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UNRAVELLING QUANTITATIVE PHENOTYPIC VARIATION OF CUSTARD APPLE SELECTIONS FROM SOUTHWESTERN PARTS OF ANDHRA PRADESH, INDIA

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ABSTRACT

An experiment was carried out at Horticultural Research station, AICRP on arid fruit crops, Rekulakunta, Ananthapuramu for approximation of growth parameters like tree height, leaf length, leaf breadth, petiole length and leaf thickness for custard apple selections to be get informed with eventuality of vegetative parameters of that particular custard apple selection. Wide range of variation was observed among the seventy-five selections of custard apple with respect to growth parameters.

Key words : Custard apple, Tree height, Leaf length, Leaf breadth and Leaf thickness.

Introduction

Custard apple is sweet soup (*Annona squamosa* L.) family Annonaceae the new super fruit of 21st century can be called as delicacy of the dry region due its very sweet delicious flesh contributed to an increase in the area of production. In India it occupies area of 55,000 hectares with 298.01 Metric tons of production. Andhra Pradesh occupies seventh place in custard apple production. The fruit is very sweet (up to 28% of sugars) and aromatic, significant use of tree parts in ayurveda in India to control diabetes from the ages (Mustapha, 2013; Okhale *et al.*, 2016). However, to our understanding, there have been limited studies investigating the morphological diversity within this shrub species (Folorunso and Olorode, 2006), despite the significance of quantitatively assessing the plant's morphological variability for conservation and domestication strategies (Pauku *et al.*, 2010; Gouwakinnou *et al.*, 2011; Ewédjè *et al.*, 2012; Padonou *et al.*, 2017). The significant implication is that the pattern of this morphological variability serves as a valuable tool for comprehending the resilience potential of plant resources against environmental challenges like climate change, thereby enhancing efforts in conservation and domestication (Hounkpèvi *et al.*, 2016). Specifically, we anticipate observing notable variations in morphological characteristics among custard apple selections found in the Ananthapuramu district, located in the south-western region of Andhra Pradesh.

Materials and Methods

Experimental location

The experiment was conducted in the custard apple germplasm block at the Dr. YSR Horticultural University-Horticulture Research Station (a center for the All India Coordinated Research Project on Arid Fruits), located in Rekulakunta, Ananthapuramu District, Andhra Pradesh. This site is positioned in agro climatic zone 6 of Andhra Pradesh, aligning with agro-climatic zone 10 of India, which is designated as the 'Scarce Rainfall Zone'. The

Table 1 : Custard apple selections assessed for phenotypic variation studies.

S. no.	Custard apple selections
1.	Balanagar
2.	Arka sahan
3.	Rayadurg
4.	Red seethaphal
5.	CRIDA selection
6.	Jambugumpala -1
7.	Jambugumpala- 2
8.	Jambugumpala- 3
9.	Jambugumpala- 4
10.	Jambugumpala- 5
11.	Jambugumpala- 6
12.	Jambugumpala-7
13.	K. Dayalauripalli 13
14.	K.E. Palli-1
15.	K.E. Palli -2
16.	K.E. Palli- 3
17.	Kadiri-305
18.	Kadiri-306
19.	Kadiri -132
20.	Kadiri -169
21.	Kokkanti
22.	Kokkanti -307
23.	Molakalmur
24.	Molakalmur -1
25.	Molakalmur -7
26.	Molakalmur -8
27.	Molakalmur -9
28.	Molakalmur -10
29.	Molakalmur -12
30.	Molakalmur -13
31.	Molakalmur -14
32.	Mutravanipalli -1
33.	Mutravanipalli-2
34.	Nallaldadi
35.	Nallaldadi -2
36	Nallaldadi-4
37.	Nallaldadi -5
38.	Nallaldadi -8
39.	Nallaldadi -9
40.	Nallaldadi -10
41.	Nallaldadi -11
42.	Nallaldadi -12
43.	Nallaldadi-13
44.	Pythota -1
45.	Pythota -2
46.	Pythota -3
47.	Pythota -4
48.	Pythota -5
49.	Pythota - 6
50.	Yengalampalli
51.	Yengalampalli -1
52.	Yengalampalli -2
53.	Yengalampalli-4
54.	Yengalampalli -5
55.	Yengalampalli -6
56.	Yengalampalli -7
57.	Yengalampalli -8
58.	Yengalampalli -9
59.	Yengalampalli -10
60.	Yengalampalli -12
61.	Yengalampalli -13
62.	Yengalampalli -14
63.	Yengalampalli -15
64.	Yengalampalli -16
65.	Yangalampalli -17
66.	Diwan Cheruvu-1
67.	Diwan Cheruvu -2
68.	Diwan Cheruvu -3
69.	Sri Krishnapatnam-1
70.	Sri Krishnapatnam -2
71.	Sri Krishnapatnam -3
72.	Sri Krishnapatnam -4
73.	Sri Krishnapatnam -5
74.	Sri Krishnapatnam -6
75.	Sri Krishnapatnam -7

Table 1 continued...

geographical coordinates of the site are 14°41'N latitude and 77°40'E longitude, with an elevation of 350 meters above mean sea level. The area receives a normal annual rainfall of 551 mm.

An experiment was conducted on 15 years old custard apple selections .A total of seventy-five selections were assessed for phenotypical quantitative variabilities. Traits like tree height, leaf length, leaf breadth, petiole length, leaf thickness were measured by following DUS guide lines (PPV and FRA, 2001). Tree height was measured on visual basis with help of standard wooden scale from the base of the plant to the highest point of the crown and expressed in metre (m). Length and width were measured from the fifth mature leaf of the current season's growth, known as the index leaf. Length of the leaf, petiole and breadth of the leaf was measured with help of measuring scale in terms of centimeters. Leaf

thickness was measured with help of vernier caliper in terms of millimetres converted to centimetres (DUS centres, Division of fruit Science, IIHR, 2011). Descriptive statistical analysis was done using PAST 3 (Palaeontological Statistics; Hammer *et al.*, 2001) software version.

Results and Discussion

Among the custard apple selections maximum variation was observed with respect to tree height, leaf length, leaf breadth, petiole length and leaf thickness as depicted in the Tables 2 and 3. Graphical representation is depicted in Figs. 1-5.

Phenotypic characters indicates wide range of variability in growth attributes among custard apple selections with respect to tree height (2.19 -3.76 m), leaf length (8.22 -21.03 cm.), leaf breadth (3.54 - 7.44 cm.), Petiole length (1.10 - 1.98 cm.), leaf thickness (0.24-0.60 cm.). A larger leaf area could facilitate the synthesis and accumulation of photosynthates, potentially contributing to improved growth. Differences in the genetic composition of the selections and environmental influences on specific progenies contribute to variations

Table 2 : Descriptive statistics for growth parameters in custard apple selections (*Annona squamosa* L.).

Parameters	Minimum	Maximum	Mean	Standard Deviation	Coefficient of variation
Tree height (m)	2.19	3.76	2.97	0.39	12.50
Leaf length (cm)	8.22	21.03	14.62	1.53	14.80
Leaf breadth (cm)	3.54	7.44	5.49	0.70	15.02
Petiole length (cm)	1.10	1.98	1.54	0.21	13.74
Leaf thickness (cm)	0.24	0.60	0.42	0.07	18.92

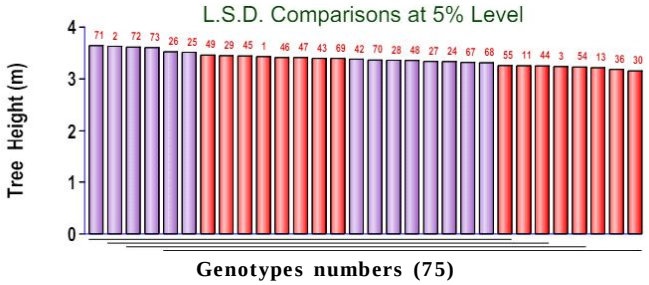

Fig. 1 : Representation of highest to lowest tree height within genotypes.

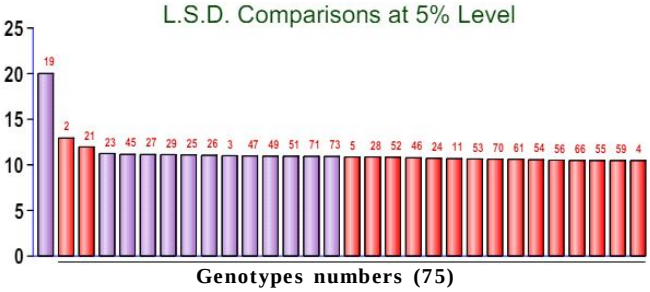

Fig. 2 : Representation of highest to lowest leaf length within genotypes.

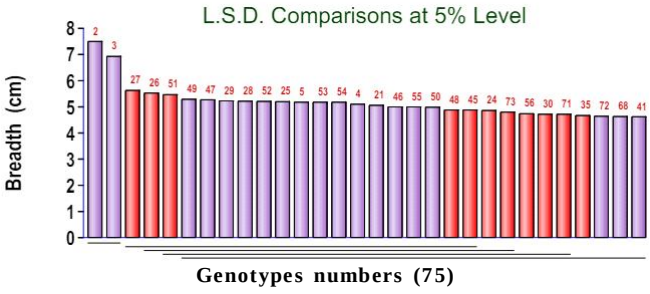

Fig. 3 : Representation of highest to lowest leaf breadth within genotypes.

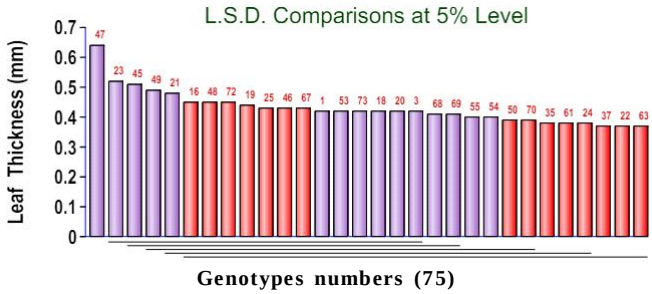

Fig. 4 : Representation of highest to lowest leaf thickness within genotypes.

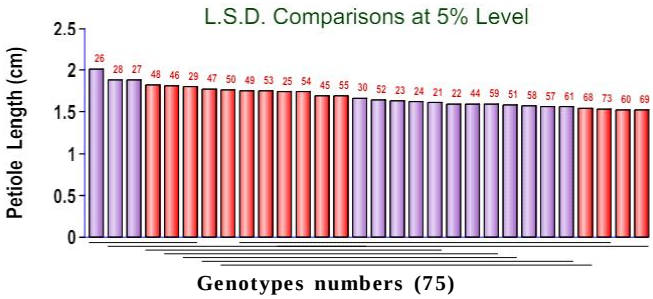

Fig. 5 : Representation of highest to lowest petiole length within genotypes.

Table 3 : Descriptive statistics for growth parameters in custard apple selections (*Annona squamosa* L.).

Parameters	Custard apple selections	
	Minimum	Maximum
Tree height (m)	Jambugampala-5	SK-3
Leaf length (cm)	Nallaladadi-9	Kadiri-132
Leaf breadth (cm)	Yengalampalli-17	Arka sahan
Petiole length (cm)	K.E. palli no.-3	Molkalmur-8
Leaf thickness (cm)	SK-3	Pythota-4

in these vegetative and floral characteristics. Research conducted by Vikas Yadav *et al*. (2019) and Ghawade *et al*. (2018) underscored considerable diversity among custard apple genotypes regarding various vegetative and floral traits.

Conclusion

Evaluation of custard apple selections during the prefatory stage with respect to growth parameters like tree height, leaf length, leaf breadth, petiole length and leaf thickness will be helpful to know the enormity of custard apple selections under the study, which can be further considered for breeding programme in the process of development of superior selections. In addition to the genetic characteristics of the plant, soil quality and environmental conditions also play a crucial role in the growth and development process.

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