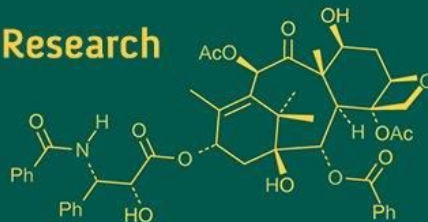
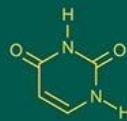
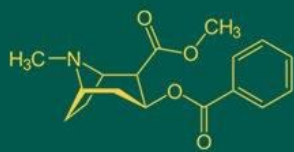


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(10): 45-51
www.biochemjournal.com
Received: 24-08-2024
Accepted: 27-09-2024

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Study on phenology of mango (*Mangifera indica* L.) commercial varieties of coastal Andhra Pradesh

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DOI: <https://doi.org/10.33545/26174693.2024.v8.i10a.2411>

Abstract

An experiment was conducted at College of Horticulture, Venkataramannagudem, West Godavari, Andhra Pradesh during the year 2023-24 to study the phenology of commercial varieties viz., Cherukurasam, Chinnarasam, Himamapasand, Peddarasam and Suvarnakha of Mango under Coastal Andhra Pradesh. The experiment was laid out in Randomized Block Design (RBD) with 4 replications. The results revealed that among the varieties studied Cherukurasam variety of Mango was earlier for days required to 50% flowering from panicle emergence (10.8 days), days required to full bloom from panicle emergence (32.6 days), days required to marble and maturity stage from first fruit set (32.6 & 100.6 days respectively) and maximum number of flowers set/ panicle (8.8). Peddarasam variety of Mango has maximum panicle length (28.5cm), highest number of flowers per panicle (1348), with highest flowering intensity (63.7). The variety Suvarnakha recorded highest number of Hermaphrodite flowers (313.4) with sex ratio of 2.5% (male to hermaphrodite flowers). Among the varieties, Chinnarasam variety of Mango found to be late for days required to 50% flowering (15.1days), days to full bloom from panicle emergence (34.9days) and recorded minimum panicle length (23.2cm), lowest number of hermaphrodite & total flowers/ panicle (178.4 and 982.6 respectively), lowest flowering intensity (32.0%) and lowest number of flowers set per panicle (5.8) under same set of environmental conditions.

Keywords: Mango, phenology, flowering, Coastal Andhra Pradesh

Introduction

Mango (*Mangifera indica* L.) belongs to family Anacardiaceae is one of the most important tropical and subtropical fruit crops grown in India. Mango is popularly known as 'King of Fruits' due to its excellent flavour, attractive colour, delicious taste, huge variability and varied end usage. In Andhra Pradesh Mango is the most important fruit crop grown in 1.31 lakh hectare area and producing 43.5 lakh metric tonnes (Anonymous, 2023) [1].

Phenology is the study of periodic events in biological life cycles which are influenced by seasonal variations in climate. It depends on the environmental factors and the adaption capacity of the plants to a particular environment. It helps to understand the influence of weather dynamics on vegetative and reproductive growth period and also helps in adopting better crop management practices such as pruning, water and nutrient management, better integrated pest and disease management.

Flowering is a decisive factor in the productivity of mango and is more or less a varietal character but mainly influenced by weather conditions. (Davenport, 2003) [2] observed that the flowering pattern of mango cultivars expresses differentially under tropical and subtropical conditions. The process associated with mango flowering involves shoot initiation followed by floral differentiation, and panicle emergence (Murti and Upreti, 2000) [3]. All these developmental events occur in most of the mango cultivars during October-December under tropical as well as subtropical conditions. Mango flowering is greatly influenced by the weather conditions and varietal genotypes and is most important traits as it directly affects the yield (Khushboo *et al.*, 2018) [4].

The information on the phenological behaviour of commercial varieties of Coastal Andhra Pradesh was limited, hence this study was under taken to know the phenological behaviour of commercial varieties of Mango under Coastal Andhra Pradesh.

Methodology

The present investigation was taken up at College of Horticulture, Venkataramannagudem, Dr. YSR Horticultural university, West Godavari District, Andhra Pradesh. The experimental site falls under 'Agro-climatic Zone-10, humid, East Coast Plain and Hills'(Krishna-Godavari Zone) with an average annual rainfall of 900 mm at an altitude of 34 m (112 feet) above the mean sea level. It was geographically suited at 16° 63' 120" latitude and 81° 27' 568" East longitudes with hot humid summer and mild winter climate. The experiment was laid out in randomised block design (RBD) with four replications. Two trees were selected for each replication under each treatment. For recording all the observations sixty shoots were tagged in four direction (E,W,N&S) and the observations were made on daily basis.

The observations were recorded on flowering characteristics viz., Days to panicle emergence from flower bud differentiation, Length of panicle by using measuring scale, Days to 50% flowering from panicle emergence, Days to full bloom, Days to first fruit set from panicle emergence by counting the days taken from panicle emergence, Number of hermaphrodite flowers, Number of male flowers, Total number of flowers which was counted physically at full bloom stage, Sex ratio, Flowering intensity(%), Average

number of flowers set/ panicle, Days to marble stage from first fruit set, Days to maturity stage from first fruit set. Sex ratio was calculated by dividing number of male flowers with number of hermaphrodite flowers by using following formula.

$$\text{Sex ratio} = \frac{\text{Number of male flowers}}{\text{Number of hermaphrodite flowers}}$$

Reproductive shoots per square meter area under four directions were counted and the flowering intensity was worked out with the following formula.

$$\text{Flowering intensity (\%)} = \frac{\text{Number of flowering shoots}}{\text{Total number of shoots}} \times 100$$

Statistical analysis

The data recorded on various parameters during the experiment were subjected to statistical analysis and the mean values have been summarized as per Panse & Sukhatme (1985) [5] and presented in various tables along with graphs and photographs.

Results and Discussion

The results based on statistical analysis were presented in Table 1 & 2.

Table 1: Flowering behaviour of commercial varieties of Mango under Coastal Andhra Pradesh

Treatments	Days required to panicle emergence from flower bud differentiation	Days required to 50% flowering from panicle emergence	Days required to full bloom from panicle emergence	Days required to first fruit set from panicle emergence	Days required to marble stage	Days to required maturity stage
Cherukurasam	7.5	10.8	32.6	35.3	32.6	100.6
Chinnarasam	8.2	15.1	34.9	37.2	35.5	106.6
Himampasand	7.5	14.1	33.1	36.8	36.3	111.6
Peddarasam	7.5	12.5	34.6	37.6	37.8	114.0
Suvarnarekha	8.0	14.6	34.7	34.8	35.3	101.4
SE m ±	0.4	0.5	0.5	1.3	0.8	1.0
CD (0.05P)	NS	1.6	1.5	NS	2.4	3.1
CV%	11.0	7.9	2.9	7.3	4.5	1.9

Results in Table 1 revealed that among the varieties studied, Cherukurasam variety of Mango took less days for 50% flowering from panicle emergence (10.8 days), days for full bloom from panicle emergence (32.6days) and that was on par with Himampasand variety which took 33.1 days for full bloom. However, Chinnarasam variety was found late as it took maximum days i.e. 15.1 & 34.9 days for 50% flowering and for full bloom respectively. There was no significant difference observed for days to panicle emergence from flower bud differentiation and days to first fruit set from panicle emergence. Regarding days to marble stage & days to maturity stage, Cherukurasam variety was found to be early as it took 32.6 & 100.6 days respectively while Peddarasam was late which was recorded 37.8 and 114 days respectively for days to marble stage and maturity stage.

The difference observed for the above characters among the varieties studied might be attributed to genetic architecture and gene x environment interaction effect. In addition to this, the temperature and maturity of shoot have more significant role in determining the panicle initiation and flowering duration. These results were in line with findings of Singh *et al.* (2014) [6] and Singh (2002) [7] in Mango.

The results from the Table (2) indicated that panicle length was found significantly maximum (28.5cm) in Peddarasam while it was minimum (23.2cm) in Chinnarasam variety. It

was observed that the number of hermaphrodite flowers/ panicle were more in Suvarnarekha (313.4) while Chinnarasam recorded lowest number of hermaphrodite flowers (178.4) per panicle. Significantly more number of male flowers were observed in Peddarasam (1055) while Suvarnarekha recorded less (772.7). Regarding total number of flowers/ panicle Peddarasam recorded significantly highest (1348) while lowest number of flowers recorded in Chinnarasam (982.6). Sex ratio (male to hermaphrodite flowers) was highest (4.9) in Cherukurasam and lowest (2.5) in Suvarnarekha. Flowering intensity (%) was found to be highest (63.7%) in Peddarasam which was on par with Cherukurasam (61.4%) while lowest flowering intensity was recorded in Chinnarasam (32.0%). Among the different commercial varieties, highest number of flowers set into fruits/ panicle were observed in Cherukurasam (8.8) which was on par with Suvarnarekha (8.7) and Himampasand (7.9) whereas in Chinnarasam the number of flowers set into fruits was low (5.7).

The variation in panicle length among the varieties might be due to the genetic constitution of the cultivars and their interaction with the environmental conditions and more specifically the physiological conditions of shoot on which panicle is raised (Indian *et al.*, 2020) [8]. The variation in sex ratio might be due to physiological and environmental conditions (Davenport and Nunez-Elisea, 1997) [9]. The

difference observed for number of hermaphrodite, male and total flowers per panicle may be due to inherent genetic differences of different Mango varieties (Hada and Singh,

2017) ^[10]. The variation in flowering intensity may be due to genetic make up of the parental mango genotype (Kumar *et al.*, 2010) ^[11].

The results based on statistical analysis were presented in Figure 1 to 11

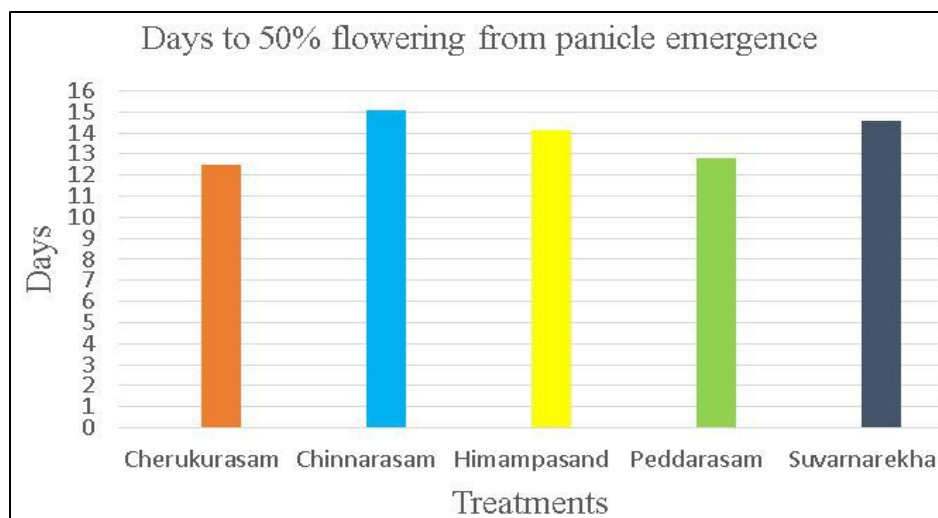


Fig 1: Days to 50% flowering from panicle emergence

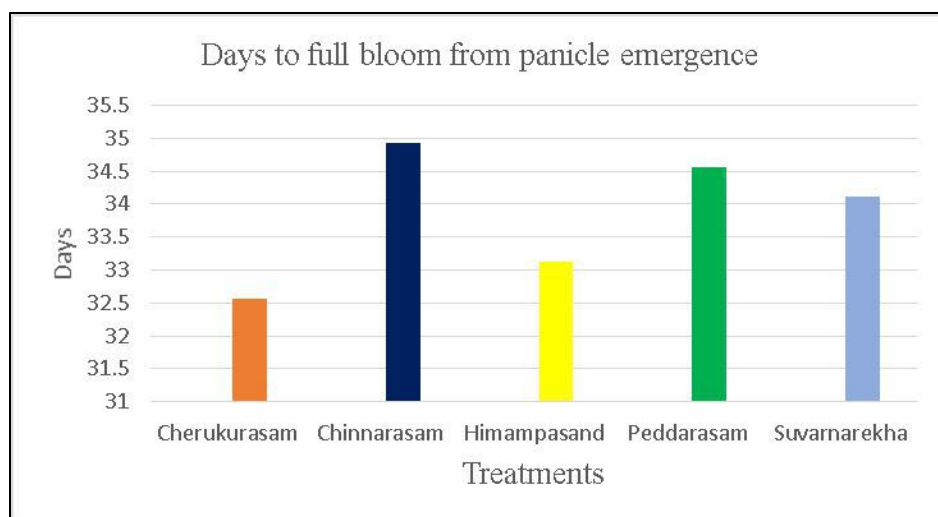


Fig 2: Days to full bloom from panicle emergence

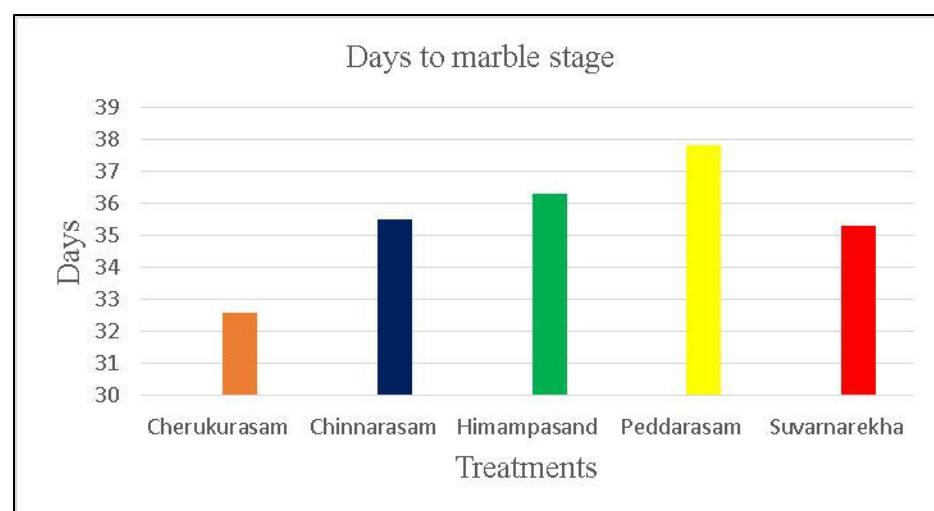


Fig 3: Days to marble stage

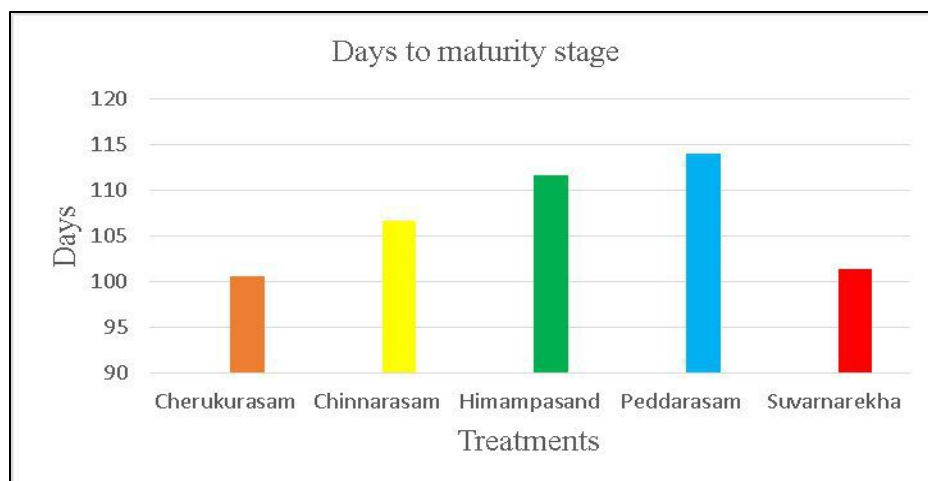


Fig 4: Days to maturity stage

Table 2: Flowering behaviour of commercial varieties of Mango under Coastal Andhra Pradesh

Treatments	Length of panicle (cm)	Number of hermaphrodite flowers per panicle	Number of male flowers per panicle	Total number of flowers per panicle	Sex ratio	Flowering intensity (%)	Average number of flowers set /panicle
Cherukurasam	26.2	208.3	1024.2	1232.5	4.9	61.4	8.8
Chinnarasam	23.2	178.4	804.2	982.6	4.5	32.0	5.7
Himampasand	25.8	195.7	911.6	1107.5	4.6	56.5	7.9
Peddarasam	28.5	293.1	1055.0	1348.0	3.6	63.7	7.0
Suvarnarekha	24.1	313.4	772.7	1086.2	2.5	49.2	8.7
SE m ±	0.5	2.3	3.3	4.1	0.2	1.5	0.4
CD (0.05P)	1.4	6.9	10.2	12.6	0.6	4.6	1.3
CV%	3.7	1.9	0.7	0.7	9.6	5.7	10.8

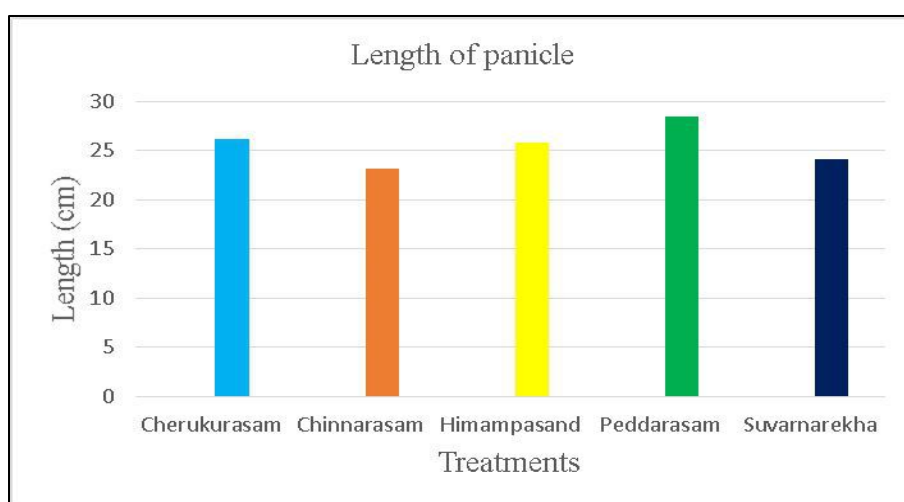


Fig 5: Length of panicle (cm)

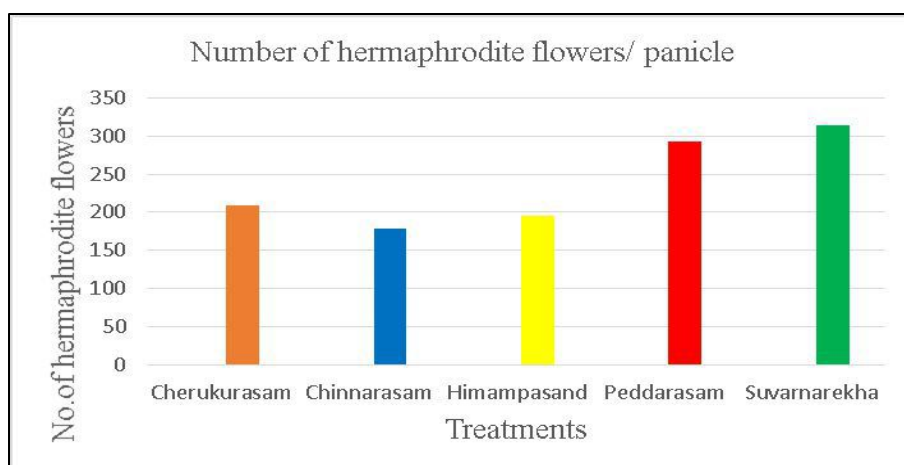
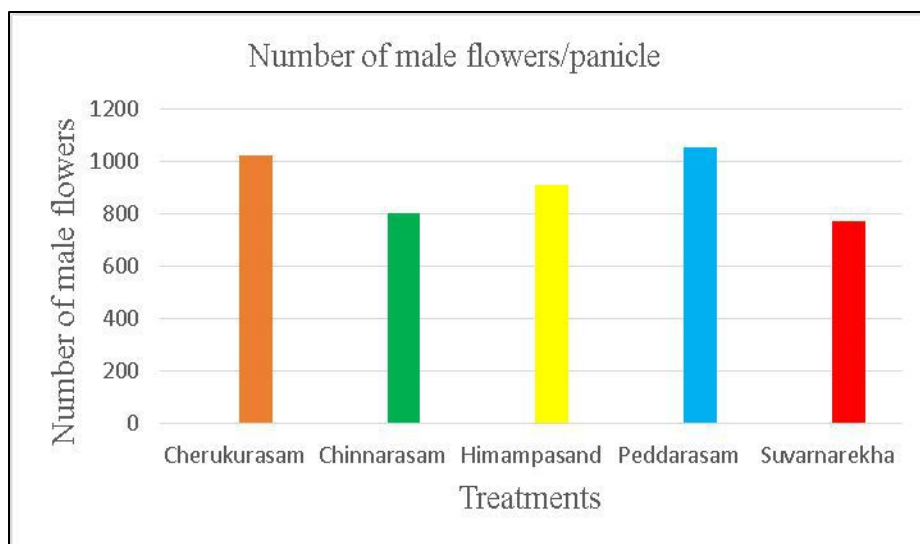
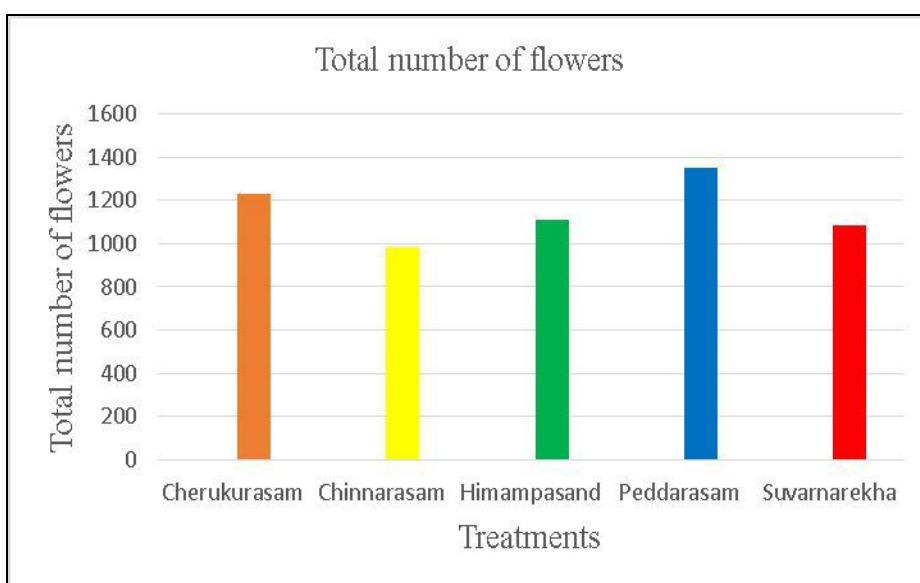
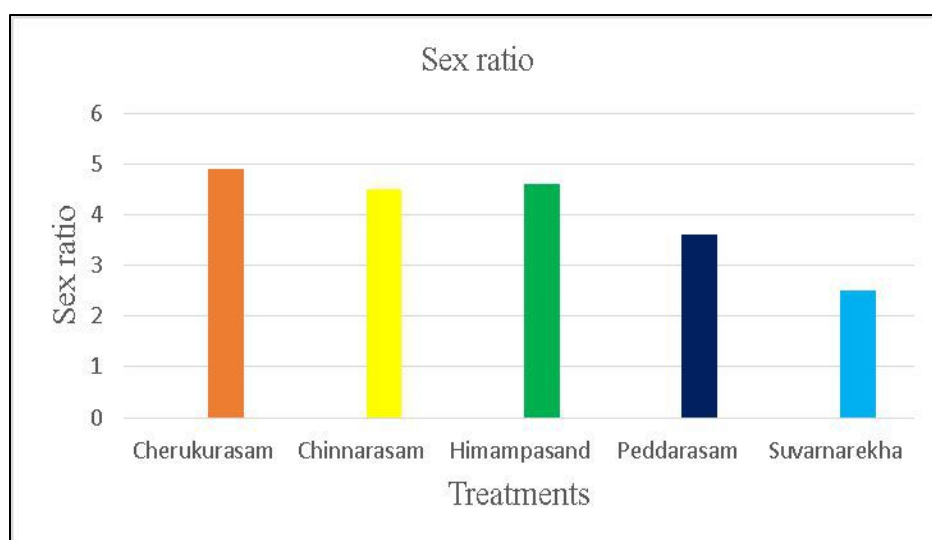
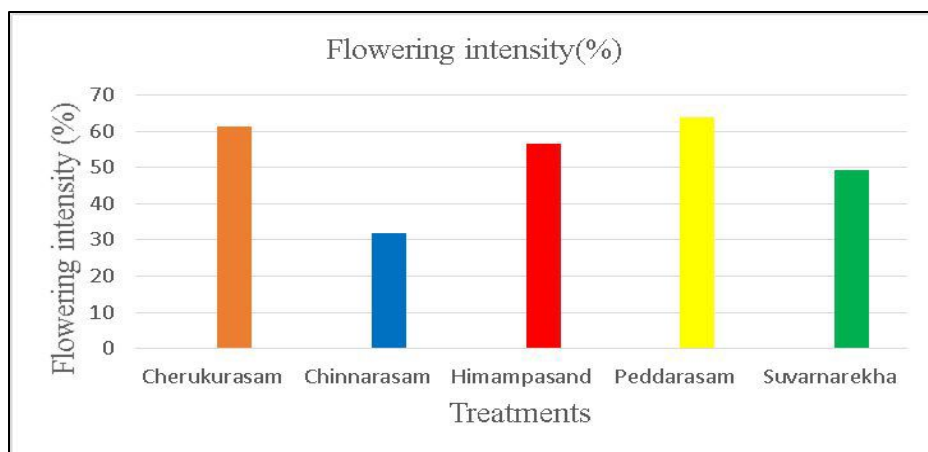
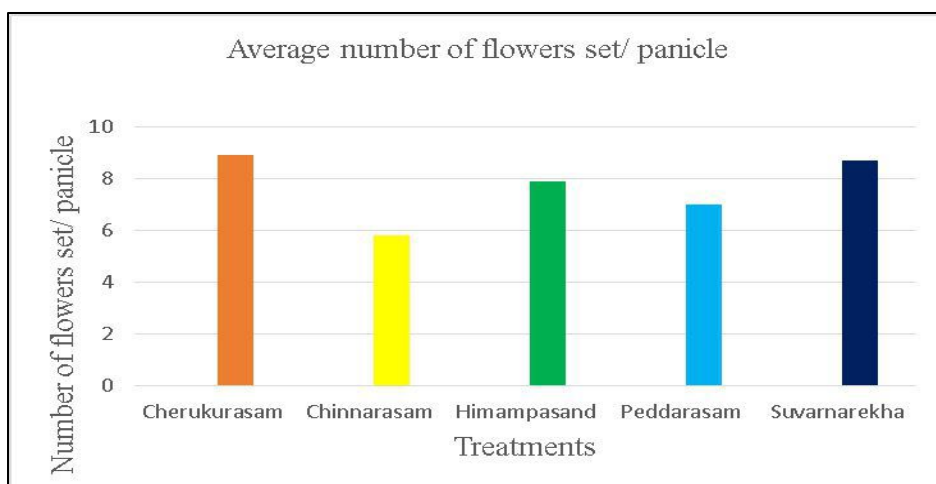
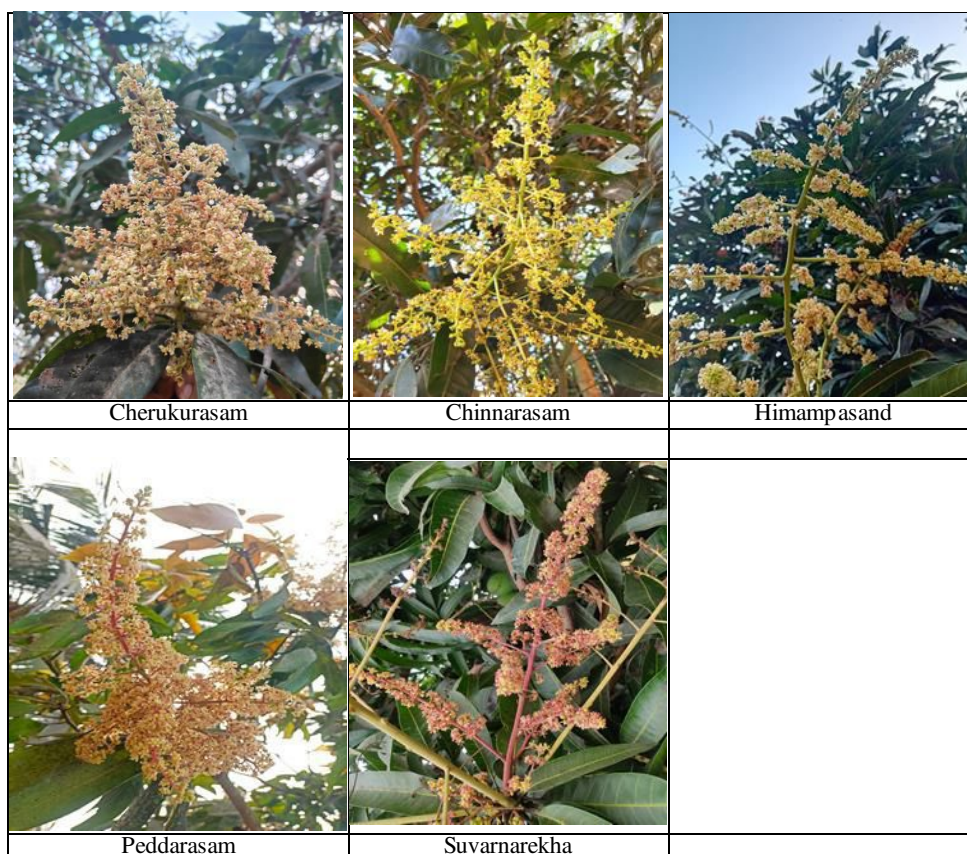


Fig 6: Number of hermaphrodite flowers/panicle

**Fig 7:** Number of male flowers/ panicle**Fig 8:** Total number of flowers/ panicle**Fig 9:** Sex ratio

**Fig 10:** Flowering intensity (%)**Fig 11:** Average number of flowers set/ panicle**Plate1:** Full bloom in different commercial varieties of Mango

Conclusion

From the above results it can be concluded that Cherukurasam variety of Mango was found to be early in terms of days to 50% flowering, days to full bloom, days to marble stage and days to maturity stage fruits and Suvarnarekha was performed better in terms of sex ratio and fruit set under same set of environmental conditions in coastal Andhra Pradesh.

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