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Original Research Paper

Morpho-biochemical characterization and correlation coefficients of soursop (*Annona muricata* L.) accessions

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ABSTRACT

A systematic study was carried out to assess the variability among 50 soursop accessions based on 16 morpho-biochemical and yield parameters, during 2023 to 2025. The results showed wide variability for yield and morpho-biochemical traits. The accession KVKH-Am-13 recorded maximum fruit weight (1459 g), length (20.45 cm), diameter (13.13 cm), pulp weight (1186.63 g). For biochemical traits, the highest TSS and lowest acidity were observed in accession KVKH-Am-12 (19.85 °Brix and 0.63%, respectively). The maximum yield per tree (40 fruits/tree) was recorded in CHESC-Am-19, and the minimum (15 fruits/tree) was noted in KVKH-Am-14 and KVKH-Am-19. The correlation analysis revealed a highly positive correlation between fruit weight and pulp weight, peel weight, fruit length, fruit diameter, seed weight and peduncle weight. However, TSS content showed a highly significant negative correlation with acidity content. The study identified superior accessions exhibiting key economic traits, including high fruit and pulp weight (KVKH-Am-13), high total soluble solids with low acidity (KVKH-Am-12) and improved yield (CHESC-Am-19), underscoring their potential utility in future improvement programme of soursop.

Keywords: Biochemical traits, correlation, morphological traits, soursop, yield

INTRODUCTION

Soursop (*Annona muricata* L.), family Annonaceae, is a tropical fruit tree reported to be native to Tropical America. It is now widely cultivated across Asia, Africa, and other tropical regions (Pinto et al., 2005) along with other species of Annona. It is commonly known as Guanábano, Catuche, Catoche, Anona, Graviola in different countries of the world. In India, soursop is found only in small quantities as backyard crops or homestead crops mainly in the Southern sub-tropical areas of Karnataka, Kerala, Tamil Nadu and Andhra Pradesh (Maheswari & Sinduja, 2020). In recent days, it has gained importance because of its bioactive compounds, which have nutraceutical properties (Chang et al., 2018). More than 200 different bioactive compounds have been identified in this plant, including major classes such as acetogenins, alkaloids, and phenol (Gyesi et al., 2019). The pulp of soursop is a good source of fiber and contains several beneficial phytochemicals. For instance, polyphenols, which are naturally occurring compounds with antioxidant properties, are present in soursop plants and protect cells from damage caused by free radicals (Gonzalez et al., 2017).

Despite its nutritional and medicinal importance, soursop remains underutilized and relatively less studied compared to other tropical fruit crops in India. Currently, soursop is not grown on a large scale and also does not have any released variety for commercial cultivation. Hence, there is a need for the development of high-yielding varieties for commercial cultivation. Soursop plants are traditionally cultivated by sowing seeds which has resulted in creating wide variability with respect to morphological and biochemical traits. The lack of systematic research on its genetic diversity and characterisation is a constraint for breeding and crop improvement efforts. Morphological characterisation of a species is very useful in the separation of populations into different morphotypes and proper utilization of genetic resources in plant breeding programme (Piyasundara et al., 2009). The present study aimed to evaluate 50 accessions maintained in the field genebank across distinct locations at ICAR-Indian Institute of Horticultural Research, Bengaluru, India; Central Horticultural Experiment Station, Chettalli, India and Krishi Vigyan Kendra, Hirehalli, India, using a comprehensive set of morpho-biochemical traits. Additionally, the study analyzed correlation coefficients to reveal relationships among

Table 1 : The details of soursop accessions from different locations

Location	Accession	Altitude (m)	Latitude (°N)	Longitude (°E)
ICAR-IIHR, Bengaluru	IIHR-Am-1, IIHR-Am-2, IIHR-Am-3	920	12.97°	77.58°
KVK, Hirehalli, Tumkuru	KVKH-Am-1, KVKH-Am-2, KVKH-Am-3, KVKH-Am-4, KVKH-Am-5, KVKH-Am-6, KVKH-Am-7, KVKH-Am-8, KVKH-Am-9, KVKH-Am-10, KVKH-Am-11, KVKH-Am-12, KVKH-Am-13, KVKH-Am-14, KVKH-Am-15, KVKH-Am-16, KVKH-Am-17, KVKH-Am-18, KVKH-Am-19	823	13.28°	77.18°
IIHR-CHES, Chettalli, Kodagu	CHESC-Am-1, CHESC-Am-2, CHESC-Am-3, CHESC-Am-4, CHESC-Am-5, CHESC-Am-6, CHESC-Am-7, CHESC-Am-8, CHESC-Am-9, CHESC-Am-10, CHESC-Am-11, CHESC-Am-12, CHESC-Am-13, CHESC-Am-14, CHESC-Am-15, CHESC-Am-16, CHESC-Am-17, CHESC-Am-18, CHESC-Am-19, CHESC-Am-20, CHESC-Am-21, CHESC-Am-22, CHESC-Am-23, CHESC-Am-24, CHESC-Am-25, CHESC-Am-26, CHESC-Am-27, CHESC-Am-28	890	12.39°	75.84°

these traits, facilitating the identification of superior genotypes for genetic improvement programs.

MATERIALS AND METHODS

The present study was conducted over two consecutive years (2023 to 2025) on 50 soursop accessions maintained at the field genebank of ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru (3 accessions), Krishi Vigyan Kendra, Hirehalli (19 accessions), and Central Horticultural Experiment Station, Chettalli (28 accessions). The climate of ICAR-IIHR, Hesaraghatta, Bengaluru is a semi-arid tropical climate with moderate temperatures year-round. The temperature range in summer is from 25°C to 35°C, and 15°C to 25°C in winter, with an annual rainfall of 800–900 mm, mostly occurring during June–September. The soil is red loamy soil, well-drained and slightly acidic to neutral pH. The IIHR-CHES, Chettalli has a subtropical hill climate with cooler temperature, located at 1050 m above sea level, with temperature ranged from 19°C to 32°C with high annual rainfall of 1500 mm, received in July to August. The soil is deep, dark brown sandy loam to sandy clay loam, well-drained and fertile. The KVK Hirehalli, Tumkur has a dry tropical climate with hot summer and mild winter receiving low to moderate rainfall, around 600–700 millimeter (mm) annually. The soil is red sandy loam, shallow to medium depth, and moderately fertile. The details of accessions and locations are presented in Table 1. The seedling trees that were of minimum 8-year-old which were selected for this experiment, were planted at a 6 x 6 m distance in all three locations. An individual tree is considered as one unit. Six fruits from each accession were used for morphological and biochemical analysis.

Observations on tree height was measured from the base of the trunk to the apex using a wooden scale and height was expressed in meter. Canopy spread in East-West and North-South directions were measured using a measuring tape and expressed in meter. Trunk diameter was measured at the point of first branching using a measuring tape and stated in cm. Leaf length was measured by measuring scale from the leaf base to the tip using a ruler and width was measured at the widest portion of the lamina and expressed in centimeter. For each tree, 10 fully expanded and healthy leaves were randomly sampled across the canopy, and the mean values were calculated.

Fruit length was measured from the peduncle attachment to the distal end, and fruit diameter was measured at the widest part of the fruit using a measuring scale and presented in centimeter. The individual fruit weight was taken in gram using an electronic balance. Each fruit was dissected to separate the peel, pulp, peduncle, and seed. The weight of individual components was recorded using a digital balance and expressed in gram. The total number of fruits harvested per tree was counted manually at maturity.

Total soluble solids was measured in degree brix using ripe fruit by a hand refractometer (Model: Atago PAL-1 Digital Hand-held Pocket refractometer). Using the titration method, the titratable acidity of fruit was determined (Ranganna, 1986). For this, 5 g of fruit pulp was weighed, crushed, and 50 mL of water was added. It was carefully blended and filtered. The 20 mL of filtered sample was titrated against a 0.1 N NaOH solution using a phenolphthalein indicator of 1 per cent. The titer value was used to calculate the titratable acidity value and expressed as percent citric acid. Using the following formula, the titer value was used to calculate the titratable acidity value as per cent citric acid:

$$\text{Titrable acidity (\%)} = \frac{\text{Titre value x normality of alkali x volume made up x equiv. wt. of acid x 100}}{\text{Vol. of sample taken for estimation x wt. or vol. of sample taken x 1000}}$$

To perform the descriptive statistics, the analysis of variance (ANOVA) for each character was carried out as suggested by Panse & Sukhatme (1967). The MS-Office Excel software was utilized to compute the simple correlation matrix for pooled data, as described by Snedecor & Cochran (1981).

RESULTS AND DISCUSSION

Morphological assessment of tree traits

The data pooled analysis revealed significant and stable variation among soursop accessions for plant and leaf traits (Table 2). Wide variation was observed for plant height (3.85-8.35 m), plant spread E-W (3.15-6.10 m), plant spread N-S (2.80-7.10 m), trunk diameter (39.5-103.5 cm) at first branching, leaf length (12.37-19.72 cm), leaf width (4.38-6.83 cm). Maximum plant height in CHESC-Am-18, canopy spread (E-W and N-S) and trunk diameter were observed in CHESC-Am-19. The highest leaf length (19.72 cm) and leaf width (6.83 cm) were noted in IIHR-Am-2 and CHESC-Am-8, respectively. These results showed a remarkable morphological variability between the genotypes evaluated which may be attributed to the seed propagation, heterozygous nature and cross-pollinated nature of the crop. Moreira-Macias et al. (2020) reported similar variability for 60 soursop germplasm from different locations of Ecuador, which was found to be highest in tree height (3.22 m), and crown diameter (2.61-18.00 m), while almost similar in leaf length (7.89-18.04 cm) and width (3.88-7.16 cm) compared to present study.

Evaluation of fruit traits and yield

Fruit traits exhibited wide genotypic and climactic differences as fruit length (11.73–20.45 cm), fruit diameter (8.28–13.13 cm), fruit weight (367.93-1459.50 g), pulp weight (264.73–1186.63 g/fruit), peel weight (79.53–196.90 g/fruit), seed weight (12.35–63.55 g), and peduncle weight (11.25–49.18 g). The highest fruit length, diameter, fruit and pulp weight were found in accession KVKH-Am-13, while, the lowest peel weight, seed weight and peduncle weight were registered in IIHR-Am-2, KVKH-Am-15 and KVKH-Am-5, respectively. The variability respect to fruit traits *viz.*, fruit weight, pulp weight, seed weight, peel weight, number of seeds, fruit length and diameter in soursop were also observed (Villarreal-Fuentes et al., 2020). Yield varied from 15 fruits per tree (KVKH-Am-14 and KVKH-Am-19) to 42 fruits per tree CHESC-Am-19), underscoring the strong genotypic influence on productivity. Moreira-Macías et al. (2020) reported that fruit number per tree varied from 20 to 250 in 60 soursop germplasm.

Biochemical parameters

The biochemical attributes showed marked variation, which differed significantly among the accessions studied. The TSS ranged from 9.75 °Brix (CHESC-Am-1) to 19.85 °Brix (KVKH-Am-12) and titratable acidity from 0.61% (CHESC-Am-25 and CHESC-Am-26) to 1.19% (CHESC-Am-9). Paitan et al. (2025) reported TSS (12.36-17.70%) and acidity (0.66-1.11%) in soursop, however, Villarreal-Fuentes et al. (2020) observed TSS ranged from 3.7-19.5 °Brix in soursop.

Across the three locations, soursop performance showed marked variation. At Bengaluru, the semi-arid tropical climate with moderate year-round temperature and moderate rainfall consistently supported taller plants with stable fruit size and yield. In Hirehalli, characterized by a dry tropical climate with hot summer, mild winter, and lower rainfall, plants were generally shorter, with moderate fruit development and variable yield. In contrast, the plants conserved in Chettalli exhibited the highest variability across all

Table 2 : Mean performance of different morpho-biochemical and yield parameters

Accession	PH	E-W	N-S	TD	LL	LB	FL	FD	FW	PLW	PW	SW	PDW	TSS	TA	Y
IIHR-Am-1	7.68	5.18	5.08	67.00	16.40	6.31	14.38	9.80	601.70	92.23	455.78	36.68	17.03	13.53	0.98	31.50
IIHR-Am-2	7.18	5.55	4.78	74.50	19.72	4.50	14.05	8.28	367.93	79.53	264.73	13.23	10.45	14.63	0.85	29.00
IIHR-Am-3	6.55	5.49	4.58	69.50	17.83	5.56	15.00	9.08	551.45	101.43	412.75	18.08	19.20	13.38	0.82	33.50
KVKH-Am-1	6.78	5.80	5.15	97.50	16.21	5.90	15.73	10.83	746.65	108.70	584.53	38.95	14.48	12.55	0.91	21.50
KVKH-Am-2	6.15	5.35	4.60	92.50	12.73	4.38	13.45	10.55	428.83	102.13	296.03	17.30	13.38	16.68	0.67	17.00
KVKH-Am-3	4.95	4.30	4.75	70.50	13.35	5.61	14.18	9.40	535.43	103.68	389.50	26.90	15.35	14.05	0.91	18.50
KVKH-Am-4	4.65	3.70	3.30	72.50	12.54	4.99	12.75	9.60	367.93	83.10	230.73	35.85	18.25	18.08	0.67	21.00
KVKH-Am-5	4.90	4.60	4.45	71.50	18.59	4.66	11.73	10.90	394.25	83.00	276.93	23.08	11.25	15.43	0.76	18.00
KVKH-Am-6	4.80	4.00	4.00	48.50	16.56	6.64	15.25	12.75	879.43	121.35	711.70	27.58	18.80	14.40	0.88	17.50
KVKH-Am-7	6.60	6.00	5.00	69.50	17.55	6.71	12.48	10.53	383.75	94.20	258.68	16.25	14.63	15.98	0.64	29.50
KVKH-Am-8	6.10	4.45	4.05	71.00	12.37	6.37	16.18	10.20	948.85	131.40	756.85	35.75	24.85	17.58	0.74	19.00
KVKH-Am-9	6.70	4.25	4.55	57.50	19.52	4.93	17.58	11.78	1044.40	124.05	827.33	57.00	36.03	13.88	0.87	20.50
KVKH-Am-10	4.30	3.75	3.45	39.50	18.55	5.01	13.50	9.98	585.70	91.58	446.30	26.13	21.70	15.10	0.71	19.50
KVKH-Am-11	6.15	4.38	3.35	59.00	14.01	6.11	14.43	11.33	933.58	130.30	742.93	37.25	23.10	18.28	0.83	26.00
KVKH-Am-12	5.65	5.00	3.60	49.00	13.58	5.34	13.65	8.85	540.25	80.58	433.00	14.88	11.80	19.85	0.63	35.00
KVKH-Am-13	5.35	3.90	4.25	63.50	13.54	4.72	20.45	13.13	1459.50	190.35	1186.63	41.60	40.93	17.08	0.66	22.50
KVKH-Am-14	5.70	4.95	5.40	68.00	14.29	5.73	14.08	11.68	707.38	127.58	539.15	19.18	21.48	16.03	0.87	15.00
KVKH-Am-15	6.65	4.65	5.00	89.00	16.11	4.47	13.90	11.28	548.48	103.53	416.90	12.35	15.70	14.48	0.70	16.00
KVKH-Am-16	6.05	3.65	3.35	74.50	15.49	6.42	15.68	11.13	777.60	106.18	637.34	21.78	12.31	15.28	0.78	17.00
KVKH-Am-17	6.65	5.15	3.65	69.00	15.19	5.01	14.08	9.70	877.23	107.50	692.21	49.98	27.54	15.95	0.86	21.50
KVKH-Am-18	6.25	4.50	4.35	61.00	16.45	5.55	16.98	11.15	819.43	109.18	652.53	37.85	19.88	15.35	0.79	19.00
KVKH-Am-19	5.25	5.05	4.25	62.00	12.83	5.16	13.95	10.83	613.95	96.38	461.43	33.15	23.00	17.78	0.70	15.00
CHESC-Am-1	7.20	4.40	4.48	75.50	16.10	6.19	14.38	11.73	812.50	160.15	612.55	16.68	23.13	9.75	0.64	20.50
CHESC-Am-2	7.23	4.30	4.70	58.50	15.35	5.92	15.38	11.58	872.03	175.68	658.70	21.60	16.05	11.65	0.81	29.50
CHESC-Am-3	7.75	3.75	5.53	78.00	15.61	6.80	16.50	9.85	759.65	167.50	536.31	29.44	26.40	10.68	1.02	19.50
CHESC-Am-4	7.45	4.00	4.05	64.50	15.20	6.37	13.88	11.30	962.28	168.53	738.53	28.35	26.88	10.53	0.89	21.50
CHESC-Am-5	8.20	4.40	4.50	84.00	14.95	6.30	16.78	10.08	988.65	187.08	728.10	49.53	23.95	11.31	0.93	32.50
CHESC-Am-6	5.35	3.25	3.20	69.50	16.55	6.08	17.65	11.05	970.88	154.50	739.55	47.93	28.90	10.80	0.86	23.50
CHESC-Am-7	6.83	5.80	4.65	93.75	14.30	5.60	15.58	11.28	892.40	157.38	677.65	32.70	24.68	13.70	0.72	18.50
CHESC-Am-8	7.60	3.45	4.85	75.50	14.45	6.83	19.33	12.30	1153.33	186.53	866.85	63.55	36.40	11.51	0.94	26.00
CHESC-Am-9	8.30	4.90	4.75	82.50	14.85	5.67	14.93	11.98	974.73	144.90	771.58	31.25	27.00	9.98	1.19	27.00
CHESC-Am-10	7.20	5.20	6.15	93.50	15.89	6.20	15.14	11.05	932.63	163.18	680.58	53.18	35.70	10.60	1.02	18.00
CHESC-Am-11	6.20	3.15	2.80	61.00	15.78	5.76	12.53	10.60	808.88	150.88	624.20	20.35	13.45	14.83	0.85	36.00
CHESC-Am-12	5.35	4.55	4.05	71.00	14.15	6.28	16.33	10.50	677.65	138.73	489.58	30.88	18.48	10.85	0.93	21.50
CHESC-Am-13	6.60	4.40	4.20	71.00	15.58	6.02	14.93	10.03	812.98	150.80	603.30	34.25	24.63	10.39	0.89	17.00
CHESC-Am-14	6.80	4.25	5.05	76.00	13.84	5.93	14.70	11.53	877.80	132.23	698.75	28.73	18.10	10.53	0.69	24.50
CHESC-Am-15	5.70	4.25	4.95	83.00	15.25	5.03	15.53	9.88	709.40	165.58	497.08	27.70	19.05	13.03	0.83	34.50
CHESC-Am-16	6.05	5.00	5.05	75.50	12.40	5.46	15.55	11.38	806.63	153.05	594.95	36.95	21.68	12.53	0.86	22.50
CHESC-Am-17	6.90	3.28	4.40	68.00	14.77	5.73	15.70	10.95	893.25	157.90	692.25	25.20	17.90	11.38	0.84	28.00
CHESC-Am-18	8.35	5.10	5.00	81.00	14.96	6.11	16.30	11.03	1024.30	149.13	804.18	44.43	26.58	10.95	0.93	28.50
CHESC-Am-19	8.15	6.10	7.10	103.50	16.21	5.46	16.65	12.40	938.73	170.90	704.43	28.45	34.95	11.86	0.91	42.00
CHESC-Am-20	8.20	5.00	4.65	87.50	15.82	6.28	18.05	11.43	938.70	196.90	650.25	42.38	49.18	10.83	0.81	36.50
CHESC-Am-21	6.10	4.80	3.95	94.00	14.05	4.69	16.58	11.35	939.90	185.60	674.43	43.58	36.30	12.65	0.78	25.50
CHESC-Am-22	5.20	4.50	4.25	52.50	15.03	4.99	14.40	9.63	837.68	165.38	623.45	25.58	23.28	12.90	0.89	25.00
CHESC-Am-23	4.13	4.95	4.50	60.00	16.07	5.84	17.50	13.08	1138.40	168.20	909.25	33.20	27.75	12.93	0.83	38.50
CHESC-Am-24	4.55	4.35	3.88	67.50	14.94	5.77	13.94	10.33	764.33	168.25	550.55	22.98	22.55	14.23	0.93	29.00
CHESC-Am-25	4.38	3.30	3.85	65.50	14.77	5.40	17.80	11.83	1038.03	180.98	805.40	31.95	19.70	14.15	0.61	28.00
CHESC-Am-26	4.73	3.53	3.13	58.00	14.86	6.09	17.90	11.20	881.80	157.58	670.83	27.18	26.23	12.40	0.61	20.00
CHESC-Am-27	4.15	3.68	3.70	50.00	15.12	5.66	14.70	9.93	750.30	138.85	567.28	24.85	19.33	13.50	0.62	21.50
CHESC-Am-28	3.85	3.60	3.20	52.00	15.09	6.18	15.30	11.08	910.40	155.78	707.73	22.28	24.63	13.75	0.69	28.00
SEm±	0.037	0.566	0.063	1.151	0.085	0.035	1.604	1.048	179.013	26.619	161.781	11.316	5.601	0.616	0.034	0.484
CD at 5%	0.103	1.590	0.178	3.231	0.238	0.099	4.501	2.942	502.394	74.706	454.033	31.759	15.721	1.729	0.097	1.359
CV (%)	0.849	17.264	2.060	2.286	0.788	0.886	17.251	13.651	31.502	27.200	37.443	51.105	34.628	6.415	6.012	2.780

PH: plant height (m), N-S (m), E-W (m), TD: trunk diameter (cm) at first branching, LL: leaf length (cm), LB: leaf breadth (cm), FL: fruit length (cm), FD: fruit diameter (cm), FW: fruit weight (g), PLW: peel weight (g), PW: pulp weight (g), SW: seed weight (g), PDW: peduncle weight (g), TSS, TA: titratable Acidity (%), Y: yield (No. of fruits/plant)

Table 3 : Correlation coefficients of 50 soursop accessions for 16 different parameters

Trait	PH	N-S	E-W	SD	LL	LB	FL	FD	FW	PLW	PW	SW	PDW	TSS	TA
PH	1														
N-S	0.39**	1													
E-W	0.573***	0.607***	1												
SD	0.587***	0.501***	0.613***	1											
LL	0.124	0.12	0.122	-0.126	1										
LB	0.26	-0.177	0.037	-0.059	-0.055	1									
FL	0.129	-0.218	0.1	0.121	-0.087	0.223	1								
FD	0.039	-0.119	0.168	0.102	-0.083	0.184	0.512***	1							
FW	0.155	-0.292*	-0.004	0.001	-0.175	0.283*	0.78***	0.678***	1						
PLW	0.195	-0.278	0.116	0.202	-0.227	0.307*	0.641***	0.499***	0.778***	1					
PW	0.123	-0.294*	-0.039	-0.057	-0.16	0.265	0.754***	0.685***	0.991***	0.7***	1				
SW	0.259	-0.082	0.082	0.194	-0.094	0.19	0.587***	0.28*	0.596***	0.371**	0.556***	1			
PDW	0.26	-0.013	0.187	0.211	-0.061	0.14	0.668***	0.476***	0.707***	0.658***	0.643***	0.674***	1		
TSS	-0.457***	0.077	-0.355*	-0.342*	-0.19	-0.405**	-0.328*	-0.226	-0.353*	-0.588***	-0.287*	-0.233	-0.334*	1	
TA	0.503***	0.153	0.405**	0.281*	0.139	0.297*	0.091	0.009	0.195	0.204	0.165	0.368**	0.212	-0.49***	1
Y	0.228	0.156	0.129	0.063	0.154	0.092	0.153	-0.016	0.164	0.311*	0.136	-0.034	0.136	-0.153	0.135

traits, suggesting that its favourable subtropical hill climate with cooler temperature and high rainfall, and genotype × environment interactions, contributed to growth and productivity. These findings highlight the significant influence of environmental conditions on plant growth, fruit characteristics, and overall yield, while also revealing that genotypic differences are expressed differently across locations. According to Singh et al. (2025), variations in fruit traits are likely to be determined both by the genetic makeup of the genotypes and by the local conditions to which they are adapted, underscoring the critical role of the environment in shaping growth parameters.

Correlation coefficients

Correlation analysis revealed that vegetative growth traits such as plant height, canopy spread and stem diameter were strongly and positively associated, indicating that taller plants with thicker stems generally developed wider canopies (Table 3). Fruit weight showed a very strong positive correlation with all its component traits, including pulp weight, peel weight, fruit length, fruit diameter, seed weight, and peduncle weight, confirming that larger fruits consistently accumulated greater weight. A similar positive result was obtained in correlation of fruit morphological characters in avocado and mango (Muralidhara et al., 2024; Das et al. 2021). In contrast, yield per tree exhibited only moderate associations, the highest being with peel weight, suggesting a limited direct contribution of component traits to overall productivity.

Total soluble solid was negatively correlated with plant height, stem diameter, fruit weight, peel weight, peduncle weight, yield and acidity, highlighting that larger plants and heavier fruits generally had reduced sweetness. Conversely, titratable acidity was positively related to plant height, canopy spread, stem diameter, and leaf breadth, indicating that more vigorous plants tended to produce slightly more acidic fruits. The present result was confirmed by the study of Krishna et al. (2017), where they recorded a negative correlation between TSS and other parameters like yield and acidity. These findings suggest that while selection for larger fruit size favours higher component traits, it may lower TSS content, and vigorous vegetative growth may promote fruit size but compromise fruit sweetness, thus requiring a careful balance of vegetative vigour, yield components and quality traits in breeding and orchard management to meet specific market demands.

CONCLUSION

The two consecutive year evaluation of soursop accessions showed strong variability for morpho-biochemical traits with wide seasonal influence. Fruit size, pulp yield, and quality varied widely among accessions, offering ample scope for selection. In this study, accession KVKH-Am-13 was found superior for fruit length, diameter, fruit and pulp weight, while, KVKH-Am-12 for biochemical traits such as high TSS along with low acidity, and CHESC-Am-19 for yield which have potential utility in further crop improvement programme. Fruit weight was positively associated with all its component traits such as pulp, peel, length, diameter, seed, and peduncle weight whereas, yield was moderately correlated with plant height, fruit length and weight. The identified accessions enable breeding programs to develop large, high-pulp fruits while maintaining tree vigour and sweetness.

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