



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2023; 12(4): 1821-1823  
© 2023 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 02-01-2023

Accepted: 04-02-2023

**Rakesh Kumar**

Associate Professor, SKUAST-Jammu, Jammu and Kashmir, India

**Vijay Kumar**

Associate Professor, SKUAST-Jammu and Kashmir, India

**Parshant Bakshi**

Professor, Division of Fruit Science, SKUAST-Jammu, Jammu and Kashmir, India

**Neerja Sharma**

Associate Professor, SKUAST-Jammu, Jammu and Kashmir, India

**Reetika Sharma**

KVK (SMS) and Research Scholar, SKUAST-Jammu, Jammu and Kashmir, India

**Shahid Ahamad**

Associate Director Research and Seed Science SKUAST-Jammu, Jammu and Kashmir, India

**Muzafar Mir**

KVK (SMS) and Research Scholar, SKUAST-Jammu, Jammu and Kashmir, India

**Corresponding Author:**

**Rakesh Kumar**

Associate Professor, SKUAST-Jammu, Jammu and Kashmir, India

## Assessment of morphological diversity of Kagzi lime (*Citrus aurantifolia* Swingle) genotypes in Jammu subtropics, Jammu and Kashmir (UT)

**Rakesh Kumar, Vijay Kumar, Parshant Bakshi, Neerja Sharma, Reetika Sharma, Shahid Ahamad and Muzafar Mir**

### Abstract

Kagzi lime is one of the most preferred and demanding fruit crops in Jammu and Kashmir (UT) around the year due to its nutritional value, higher economic return and wider adaptability in rainfed areas. The present study was sought to determine the genotypes of acid lime in Jammu sub-tropics for evaluating their vegetative and physical characteristics during the years 2015-2016 Jammu, subtropics- J&K (UT). During the investigation, it was revealed that the maximum plant height was noted in KL<sub>3</sub>, KL<sub>4</sub> and KL<sub>10</sub>. Whereas, in terms of flowering time, it was observed that flowering time of selected strains were registered during the months of February-March and June- July. Meanwhile early flowering initiation, fruit setting, fruit surface; (Smooth) and fruit colour (Light yellow) was noticed in strain KL<sub>1</sub>.

**Keywords:** Kagzi lime, flowering characteristics, genotypes

### Introduction

One of the most significant fruit crops is Kagzi lime (*Citrus aurantifolia* Swingle), which ranks third in terms of species importance after mandarin and sweet orange. It is also known as Pati lime, Spur lime, Acid lime, and Mexican Lime. In India, lime/lemon is effectively grown in all subtropical and tropical climates, covering an area of 317 thousand hectares and yielding 3717 thousand MT (Anonymous, 2019) <sup>[1]</sup>. Given the favourable agro-climatic conditions of Jammu and Kashmir (UT), Kagzi lime is a very significant and extremely lucrative fruit crop. It has a lot of potential for agriculture in the Jammu plain, the Pir Panjal hills, and the foothills of the Himalayas. Old citrus germplasm in this area, which is primarily of seedling origin and is currently mostly growing along roadsides, riverbanks, undulating terrain in mountainous tracts, government revenue lands, etc., displays a wide range of variability in desirable horticultural traits like fruit shape, size, juice consistency, bearing regularity, fruit yield, tolerance/resistance to various biotic and abiotic stresses. In Jammu subtropics, lime is grown in various districts viz., Jammu, Kathua, Samba, Udhampur, Reasi, and Rajouri districts etc. In these regions, the maximum areas predominately of superior genotypes which were originated from naturally and showed different types of genetic variability. This variability is a great option to screen of superior's strain and demonstration in fruit growers community. As existing strains are also easily adopted in same climatic condition. The different genotypes do not perform equally well in all regions due to differences in variability, adaptability and micro climatic variation. Many studies have focused on the evaluation of acid lime varieties and genotypes under different regions of India during *ambe* and *mrig bahar* (Srinivas *et al.*, 2006 and Kumar *et al.*, 2011) <sup>[12, 7]</sup>. The genotypic character with respect to growth parameters, flowering, fruit development and maturity varies under each genotype and from *bahar* to *bahar* (Iqbal and Karacali, 2004; Mukhim *et al.*, 2015) <sup>[6, 9]</sup>. These studies aimed to screening of superior strains in Jammu subtropics to enhance the areas and production under rainfed conditions. Therefore, intensive survey was conducted to explore the superior's germplasm on the basis of their growth, yield and quality. Therefore, it is essential to select superior Kagzi lime strains for collection, conservation, evaluation, and use in subsequent breeding programmes. The current investigations were therefore carried out to document the extent of genetic variability among existing Kagzi lime genotypes, association of variables linked to fruit yield and quality, and identify the elite genotypes possessing acceptable fruit traits.

## Materials and Methods

The present investigation was conducted during the years 2015-2016 at the Rainfed Research Sub-station for Sub-tropical Fruits (RRSS), Raya, Samba, SKUAST –Jammu, J&K (UT) with the collaboration of farmer field. Various tree characters were registered throughout the year in the farmer field as well as research station. By using eye observations, the following Kagzi lime strains were identified; the tree characteristics of the Kagzi lime selections are reported. When the tree was at its flowering and full bloom, the month of flowering was recorded month wise. The tree height was recorded from the ground level to the top most branching level and expressed in meters. The experimental site was arranged in a Randomized Complete Block Design. The treatments were all the bearing sides of the fruit trees and an individual tree of each site was taken as replications. After fruit setting, the various fruit parameters were recorded i.e. the fruits colour and surface. The data recorded in respect of

all the physical parameters were subjected to statistical analysis and for interpretation of results.

## Results and Discussions

### Plant growth

Vegetative growth is an important aspect of lime fruit crop and this indicates the adaptability of crop. During the investigations, It was revealed that the all-selected genotypes of Kagzi lime were easily survived under rainfed condition as well as plants can easily survived in winter season It was observed that the maximum plant height was noted in KL<sub>3</sub> followed by KL<sub>4</sub>, KL<sub>6</sub>, and Whereas the lowest plant height was registered in KL<sub>7</sub> (Figure-1 ). Huge variation among the trees within a district has been reported by (Dorji, 2011) <sup>[4]</sup>. It may cause due to the vigorous growth and also may be due to some amount of genetic influence. This was in concurrence with the earlier findings of Madhavi and Babu (2003) <sup>[8]</sup>, Shinde *et al.*, (2004) <sup>[11]</sup> and Srinivas *et al.*, (2006) <sup>[12]</sup>.

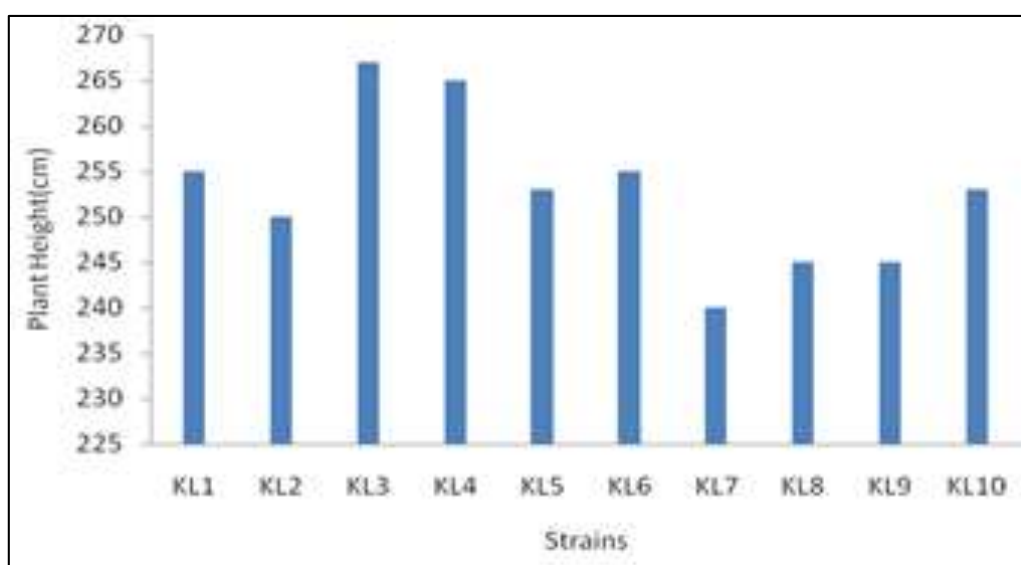


Fig 1: Plant height of selected strains of Kagzi lime (*Citrus aurantifolia* Swingle)

### Flowering characteristics

Flowers are a critical determinate of eventual yield of perennial fruit trees. Therefore, an understanding of the underlying mechanisms and influencing factors, as well as the general phenology of flower development in citrus, is critically important to the sustainability of successful commercial citrus production. Among of selected strains, it was observed that the early initiation flowering time 28<sup>th</sup> February and 3<sup>rd</sup> June 1<sup>st</sup> week of July during the year. Flowering is a continuous event, mostly determined by the availability of sufficient rainfall or water supply reported by Schneider (1968) <sup>[10]</sup>. In the case of full bloom, it was observed that early full bloom 1<sup>st</sup> week of April and 1<sup>st</sup> week of July was observed in KL<sub>1</sub>. Moreover, fruit colour surface and smoothness were also registered in KL<sub>1</sub>. This might be caused due to the genetically difference among the strains of Kagzi lime and similar study was conducted by Badiyala *et al.* (1992) <sup>[2]</sup>. Bangerth, (2009) <sup>[3]</sup> observed that the change from a vegetative to a reproductive state due to

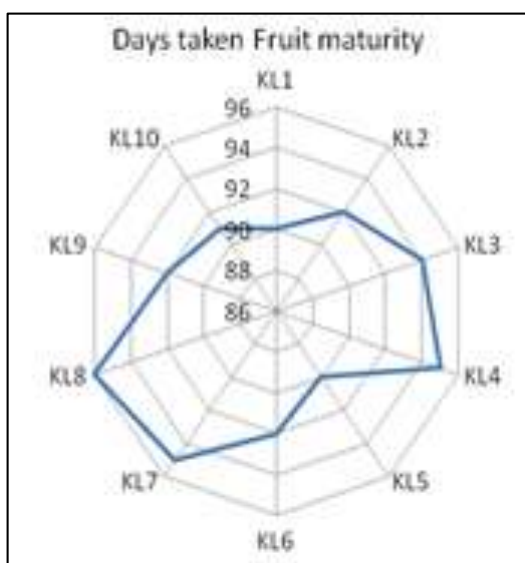
morphogenesis process

### Fruit maturity

The variation among accession within location also varied for all at maturity stage. The variation indicated that accession in the germplasm consisted of phenotypically different individuals, the differences in individual accession could be attributed to mutation and cross pollination. During the investigation it was observed that the minimum days taken of fruit maturity of Kagzi lime strain in KL<sub>1</sub> and KL<sub>5</sub> in figure -2. It might be due to the vigorous of genetic influence. Hulme (1970) <sup>[5]</sup> reported cell division continued to take place during initial stages of fruit growth and at later stage only cell elongation occurred. These results are in accordance with the earlier finding of Srinivas *et al.* (2006) <sup>[12]</sup>. Thomas *et al.*, (2000) <sup>[13]</sup> reported that growth promoting environmental conditions, lead to the meristem's morphological transition from a vegetative to a reproductive state

**Table 1:** Physical characters of fruits of Kagzi lime (*Citrus aurantifolia* Swingle) strains

Strains Code	Plant Height (cm)	Flowering time				Fruit colour	Fruit surface: roughness
		Flowering initiation date	Full bloom	Flowering initiation date	Full bloom		
KL <sub>1</sub>	255	28 <sup>th</sup> February	1 <sup>st</sup> week of April	3 <sup>rd</sup> June	1 <sup>st</sup> week of July	Light yellow	Smooth
KL <sub>2</sub>	250	2 <sup>nd</sup> March	2 <sup>nd</sup> week of April	5 <sup>th</sup> June	2 <sup>st</sup> week of July	Light yellow	Smooth
KL <sub>3</sub>	267	5 <sup>th</sup> March	2 <sup>nd</sup> week of April	7 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>4</sub>	265	4 <sup>th</sup> March	2 <sup>nd</sup> week of April	5 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>5</sub>	253	7 <sup>th</sup> March	2 <sup>nd</sup> week of April	3 <sup>rd</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>6</sub>	255	5 <sup>th</sup> March	2 <sup>nd</sup> week of April	7 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>7</sub>	240	9 <sup>th</sup> March	2 <sup>nd</sup> week of April	10 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>8</sub>	245	5 <sup>th</sup> March	2 <sup>nd</sup> week of April	5 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>9</sub>	245	7 <sup>th</sup> March	2 <sup>nd</sup> week of April	9 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth
KL <sub>10</sub>	253	4 <sup>th</sup> March	2 <sup>nd</sup> week of April	5 <sup>th</sup> June	3 <sup>rd</sup> week of July	Light yellow	Smooth

KL<sub>1-10</sub>: Strains of Kagzi lime**Fig 2:** Average days taken of fruit maturity both season of selected strains of Kagzi lime (*Citrus aurantifolia* Swingle)

### Conclusion

The results of the current study showed that the variation among accession with in location and also varied their characteristics .The most appropriate strain was KL<sub>1</sub> with respect to plant height, density of branches, flowering time, fruit colour, surface: roughness Therefore, there was a considerable diversity among the studied genotypes based on the physical traits of fruits. The existence diversity among kagzi lime germplasm can be the first step of breeding programs for introducing desirable cultivars which were better in terms of fruit quality and yield.

### References

- Anonymous. Horticultural statistics at a glance. Government of India, Ministry of Agriculture and Farmer Welfare, Department of Agriculture Cooperation and Farmers Welfare Horticulture Statistics Division; c2019.
- Badiyala SD, Bhargava JN, Lakhunpal SC. Variability studies in kagzi lime (*Citrus aurantifolia* Swingle) strains of puonta valley of Himachal Pradesh. Punjab Hort. J. 1992;32:5-9.
- Bangerth KF. Floral induction in mature, perennial angiosperm fruit trees: Similarities and discrepancies with annual/biennial plants and the involvement of plant hormones. Scientia Horticulturae. 2009;122:153-163.
- Dorji K. Identification of Mandarin (*Citrus reticulata*

- Blanco) in Bhutan by Using Morphological Characteristics and AFLP Analysis. MSc. thesis. Kasetsart University. Bangkok, Thailand; c2011
- Hulme AC. The Biochemistry of fruit and their product. Academic Press, New York; c1970.
- Iqbal N, Karacali I. Flowering and fruit set behaviour of Satsuma mandarin (*Citrus unshiu* Marc.) as influenced by environment. Pakistan J Bio. Sci. 2004;7(11):1832-1836.
- Kumar M, Parthiban S, Saraladevi D, Aruna P. Evaluation of acid lime (*Citrus aurantifolia* Swingle) cultivars for yield attributes. The Asian J Hort. 2011;6(2):442-444.
- Madhavi M, Babu KH. Performance of certain sweet orange varieties in Andhra Pradesh. Madras Agric J. 2003;90:560- 562.
- Mukhim C, Nath A, Deka BC, Swer TL. Changes in physicochemical properties of Assam lemon (*Citrus limon* Burm.) at different stages of fruit growth and development. The Bioscan. 2015;10(2):535-537.
- Schneider H. Anatomy of Citrus. In: Reuther, W. (Ed.), The citrus industry. Univ. Calif Div Agr Sci, Berkeley, 1968; 2:1-85.
- Shinde NN, Jature SD, Patil MB, Shinde VN. Seedless lime a promising mutant of acid lime. J. Maharashtra agric. Univ. 2004;29:227-228
- Srinivas N, Athani SI, Sabarad AI, Patil PB, Kotikal YK, Swamy GSK, *et al.* Studies on variability of fruitphysical characters quality and yield in seedling strains Kagzilime (*Citrus aurantifolia* Swingle). The Asian. J Hort. 2006;2(3):148-150.
- Thomas HM, Ougham H. Annuality, perenniality and cell death. Journal of experimental Botany. 2000;51(352):1781-1788.