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EVALUATION OF IVY GOURD (*COCCINIA GRANDIS* L.) GENOTYPES FOR GROWTH, YIELD AND QUALITY IN GODAVARI ZONE OF ANDHRA PRADESH INDIA

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ABSTRACT

This study was conducted at college of horticulture, Dr. Y. S. R. Horticultural university, in late *rabi* season of 2022-2023 to evaluate the growth, yield and quality traits of different genotypes of ivy gourd (*Coccinia grandis* L.), with a particular focus on performance in comparison to standard check varieties (Arka Neelachal Sabuja and Arka Neelachal Kunkhi). A significant variation in growth characteristics, yield potential, and nutritional quality was observed among the genotypes. VRGIG-3 emerged as the most superior genotype, exhibiting the highest vine length (6.57 m), number of primary branches (26.95), chlorophyll content (45.37 SPAD values), and days taken to 50% flowering (33.13 days). It also outperformed other genotypes in terms of fruit weight (24.02 g), yield per plant (8.19 kg) and yield per plot (83.63 kg). VRGIG-3 showed an excellent balance between growth and productivity, though it had lower ascorbic acid content compared to the check variety Arka Neelachal Sabuja (19.44 mg/100 g^{-1}). Genotypes like VRGIG-14 and VRGIG-4 excelled in qualitative traits such as total soluble solids (1.95 ^{o}B) and protein content (11.97%). These findings provide valuable insights for the selection of high-yielding, high-quality genotypes of ivy gourd for both commercial production and nutritional purposes.

***Key words*:** Mean performance, *Coccinia grandis*, Genetic diversity, Growth, Yield, Quality

Introduction

Ivy gourd (*Coccinia grandis* L.), also known by several common names such as little gourd, scarlet gourd, kundru, tondali, and bimba, is a versatile and underutilized crop in the family Cucurbitaceae. Native to tropical Asia, particularly India, *Coccinia grandis* is widely cultivated in regions like India, Myanmar, Sri Lanka, and Malaysia (Chandrashekara *et al.*, 2015). The plant thrives in hot and humid climates and is a popular vegetable across many parts of India, especially in states such as Karnataka, Tamil Nadu, Kerala, Maharashtra, Andhra Pradesh, Gujarat, Telangana, and West Bengal (Prakash *et al.*, 2017).

This dioecious species (2n = 24 chromosomes) is characterized by its aggressive climbing habit and long tuberous roots. The immature fruits are bright green with white stripes, turning scarlet upon ripening (Soundarya *et al.*, 2022). Coccinia fruits are typically consumed in their tender, immature state, either fried, boiled, or blanched, while the young shoots and leaves are also

Table 1: Details of Ivy gourd genotypes collected.

S. No.	Genotype	Source of genotype
1.	VRG-IG-1	Srikakulam, Andhra Pradesh
2.	VRG-IG-3	Madiki, Andhra Pradesh
3.	VRG-IG-4	Kumata, Karnataka
4.	VRG-IG-5	Ippaguda, Orissa
5.	VRG-IG-8	Venkataramannagudem, Andhra Pradesh
6.	VRG-IG-10	Kasinagar, Orissa
7.	VRG-IG-11	Guntur, Andhra Pradesh
8.	VRG-IG-13	Jangareddygudem, Andhra Pradesh
9.	VRG-IG-14	Srikakulam, Andhra Pradesh
10.	VRG-IG-17	Raipur, Chhattisgarh
11.	VRG-IG-18	Raipur, Chhattisgarh
12.	VRG-IG-19	Trichy, Tamil Nadu
13.	VRG-IG-20	Trichy, Tamil Nadu
14.	VRG-IG-21	Srikakulam, Andhra Pradesh
15.	ARKA NEELANCHAL SABUJA	CHES, Bhubaneswar
16.	ARKA NEELANCHAL KUNKI	CHES, Bhubaneswar

consumed (Ravindran, 2004). The flesh of the fruit is processed into dehydrated chips, which can be stored for extended periods (Nayak and Mathur, 2012). The plant has been recognized not only for its nutritional benefits but also for its medicinal properties, with uses ranging from diabetes management to antimicrobial treatment (Patel *et al.*, 2015).

Despite its potential, the crop is underexploited in many regions, and its cultivation remains limited due to challenges such as its dioecious nature, which results in a 50% male plant population that hinders successful seed propagation (Pandey, 2008). While it can also be propagated via cuttings and tuberous roots, these methods are not always commercially viable (Choudhury and Kaur, 2014). Additionally, the crop's growth is restricted to well-drained, sandy loam soils, and it is highly susceptible to waterlogging, making soil drainage a critical factor for successful cultivation (Prakash *et al.*, 2017).

The importance of improving *Coccinia grandis* for better yield, disease resistance, and broader adaptation has gained attention in recent years. There is increasing interest in expanding the area under cultivation due to

Table 2: Mean performance of vegetative and flowering characters.

GENOYPES	VL	INL	NPB	LA	PL	CLC	NFFA	DFFA	DFF	DFFM
VRGIG-1	5.85	9.35	21.19	45.09	5.07	42.79	11.2	34.25	40.91	10.02
VRGIG-3	6.57	10.90	26.95	73.89	3.69	45.37	7.13	31.70	33.13	7.64
VRGIG-4	5.44	8.50	23.04	42.08	3.81	40.16	15.25	38.38	41.28	10.60
VRGIG-5	5.29	7.40	22.26	55.76	5.83	33.69	17.30	40.08	45.13	7.86
VRGIG-8	6.08	8.05	19.06	60.96	3.92	39.51	17.72	36.12	40.96	9.26
VRGIG-10	5.15	9.90	21.80	38.34	5.97	40.98	21.21	43.00	47.46	8.12
VRGIG-11	5.30	10.80	21.81	54.61	3.54	44.78	11.24	41.88	49.11	8.50
VRGIG-13	5.85	7.05	21.68	36.41	4.28	33.61	11.44	40.47	49.27	9.04
VRGIG-14	5.69	6.50	20.19	55.33	3.35	37.38	11.29	41.17	45.88	8.58
VRGIG-17	5.13	8.3	10.49	66.26	3.88	32.94	12.93	34.71	41.08	8.06
VRGIG-18	5.63	8.53	22.84	53.24	4.37	43.86	13.86	37.23	45.54	8.41
VRGIG-19	5.45	10.55	22.99	47.89	4.36	40.06	11.38	37.08	44.96	9.73
VRGIG-20	5.23	10.05	21.68	50.57	4.93	34.00	18.04	40.78	46.53	9.68
VRGIG-21	5.51	10.85	19.26	53.13	5.07	33.14	12.29	38.07	45.08	8.63
ARKA NEELANCHAL SABUJA	5.69	8.45	19.53	63.82	4.52	39.87	11.89	35.40	44.61	8.07
ARKA NEELANCHAL KUNKI	5.76	8.05	20.91	45.27	4.20	44.59	10.23	36.80	43.96	7.98
AVERAGE Mean	**5.60**	**8.95**	**20.98**	**52.66**	**4.42**	**39.17**	**13.40**	**37.88**	**44.05**	**8.76**
SE(m) ±	0.06	0.67	0.30	0.60	0.15	2.64	0.54	1.97	1.10	0.35
C.D. 5%	0.17	2.03	0.90	1.80	0.44	7.96	1.63	5.93	3.32	1.06
Range Lowest	5.13	6.50	10.49	36.41	3.35	32.94	7.13	30.70	33.13	7.64
Range Highest	6.57	10.90	26.95	73.89	5.97	45.37	21.21	43.00	49.27	10.60

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); **NFFA:** Node at which first female flower appears; **DFF:** Days taken for 50% flowering; **DFFA:** Days taken for first female flower appearance; **DFFM:** Days taken from fruit set to maturity

Table 3: Mean performance of fruit and yield attributes.

GENOYPES	FL	FW	FD	NFPP	YPP	YPPL	TSS	A (%)	AA	TP	TPH
VRGIG-1	8.37	21.89	2.42	312.82	6.62	66.86	1.39	0.49	11.40	11.17	12.68
VRGIG-3	7.49	24.02	2.42	437.85	8.19	83.63	1.23	0.45	8.46	6.42	11.36
VRGIG-4	8.06	20.64	2.43	247.38	4.97	51.26	1.62	0.53	15.03	11.97	10.32
VRGIG-5	6.28	15.90	2.36	297.08	4.51	46.48	1.48	0.34	16.28	11.56	14.37
VRGIG-8	7.36	17.93	2.17	279.85	4.95	50.63	1.23	0.17	15.11	6.89	15.19
VRGIG-10	7.16	16.24	2.12	310.56	4.87	49.52	1.39	0.31	11.38	6.25	14.30
VRGIG-11	6.04	19.08	2.67	206.96	4.85	49.84	1.81	0.23	14.82	8.36	12.79
VRGIG-13	8.03	18.11	1.96	259.02	4.59	48.00	1.42	0.39	13.61	10.55	15.76
VRGIG-14	7.23	19.86	2.16	236.44	4.67	45.13	1.95	0.40	18.02	8.54	17.59
VRGIG-17	5.16	17.38	2.54	294.68	5.03	50.49	1.40	0.34	15.57	11.75	7.61
VRGIG-18	8.18	18.54	2.11	274.12	4.98	51.18	1.53	0.50	16.12	11.67	9.96
VRGIG-19	8.03	21.10	2.15	230.62	4.60	48.15	1.32	0.32	12.39	10.44	13.86
VRGIG-20	7.98	19.65	2.02	282.93	5.37	56.52	1.31	0.38	13.51	10.03	15.50
VRGIG-21	7.04	16.58	2.11	331.64	5.23	53.44	1.57	0.37	17.53	10.90	18.50
ARKA NEELANCHAL SABUJA	5.81	16.44	2.37	366.27	5.86	59.87	1.62	0.29	19.44	10.94	9.79
ARKA NEELANCHAL KUNKI	8.12	18.89	2.11	337.77	6.19	63.67	1.74	0.44	13.63	10.50	11.97
AVERAGE Mean	**7.27**	**18.89**	**2.25**	**294.12**	**5.34**	**54.66**	**1.50**	**0.37**	**14.51**	**9.87**	**13.22**
SE(m) ±	0.19	0.55	0.12	2.29	0.08	0.66	0.06	0.08	0.29	0.78	0.16
C.D. 5%	0.58	1.66	0.35	6.91	0.23	1.98	0.19	NS	0.88	2.35	0.50
Range Lowest	5.16	15.90	1.96	206.96	4.51	45.13	1.23	0.17	8.46	6.25	7.61
Range Highest	8.37	24.02	2.67	437.85	8.19	83.63	1.95	0.53	19.44	11.97	18.50

FL: Fruit length (cm), **FW:** Fruit weight (g); **FD:** Fruit diameter (cm); **NFPP:** Number of fruits per plant; **YPP:** Yield per plant (kg); **YPPL:** Yield per plot (kg); **TSS:** Total soluble solids (Brix); **AA:** Ascorbic acid (mg $100g^{-1}$); **A(%):** Acidity (%) **TP:** Total proteins (%); **TPH** Total phenols (mg/$100g^{-1}$)

the crop's commercial, nutritional, and medicinal value (Mohan *et al.*, 2016). In this context, the Godavari zone in Andhra Pradesh, with its favorable climatic conditions, provides a promising area for evaluating diverse genotypes of ivy gourd. Understanding the growth, yield, and quality traits of different genotypes will be critical for advancing this crop's productivity and ensuring its successful cultivation across diverse Agro-ecosystems in India.

Materials and Methods

The experiment was carried out at the College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari District, Andhra Pradesh, during the late rabi season of 2022-23. The spacing maintained between row to row and plant to plant was 1 m and 1 m, respectively. All cultural practices and the plant protection measures were adapted uniformly to the entire treatments to raise healthy crop. The observations were recorded on five randomly selected plants from each treatment on fifteen characters *viz.*, Vine length (m), Internodal length (cm), Number of primary branches, Leaf area (cm^2), Petiole length (cm), Chlorophyll content (SPAD values), Node at which first female flower appears, Days taken for first female flower appearance, Days taken for 50% flowering, Days taken from fruit set to maturity, Fruit length (cm), Fruit weight (g), Fruit diameter (cm), Number of fruits per plant, Yield per plant (kg), Yield per plot (kg), Total soluble solids, Ascorbic acid (mg $100g^{-1}$), Total proteins (%) and Total phenols (mg/$100g^{-1}$). The experimental design used was Randomized Block Design (RBD), with two replications.

Statistical Analysis

The data collected were subjected to statistical analysis using standard methods for the Randomized Block Design as suggested by Fisher, R.A. and Yates (1963). Significant differences among genotypes for growth, yield and quality attributes were determined using Analysis of Variance (ANOVA).

Plant Material and Experimental Details

A total of 16 genotypes of ivy gourd were evaluated in this study. Of these, 14 genotypes were sourced from different regions of south India (Table 1), and the

remaining two were used as standard check varieties (Arka Neelachal Sabuja and Arka Neelachal Kunki), which were obtained from the Central Horticultural Experiment Station (CHES), Bhubaneswar. The check varieties served as a benchmark for comparing the performance of the selected genotypes.

Results and Discussion

The results of this study highlighted the considerable genetic variation in ivy gourd (*Coccinia grandis*) genotypes, particularly in growth characteristics, yield, and nutritional quality. Similar studies have reported variability in growth parameters within different genotypes of ivy gourd, making it a highly adaptable crop for diverse Agro-climatic conditions (Srinivasan *et al.,* 2017; Singh *et al.,* 2018). The *per se* performance of different genotypes of ivy gourd (coccinia) has been presented in Table 2, and Table 3.

In the present study, VRGIG-3 was the standout genotype, excelling in several growth parameters including vine length (6.57 m), internodal length (10.9 cm), and the number of primary branches (26.95). These findings corroborate with previous research that indicates that vine length and branching are important determinants of plant productivity in cucurbits (Zhou *et al.,* 2019). The higher chlorophyll content observed in VRGIG-3 (45.37 SPAD values) is indicative of enhanced photosynthetic efficiency, which likely contributes to its superior growth and yield. This is consistent with findings from Sharma *et al.,* (2021), who noted that high vine length and branch number correlate with higher fruiting potential and yield in cucurbits.

Minimum number of days taken for node at which first female flower appeared (7.13), days taken for first female flower appearance (31.70), days to 50% flowering (33.13) and days taken from fruit set to maturity (7.64) was recorded in VRGIG-3 which was superior over check varieties. Where as fruit length (8.37 cm) was highest in VRGIG-1, VRGIG-3 recorded maximum fruit weight (24.02 gm) and fruit diameter (2.67 cm) was maximum in VRGIG-11. which suggests its potential for early harvest and rapid turnover in production systems. This early maturity trait is critical for improving productivity in regions with shorter growing seasons (Verma *et al.,* 2020).

Highest number of fruits per plant (437.85), yield per plant (8.19 kg) and yield per plot (83.63 kg) was recorded in VRGIG-3 which is superior then checks and on par performance with genotype VRGIG-1. This is consistent with findings from Sharma *et al.,* (2021), who noted that high vine length and branch number correlate with higher fruiting potential and yield in cucurbits.

The evaluation of fruit quality revealed significant variation in terms of TSS (total soluble solids), ascorbic acid content, and protein content. VRGIG-14 recorded the highest TSS (1.95°Brix). This finding is in agreement with a study by Rathore *et al.,* (2019), who found that TSS content is a crucial trait for the acceptability of cucurbits as a fresh fruit. However, VRGIG-3 recorded the lowest ascorbic acid content (8.46 mg/100g), which is significantly lower than the check variety Arka Neelachal Sabuja (19.44 mg/100g). This variation in vitamin C content underscores the importance of genotype selection for nutritional attributes (Chaudhary *et al.,* 2021). On the other hand**,** VRGIG-4 showed the highest protein content (11.97%), which aligns with previous findings that indicate the nutritional value of cucurbits can be enhanced through selective breeding (Singh *et al.,* 2017).

Variation in acidity percentage and total phenol content was also observed. The acidity ranged from 0.17% to 0.53%, with VRGIG-21 showing the highest phenol content (18.50 mg/100g). Phenolic compounds are known for their antioxidant properties (Chaudhary *et al.,* 2021), suggesting that VRGIG-21 may be beneficial for functional food development.

Conclusion

The study revealed significant genetic variation among the ivy gourd (*Coccinia*) genotypes. VRGIG-3 emerged as the most promising genotype, demonstrating superior growth characteristics, high yield, early maturity, and excellent productivity, making it ideal for commercial cultivation. Although it showed lower ascorbic acid content compared to the check varieties, VRGIG-3 outperformed others in terms of vine length, number of fruits per plant, and yield per plot. Genotypes like VRGIG-14 and VRGIG-4 exhibited favorable quality traits, such as higher TSS and protein content, suggesting their potential for enhancing the nutritional profile of ivy gourd. Overall, VRGIG-3 offers the best combination of high yield and desirable growth traits, while other genotypes may be used to improve specific quality aspects in future breeding programs.

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