of Cape gooseberry (*Physalis peruviana* L.), grown by direct sowing outside under conditions of Bulgaria. *Turk. J. Agric. Nat. Sci*, *1,* 1141-1146.

Rodrigues, F. A., Penoni, E. dos S., Soares, J. D. R., Silva, R. A. L. and Pasqual, M. (2013). Phenological characterization and productivity of *Physalis peruviana* cultivated in greenhouse *Bio. Sci*., *29*(6), 1771-1777.

Singh, M. and Dwivedi, D. H. (2014). Effect of different date of sowing on germination of *cape gooseberry* (*Physalis peruviana* L.) in central Uttar Pradesh *Inter J.of adv. Bio.& Res*, *5*(4), 750-754.

Sandoval, J. A. L., Rosales, E. J. M., Vibrans, H., Mortera, E.U., Ponce, O. V. and Salas, M. M. D. (2018). Cultivation of wild species of genus *Physalis* and Tropical and Sub tropical. *Agroecosystems, 21*(2), 303-315.

Sharma, M. K., Nazir, N., Parray, E. A. and Sundouri, A. S. (2019). Production potential of some Cape gooseberry selections. *J. Pharmacogn. Phytochem.*, *8*(4), 1215-1216.

Silva, D. F. (2013). Postharvest and fruit production of Cape gooseberry in Minas Gerais State, Brazil. *Revista Ceres*, ***60***(6), 826-832.

Tapia, M. and Fires, A. (2007). Guia de campo de losclutivosandinos.FAO y ANPE, Lima.

Verma, A., Singh, S. P., Pal, A. K. and Singh, B. K. (2017). Response of physico-chemical attributes in Cape gooseberry (*Physalis peruviana* L.) to integrated nutrient management. *Int. J. of Currt. Microbi. and Appl. Sci*, *6*(11), 1940-1945.

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