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**| RESEARCH ARTICLE**

# Adaptation of Fourteen Varieties of Red Onion (Allium Ascalonicum L.) in The Plateau

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**| ABSTRACT**
The adaptability of a variety is one of the determinants of the domestication conditions of a variety—fourteen varieties of onions, including those whose domestication is lowland adapted to the highlands. Fourteen varieties of shallots are Brebes Variety (V 1), Pikatan Variety (V 2), Thai Variety (V 3), Sumenep Variety (V 4), Super Philips Variety (V 5), Manjung Variety (V 6), Bauji Variety (V 7), Jeneponto Adaptation Bima Variety (V 8), Bima Variety enrekang adaptation (V 9), Bangkok Variety adaptation Jeneponto (V 10), Palu Local Variety (V 11), Katumi Varieties (V 12), Trident Varieties (V 13) and Mentes Varieties (V 14) conducted in the form of Group Randomized Designs (RAK), Results from this study found that flowering naturally occurs in 12 varitas that produce flowers from 14 varieties of tried onions, and can be found. The five varieties that flower more are the Bangkok Variety adaptation jeneponto, Bima Brebes, Manjung, Bauji, and the mentes variety. The growth and production of bulbs grown in the highlands are generally determined by the genetic traits and adaptability of each variety. This is indicated by the difference in the results of each component of observation parameters of the same variety. As produced, five varieties selected the production of different perhektar bulbs based on the location of planting. Bangkok Jeneponto varieties 11.5 tons $h^{-1}$, Bauji varieties 10.0 tons $h^{-1}$, Bima Brebes varieties 3.0 tons $h^{-1}$, Manjung varieties 7.5 tons $h^{-1}$, and Mente's varieties 19.0 tons $h^{-1}$.

**| KEYWORDS**

Adaptation, Varieties, Onions, Highlands

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## 1. Introduction

Onions are one of the leading vegetable commodities that have long been cultivated by farmers intensively. This commodity is also a source of income and employment opportunities that contribute quite high to the economic development of the region. Because it has a high economic value, the cultivation of onions has spread in almost all provinces in Indonesia. Although the interest of farmers in onions is quite strong in the process of business, there are still various obstacles, both technical and economic constraints. (Waluyo & Sinaga, 2015), (Sumarni, 2012).

Onion farmers in Indonesia, in general, still use bulbs as plant material; on the other hand, limited quality seed bulbs. The limitations of quality seed bulbs are caused in general that handlers do not sort seed bulbs and shrink weights that can reach 30%, which result in farmers often using seed bulbs whose harvest age is the same as for consumption bulbs, and sometimes using seed bulbs from imported onions whose prices are relatively low. (Basuki, 2009), (Kartinaty et al., 2018), (Nurjanani & Djufry, 2019).

Good quality seed bulbs are a very important factor in increasing the productivity of onion plants. The cause of the low productivity of onion plants, especially in the production center area, among others, is the low quality of bulbs/seeds. Therefore, efforts to increase onion production must begin with the availability of quality bulbs/seeds to produce higher, insufficient volume, and available every season so that farmers can plant on time. (Palupi, Rosliani, 2015), (Prayudi et al., 2014), (Wiguna et al., 2016)

The Central Bureau of Statistics (BPSn 2013 reported that onion production in Indonesia in 2013 amounted to 1,010,773 kg with a land area of 98,937 ha, and productivity of 10.22 $th^{-1}$, from potential yields of 20 - 25 $years^{-1}$. The low productivity is a result of the use of poor quality seed bulbs, poor planting media, inadequate pest and disease control, scarcity of availability of quality bulbs, low-yielding seed bulbs, and the price of seed bulbs that are often expensive when planting time arrives. (Sumarni, 2012), (Widiawati, 2014).

Steps that can be taken in overcoming this, then the availability of quality onion seed bulbs are needed in the framework of efforts to increase productivity. The need for plant materials (seed bulbs) that continues to increase requires that the readiness of the availability of onion seed bulbs must be maintained continuously. But it is something that is not easy to do, considering the dormancy period in seedlings and limited shelf life, so it often results in scarcity or unavailability of seed bulbs. (Rosliani et al., 2005), (Sartono Putrasamedja dan Suwandi, 1996).

## 2. Methodology

### *2.1Time and Place*

This research has been carried out from May 2014 to August 2014 in Tombolo Pao Subdistrict (at a place height of 1000 m above sea level).

### *2.2 Materials and Tools*

The materials used in this study are onion seed bulbs derived from: 1) Bangkok Jeneponto, 2) Bima Jeneponto from Jeneponto Regency, 3) Bima Enrekang from Enrekang regency, 4) Local Palu from Palu, 5)Bauji, 6)Bima Brebes, 7)Katumi, 8)Manjung, 9) Mentes, 10)Super Philips, 11)Pikatan, 12) Thailand from Brebes, 13) Sumenep from Sumenep, and 14) Trident from Lembang Bandung. MOL-M2 liquid organic fertilizer, wasp cap granuler organic fertilizer (16-16-16), and goat manure.

The tools used in this study are Tractors for the initial clearing of land, hoes for the manufacture of beds, sickles for weed cleaning, machetes as cutting tools, digital scales brand CAMRY Model EHA401(0.01-100 g), meters, GPS, thermometers, plastic drums, flushes (*gembos*), stream in cloth bags, silver plastic mulch, plastic mulch perforations, writing-stationery, Canon type EOS 60D cameras.

### *2.3 Method of Implementation*

The research was conducted in the form of field experiments. The experimental design used for the Group Random Design, Each variety as a treatment is repeated twice, so that 28 experimental units are obtained, which are planted at a place height of 1000 m above sea level (plateau). To assess the effect of treatment, observations of observation (Y) are made expressed by the model of forecasting analysis:

$xijk = \mu + \alpha i + \beta j + \varepsilon ijk$

Description :xijk: Random change value/*k-observation* data in the ith group and j-10th treatment
μ: total average
α i: the influence of blocks/groups
βj: effect of treatment
εijk : effect error (error)

The results of the observations were carried out combined variety analysis, and to determine the best treatment, a follow-up test was conducted by comparing two average values using the Duncan test.

The method of procuring seed bulbs 14 varieties of shallots was imported from Lembang Bandung, Sumenep, Brebes, Enrekang, Jeneponto and Palu. Soil processing begins with the use of tractors, then continued the manufacture of being with a size of 0.5 x 2 m, along with the provision of organic fertilizer goat manure as much as 8 kg / $m^2$ or equivalent to 8 t / $^{h-1}$. One week after the manufacture of the bed is done, watering mol-M2 organic fertilizer, as much as 1 L / $m^2$, followed by the installation of silver plastic mulch. After the mulch is installed properly, then made a planting hole using a perforation tool with a diameter of 10 cm.

Planting is carried out after the manufacture of planting holes in every bed and variety. Seed bulbs to be planted have been cut the ends of the bulbs as much as 1/4 part done two days before planting or until buds appear, which aims so that the seedlings can grow uniformly. The number of seed bulbs per plot/bed is as much as 60 using a planting distance of 10 x 20 cm.

Fertilization is carried out at the age of 15, 30, and 45 days after planting, using granular organic fertilizer cap Wasps as much as 10 g / clump and watering mol-M2 liquid organic fertilizer as much as 1 L / $m^2$.

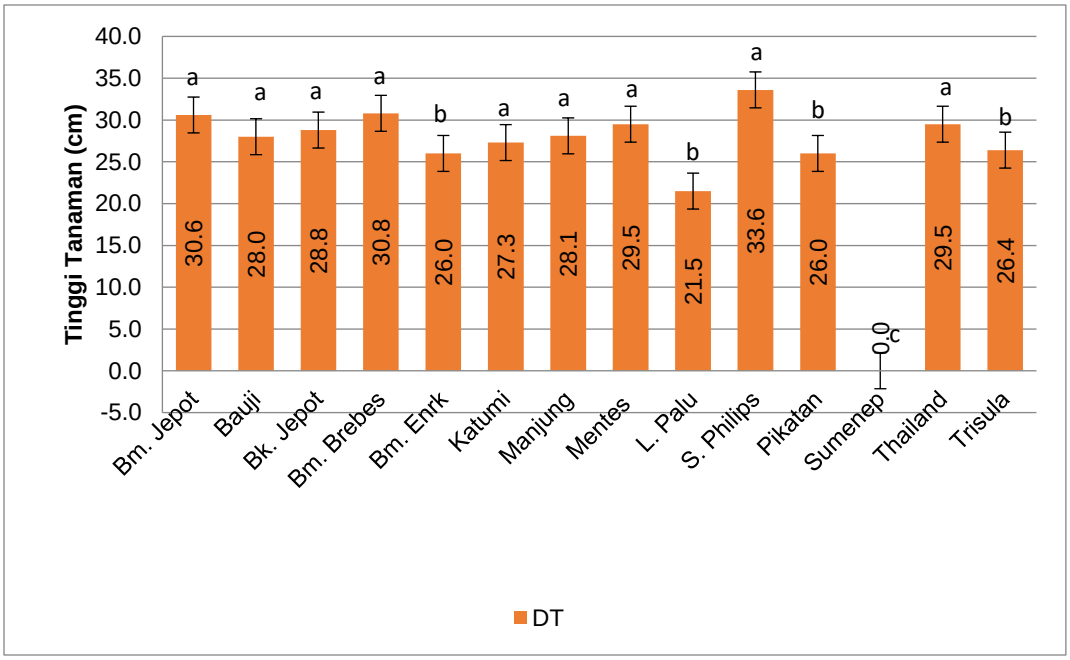
Each variety as a treatment is repeated twice so that 28 experimental units are obtained, which are planted at altitudes of 10 m above sea level (lowlands) and 1000 m above sea level (highlands). To assess the effect of treatment, observations of observation (Y) are made expressed by the model of forecasting analysis:

xijk = μ + α i + βj + εijk
Description :xijk: Random change value/*k-observation* data in the group and j-10th treatment
μ: total average
αi : block/group influence
βj : treatment effect /treatment
εijk : effect error

The results of the observations carried out a combined analysis of variance, and to determine the best treatment, further tests were carried out by comparing the two mean values using Duncan's test.

**3. Results and Discussion**

***a. Plant height***



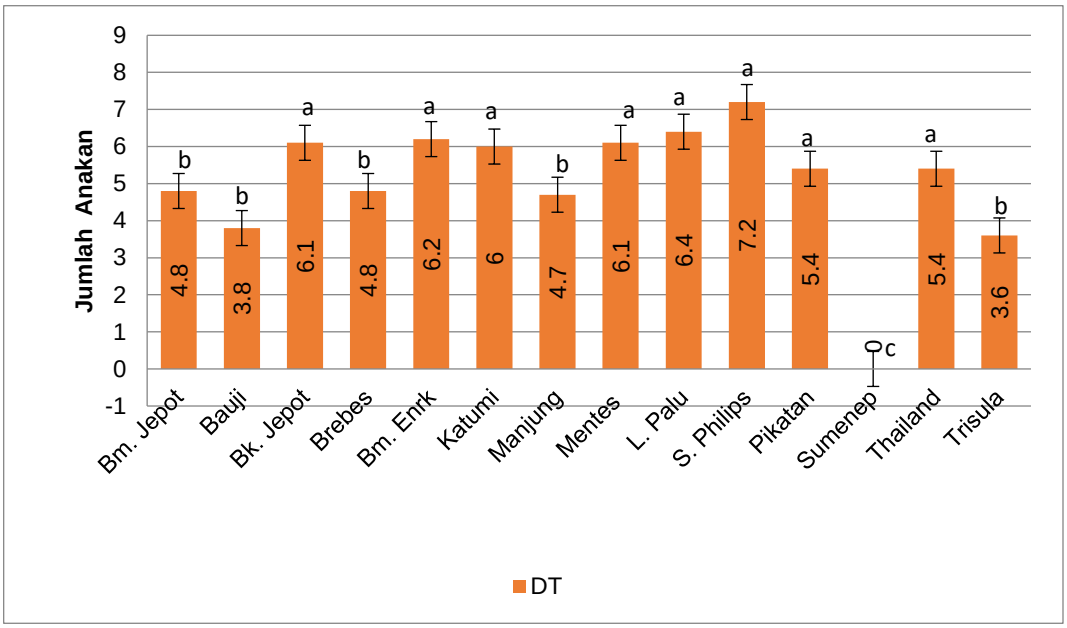

Description: The number followed by the same letter on the same bar color at each different treatment is not noticeable on Duncan test level 5%;

**Figure 1. High onion plants in the highlands**

The wide variety of onion plants grown at high altitudes varieties have a real effect on the height of the plant. Acquired plant height ranges from 26.0 – 33.6 cm (Figure 1), where the Super Philips variety has the highest plant height and differs markedly from the local varieties of Palu and Sumenep but is not noticeable with other varieties. Similarly, between bauji varieties, Bangkok Jeneponto, Bima Enrekang, Katumi, Manjung, Lokal Palu, Pikatan, and different trident varieties are not real.

Super Philips varieties grown at an altitude of 1000 m above sea level have the highest plant height (33.6 cm) compared to other varieties and are different from local varieties of Palu and Sumenep but are not real from other varieties.

**1. Number of Sapves**

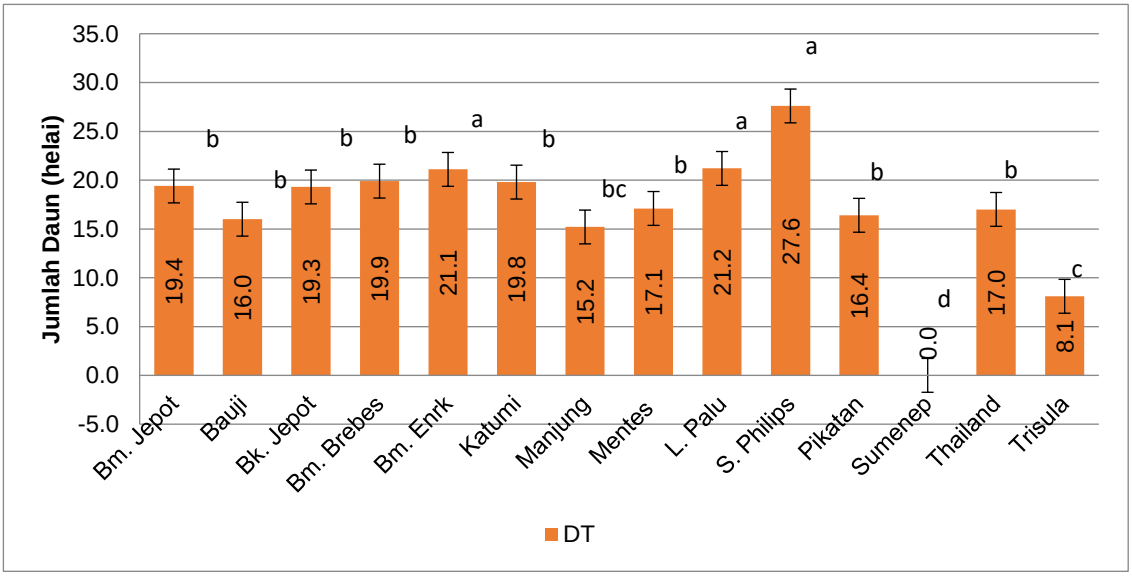



Description: The number followed by the same letter on the same rod color at each different treatment is not real on duncan test level 5%;

**Figure 2. Number of onion saprings in the highlands**

The variety of onion saprings grown at high altitudes shows that the variety has a very real effect on the number of saprings formed. The Super Philips variety (Figure 2) forms more saples than any other variety but is not noticeable with the Bangkok Jeneponto, Bima Enrekang, Katumi, Mentes, and Local Palu varieties, but differs very noticeably from the varieties Bima Jeneponto, Bauji, Bima Brebes, Manjung, Pikatan, Sumenep, Thailand, and Trisula. The average number of saplings formed from all varieties grown at high altitudes is between 3.6 – 7.2 saplings.

**1. Number of Leaves**

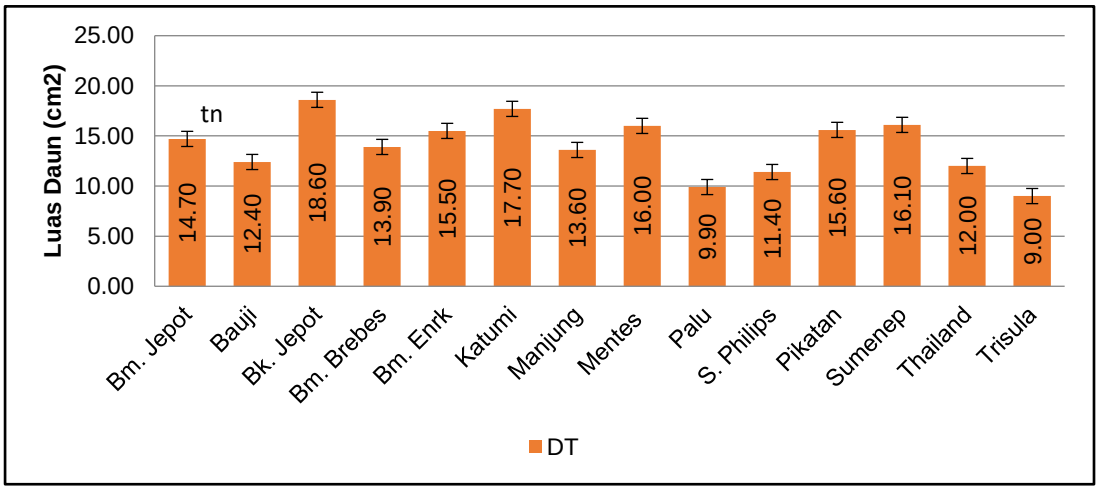



Description: The number followed by the same letter on the same rod color on each treatment is not really different on duncan test level 5%;

**Figure 3. The number of red leeks formed that are planted in the highlands.**

The variety of leeks grown at high altitudes shows that the variety has a very real effect on the number of leaves formed. Super Philips varieties form more leaves than other varieties and differ very noticeably from the varieties Bauji, Manjung, Mentes, Piukatan, Sumenep, and Trident varieties, but differ not noticeably from the varieties of Bima Jeneponto, Bangkok Jeneponto, Bime Brebes, Bima Enrekang, Katumi and local varieties of Palu (Figure 3).

**a. Luas Daun**

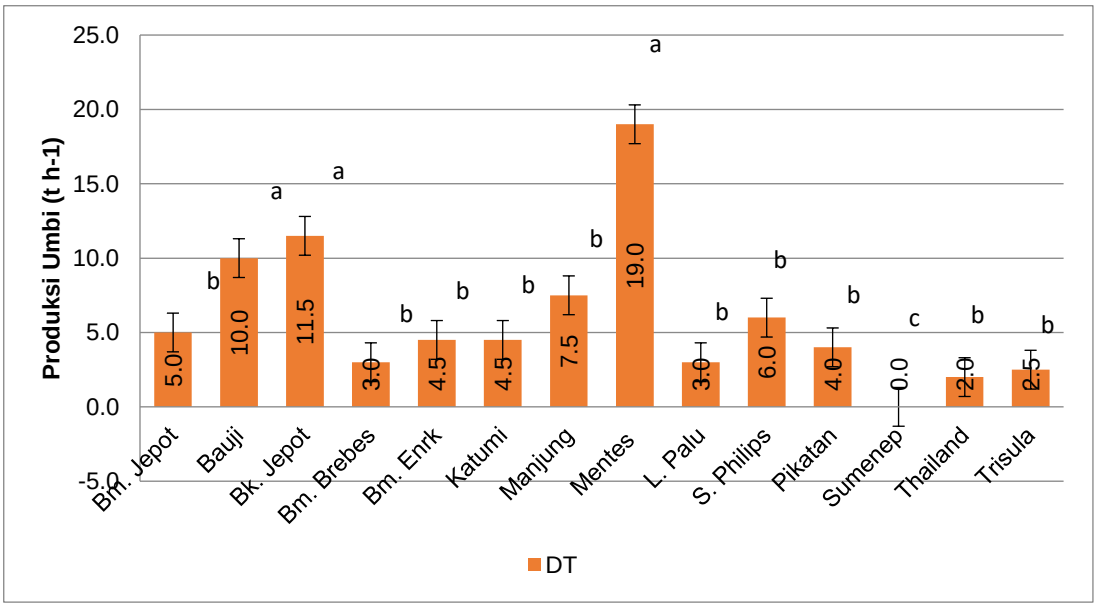



Description: The number followed by the same letter on the same bar color at each different treatment was not noticeable on duncan's 5% test.

**Figure 4. Broad red leeks planted in the highlands**

Fingerprint the wide variety of leeks grown on high altitudes (indicating that the variety has no effect on the leaf area. But the Bangkok Jeneponto variety tends to have the widest leaf area (Figure 4).

**b. Bulb Production**



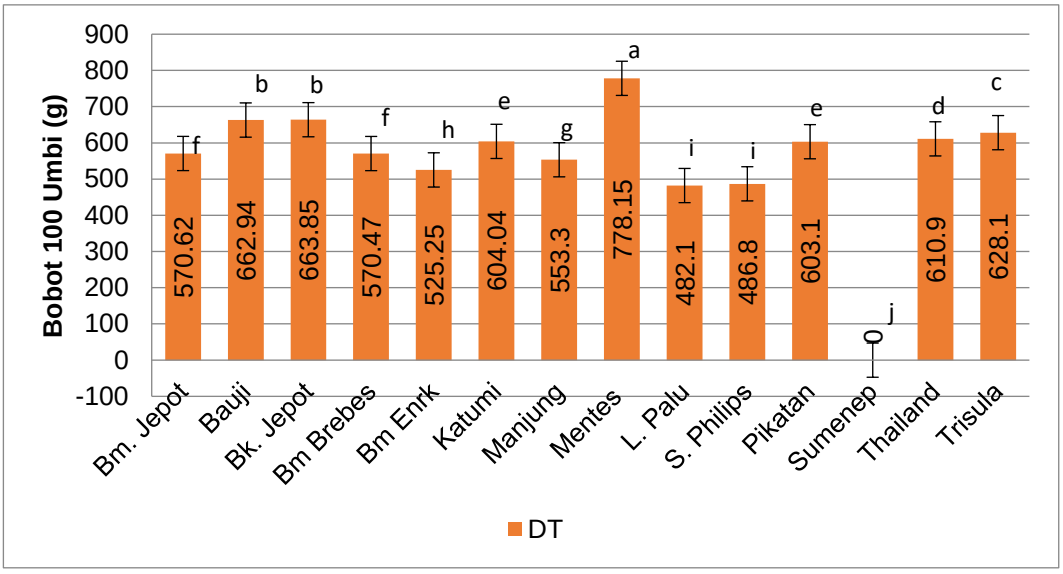

Description: The number followed by the same letter on the same rod color at each treatment is not really different on duncan test level 5%.

**Figure 5. Production of onion bulbs grown in the highlands**

The variety of onion tuber production grown at high altitudes shows that the variety has a real effect on bulb production. The Mentes variety produces more bulbs (19.0 t $h^{-1}$) than any other variety (Figure 5) and differs markedly from the Varieties of Bima

Jeneponto, Bangkok Jeneponto, Bima Brebes, Bima Rnrekang, Katumi, Lokal Palu, Super Philips, Pikatan, Sumenep. Thailan and Trident, however, are not real with the Varieties of Bauji, Bangkok Jeneponto, and Manjung.

**c. Shallot Bulbs Quality**

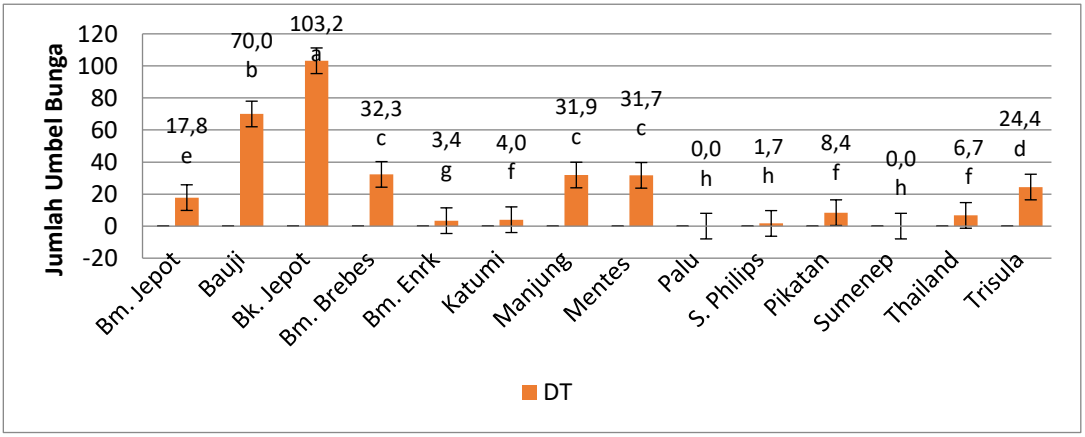



Description: The number followed by the same letter on the same rod color in each treatment is not real different on duncan test level 5%

**Figure 6. Quality of onion bulbs grown in the highlands**

The quality of onion bulbs grown at high altitudes shows that varieties have a real effect on the quality of bulbs. Mentes varieties have the best quality bulbs, which are 778.15 g per 100 bulbs (Figure 6), in stark contrast to the varieties Bima Jeneponto, Bima Brebes, Bima Enrekang, Manjung, Lokal Palu, Super Philips, and Sumenep varieties, but differ not noticeably from the varieties Bauji, Bangkok Jeneponto, Bima Brebes, Bima Enrekang, Katumi, Lokal Palu, Super Philips, Pikatan, Thailan, and Trisula varieties.

**1. Flowering naturally**




Description: The number followed by the same letter on the same rod at each treatment is not real different on duncan test level 5%

**Figure 7. The number of naturally formed onion flowers in the highlands**

The natural print of onions that produce flowers shows that the variety has a very real effect on the natural flowering grown at high altitudes. In this study, naturally, flowering onions only occur at high altitudes; of the 14 varieties tried, there are 12 varieties that can flower naturally in the highlands, while onions grown in lowlands cannot flower naturally.

The varieties that produce the average flower umbel naturally more perpetak in order are Bangkok Jeneponto variety (103.2 umbel flower), Bauji (70.0 umbel flower), Bima Brebes (32.3 umbel flower), Manjung (31.9 umbel flower), and Mente's variety (31.7 umbel flower). Bangkok Jeneponto varieties are not real with Bauji varieties, but they differ very markedly from other varieties. Likewise, varieties of Bima Brebes, Manjung, and Mentes are not real.

| **Correlation between varied observations** Table 1. Correlation between red variables in the highlands Variable | Number of leaves | Leaf area | Plant height | Flowering percentage | Tuber/ha production | Weight 100 bulbs |
|---|---|---|---|---|---|---|
| Number of sapves | 0.89** | -0.04 | 0.76** | -0.02 | 0.26 | 0.50 * |
| Number of leaves | | -0.01 | 0.71** | -0.06 | 0.18 | 0.35 |
| Leaf area | | | -0.14 | 0.23 | 0.38 * | 0.07 |
| Plant high | | | | 0.22 | 0.28 | 0.69 ** |
| **Flowering percentage** | | | | | **0.51 **** | 0.43 * |
| Tuber/ha production | | | | | | 0.55 ** |

Description: ** Real correlated at α = 0.01 and *real correlated at α = 0.05

The results of the correlation analysis between the change at high altitudes with an altitude of 1,000 m above sea level (Table 1), the number of sapleds correlated very markedly with the height of the plant, and real to the weight of 100 bulbs. The number of leaves correlated very markedly with the height of the plant, the area of the leaves correlated markedly with the production of per hectare bulbs, the percentage of flowering plants naturally correlated very markedly with the production of per hectare bulbs and real to the weight of 100 bulbs, as well as the production of per hectare bulbs correlated very real with the weight of 100 bulbs.

An analysis of inter-variable correlations showed that the number of sapfuls correlated very markedly with the number of leaves (r = 0.89**) and the height of the plant (r = 0.76**). Bulb weights are markedly correlated with the number of sapouts (r = 0.50*) and plant height (0.69**), based on an analysis of correlations between plateau variables.

**1. Specifications of Advantages of Onion Varieties**

Referring to the results of an analysis of responds varieties on the growth and flowering of onions that had been served in Appendix Tables 3 – 15, it found some specific advantages of several varieties tested at both altitude locations of different specific characters.

The specification of the advantages of onion varieties is influenced by the response of the variety to the location of the altitude where the plant grows both at high and low altitudes. This is evident in the observed plant plant plant, the specific specification that is seen is the flowering ability of all varieties tested can flower at high altitudes; this is because the changeers are also controlled by genotype and environmental factors. Therefore, the selection of varieties based on the ability of plants to form flowers naturally needed for the determination of further testing can be based on the observed response of the plant.

**4. Conclusion**

Flowering naturally occurs more in the highlands; there are 12 varieties out of 14 varieties of onions that produce flowers, and selected as many as five varieties that flower more, namely The Bangkok Jeneponto Variety, Bima Brebes, Manjung, Bauji, and Mentes varieties. The growth and production of bulbs grown in the highlands are generally determined by the genetic traits and adaptability of each variety. This is indicated by the difference in the results of each component of observation parameters of the same variety. As produced, five varieties selected the production of a different per hectare.

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**Conflicts of Interest:** The authors declare no conflict of interest

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