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Characterization of Doubled Haploid Eggplant (*Solanum melongena* L.) Lines Obtained from Anther Culture

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Abstract

Eggplant (*Solanum melongena* L.) is an important horticultural crop widely cultivated worldwide. Stable genetic material and comprehensive information on genetic variability are essential for the development of superior varieties. Previous studies have obtained genetically stable doubled-haploid (DH) lines through anther culture. However, their agronomic performance has not been well identified. Therefore, this study aims to characterize doubled haploid (DH) eggplant lines (*Solanum melongena* L.) and identify potential candidates for future use as parental lines in hybrid breeding programs. Eleven doubled-haploid lines and three commercial varieties were evaluated using a randomized complete block design. Quantitative data were analyzed using analysis of variance (ANOVA), followed by Tukey's HSD test at a 5% significance level, and cluster analysis based on phenotypic similarity. The results revealed significant variability among the genotypes for all quantitative characters except days to final harvest. Cluster analysis classified the genotypes into two major groups. Among the evaluated genotypes, Pro-AM1, Pro-AM38, Pro-AM50, and Hit-AM30 exhibited superior yield-related characters and are considered promising parental lines for hybrid development in eggplant. These findings demonstrate substantial genetic variability among the double-haploid eggplant lines and provide valuable resources for selecting superior lines to support future hybrid development.

Keywords: anther culture, cluster analysis, doubled haploid, eggplant, genetic variability, hybrid

Introduction

Eggplant (*Solanum melongena* L.) is a major vegetable crop in the Solanaceae family, cultivated and consumed for its edible fruit (Mir et al., 2021; You et al., 2022). Commonly used as a fresh vegetable and in various processed dishes, eggplants are widely cultivated and consumed vegetables in the Mediterranean, Asia, and Southeast Europe (Omondi et al., 2025). In Indonesia, eggplants are considered one of the key horticultural commodities that contribute to farmers' income and welfare (Poto & Rato, 2022). Eggplant can be harvested multiple times within a single growing season, thereby enhancing their economic value. In 2018, Indonesia exported 17 types of seasonal vegetables, including eggplants, with a total export value of US$11.82 million. Eggplant alone contributed 3% of this value, equivalent to US$400,939 (Statistics Indonesia, 2019). Public demand for eggplants continues to grow, as reflected in national production, which increased from 545,646 tons in 2013 to 691,738 tons in 2022 (Statistics Indonesia, 2024). Thus, strategic efforts are made in eggplant production to meet market requirements.

The use of superior varieties is a key component of cultivation technology that improves the quality and quantity of eggplant production (Hasnidar et al., 2022). In recent years, eggplant breeding has predominantly focused

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on developing hybrid varieties, which have been shown to enhance yield potential (Kumar et al., 2020) and fruit quality (Rachmatika et al., 2017). The potential benefits of eggplant hybrids were first documented by Kakizaki (1931), who reported increased fruit size and weight associated with larger embryo development. This phenomenon is attributed to heterosis, also known as hybrid vigor, in which hybrid progeny outperforms their parents in traits such as yield and resistance (Li et al., 2024). In Indonesia, 119 eggplant varieties have been officially registered, including the first hybrid variety, Mustang F1, released in 1999 (Directorate of Horticultural Seeds, Indonesia Ministry of Agriculture, 2025).

Pure lines are essential parental materials in hybrid breeding programs (Grigolava et al., 2021). These homozygous lines are traditionally obtained through conventional methods, such as repeated selfing or self-pollination over several generations (Hussain et al., 2021). However, this approach is both time-consuming and costly, often requiring 6–10 generations to achieve homozygosity (Prigge et al., 2012). To overcome these limitations, researchers have developed more efficient techniques, such as the doubled haploid (DH) approach via anther culture (Purwoko & Dewi, 2022). Doubled haploid technology plays a crucial role in modern plant breeding and genetic studies (Niazian & Shariatpanahi, 2020) by enabling the rapid production of completely homozygous lines in a single generation from haploid gametic cells (Khan, 2022). This technique shortens the time required to produce homozygous plants compared to conventional breeding methods (Sharma et al., 2024; Yel et al., 2023). In addition to reducing the breeding cycle time, this method lowers production costs (Rivas-Sendra et al., 2017). Despite its advantages, the application of double haploid technology in eggplant breeding remains limited in Indonesia. Therefore, the use of anther culture is a promising strategy for accelerating the development of superior eggplant lines in national breeding programs.

This study used doubled-haploid (DH) eggplant lines developed by Mulyana et al. (2023a), obtained through spontaneous haploid doubling via several anther culture techniques using the donor genotypes Mustang F1 (long purple), Provita F1 (striped round green), and Hitavi F1 (long green). The formation rate of spontaneous doubled haploid (DH0) plants was 25.9%, as determined by ploidy analysis via flow cytometry. Among the donors, Hitavi F1 produced the highest percentage of DH plants (30.4%). The lines (DH1) derived from the research require further characterization to evaluate their breeding potential to develop a superior cultivar. Characterization also supports the identification of promising lines for hybrid development that align with market demand and consumer preferences.

Material and Methods

Experimental Design

The research was conducted from September 2023 to January 2024 in a greenhouse at the Center for Standard Testing of Biotechnology Instruments and Agricultural Genetic Resources (BB PSI Biogen), located at Jl. Tentara Pelajar No. 3A, Menteng Village, West Bogor, Bogor, Indonesia. The experimental site was situated at an altitude of 220 m above sea level (masl). A single-factor randomized complete block design was employed, with eggplant genotypes as the treatment factor and blocks as replicates. The study evaluated 11 doubled haploid lines and three commercial varieties of eggplant. The ploidy level of doubled haploid lines had previously been validated through flow cytometry, as reported by Mulyana et al. (2023b). Each experimental unit consisted of one plant per genotype, with three replicates, resulting in a total of 42 experimental units. The average temperature, relative humidity, and the day length during the experimental period are presented in Table 1.

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Table 1

Daily Climate Data at BBPSI Biogen, Bogor

Parameters	Month					Average
	September 2023	October 2023	November 2023	December 2023	January 2024	
Temperature (°C)	26.89	27.74	26.85	27.18	26.34	27.05
Humidity (%)	72.46	74.07	83.97	80.00	86.14	79.18
Sunlight duration (hr)	8.08	7.71	5.90	5.73	3.92	6.35

Note. Modified data from Badan Meteorologi, Klimatologi, dan Geofisika, 2023.

Experimental Procedure

The experiment began with pre-sowing preparation, where eggplant seeds were soaked in clean water for 1–5 days until radicles emerged, ensuring successful germination. The germinated seeds were then sown in seedling boxes filled with loose soil, which served as the planting medium for the experiment. Pre-sowing and seedling maintenance were conducted in a greenhouse, where all seedling trays and polybags were kept under uniform conditions until final transplanting. Seeds were arranged in rows according to their respective lines, and each line was labeled. After one week, the seedlings were transplanted small polybags (8 cm × 10 cm) filled with loose soil and maintained until they were ready for final transplanting four weeks after sowing or when they had developed three to four true leaves. The seedlings were then transplanted into 10-liter buckets filled with a soil-and-manure mixture at a 7:1 ratio, spaced at 50 cm × 70 cm. Fertilization was applied in two stages: basal fertilization, using 10 g of NPK per plant, broadcast; and supplementary fertilization, following a modified method by Rotilihya (2017). The basal fertilization was applied before planting to enrich the growing medium, whereas the supplementary fertilizers were applied as a drench from 1 to 7 weeks after planting (WAP). The NPK concentration was 5 g/L during weeks 1–2 WAP and increased to 10 g/L during weeks 3–7 WAP. The volume applied was 250 ml per plant per application.

Crop management includes watering, replanting, staking, pest control, and greenhouse cleaning. Harvesting was performed when the fruit showed a bright or glossy color, the flesh was firm but not hard, and remained pure white. Fruits were harvested by cutting the stalks at the base using a knife. Experimental observations were conducted on quantitative characters based on the Individual Testing Guide (PPI) for eggplant (Pusat Perlindungan Varietas Tanaman, 2007), which included plant height, stem diameter (cm), leaf length (cm), leaf width (cm), petiole length (cm), days to flowering (HST), fruit length (cm), fruit diameter (cm), fruit stalk length (cm), days to first harvest (DAP), days to final harvest (DAP), number of fruits per plant, weight per fruit (g), and total fruit weight per plant (g).

Data Analysis

Analysis of variance (ANOVA) was performed to assess the quantitative characteristics. When the *F* test indicated significant differences, further analysis was conducted using the Tukey HSD test at a 5% significance level using PKBT STAT 3.1 software. Cluster analysis was performed to group genotypes based on similarities in phenotypic traits using PBSTAT-CL, a feature in PKBT STAT 3.1. Clustering was based on 13 quantitative characters: plant height, stem diameter, leaf length, leaf width, petiole length, fruit length, fruit diameter, fruit stalk length, weight per fruit, number of fruits per plant, total fruit weight per plant, days to flowering, and days to harvest.

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Results and Discussion

Variability of Quantitative Characters of Eggplant Genotypes

Analysis of variance showed that genotype had a significant effect on all quantitative characters, except for days to final harvest (Table 2). A significantly different variance suggests that the tested genotypes exhibit high genetic variability, providing opportunities for effective selection. For certain characters that did not meet the assumptions of normality, the data were transformed using the formula √x + 3 prior to analysis of variance to stabilize variance and improve the data distribution. The coefficient of variation (CV) ranged from 5.02% to 16.23%. The coefficient of variation (CV) is an indicator of a study's accuracy. In general, a CV value below 20% is considered medium to low, indicating high research accuracy; the lower the CV, the greater the accuracy.

Quantitative Characters in Vegetative Components

The variability in the vegetative characters of eggplant, including plant height, stem diameter, leaf length, petiole length, and leaf width, is presented in Table 3. Based on the PPVT (2007) classification, plant height was categorized as follows: short (30–60 cm), medium (60–100 cm), tall (100–150 cm), and very tall (>150 cm). The average plant height among the genotypes ranged from 102.00 to 137.33 cm, with all genotypes classified as "tall". The Hit-AM45 genotype exhibited significantly greater plant height compared to Pro-AM1, Hit-AM30, Pro-AM46, Pro-AM50, Provita F1, Hitavi F1, and Mustang F1. According to Nafilah et al. (2018), tall eggplant plants are more prone to lodging; therefore, eggplant genotypes in the medium-height category are preferable.

The average of the stem diameter ranged from 1.07 to 2.04 cm (Table 3). The Mus-AM36 genotype had a significantly larger stem diameter than all other genotypes, except for Mustang F1. Stem diameter reflects a plant's vegetative

Table 2

Analysis of Variance of 14 Eggplant Genotypes

No	Character	F value	CV (%)
1	Plant height (cm)	7.86**	5.49
2	Stem diameter (cm)	27.92**	6.54
3	Leaf length (cm)	46.11**	5.17
4	Petiole length (cm)	4.86**	11.69
5	Leaf width (cm)	23.54**	10.04
6	Weight per fruit (g)	66.18**	9.35t
7	Fruit length (cm)	75.49**	16.23
8	Fruit diameter (cm)	12.02**	6.94
9	Fruit stalk length (cm)	19.46**	8.99
10	Days to flower (DAP)	4.70**	5.02
11	Days to first harvest (DAP)	7.04**	9.11
12	Days to final harvest (DAP)	0.89ns	7.81
13	Number of fruits per plant	12.57**	14.71t
14	Fruit weight per plant (g)	10.80**	14.47t
15	Harvesting period (days)	3.17**	12.56t

Note. ** = significant effect at α = 1%, ns = not significant at α = 1%, DAP = days after planting, t = transformed data √x+3.

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growth and development, with a larger diameter indicating more efficient translocation of assimilates within the stem, thereby enhancing its structural strength and stability (Feng et al., 2023). Additionally, stem diameter is an indicator of nutrient adequacy during the vegetative phase.

The average leaf length ranged from 20.70 to 38.40 cm. Hitavi F1 exhibited longer leaves than the other genotypes and did not differ significantly from Mus-AM36 and Mustang F1. Petiole length ranged from 9.83 to 15.67 cm, and Hitavi F1 had the longest petioles, which were significantly longer than those of Pro-AM38, Pro-AM46, Pro-AM48, and Pro-AM50. The leaf width ranged from 13.90 to 36.17 cm, with Mus-AM36 also showing the greatest leaf width. Leaf length and width are important parameters for estimating leaf area and leaf area index (LAI), which are closely related to plant performance and potential yield (Hinnah et al., 2014). An increase in leaf area can enhance the rate of assimilation; however, it is also influenced by the distribution of sunlight within the plant canopy (Purnamasari & Pratiwi 2020).

Quantitative Characters in the Reproductive Components

Variability in Days to Flowering, Days to First Harvest, and Harvest Duration

The variability in the quantitative characteristics of eggplant, including days to flower, days to first harvest, days to final harvest, and harvesting period, is presented in Table 4. Plants began flowering at the age range of 33–41 DAP, and the first harvest began at 64–99.7 DAP. Provita F1 and Pro-AM1 are genotypes with the fastest flowering and harvesting times, but no significant differences were observed between them. The genotype with the latest flowering time was Mus-AM36, which also had the longest harvesting time and differed significantly from all other genotypes observed. The results of this study are consistent with the

Table 3

Characteristics of plant height, stem diameter, leaf length, petiole length, and leaf width of 14 Eggplant Genotypes

No	Genotipe	Plant height (cm)	Stem diameter (cm)	Leaf length (cm)	Petiole length (cm)	Leaf width (cm)
1	Pro-AM1	105.00^{c}	1.62^{c}	31.33^{cd}	11.67$^{a\text{-}c}$	23.47$^{b\text{-}d}$
2	Pro-AM18	112.00^{bc}	1.39$^{c\text{-}e}$	27.83^{de}	12.50$^{a\text{-}c}$	17.40$^{d\text{-}f}$
3	Hit-AM30	105.33c	1.47$^{c\text{-}e}$	33.17^{bc}	13.67$^{a\text{-}c}$	24.67^{bc}
4	Mus-AM36	129.33^{ab}	2.04^{a}	37.90^{a}	13.67$^{a\text{-}c}$	36.17^{a}
5	Pro-AM38	107.67^{c}	1.35$^{c\text{-}f}$	25.57^{ef}	9.83c	18.80$^{c\text{-}f}$
6	Pro-AM40	119.00$^{a\text{-}c}$	1.28^{ef}	27.17^{de}	14.00$^{a\text{-}c}$	19.43$^{c\text{-}f}$
7	Hit-AM45	137.33^{a}	1.58^{cd}	31.50^{cd}	15.33^{ab}	22.00$^{b\text{-}e}$
8	Pro-AM46	106.33^{c}	1.07^{f}	21.10^{fg}	9.83^{c}	13.90^{f}
9	Pro-AM47	120.67$^{a\text{-}c}$	1.09^{f}	20.70^{g}	12.17$^{a\text{-}c}$	14.67^{f}
10	Pro-AM48	118.00^{bc}	1.26^{ef}	23.93$^{e\text{-}g}$	10.50^{c}	15.63^{ef}
11	Pro-AM50	110.00^{c}	1.32$^{d\text{-}f}$	25.93^{e}	11.17^{bc}	18.50$^{c\text{-}f}$
12	Provita F1	102.00^{c}	1.19^{ef}	25.80^{e}	12.33$^{a\text{-}c}$	19.23$^{c\text{-}f}$
13	Hitavi F1	114.33^{bc}	1.63^{bc}	38.40^{a}	15.67^{a}	27.00^{b}
14	Mustang F1	107.00^{c}	1.91a^{b}	36.83^{ab}	13.83$^{a\text{-}c}$	26.33^{b}

Note. Values followed by the same lowercase letter in the same column are not significantly different according to HSD at α=5%.

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findings of Nafilah et al. (2018), who reported a significant positive correlation between flowering and harvesting time, indicating that harvesting can be performed faster in genotypes with the earliest flowering time. The days to final harvest of the plants ranged from 111.3 to 131.0 DAP. Genotypic factors did not affect the days to final harvest. The average harvest period ranges from 21.3 to 63.7 days. No genotype had the longest harvest period.

Variability in Fruit Length, Fruit Diameter, Fruit Stalk Length, Fruit Weight per Plant, Weight per Fruit, Number of Fruits per Plant

The variability in the reproductive characters of eggplant, including fruit length, fruit diameter, and fruit stalk length, is presented in Table 5. According to the PPVT (2007), fruit length is classified as short (2–5 cm), medium (5–10 cm), long (10–20 cm), and very long (>20 cm). The average fruit length among the genotypes ranged from 3.22 to 22.13 cm. The Hit F1 genotype had a significantly greater fruit length than most genotypes, except for Hit-AM45, Mus-AM36, and Hit-AM30. Fruit diameter was categorized as small (2–3 cm), medium (3–5 cm), large (5–10 cm), and very large (>10 cm) (PPVT, 2007). The average fruit diameter ranged from 3.44 to 5.12 cm. Pro-AM1 had the largest diameter, although it was not significantly different from Hit-AM30, Mus-AM36, Hit-AM45, and Mustang F1. The genotypes had average fruit stalk lengths ranging from 3.10 to 6.33 cm. Hit-AM45 and Hit-AM30 exhibited the longest stalks, which were significantly longer than those of the other genotypes, but not significantly different from each other.

The variability in the quantitative yield-related characters of eggplant, namely, fruit weight per plant, weight per fruit, and number of fruits per plant, is presented in Table 5. The average fruit weight per plant ranged from 248.7 to 1,547.0 g. Pro-AM1 exhibited a significantly higher fruit weight per plant than the other tested genotypes, except for Hit-AM30 and the three check varieties. The average weight per fruit ranged from 21.02 to 145.94 g. Genotypes Hit-AM30, Pro-AM1, Mus-AM36, Hitavi F1, and Mustang F1 showed no significant difference in

Table 4

Characteristics of Days to Flowering, Days to First Harvest, Days to Final Harvest, and Harvesting Period were Measured for 14 Eggplant Genotypes

No	Genotype	Days to flower (DAP)	Days to first harvest (DAP)	Days to final harvest (DAP)	Harvesting period (days)
1	Pro-AM1	33.0[b]	64.0[b]	127.7	63.7[a]
2	Pro-AM18	33.0[b]	67.7[b]	118.0	50.3[ab]
3	Hit-AM30	37.0[ab]	64.0[b]	124.3	60.3[a]
4	Mus-AM36	41.0[a]	99.7[a]	121.0	21.3[b]
5	Pro-AM38	33.7[b]	64.0[b]	121.0	57.0[a]
6	Pro-AM40	37.0[ab]	64.0[b]	117.3	53.3[ab]
7	Hit-AM45	34.3[b]	64.0[b]	124.7	60.7[a]
8	Pro-AM46	35.7[ab]	64.0[b]	111.3	47.3[ab]
9	Pro-AM47	34.3[b]	64.0[b]	115.0	51.0[ab]
10	Pro-AM48	34.3[b]	66.0[b]	124.7	58.7[a]
11	Pro-AM50	34.3[b]	64.0[b]	124.7	60.7[a]
12	Provita F1	33.0[b]	64.0[b]	124.3	60.3[a]
13	Hitavi F1	35.7[ab]	67.7b	131.0	63.3[a]
14	Mustang F1	37.0[ab]	66.0[b]	121.3	55.3[ab]

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fruit weight and had higher values than the other genotypes. According to Putri et al. (2017), there is a negative correlation between fruit weight and the number of fruits per plant. Plants with fewer fruits receive a greater proportion of translocated photosynthates, thereby increasing the fruit weight. The number of fruits per plant ranged from 3.3 to 34.7 (Table 5), with no significant differences observed among the genotypes. The number of fruits produced can be influenced by multiple genetic factors (Kumar & Wehner, 2013), competition for assimilates between vegetative and generative organs (Marcelis, 1996), and environmental conditions. This environmental effect is supported by Ma'arif et al. (2025), who reported a reduction in the number of fruits in eggplant grown under different shading levels.

Based on the observations presented in Table 5, the average reproductive characters and yield components of the Provita F1, Hitavi F1, and Mustang F1 genotypes were lower than those reported in their respective variety descriptions. The observed fruit weights per plant were 1,015.3 g for Provita F1, 987.3 g for Hitavi F1, and 1,366.7 g for Mustang F1, respectively. In contrast, the variety descriptions indicate fruit weight ranges of 1.58–2.06, 2.66–2.92, and 1.58–2.06 kg, respectively. According to Putri et al. (2017), the fruit weight per plant is positively correlated with the fruit length, width, diameter, and number of fruits per plant. In the present study, these variables for the three check varieties were all lower than those listed in the variety descriptions, potentially explaining the reduced yields.

The lower yield observed suggests that the check varieties did not achieve their optimum production potential under the experimental conditions. This may be attributed to suboptimal environmental factors, such as greenhouse temperature, irrigation practices, soil conditions, or pest incidence, none of which were specifically monitored in this study. These genotypes are expected to perform better when cultivated under optimal environmental conditions.

Table 5

Characteristics of Fruit Length, Fruit Diameter, Fruit Stalk Length, Fruit Weight per Plant, Weight per Fruit, Number of Fruits per Plant

No	Genotipe	Fruit length (cm)	Fruit diameter (cm)	Fruit stalk length (cm)	Fruit weight per plant (g)	Weight per fruit (g)	Number of fruits per plant
1	Pro-AM1	8.72^{d}	5.12^{a}	4.87^{bc}	1,547.0^{a}	103.79^{a}	14.0^{b-d}
2	Pro-AM18	3.42^{e}	3.64^{ef}	3.57^{d}	442.7^{d-f}	22.70^{b}	19.7^{bc}
3	Hit-AM30	18.50^{a-c}	4.86^{ab}	5.46^{ab}	1,108.7^{a-c}	145.94^{a}	7.7^{cd}
4	Mus-AM36	14.06^{c}	4.58^{a-d}	4.20^{cd}	373.3^{f}	107.28^{a}	3.3^{d}
5	Pro-AM38	3.48^{e}	3.55^{f}	4.01^{cd}	608.7^{c-f}	22.85^{b}	28.0^{ab}
6	Pro-AM40	3.58^{e}	3.80^{def}	3.93^{cd}	471.7^{d-f}	24.91^{b}	21.3^{a-c}
7	Hit-AM45	16.21^{bc}	4.47^{a-e}	5.73^{ab}	967.3^{b-e}	124.29^{a}	8.7^{cd}
8	Pro-AM46	3.24^{e}	3.44^{f}	3.48^{d}	410.7^{ef}	21.02^{b}	19.3^{bc}
9	Pro-AM47	3.22^{e}	3.60^{f}	3.10^{d}	248.7^{f}	21.37^{b}	11.7^{Cd}
10	Pro-AM48	3.37^{e}	3.83^{def}	4.03^{cd}	570.7^{c-f}	24.92^{b}	21.7^{a-c}
11	Pro-AM50	3.28^{e}	3.49^{f}	3.47^{d}	584.7^{c-f}	22.48^{b}	27.3^{ab}
12	Provita F1	3.62^{e}	3.88^{c-f}	3.40^{d}	1,015.3^{a-d}	29.03^{b}	34.7^{a}
13	Hitavi F1	22.13^{a}	4.16^{b-f}	6.33^{a}	987.3a^{-e}	140.66^{a}	7.7^{cd}
14	Mustang F1	19.53^{ab}	4.73^{abc}	5.01^{bc}	1,366.7^{ab}	144.98^{a}	9.3^{cd}

Note. Values followed by the same lowercase letter in the same column are not significantly different according to HSD at α=5%.

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Cluster Analysis

Cluster analysis is a multivariate analysis method used to group units into several clusters based on their similarities (Lathifaturrahmah, 2014). Cluster analysis is a fundamental tool in plant breeding programs, enabling the identification of desirable characters and selection of appropriate parental lines for hybridization (Akilan et al., 2023). Cluster analysis aims to identify groups of objects that are similar within each group and distinct from objects in other groups (Acito, 2023). In this context, the smaller the genetic distance between genotypes (i.e., closer to 0), the similar they are.

The eggplant genotypes in this study were grouped into four clusters (Figure 2). Based on the cluster analysis, the tested genotypes were broadly divided into two groups. Cluster I was characterized by genotypes with short fruit length, small fruit diameter, medium fruit stalk length, and an average fruit weight ranging from 21.02 to 29.03 g. This cluster comprises seven breeding lines and one check variety: Pro-AM47, Pro-AM46, Pro-AM48, Pro-AM40, Pro-AM50, Pro-AM38, Pro-AM18, and Provita F1. Cluster II includes genotypes with medium to long fruit length, medium fruit diameter, medium to long fruit stalk, and an average fruit weight between 103.79 and 145.94 g. This cluster consisted of four breeding lines and two check varieties: Mus-AM36, Hit-AM45, Hit-AM30, Pro-AM1, Mustang F1, and Hitavi F1. The variability of fruit traits among the genotypes is presented in Figure 1.

Figure 1

Fruit Trait Variability among Doubled-Haploid (DH) Eggplant Lines Obtained from Anther Culture and Commercial Varieties Evaluated in this Study

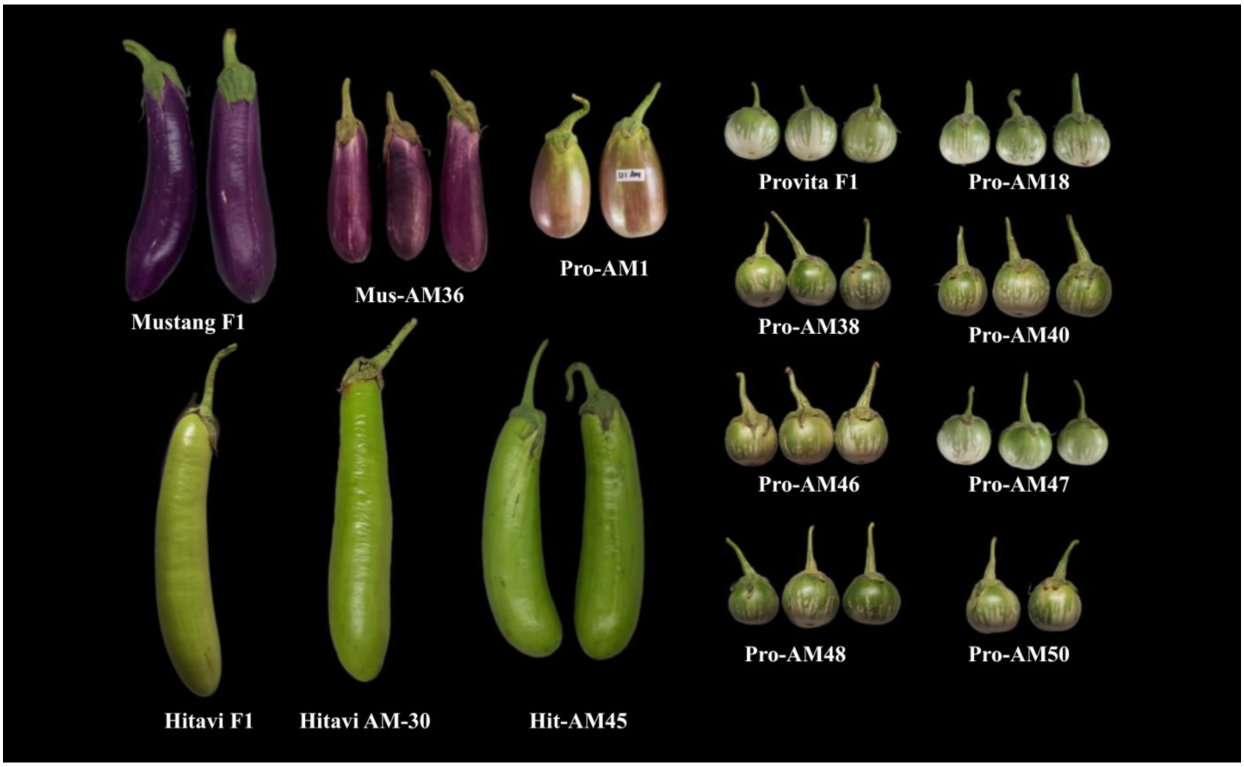

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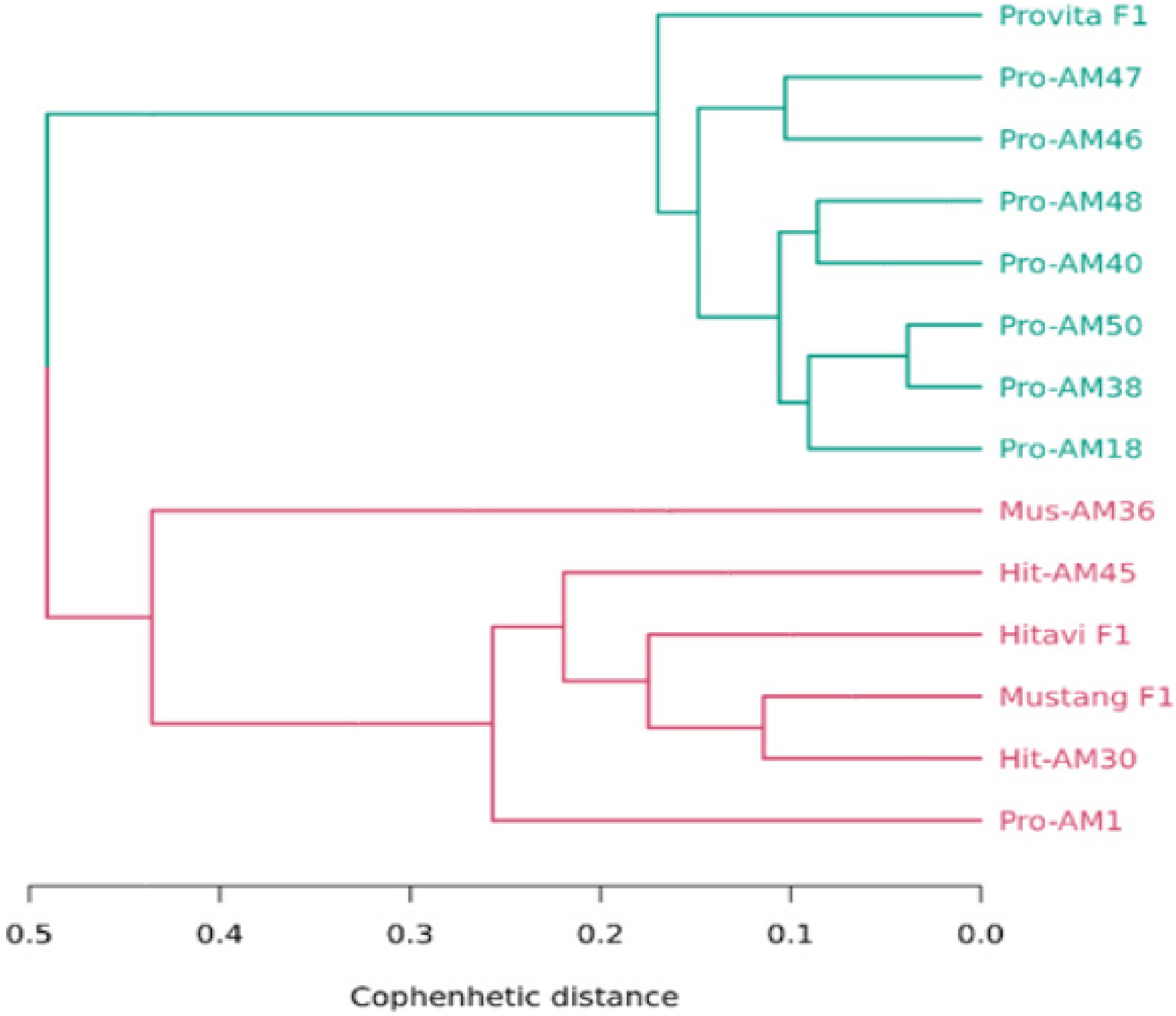
Figure 2

Dendrogram of Doubled Haploid Lines of Eggplant and Check Varieties based on 13 Quantitative Characters



The potential to achieve high heterosis in hybrid progeny can be predicted by selecting parental lines with large genetic distances (Ritonga, 2023). Based on key yield components, namely, the number of fruits per plant, weight per fruit, and total fruit weight per plant, along with the results of cluster analysis (Figure 2), Pro-AM38, Hit-AM30, Pro-AM1, and Pro-AM50 were considered promising for hybridization. These genotypes exhibited desirable traits in terms of the number of fruits and total fruit weight per plant and belonged to different clusters, indicating greater genetic divergence.

Another potentially promising cross is between Pro-AM1 and Hit-AM30, which showed superior performance in fruit weight, fruit length, and fruit diameter and were grouped into different clusters in the analysis shown in Figure 2. This genetic divergence, combined with complementary agronomic traits, suggests that both crosses may produce hybrids with improved performance through heterosis.

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Conclusions

The doubled-haploid eggplant lines evaluated in this study exhibited significant variation across all quantitative characters, except for the days to final harvest. Cluster analysis grouped the genotypes into two major clusters based on quantitative performance. Among the tested lines, Pro-AM1, Pro-AM38, Pro-AM50, and Hit-AM30 demonstrated superior yield-related traits, highlighting their potential as parental lines for hybrid breeding programs. These findings provide a valuable foundation for selecting elite lines for eggplant improvement using doubled-haploid technology.

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