AGRITROPICA
Journal of Agricultural Sciences

Content is available at :
https://ejournal.unib.ac.id/jagritropica
ISSN: (Print) 2621-217X, (Online) 2621-699X
Agritropica. J. Agr. Sci. 8 (1): 14-22 May 2025

Genetic Variability and Heritability of Vegetative Growth Variables in 41 Cayenne Pepper Cultivars

Pringky Okta Saputra [1], Catur Herison [1*], Rustikawati [1], Uswatun Nurjanah[1], Dwi Wahyuni Ganefianti [1] and Sukisno [2]

1Department of Crop Production, Faculty of Agriculture, University of Bengkulu, Indonesia.
2Department of Soil Science, Faculty of Agriculture, University of Bengkulu, Indonesia.
***Corresponding Author: catur_herison@unib.ac.id**
Article info: Submitted: 2025-03-13, Accepted: 2025-06-27, Publish: 2025-06-29

ABSTRAK: This study aimed to estimate genetic and phenotypic variability, as well as heritability values, in 41 Cayenne pepper cultivars based on vegetative traits. The research was conducted from May to October 2024 at the Experimental Farm of the Faculty of Agriculture, University of Bengkulu, situated in Beringin Raya village, Bengkulu City, at an elevation of 10 m above sea level. A Randomised Complete Block Design (RCBD) was employed with a single factor consisting of 41 cultivars with three replications, each comprising 20 plants per replication. The results revealed a wide range of genetic variability for traits such as plant height, first dichotomous height, number of leaves, leaf area, leaf greenness, number of dichotomous points, canopy area, stem diameter, shoot fresh weight, and shoot dry weight. High phenotypic variability was observed across all evaluated traits. High heritability was found in the trait of first dichotomous height. Moderate heritability was observed for plant height, number of leaves, leaf greenness, number of dichotomous points, canopy area, shoot fresh weight, and shoot dry weight. Low heritability was detected in leaf area, stomatal density, and stem diameter.

Keywords: genetic variation, heritability, phenotypic variation, vegetative traits

Reference to this paper should be made as follows:
Saputra, P. O., Herison, C., Rustikawati., Nurjanah, U., Ganefianti, D. W., and Sukisno. (2025). Evaluation of Vegetative Trait Variability and Heritability in 41 Cayenne Pepper (*Capsicum annuum* L.) Cultivars. Agritropica. J. Agr. Sci. 8 (1):14-22. Doi: https://doi.org/10.31186/J.agritropica.8.1.14-22.

INTRODUCTION

Cayenne pepper (*Capsicum annuum* L.) is an important horticultural crop for the community due to its high economic value and various benefits (Wulandari, 2020). Cayenne peppers are rich in vitamin C, which acts as an antioxidant and can enhance the immune system through dietary modifications when consumed regularly (Varghese *et al.*, 2017). In 2022, Indonesia's production of Cayenne pepper reached 1,017,381.8 tons. However, this amount was insufficient to meet domestic demand, as evidenced by the import volume of 48,167.66 tons in the same year (Badan Pusat Statistik Indonesia, 2022). The demand for Cayenne pepper continues to increase annually, partly due to population growth (Badan Pusat Statistik, 2023). Therefore, efforts to enhance the productivity and quality of cayenne pepper through genetic improvement are essential to meet the growing demand for consumption and market needs.

The increase in cayenne pepper production can be achieved through the use of superior cultivars and the utilization of suboptimal lands, such as acidic soils, due to the declining availability of fertile land caused by land-use conversion (Prabowo *et al.*, 2020). The development of superior varieties is carried out through plant breeding programs, which require information on genetic variability, heritability, and the potential for genetic gain (Laila *et al.*, 2023; Deviona *et al.*, 2022). Such information serves as the foundation for identifying important heritable traits to be used in genotype selection, thereby enabling a more efficient and targeted breeding process.

Genetic parameters play a pivotal role in determining the success and direction of plant breeding programs. Plants with low genetic variability are less suitable to be used as parental lines in cultivar development due to their limited potential for genetic improvement. The greater the genetic variability, the higher the probability of obtaining superior cultivars (Martono, 2020). Another essential genetic parameter for understanding plant traits is heritability, which refers to the proportion of phenotypic variance attributable to genetic variance. Heritability values range from 0 (environmentally influenced) to 1 (genetically influenced) (Effendy *et al.*, 2018). A high heritability value indicates that the trait can be passed on to the next generation (Nilawati *et al.*, 2017).

Both genetic variability and heritability are crucial for the success of plant breeding programs. Genetic variation within plant populations allows breeders to select for desirable traits, while heritability reflects the transmission potential of these traits across generations (Acquaah, 2007). The study aimed to evaluate genetic and phenotypic variability in a population of 41 cayenne pepper cultivars and to estimate the heritability of vegetative traits.

MATERIALS AND METHODS

The research was conducted from May to October 2024 at the Experimental Farm of the Faculty of Agriculture, University of Bengkulu, situated in Beringin Raya village, Bengkulu City, at an elevation of approximately 10 meters above sea level. According to climate data from the Badan Meteologi dan Geofisika (BMKG, 2024)During the study period, the average relative humidity was 82%, the total rainfall was 163 mm, and the average daily sunshine duration was 6.6 hours. The number of rainy days recorded per month was 12 in May, 14 in June, 7 in July, 6 in August, 9 in September, and 13 in October. These data indicate fluctuations in monthly rainfall; however, overall, the climatic conditions during the study period were generally favourable for the growth of Cayenne pepper plants.

The initial soil analysis conducted at the Soil Science Laboratory of the University of Bengkulu revealed that the soil at the research site had a pH of 4.13 (strongly acidic), nitrogen (N) content of 0.37% (moderate), organic carbon (C-organic) content of 2.11% (mild), phosphorus (P) level of 4.31 ppm (very low), potassium (K) level of 0.31 me/100g (low), exchangeable aluminum (Al^{3+}) of 2.61 me/100g (high), and a cation exchange capacity (CEC) of 18.68 me/100g (moderate).

The study employed a Randomized Complete Block Design (RCBD) consisting of 41 Cayenne pepper cultivars as a single treatment factor with three replications, resulting in a total of 123 experimental units. Each experimental unit consisted of a raised bed measuring 1 m × 4 m, with plant spacing of 50 cm × 40 cm, accommodating 20 plants arranged in two rows. Five plants were selected as samples per replication, resulting in a total of 615 sample plants.

The plant materials used in this study were seeds of 41 Cayenne pepper cultivars: 'Mada', 'Baja F1', 'Lontanbar', 'Rotane', 'Locker', 'Kopay', 'Radha', 'Ateng', 'Paten', 'Dumay', 'Lokal Legum', 'CMK Lolay', 'Indrapura Reborn', 'Vitra Unggul', 'Twist 42', 'Seulawah Aceh', 'Klope Lokal Aceh', 'Awe Aceh', 'CMK Tavi', 'Simpatik 17', 'Hellboy', 'Sempurna', 'Horison', 'Anies IPB', 'Iggo', 'Andalas', 'Kawat', 'Glora', 'Ferosa', 'Bali 77', 'Lajang', 'Tenggo', 'Laris', 'Perintis', 'Landung', 'Labek', 'Caman', 'Romario', 'Aka', 'Vitra OP', and 'CK Anvi'. Other materials used included cow manure, NPK fertilizer, urea, TSP fertilizer, KCl fertilizer, insecticides, fungicides, and acaricides.

Land preparation began with ploughing using a tractor, followed by soil loosening with a hoe. The field was divided into three blocks, and raised beds measuring 4 m × 1 m were constructed with a spacing of 50 cm between beds. Cow manure at a rate of 20 tons per hectare was evenly distributed on the surface of each bed, thoroughly mixed into the soil, covered with silver-black plastic mulch, and incubated for two weeks. Planting holes were prepared in two rows per bed, with a spacing of 50 cm between rows and 40 cm within rows, one day before transplanting.

Seedling preparation was carried out using 72-cell trays. The seeds were soaked in warm water (40°C) for approximately 15 minutes and then germinated on moist tissue paper for three days. Germinated seeds were sown in a growing medium composed of a 1:1 mixture of cow manure and topsoil, and placed in the greenhouse of the Department of Agriculture, University of Bengkulu. Watering was done twice daily, in the morning and afternoon.

Transplanting was carried out by moving the seedlings to the raised beds, with 20 plants per bed. Crop maintenance included drip irrigation, fertilization, pest control, weeding, gap filling at 1 week after transplanting, removal of shoots below the first dichotomous point, and staking using 100 cm wooden stakes. Pest control was conducted weekly using diafenthiuron and profenofos, and preventively every four days using a mixture of insecticides (imidacloprid, deltamethrin, pyridaben, diafenthiuron) and fungicides (propineb, mancozeb, difenoconazole, azoxystrobin) at concentrations of 1–2 mL/L or g/L (Herison *et al.,* 2021). Weeds were manually removed on a weekly basis.

Fertilization consisted of 400 kg/ha of urea, 400 kg/ha of TSP, and 150 kg/ha of KCl. Half of the urea, along with the full doses of TSP and KCl, was applied before transplanting at a distance of 10 cm from each planting hole. The remaining urea was applied at 6 weeks after transplanting (WAT). Supplemental fertilization was carried out weekly using NPK 16-16-16, Mutiara Grower, Karate Plus Boroni, UltradaP, Power Soil, and MKP. Foliar fertilization was conducted using Gandasil D, Growmore, eco-enzyme, and MKP.

The observed variables included plant height (cm), first dichotomous height (cm), number of leaves, leaf area (cm^2), leaf greenness, number of dichotomous points, canopy area (cm^2), stomatal density (stomata/mm^2), stem diameter (mm), shoot fresh weight (g), and shoot dry weight (g). Plant height was measured using a measuring tape from the base of the stem to the highest growing point. The first dichotomous height was measured from the base of the stem to the first dichotomous branching point. The number of leaves was counted per plant. All measurements were taken after the final harvest. Leaf area was measured using the ImageJ application. Leaf greenness was assessed using a SPAD (Soil Plant Analysis Development) meter. The number of dichotomous points was counted at the final harvest. Canopy area was calculated using the ellipse formula: $\pi \times (0.5 \times L) \times (0.5 \times W)$, where L was canopy length and W was canopy width. (Herison *et al.,* 2021). Stomatal density was observed using a microscope at 400× magnification (10× ocular lens and 40× objective lens), after counting the number of stomata in the microscope's field of view. Stomatal density was then calculated using the following formula:

$$\text{Stomatal density} = \frac{\text{Number of stomata}}{\text{Area of stomatal field of view (mm}^2\text{)}}$$

Stem diameter was measured at the third node above the soil surface. Shoot fresh weight was measured after the final harvest. The shoot dry weight was obtained by oven-drying the shoot biomass at 70°C until a constant weight was achieved.

Data Analysis

The observational data were statistically analyzed using analysis of variance (ANOVA) to determine the mean square expectations, with significance tested at the 5% level using the F-test. Genetic and phenotypic variability were estimated through variance component analysis. The genetic variance and phenotypic variance were calculated as follows:

Table 1. Analysis of genetic and phenotypic variance

Source of Variation (SV)	Degrees of Freedom (DF)	Sum of Squares (SS)	Mean Square (MS)	Expected Mean Square (EMS)
Replication	(r-1)	SSr	MSr	-
Genotypes	(g-1)	SSg	MSg	$\sigma_e^2 + r\sigma_g^2$
Error	(g-1) (r-1)	SSe	MSe	σ_e^2
Total	gr-1	SSt	-	

$$\text{Variance Genetic } (\sigma_g^2) = (\text{MSg} - \text{MSe})/r$$
$$\text{Phenotypic Variance } (\sigma_f^2) = \sigma_g^2 + \text{MSe}$$

The standard deviation of genetic variance and phenotypic variance was calculated using the following formula, as proposed by Anderson and Bancroft (as cited in Sihombing *et al.,* 2022)

$$\text{SE}\sigma^2\text{g} = \sqrt{\frac{2}{r^2}\left[\frac{\text{MSg}^2}{\text{df genotypes} + 2} + \frac{\text{MSe}^2}{\text{df eror} + 2}\right]}$$

$$\text{SE}\sigma^2\text{f} = \sqrt{\frac{2}{r^2}\left[\frac{\text{MSg}^2}{\text{df genotypes} + 2}\right]}$$

Information:
MSg = mean square genotypes
MSe = mean square error
r = replication
df_g = degrees of freedom genotypes
df_e = degrees of freedom error

A trait is considered to have a broad genetic variability if $\sigma^2 g > 2\,SE(\sigma^2 g)$, and the same criterion applies to phenotypic variability. The classification of heritability values was determined based on the requirements established by Comstock *et al.* (1949).

$$h^2 = \frac{\sigma_g^2}{\sigma_f^2} \times 100\%$$

where: h^2 (%) values of 0–30% are classified as low, 31–60% as moderate, and values above 60% as high.

RESULTS AND DISCUSSION

During the study, observations showed that the 41 Cayenne pepper cultivars exhibited good growth performance, with a plant survival rate of 96.6% and a mortality rate of only 3.4%. Among the surviving plants, 87.4% grew normally, 7.8% exhibited leaf curling symptoms, and 1.4% showed signs of stunted growth. Several pests were identified attacking the Cayenne pepper plants, including armyworms (*Spodoptera litura*), cutworms (*Agrotis ipsilon*), thrips (*Thrips parvispinus*), and mites (*Polyphagotarsonemus latus and Tetranychus* spp.). Armyworm infestation was characterized by holes in the leaves, which varied depending on the color and developmental stage of the larvae. Cutworms caused young plants to break, and were active mainly at night. Both thrips and mites induced leaf curling; however, thrips were identified by a silvery discolouration on the underside of the leaves, while mites caused leaf margins to roll upward. The primary disease identified was wilting caused by root-knot nematodes (*Meloidogyne* spp.), with distinctive symptoms such as wilting from the shoot tips and the presence of galls on the roots. The disease spreads through contaminated water and infected soil. (Moekasan *et al.,* 2015).

Genetic and Phenotypic Variability in 41 Cayenne Pepper Cultivars

The analysis results showed that most traits exhibited wide genetic and phenotypic variances, indicating substantial genetic differences among the cultivars in the tested population. Leaf area and canopy area displayed the highest genetic variance values, at 80.38 and 36.42, respectively. Similarly, the phenotypic variance values for these traits were also high, recorded at 262.92 and 100.77, respectively. This suggests that although environmental factors influence trait expression, genetic factors still play a significant role in contributing to phenotypic variation (Table 2). According to Jalata *et al.* (2010)High genetic variability indicates a good potential for selecting specific traits, thereby supporting the success of breeding programs. Qosim *et al.* (2013) Reported that populations derived from genetically diverse parents tend to have greater variability than populations with closely related genetic backgrounds. Hefena *et al.* (2016) Stated that when phenotypic variance is greater than genetic variance, environmental influence on the trait is considered significant.

Heritability

The broad-sense heritability (h^2) values obtained in this study ranged from 1.3% to 66.4% (Table 2). The trait with the highest heritability value was first dichotomous height, at 66.4%, which falls into the high category. This finding aligns with the study of Syukur *et al.* (2010), which also reported high heritability for the first dichotomous height. This suggests that most of the phenotypic variation in this trait is due to genetic differences, indicating that selection for this trait can be effectively carried out in the early generations of a breeding program. According to Sutjahjo *et al.* (2015) Traits with high heritability can be selected in early generations. Udensi, as cited in Qosim *et al.* (2013) It was stated that traits with high heritability tend to have high breeding value due to their additive inheritance. Therefore, selecting traits with high heritability and wide genetic variability is essential in variety improvement programs.

In addition to the first dichotomous height, several other traits, such as plant height, number of leaves, leaf greenness, number of dichotomous points, canopy area, shoot fresh weight, and shoot dry weight, also exhibited moderate heritability values, ranging from 34.1% to 47%. These traits are reasonably responsive to selection, although environmental influences must still be considered. Conversely, characteristics such as leaf area, stomatal density, and stem diameter exhibited very low heritability values, ranging from 1.3% to 30.6%, indicating that environmental conditions significantly influence their expression. Therefore, phenotypic selection for these traits is not recommended. According to Saravanan *et al.* (2019), traits with low heritability are influenced by environmental factors, and thus selection should be postponed to later generations. Saputra *et al.* (2019) Also, it is suggested that low heritability values result from environmental effects being more dominant than genetic factors. However, Anugrah *et al.* (2018) Argued that both high and low heritability traits can be used in selection, depending on the strategy employed.

Table 2. Estimates of genetic variance, phenotypic variance, and heritability of 41 red chilli cultivars

Character	$\sigma^2 g$	$2.Sd\sigma^2 g$	Criteria	$\sigma^2 f$	$2.Sd\sigma^2 f$	Criteria	$\sigma^2 e$	$h^2(\%)$	Criteria
PH	34.13	22.19	High	72.61	20.50	High	38.48	47	Moderate
FDH	9.83	5.13	High	14.80	5.01	High	4.97	66.4	High
NL^T	10.08	7.64	High	26.24	6.75	High	16.7	38.4	Sedang
LA^T	80.38	73.65	High	262.92	61.64	High	182.53	30.6	Low
LG	13.80	9.40	High	31.29	8.57	High	17.50	44.1	Moderate
NDP^T	10.29	7.80	High	26.80	6.89	High	16.51	38.4	Moderate
CA^T	36.42	28.98	High	100.77	25.26	High	64.35	36.1	Moderate
SD^T	0.08	1.69	Low	6.42	0.96	High	6.33	1.3	Low
DS	0.58	0.55	High	1.97	0.46	High	1.39	29.5	Low
SFW^T	3.33	2.78	High	9.77	2.39	High	6.44	34.1	Moderate
SDW^T	0.79	0.61	High	2.10	0.54	High	1.31	37.8	Moderate

Note: PH = plant height, FDH = first dichotomous height, NL = number of leaves, LA = leaf area, LG = leaf greenness, NDP = number of dichotomous points, CA = canopy area, SD = stomatal density, DS = stem diameter, SFW = shoot fresh weight, SDW = shoot dry weight; T = transformed data

Correlation Among Traits

The correlation analysis among vegetative traits revealed strong associations between several growth parameters (Table 3). Plant height showed a positive and significant correlation with first dichotomous height (r = 0.75), stem diameter (r = 0.63), and both shoot fresh and dry weights (r = 0.60 for each). This suggests that taller plants tend to have thicker stems and produce greater biomass. Similarly, the number of leaves, leaf area, and number of dichotomous points were highly significantly correlated with shoot fresh and dry weights, with correlation values exceeding r > 0.70. This indicates that improvements in these traits can directly influence the plant's biomass productivity. In contrast, stomatal density did not show significant correlation with any other trait, suggesting that this variable is relatively independent and not directly related to the plant's growth potential or yield components. Setiawan *et al.* (2019) Reported that taller plants tend to develop more leaves and branches. According to Bernard & Michael (2018)Cayenne pepper plants with higher dichotomous branching tend to produce more fruit. As the dichotomous point increases in height, the fruits are positioned farther from the ground, potentially reducing the risk of soil-borne disease infections caused by splashing.

Table 3. Correlation matrix of vegetative traits in 41 cayenne pepper cultivars

	PH	FSH	NL	LA	LG	NDP	CA	DS	SD	SFW	SDW
PD	1.00										
FSH	0.75**	1.00									
NL	0.36*	0.33*	1.00								
LA	0.41**	0.40**	0.85**	1.00							
LG	-0.42**	-0.40**	-0.44**	-0.34*	1.00						
NDP	0.36*	0.32*	0,99**	0.85**	-0.44**	1.00					
CA	0.56**	0.39*	0.46**	0.40**	-0.54**	0.46**	1.00				
DS	0.63**	0.31ns	0.56**	0.55**	-0.40*	0.56***	0.53***	1.00			
SD	-0.10ns	0.11ns	-0.11ns	-0.07ns	-0.11ns	-0.11ns	0.01ns	-0.15ns	1.00		
SFW	0.60**	0.37*	0.77**	0.70**	-0.57**	0.77**	0.57**	0.73**	0.12ns	1.00	
SDW	0.60**	0.43**	0.77**	0.73**	-0.56**	0.77**	0.62**	0.78**	0.11ns	0.98**	1.00

Note: PH = plant height, FDH = first dichotomous height, NL = number of leaves, LA = leaf area, LG = leaf greenness, NDP = number of dichotomous points, CA = canopy area, SD = stomatal density, DS = stem diameter, SFW = shoot fresh weight, SDW = shoot dry weight; ns = non-significant correlation, * = significant at the 95% confidence level, ** = significant at the 99% confidence level.

Scott-Knott Test Results on the Mean Values of Vegetative Traits

Grouping based on the Scott-Knott test of the mean values for 41 cultivars indicated that most vegetative traits significantly differentiated among cultivars (Table 4). Cultivars such as 'Or Twist 47', 'Seulawah Aceh', 'Perintis', and 'Romario' exhibited superior performance in several key traits, including plant height, number of dichotomous points, and shoot biomass. Meanwhile, the cultivar Lontanbar recorded the highest number of leaves and leaf area, with 1,230 leaves and 8,299 cm^2, respectively, indicating its strong potential for light interception and supporting photosynthetic activity. In contrast, some cultivars such as 'Anies IPB', 'Horison', and 'Glora' were grouped into the lowest category for most parameters and are therefore less recommended as parental lines in hybridization programs aimed at improving growth performance.

Overall, the combination of wide genetic variance, moderate to high heritability, and positive correlation with biomass makes traits such as first dichotomous height, leaf greenness, and shoot biomass important indicators for selection. Cultivars that exhibit superior vegetative performance can be considered as potential parental candidates for the development of high-yielding Cayenne pepper varieties. Conversely, traits with low heritability and non-significant correlations, such as stomatal density, should not be used as primary selection criteria; instead, they should be considered in later generations or multi-location trials.

CONCLUSION

The population of 41 Cayenne pepper cultivars exhibited wide genetic variance in traits such as plant height, first dichotomous height, number of leaves, leaf area, leaf greenness, number of dichotomous points, canopy area, stem diameter, shoot fresh weight, and shoot dry weight. Stomatal density shows narrow genetic variance. The phenotypic variance for most traits were categorized as wide. A high heritability estimate was observed in the first dichotomous height. Traits such as plant height, number of leaves, leaf greenness, number of dichotomous points, canopy area, shoot fresh weight, and shoot dry weight demonstrate moderate heritability values. In contrast, leaf area, stomatal density, and stem diameter exhibit low heritability. These findings suggest that certain traits can be effectively selected in early generations, while others may require delayed selection due to more substantial environmental influence.

ACKNOWLEDGEMENTS

The University of Bengkulu funded this research through the 2024 UNIB Flagship Research Scheme, under Contract No. 2964/UN/30.15/PT/2024.

Table 4. Mean performance and Scott-Knott's grouping of vegetative traits in 41 cayenne pepper cultivars

Treatment	PH (cm)		FSH (cm)		NL		LA (cm²)		LG		NDP		CA (cm²)		DS (mm²)		SD (mm)		SFW (g)		SDW (g)	
Mada	58.8	a	25.7	b	420	a	1,705	a	49.4	a	406	a	3,753	b	182	a	8.8	a	164	a	56.9	a
Baja F1	61.9	b	29.2	c	194	a	1,334	a	53.5	b	182	a	3,160	a	116	a	9.7	b	94.0	a	41.9	a
Lontanbar	59.2	b	28.2	c	1230	b	8,299	c	51.8	a	1,215	b	3,791	b	116	a	11.9	b	303	b	96.0	b
Rotane	64.9	b	24.6	b	677	a	3,675	a	40.0	a	664	a	4,010	b	168	a	10.3	b	343	b	95.0	b
Locker	67.1	b	34.1	d	472	a	3,058	a	48.8	a	455	a	2,620	a	186	a	9.4	a	228	b	71.2	b
Kopay	53.7	a	25.3	b	316	a	1,794	a	62.6	b	304	a	2,609	a	198	a	8.1	a	103	a	39.4	a
Radha	54.0	a	18.1	a	283	a	1,707	a	59.5	b	271	a	3,145	a	98.0	a	8.9	a	86.0	a	35.1	a
Ateng	58.1	a	26.8	b	337	a	2,083	a	54.6	b	325	a	2,763	a	168	a	9.0	a	140	a	50.2	a
Paten	53.6	a	25.4	b	306	a	1,582	a	55.4	b	293	a	2,744	a	126	a	8.6	a	98.0	a	39.9	a
Dumay	56.2	a	25.7	b	333	a	2,140	a	56.2	b	319	a	3,136	a	110	a	9.2	a	119	a	46.7	a
Lokal Legum	62.6	b	30.7	d	493	a	2,162	a	45.8	a	477	a	4,267	b	86.0	a	10.4	b	159	a	61.6	b
Cmk Lolay	53.8	a	25.3	b	233	a	1,524	a	55.0	b	219	a	2,667	a	158	a	8.5	a	85.0	a	37.8	a
Indrapura Reborn	50.9	a	24.2	b	351	a	2,420	a	52.4	a	339	a	2,654	a	157	a	8.3	a	100	a	37.7	a
Vitra Unggul	69.7	b	29.5	c	426	a	2,711	a	57.3	b	413	a	3,304	a	105	a	10.1	b	139	a	55.0	a
Or Twist 47	72.5	b	32.6	d	610	a	5,160	b	50.3	a	595	a	5,000	b	146	a	10.6	b	260	b	89.4	b
Seulaweah Aceh	70.0	b	32.9	d	438	a	2,717	a	47.4	a	424	a	4,901	b	208	a	11.0	b	197	b	69.2	b
Klope Lokal Aceh	60.5	b	23.6	b	325	a	3,174	a	57.2	b	314	a	3,499	a	117	a	11.3	b	216	b	70.8	b
Awe Aceh	54.6	a	25.4	b	448	a	2,691	a	55.7	b	434	a	2,952	a	90.0	a	8.9	a	138	a	46.6	a
Cmk Tavi	47.9	a	23.3	b	371	a	1,947	a	55.2	b	359	a	2,664	a	155	a	8.0	a	96.0	a	38.8	a
Simpatik 17	57.4	a	29.0	c	323	a	1,915	a	53.9	b	305	a	3,034	a	166	a	9.4	a	97.0	a	41.9	a
Hellboy	52.7	a	25.0	b	363	a	2,283	a	50.9	a	349	a	5,876	b	179	a	8.5	a	147	a	53.5	a
Sempurna	61.0	b	28.0	c	517	a	4,317	b	51.5	a	503	a	3,274	a	109	a	10.1	b	187	b	70.0	b
Horison	55.1	a	27.6	c	178	a	1,334	a	51.7	a	165	a	1,721	a	201	a	8.3	a	92.0	a	36.7	a
Anies IPB	39.8	a	19.9	a	110	a	404	a	56.8	b	101	a	1,519	a	147	a	8.0	a	64.0	a	27.6	a
Iggo	69.1	b	27.5	c	443	a	2,230	a	53.7	b	431	a	4,471	b	163	a	11.6	b	265	b	88.4	b
Andalas	61.3	b	29.3	c	423	a	2,126	a	55.6	b	409	a	3,865	b	160	a	9.4	a	159	a	55.6	a
Kawat	56.9	a	23.9	b	383	a	2,046	a	49.9	a	369	a	3,640	b	138	a	9.6	a	147	a	53.2	a
Glora	49.3	a	20.5	a	308	a	1,690	a	58.5	b	296	a	2,281	a	213	a	9.9	b	136	a	56.8	a
Ferosa	51.4	b	22.9	b	436	a	1,341	a	51.2	a	421	a	4,068	b	167	a	10.8	b	186	b	59.8	b
Bali 77	59.4	a	26.6	b	241	a	1,189	a	56.2	b	228	a	2,222	a	119	a	9.2	a	113	a	39.6	a
Lajang	58.8	a	25.7	b	287	a	1,258	a	53.8	b	275	a	3,298	a	102	a	9.3	a	94.0	a	41.5	a
Tenggo	53.2	b	24.9	b	612	a	1,288	a	52.5	a	600	a	3,093	a	136	a	9.4	a	177	b	62.0	b

Treatment	PH (cm)		FSH (cm)		NL		LA (cm^2)		LG		NDP		CA (cm^2)		DS (mm^2)		SD (mm)		SFW (g)		SDW (g)	
Laris	57.7	b	22.9	b	416	a	1,323	a	54.9	b	405	a	2,849	a	143	a	10.0	b	194	b	66.1	b
Perintis	70.9	b	31.5	d	472	a	2,380	a	53.7	b	459	a	4,358	b	160	a	9.8	b	194	b	69.3	b
Landung	61.0	b	23.8	b	174	a	717	a	57.5	b	162	a	2,471	a	94.0	a	10.0	b	92.0	a	35.2	a
Labek	56.3	a	25.4	b	466	a	2,267	a	54.1	b	454	a	2,980	a	112	a	9.1	a	118	a	43.6	a
Caman	61.9	b	26.0	b	456	a	1,631	a	53.8	b	442	a	3,804	b	90.0	a	9.1	a	165	a	54.5	a
Romario	63.8	b	30.2	c	566	a	2,696	a	47.5	a	551	a	3,971	b	125	a	9.8	b	181	b	66.3	b
Aka	53.4	a	24.3	b	387	a	1,149	a	55.8	b	374	a	3,180	a	122	a	8.9	a	105	a	37.9	a
Vitra Op	62.2	b	24.6	b	453	a	1,976	a	55.5	b	441	a	3,155	a	109	a	10.0	b	170	a	57.6	a
Ck Anvi	51.1	a	26.9	b	330	a	1,542	a	64.4	b	318	a	2,029	a	163	a	7.6	a	123	a	43.4	a
Min.	39.8		18.1		110		404		40		101		1,519		86		7.6		64		27.6	
Maks.	72.5		34.1		1,230		8,299		64.4		1,215		5,876		213		11.9		343		96	
Rata-rata	56.2		26		670		4,352		52.2		658		3,698		150		9.8		204		61.8	
Sta Dev.	6.84		3.47		180		1,327		4.37		179		892		35		1		62.5		17.2	

Note: PH = plant height, FDH = first dichotomous height, NL = number of leaves, LA = leaf area, LG = leaf greenness, NDP = number of dichotomous points, CA = canopy area, SD = stomatal density, DS = stem diameter, SFW = shoot fresh weight, SDW = shoot dry weight

REFERENCES

Acquaah, G. (2007). Principles of plant genetics and breeding. Willey-Blackwell. West Sussex. P 72-76.

Anugrah, L. T., Ujianto, L., & Yakop, U. M. (2018). Pendugaan keragaman genetik dan nilai heritabilitas pada keturunan kedua (F2) hasil persilangan paprika (Capsicum Annuum Var-Grossum) dengan cabai merah (Capsicum Annuum). 1–12.

Badan Meteology dan Geofisika (BMKG). (2024). Data iklim harian kota bengkulu bulan mei-oktober. https://dataonline.bmkg.go.id/data-harian

Badan Pusat Statistik. (2023). Jumlah penduduk pertengahan tahun. https://www.bps.go.id/indicator/12/1975/1/jumlah-penduduk-pertengahan-tahun.html

Badan Pusat Statistik Indonesia. (2022). Produksi tanaman sayuran menurut provinsi dan jenis tanaman. https://www.bps.go.id/indicator/12/1975/1/jumlah-penduduk-pertengahan-tahun.html

Bernard, A., & Michael, E. (2018). Growth and yield of sweet pepper as influence by different growth media. Greener Journal of Agricultural Sciences, 8(11), 325–331. https://doi.org/10.15580/gjas.2018.11.111118156

Comstock, R. E., Robinson, H. F., & Harvey, P. H. (1949). A breeding procedure designed to make maximum use of both general and specific combining ability. Agronomy Journal, 41(8), 360–367. https://doi.org/https://doi.org/10.2134/agronj1949.00021962004100080006x

Deviona, Yunandra, & Budiati, D. D. A. (2022). Pendugaan parameter genetik beberapa genotipe cabai toleran pada lahan gambut (estimation of genetic parameters of some chili genotypes tolerant in peatlands). Jurnal Agroteknologi, 12(2), 73–80.

Effendy, Respatijarti, & Waluyo, B. (2018). Keragaman genetik dan heritabilitas karakter komponen hasil dan hasil ciplukan (Physalis sp.). Jurnal Agro, 5(1), 30–38. https://doi.org/10.15575/1864

Hefena, A. G., Sultan, M. S., Abdel-Moneam, M. A., Hammoud, S. A., Celaleddin, B., & EL-Sabagh, A. (2016). Genetic variability, heritability and genetic advance for yield and associated traits in F2 rice population. Journal of Agriculture Biotechnology, 1(02), 49–58.

Herison, C., Suharjo, U. K. J., Handajaningsih, M., Rustikawati, & Kurin, A. S. (2021). Evaluasi paket teknologi budidaya hibrida cabai merah untuk hasil tinggi di ultisol. Jurnal Hortikultura Indonesia, 12(1), 21–30. https://doi.org/10.29244/jhi.12.1.21-30

Jalata, Z., Ayana, A., & Zeleke, H. (2010). Variability, heritability and genetic advance for some yield and yield related traits in ethiopian barley (Hordeum vulgare L.) landraces and crosses. International Journal of Plant Breeding and Genetics, 5(1), 44–52. https://doi.org/10.3923/ijpbg.2011.44.52

Laila, F., Zainal, A., Alaydrus, A., Umarie, I., Abdul, A. J., Indah, H., Rini, S., Dini, I., & Eliyani, H. (2023). Dasar-Dasar Pemuliaan Tanaman Get Press Indonesia (pp. 35–72).

Martono, B. (2020). Keragaman genetik, heritabilitas dan korelasi antar karakter kuantitatif nilam (Pogostemon sp.) hasil fusi protoplas. Jurnal Penelitian Tanaman Industri, 15(1), 9–15. https://doi.org/10.21082/jlittri.v15n1.2009.9-15

Moekasan, T, K., L, P., Adiyoga, W., & Putter H, D. (2015). Modul pelatihan 2 budidaya cabai merah, tomat dan mentimun berdasarkan konsepsi pengendalian hama terpadu (Issue 4).

Nilawati, N., Ganefianti, D. W., & Suryati, D. (2017). Variabilitas genetik dan heritabilitas pertumbuhan dan hasil 26 genotipe tomat. Akta Agrosia, 20(1), 25–34. https://doi.org/10.31186/aa.20.1.25-34

Prabowo, R., Bambang, A. N., & Sudarno. (2020). Pertumbuhan penduduk dan alih fungsi lahan pertanian. Mediagro, 16(2), 26–36.

Qosim, W. A., Rachmadi, M., Hamdani, J. S., & Nuri, I. (2013). Penampilan fenotipik, variabilitas, dan heritabilitas 32 genotipe cabai merah berdaya hasil tinggi. J. Agron. Indonesia, 41(2), 140–146.

Saputra, H. E., Wahyuni Ganefianti, D., Salamah, U., Sariasih, Y., & Dwi Ardiansyah, N. (2019). Estimasi ragam, jumlah kelompok gen pengendali karakter dan heritabilitas hasil tomat di dataran rendah. Jurnal Hortikultura Indonesia, 10(2), 112–118.

Saravanan, K. R., Vishnupriya, V., Prakash, M., & Anandan, R. (2019). Variability, heritability and genetic advance in tomato genotypes. Indian Journal of Agricultural Research, 53(1), 92–95. https://doi.org/10.18805/IJARe.A-5030

Setiawan, I. ., Waluyo, B., & Saptadi, D. (2019). Uji daya hasil 6 genotip tanaman cabai besar (Capsicum annuum L.) di dataran tinggi. 7(12), 2344–2351.

Sihombing, R. D., Badriyah, L., Sary, D. N., & Syauqy, T. A. (2022). Agronomic character variability among upland rice genotypes (Oryza sativa L.). In 1st International Conference of Biology for Student 2022 (Vol. 2022). https://doi.org/10.11594/nstp.2022.2610

Sutjahjo, S. H., Herison, C., Sulastrini, I., & Marwiyah, S. (2015). Pendugaan keragaman genetik beberapa karakter pertumbuhan dan hasil pada 30 genotipe tomat lokal (the estimation of genetic variability of growth and yield taits on 30 local tomato genotypes). J. Hort, 25(4), 304–310.

Syukur, M., Sujiprihati, S., & Siregar, A. (2010). Pendugaan parameter genetik beberapa karakter agronomi cabai F4 dan evaluasi daya hasilnya menggunakan rancangan perbesaran (Augmented Design). Jurnal Agrotropika, 15(1), 9–16.

Varghese, S., Kubatka, P., Rodrigo, L., Gazdikova, K., Caprnda, M., Fedotova, J., Zulli, A., Kruzliak, P., & Büsselberg, D. (2017). Chili pepper as a body weight-loss food. International Journal of Food Sciences and Nutrition, 68(4), 1–10. https://doi.org/10.1080/09637486.2016.1258044

Wulandari, S, A. (2020). Fluktuasi harga cabai merah di masa pandemi covid 19 di kota jambi. Jurnal MeA (Media Agribisnis), 5(2), 112–120. https://doi.org/10.33087/mea.v5i2.82