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DIVERSITY STUDIES ON FLORAL AND POMOLOGICAL CHARACTERISTICS OF NATIVE BAEL (*AEGLE MARMELOS* CORREA) ACCESSIONS OF MAHASAMUND DISTRICT OF CHHATTISGARH, INDIA

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ABSTRACT

Forty-one bael genotypes were assessed at different villages of five blocks in Mahasamund district of Chhattisgarh, India during the years 2022-23 and 2023-24 to find out the variability in floral and pomological characteristics of indigenous bael genotypes. Among the 41 bael genotypes, the inflorescence type was terminally biparous in 8 genotypes, terminally multiparous in 12 genotypes, axillary biparous in 5 genotypes, axillary multiparous in 12 genotypes and axillary uniparous in 4 genotypes, while, the inflorescence length was small in 25 genotypes and large in 16 genotypes and flower size was small in 18 genotypes, medium in 15 genotypes and large in 8 genotypes. Furthermore, the fruit characteristics like fruit surface was found smooth in 19 genotypes and rough in 22 genotypes, fruit shape was round in 10 genotypes, ovate in 10 genotypes, globose in 11 genotypes and elliptical in 10 genotypes, immature fruit colour was green in 9 genotypes, light green in 23 genotypes and dark green in 9 genotypes, mature fruit colour was green in 7 genotypes, yellowish green in 19 genotypes and greenish pale yellow in 15 genotypes, styler end cavity was shallow in 16 genotypes, depressed in 19 genotypes and highly depressed in 6 genotypes, stem end cavity was shallow in 15 genotypes, depressed in 11 genotypes and flattened in 15 genotypes, locule arrangement was scattered in 11 genotypes, centric in 22 genotypes and highly centric in 8 genotypes, seed shape was round in 24 genotypes and oblong in 17 genotypes and pulp colour was yellow in 11 genotypes, pale yellow in 17 genotypes and dark yellow in 13 genotypes under the present exploration.

***Keywords* :** Bael, Floral, Pomological, Genotypes, Variability, Goma Yashi, MB, Mahasamund Bael, Fruit Pulp and Accessions.

Introduction

Bael (*Aegle marmelos* Correa.) also known as Bengal quince, Bilva, Bilpatre, Maredu, Shul, Vilvam and Shaiphal, etc., belongs to the family Rutaceae. In Garo language, bael is called as Selfree. It is a subtropical plant which can grow up to an altitude of 1200 m from the sea level. The generic name Aegle is of Greek origin and the species marmelos is of Portuguese origin. Aegle belong to one of the three monotypic genera of orange sub family Aurantioideae, tribe Clauseneae and sub-tribe Balsamocitrinea (Nair and Barche, 2016). The chromosome number 2n = 36. Bael can adapt a wide range of habitat and can be cultivated worldwide. It is native to India and has its origin from Eastern Ghats and Central India. It is grown in various parts of Southeast Asia including India, Sri Lanka, Pakistan, Burma, Bangladesh, Thailand etc. In India, bael is being grown throughout the country but concentrated area under bael is in eastern parts of the Gangetic plains and nearby areas particularly in Uttar Pradesh, Bihar, Madhya Pradesh, Chhatisgarh, Jharkhand and it can also be seen growing in West Bengal, Punjab and Odisha (Singh *et al*., 2008).

India is one of the countries where, Bael are grown on area 8.43 thousand hectares, with an annual production 81.88 thousand tonnes. Odisha is the leading producing Indian state, with a cultivated area of 7.28 thousand ha, an annual production of 45.29 thousand tonnes (Anon., 2021a). In Chhattisgarh, Bael are grown on an area of 0.06 thousand hectares, with an annual production of 0.43 thousand tonnes. Mahasamund district is the leading in area and production of bael in Chhattisgarh state with an area of 0.04 thousand ha and production of 0.33 thousand tonnes (Anon., 2021b).

The pulp of ripe fruits is eaten fresh or in the form of sharbat and used for preparation of value-added products such as jam, murabba, squash, powder, pickle, ice cream, slab, nectar, toffee and ice -creame etc. Bael fruit is one of the most nutritious fruits. Analysis of the fruit gave 61.5 g moisture, 1.8 g protein, 0.39 g fat, 31.8 g carbohydrates, 1.7 g minerals, 55 mg carotene, 0.13 mg thiamine, 1.19 mg riboflavin, 1.1mg niacin and 8.0 mg vitamin C per 100 g of edible portion (Gopalan *et. al*., 1985). No other fruit has such a high content of riboflavin. Tannic acid is only phenolic substance detected from bael fruits.

A wide range of genetic variability with respect to plant morphology have been observed in different bael accessions. Considerable variations with respect to shape, margin, base and apex of leaf have been reported by (Singh *et al*., 2012).

Bael produces flower while grafted one starts flowering at the age of 3 years. Bael tree flowers in April-June, fruit setting takes place by the end of May and continues till July. Time of flowering may vary according to agro-climatic condition and genetic makeup of varieties. The bisexual flowers are born in clusters and they are greenish, white, axillary or terminal cymes. The calyx is shallow with 4 or 5 short (tetramerous), broad teeth, pubescent outside. Petals are oblong oval, 4 or 5 in numbers and pale greenish white in colour. Stamens are numerous, hypogynous with short filaments. Ovary is oblong ovoid, slightly tapering in to the thick, short style which is thickened upward, stigma capitate, deciduous multi celled (8-20), arranged in a circle with numerous ovules (1-5) in each cell.

Flower bud emergence, flowering duration, time of anthesis, dehiscence of anther, stigma receptivity and pollen viability vary according to variety and locality (Srivastava and Singh, 2000). Natural pollen transfer in the species was highly efficient. The levels of fruit set following open pollination were quite high and it is reduced considerably by following hand pollination probably due to injury caused to stigma during emasculation. In spite of synchronous nature of anther dehiscence and stigmatic receptivity, selfing in a flower is avoided due to herkogamy.

Fruit is berry usually globose, round, flat conical, elliptical, obvate, pericarp (shell) thick to thin, smooth or rough surface, light green to green (immature stage), greenish yellow to yellowish green (mature fruit), whereas fruit surface texture may be plain and undulating and, in few genotypes, it is following pattern as musk melon (Singh *et al*., 2016).

Farmers are experiencing the challenges of identifying the cultivars as they are unfamiliar with the characteristics of many varieties of bael. In order to identify distinct characters of various bael cultivars for seed and qualitative character are very important for germplasm evaluation. In the absence of suitable genotype, desirable growth, flowering and fruit set has not been accomplished. Identification of suitable genotype for the region is necessary for promoting its productivity, production and quality of the fruits under semi-arid conditions. Keeping in view of the above significances the present exploration was undertaken to assess the floral and pomological diversity and find out the suitable variety for hot semi-arid region, so that unproductive land of such region could be made productive by growing such a hardy fruit tree like bael, which holds promise for nutritional security.

Materials and Methods

The experimental site is geographically located at Mahasamund district of Chhattisgarh state. Mahasamund district is situated in the Eastern part of the Chhattisgarh state. It falls in the Survey of India’s Degree Sheet No. 64 K, O, L and G between the Latitude 20º49’30”-21º33’07” N and Longitude 81º59’56”-83º16’10” E and an altitude of 318 meters above from mean sea level. From the exploration of Mahasamund district of Chhattisgarh about 18 to 40 years old Forty Bael genotypes from 5 different block were randomly marked or chosen for study with the help of local villagers. The blocks were Mahasamund, Baghbahra, Basna, Pithoura and Saraipali. Two villages were nominated for each block viz. Machewa & Paraskol from Mahasamund block, Khamariya & Bakma from Baghbahra block, Bansula & Baraspur from Basna block, Kisanpur & Kotapara from Pithoura block and Sagarpali & Sajapali from Saraipali block.

Four different Bael genotypes were selected from each village for further investigation and all the genotypes were compared with check variety (Goma Yashi). All the chosen or assigned genotypes were found growing as wild plants on forest land, bund, farmer's land, backyard, roadside and near pond etc. and the morphological observation were recorded as per the key descriptor of *Aegle marmelos* Correa, CIAH, Godhra, Gujrat, 2015. The experiment was carried out in Randomized Block Design (RBD) with Forty-one Bael genotypes (treatments) each having four branches in four directions *i.e.* East, West, North and South which was treated as a replication and four fruits from each branch were randomly collected, so from one single Bael genotypes total 16 fruits were collected for recording concern observations. The genotypes were identified from local farmer's field and fruits were randomly collected from each Bael genotypes from each village for further investigation at Horticulture Processing Laboratory, Department of Fruit Science, College of Agriculture, IGKV, Raipur Chhattisgarh.

Result and Discussion

Diversity in floral characteristics

The floral characteristics of Bael genotypes were recorded for the following variables *i.e.* inflorescence type, inflorescence length and flower size, respectively, based on Bael key descriptor, which are presented in Table 1 and graphically depicted from Fig. 1. to 3.

Inflorescence type

Inflorescence type of all forty-one genotypes of Bael was categorized into five different group *i.e.* axillary uniparous cyme, axillary biparous cyme, axillary multiparous cyme, terminally biparous cyme and terminally multiparous cyme. Out of the 41 genotypes, 12 genotypes *viz.* MB-16, MB-18, MB-20, MB-21, MB-24, MB-26, MB-31, MB-33, MB-36, MB-39, MB-40 and Goma Yashi was observed as axillary multiparous cyme. Similarly, 12 genotypes namely MB-7, MB-8, MB-9, MB-10, MB-11, MB-13, MB-14, MB-15, MB-34, MB-35, MB-37 and MB-38 was seen as terminally multiparous cyme type of inflorescence in the present investigation. Moreover 8 genotypes *i.e.* MB-1, MB-2, MB-3, MB-4, MB-5, MB-6, MB-17 and MB-22 was recorded as terminally biparous cyme, whereas 5 Bael genotypes verified as axillary biparous cyme *viz.* MB-25, MB-27, MB-29, MB-30 and MB-32. The remaining 4 genotypes were observed as axillary uniparous cyme type of inflorescence in the present study. So, that the maximum frequency for inflorescence type of Bael genotypes were recorded in axillary multiparous cyme and terminally multiparous cyme category of 29.27 and 29.27% respectively, followed by terminally biparous cyme (19.51%) while, the minimum frequency was noted in axillary biparous cyme (12.20%) and axillary uniparous cyme (9.75%) type of inflorescence.

Inflorescence length

The inflorescence length of all forty-one Bael genotypes was classified into small and large. From the 41 genotypes, 25 genotypes namely MB-1, MB-2, MB-3, MB-4, MB-6, MB-7, MB-8, MB-10, MB-11, MB-12, MB-13, MB-14, MB-15, MB-17, MB-18, MB-19, MB-23, MB-25, MB-30, MB-32, MB-33, MB-34, MB-35, MB-36 and Goma Yashi was verified as small inflorescence while, 16 genotypes *viz.* MB-5, MB-9, MB-16, MB-20, MB-21, MB-22, MB-24, MB-26, MB-27, MB-28, MB-29, MB-31, MB-37, MB-38, MB-39 and MB-40 was found large size inflorescence in the present experiment. The maximum frequency for inflorescence length was documented in small size category with 60.98% and minimum was recorded in large size group having the percentage of 39.02%.

Flower size

The flower size of all forty-one genotypes of Bael was grouped into small, medium and large. Out of the 41 genotypes, 18 genotypes *viz.* MB-12, MB-13, MB-14, MB-15, MB-16, MB-17, MB-18, MB-19, MB-20, MB-21, MB-26, MB-31, MB-32, MB-33, MB-34, MB-35, MB-36 and Goma Yashi showed small size flower. Moreover, the 15 genotypes *i.e*. MB-1, MB-2, MB-3, MB-4, MB-5, MB-6, MB-7, MB-8, MB-9, MB-10, MB-11, MB-37, MB-38, MB-39 and MB-40 was recorded as medium size flower and remaining 8 genotypes *viz.* MB-22, MB-23, MB-24, MB-25, MB-27, MB-28, MB-29 and MB-30 had found large size flower. Therefore, the maximum frequency for flower size was noted in small size group with 43.90%, which was followed by the medium size flower group having 36.59%. Besides, large size flower group possess frequency of 19.51%, which was observed minimum frequency for flower size under the present exploration.

Discussion

The wide variation was observed in case of floral characteristics under the present investigation. Flowering is believed to be the most important trait and is affected by many factors such as soil fertility, soil water content and other environmental factors. Disparity for floral characteristics might be due to variations in genetic makeup among different Bael genotypes. Variation in floral traits among Bael genotypes have also been reported under different climatic conditions by Lal (2002), Singh and Misra (2004) and Singh *et al*. (2014).

Table 1: Diversity in floral characteristics of forty-one different Bael genotypes

Bael Genotypes	Inflorescence Type	Inflorescence length	Flower size
MB-1	Terminally Biparous cyme	Small	Medium
MB-2	Terminally Biparous cyme	Small	Medium
MB-3	Terminally Biparous cyme	Small	Medium
MB-4	Terminally Biparous cyme	Small	Medium
MB-5	Terminally Biparous cyme	Large	Medium
MB-6	Terminally Biparous cyme	Small	Medium
MB-7	Terminally Multiparous cyme	Small	Medium
MB-8	Terminally Multiparous cyme	Small	Medium
MB-9	Terminally Multiparous cyme	Large	Medium
MB-10	Terminally Multiparous cyme	Small	Medium
MB-11	Terminally Multiparous cyme	Small	Medium
MB-12	Axillary Uniparous cyme	Small	Small
MB-13	Terminally Multiparous cyme	Small	Small
MB-14	Terminally Multiparous cyme	Small	Small
MB-15	Terminally Multiparous cyme	Small	Small
MB-16	Axillary Multiparous cyme	Large	Small
MB-17	Terminally Biparous cyme	Small	Small
MB-18	Axillary Multiparous cyme	Small	Small
MB-19	Axillary Uniparous cyme	Small	Small
MB-20	Axillary Multiparous cyme	Large	Small
MB-21	Axillary Multiparous cyme	Large	Small
MB-22	Terminally Biparous cyme	Large	Large
MB-23	Axillary Uniparous cyme	Small	Large
MB-24	Axillary Multiparous cyme	Large	Large
MB-25	Axillary Biparous cyme	Small	Large
MB-26	Axillary Multiparous cyme	Large	Small
MB-27	Axillary Biparous cyme	Large	Large
MB-28	Axillary Uniparous cyme	Large	Large
MB-29	Axillary Biparous cyme	Large	Large
MB-30	Axillary Biparous cyme	Small	Large
MB-31	Axillary Multiparous cyme	Large	Small
MB-32	Axillary Biparous cyme	Small	Small
MB-33	Axillary Multiparous cyme	Small	Small
MB-34	Terminally Multiparous cyme	Small	Small
MB-35	Terminally Multiparous cyme	Small	Small
MB-36	Axillary Multiparous cyme	Small	Small
MB-37	Terminally Multiparous cyme	Large	Medium
MB-38	Terminally Multiparous cyme	Large	Medium
MB-39	Axillary Multiparous cyme	Large	Medium
MB-40	Axillary Multiparous cyme	Large	Medium
Goma Yashi	Axillary Multiparous cyme	Small	Small

Note: MB stand for Mahasamund Bael

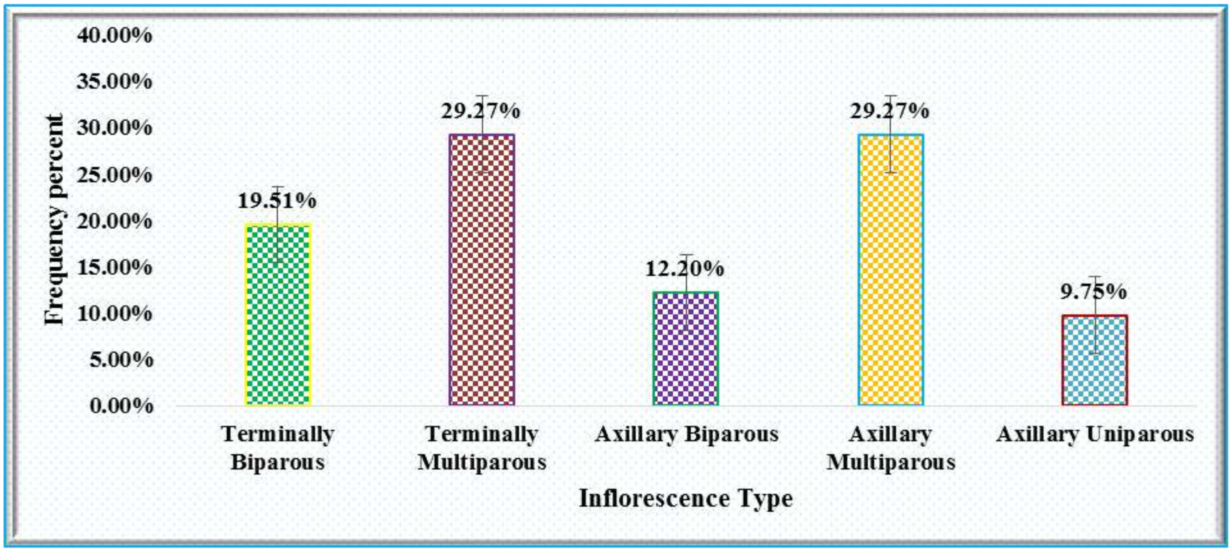

Fig. 1: Inflorescence type percentage of forty-one different Bael genotypes

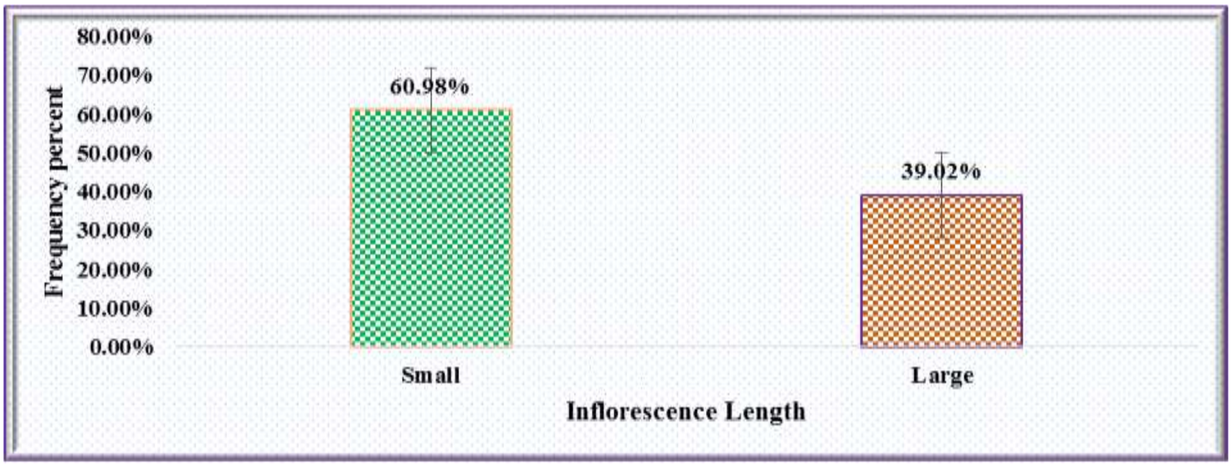

Fig. 2: Inflorescence length percentage of forty-one different Bael genotypes

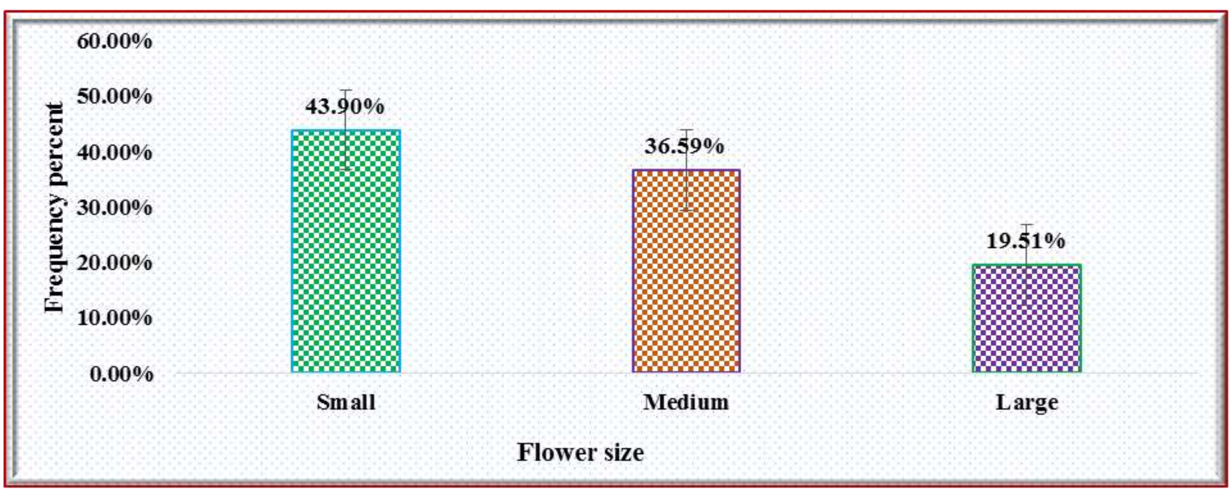

Fig. 3: Flower size percentage of 41 different Bael genotypes

Diversity in pomological characteristics

The pomological characteristics of Bael genotypes were recorded for the following variables *i.e.* fruit surface, fruit shape, immature fruit colour, mature fruit colour, styler end cavity, stem end cavity, locule arrangement, seed shape and pulp colour, based on

Bael key descriptor, which are offered in Table 2 and graphically shown from Fig. 4 to 12.

Fruit surface

The fruit surface of forty-one genotypes of Bael was divided into smooth type and rough type. Out of the 41 genotypes, 19 genotypes *viz.* MB-1, MB-2, MB-3, MB-4, MB-5, MB-6, MB-11, MB-14, MB-16, MB-18, MB-19, MB-21, MB-23, MB-24, MB-33, MB-34, MB-35, MB-36 and Goma Yashi was found as smooth type of fruit surface whereas, 22 genotypes *i.e.* MB-7, MB-8, MB-9, MB-10, MB-12, MB-13, MB-15, MB-17, MB-20, MB-22, MB-25, MB-26, MB-27, MB-28, MB-29, MB-30, MB-31, MB-32, MB-37, MB-38, MB-39 and MB-40 was confirmed as rough type of fruit surface. The highest frequency for fruit surface was observed in rough category with 53.66%, while lowest was noted in smooth type of fruit surface group having 46.34%.

Fruit shape

Fruit shape of all forty-one genotypes of Bael was categorized into four different group *viz.* round, ovate, globose and elliptical. From the 41 genotypes, 11 genotypes namely MB-21, MB-22, MB-23, MB-24, MB-25, MB-26, MB-27, MB-28, MB-29, MB-30 and Goma Yashi were found globose type of fruit shape. The genotypes *i.e*. MB-31, MB-32, MB-33, MB-34, MB-35, MB-36, MB-37, MB-38, MB-39 and MB-40 were assembled into elliptical type of fruit shape category and 10 genotypes were documented in round shape group *viz.* MB-1, MB-2, MB-3, MB-4, MB-5, MB-6, MB-7, MB-8, MB-9 and MB-10. Whereas, remaining 10 genotypes were classified into ovate type of fruit shape, which was MB-11, MB-12, MB-13, MB-14, MB-15, MB-16, MB-17, MB-18, MB-19 and MB-20 respectively. The maximum frequency of fruit shape of Bael genotypes were recorded in globose type fruit shape having 26.83%, whereas the remaining categories contributed similar frequency *viz.* 24.39, 24.39 and 24.39% for round, ovate and elliptical type of fruit shape.

Immature fruit colour

Immature fruit colour of all forty-one Bael genotypes was classified into three distinct groups *viz*. green, light green and dark green. From the 41 genotypes, 23 genotypes namely MB-1, MB-2, MB-3, MB-4, MB-5, MB-6, MB-7, MB-10, MB-12, MB-13, MB-15, MB-16, MB-17, MB-29, MB-30, MB-31, MB-32, MB-33, MB-34, MB-35, MB-36, MB-37 and Goma Yashi was verified as light green colour of immature fruit. However, the green colour was confirmed by the 9 genotypes which was MB-8, MB-9, MB-11, MB-23, MB-24, MB-25, MB-26, MB-27 and MB-28, respectively. Besides, remaining genotypes like MB-14, MB-18, MB-19, MB-20, MB-21, MB-22, MB-38, MB-39 and MB-40 was found dark green colour of immature fruit. The maximum frequency for immature fruit colour was documented in light green colour category with 56.10%, while minimum was recorded in green and dark green colour of immature fruit with the percentage of 21.95 and 21.95% respectively.

Mature fruit colour

The mature fruit colour of all forty-one genotypes of Bael was characterized into three distinct group *viz.* green, yellowish green and greenish pale yellow. It was detected that the 19 genotypes *viz.* MB-1, MB-2, MB-3, MB-4, MB-8, MB-9, MB-11, MB-12, MB-13, MB-14, MB-15, MB-17, MB-18, MB-33, MB-34, MB-35, MB-36, MB-37 and MB-39 was found yellowish green colour of mature fruit. Moreover, the 15 genotypes *i.e.* MB-5, MB-6, MB-7, MB-10, MB-16, MB-19, MB-20, MB-21, MB-22, MB-23, MB-24, MB-25, MB-38, MB-40 and Goma Yashi was recorded as greenish pale yellow and remaining 7 genotypes were observed as green colour of mature fruit, which was MB-26, MB-27, MB-28, MB-29, MB-30, MB-31 and MB-32 respectively. The maximum frequency for mature fruit colour was observed in yellowish green colour category with 46.34%, which was followed by greenish pale yellow colour of mature fruit having 36.59%, whereas, minimum frequency was perceived in green colour with 17.07%.

Styler end cavity

The styler end cavity of all forty-one genotypes of Bael was grouped into shallow, depressed and highly depressed. Out of the 41 genotypes, 19 genotypes *viz.* MB-1, MB-9, MB-10, MB-11, MB-12, MB-13, MB-14, MB-20, MB-21, MB-22, MB-23, MB-24, MB-25, MB-32, MB-33, MB-34, MB-35, MB-36 and Goma Yashi showed depressed styler end cavity. Likewise, the 16 genotypes *i.e*. MB-3, MB-15, MB-16, MB-17, MB-18, MB-19, MB-26, MB-27, MB-28, MB-29, MB-30, MB-31, MB-37, MB-38, MB-39 and MB-40 was recorded as shallow styler end cavity and remaining 6 genotypes *viz.* MB-2, MB-4, MB-5, MB-6, MB-7 and MB-8 had found highly depressed type of styler end cavity. The maximum frequency of styler end cavity was distinguished in depressed type of styler end cavity group with 46.34%, which was closely followed by the shallow styler end cavity having 39.02%. The minimum frequency was confined in the highly depressed type of styler end cavity by 14.64%.

Stem end cavity

The stem end cavity of all forty-one Bael genotypes was classified into three distinct groups *viz*. shallow, depressed and flattened. From the 41 genotypes, 15 genotypes namely MB-1, MB-2, MB-3, MB-4, MB-5, MB-14, MB-15, MB-16, MB-17, MB-18, MB-19, MB-20, MB-34, MB-35 and MB-36 was detected as flattened type of stem end cavity. Similarly, 15 genotypes were recorded as shallow type of stem end cavity *i.e*. MB-6, MB-7, MB-8, MB-21, MB-22, MB-23, MB-25, MB-26, MB-27, MB-28, MB-29, MB-37, MB-38, MB-39 and MB-40. The remaining 11 genotypes *viz.* MB-9, MB-10, MB-11, MB-12, MB-13, MB-24, MB-30, MB-31, MB-32, MB-33 and Goma Yashi was found depressed stem end cavity. The maximum frequency for stem end cavity was documented in flattened and shallow category with 36.59 and 36.59%, respectively. While minimum frequency was recorded in depressed stem end cavity with the percentage of 26.82%.

Locule arrangement

Locule arrangement of all forty-one genotypes of Bael was categorized into centric, highly centric and scattered. Out of the 41 genotypes, 22 genotypes *viz.* MB-1, MB-2, MB-3, MB-4, MB-5, MB-9, MB-10, MB-11, MB-12, MB-13, MB-17, MB-18, MB-19, MB-20, MB-21, MB-30, MB-31, MB-32, MB-38, MB-39, MB-40 and Goma Yashi was observed as centric locule arrangement. Moreover 11 genotypes *i.e.* MB-6, MB-7, MB-8, MB-22, MB-23, MB-24, MB-25, MB-26, MB-27, MB-28 and MB-29 was seen as scattered type and remaining 8 genotypes had highly centric locule arrangement which was MB-14, MB-15, MB-16, MB-33, MB-34, MB-35, MB-36 and MB-37, respectively. The maximum frequency for locule arrangement of Bael genotypes were recorded in centric category (53.66%), followed by scattered locule arrangement having 26.83%. However, the minimum frequency was perceived in highly centric locule arrangement by 19.51%.

Seed shape

The seed shape of forty-one genotypes of Bael was divided into round and oblong. Out of the 41 genotypes, 24 genotypes *viz.* MB-1, MB-2, MB-3, MB-4, MB-9, MB-10, MB-11, MB-12, MB-13, MB-14, MB-15, MB-16, MB-17, MB-24, MB-25, MB-26, MB-27, MB-28, MB-29, MB-37, MB-38, MB-39, MB-40 and Goma Yashi was observed as round shape of seed. The oblong type of seed shape was noted in the remaining 17 genotypes *i.e.* MB-5, MB-6, MB-7, MB-8, MB-18, MB-19, MB-20, MB-21, MB-22, MB-23, MB-30, MB-31, MB-32, MB-33, MB-34, MB-35 and MB-36 under the present exploration. The highest frequency of seed shape was observed in round shape category with 58.54%, while lowest was noted in oblong seed shape having 41.46%.

Pulp colour

Pulp colour of all forty-one genotypes of Bael was categorized into yellow, pale yellow and dark yellow. From the 41 genotypes, 17 genotypes *viz.* MB-5, MB-6, MB-7, MB-8, MB-9, MB-10, MB-16, MB-17, MB-18, MB-19, MB-20, MB-25, MB-26, MB-27, MB-28, MB-37 and MB-38 were found pale yellow colour of pulp. Furthermore, dark yellow pulp colour was seen in 13 genotypes *i.e.* MB-1, MB-2, MB-3, MB-4, MB-21, MB-22, MB-23, MB-24, MB-32, MB-33, MB-34, MB-39 and MB-40, whereas remaining 11 Bael genotypes *viz.* MB-11, MB-12, MB-13, MB-14, MB-15, MB-29, MB-30, MB-31, MB-35, MB-36 and Goma Yashi showed yellow pulp. The maximum frequency of pulp colour of Bael genotypes were recorded in pale yellow pulp (41.46%), which was followed by dark yellow pulp colour having 31.71%. However, the minimum frequency was observed in yellow pulp colour with percentage of 26.83%.

Discussion

Diversity in the pomological characters of Bael genotypes at different locations might be due to varied agro-climatic conditions, root distribution pattern of individual genotypes, availability of nutrient to individual plant, management practices of the crop and genetic make-up of the genotypes. Similar results were also reported by Pale *et al*. (2019), Amulya *et al*. (2022), Chaturvedi *et al.* (2023) and Singh *et al.* (2024) in Bael genotypes.

Table 2: Diversity in pomological characteristics of forty-one different Bael genotypes

Bael Genotypes	Fruit surface	Fruit shape	Immature fruit colour	Mature fruit colour	Styler end cavity	Stem end cavity	Locule arrangement	Seed shape	Pulp colour
MB-1	Smooth	Round	Light Green	Yellowish Green	Depressed	Flattened	Centric	Round	Dark Yellow
MB-2	Smooth	Round	Light Green	Yellowish Green	Highly Depressed	Flattened	Centric	Round	Dark Yellow
MB-3	Smooth	Round	Light Green	Yellowish Green	Shallow	Flattened	Centric	Round	Dark Yellow
MB-4	Smooth	Round	Light Green	Yellowish Green	Highly Depressed	Flattened	Centric	Round	Dark Yellow
MB-5	Smooth	Round	Light Green	Greenish Pale Yellow	Highly Depressed	Flattened	Centric	Oblong	Pale Yellow

MB-6	Smooth	Round	Light Green	Greenish Pale Yellow	Highly Depressed	Shallow	Scattered	Oblong	Pale Yellow
MB-7	Rough	Round	Light Green	Greenish Pale Yellow	Highly Depressed	Shallow	Scattered	Oblong	Pale Yellow
MB-8	Rough	Round	Green	Yellowish Green	Highly Depressed	Shallow	Scattered	Oblong	Pale Yellow
MB-9	Rough	Round	Green	Yellowish Green	Depressed	Depressed	Centric	Round	Pale Yellow
MB-10	Rough	Round	Light Green	Greenish Pale Yellow	Depressed	Depressed	Centric	Round	Pale Yellow
MB-11	Smooth	Ovate	Green	Yellowish Green	Depressed	Depressed	Centric	Round	Yellow
MB-12	Rough	Ovate	Light Green	Yellowish Green	Depressed	Depressed	Centric	Round	Yellow
MB-13	Rough	Ovate	Light Green	Yellowish Green	Depressed	Depressed	Centric	Round	Yellow
MB-14	Smooth	Ovate	Dark Green	Yellowish Green	Depressed	Flattened	Highly Centric	Round	Yellow
MB-15	Rough	Ovate	Light Green	Yellowish Green	Shallow	Flattened	Highly Centric	Round	Yellow
MB-16	Smooth	Ovate	Light Green	Greenish Pale Yellow	Shallow	Flattened	Highly Centric	Round	Pale Yellow
MB-17	Rough	Ovate	Light Green	Yellowish Green	Shallow	Flattened	Centric	Round	Pale Yellow
MB-18	Smooth	Ovate	Dark Green	Yellowish Green	Shallow	Flattened	Centric	Oblong	Pale Yellow
MB-19	Smooth	Ovate	Dark Green	Greenish Pale Yellow	Shallow	Flattened	Centric	Oblong	Pale Yellow
MB-20	Rough	Ovate	Dark Green	Greenish Pale Yellow	Depressed	Flattened	Centric	Oblong	Pale Yellow
MB-21	Smooth	Globose	Dark Green	Greenish Pale Yellow	Depressed	Shallow	Centric	Oblong	Dark Yellow
MB-22	Rough	Globose	Dark Green	Greenish Pale Yellow	Depressed	Shallow	Scattered	Oblong	Dark Yellow
MB-23	Smooth	Globose	Green	Greenish Pale Yellow	Depressed	Shallow	Scattered	Oblong	Dark Yellow
MB-24	Smooth	Globose	Green	Greenish Pale Yellow	Depressed	Depressed	Scattered	Round	Dark Yellow
MB-25	Rough	Globose	Green	Greenish Pale Yellow	Depressed	Shallow	Scattered	Round	Pale Yellow
MB-26	Rough	Globose	Green	Green	Shallow	Shallow	Scattered	Round	Pale Yellow
MB-27	Rough	Globose	Green	Green	Shallow	Shallow	Scattered	Round	Pale Yellow
MB-28	Rough	Globose	Green	Green	Shallow	Shallow	Scattered	Round	Pale Yellow
MB-29	Rough	Globose	Light Green	Green	Shallow	Shallow	Scattered	Round	Yellow
MB-30	Rough	Globose	Light Green	Green	Shallow	Depressed	Centric	Oblong	Yellow
MB-31	Rough	Elliptical	Light Green	Green	Shallow	Depressed	Centric	Oblong	Yellow
MB-32	Rough	Elliptical	Light Green	Green	Depressed	Depressed	Centric	Oblong	Dark Yellow
MB-33	Smooth	Elliptical	Light Green	Yellowish Green	Depressed	Depressed	Highly Centric	Oblong	Dark Yellow
MB-34	Smooth	Elliptical	Light Green	Yellowish Green	Depressed	Flattened	Highly Centric	Oblong	Dark Yellow
MB-35	Smooth	Elliptical	Light Green	Yellowish Green	Depressed	Flattened	Highly Centric	Oblong	Yellow
MB-36	Smooth	Elliptical	Light Green	Yellowish Green	Depressed	Flattened	Highly Centric	Oblong	Yellow
MB-37	Rough	Elliptical	Light Green	Yellowish Green	Shallow	Shallow	Highly Centric	Round	Pale Yellow
MB-38	Rough	Elliptical	Dark Green	Greenish Pale Yellow	Shallow	Shallow	Centric	Round	Pale Yellow
MB-39	Rough	Elliptical	Dark Green	Yellowish Green	Shallow	Shallow	Centric	Round	Dark Yellow
MB-40	Rough	Elliptical	Dark Green	Greenish Pale Yellow	Shallow	Shallow	Centric	Round	Dark Yellow
Goma Yashi	Smooth	Globose	Light Green	Greenish Pale Yellow	Depressed	Depressed	Centric	Round	Yellow

Note: MB stand for Mahasamund Bael

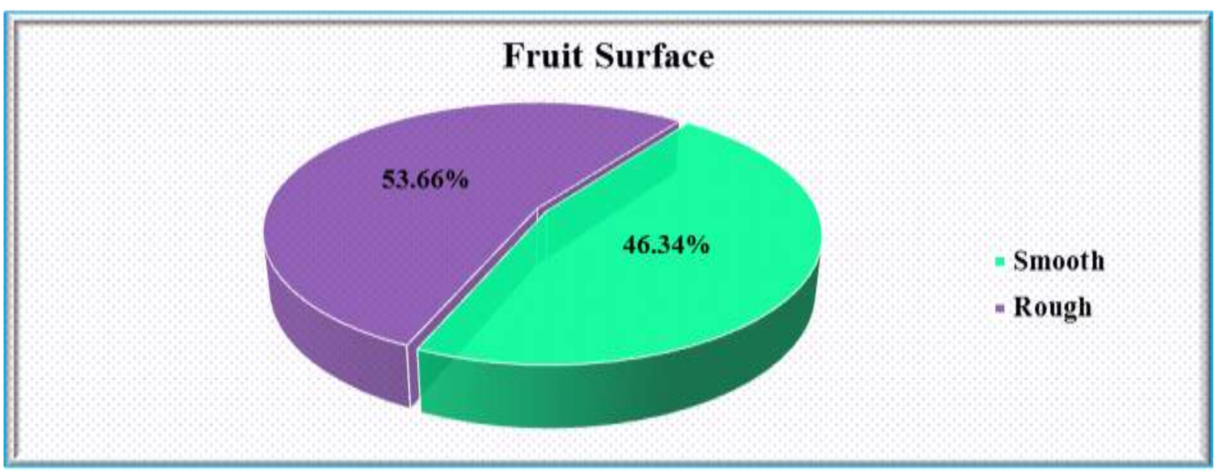

Fig. 4 : Fruit surface percentage of forty-one different Bael genotypes

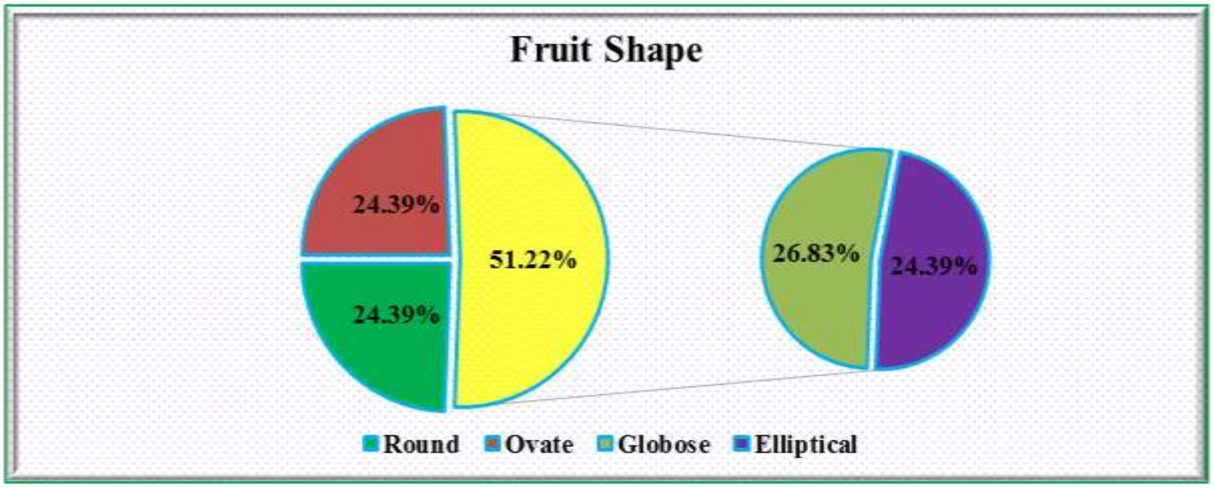

Fig. 5: Fruit shape percentage of forty-one different Bael genotypes

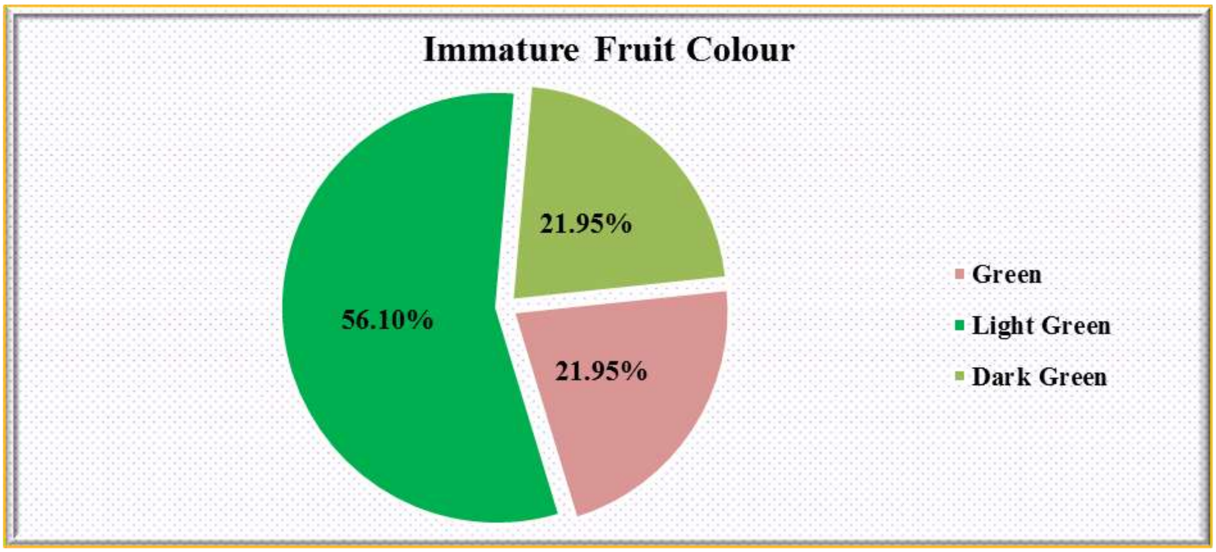

Fig. 6: Immature fruit colour percentage of forty-one different Bael genotypes

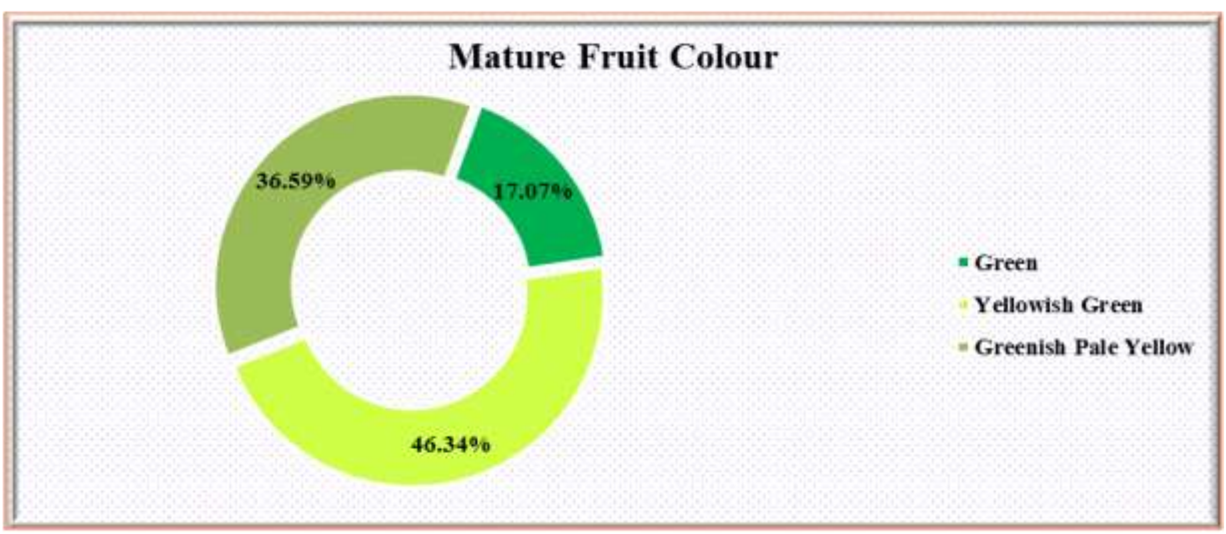

Fig. 7: Mature fruit colour percentage of forty-one different Bael genotypes

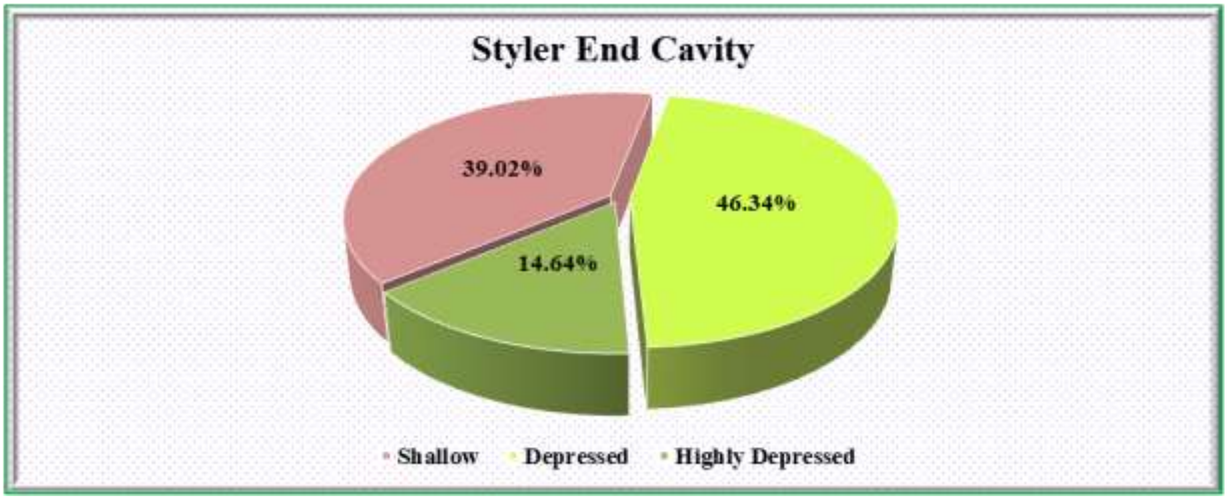

Fig. 8: Styler end cavity percentage of forty-one different Bael genotypes

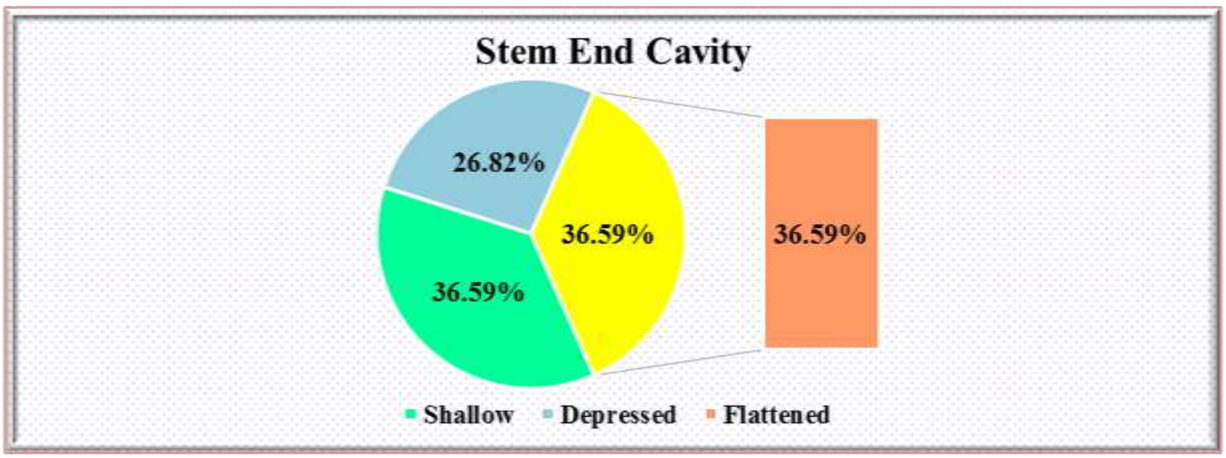

Fig. 9: Stem end cavity percentage of forty-one different Bael genotypes

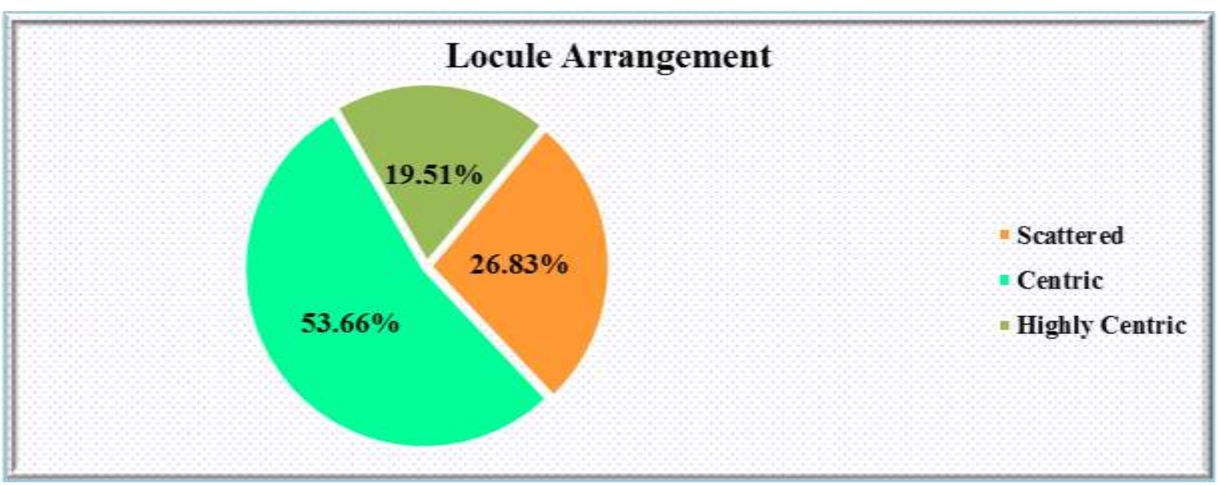

Fig. 10: Locule arrangement percentage of forty-one different Bael genotypes

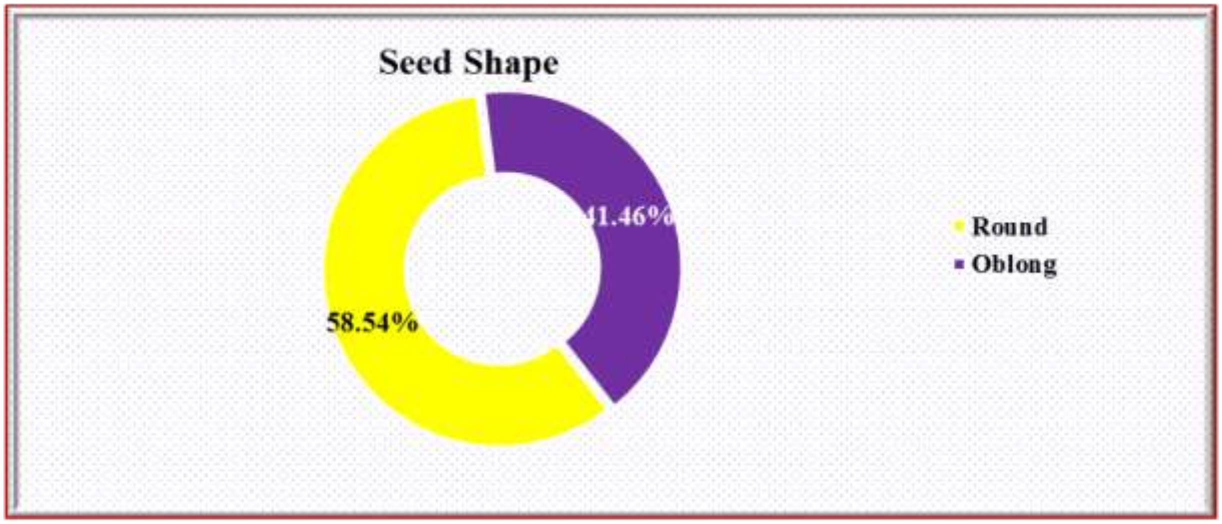

Fig. 11: Seed shape percentage of forty-one different Bael genotypes

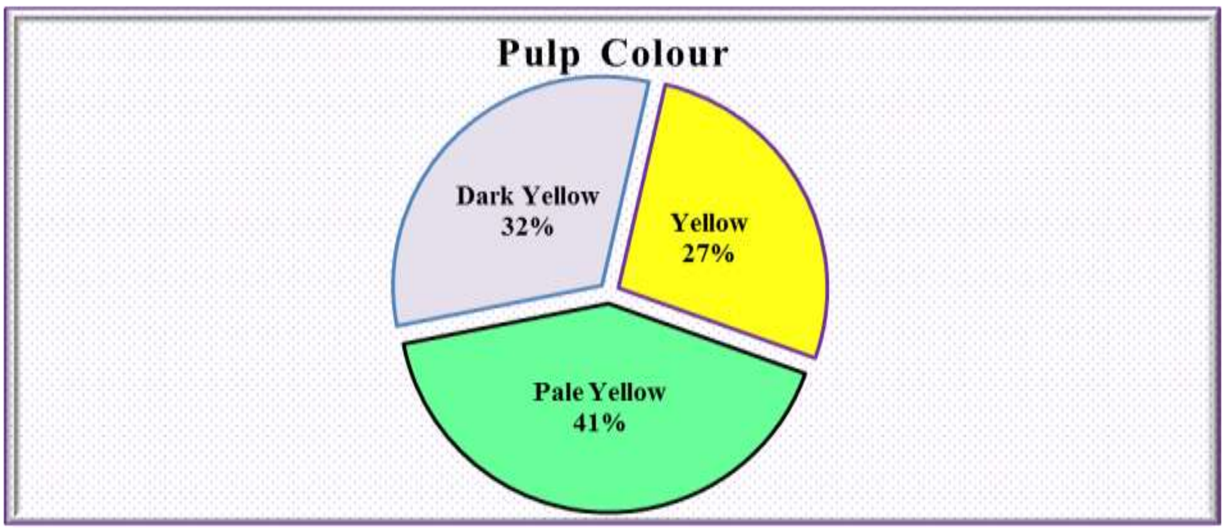

Fig. 12: Pulp colour percentage of forty-one different Bael genotypes

Conclusion

The basic requirement of the breeding program is the measurement of existing diversity of genetic material. The outcome of the present experiment revealed existing of wide range of diversity for nearly of all the floral and pomological characters suggesting the existence of sufficient variability among the genotype. Identification and characterization of genotypes gave an idea for horticultural and crop morphology characters of Bael genotypes which is required in providing the helpful information of gene bank management and further evaluation of the existing genotypes for breeding program which are ultimate goal of the research.

Suggestions for future research

- Since the results of present study was based on two years of research. To achieve any definite conclusion, it needs to be repeated during consecutive seasons.
- Since the results of present exploration was from one geographical region of Chhattisgarh. To achieve any definite conclusion, it needs to be repeated more than one geographical region because variability vary according to the geographical region.

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