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ASSESSMENT OF GENETIC DIVERSITY OF COCCINIA (*COCCINIA GRANDIS* L.) GENOTYPES USING MORPHOLOGICAL TRAITS

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ABSTRACT

A study conducted to evaluate the performance of various genotypes of coccinia with 23 genotypes and two checks, at College of Horticulture, Venkataramannagudem during *kharif* season of 2022-23 with two replications in Randomized Block Design. Significant genotypic variation was observed across all parameters, indicating substantial diversity among the genotypes. Among the growth parameters, VRGIG-3 demonstrated superior performance, exhibiting the highest vine length (6.47 m), number of primary branches (27.65), chlorophyll content (48.65 SPAD values), and yield per plant (7.78 kg), as well as the highest yield per hectare (77.76 t/ha). Early flowering and faster fruit maturation were also observed with the same genotypes. In contrast, VRGIG-2 and VRGIG-16 showed the lowest performance across multiple growth and yield-related traits. VRGIG-3 also recorded the highest fruit weight (23.79 g), while VRGIG-7 had the longest fruit (9.13 cm). Biochemical analysis revealed that VRGIG-14 had the highest TSS (2.09 °Brix), VRGIG-18 had the highest protein content (13.48%), and VRGIG-22 exhibited the highest phenolic content (31.48 mg/100 g). The study highlights VRGIG-3 as a high-yielding genotype with favorable growth and fruit quality characteristics, making it a promising candidate for commercial cultivation. Conversely, genotypes like VRGIG-16 and VRGIG-22 may be less suitable due to lower performance in key traits. The findings emphasize the potential for genotype selection based on specific growth, yield, and quality traits to optimize production outcomes.

Keywords **:** *Coccinia grandis,* Genotypes, Diversity, Morphological descriptors, mean performance.

Introduction

Ivy gourd (*Coccinia grandis* L.) is one of the most important cucurbitaceous vegetable crops grown throughout the country is also known as little gourd, scarlet gourd, kundru, tondali, bimba, dondakaya (Telugu), kovakkai *etc.* It belongs to the family Cucurbitaceae in the order Violales. The crop is native to India and has chromosome number 2n = 24. Based on the edible quality of tender fruits they have been classified into 2 distinct types *i.e.,* bitter and sweet (Soundarya *et al*., 2022). The Coccinia genus comprises 30 species confined to tropical Africa, except *Coccinia grandis*, which occurs wild from Senegal east to Somalia and south to Tanzania, and also in Saudi Arabia, Yemen and India. Coccinia is native to India, especially the eastern regions, besides Orissa, Jharkhand, Chhattisgarh, Madhya Pradesh, Gujarat, Maharashtra and Andhra Pradesh, where a

rich gene pool is available in natural forests as well as in homestead gardens due to its wider adaptability to adverse climatic conditions (Yadav *et al.,* 2024). One species *i.e., Coccinia grandis* (Syn. *Coccinia indica*) is extensively cultivated in India, Myanmar, Srilanka and Malaysia, known as a poor man's vegetable.

Coccinia is a valuable but underutilized dioecious cucurbit. This plant exhibits aggressive climbing or prostrate growth, characterized by long tuberous roots. Its fruits are initially smooth and bright green with white stripes, turning bright scarlet upon ripening. Despite its dioecious nature, where male and female flowers are borne on separate plants, female ivy gourd plants can produce parthenocarpic fruits, allowing for fruit development without fertilization. This trait can be advantageous for cultivation. Propagation methods include seeds, cuttings, and tuberous roots. However, seed propagation is less common due to the presence of approximately 50% male plants, which limits the yield of female fruit-bearing plants. As a result, vegetative methods like cuttings and tuber propagation are often preferred, ensuring a more consistent production of desirable fruits. Expanding knowledge and practices around propagation and cultivation techniques could further enhance the production of this valuable crop. In India, this is widely grown in states like Karnataka, Tamil Nadu, Kerala, Maharashtra, Andhra Pradesh, Gujarat, Telangana and West Bengal. The fruit is typically harvested when it is young and tender and can be cooked in a variety of ways, such as stir-frying, boiling, or pickling. It is a good source of vitamins, antioxidants and also contains iron, calcium, zinc besides it can also be used for various preparations of salads and mixed vegetables (Harine S, 2017). It is widely used in the traditional treatment of diabetes, bronchitis, skin disorders, small pox, ring worm, scabies, ulcers, gonorrhoea, constipation, insect bites, allergy, eye infections, gonorrhoea, syphilis, liver weakness, fever and prescribed in traditional medicine for different ailments; widely used in Ayurvedic, Unani and Siddha practice in the Indian subcontinent. It also has hypolipidemic, antimutagenic, hypoglycemic and anti-inflammatory activities (Kumar *et al.,* 2019).

Morphological characterization of germplasm not only helps in the identification of lines with unique characteristics but also in the planning of inheritance studies. But very little information is available on the genetic diversity in Indian ivy gourd species. In this present study, 25 genotypes including two checks have been characterized morphologically as per NBPGR descriptors.

Genetic diversity plays a crucial role in enhancing crop improvement through heritable traits. Understanding the nature and degree of divergence within existing germplasm is vital for selecting suitable parental combinations to create heterotic hybrids, as highlighted by Mahalanobis in 1936. Ivy gourd, known for its commercial, nutritional, and medicinal value, is an important indigenous vegetable. Improving this crop is essential for both promoting its cultivation and expanding its growing area. To support this effort, various genotypes of ivy gourd have been collected and evaluated in the Godavari zone of Andhra Pradesh. This evaluation will help identify promising genotypes that can contribute to better yields and resilience, ultimately aiding in the broader adoption of this valuable crop.

Material and Methods

The experiment was conducted at College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari District. It was conducted during *kharif* season 2022-23 and laid out in Randomized Block design replicated twice. Total twenty-five ivy gourd genotypes including two check varieties were evaluated for growth yield and yield attributes. Twenty-three genotypes were collected from different places in Andhra Pradesh and south Indian states *i.e.,* Tamila Nadu, Karnataka and Orissa checks from CHES, Bhubaneshwar. The experimental site was well prepared, cultural practices include mulching, training, pruning, weeding, irrigation, fertilizer application and plant protection measures were followed for the healthy growth of the crop. Observations on growth parameters were recorded upto 6 months of planting. Data on yield and yield attributes were collected at appropriate stages which was subjected to statistical analysis adopting standard statistical procedure.

Representation of morphological descriptors studied:

Character		**Visual description**		
Leaf shape	**:**			
		Tri lobate	Penta lobate	Multistage

Leaf apex :

Acute Acuminate Retuse

Leaf base :

Deeply lobate Slightly lobate Sagittate

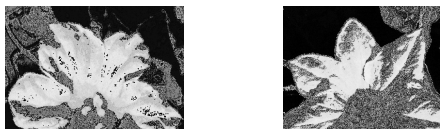
Leaf margin :

Entire Serrate

Leaf dissection :

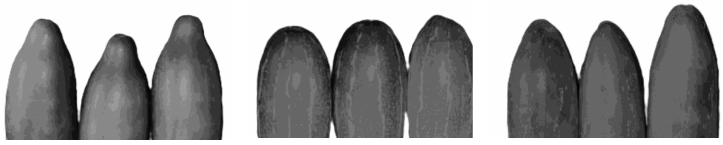
Present Absent

Petal shape :



Round Acute

Predominant fruit shape at peduncle end :

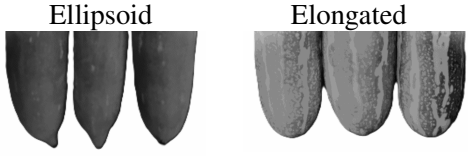


Necked Round Obtuse

Fruit shape :

Ellipsoid Elongated Cylindrical

Fruit beak :



Present Absent

Results and Discussion

Morphological characterization

Morphological variation was analyzed for twenty-five genotypes of ivy gourd and the results of all important descriptors are explained below and represented in Table 1, Table 2 and Table 3.

Within the genotypes of ivy gourd under study, ten genotypes *i.e.,* VRGIG-2, VRGIG-4, VRGIG-5, VRGIG-11, VRGIG-16, VRGIG-19, VRGIG-20, VRGIG-22, VRGIG-23 and Arka Neelachal Kunki (check) were observed trilobed leaf shape; whereas eleven genotypes *i.e.,* VRGIG-7, VRGIG-8, VRGIG-10, VRGIG-12, VRGIG-13, VRGIG-14, VRGIG-15, VRGIG-17, VRGIG-18, VRGIG-21 and Arka Neelachal Sabuja (check) were showed multistage leaf shape, three genotypes *i.e.,* VRGIG-1, VRGIG-3 and VRGIG-6 were Penta lobate, only one genotype *i.e.,* VRGIG-9 which was not lobed.

Leaf apex shape was acute for all the genotypes except five, which are Retuse shaped *i.e.,* VRGIG-9, VRGIG-11, VRGIG-14, VRGIG-16 and VRGIG-22.

Leaf base was slightly lobate for genotypes VRGIG-2, VRGIG-5, VRGIG-6, VRGIG-16, VRGIG-

18, VRGIG-19 and Arka Neelachal Kunki (check) and sagittate in genotypes VRGIG-4, 20 and VRGIG-22; whereas remaining fifteen genotypes were deeply lobate.

Among all the genotypes twenty-three were serrate leaf margins whereas VRGIG-9 and VRGIG-16 were with entire leaf margin type.

Leaf dissection was present for sixteen genotypes, whereas nine genotypes *i.e.,* VRGIG-2, VRGIG-4, VRGIG-5, VRGIG-9, VRGIG-11, VRGIG-16, VRGIG-22, VRGIG-23 and Arka Neelachal Kunki (check) had shown absence of leaf dissection.

Petal shape was acute for all the genotypes, except Arka Neelachal Sabuja (check) which was observed round shaped petals. whereas for all the genotypes, Petaloid sepals were present, sepal arrangement was close to corolla tube, corolla pubescence was high and anthers were absent.

Within twenty five genotypes, thirteen genotypes *i.e.,* VRGIG-6, VRGIG-7, VRGIG-8, VRGIG-10, VRGIG-12, VRGIG-13, VRGIG-14, VRGIG-15, VRGIG-16, VRGIG-18, VRGIG-21, VRGIG-23 and Arka Neelachal Sabuja (check) were observed necked predominant fruit shape at peduncle end, obtuse shape was observed in nine genotypes *i.e.,* VRGIG-1, VRGIG-2, VRGIG-3, VRGIG- 4, VRGIG-5, VRGIG-9, VRGIG-11, VRGIG-20 and Arka Neelachal Kunki (check) whereas, round shape was observed in genotypes VRGIG-17, VRGIG-19 and VRGIG-22. Cylindrical fruit shape was observed in VRGIG-7. VRGIG-2, VRGIG-9, VRGIG-17 and VRGIG-22 were ellipsoid fruit shaped; whereas, remaining genotypes were elongated fruit shaped.

Predominant fruit skin color was observed green in thirteen genotypes *i.e.,* VRGIG-1 to VRGIG-7, VRGIG-9, VRGIG-17, VRGIG-18, VRGIG-20, VRGIG-22 and Arka Neelachal Kunki (check) and remaining genotypes observed dark green skin color. Speckled fruit skin pattern was observed in genotypes VRGIG-1, VRGIG-3, VRGIG-11, VRGIG-15, VRGIG-16, VRGIG-23 and Arka Neelachal Sabuja (check); striped skin pattern was observed in genotypes VRGIG-2, VRGIG-4, VRGIG-5, VRGIG-6, VRGIG-9, VRGIG-17, VRGIG-18, VRGIG-19, VRGIG-20, VRGIG-22 and Arka Neelachal Kunki (check). Spotted skin pattern was observed in genotype VRGIG-7, whereas no skin pattern was observed in genotypes VRGIG-8, VRGIG-10, VRGIG-12, VRGIG-13, VRGIG-14 and VRGIG-21.

Fruit beak was present and small in genotypes VRGIG-1, VRGIG-3, VRGIG-4, VRGIG-8, VRGIG-12, VRGIG-16, VRGIG-20, VRGIG-23 and Arka Neelachal Sabuja (check), it was absent in remaining genotypes. Fruit taste of all genotypes was non-bitter except for genotype VRGIG-22 which was bitter in taste which may be due to presence of cucurbitacins.

Mean performance

The analysis of the mean performance of different genotypes reveals significant diversity across the growth, flowering, fruiting, and biochemical traits studied. Here's a detailed description of the findings:

The data on vegetative parameters (Table 4.) revealed that, the genotype VRGIG-3 recorded highest vine length (6.47 m), highest number of primary branches (27.65), highest chlorophyll content (48.65) while, VRGIG-17 recorded the highest internodal length (11.4 cm), VRGIG-9 had the largest leaf area (62.48 cm²). The longest petiole (6.36 cm) was found in VRGIG-10, which is likely associated with better leaf positioning and photosynthesis efficiency, while VRGIG-12 had the shortest petiole (2.56 cm). Whereas shortest vine length (3.64 m), lesser number of primary branches (8.56) was observed in VRGIG-2. VRGIG-22 had the smallest leaf area (35.65 cm²). These results are in accordance with Panigrahi *et al*. (2015), Bharathi and Madan (2020), Jitendra *et al*. (2020), Saikia *et al*. (2017), Hitesh *et al*. (2012) and Soundarya *et al*. (2022) in ivy gourd.

While flowering behavior and fruit maturity, VRGIG-3 had the lowest node number (7.33) for the first female flower appearance, indicating early flowering, earlier days to first female flower appearance (33.68 days), earliest 50% flowering (39.80 days), shortest time from fruit set to maturity (7.71 days), highest fruit weight (23.79 g), which indicates fast fruit development, longest fruit (9.13 cm) was observed in VRGIG-7, fruit diameter was high in VRGIG-11 (2.61 cm). In contrast, VRGIG-6 had the highest node number (23.56), VRGIG-22 recorded longer (49.33 days) days to first female flower appearance, days to 50% flowering (54.45 days), shortest fruit (4.28 cm). While VRGIG-12 took the longer days (11.12 days) to fruit set to maturity, while VRGIG-16 had the lightest fruit (11.44 g) and VRGIG-7 had the smallest fruit diameter (1.5 cm). Consent data was represented in Table 5., the Similar trend of results was also reported by Panigrahi *et al*. (2015), Bharathi and Madan (2020), Saikia *et al*. (2017) and Hitesh *et al*. (2012), Soundarya *et al*. (2022) in ivy gourd, Jayanth *et al*. (2022) in snake gourd.

As per the data presented in Table 6. For biochemical composition we can justify that, the TSS ^{o}B (Total Soluble Solids) highest was recorded in VRGIG-14 (2.09 °Brix), which is an indicator of better

sugar content and potentially better taste. VRGIG-6 recorded the highest acidity percentage (0.83%), possibly influencing the flavor profile of the fruit. Arka Neelachal Sabuja exhibited the highest ascorbic acid content (16.35 mg/100 g), which may indicate superior nutritional quality. VRGIG-18 had the highest total protein content (13.48%), suggesting potential nutritional benefits and VRGIG-22 exhibited the highest total phenolic content (31.48 mg/100 g), which could be associated with antioxidant properties. These results are supported by Hitesh *et al*. (2012), Bharathi and Madan (2020), Jitendra *et al*. (2020) and Soundarya *et al*. (2022) in ivy gourd.

The data showed from Table 6. that VRGIG-3 consistently outperforms over checks in terms of productivity. It had the highest number of fruits per plant, with an average of 391.75, highest yield per plant (7.78 kg), yield per hectare (77.76 t/ha), which demonstrates its ability to deliver high productivity under field conditions. In contrast, VRGIG-16 showed lower performance across all measures. It had the lowest number of fruits per plant 127.15, 1.97 kg yield per plant, and its yield per hectare was just 19.63 t/ha, making it the least productive variety in this comparison. These results are in accordance with Panigrahi *et al*. (2015), Bharathi and Madan (2020), Jitendra *et al*. (2020), Saikia *et al*. (2017), Hitesh *et al*. (2012) and Soundarya *et al*. (2022) in ivy gourd, Jayanth *et al*. (2022) in snake gourd.

Conclusion

The results concluded that, VRGIG-3 stands out as a high-performing genotype across multiple traits, including growth, early flowering, fruit characteristics, biochemical quality, and yield which is superior over checks. It has highest vine length, branch number, chlorophyll content, fruit weight, and yield, making it a strong candidate for cultivation with potential for high productivity. VRGIG-18 appears promising in terms of its protein content, while VRGIG-6 may be valued for its higher acidity and potential flavor profile. This analysis highlights the substantial diversity among genotypes and can serve as a guide for selecting the most appropriate genotypes for specific growth conditions, desired fruit characteristics, and yield potential.

Table 1 : Leaf descriptor parameters under study

Genotype	Leaf shape	Leaf apex	Leaf base	Leaf margins	Leaf dissection
VRGIG-1	Penta lobate	Acute	Deeply lobate	Serrate	Present
VRGIG-2	Trilobed	Acute	Slightly lobate	Serrate	Absent
VRGIG-3	Penta lobate	Acute	Deeply lobate	Serrate	Present
VRGIG-4	Trilobed	Acute	Sagittate	Serrate	Absent
VRGIG-5	Trilobed	Acute	Slightly lobate	Serrate	Absent
VRGIG-6	Penta lobate	Acute	Slightly lobate	Serrate	Present
VRGIG-7	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-8	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-9	Not lobed	Retuse	Deeply lobate	Entire	Absent
VRGIG-10	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-11	Trilobed	Retuse	Deeply lobate	Serrate	Absent
VRGIG-12	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-13	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-14	Multistage	Retuse	Deeply lobate	Serrate	Present
VRGIG-15	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-16	Trilobed	Retuse	Slightly lobate	Entire	Absent
VRGIG-17	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-18	Multistage	Acute	Slightly lobate	Serrate	Present
VRGIG-19	Trilobed	Acute	Slightly lobate	Serrate	Present
VRGIG-20	Trilobed	Acute	Sagittate	Serrate	Present
VRGIG-21	Multistage	Acute	Deeply lobate	Serrate	Present
VRGIG-22	Trilobed	Retuse	Sagittate	Serrate	Absent
VRGIG-23	Trilobed	Acute	Deeply lobate	Serrate	Absent
Arka Neelachal Sabuja	Multistage	Acute	Deeply lobate	Serrate	Present
Arka Neelachal Kunki	Trilobed	Acute	Slightly lobate	Serrate	Absent

Table 2 : Flower descriptor parameters under study

Genotype	Petal shape	Petaloid sepals	Sepal arrangement	Corolla pubescence	Anther
VRGIG-1	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-2	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-3	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-4	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-5	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-6	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-7	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-8	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-9	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-10	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-11	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-12	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-13	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-14	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-15	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-16	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-17	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-18	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-19	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-20	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-21	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-22	Acute	Present	Close to the corolla tube	High	Absent
VRGIG-23	Acute	Present	Close to the corolla tube	High	Absent
Arka Neelachal Sabuja	Round	Present	Close to the corolla tube	High	Absent
Arka Neelachal Kunki	Acute	Present	Close to the corolla tube	High	Absent

Table 3 : Fruit morphology descriptor parameters under study

Genotype	Predominant fruit shape at peduncle end	Fruit shape	Predominant fruit skin colour	Fruit skin pattern	Fruit beak	Beak nature	Taste
VRGIG-1	Obtuse	Elongated	Green	Speckled	Present	Small	Non bitter
VRGIG-2	Obtuse	Ellipsoid	Green	Striped	Absent	-	Non bitter
VRGIG-3	Obtuse	Elongated	Green	Speckled	Present	Small	Non bitter
VRGIG-4	Obtuse	Elongated	Green	Striped	Present	Small	Non bitter
VRGIG-5	Obtuse	Elongated	Green	Striped	Absent	-	Non bitter
VRGIG-6	Necked	Elongated	Green	Striped	Absent	-	Non bitter
VRGIG-7	Necked	Cylindrical	Green	Spotted	Absent	-	Non bitter
VRGIG-8	Necked	Elongated	Dark Green	-	Present	Small	Non bitter
VRGIG-9	Obtuse	Ellipsoid	Green	Striped	Absent	-	Non bitter
VRGIG-10	Necked	Elongated	Dark Green	-	Absent	-	Non bitter
VRGIG-11	Obtuse	Elongated	Dark Green	Speckled	Absent	-	Non bitter
VRGIG-12	Necked	Elongated	Dark Green	-	Present	Small	Non bitter
VRGIG-13	Necked	Elongated	Dark Green	-	Absent	-	Non bitter
VRGIG-14	Necked	Elongated	Dark Green	-	Absent	-	Non bitter
VRGIG-15	Necked	Elongated	Dark Green	Speckled	Absent	-	Non bitter
VRGIG-16	Necked	Elongated	Dark Green	Speckled	Present	Small	Non bitter
VRGIG-17	Round	Ellipsoid	Green	Striped	Absent	-	Non bitter
VRGIG-18	Necked	Elongated	Green	Striped	Absent	-	Non bitter
VRGIG-19	Round	Elongated	Dark Green	Striped	Absent	-	Non bitter
VRGIG-20	Obtuse	Elongated	Green	Striped	Present	Small	Non bitter
VRGIG-21	Necked	Elongated	Dark Green	-	Absent	-	Non bitter
VRGIG-22	Round	Ellipsoid	Green	Striped	Absent	-	Bitter
VRGIG-23	Necked	Elongated	Dark Green	Speckled	Present	Small	Non bitter
Arka Neelachal Sabuja	Necked	Elongated	Dark Green	Speckled	Present	Small	Non bitter
Arka Neelachal Kunki	Obtuse	Elongated	Green	Striped	Absent	-	Non bitter

Table 4 : Mean performance of vegetative parameters

GENOYPES	VL	INL	NPB	LA	PL	CLC
VRGIG-1	5.74	8.52	20.51	55.56	4.49	46.92
VRGIG-2	3.64	5.59	8.56	59.32	3.24	28.45
VRGIG-3	6.47	9.40	27.65	42.29	3.94	48.65
VRGIG-4	5.30	8.57	21.42	43.59	3.47	40.31
VRGIG-5	3.73	6.12	9.09	47.34	3.21	37.11
VRGIG-6	4.06	7.56	12.43	53.24	3.22	45.48
VRGIG-7	4.66	8.28	22.47	39.02	4.88	36.62
VRGIG-8	4.77	6.36	17.31	50.72	3.05	43.66
VRGIG-9	3.84	7.05	9.58	62.48	3.72	42.3
VRGIG-10	4.91	7.99	20.54	45.94	6.36	44.92
VRGIG-11	5.14	9.30	19.93	38.24	3.41	47.08
VRGIG-12	3.87	7.97	9.64	53.62	2.56	43.22
VRGIG-13	4.94	6.35	19.56	62.05	3.66	31.68
VRGIG-14	4.59	7.95	19.04	58.76	3.39	40.44
VRGIG-15	3.84	8.38	9.55	43.80	2.66	32.87
VRGIG-16	4.08	6.80	10.99	43.62	3.21	29.66
VRGIG-17	5.37	11.40	22.97	39.17	3.75	46.97
VRGIG-18	5.57	8.21	23.42	46.34	3.92	42.9
VRGIG-19	5.42	8.46	21.46	58.06	4.56	35.42
VRGIG-20	5.33	8.87	19.91	47.14	4.54	35.61
VRGIG-21	4.85	7.95	21.39	46.03	4.24	33.52
VRGIG-22	3.95	7.46	10.60	35.65	3.21	41.30
VRGIG-23	4.12	7.16	11.19	47.49	3.54	35.76
ARKA NEELANCHAL SABUJA	5.26	7.54	19.26	51.49	3.54	40.79
ARKA NEELANCHAL KUNKI	5.3	8.17	21.22	58.61	3.22	40.78
AVERAGE Mean	**4.75**	**7.89**	**17.19**	**49.18**	**3.72**	**39.69**
SE(m) ±	0.07	0.47	0.73	1.34	0.43	1.50
C.D. 5%	0.19	1.37	2.13	3.92	1.27	4.38
C.D. 1%	0.26	1.85	2.89	5.31	1.72	5.94
Range Lowest	3.64	5.59	8.56	35.65	2.56	28.45
Range Highest	6.47	11.40	27.65	62.48	6.36	48.65

VL Vine length (m) **INL** Internodal length (cm) **NPB** Number of primary branches
LA Leaf area (cm^2) **PL** Petiole length (cm) **CLC** Chlorophyll content (SPAD values)

Table 5 : Mean performance of Flower and fruit characters

GENOYPES	NFFA	DFFA	DFF	DFFM	FL	FW	FD
VRGIG-1	12.05	35.88	44.24	10.46	8.75	21.65	2.31
VRGIG-2	15.67	38.46	43.50	9.42	6.11	17.63	2.33
VRGIG-3	7.33	33.68	39.80	7.71	7.15	23.79	2.25
VRGIG-4	16.16	40.51	44.40	9.33	7.85	19.85	2.28
VRGIG-5	17.66	40.78	48.25	8.89	6.63	15.8	2.15
VRGIG-6	23.56	44.57	52.41	8.91	6.21	14.66	1.86
VRGIG-7	11.44	40.11	49.85	8.55	9.13	17.44	1.50
VRGIG-8	19.19	38.37	45.35	9.66	7.45	18.45	2.06
VRGIG-9	15.50	48.53	49.71	8.25	4.63	11.56	1.92
VRGIG-10	23.26	46.72	51.80	8.95	7.45	16.06	2.06
VRGIG-11	12.11	44.92	53.50	8.83	5.75	23.20	2.61
VRGIG-12	12.50	41.36	49.10	11.12	6.35	16.19	2.01
VRGIG-13	12.10	43.22	50.65	9.55	8.25	18.39	2.03
VRGIG-14	12.73	43.42	49.15	9.22	7.05	20.40	2.24
VRGIG-15	10.26	40.37	49.21	9.55	7.55	18.56	2.07
VRGIG-16	15.47	45.04	51.10	9.11	5.28	11.44	1.78
VRGIG-17	8.72	37.46	44.30	8.82	4.99	22.17	2.26
VRGIG-18	12.75	39.42	47.71	8.48	8.18	19.08	2.09
VRGIG-19	12.88	41.47	48.20	10.31	8.23	19.56	2.2
VRGIG-20	16.92	43.66	49.92	10.12	7.71	19.01	2.14

VRGIG-21	11.95	42.21	49.35	9.11	6.85	16.94	2.15
VRGIG-22	22.21	49.33	54.45	10.42	4.28	12.72	2.22
VRGIG-23	13.55	41.71	49.61	9.18	6.75	15.83	1.77
ARKA NEELANCHAL SABUJA	11.3	37.84	49.82	8.36	5.45	16.1	2.51
ARKA NEELANCHAL KUNKI	11.53	38.73	48.22	8.20	7.69	16.27	2.17
AVERAGE Mean	**14.35**	**41.51**	**48.54**	**9.21**	**6.87**	**17.71**	**2.12**
SE(m) ±	1.61	1.75	1.76	0.57	0.30	1.27	0.12
C.D. 5%	4.71	5.10	5.13	1.67	0.86	3.72	0.36
C.D. 1%	6.38	6.91	6.95	2.27	1.17	5.04	0.49
Range Lowest	7.33	33.68	39.80	7.71	4.28	11.44	1.50
Range Highest	23.56	49.33	54.45	11.12	9.13	23.79	2.61

NFFA Node at which first female flower appears **DFFA** Days taken for first female flower appearance
DFF Days taken for 50% flowering **DFFM** Days taken from fruit set to maturity
FL Fruit length (cm) **FW** Fruit weight (g)
FD Fruit diameter (cm)

Table 6 : Mean performance of Biochemical characters

GENOYPES	TSS	Acidity (%)	AA	TP	TPH
VRGIG-1	1.68	0.62	11.40	11.35	15.91
VRGIG-2	1.85	0.30	11.10	9.55	14.61
VRGIG-3	1.90	0.49	9.54	9.56	17.07
VRGIG-4	1.33	0.45	15.03	11.42	14.39
VRGIG-5	1.86	0.32	16.12	10.93	14.37
VRGIG-6	1.54	0.83	11.08	11.47	12.75
VRGIG-7	1.67	0.33	14.73	12.79	13.79
VRGIG-8	1.60	0.57	12.83	10.42	15.19
VRGIG-9	1.78	0.53	14.47	10.08	18.01
VRGIG-10	1.71	0.42	12.95	9.07	14.30
VRGIG-11	1.92	0.40	13.09	10.41	12.79
VRGIG-12	1.69	0.69	11.04	11.58	13.69
VRGIG-13	1.72	0.50	12.58	10.33	15.76
VRGIG-14	2.09	0.49	15.09	10.47	17.59
VRGIG-15	1.68	0.31	14.62	9.94	11.18
VRGIG-16	1.22	0.75	12.02	12.76	10.63
VRGIG-17	1.68	0.47	13.49	12.62	16.85
VRGIG-18	1.83	0.74	15.34	13.48	13.56
VRGIG-19	1.20	0.54	11.37	11.53	13.86
VRGIG-20	1.35	0.42	11.54	12.40	15.54
VRGIG-21	1.39	0.42	15.07	11.58	18.50
VRGIG-22	1.15	0.49	7.50	8.34	31.64
VRGIG-23	1.34	0.48	13.71	9.24	15.90
ARKA NEELANCHAL SABUJA	1.63	0.53	16.35	11.33	13.62
ARKA NEELANCHAL KUNKI	1.71	0.58	15.35	10.53	14.04
AVERAGE Mean	**1.62**	**0.50**	**13.09**	**10.92**	**15.42**
SE(m) ±	0.34	0.07	1.55	1.10	1.27
C.D. 5%	NS	0.21	4.53	NS	3.72
C.D. 1%	NS	0.28	6.14	NS	5.04
Range Lowest	1.15	0.30	7.50	8.34	10.63
Range Highest	2.09	0.83	16.35	13.48	31.64

TSS Total soluble solids (Brix) **AA** Ascorbic acid (mg $100g^{-1}$)
TP Total protein (%) **TPH** Total phenols (mg/100g)

Table 7 : Mean performance of Yield and yield attributes

GENOYPES	Number of fruits per plant	Yield per plant (kg)	Yield t/ha
VRGIG-1	285.52	6.18	61.82
VRGIG-2	151.43	2.67	26.70

VRGIG-3	391.75	7.78	77.76
VRGIG-4	206.50	4.92	49.13
VRGIG-5	264.56	4.18	41.80
VRGIG-6	186.46	2.74	27.34
VRGIG-7	168.30	2.94	29.35
VRGIG-8	251.57	4.65	46.42
VRGIG-9	246.43	2.85	28.49
VRGIG-10	284.70	4.57	45.72
VRGIG-11	202.93	4.71	47.08
VRGIG-12	158.05	2.56	25.59
VRGIG-13	239.75	4.41	44.09
VRGIG-14	213.29	4.35	43.51
VRGIG-15	171.56	2.36	23.59
VRGIG-16	127.15	1.97	19.63
VRGIG-17	259.97	5.09	50.85
VRGIG-18	256.77	4.91	48.99
VRGIG-19	187.14	4.15	41.49
VRGIG-20	265.71	5.05	50.51
VRGIG-21	276.46	4.69	46.83
VRGIG-22	175.19	2.23	22.29
VRGIG-23	158.92	2.52	25.16
ARKA NEELANCHAL SABUJA	362.02	5.83	58.29
ARKA NEELANCHAL KUNKI	363.51	5.91	59.15
AVERAGE Mean	**234.22**	**4.17**	**41.66**
SE(m) ±	2.17	0.04	0.40
C.D. 5%	6.32	0.12	1.15
C.D. 1%	8.57	0.16	1.57
Range Lowest	127.15	1.97	19.63
Range Highest	391.75	7.78	77.76

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