ATLANTIS PRESS

*Advances in Biological Sciences Research, volume 14*

**Proceedings of the 3rd KOBI Congress, International and National Conferences (KOBICINC 2020)**

# The Manglid (*Manglietia glauca* Bl) Growth Variations at Age of 42 Months in Candiroto Temanggung Central Java

Sugeng Pudjiono[1,*], Mudji Susanto[1], Mashudi[1], Dedi Setiadi[1], Maman Sulaeman[1] , Ratna Adji Hartati[2] , Taufik Rahmadi[2], Aris Wibowo[3]

[1]*Centre for Forest Biotechnology and Tree Improvement Jl. Palagan Tentara Pelajar Km 15 Purwobinangun, Pakem, Sleman, Yogyakarta*
[2]*Balai Pengelolaan Daerah Aliran Sungai dan Hutan Lindung Serayu Opak Progo Jl. Gedong Kuning No. 172 Yogyakarta*
[3]*Pusat Penelitian Pengembangan Pehutani Cepu Jl. Wonosari Tromol 6 Cepu. Desa Batokan, Kec. Kasiman, Kabupaten Bojonegoro Jawa Timur*
*Corresponding author: Email: sgpudjiono@gmail.com*

**ABSTRACT**
Manglid (*Manglietia glauca* Bl) is an indigenous tree species in the Indonesian forest whose existence began to be difficult to find. Wood is the part of the plant that can be used. The development of this plant which is the local genetic resources need to be done with the breeding program. In connection with this, the determination of the plant growth is necessary in order to obtain information of manglid ability in producing wood. The purpose of this research was to determine the growth variation of the manglid plants that planted at the Candiroto with an altitude between 457-464 meters above sea level, Candiroto District, Temanggung Regency, Central Java at the age of 42 months. The research method used was a Randomized Complete Block Design with the seedlings propagated from 100 parent trees, separated into 10 blocks, each block consisted of 4 tree plots, and the planting distance was 4 m x 3 m. The characteristics of plant measured were the height of the plant, stem diameter, and life percentage of manglid. The measurement results were analyzed for the variation and tested by employing a Duncan Multiple Range Test. The results showed that the height of plants was ranged between 106-1083 cm with an average of 577 cm. The stem diameter was ranged between 1,3-28,7cm with an average of 9,4 cm. The life percentage of plants was ranged between 17,5-80,0% with an average of 51,3%. The analysis results showed that the parent tree has significant effects on the total height and the stem diameter of plants. There were some variations of height characteristic from 100 parent trees, there were 23 groups, while for the stem diameter characteristic, there were 11 groups.

***Keywords:*** *growth, manglid, parent tree, tree age, variation*

## 1. INTRODUCTION

Manglid (*Manglietia glauca* BL) is one of an indigenous tree species in the Indonesian forest whose existence began to be difficult to find. This plant is naturally found in Sumatra, Java, Bali, Lombok, and Sulawesi Island in the altitude of 900-1,700 meters above sea level in the mixed forest that is humid with fertile soil [1]. The natural habitat is in Sukabumi mostly in Situ Gunung. The Manglid itself has an abundance score of 1.2 which means that it is categorized as rare [2]. Manglid is categorized as fast-growing tree species with a cycle under 10 years [3].

One of the functions of Manglid is wood utilization. The wood can be used as the raw material for bridge construction, household utensils, furniture (table, chair, cupboard), building, door material, wood coating, and plywood. The Manglid wood is categorized as the 3rd strong class and 2nd durable class with several characteristics including shiny, solid structure, smooth, light, and easy to be worked

on [4]. Since its prosperous characteristics, the local community is interested in planting Manglid in the form of community forests to meet the timber needs, especially in Priangan Timur, West Java [5].

The local community's interest in the Manglid cultivation is quite high. Meanwhile, the abundance of Manglid is rare. Therefore, it is needed to find which Manglid has the best growth. The plantation is needed in the form of nursery seedlings to obtain the superior Manglid seedling that will be developed for planting material. In forest plants, there are genetic variations between individuals. The selection of parent trees as individuals who compose the seedling plantation is important to obtain the superior Manglid seeds. For this reason, it is necessary to know the growth of plants planted from the parent trees that compose the seed garden. In connection with these problems, the selection of the best parent trees in terms of growth is an attempt to get the best plant growth information that going to be developed. The purpose of this research was to determine the variation of the plant height growth, stem diameter and the life percentage of Manglid that is planted as a source of seeds located in Candiroto, Central Java.

## 2. METHODS

### *2.1. Time and Research Place*

Manglid seedling plantation was planted in April 2016. The seeds were originated from Tasikmalaya, Sumedang and Sukabumi, West Java [6]. The measurement of the plant growth is done in October 2019 with Manglid at the age of 42 months. The coordinate location of the research is 7° 06,687 S and 111° 06.267 E. The research is done in Candiroto with the altitude of 457-464 meters above the sea level, and latosol soil types [7], located in Candiroto, Temanggung, Central Java.

### *2.2. Procedure*

#### *2.2.1 Tools and Materials*

The tools used are height measuring pole, digital caliper to measure diameter, tally sheet, map of seedling seed orchard design, field notes, and stationery. The research material was in the form of plantation in seedling seed orchard with the age of 42 months.

### *2.3. Research Design*

The research design in the field uses Randomized Complete Block Design (RCBD) with 100 parent trees originated from Tasikmalaya (15), Sumedang (10) and Sukabumi (75) divided into 10 blocks which each block consists of 4 tree plots, planting distance 4m x 3m. The characteristics of the plant that is measured are the height, stem diameter and life percentage of Manglid. The plant height measurements are carried out from the soil surface to the tip of the plant. The diameter of the stem is the measured diameter at the height of the chest, which is 130cm above the soil surface. The life percentage is measured by counting the number of living plants divided by the initial number of plants planted from each tree plot.

### *2.4. Data Analysis*

The measurement data of the height of the plant, stem diameter, and the life percentage were analyzed by using the variant analysis to understand the effect of treatment towards the characteristics that were observed. If the significant differences exist, the Duncan Multiple Range Test (DMRT) will be conducted.

## 3. RESULT AND DISCUSSION

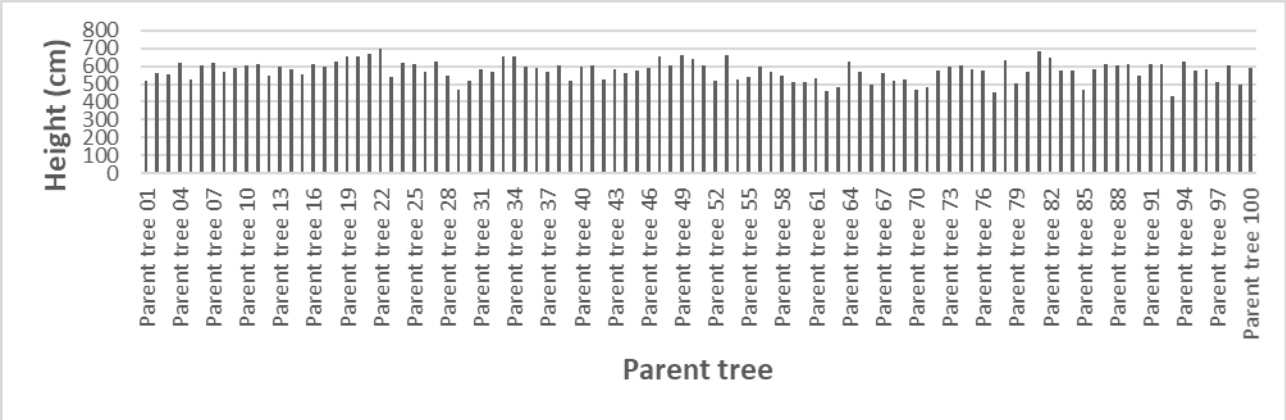
### *3.1. Result*

The results of measurements of plant height, stem diameter and life percentage of plant were analyzed for variance as shown in Table 1. The graphs of variation in plant height growth, stem diameter, and life percentage can be seen in Figure 1. Duncan Multiple Range Test was carried out because of the variant analysis results were very significantly different on plant height and stem diameter as shown in Table 2 below.

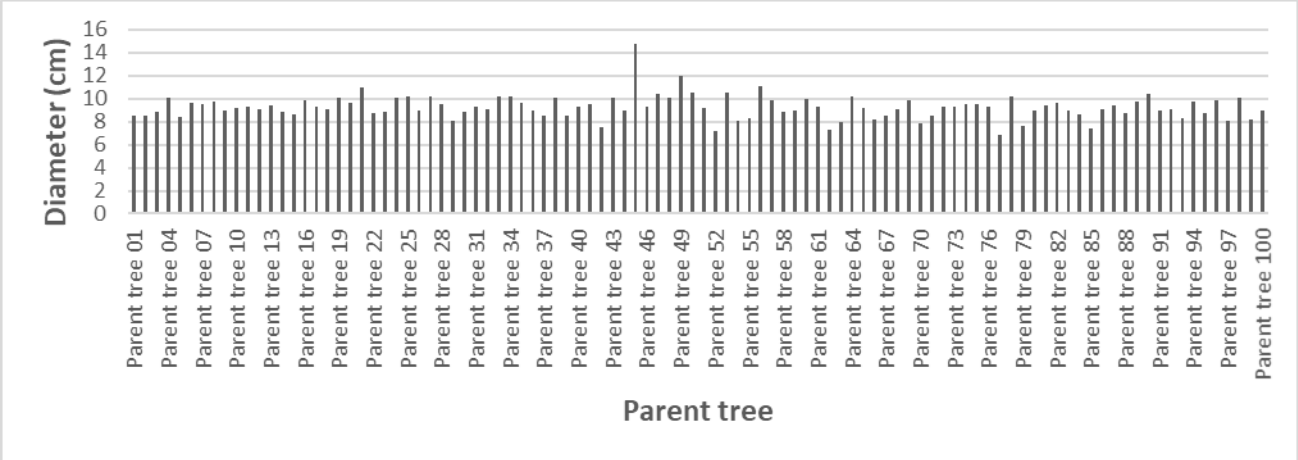
**Table 1.** Analysis of variance of the effect of parent trees on plant height, stem diameter and life percentage of manglid plants at 42 months in Candiroto, Central Java.

| Source of variation | df | Height | df | Diameter | df | Life Percentage |
|---|---|---|---|---|---|---|
| | | Mean Square | | Mean Square | | Mean Square |
| Parent Tree | 99 | 55984.307** | 99 | 23.153077** | 99 | 1635.7071** |
| Replication | 9 | 757094.855** | 9 | 240.462402** | 9 | 15665.0000** |
| Error | 1946 | 17299.67 | 1946 | 11.62810 | 891 | 849.203 |
| Corrected total | 2054 | | 2054 | | 999 | |

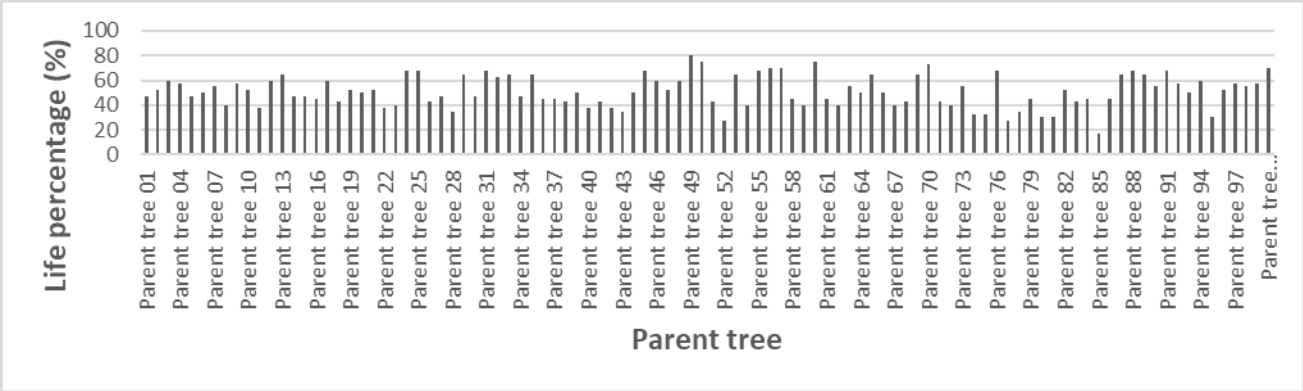
Note: ** significantly different at 0.01




(a)




(b)




(c)

**Figure 1.** Graph of plant height (a), stem diameter (b) and life percentage (c) variation of Manglid at the age of 42 months in Candiroto, Central Java.

**Table 2**. Duncan Multiple Range Test from height of Manglid at the age of 42 months in Candiroto, Central Java

| x | Parent Tree | Mean - std dev | Duncan Grouping | No | Parent Tree | Mean – std dev | Duncan Grouping |
|---|---|---|---|---|---|---|---|
| 1 | 81 | 683,17±177.92 | a | 51 | 14 | 582.37±114.88 | abcdefghijklmnopq |
| 2 | 21 | 672.33±129.07 | ab | 52 | 31 | 582.12±160.61 | abcdefghijklmnopq |
| 3 | 53 | 665.81±142.84 | abc | 53 | 43 | 580.43±200.10 | abcdefghijklmnopq |
| 4 | 49 | 663.91±189.94 | abcd | 54 | 72 | 577.06±101.71 | abcdefghijklmnopqr |
| 5 | 20 | 657.81±177.23 | abcde | 55 | 84 | 576.89±139.35 | abcdefghijklmnopqr |
| 6 | 47 | 655.81±168.79 | abcde | 56 | 45 | 575.96±107.59 | abcdefghijklmnopqrs |
| 7 | 33 | 653.84±141.28 | abcdef | 57 | 83 | 575.78±132.64 | abcdefghijklmnopqrs |
| 8 | 34 | 653.46±121.44 | abcdefg | 58 | 95 | 575.42±102.64 | abcdefghijklmnopqrs |
| 9 | 19 | 652.50±109.23 | abcdefgh | 59 | 76 | 573.93±187.40 | abcdefghijklmnopqrst |
| 10 | 82 | 648.95±165.07 | abcdefgh | 60 | 32 | 572.08±206.90 | bcdefghijklmnopqrst |
| 11 | 50 | 637.60±129.87 | abcdefghi | 61 | 26 | 568.58±89.84 | bcdefghijklmnopqrstu |
| 12 | 78 | 633.80±81.72 | abcdefghij | 62 | 80 | 567.92±193.50 | bcdefghijklmnopqrstu |
| 13 | 27 | 627.86±131.42 | abcdefghijk | 63 | 65 | 567.31±131.58 | bcdefghijklmnopqrstu |
| 14 | 94 | 627.00±144.12 | abcdefghijk | 64 | 37 | 566.00±154.55 | bcdefghijklmnopqrstu |
| 15 | 18 | 623.24±139.18 | abcdefghijkl | 65 | 57 | 565.57±160.25 | bcdefghijklmnopqrstu |
| 16 | 64 | 623.14±147.28 | abcdefghijkl | 66 | 44 | 563.80±148.63 | bcdefghijklmnopqrstuv |
| 17 | 24 | 622.63±189.42 | abcdefghijkl | 67 | 02 | 563.76±135.06 | bcdefghijklmnopqrstuv |
| 18 | 07 | 622.59±138.86 | abcdefghijkl | 68 | 67 | 560.50±105.02 | cdefghijklmnopqrstuv |
| 19 | 04 | 621.78±125.64 | abcdefghijklm | 69 | 03 | 554.63±132.65 | defghijklmnopqrsstuv |
| 20 | 87 | 615.23±147.63 | abcdefghijklmn | 70 | 15 | 552.78±105.63 | efghijklmnopqrstuv |
| 21 | 91 | 615.04±228.17 | abcdefghijklmn | 71 | 12 | 549.71±167.75 | efghijklmnopqrstuv |
| 22 | 25 | 614.59±69.27 | abcdefghijklmn | 72 | 28 | 549.35±188.09 | efghijklmnopqrstuv |
| 23 | 92 | 613.78±146.25 | abcdefghijklmn | 73 | 58 | 547.94±153.47 | efghijklmnopqrstuv |
| 24 | 11 | 612.13±125.72 | abcdefghijklmn | 74 | 90 | 544.91±103.11 | fghijklmnopqrstuv |
| 25 | 89 | 609.54±124.05 | abcdefghijklmn | 75 | 23 | 542.89±153.79 | ghijklmnopqrstuv |
| 26 | 16 | 609.08±203.71 | abcdefghijklmn | 76 | 55 | 542.30±132.99 | hijklmnopqrstuv |
| 27 | 98 | 608.05±95.13 | abcdefghijklmno | 77 | 61 | 534.00±73.21 | ijklmnopqrstuvw |
| 28 | 74 | 607.00±134.03 | abcdefghijklmno | 78 | 54 | 528.88±92.66 | ghijklmnopqrstuv |
| 29 | 06 | 606.60±84.66 | abcdefghijklmno | 79 | 05 | 528.63±118.80 | ijklmnopqrstuvw |
| 30 | 38 | 606.10±126.94 | abcdefghijklmno | 80 | 42 | 525.80±169.47 | jklmnopqrstuvw |
| 31 | 88 | 606.07±117.67 | abcdefghijklmno | 81 | 69 | 523.65±94.02 | jklmnopqrstuvw |
| 32 | 41 | 604.47±58.40 | abcdefghijklmnop | 82 | 30 | 520.15±130.97 | klmnopqrstuvw |
| 33 | 48 | 602.29±158.61 | abcdefghijklmnop | 83 | 01 | 518.68±132.44 | klmnopqrstuvw |
| 34 | 51 | 601.76±179.10 | abcdefghijklmnop | 84 | 52 | 518.55±101.76 | klmnopqrstuvw |
| 35 | 10 | 601.48±172.78 | abcdefghijklmnop | 85 | 39 | 517.73±134.29 | klmnopqrstuvw |
| 36 | 13 | 601.12±204.84 | abcdefghijklmnop | 86 | 68 | 517.59±156.95 | klmnopqrstuvw |
| 37 | 56 | 599.50±173.36 | abcdefghijklmnop | 87 | 97 | 513.43±112.64 | lmnopqrstuvw |
| 38 | 40 | 599.42±105.94 | abcdefghijklmnop | 88 | 59 | 511.38±154.76 | mnopqrstuvw |
| 39 | 22 | 598.50±177.76 | abcdefghijklmnop | 89 | 60 | 509.57±156.74 | nopqrstuvw |
| 40 | 35 | 595.39±126.12 | abcdefghijklmnop | 90 | 79 | 504.67±99.90 | nopqrstuvw |
| 41 | 17 | 595.18±98.31 | abcdefghijklmnop | 91 | 99 | 497.83±125.07 | opqrstuvw |
| 42 | 73 | 595.14±108.50 | abcdefghijklmnop | 92 | 66 | 494.80±149.81 | pqrstuvw |
| 43 | 09 | 592.17±131.81 | abcdefghijklmnop | 93 | 63 | 481.95±120.80 | qrstuvw |
| 44 | 100 | 588.89±152.62 | abcdefghijklmnopq | 94 | 71 | 479.47±122.28 | qrstuvw |
| 45 | 36 | 588.00±175.63 | abcdefghijklmnopq | 95 | 70 | 470.97±184.97 | rstuvw |
| 46 | 46 | 587.96±128.72 | abcdefghijklmnopq | 96 | 85 | 467.86±111.30 | stuvw |
| 47 | 75 | 586.86±107.18 | abcdefghijklmnopq | 97 | 29 | 466.74±141.60 | tuvw |
| 48 | 08 | 585.69±208.34 | abcdefghijklmnopq | 98 | 62 | 463.56±118.22 | uvw |
| 49 | 86 | 584.67±116.28 | abcdefghijklmnopq | 99 | 77 | 456.89±70.51 | vw |
| 50 | 96 | 583.62±172.72 | abcdefghijklmnopq | 100 | 93 | 431.35±138.25 | W |

Note: - The number that is followed by the same alphabet in the same column are not significantly different at 0.01.
- Family number 1-15 comes from Tasikmalaya population; family number 16-25 comes from Sumedang population and family number 26 – 100 comes from Sukabumi population.

**Table 3**. Duncan Multiple Range Test from stem diameter of Manglid at the age of 42 months in Candiroto, Central Java

| No | Parent Tree | Mean - std dev | Duncan Grouping | No | Parent Tree | Mean- std dev | Duncan Grouping |
|---|---|---|---|---|---|---|---|
| 1 | 45 | 14.785±2.085 | a | 51 | 100 | 9.246±2.463 | bcdefghijk |
| 2 | 49 | 11.984±3.652 | b | 52 | 51 | 9.194±2.652 | bcdefghijk |
| 3 | 56 | 11.089±3.204 | bc | 53 | 65 | 9.162±2.488 | bcdefghijk |
| 4 | 21 | 10.980±2.018 | bcd | 54 | 92 | 9.109±2.872 | cdefghijk |
| 5 | 50 | 10.560±4.174 | bcde | 55 | 12 | 9.096±3.293 | cdefghijk |
| 6 | 53 | 10.473±3.251 | bcdef | 56 | 68 | 9.088±3.353 | cdefghijk |
| 7 | 90 | 10.455±1.968 | bcdefg | 57 | 32 | 9.042±3.313 | cdefghijk |
| 8 | 47 | 10.400±2.861 | bcdefg | 58 | 18 | 9.033±2.145 | cdefghijk |
| 9 | 34 | 10.223±2.150 | bcdefgh | 59 | 86 | 9.028±1.972 | cdefghijk |
| 10 | 27 | 10.214±2.028 | bcdefgh | 60 | 38 | 9.013±2.496 | cdefghijk |
| 11 | 33 | 10.195±2.844 | bcdefgh | 61 | 44 | 9.000±2.474 | cdefghijk |
| 12 | 64 | 10.181±2.257 | bcdefgh | 62 | 10 | 8.995±2.932 | cdefghijk |
| 13 | 78 | 10.173±1.533 | bcdefghi | 63 | 09 | 8.991±1.936 | cdefghijk |
| 14 | 25 | 10.141±2.327 | bcdefghi | 64 | 91 | 8.974±3.032 | cdefghijk |
| 15 | 98 | 10.132±1.853 | bcdefghi | 65 | 80 | 8.942±3.172 | cdefghijk |
| 16 | 04 | 10.122±2.258 | bcdefghi | 66 | 83 | 8.917±1.981 | cdefghijk |
| 17 | 19 | 10.120±2.643 | bcdefghi | 67 | 26 | 8.916±2.116 | cdefghijk |
| 18 | 24 | 10.119±2.109 | bcdefghi | 68 | 59 | 8.913±2.817 | cdefghijk |
| 19 | 43 | 10.114±1.695 | bcdefghi | 69 | 14 | 8.879±2.214 | cdefghijk |
| 20 | 48 | 10.054±2.331 | bcdefghi | 70 | 23 | 8.878±2.177 | cdefghijk |
| 21 | 38 | 10.030±2.496 | bcdefghij | 71 | 58 | 8.872±3.139 | cdefghijk |
| 22 | 60 | 9.990±4.526 | bcdefghij | 72 | 03 | 8.838±2.424 | cdefghijk |
| 23 | 16 | 9.913±3.480 | bcdefghij | 73 | 30 | 8.804±2.595 | cdefghijk |
| 24 | 57 | 9.896±3.823 | bcdefghij | 74 | 95 | 8.792±2.615 | cdefghijk |
| 25 | 69 | 9.865±2.162 | bcdefghij | 75 | 88 | 8.789±2.014 | cdefghijk |
| 26 | 96 | 9.862±1.926 | bcdefghij | 76 | 22 | 8.706±2.393 | cdefghijk |
| 27 | 94 | 9.733±1.751 | bcdefghij | 77 | 15 | 8.650±1.843 | cdefghijk |
| 28 | 08 | 9.713±3.844 | bcdefghijk | 78 | 84 | 8.622±2.347 | cdefghijk |
| 29 | 89 | 9.704±1.994 | bcdefghijk | 79 | 02 | 8.576±2.697 | cdefghijk |
| 30 | 06 | 9.675±2.051 | bcdefghijk | 80 | 01 | 8.568±2.061 | cdefghijk |
| 31 | 20 | 9.633±2.468 | bcdefghijk | 81 | 67 | 8.544±2.184 | cdefghijk |
| 32 | 35 | 9.633±2.951 | bcdefghijk | 82 | 37 | 8.529±2.615 | cdefghijk |
| 33 | 82 | 9.590±2.387 | bcdefghijk | 83 | 39 | 8.527±1.773 | cdefghijk |
| 34 | 41 | 9.559±1.736 | bcdefghijk | 84 | 71 | 8.506±2.176 | cdefghijk |
| 35 | 07 | 9.541±2.592 | bcdefghijk | 85 | 05 | 8.447±2.669 | cdefghijk |
| 36 | 74 | 9.538±2.620 | bcdefghijk | 86 | 55 | 8.344±3.253 | cdefghijk |
| 37 | 75 | 9.500±1.406 | bcdefghijk | 87 | 93 | 8.260±3.044 | cdefghijk |
| 38 | 28 | 9.492±2.849 | bcdefghijk | 88 | 66 | 8.235±3.348 | cdefghijk |
| 39 | 13 | 9.458±3.860 | bcdefghijk | 89 | 99 | 8.200±2.262 | cdefghijk |
| 40 | 81 | 9.442±2.839 | bcdefghijk | 90 | 29 | 8.126±2.679 | defghijk |
| 41 | 87 | 9.385±2.069 | bcdefghijk | 91 | 54 | 8.119±1.719 | defghijk |
| 42 | 40 | 9.353±2.041 | bcdefghijk | 92 | 97 | 8.043±2.235 | efghijk |
| 43 | 72 | 9.344±2.577 | bcdefghijk | 93 | 63 | 7.955±2.860 | efghijk |
| 44 | 31 | 9.296±2.828 | bcdefghijk | 94 | 70 | 7.879±2.681 | efghijk |
| 45 | 61 | 9.924±2.578 | bcdefghijk | 95 | 79 | 7.650±1.917 | fghijk |
| 46 | 11 | 9.293±2.845 | bcdefghijk | 96 | 42 | 7.550±2.648 | ghijk |
| 47 | 17 | 9.282±1.921 | bcdefghijk | 97 | 85 | 7.371±2.135 | hijk |
| 48 | 73 | 9.282±2.132 | bcdefghijk | 98 | 62 | 7.281±2.305 | ijk |
| 49 | 46 | 9.271±2.137 | bcdefghijk | 99 | 52 | 7.145±2.083 | jk |
| 50 | 76 | 9.259±2.778 | bcdefghijk | 100 | 77 | 6.833±1.774 | K |

Note: - The number that is followed by the same alphabet in the same column are not significantly different at 0.01. - Family number 1-15 comes from Tasikmalaya population; family number 16-25 comes from Sumedang population and family number 26 – 100 comes from Sukabumi population.

**Table 4.** Duncan Multiple Range Test from life percentage of Manglid at the age of 42 months in Candiroto, Central Java

| No | Parent Tree | Mean - std dev | Duncan Grouping | No | Parent Tree | Mean -std dev | Duncan Grouping |
|---|---|---|---|---|---|---|---|
| 1 | 49 | 80.00 ±22.97 | a | 51 | 38 | 50.00 ±33.33 | abcdefghij |
| 2 | 50 | 75.00 ±28.87 | ab | 52 | 06 | 50.00 ±26.35 | abcdefghij |
| 3 | 60 | 75.00 ±23.57 | ab | 53 | 66 | 50.00 ±33.33 | abcdefghij |
| 4 | 70 | 72.50 ±32.17 | abc | 54 | 64 | 50.00 ±39.09 | abcdefghij |
| 5 | 57 | 70.00 ±25.82 | abcd | 55 | 44 | 50.00 ±31.18 | abcdefghij |
| 6 | 56 | 70.00 ±20.58 | abcd | 56 | 05 | 47.50 ±39.88 | abcdefghij |
| 7 | 100 | 70.00 ±22.97 | abcd | 57 | 29 | 47.50 ±39.88 | abcdefghij |
| 8 | 91 | 67.50 ±28.99 | abcde | 58 | 01 | 47.50 ±29.93 | abcdefghij |
| 9 | 23 | 67.50 ±31.29 | abcde | 59 | 33 | 47.50 ±32.17 | abcdefghij |
| 10 | 45 | 67.50 ±16.87 | abcde | 60 | 14 | 47.50 ±21.89 | abcdefghij |
| 11 | 55 | 67.50 ±20.58 | abcde | 61 | 26 | 47.50 ±36.23 | abcdefghij |
| 12 | 30 | 67.50 ±20.58 | abcde | 62 | 40 | 47.50 ±32.11 | abcdefghij |
| 13 | 24 | 67.50 ±28.99 | abcde | 63 | 35 | 45.00 ±34.96 | bcdefghij |
| 14 | 76 | 67.50 ±26.48 | abcde | 64 | 15 | 45.00 ±34.96 | bcdefghij |
| 15 | 88 | 67.50 ±36.89 | abcde | 65 | 79 | 45.00 ±36.89 | bcdefghij |
| 16 | 69 | 65.00 ±35.75 | abcdef | 66 | 61 | 45.00 ±32.91 | bcdefghij |
| 17 | 87 | 65.00 ±26.87 | abcdef | 67 | 86 | 45.00 ±36.89 | bcdefghij |
| 18 | 65 | 65.00 ±35.74 | abcdef | 68 | 58 | 45.00 ±32.91 | bcdefghij |
| 19 | 53 | 65.00 ±33.75 | abcdef | 69 | 84 | 45.00 ±32.91 | bcdefghij |
| 20 | 34 | 65.00 ±33.75 | abcdef | 70 | 36 | 45.00 ±25.82 | bcdefghij |
| 21 | 89 | 65.00 ±35.75 | abcdef | 71 | 51 | 42.50 ±26.48 | bcdefghij |
| 22 | 28 | 65.00 ±39.44 | abcdef | 72 | 83 | 42.50 ±39.18 | bcdefghij |
| 23 | 13 | 65.00 ±24.15 | abcdef | 73 | 71 | 42.50 ±39.18 | bcdefghij |
| 24 | 32 | 65.00 ±33.75 | abcdef | 74 | 37 | 42.50 ±28.99 | bcdefghij |
| 25 | 31 | 62.50 ±37.73 | abcdefg | 75 | 41 | 42.50 ±35.45 | bcdefghij |
| 26 | 46 | 60.00 ±26.87 | abcdefgh | 76 | 17 | 42.50 ±31.29 | bcdefghij |
| 27 | 03 | 65.00 ±29.34 | abcdefgh | 77 | 25 | 42.50 ±39.18 | bcdefghij |
| 28 | 94 | 65.00 ±44.41 | abcdefgh | 78 | 68 | 42.50 ±26.48 | bcdefghij |
| 29 | 12 | 65.00 ±29.34 | abcdefgh | 79 | 59 | 40.00 ±37.64 | cdefghij |
| 30 | 16 | 65.00 ±- | abcdefgh | 80 | 67 | 40.00 ±35.75 | cdefghij |
| 31 | 48 | 65.00 ±31.62 | abcdefgh | 81 | 54 | 40.00 ±29.34 | cdefghij |
| 32 | 99 | 57.50 ±23.72 | abcdefgh | 82 | 62 | 40.00 ±26.87 | cdefghij |
| 33 | 97 | 57.50 ±33.44 | abcdefgh | 83 | 22 | 40.00 ±29.34 | cdefghij |
| 34 | 09 | 57.50 ±31.29 | abcdefgh | 84 | 08 | 40.00 ±37.64 | cdefghij |
| 35 | 04 | 57.50 ±33.44 | abcdefgh | 85 | 72 | 40.00 ±29.34 | cdefghij |
| 36 | 92 | 57.50 ±28.99 | abcdefgh | 86 | 11 | 37.50 ±27.00 | defghij |
| 37 | 63 | 55.00 ±40.48 | abcdefghi | 87 | 39 | 37.50 ±41.25 | dcfghij |
| 38 | 07 | 55.00 ±38.73 | abcdefghi | 88 | 21 | 37.50 ±31.73 | defghij |
| 39 | 73 | 55.00 ±22.97 | abcdefghi | 89 | 42 | 37.50 ±31.73 | defghij |
| 40 | 90 | 55.00 ±38.73 | abcdefghi | 90 | 43 | 35.00 ±31.62 | efghij |
| 41 | 98 | 55.00 ±25.82 | abcdefghi | 91 | 27 | 35.00 ±31.62 | efghij |
| 42 | 47 | 52.50 ±32.17 | abcdefghi | 92 | 78 | 35.00 ±29.34 | efghij |
| 43 | 10 | 52.50 ±36.23 | abcdefghi | 93 | 75 | 32.50 ±23.72 | fghij |
| 44 | 18 | 52.50 ±29.93 | abcdefghi | 94 | 74 | 32.50 ±35.45 | fghij |
| 45 | 02 | 52.50 ±34.26 | abcdefghi | 95 | 81 | 30.00 ±30.73 | ghij |
| 46 | 82 | 52.50 ±29.98 | abcdefghi | 96 | 95 | 30.00 ±28.38 | ghij |
| 47 | 96 | 52.50 ±24.86 | abcdefghi | 97 | 80 | 30.00 ±19.72 | ghij |
| 48 | 20 | 52.50 ±38.10 | abcdefghi | 98 | 52 | 27.50 ±27.51 | hij |
| 49 | 19 | 50.00 ±26.35 | abcdefghij | 99 | 77 | 22.50 ±24.86 | ij |
| 50 | 93 | 50.00 ±28.87 | abcdefghij | 100 | 85 | 17.50 ±23.72 | j |

Note: - The number that is followed by the same alphabet in the same column are not significantly different at 0.01.

The measurement result of total plant height showed that plant height ranged between 106 to 1083cm with an average of 577cm. The highest plants come from the parent tree number 81 from Sukabumi. The stem diameters ranged between 1.3cm to 28.7cm with an average of 9.4cm, the largest diameter comes from the parent tree number 45 from Sukabumi. The life percentage ranged between 17.5% to 80% with an average of 51.3%. The highest life percentage is indicated by the parent tree number 49 from Sukabumi.

### *3.2. Discussion*

Table 1 shows that the parent tree has a very significant effect on height growth, stem diameter and life percentage of Manglid plant at the age of 42 months in Candiroto, Central Java. According to [8], the tropical plant species generally have a wide distribution with different genetic characters between populations in which the individuals tend to differentiate each other. The existing diversity among parent trees is caused by geographical conditions such as the height of the growth place including soil type, rainfall, and the associations with other plants from each parent tree in different populations [6],[9]. This is because the Manglid parent trees were originated from 3 populations in West Java (Tasikmalaya, Sumedang and, Sukabumi). The effect of the parent tree on the height growth, stem diameter, and life percentage characteristics can be differentiated based on the results of Duncan Multiple Range Test (DMRT) as shown in Table 2, Table 3, and Table 4 above. The results show that there are some different groups on each characteristic.

Table 2 shows that the height of the Manglid plant at the age of 42 months in Candiroto has 23 groups. In Table 3 the stem diameter is separated into 11 groups. Meanwhile, the life percentage is divided into 10 groups. The results of the group show that height growth is the character with the highest diversity compared to other characteristics. This is in accordance with the result of [10] on the wide leaf Mahogany type (*Swietenia macrophylla*), [11] blackboard tree (*Alstonia scholaris*), and [12] Meranti Tembaga (*Shorea leprosula*). The high diversity of measured characteristics which are height and stem diameter shows that each parent tree has some characteristics that can be selected for breeding activities. In forest plant breeding activities with high diversity, it is possible to choose certain characteristics that are desired to obtain a maximum result. High diversity is the fundamental thing in the experiments in order to get the expected product.

The significantly different of the stem diameter characteristics which differentiated into 11 groups makes it possible to select the trees that are expected to have large diameters. Diameter is interpreted as the best predictor of life percentage and seedling growth in the field [13]. The larger diameter indicates that the root system and stem volume are larger [14]. Finally, it will increase the number of nutrients and water transported by the xylem as it is getting bigger [15].

The genetic variation between parent trees in Manglid populations is significantly different for plant height, stem diameter, and life percentage. Research on Manglid seedlings in the nursery at the age of 7 months showed the same result [16]. This result shows the existing diversity. Most forest tree characters are quantitatively controlled by the environment and many gene loci which only contribute slightly to the phenotype. This quantitative phenotype character expression involves many genes. Therefore, the inheritance is very complex [17].

The genetic diversity of Manglid growth from 100 parent trees is significantly different. The plant height characteristic is differentiated into 23 groups, the stem diameter into 11 groups, and the life percentage into 10 groups. The parent tree number 81 is best for the total plant height characteristic, the best stem diameter is the parent tree number 45, and the best parent tree for life percentage is number 49. This existing significant difference gives an opportunity to obtain a superior plant in accordance with the required characteristics.

## 4. CONCLUSION

There are some variations of the height of the plant, stem diameter, and life percentage of Manglid at the age of 42 months in Candiroto. From 100 parent trees there were some different groups, there were 23 groups in plant height, 11 groups in the stem diameter, and 10 groups in life percentage.

## ACKNOWLEDGMENT

The researcher would like to thank the head of Centre for Forest Biotechnology and Tree Improvement, the head of Balai Pengelolaan Daerah Aliran Sungai Dan Hutan Lindung Serayu Opak Progo and the head of Pusat Penelitian Pengembangan Perhutani Cepu that gave the permission for the location of the seedling plantation and the grants.

## REFERENCES

[1] S. Pudjiono, Eksplorasi Bahan Genetik Untuk Pemuliaan Manglid (*Manglietia glauca* Bl.). Prosiding Seminar Nasional. Pemanfaatan Sumber Daya Genetik Lokal Dalam Mendukung Keberhasilan Program Pemuliaan 1 2016 433-444. [In Bahasa Indonesia]

[2] T. Kalima, M. Wardani, Potensi Jenis *Dipterocarpus retusus* Blume di kawasan hutan Situ Gunung Sukabumi. Bulletin Plasma Nutfah 3(2) (2013) 102-112. [In Bahasa Indonesia]

[3] A. Sudomo, E. Rachman, dan N. Mindawati, Mutu bibit Manglid (*Manglietia glauca* Bl.) pada tujuh jenis media sapih. Jurnal Penelitian Hutan Tanaman 7(5) (2010) 265-272. [In Bahasa Indonesia]

[4] D.F. Djam'an, Mengenal Manglid Baros (*Manglietia glauca* Bl.) manfaat dan permasalahan. Majalah Kehutanan Indonesia, Edisi VI, 2006. Available from: http://www.dephut.go.id. [In Bahasa Indonesia]

[5] A. Rohandi, D. Swestiana, Gunawan, Y. Nadiharto, B. Rahmawan, I. Setiawan, Identifikasi sebaran populasi dan potensi lahan jenis manglid untuk mendukung pengembangan sumber benih dan hutan rakyat di wilayah Priangan Timur. Laporan Hasil Penelitian, Balai Penelitian Kehutanan Ciamis, Ciamis, 2010. [In Bahasa Indonesia]

[6] S. Pudjiono, Eksplorasi dan penanganan benih Manglid (*Manglietia glauca* Bl.) sebagai materi genetik untuk membangun sumber benih. Informasi Teknis 14(1) (2016) 21-28. [In Bahasa Indonesia]

[7] Rencana Kerja Pemerintah Daerah. Kabupaten Temanggung. Gambaran Umum dan Kondisi Daerah. Accessed on: www.temanggungkab.go.id, 2015. [In Bahasa Indonesia]

[8] D. Hartati, A. Rimbawanto, Taryono, E. Sulistyaningsih, A.Y.P.B.C. Widyatmoko, Pendugaan keragaman genetik di dalam dan antar provenan pulai (*Alstonia scholaris* (L.) R.Br.) menggunakan penanda RAPD. Jurnal Pemuliaan Tanaman Hutan 1(2) (2007) 89-98. [In Bahasa Indonesia]

[9] T.P. Yudohartono, P.R. Herdiyanti, Variasi pertumbuhan bibit jabon berbagai pohon induk dari provenan Lombok Barat dan Ogan Ilir. Wana Benih 13(2) (2012) 77-88. [In Bahasa Indonesia]

[10] Mashudi. Keragaman pertumbuhan bibit mahoni daun lebar (*Swietenia macrophylla* King) dari dua populasi di Yogyakarta, In: Prosiding Nasional Biodiversitas VI Departemen Biologi Fakultas Sains dan Teknologi. A Hayati, D. Winarni, H. Purnobasuki, Ni'matuzahroh, T. Soedarti, & E.P. Kuncoro (Eds.), Universitas Airlangga, 2016, pp.121-129. [In Bahasa Indonesia]

[11] Mashudi. Keragaman Pertumbuhan beberapa sumber populasi *Alstonia scholaris* (l.) R.Br. (pulai gading) pada umur 3 tahun di Gunung Kidul. Widyariset 3(2) (2017) 161-172. [In Bahasa Indonesia]

[12] Mashudi, M. Susanto, S. Pudjiono, Pertumbuhan bibit meranti tembaga (*Shorea leprosula*) umur 6 bulan dari tiga populasi di Kalimantan Timur, In: Seminar Nasional XV Pendidikan Biologi FKIP UNS. Program Studi Pendidikan Biologi Fakultas Keguruan dan Ilmu Pendidikan. Universitas Sebelas Maret. Surakarta, Indonesia, 15(1) (2018) 801-806. [In Bahasa Indonesia]

[13] E. Windyarini, T.M. Hasnah, Identifikasi dan evaluasi pertumbuhan semai jenis-jenis Shorea penghasil tengkawang. Jurnal Wasian 2(1) (2015) 32-40. [In Bahasa Indonesia]

[14] D.L. Hasse, Morphological and physiological evaluations of seedling quality in forest and conservation nursery (National Proceedings, 2006). In: Riley, L.E., Dumroese, R.K., Landis, T. D., tech. cords (ed). Proc. RMRS-P-50. Fort Collins, CO: U.S. Departement of Agriculture, Forest Service. Rocky Mountain Research Station, 2007.

[15] I. Winarni, E.S. Sumadiwangsa, D. Setyawan, Pengaruh tempat tumbuh, species dan diameter batang terhadap produktivitas pohon penghasil biji tengkawang. Jurnal Penelitian Hasil Hutan 22(1) (2004) 23-33. [In Bahasa Indonesia]

[16] S. Pudjiono, Variasi pertumbuhan bibit manglid (*Manglietia glauca* Bl.) pada beberapa pohon induk dari tiga provenan. Prosiding Seminar nasional Biodiversitas 5(1) (2017) 57-62. [In Bahasa Indonesia]

[17] M. Na'iem, Keuntungan dan pembatas kegiatan pemuliaan pohon, Bahan kuliah Program Pasca Sarjana, Universitas Gadjah Mada Yogyakarta, 2003. [In Bahasa Indonesia]