Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; Sp 9(5): 834-837
Received: 15-08-2020
Accepted: 19-09-2020

Wineet Chawla
a. Department of Horticulture, Lovely Professional University, Phagwara, Punjab, India
b. Department of Agriculture, Baba Farid College, Bathinda, Punjab, India

Shailesh Kumar Singh
Department of Horticulture, Lovely Professional University, Phagwara Punjab, India

Corresponding Author:
Wineet Chawla
a. Department of Horticulture, Lovely Professional University, Phagwara, Punjab, India
b. Department of Agriculture, Baba Farid College, Bathinda, Punjab, India

Evaluation of different strawberry genotypes for flower characters under Punjab conditions

Wineet Chawla and Shailesh Kumar Singh

DOI: https://doi.org/10.22271/phyto.2020.v9.i6Sk.13342

Abstract
An experiment was conducted at the experimental Research farm, Department of Agriculture, Baba Farid College, Bathinda India during 2017-19 to study the performance of different genotype of strawberry under Punjab Conditions for flower characters. The genotype 'Camarosa' (V_3) and 'E1-13#32' (V_5) were showed the highest flower size and petal size. The maximum number of stamen was found in genotype 'Winter Dawn'. The genotype 'Camarosa' and 'Chandler' and 'Winter dawn' were found highest flower count and longest duration of flowering while genotype 'E-22'was lowest flowering period and lesser count of flower under Punjab conditions.

Keywords: Genotypes, strawberry, flowering etc.

Introduction
Strawberry is attractive herbaceous plants belongs to family Rosaceae having chromosome number 2n=8x=56. The demands of strawberry fruit are good in fresh fruit market and also in processing industries for making ice creams, juices etc. In India, Maharashtra is a leading state in production of strawberry fruits. In recent years, its cultivation has also been extended from the temperate to the sub-tropical regions (Punjab) where it grows as an annual crop. Initially strawberry cultivated in temperate zone of the country but now it is possible to grown in the sub-tropical zones as well with the introduction of day neutral cultivars. Many cultivars are found in strawberry but the photo/therrno sensitive nature of this crop warrants the checking of these genotypes for its adaptability in new areas before recommending for commercial cultivation [1]. In Punjab the cultivation of strawberry are limited scales due to unavailable of suitable package of practices. In the present investigation, the twelve strawberry genotypes were put into trial at Bathinda with a view to evaluate their flower characters.

Material and Methods
The present investigation was carried out in experimental farm, Department of Agriculture, Baba Farid College, Bathinda and between 30.2518°N latitude 74.8417°E longitude at average 201-meter elevation above from mean sea level. The twenty one runners were transplanted on raised beds at 30 cm row to row and plant to plant. The investigation was carried out in the as randomized complete block design (RCBD) with three replications consisting 36 beds (2x1 m) in which twelve strawberry genotypes runners were planted at a spacing of 30 x 30 cm. The genotypes which were used as treatments are: V_1(Chandler), V_2(Winter Dawn), V_3(Camarosa), V_4(FL-09-127), V_5(E1-13#32), V_6(Sweet Charlie), V_7(Hadar), V_8(E1-13#33), V_9(E1-13#31), V_{10}(Yamini), V_{11}(E-22), V_{12}(Shani).
The mean flower size, petal length, petal breadth were calculated from selected 10 flowers per replication. The number of days for flowering was estimated on the basis of days counted from planting date to the opening of 1stflower as described by Kidmose *et al.*(1996) [2]. The flowers were counted at week interval on the same plant in each treatment per replication from the 10 marked plants and indicated as total average number of flowers per plant. Flower type was checked by visually observation which was classified as staminate, pistillate and hermaphrodite. The anther attachment was recorded in each treatment from the attachment of anther with filament which was classified as versatile, dorsifixed, adnate or basifixed. The petal shape was evaluated by visual observation which was classified as obovate, orbicular and ovate.

Results and Discussion

The flower characters like flower size, petal size, number of stamens were significantly differed among genotypes (Table-1). The results were found significantly in different genotypes under Punjab condition in term of flower size and varied from 1.76 cm to 1.97 cm. The genotype 'Camarosa' (V_3) was recorded (1.97 cm) maximum flower size which was significantly different from the other gernotypes and was followed by 'Shani' (V_{12}) (1.94 cm), 'E1-13#32' (V_5) (1.92 cm) and 'E1-13#31' (V_9) (1.91 cm) while, lowest flower size was found in 'E-22' (V_{11}) (1.76 cm) followed 'Yamini' (V_{10}) and 'FL-09-127' (V_4) (1.81 cm). These results may be due to germplasm variation according to findings of Gupta (1998) [3]. The highest petal length in genotype was recorded in 'E1-13#32' (V_5) (0.88 cm) which was statistically at par with 'Camarosa' (V_3) (0.87 cm), 'E1-13#31' (V_9) (0.87 cm) and 'Shani' (V_{12}) (0.86 cm) while lowest was observed in 'E-22' (V_{11}) (0.74 cm) closely related by 'Yamini' (V_{10}) (0.76 cm). The maximum breadth of petal was found in 'E1-13#32' (V_5) (0.88 cm) which was statistically at par with 'Camarosa' (V_3) (0.87 cm), 'E1-13#31' (0.87 cm) and 'Shani' (V_{12}) (0.86 cm). Similar variation in petal size was also reported by Lata (2016) [4]. There was no significant difference in term of number of petals in different genotypes. Similarly, Singh (2016) [5] reported that value of petals number per fruit ranged from 5 to 6.

The genotype 'E1-13#32', 'Sweet Charlie' showed the minimum stamens count (20) followed by 'FL-09-127', E1-13#31', 'E-22', 'Hadar' (V_7) and 'E1-13#33' (V_8) (Table-1). The maximum (22.67) was found in 'Winter Dawn' (V_2) followed by 'Shani' (V_{12}) (22), 'Yamini' (V_{10}) and 'Camarosa' (V_3). Garg (2013) [6] had also confirmed certain degree of variation in stamens count in strawberry as a function of varieties which ranged between 19.33 and 24.33.

Table 1: Evaluation of different strawberry genotypes on the basis of quantitative traits of flower

Genotypes		Flower size (cm)	Petal length (cm)	Petal breadth (cm)	Number of stamens	Number of petals
V_1	Chandler	1.85^{bc}	0.83^{bc}	0.85^{b}	21.67^{b}	5.33
V_2	Winter Dawn	1.85^{bc}	0.80^{c}	0.79^{cd}	22.67^{a}	5.67
V_3	Camarosa	1.97^{a}	0.87^{ab}	0.89^{a}	22.00^{ab}	5.33
V_4	FL-09-127	1.81^{c}	0.79^{cd}	0.81^{c}	20.33^{c}	6.00
V_5	E1-13#32	1.92^{ab}	0.88^{a}	0.83^{bc}	20.00^{c}	5.00
V_6	Sweet Charlie	1.89^{b}	0.81^{bc}	0.78^{cd}	20.00^{c}	5.00
V_7	Hadar	1.87^{bc}	0.84^{b}	0.89^{a}	20.67^{c}	5.67
V_8	E1-13#33	1.84^{bc}	0.81^{bc}	0.77^{d}	20.67^{c}	5.00
V_9	E1-13#31	1.91^{ab}	0.87^{ab}	0.83^{b}	20.33^{c}	5.67
V_{10}	Yamini	1.79^{c}	0.76^{d}	0.79^{cd}	22.00^{ab}	5.00
V_{11}	E-22	1.76^{c}	0.74^{d}	0.73^{e}	20.33^{c}	5.67
V_{12}	Shani	1.94^{ab}	0.86^{ab}	0.84^{b}	22.00^{ab}	5.33
Mean		1.87	0.82	0.82	21.06	5.39
C.D.		0.065	0.029	0.027	0.861	N/A
SE(m)		0.022	0.01	0.009	0.292	0.259
SE(d)		0.031	0.014	0.013	0.412	0.367
C.V.		2.032	2.095	1.947	2.399	8.341

The results of duration of flowers were statistically different in genotypes and ranged from 75.7 days to 88 days (Table-2). The largest period of flowering (88 days) was obtained in 'Camarosa' (V_3) which was statistically at par with 'Chandler' (V_1) (87.3 days) whereas smallest period of flowering (75.3 days) was recorded in genotype 'E-22' (V_{11}). The duration of flowering was varied in different genotype of strawberry as recorded by Sharma and Suman (2006) [7] and Sharma *et al*. (2014) [8]. The earliest flowering was produced in genotype 'Sweet Charlie' (V_6) after planting while genotype 'E-22' (V_{11}) took maximum day (88 days) to produce flowering after planting. The germplasms 'Chandler' (V_1), 'Camarosa' (V_3) and 'Winter Dawn' (V_2) took 78.67 days, 79.67 days and 82 days respectively to produce flower after planting. The variation in days to flowering after planting in different genotypes may be probably due to variability in chilling requirement of germplasm under investigation where some of the genotypes reflected early flowering with little chilling period (Craig and Brown, 1977[9]; Nicoll and Galletta, 1987) [10].

The maximum (21.67) flowers count per plant was registered in 'Camarosa' (V_3) which was at par with 'Winter Dawn' (V_2) (20.66) and 'Chandler' (V_1) (19.67) while genotype 'E-22' (V_{11}) had produced the minimum flower per plant. The genotype 'Shani' (V_{12}), 'E1-13#32' (V_5), 'FL-09-127' (V_4), 'Yamini' (V_{10}) and 'E1-13#31' (V_9) were produced 18.5, 18.3, 17, 17 and 16.67 flowers per plant, respectively. The results of flowers count in present investigation were in similarity with the observations recorded by Deepa *et al*. (2012) [11] who reported that 'Chandler' and 'Gorella' produced highest flowers per plant. Similar results have been observed by Neetu and Sharma (2018) [12] who the highest flowers count per plant was recorded in Nabila (27.42) and Camarosa (26.18).

Table 2: Evaluation of different strawberry genotype on the basis of flowering behaviors

Genotypes		Days to flowering	Duration of flowering	Number of flowers
V_1	Chandler	78.67^{f}	87.33^{ab}	19.67^{ab}
V_2	Winter Dawn	82.00^{d}	86.67^{b}	20.67^{ab}
V_3	Camarosa	79.67^{ef}	88.00^{a}	21.67^{a}
V_4	FL-09-127	82.33^{d}	84.67^{c}	17.00^{bc}
V_5	E1-13#32	79.00^{ef}	82.00^{d}	18.33^{bc}
V_6	Sweet Charlie	72.33^{g}	78.67^{f}	15.33^{c}
V_7	Hadar	73.00^{g}	78.00^{f}	13.00^{cd}
V_8	E1-13#33	80.00^{e}	80.33^{e}	15.00^{c}
V_9	E1-13#31	84.00^{c}	83.00^{d}	16.67^{bc}
V_{10}	Yamini	86.33^{b}	85.67^{bc}	17.00^{bc}
V_{11}	E-22	88.00^{a}	75.67^{g}	10.83^{d}
V_{12}	Shani	86.00^{b}	83.67^{cd}	18.50^{b}
Mean		80.94	82.81	16.97
C.D.		1.13	1.09	3.09
SE(m)		0.38	0.37	1.05
SE(d)		0.54	0.52	1.48
C.V.		0.82	0.77	10.69

Qualitative flower characters

All the germplasms were reported to bear hermaphrodite flowers (Table-3). Similar findings for cultivated strawberry genotypes were also reported by Lata (2016) [4]. The shape of petal in germplasm 'Chandler', 'Winter Dawn', 'Camarosa', 'FL-09-127', 'Hadar', 'Yamini', 'Shani' and 'E1-13#31' was orbicular-ovate shape while genotype 'E-22' and 'E1-13#33' had orbicular-obovate shape. Ovate-obovate shape of petal was found in genotye 'E1-13#32' and 'Sweet Charlie'. Similar variations were reported by Gupta (1998) [3] and Garg (2013) [6]. All genotypes of strawberry showed white colour of petals. The dorsifixed type of another attachment was recorded in all genotypes of strawberry in this investigation.

Table 3: Evaluation of different strawberry germplasm on the basis of qualitative traits of flower

Code	Germplasms	Flower type	Petal shape	Petal colour	Anther attachment
V1	Chandler	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V2	Winter Dawn	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V3	Camarosa	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V4	FL-09-127	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V5	E1-13#32	Hermaphrodite	Ovate-obovate	White	Dorsifixed
V6	Sweet Charlie	Hermaphrodite	Ovate-obovate	White	Dorsifixed
V7	Hadar	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V8	E1-13#33	Hermaphrodite	Obovate-orbicular	White	Dorsifixed
V9	E1-13#31	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V10	Yamini	Hermaphrodite	Orbicular-ovate	White	Dorsifixed
V11	E-22	Hermaphrodite	Orbicular-Obovate	White	Dorsifixed
V12	Shani	Hermaphrodite	Orbicular-ovate	White	Dorsifixed

Conclusion

Among the genotypes, 'Camarosa', 'Winterdawn', 'Chandler' produced maximum flowers under Punjab conditions. The genotype 'Camarosa' and Chandler were found longest period of flowering. These genotypes have performed better with respect to floral character while genotype 'E-22' was weak performance than other genotypes.

Acknowledgement

Thanks to Dr. Shailesh Kumar Singh for his guidance of the work and Dr. S.S Bal and Dr. Ramesh Sadawarti for their suggestions. Thanks to UHF Nauni and KF bioplant pvt. Ltd. for providing planting materials.

References

1. Pradeepkumar T, Babu DS, Aipe KC. Performance of strawberry varieties in Wayanad District of Kerala. Journal of Tropical Agriculture 2006;40:51-2.
2. Kidmose U, Andersen H, Vang-Petersen O. Yield and quality attributes of strawberry cultivars grown in Denmark 1990-1991. Journal of American Pomological Society 1996;50:160-7.
3. Gupta U. Description and evaluation of strawberry cultivars under mid hills of H.P. (M.Sc. Thesis), Dr. YSPUHF, Solan (HP), India 1998.
4. Lata S. Pollination studies and development of day neutral cultivars in strawberry (*Fragaria x ananassa* Duch.). (Ph.D. Thesis), Dr. YSPUHF, Solan (HP), India 2016.
5. Singh R. Evaluation of strawberry *(Fragaria x ananassa* Duch.) cultivars under sub-tropical conditions of Punjab. (M.Sc. Thesis), Punjab Agricultural University, Ludhiana 2016.
6. Garg S. Variability and association studies in strawberry (*Fragaria x ananassa*). (MSc. Thesis), Dr. YSPUHF, Solan (HP), India 2013.
7. Sharma G, Suman DK. Correlation and path analysis studies in strawberry (*Fragaria x ananassa* Duch.). Haryana Journal of Horticultural Sciences 2006;35(1/2):38.
8. Sharma G, Yadav A, Thakur M. Studies on Growth and Flowering Attributes of Different Strawberry Cultivars (*Fragaria x ananassa* Duch.) in Himachal Pradesh. Asian J of Adv. Basic Sci 2014;3(1):1-4.

9. Craig DL, Brown GL. Influence of digging date, chilling, cultivars and culture on glasshouse strawberry producton in Nova Scotia. Canadian Journal of Plant Science 1977;57(2):571-6.
10. Nicoll MF, Galletta GJ. Variation in growth and flowering habits of Junebearing and everbearing strawberries. Journal of the American Society for Horticultural Science 1987;112(5):872-80.
11. Deepa DH, Chaturvedi SK, Ram RB, Maurya D. Flowering, fruiting and yield of some strawberry cultivars under Lucknow conditions. Progressive Horticulture 2011;43(2):200-2.
12. Neetu, Sharma SP. Evaluation of Strawberry Cultivars for Growth and Yield Characteristics in plain Region of Chattisgrah India. Int. J Curr Microbiol, App. Sci 2018;7(02):2835-40.