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GROWTH AND YIELD OF SEVEN NEW HYBRID CHILLI PEPPER GENOTYPES IN HYDROPONIC SYSTEMS

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ABSTRACT

In the midst of limited agricultural land in urban areas, a hydroponic plant system is an effective and efficient solution. Varieties that are able to adapt to a wide range of environmental are needed. Hydroponic systems can produce better crops and good quality harvests. This research aims to obtain the harvest yield and harvest quality of hybrid chilli pepper using hydroponic systems. This research was carried out using a complete random design with one factor consisting of 7 hybrid chilli pepper varieties, namely UNIB C H 13, UNIB C H43, UNIB C H433, UNIB C H23, UNIB C H63, UNIB C H 83, UNIB C H53 and 2 commercial varieties (Taro and Lado). Each treatment was repeated 5 times, with 3 plants per repeat. The results of the study showed that in chilli pepper hybrid cultivated hydroponically, the plant components were better than in the field. However, the yield of fruit per plant is better in the field. The UNIB C H23 and UNIB C H83 genotypes have the best yield character in the cultivation of hydroponic systems. UNIB C H23 has a fast-flowering life, weight per fruit, number of fruits, and high fruit weight per plant. Meanwhile, UNIB C H83 has the best results in weight per fruit, fruit weight plant, fruit length, fruit diameter, and fruit skin thickness.

Keywords: Urban Agriculture, Variety Testing, Heritability, Correlation

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1. INTRODUCTION

Chilli pepper (*Capsicum annuum* L.) is a horticultural crop that has high economic value. Chilli pepper fruits are used for daily and industrial needs. Generally, chilli pepper is consumed in a fresh state, dried chilli pepper, and flour (Jupri *et al*., 2022). Chilli pepper fruits are also used for the pharmaceutical, paste, cosmetic, and dye industries (Saadah *et al*., 2018) Chilli pepper has a vitamin C content of 550.69mg/100g, (Murti, 2017). Chilli pepper productivity in Indonesia in 2022 was recorded at 10.65 tons/ha, increasing in 2023 to 11.52 tons/ha (Ministry of Agriculture 2024). However, the potential productivity of chilli pepper can reach 20-30 tons/ha (Marpaung, *et al*., 2019). Chilli pepper productivity can be increased by using hybrid chilli pepper varieties.

Hybrid varieties are the F1 generation that is the result of a cross between a pair or more elders (pure strains) that have superior traits (Gousya, 2023). Hybrid chilli pepper varieties have higher productivity than non-hybrid varieties. This is due to the high heterosis value in yield character, such as in cross-pollinating plants. According to Sirojuddin *et al*., (2015), the weight of the fruit in chilli pepper has a heterosis value of 43.35%. According to Ganefianti and Fahrurrozi (2018), the heterosis of chilli pepper can reach 139%, and (Liferdi *et al*., 2014) states that the heterosis value of chilli pepper is more than 70%.

The University of Bengkulu has produced several hybrid varieties, namely UNIB C H13, UNIB C H43, UNIB C H433, UNIB C H23, UNIB C H63, UNIB C H83, and UNIB C H53. These varieties still need testing in various environments before they can be officially released. Research on the use of various varieties of chilli pepper in various locations has been conducted (Wiratama *et al*., 2015). The new hybrid chilli pepper variety produced by the University of Bengkulu shows a productivity of up to 10 tons/ha and is resistant to Begomovirus, the cause of yellow curly leaf disease in chilli pepper (Ganefianti *et al*., 2017). However, the adaptation of these varieties to all environments has not been carried out.

The current agricultural trend is the modification of the environment with the cultivation of hydroponic systems. The application of hydroponic systems has been tested on various crops using various planting methods and media. The results showed that the best treatment was the treatment of cocopeat planting media + 1000 ppm of AB mix nutrients with a total fresh weight per plant of 171.64 g and a standard total fresh weight of 150 g (Ainina, 2017). According to Rehatta *et al*., (2023) the administration of AB Mix nutrient concentration did not show a significant effect on plant height at 42 HST, root length, and fresh weight of the roots. However, this treatment has a significant effect on the number of leaves at 42 HST, leaf area, and fresh weight of plants. The results showed that the type of planting medium had a very significant effect on the height of chilli pepper plants at the age of 14, 21, 28, 35 and 56 HST, stem diameter at the age of 21, 35, 42 and 56 HST, the length of the fruit had a real effect on the height of chilli pepper plants at the age of

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42 and 49 HST, and the stem diameter at the age of 14 and 28 HST (Andani *et al*., 2020). The advantages of hydroponics include increased crop yields, resource efficiency, and less reliance on soil quality, making it a potential solution for sustainable agriculture. According to Rehatta *et al*., (2023) the nutrient commonly used in hydroponic techniques is AB Mix. AB mix is a nutrient solution consisting of stock A which contains macronutrients and stock B contains micronutrients. Several studies have been conducted by researchers that show that hydroponic systems produces more and quality fruit. Hydroponic cherry tomatoes produce 95% grade A quality fruit, compared to conventional cultivation (Wulansari *et al*., 2021). Syafputri, (2017) Shows that nutrient concentration treatment increases plant leaf length and number. The results showed that cocopeat planting medium showed the best results in plant length, number of leaves, canopy width, leaf area, and total fresh weight (Zenita *et al*., 2019). The results of the study showed that the planting medium with a composition of 80% cocopeat and 20% zeolite was able to increase the growth and yield of melon plants (Nabiela 2019). The results showed that the variation in the EC value of the nutrient solution had an effect on the growth of strawberry plants. The EC value of the nutrient solution that has the best effect on strawberry growth is EC 2.2 mS/cm (Putri *et al*., 2020). Therefore, research is needed on the growth and yield of seven new hybrid chilli pepper varieties in hydroponic systems to increase the overall productivity of chilli pepper plants. This research aims to obtain the harvest and harvest quality of hybrid chilli pepper using hydroponic systems.

2. MATERIALS AND METHODS

Time and place

This research has been carried out from August to December 2024 on the experimental land of the Agricultural Zone, Faculty of Agriculture, University of Bengkulu with an altitude of ± 10 meters above sea level. This study used a complete random design (RAL) with one factor, namely seven hybrid chilli pepper varieties, UNIB C H13, UNIB C H43, UNIB C H433, UNIB C H23, UNIB C H63, UNIB C H83, UNIB C H53 and two comparative varieties (Taro and Lado). Each treatment was repeated 5 times, with 3 plants per repeat. The total number of plants is 135 plants.

Planting Procedure

The chilli pepper seeds are soaked in warm water at 50ºC for 10 minutes to speed up the dormancy period of the seeds. After that, the chilli pepper seeds are sown on merang paper that has been dripped with water until wet, then germinated for 6-7 days or until radicules appear in moist conditions, then moved to the seedling tray for 1 month. Chilli pepper seedlings that are 30 days old and have 5 to 6 leaves are ready to be transplanted into planting pots. The planting medium is a mixture of coconut powder *(cocopeat*) and husk charcoal with a ratio of 2 : 1. The *cocopeat* media is sifted first, then washed using water until clean and the tannins are gone, then *the*

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cocopeat is sun-dried. The *cocopeat* that has been cleaned is transferred to the planting pot (30 x 40 cm).

Planting is carried out in the afternoon to avoid exposure to too hot sunlight which can interfere with the growth of seedlings. Maintenance includes watering and providing nutrients automatically using a drip irrigation system. The application of AB mix nutrient solution starts from transplanting chilli pepper plants to the end of the planting period so that the moisture of the planting medium and the nutrient needs of the plants are met. The application of AB mix solution nutrition is carried out in stages, namely in the vegetative phase with a concentration level of 500 ppm, a concentration of 1000 ppm in the generative phase I, and a concentration of 1,500 ppm in the generative phase II. Watering and nutrition are carried out automatically with a predetermined time using *a digital irrigation timer* watering interval 4 times a day every 3 hours (07.00 WIB; 10.00 WIB; 13.00 WIB; 16.00 WIB).

Embroidery is done at the age of 7 days after planting (HST) to replace dead or poorly growing plants. Pruning is carried out at the age of 5 weeks after planting (MST) to ensure that the plant remains upright using a mining rope. Weeds are cleaned manually by pulling them out of the vicinity of the plant. Pest and disease control is carried out if necessary. Harvesting is carried out when the chilli pepper fruits have reached red color as a sign of ripeness is carried out seven times with an interval of one week.

The variables observed in this study included plant height, dichotomous height, dichotomous number, stem diameter, canopy area, flowering age, fruit length and diameter, number of fruits per plant, number of stomata, weight of fruit per plant, weight per fruit, and thickness of chilli pepper fruit skin.

Data Analysis

The data obtained was analyzed using Variance Analysis (ANOVA) with an F test at the level of 5%. If there is a significant difference, further tests are carried out using the Duncan Multiple Range Test (DMRT) at the level of 5%. This study calculated the heritability value in 9 genotypes of new hybrid chilli pepper. The data was obtained through direct observation of 13 variables. Estimate the heritability value using a formula.

$$h^2 = (\sigma_g^2 \,/\, \sigma_p^2) \times 100\%$$

Information:

h2 = Heritability

σ_g^2 = Genotype variety

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σ_p^2 = Variety of phenotypes

According to Zen (2012) in Rohcahyani *et al*., (2022) heritability: high ($h^2 > 50\%$), medium ($20\% < h^2 \leq 50\%$), and low ($h^2 \leq 20\%$).

3. RESULTS AND DISCUSSION

The results of the analysis of variants of seven new hybrid chilli pepper genotypes and two comparative variables showed that there was a real influence between varieties on 13 observation variables and three variables with an unreal effect. The 10 variables that had a real effect were plant height, dichotomous height, dichotomous number, number of dicotomes, flowering age, number of stomata, fruit length, fruit diameter, weight per fruit, number of plant fruits, fruit weight per plant. The results of the analysis of the variants that had an unreal effect were the diameter of the stem, the area of the canopy, and the thickness of the fruit (Table 1). The results of Andani *et al*., (2020) also found that varieties had a real effect on the height of chilli pepper plants, but varieties had no real effect on the variables in the number of fruits per plant and weight per fruit. The results of the variety analysis showed that chilli pepper varieties had a real effect on the number of chilli pepper per plant. (Firdaus, *et al*., 2022).

Table 1: The results of the analysis of growth character variants and the results of nine genotypes of hybrid chilli pepper varieties.

No	Variabel Observation	KT Treatment	F Value	CV %
1.	Plant height	649.0	4.6*	7.8
2.	Dichotomous height	259.9	7.7*	13.4
3.	Number of dichotomous	16901.3	3.6*	22.1
4.	Diameter batang	1.2	1.1ns	7.2
5.	Canopy area	9730688.2	1.8ns	25.5
6.	Flowering age	165.7	17.6*	8.6
7.	Fruit length	36 .6	26.0*	9.9
8.	Fruit diameter	30.7	62.7*	8.4
9.	Number of fruits per plant	4750.8	3.2*	25.5
10.	Number of stomata	2166	2.6*	13.1
11.	Weight of fruit per plant	75602.7	7.2*	21.5
12.	Weight per fruit	28.1	35.3*	17.0
13.	Thickness of the fruit peel	0.03	1.9ns	14.3

Description: * = real effect, ns = unreal effect

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The plant height of the nine genotypes of new hybrid chilli pepper grown in hydroponic systems ranged from 135.8 cm to 169.13 cm and for the comparison varieties it was 144.8 cm to 164.13 cm. UNIB C H433 has the highest plant height of 169.13 cm, not significantly different from UNIB C H63 and TARO. However, the high yield of the plant is noticeably different from the rest. (Table 2). This means that UNIB C H433 is higher than the LADO comparator variety. According to Rahmadani (2024), the UNIB C H433 variety planted on the land has a plant height of 96.1cm, UNIB C 63 99.1 cm, and a TARO of 97.6cm. In general, the plants planted in hydroponic systems are higher than in the land. The results of the correlation analysis showed that plant height was positively correlated with dichotomy height (r=0.53), stem diameter (r=0.37), and number of stomata (r=0.31). Plant height was also negatively correlated with fruit weight (r=-0.37), fruit weight (r=-0.34), and fruit length (r=-0.38). These results show that in hydroponic systems, the tall plants are also high in dichotom with a large stem diameter and a large number of stomata. Tall plants have a small weight per fruit, short fruit and fruit length, and low planting fruit weight. According to Dzikrillah *et al*., (2023), plant height has a negative correlation with fruit weight per plant and bedding weight. According to Jabeen *et al*., (2011) the weight of crop fruits is significantly correlated with the number of fruits per plant, the number of branches per plant, and the height of the plant. According to Syukur *et al*., (2022) plant height is positively correlated with the number of plant fruits. The high appearance of the plant is influenced by genetics and the environment is indicated by a heritability value of 0.42% (moderate). However, according to Farwah *et al*., (2020) the heritability value at plant height is 98% (height). According to Sayekti *et al*., (2021) the heritability value at plant height is 61%, fruit length is 65%, and leaf length is 51% (height).

Table 2: The appearance of the character of plant height, dichotomous height, number of dichotomes, stem diameter, number of stomata, and canopy area.

Treatment	PH (cm)	DH (cm)	ND	ST (mm)	NS (mm2)	CA (cm2)
CH13	145.2 cd	38.1 c	275.7 b	12.3 b	20.2 abc	11350.4 a
CH23	139.9 d	39.1 c	291.8 ab	13 ab	20.6 abc	10344.8 ab
CH43	147.4 cd	42.2 bc	307.2 ab	13.1 ab	22.1 abc	9794.3 ab
CH433	169.1 a	57.3 a	358.9 ab	12.6 ab	24.3 a	9135.7 ab
CH53	135.8 d	35.8 c	268 bc	12.5 ab	22.8 ab	8663.3 ab
CH63	160.9 abc	49.6 b	338 ab	13.2 ab	18.3 c	7922.7 b
CH83	151 bcd	48.6 b	184.2 c	13.4 ab	22.5 ab	7662.6 b
LADO	144.8 cd	37.9 c	382.9 a	13.3 ab	23.4 bc	7505.4 b

Description: PH = Plant Height (cm), DH= Dichotomous Height (cm), ND= Number of Dichotomes, ST= Stem Diameter (mm), NS= Number of Stomata, CA= Canopy Area (cm^2)

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UNIB C H433 has the highest dichotomous height of 57.35 cm, in stark contrast to all new hybrid chilli pepper varieties and comparator varieties. The UNIB C H43 variety is not significantly different from the UNIB C H13, UNIB C H23, UNIB C H53, UNIB C H63, UNIB C H83 and the LADO and TARO comparator varieties (Table 2). According to Rahmadani (2024), the UNIB C H433 chilli pepper variety planted on land has a height of 30.3 cm. This means that chilli pepper plants grown in hydroponic systems are higher in diatoms than in land. Kusmanto *et al*., (2015) stated that the highest dichotomous height in the tested chilli pepper genotype was 30.1 cm. Syukur *et al*., (2022) estimated the height of the dichotomous measured in their study ranging from 15.00-34.57 cm throughout the planting site. The results of the correlation analysis showed that the height of the dichotomus was positively correlated with the thickness of the fruit (r =0.34). Dichotomus height was also negatively correlated with weight per fruit (r=-0.29), planting fruit weight (r=-0.37), and fruit length (r=-0.62). These results show that in hydroponic systems plants with a high dichotomous height have a thick thickness of the fruit skin. Plants with high dichotomi have a small weight per fruit, short fruits, and low crop fruit weight. According to Ganefianti *et al*., (2024) the height of the dichotomy is positively correlated very significantly with the number of fruits (r =0.67). According to Yunandra *et al*., (2023) the height of the dichotomy is positively correlated with the number of fruits planted (r=0.68). The height of the dichotomus is influenced by genetic factors, this can be seen from the heritability value of 57% (Table 4). According to Arifin, *et al*., (2014) the heritability value at dichotomous height is 43% (medium). According to Romadhoni, *et al*., (2014) the high heritability value of dichotomus is 73% (high).

The character of the number of dichotomes, the LADO variety has the highest number of dichotomies, which is 382.93, equivalent to the hybrids of UNIB C H23, UNIB C H43, UNIB C H433, UNIB C H63, and TARO. However, the LADO variety is markedly different from the hybrid chilli pepper UNIB C H13, and UNIB C H83. According to Simatupang *et al*., (2020) chilli pepper grown on land have a dichotomous number of 83.93 to 96.01. This means that chilli pepper grown in hydroponic systems have a higher number of dichotomes compared to chilli pepper grown on land. This character has a heritability value of 35% (medium). This means that genetics and environment influence this appearance. Each dichotomy will produce flowers. However, the number of these dichotomes does not correlate with the number of fruits. This suggests the role of genetics and environment greatly influences the character.

The stem diameter in the hybrid chilli pepper tested ranged from 12.33 mm to 13.94 mm. TARO has a significantly larger diameter of 13.94 mm which is not significantly different from the varieties UNIB C H 23, UNIB C H43, UNIB C H433, UNIB C H53, UNIB C H63, UNIB C H83 and the Lado comparator variety. However, the stem diameter of the TARO variety is significantly different from that of the UNIB C H13 variety (Table 2). According to Rahmadani (2024), the TARO variety planted on the land has a stem diameter of 10.2 mm. In general, plants grown in

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hydroponic systems have a larger stem diameter than in the field. According to Maryono *et al*., (2019) the C H23 genotype has a rod diameter of 8.51 mm. large stem diameters provide advantages on vegetative and generative growth, as plants become sturdier and less easily collapsed (Wilis *et al*., 2024) stem diameter is influenced by genetic and environmental factors, this can be seen a heritability value of 50% (medium). According to Santos *et al.*, (2014) Heritability value at 58% stem diameter (height). The results of the research Qosim *et al*., (2013) heritability value at the stem diameter are 99% (height).

In terms of the number of stomata characters, UNIB C H433 has the highest number of stomata of 24.37 and is not significantly different from UNIB C H13, UNIB C H23, UNIB C H43, UNIB C H433, UNIB C H53, UNIB C H83, and the TARO comparator. However, it is significantly different when compared to UNIB C H63, the LADO comparator variety (Table 2). According to Kasi *et al*., (2017) chilli pepper planted on land have an average of 9.33-9.78 stomata. Meanwhile, planting with a hydroponic system has an average of 18.35 -24.37. This means that chilli pepper plants with a hydroponic system produce a greater number of stomata compared to those grown in the field. Stomata regulate the evaporation of water from plants so that water can move from roots to leaves. When the temperature rises, the stomata close to keep the plant from drying out, but when the air is not too hot, the stomata will open and water can penetrate from the leaf surface into the leaf tissue Rohmah *et al*., (2018) The heritability value of the number of stomata is 20% (low) means that the appearance of this character is greatly influenced by environmental factors.

The canopy area in the new hybrid chilli pepper variety ranges from 7662.65cm^2– 11350.47cm^2. UNIB C H433 has the widest canopy of 11350.47cm^2, which is significantly different from the UNIB C H63 variety (Table 2), but is no different from the UNIB C H23, UNIB C H43, UNIB C H53, UNIB C UNIB C H83 and the comparative varieties namely LADO and TARO. The wide character of the canopy was positively correlated with the number of stomata (r=0.32). These results show that in hydroponic systems of plants with a large canopy area, the number of stomata will increase. According to Rahmadani (2024), the width of the canopy is positively correlated with leaf length (r=0.71) and leaf width (r=0.55). According to Kusmanto *et al*., (2015) the leaf area is positively correlated with the crown area (r=0.38), dichotomous height (r=0.48), and stem diameter (r=0.52) the heritability value of the canopy area is 17% (low), meaning that the appearance of this character is greatly influenced by environmental factors. Murniati, *et al*., (2013) stated that the crown of the plant (canopy) is influenced by the height, number of leaves, and branching of chilli pepper plants because the number of leaves increases, and the branching of the plant will be straight with the width of the plant crown.

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Figure 1: Appearance of chilli pepper plants 7 new hybrid chilli pepper genotypes and 2 comparative varieties

Table 3: Character Appearance: flowering age, weight per fruit, number of fruits, weight of plant fruits, fruit length, fruit diameter, and fruit thickness.

Treatment	FA (day)	WPF (g)	NF	PFW (g)	FL (cm)	FD (mm)	FST (mm)
CH13	30 de	4.5 c	135.5 abc	454.3 bc	13.5 ab	7.1 c	0.8 ab
CH23	28.8 e	6.5 b	122.8 bcd	664.2 a	14.4 ab	9 c	1 a
CH43	37.8 bc	3.3 c	149.6 abc	343.9 c	6.1 e	9.2 b	0.9 a
CH433	45.6 a	4.1 c	137.1 abc	393.5 c	11.6 c	6.6 c	0.7 b
CH53	33.5 cd	4.2 c	113.8 cd	419.5 c	12.8 bc	7.4 c	0.9 ab
CH63	42 a	5.8 b	168.2 ab	377.8 c	9.3 de	6.6 c	0.9 a
CH83	36.7 bc	10.9 a	79.4 d	655.6 a	14.7 a	14.3 a	1 a
LADO	30 de	3.9 c	184.8 a	570.1 ab	12.5 bc	6.8 c	0.9 ab
TARO	32.9 cde	3.6 c	148 abc	393 c	1.,5 c	6.9 c	0.9 ab

Description: FA=Flowering age(days), WPF=Weight per fruit (g), NF=Number of fruits, PFW=Planted fruit weight (g), FL=Fruit length (cm), FD=Fruit diameter (mm), FST=Fruit skin thickness (mm)

The flowering age character of hybrids ranges from 28 to 45 HST and the comparative varieties range from 30 to 33 HST. UNIB C H23 (28 HST) has a flowering time equivalent to UNIB C H13, and the comparative varieties LADO and TARO. However, the varieties of UNIB C H23 are markedly different when compared to UNIB C H43, UNIB C H433, UNIB C H53, UNIB C H63, UNIB C H83 (Table 3). UNIB C H23 varieties have a faster flowering life when compared to the TARO and LADO comparison varieties. According to Rahmadani (2024), the UNIB C H23 variety has a flowering age of 32 HST. This means that the UNIB C H23 variety will flower faster when planted in hydroponic systems. Maryono *et al*., (2019) stated that the UNIB C H23 genotype has

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a flowering age of 34.00 HST in ultisol land and 38.50 HST in hizolar land. The results of correlation analysis showed that flowering age was negatively correlated with fruit length (r =-0.39). This means that plants that have a fast-flowering life have a short fruit length. According to Chesaria *et al*., (2018) flowering age is positively correlated with harvest age, number of fruits, weight of fruit per plant, and weight per fruit. According to (Yunandra, *et al*., (2023) flowering age is positively correlated with harvest age (r=0.62). The appearance of flowering age is influenced by genetics which is indicated by a heritability value of 76% (high). According to Ritonga *et al*., (2017) the heritability value at the flowering age is 50% (moderate).

The weight per fruit of hybrid chilli pepper ranges from 3.3 g to 10.9 g and for comparison varieties ranges from 3.6 g to 3.9 g. UNIB C H83 has the heaviest weight per fruit of 10.9 g. However, it is noticeably different when compared to UNIB C H13, UNIB C H23, UNIB C H43, UNIB C H433 and UNIB C H53, UNIB C H63, and the TARO and LADO comparison varieties (Table 3). According to Rahmadani (2024), the UNIB C H23 variety planted on land has a weight of 4.3 g while hydroponically it has a weight of 6.3g. In general, plants grown in hydroponics have a heavier weight than those grown in the field. The results of the correlation analysis showed that the weight per fruit was positively correlated with the thickness of the fruit (r=0.44). Weight per fruit was also negatively correlated with fruit length (r=-0.49), and fruit diameter (r=-0.30). These results show that in hydroponic systems, the weight per fruit is heavy, so it has the character of thick fruit skin thickness. The weight per heavy fruit has a short fruit character and a small fruit diameter. According to Nisa *et al*., (2022) the weight per fruit is positively correlated with the length of the fruit (r=0.54), and the diameter of the fruit (r=0.55). According to Yunandra *et al.*, (2020) Weight per fruit (r=0.82) is positively correlated with fruit diameter (r = 0.95), thickness of fruit flesh (r=0.76). Ganefianti *et al*., (2017) also stated that the UNIB C H23 hybrid has a higher fruit length, fruit diameter, weight of fruit per fruit, and weight of fruit per plant than other comparative varieties. In line with this statement. Erviana, *et al*., (2020) added that the weight of chilli pepper fruits is greatly influenced by the length of the fruit and the diameter of the fruit. The weight character per fruit is influenced by genetic factors, this can be seen from the heritability value of 87% (high). According to Fransisko (2020), the heritability value is 90% (high).

The number of fruits per hybrid plant ranges from 79.4 to 168.26 fruits and for comparative varieties ranges from 148.06 to 184.86 fruits. LADO (184.86 pieces) has the highest number of fruits per plant but does not differ significantly from UNIB C H13, UNIB C H43, UNIB C H433, UNIB C H63, UNIB C H83 and the TARO comparator varieties (Table 3). According to Rahmadani (2024), the LADO variety has an average number of 213 fruits. This means that plants grown on land have a greater number of fruits than those grown hydroponically. The results of the correlation analysis showed that the number of fruits was negatively correlated with the diameter of the fruit (r=-0.49), and the thickness of the fruit (r=-0.30). These results show that in hydroponic

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systems, the large number of fruits has a small fruit diameter and a thin thickness of the fruit skin. According to Dzikrillah *et al.*, (2023) The number of fruits is positively correlated with the weight of the planting fruit and the weight of the berbedeng. According to Amalia *et al*., (2023) the number of fruits is positively correlated with the weight of the fruit of the crop (r=0.99). The number of crops is influenced by environmental factors; this can be seen with a heritability value of 36% (medium). According to Evelyn (2023), the heritability value of the number of planted fruits is 88% (high). According to Qosim *et al*., (2013) the heritability value of the number of planted fruits is 99% (high).

The fruit weight per new hybrid chilli pepper plant ranged from 343.9 g to 664.2 g and for the comparison variety ranged from 393.0 g to 570.1 g. UNIB C H23 had the highest fruit weight per plant at 664.2 g (15.33 tons/ha) and differed not significantly when compared to the UNIB C H83 genotype. However, the UNIB C H83 variety is significantly different when compared to the UNIB C H13, UNIB C H43, UNIB C H433, UNIB C H53, UNIB C and the LADO comparator variety (Table 3). According to Rahmadani (2024), UNIB C H23 has a weight of 733.9 g planted on land. This means that plants grown in the field have a heavier weight of fruit per plant compared to the hydroponic systems. Furthermore, the genotypes that produce fruit weight per plant from high to low are UNIB C H83 (655.66 g = 15.12 tons/ha), LADO comparison variety (570.13 g = 13.16 tons/ha), UNIB C H13 (454.39 g = 10.43 tons/ha), UNIB C H53 (419.59 g = 9.66 tons/ha), UNIB C H433 (393.53 g = 9.03 tons/ha), TARO comparison variety (393 g = 9.03 tons/ha), UNIB C H63 (377.86 g = 8.68 tons/ha), UNIB C H43 (343.95 g = 7.91 tons/ha). Ganefianti *et al*., (2017) stated that the C H23 hybrid has a higher fruit weight per plant than other comparative varieties. This is in line with the description, namely UNIB C H23 has a weight ranging from 220.52 g to 752.80 g. The weight character of the fruit is influenced by genetic factors, where each genotype has a different fruit size. Sahid *et al*., (2022) added that the weight of chilli pepper fruits is greatly influenced by the length of the fruit and the diameter of the fruit. The results of the correlation analysis showed that the weight of fruit per plant was positively correlated with the length of the fruit (r=0.62), and the diameter of the fruit (r=0.45). Fruit weight per plant was also negatively correlated with flowering age (r=-0.34). These results show that in hydroponic systems, the weight of fruit per plant is heavy, so it has a long fruit character and a large fruit diameter. The character of the slow flowering age will increase the weight of the fruit produced. According to Rizki *et al*., (2015) the weight of fruit per plant is positively correlated with the diameter of the fruit (r=0.71), and the weight per fruit (r=0.85). According to (Rizki *et al*., (2015) the weight of fruits per plant is negatively correlated with flowering age (r=-0.73). Sugestiadi, *et al*., (2014) stated that the weight of fruits per plant is negatively correlated with flowering age. The appearance of the weight of the planting fruit is influenced by genetic factors which are indicated by a heritability value of 55% (high). According to Dalimunthe *et al*., (2024) the heritability value of the weight of the

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planted fruit is 56% (high). According to Dhanussela *et al.*, (2024)) heritability value of fruit weight per plant is 73% (high).

The length of the fruit of the hybrid chilli pepper ranges from 6.1 cm to 14.7 cm and for the comparison variety ranges from 11.5 to 12.5 cm. UNIB C H83 has the longest fruit, which is 14.7 cm, this result is not significantly different when compared to UNIB C H23 and UNIB C H13. However, it is significantly different when compared to the varieties UNIB C H43, UNIB C H433, UNIB C H53, UNIB C H63 and the comparative varieties LADO and TARO (Table 3). This means that UNIB C H83 has a longer fruit length when compared to the LADO and TARO comparison varieties. However, UNIB C H83 is not real from UNIB C H23. UNIB C H23 has a fruit length of 14.46 cm in a hydroponic system. According to Rahmadani (2024), UNIB C H23 has a fruit length of 13.1 cm planted on land. In general, plants grown in hydroponic systems have a longer fruit length than in the field. The results of Santoso's (2015) research show that the UNIB C H23 genotype has the longest fruit (15.03 cm) on regosol land. This can be interpreted that plants that have a long appearance of fruits, the weight of the fruit produced will also be high. The appearance of the length of the fruit is influenced by genetic and environmental factors this is indicated by a heritability value of 83% (high). According to Istiqlal *et al*., (2014) the length heritability value of the fruit is 93% (height). According to Cahya *et al*., (2014) the value of the heritability of the fruit length is 82% (high).

The diameter of the fruit of the hybrid chilli pepper ranges from 6.6 mm to 14.3 mm and for the comparison variety ranges from 6.8 mm to 6.9 mm. UNIB C H83 has the largest fruit diameter of 14.3 mm. However, UNIB C H83 is significantly different when compared to the varieties UNIB C H13, UNIB C H23, UNIB C H43, UNIB C H433, UNIB C H53, UNIB C H63 and the comparative varieties LADO and TARO. (Table 3). The UNIB C H23 variety in the hydroponic system has a fruit diameter of 9.03 mm. Rahmadani (2024) UNIB C H23 has a fruit diameter of 8.2 mm planted on land. This means that hydroponic systems will produce a larger diameter of fruit compared to those grown on the field. Santoso (2015) stated that genotype C H23 has the largest fruit diameter, which is 8.81 mm in regosol land and 8.83 mm in ultisol land. The results of the analysis of fruit diameter were positively correlated with the thickness of the fruit skin (r =0.44). This means that the appearance of plants that have a large diameter will increase the thickness of the fruit skin. According to Dzikrillah *et al*., (2023) the diameter of the fruit is negatively correlated with the weight of the fruit per plant and the weight of the fruit per bed. The appearance of the diameter of the fruit is influenced by genetic factors, this can be seen from the heritability value of 0.92%. (Table 4). According to Cahya *et al*., (2014) the heritability value of fruit diameter is 92% (height). According to Evelyn (2023), the heritability value of fruit diameter is 52% (height).

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The thickness of the skin of the hybrid chilli pepper fruit ranges from 0.7 mm to 1.07 mm and for the comparative variety ranges from 0.90 mm to 0.91 mm. UNIB C H83 has the thickest fruit skin thickness of 1.07 mm. However, it is not significantly different from UNIB C H13, UNIB C H23, UNIB C H43, UNIB C H53, UNIB C H63, and the LADO and TARO comparator varieties. UNIB C H83 is significantly different from UNIB C H63 (Table 3).

The heritability value of 28% (medium) means that the appearance of this character is greatly influenced by environmental factors. According to Komariah (2007), the heritability value of fruit skin thickness is 88% (high). According to Firdaus, *et al*., (2022) the heritability value of the thick fruit peel is 91% (high).

Table 4: Estimated Heritability Value of 9 New Hybrid Chilli Pepper Genotypes.

NO	OBSERVATION VARIABEL	HERITABILITY (%)	DESCRIPTION
1.	Plant height	42	Medium
2.	Dichotomous height	57	High
3.	Number of dichotomous	35	Medium
4.	Rod diameter	50	Medium
5.	Canopy area	17	Low
6.	Weight per fruit	87	High
7.	Number of fruits per plant	36	Medium
8.	Weight of fruit per plant	55	High
9.	Number of stomata	20	Medium
10.	Flowering age	76	High
11.	Fruit length	83	High
12.	Fruit diameter	92	High
13.	Thickness of the fruit peel	28	Medium

Remarks: According to Zen (2012) in Rohcahyani *et al*., (2022) are grouped as follows: High: h2>50%Medium: 20%<h2>50%Low: h2<20%.

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Table 5: Correlation test between the variables of Growth and Yield of chilli pepper plants.

Treat	PH	DH	ND	SD	CA	WPF	NF	PFW	NS	FA	FL	FD	FST
TT		0.53**	0.24 ns	0.37*	0.24 ns	(-)0.37*	0.12 ns	(-)0.34*	0.31*	(-)0.03 ns	(-)0.38**	(-)0.17 ns	0.24 ns
TDI			0.08 ns	0.13 ns	0.04 ns	(-)0.29*	0.05 ns	(-)0.37*	0.12 ns	0.13 ns	(-)0.62**	(-)0.07 ns	0.30*
JDI				0.15 ns	(-)0.07 ns	(-)0.2 ns	0.19 ns	0.18 ns	0.11 ns	(-)0.21 ns	(-)0.01 ns	(-)0.02 ns	(-)0.10 ns
DBA					0.21 ns	(-)0.19 ns	0.13 ns	0.03 ns	0.24 ns	0.05 ns	0.007 ns	(-)0.15 ns	0.03 ns
LK						(-)0.16ns	0.01ns	(-)0.23ns	0.32*	0.26ns	(-)0.14ns	(-)0.21ns	0.08 ns
BPB							0.15ns	(-)0.26ns	0.00ns	(-)0.28ns	(-)0.49**	(-)0.30*	0.44**
JB								0.15ns	(-)0.26ns	0.00ns	(-)0.28ns	(-)0.49**	(-)0.30*
BBP									(-)0.13ns	(-)0.34*	0.62**	0.45**	0.14ns
JS										0.18ns	0.04ns	0.11ns	0.00ns
UB											(-)0.39**	(-)0.03ns	(-)0.06ns
PB												0.26ns	0.07ns
DB													0.44**
KB													

Description: * = real effect at 5%, ** = real effect at 1%, ns = no effect, Description: PH = Plant Height, DH = Dichotomous Height, ND = Number of Dichotomous, SD= Stem Diameter, NS = Number of Stomata, CA= Canopy Area, FA = Flowering Age, WPF = Weight per fruit, NF = Number of fruits, PFW = Plant Fruit weight, FL = Fruit length, FD = Fruit Diameter, FST = Fruit skin thickness.

CONCLUSION

1. The UNIB C H433 genotype has the best growth in the cultivation of hydroponic systems characterized by superior plant height, dichotomous height, dichotomy number, stem diameter, number of stomata, and superior canopy area.
2. The UNIB C H23 and UNIB C H83 genotypes have the best yield character in the cultivation of hydroponic systems. UNIB C H23 has a fast-flowering life, weight per fruit, number of fruits, and high fruit weight per plant. Meanwhile, UNIB C H83 had the best results in weight per fruit, fruit weight plant, fruit length, fruit diameter, and fruit skin thickness.

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