

Characterization of Different Stock (*Matthiola incana* L.) Genotypes for Growth, Flowering and Yield Traits under the Hill Zone of Karnataka

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(Received: 19 July 2023; Revised: 17 August 2023; Accepted: 15 September 2023; Published: 15 October 2023)

(Published by Research Trend)

ABSTRACT: Stock (*Matthiola incana* L.) is a magnificent cut flower which is being grown only in a few parts of the temperate countries. So, this investigation aims to introduce this cut flower crop to the hill zone of Karnataka, India. The performances of 11 distinct stock genotypes were studied using a Randomized Block Design with three replications. The study revealed that plant height (72.00 cm), internodal length (2.99 cm), stalk length (93.93 cm), number of florets per stalk (32.07) and vase life (13.47 days) were recorded as the maximum in genotype Stock Katz Blue. Stock Katz Ruby recorded the maximum number of leaves (70.73), leaf area (3,199.94 cm²/plant), longevity in the plant (36.61 days) and the minimum number of days taken for stalk emergence and harvest (43.60 and 74.40, respectively). The maximum leaf length (18.55 cm) and plant spread (39.00 cm in E-W and 38.94 cm in N-S) were recorded in Stock Katz Purple. Stalk girth (10.40 mm), floret diameter (4.22 cm) and the number of cut flowers per m² (25.00) were showed the highest for Arrow White. Based on these findings the Stock Katz Blue was found to be superior with quality parameters, the genotype Stock Katz Ruby was found to be the most suitable for earliness and maximum longevity in the plant while, the genotype Arrow White was found the best for marketable flower yield.

Keywords: Brassicaceae, Characterization, Cut flower, Genotype and Stock.

INTRODUCTION

Stock, earlier known as *Leucoium album* or *Viola alba*, was later renamed as *Matthiola* after Peter Andrew Matthioli, an Italian physician and botanist. This was being grown by the ancient Greeks and was liked for its fragrance. In the wild state, stocks are found in the Mediterranean, Egypt, south Europe and South Africa and two species, *Matthiola incana* and *M. sinuate* are among the rare British natives. This has now been naturalized in many parts of the world predominantly the southern parts of California. Both single and double forms were grown in Europe from the 10th century onwards and became popular garden flowers. Sowing stock seeds mixed with radish seeds in order to distract flea beetles was a common practice. British settlers spread stock from Europe to different parts of the world and presently two species are mainly described *Matthiola annua* and *Matthiola incana* but the varieties usually cultivated are of *Matthiola incana* L. (Singh,

2006). Stock or Gillyflower (*Matthiola incana* L.) is an annual or biennial plant flowering in terminal clusters and belongs to the cabbage family Brassicaceae with the chromosomal number 2n = 14 (Irani *et al.*, 2016). It exists in both single and double forms but the double-flowered kinds are the most popular ones. These have evolved through the changing of stamens into petals and are valued as fragrant flowers that can be used as fresh or dried cut flowers and also as summer bedding. Stocks are the most valuable race of garden plants for they are easy to grow and can be in bloom during the greater part of the year. They are excellent pot plants for the greenhouse in winter and spring and provide good cut flowers. Flowers are well arranged on a long column and the colours are variable from white to rose, crimson, purple, yellow, mauve, pink, etc. The highly fragrant flowers are used as a garnish, especially with sweet desserts (Tatsuzawa *et al.*, 2012).

There are several studies revealing the performance of different varieties of different crops at specific regions

viz., in lisianthus, the highest plant height (73.55 cm) and a greater number of leaves (42.00) was observed in Areenachampagne, the widest plant spread was recorded in Rosita Red (176.22cm) discoursed by Bhargav *et al.* (2020). Ho *et al.* (2022) reported that the cultivar pink double recorded maximum floret diameter (5.20 cm), inflorescence length (28.20 cm), plant height (80.80 cm) and leaf length (15.40 cm) in *Matthiola incana* L. Gurung *et al.* (2021) reported that the variety Wed in Bouquets obtained maximum plant height (59.09 cm) but maximum spike length (117.56 cm), spike weight (107.94 g) and numbers of florets (13.33) in gladiolus.

There is always demand for novel flower crops over existing ones. Hence, there is a need to evaluate the performance of various genotypes under specific regions.

MATERIAL AND METHODS

The investigation consisted of 11 genotypes (Plate-1), which were replicated thrice in a Randomized Complete Block Design (RCBD) which was carried out under a naturally ventilated polyhouse at College of Horticulture, Mudigere, under Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during 2022-23. Standard cultural practices were followed throughout the crop period. The objective of this investigation was to study the characterization of different stock (*Matthiola incana* L.) genotypes for growth, flowering and yield traits under the hill zone of Karnataka. One-month-old seedlings were transplanted onto raised beds with a spacing of 25×25 cm. Observations were recorded in each genotype for plant height (cm), Number of leaves per plant, leaf length (cm), leaf width, leaf area, internodal length, days taken for stalk emergence, number of

florets per stalk, floret diameter, stalk length, stalk girth, stalk weight, vase life, longevity in plants and number of cut flowers per m². The analysis of variance was done as per the method suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The findings were considerably interpreted and listed in Table 1-3 and Plate 1 based on the observations recorded in the present research.

A. Mean performance of cultivars for morphological traits

All morphological traits varied significantly among the cultivars.

The mean performance of 11 stock genotypes for different growth characters is presented in Table 1. It is evident from the data that the genotype Stock Katz Blue recorded the maximum plant height (72.00 cm) which was statistically on par with Stock Katz Ruby (68.44 cm), Stock Katz Purple (67.27 cm) and Early Iron White (66.65 cm) while, the minimum plant height was recorded in Quartet Deep Yellow (54.87 cm) which is on par with Early Iron Marine (55.61 cm). The maximum internodal length was recorded in the genotype Stock Katz Blue (2.99 cm) which is on par with Stock Katz Purple (2.80 cm) whereas, the minimum internodal length was recorded in the genotype Early Iron Yellow (1.25 cm). Being the varietal traits, variations among the genotypes might be accredited to the plant's genetic makeup. The results were in agreement with Sanderson and Martin (1984) in snapdragon, Ho *et al.* (2020) in stock, Bhargav *et al.* (2020) in lisianthus, Goyanka and Singh (2021); Gurung *et al.* (2021) in gladiolus.

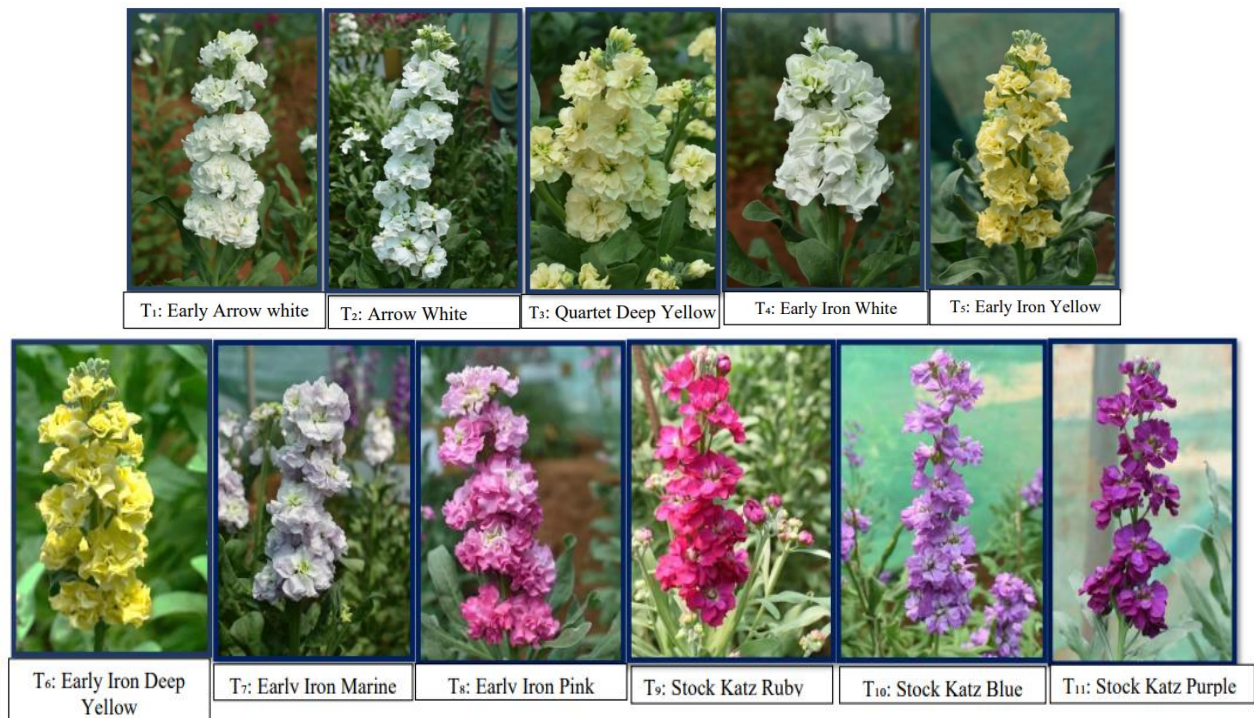


Plate 1: Genotypes used in the investigation.

Table 1: The mean performance of eleven stock genotypes for different growth characters

Genotypes	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf width (cm)	Leaf area (cm ² /plant)	Plant spread [E-W] (cm)	Plant spread [N-S] (cm)	Internodal length (cm)
G ₁ - Early Arrow white	56.73	65.73	14.33	3.02	1559.41	20.02	23.68	2.53
G ₂ - Arrow White	61.79	54.53	17.10	3.38	1997.21	25.89	28.43	1.69
G ₃ - Quartet Deep Yellow	54.87	51.27	13.87	4.09	1768.44	24.73	23.60	2.42
G ₄ - Early Iron White	66.65	59.27	16.17	3.87	1668.91	28.58	29.73	1.42
G ₅ - Early Iron Yellow	56.59	52.00	12.77	2.65	1868.49	24.00	23.27	1.25
G ₆ - Early Iron Deep Yellow	56.55	47.33	13.75	3.35	1472.95	28.59	24.43	1.39
G ₇ - Early Iron Marine	55.61	53.33	14.74	4.03	1864.78	23.73	20.63	1.81
G ₈ - Early Iron Pink	56.08	59.33	14.75	3.08	2134.83	22.83	25.56	1.32
G ₉ -Stock Katz Ruby	68.44	70.73	17.83	3.09	3199.94	28.46	31.85	2.21
G ₁₀ - Stock Katz Blue	72.00	53.87	16.65	3.40	2237.32	33.71	26.97	2.99
G ₁₁ - Stock Katz Purple	67.27	66.47	18.55	3.03	2880.85	39.00	38.94	2.80
S. Em ±	2.12	1.95	0.28	0.12	67.23	1.00	0.77	0.06
CD @ 5%	6.24	5.76	0.83	0.36	198.33	2.95	2.26	0.19

The number of leaves per plant in case of genotype Stock Katz Ruby (70.73), was significantly the maximum than other genotypes which is on par with Stock Katz Purple (66.47) and Early Arrow white (65.73) while, the minimum number of leaves per plant recorded in the genotype Early Iron Deep Yellow (47.33). The genotype Stock Katz Purple (18.55 cm) recorded the maximum leaf length and which was on par with Stock Katz Ruby (17.83 cm) while, the minimum leaf length recorded in Early Iron Yellow (12.77 cm). The genotype Quartet Deep Yellow (4.09 cm) recorded the maximum leaf width which was on par with Early Iron Marine (4.03 cm) and Early Iron White (3.87 cm) whereas, the minimum leaf width recorded in Early Iron Yellow (2.65 cm). Stock Katz Ruby had recorded significantly maximum leaf area (3199.94 cm²/plant) whereas, the minimum leaf area was recorded in the genotype Early Iron Deep Yellow (1472.95 cm²/plant), this variation is due to the constructive relationship with leaf length, width and the number of leaves per plant. The results are in consonance with Sanderson and Martin (1984) in snapdragon, Geeta *et al.* (2014); Swetha *et al.* (2020) in gladiolus, Ho *et al.* (2020) in stock, Bhargav *et al.* (2020) in lisianthus, Kolar *et al.* (2022) in China aster. The maximum plant spread was observed in the genotype Stock Katz Purple (39.00 cm) whereas, the minimum plant spread was observed in Early Arrow white (20.02 cm) in the East-West direction. The maximum plant spread was observed in Stock Katz Purple (38.94 cm) while, the minimum plant spread was observed in Early Iron Marine (20.63 cm) in the North-South direction. Different genotypes significantly impact plant spread or canopy spread, which is regarded as a crucial factor that specifies the rate of vegetative growth. The results were in agreement with Bhargav *et al.* (2020) in lisianthus, Goyanka and Singh (2021); Gurung *et al.* (2021) in gladiolus. Kolar *et al.* (2022) in China aster.

B. Mean performance of cultivars for flowering and flower quality traits

All flowering and flower quality traits varied significantly among the cultivars.

The mean performance of 11 stock genotypes for different flowering and flower quality characters is presented in Table 2. It is evident from the data that the genotype Stock Katz Ruby (43.60 and 74.40, respectively) recorded the minimum number of days to flower stalk emergence and days taken to flower stalk harvest which is followed by Stock Katz Purple (49.53 and 81.07, respectively) and Stock Katz Blue (51.67 and 83.13, respectively) whereas, genotype Early Iron Deep Yellow (96.53 and 129.13, respectively) recorded the maximum number of days. Being the varietal traits, variations among the genotypes might be attributed to the plant's genetic makeup. The results are in tune with Sanderson and Martin (1984) in snapdragon, Ho *et al.* (2020) in stock, Bhargav *et al.* (2020) in lisianthus, Singh *et al.* (2021).

The maximum stalk length was recorded in the genotype Stock Katz Blue (93.93 cm) and followed by Stock Katz Ruby (89.07 cm) which is on par with Stock Katz Purple (87.07 cm) while, the minimum stalk length was recorded in the genotype Quartet Deep Yellow (64.87 cm) this variation might be due to the variation in plant height. The maximum stalk girth was recorded in the genotype Arrow White (10.04 mm) while, the minimum stalk girth was recorded in the genotype Stock Katz Blue (6.37 mm). The maximum number of florets per stalk was recorded in the genotype Stock Katz Blue (32.07) followed by Stock Katz Ruby (27.13) while, the minimum number of florets per stalk was recorded in the genotype Quartet Deep Yellow (13.20) this might be due to variation in stalk length *i.e.*, higher the stalk length more will be the number of florets.

The genotype Arrow White recorded the maximum floret diameter (4.22 cm) while, the minimum was recorded in the genotype Early Iron Marine and Stock Katz Ruby (3.31 cm). Vase life was showed maximum (13.47 days) in the genotype Stock Katz Blue while, the minimum vase life was recorded in the genotype Quartet Deep Yellow (7.33 days) and Early Iron Deep Yellow (7.33 days). The maximum longevity was recorded in the genotype Stock Katz Ruby (36.61 days) followed by Stock Katz Purple (30.62 days) and Stock Katz Blue (29.02 days) while, the minimum longevity was recorded in the genotype Early Iron Deep Yellow (14.55 days). Similar results have been obtained by Chandrashekhara *et al.* (2018) in lily, Ho *et al.* (2020) in stock, Bhargava *et al.* (2020) in lisianthus, Goyanka and Singh (2021); Gurung *et al.* (2021) in gladiolus. Kolar *et al.* (2022) in China aster and Singh *et al.* (2021) in tuberose.

C. Mean performance of cultivars for yield traits

The mean performance of 11 stock genotypes for different flowering and flower quality characters is presented in Table 3. The genotypes Arrow White and Early Arrow White produced the maximum number of per m² (25.00) and per 1000 m² (20,000.00). However, the minimum number of stalks per m² (15.67) and per 1000 m² (12533.33) was observed in the genotypes Early Iron Pink and Stock Katz Blue. The increase in stalk yield might be attributed to more number of double-type flower productions and the variation in the number of doubleness of the Stock genotypes might be the differences in the genetic makeup. Similar results have been obtained by Sanderson and Martin (1984) in snapdragon, Waseem *et al.* (2013); Ho *et al.* (2020) in stock, Bhargava *et al.* (2020) in lisianthus, Goyanka and Singh (2021); Gurung *et al.* (2021) in gladiolus.

Table 2: Mean performance of cultivars for flowering and flower quality traits.

Genotypes	Days taken for			Stalk length (cm)	Stalk girth (mm)	Stalk weight (g)	Number of florets/stalk	Floret diameter (cm)	Longevity in plants (days)	Vase life (days)
	Stalk emergence	First visible flower	Stalk harvest							
G ₁ - Early Arrow white	78.20	88.40	104.13	74.53	7.73	61.27	20.33	3.40	15.86	10.20
G ₂ - Arrow White	79.20	89.93	109.67	78.87	10.40	106.60	25.47	4.22	22.25	8.47
G ₃ - Quartet Deep Yellow	73.53	83.33	96.60	64.87	9.00	140.53	13.20	3.40	28.48	7.33
G ₄ - Early Iron White	81.47	91.47	110.67	71.87	7.20	120.73	20.67	3.68	14.70	9.87
G ₅ - Early Iron Yellow	87.40	97.47	113.93	74.27	8.47	160.07	20.13	3.46	16.27	8.13
G ₆ - Early Iron Deep Yellow	96.53	106.53	129.13	79.13	7.87	169.87	24.33	3.43	14.55	7.33
G ₇ - Early Iron Marine	72.27	81.53	97.47	69.20	7.80	86.93	16.07	3.31	27.44	11.00
G ₈ - Early Iron Pink	81.60	91.60	106.60	70.27	8.60	109.73	16.40	4.02	23.38	9.80
G ₉ -Stock Katz Ruby	43.60	55.40	74.40	89.07	6.70	94.87	27.13	3.31	36.61	10.20
G ₁₀ - Stock Katz Blue	51.67	62.93	83.11	93.93	6.37	88.13	32.07	3.97	29.02	13.47
G ₁₁ - Stock Katz Purple	49.53	60.20	81.07	87.07	6.77	86.60	13.53	3.39	30.62	8.47
S. Em ±	0.84	1.12	2.00	1.35	0.36	1.58	0.64	0.05	0.39	0.28
CD @ 5%	2.49	3.29	5.90	3.97	1.07	4.65	1.89	0.15	1.15	0.81

Table 3: Performance of Stock (*Matthiola incana* L.) genotypes with respect number of cut flower yield/m² and yield/1000m² under protected cultivation.

Genotypes	Number of cut flowers/m ²	Number of cut flowers/1000 m ²
G ₁ - Early Arrow white	23.67	18,933
G ₂ - Arrow White	25.00	20,000
G ₃ - Quartet Deep Yellow	19.67	15,733
G ₄ - Early Iron White	24.67	19,733
G ₅ - Early Iron Yellow	21.33	17,066
G ₆ - Early Iron Deep Yellow	21.67	17,333
G ₇ - Early Iron Marine	16.67	13,333
G ₈ - Early Iron Pink	15.67	12,533
G ₉ -Stock Katz Ruby	16.67	13,333
G ₁₀ - Stock Katz Blue	15.67	12,533
G ₁₁ - Stock Katz Purple	22.00	17,600
S. Em ±	0.58	461
CD @ 5%	1.70	1360

CONCLUSIONS

Results of the experiment clearly confirmed that the genotype Stock Katz Blue followed by Stock Katz Ruby, Stock Katz Purple and Early Iron Pink were found to be superior with regard to most morphological, flowering and quality traits while, Arrow White followed by Early Iron Deep Yellow were found to be superior with regard to the yield parameters. From this, we can recommend that these genotypes can be utilized

for commercial production and crop improvement for quality and yield traits.

Since, the genotypes *viz.*, Stock Katz Ruby and Stock Katz Blue have better quality and longevity in plants, these genotypes can be suggested for bedding and pot planting.

FUTURE SCOPE

Further scope for the experiment is to screen for major pest and disease incidences that need to be studied in the Stock genotypes and promising genotypes might be utilized in the crop improvement Programme.

Acknowledgement. The authors thank the College of Horticulture, Mudigere, for its facilities.

Conflict of Interest. None.

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How to cite this article: Sanketh M.R., Hemla Naik B., Chandrashekar S.Y., Kantharaj Y. and Ganapathi M. (2023). Characterization of Different Stock (*Matthiola incana* L.) Genotypes for Growth, Flowering and Yield Traits under the Hill Zone of Karnataka. *Biological Forum – An International Journal*, 15(10): 132-136.