



Effect of Root-Up Concentration and Planting Media on Crown Root Formation in Pineapple Plants (*Ananas comosus* L. Merr) Smooth Cayenne Variety

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Abstract

This research was carried out from September to November 2022 at an altitude of 447.0 m above sea level, Cirangkong Village, Cijambe District, Subang Regency, West Java Province. This study is to study the growth of crown roots in pineapple plants with the application of Root UP and different planting media. Therefore, the research method used is verification by conducting field experiments using polybags. The materials used in this experiment were Smooth Cayenne Pineapple crown seeds, Root-UP, planting media (soil and husks), polybags and water. Meanwhile, the tools used in this experiment are meters, hoes, electric scales, buckets, dippers, calculators, stationery and cameras. This experiment was carried out using a Random Group Design (RAK) of a factorial pattern consisting of two factors, the first factor was the concentration of Root-UP (H) of 4 levels and the second factor was the planting medium (M) of 4 levels, repeated 3 times. There were 16 treatment combinations that were randomly placed on each replicate. The results showed that the treatment of Root-UP concentration and planting medium had a significant effect on the number of crown roots, crown root length, and crown root dry weight in pineapple plants of the Smooth Cayenne variety. The use of Root-UP Concentration (3.5 mg L⁻¹) had a significant effect on crown root length, and did not differ significantly on the dry weight of crown roots in Smooth Cayenne pineapple plants. Planting medium (Soil Media + Husk 1 : 1) has a real effect on the number of crown roots, crown root length and crown dry weight in pineapple plants of the Smooth Cayenne variety.

Keywords: Pineapple, Root-Up, Crown Root

1. Introduction

The potential for pineapple development in Indonesia is very good because it is supported by agro-climate and land suitable for pineapple cultivation (Febrianna, Prijono, & Kusumarini, 2018), (Warintan, Purwaningsih, & Tethool, 2021). According to (Hirani, Suhartanto, & Widajati, 2020) Generally, pineapples are propagated vegetatively using crowns, slips, hapas and suckers which are also done by cutting the plant stem and crown. (Hairani et al., 2020), (Roostika et al., 2012). However, slips, hapas and sucker seeds that can be produced by the parent plant are limited so they cannot meet the needs of seeds in the field. (Sirait, Suwarno, Wahyono, Sembiring, & Asmono, 2019) (Hidayat & Hidayat, 2020). The use of fruit crowns actually has great potential but requires efforts to accelerate growth, namely by providing sufficient macro nutrients (Nayli, 2019), (Hasanuddin, nd), micro elements and appropriate factors, organic fertilizer to improve soil fertility, giving ZPT either through the leaves or the seeds (Yuliana, 2020), (Felinda, 2021).

2. Methods

The research method used is verification by conducting field experiments using polybags. This experiment was carried out from September to November 2022 at an altitude of 447.0 m above sea level, Cirangkong Village, Cijambe District, Subang Regency, West Java Province. The materials used in this experiment were crown seeds of Smooth Cayenne Pineapple Variety, Root-UP, planting media (soil and husks), polybags and water. Meanwhile, the tools used in this experiment were meters, hoes, electric scales, buckets,



scoops, calculators, writing instruments and cameras. This experiment was carried out using a Randomized Block Design (RAK) factorial pattern consisting of two factors, namely the first factor was Root-UP concentration (H) at 4 levels and the second factor was planting media (M) at 4 levels, repeated 3 times. There were 16 treatment combinations that were randomly assigned to each replication.

Table 1.Operational Independent Variables and Dependent Variables

No	Variable Type	Sub Variable	Variable Indicator
1	independent variable (Treatment)	1. Root UP concentration (h)	h0 = Root-UP 1.5 mg L-1 h1 = Root-UP 2.5 mg L-1 h2 = Root-UP 3.5 mg L-1 h3 = Root-UP 4.5 mg L-1
		2. planting medium (m)	m1 = Soil Media m2 = Soil Media + Husk 1: 1 m3 = Soil Media + Husk 2 : 1 m4 = Soil Media + Husk 1 : 2
2	dependent variable (response)	1. Characteristics of pineapple crown root growth	1) number of roots 2) root length 3) root dry weight

2.1 Additive Linear Models

$$Y_{ijh} = \mu + r_i + K_j + Y_h + (KY)_{jh} + e_{ijh}$$

Information : Y_{ijh} = Observation results on the i -th experimental unit which received a combination of the j -th level of treatment from factor K, and the h -th level of factor Y

μ = general average

R_i = The i -th influence of the group/replication factor

K_j = influence of the j th level of factor from factor K

Y_h = influence of the h th level of factor Y

$(KY)_{jh}$ = influence of the j th level of factor K and the h th level of factor Y

E_{ijh} = random effect from the 1st replication, interaction of the two factors that received the treatment combination jh

Table 2.List of Factorial Pattern Randomized Group Design Analysis

Diversity Source	Degrees of Freedom	Sum of Squares	Middle Square	F count
Deuteronomy (r)	$r-1 = 2$	JKr	KTr	KTr/KTg
Treatment(t)	$ky - 1 = 15$	JKt	Summit	KTP/KTG
Root UP (H)	$k - 1 = 3$	JK (k)	KT (k)	$KT (k)/KTg$
Planting Media (M)	$y - 1 = 3$	JK (y)	KT (y)	$KT (y)/KTg$
Interaction (KY)	$(k-1)(y-1) = 9$	JK (ky)	KT (ky)	$KT (ky)/KTg$
Error (g)	$(ky-1)(r-1) = 30$	JK is wrong	KTg	
total	$kyr - 1 = 29$	JKT		

Source Herdiyantoro (2013) in Yati Haryati (2018)

3. Results and Discussion

3.1 Observation of Number of Roots

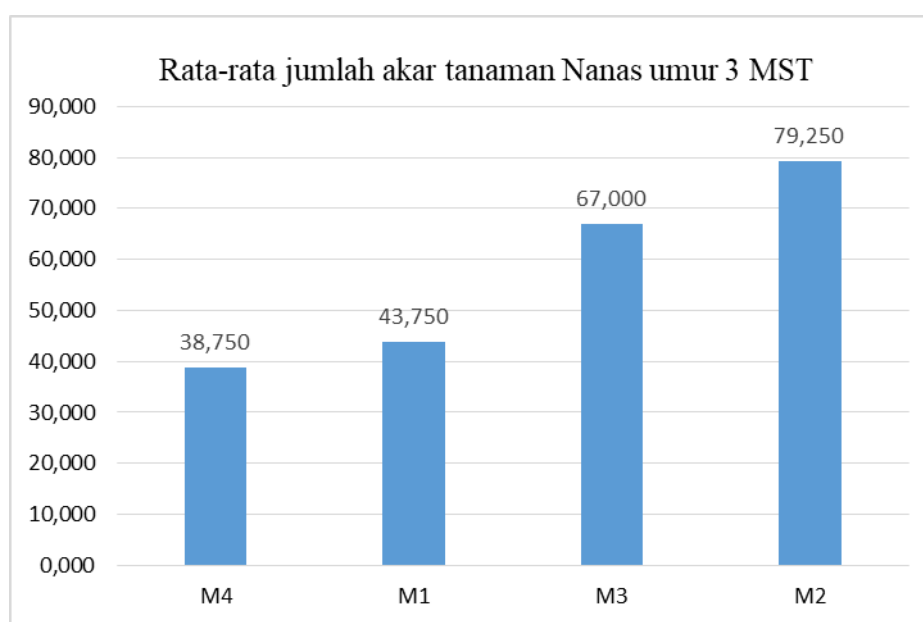
Plant growth will be maximum if there is a match between the genetic factors of the plant and its growing environment. Likewise, the success of plant propagation using buds in the crown is provided by the availability of a supportive environment and the ability of the planting material to produce shoots (Sari and Maghfoer, 2018). The results of analysis of variance (ANOVA) proved that giving ZPT Root UP had a significant effect on the number of roots at the 5% level.

Table 3.Table of variance of the influence of root-up concentration and planting media on the formation of the number of roots in pineapple aged 3 WAP

Diversity Source	Degrees of Freedom	Sum of Squares	Middle Square	F count	Table	
					5%	10%
Deuteronomy (r)	2	350,292	175,146	1,674	3,295	3,295
Root UP (H)	3	134,417	44,806	0,428	2,901	2,901
Planting Media (M)	3	1283,417	427,806	4,088	2,901	2,901
Interaction (HM)	9	478,750	53,194	0,508	2,189	2,189
Error (g)	32	3349,042	104,658	-	-	-
total	47	5595,917	-	-	-	-

Keterangan : * = berpengaruh

** = sangat berpengaruh

**Figure 1.**Graph of number of pineapple roots aged 3 WAP

The graph above shows that the planting media treatment has an effect on the number of roots, the highest number of roots from the soil + husk 1 : 1 (M2) planting media comparison treatment; 79.25 lowest (M4) / soil + husk 1;2 with a value of 38.75

3.2 Root Length

Roots are an important component for root growth, roots have the function of absorbing nutrients, water and minerals. Providing ZPT on root length produces influential results. Treatment with Root Up and planting media had a significant effect on the length of pineapple roots.

Table 4.Table of variance of the influence of root-up concentration and planting media on the formation of root length in pineapple aged 3 WAP

Diversity Source	Degrees of Freedom	Sum of Squares	Middle Square	F count	Table	
					5%	10%
Deuteronomy (r)	2	5,505	2,753	0,622	3,295	3,295
Root UP (H)	3	111,538	37,179	8,401 **	2,901	2,901
Planting Media (M)	3	25,222	8,407	1,900*	2,901	2,901
Interaction (HM)	9	57,189	6,354	1,436*	2,189	2,189
Error (g)	32	141,625	4,426	-	-	-
total	47	341,079	-	-	-	-

Keterangan : * = berpengaruh
 ** = sangat berpengaruh

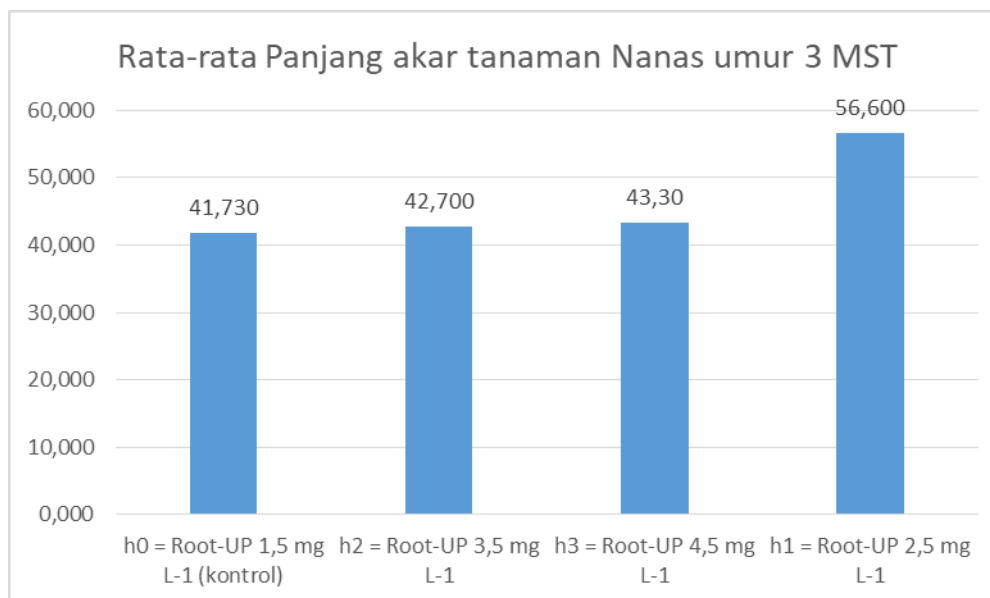


Figure 2. Graph of root length for pineapple aged 3 WAP

Based on the diagram above, it shows that the ZPT Root UP treatment has a great influence on the length of the pineapple plant roots, but there is not much difference between the treatments.

3.3 Root Dry Weight

The dry weight of the roots is the roots that grow on the corn, dried and weighed using a digital scale. observations were made at the end of the research.

Table 5. Table of variance of the influence of root-up concentration and planting media on dry weight of pineapple roots

Diversity Source	Degrees of Freedom	Sum of Squares	Middle Square	F count	Table	
					5%	10%
Deuteronomy (r)	2	2,613	1,307	0.505	3,295	3,295
Root UP (H)	3	0.293	0.098	0.038	2,901	2,901
Planting Media (M)	3	14,191	4,730	1,828*	2,901	2,901
Interaction (HM)	9	11,766	1,307	0.505	2,189	2,189
Error (g)	32	82,823	2,588	-	-	-
total	47	111,687	-	-	-	-

Keterangan : * = berpengaruh
 ** = sangat berpengaruh

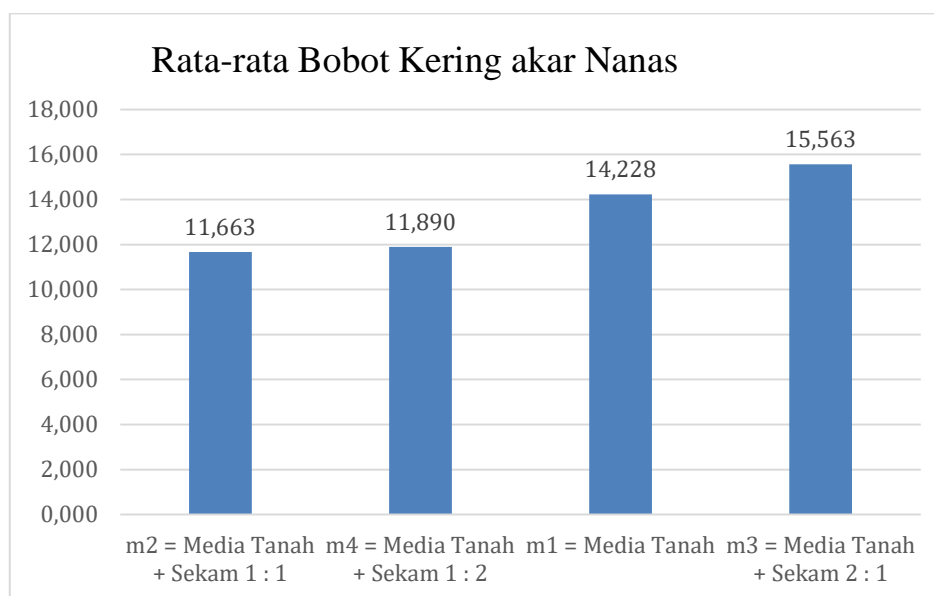


Figure 2. Graph of dry weight of pineapple roots

Based on the diagram above, it shows that the ZPT Root UP treatment and planting media did not have a significant effect on the dry weight of pineapple roots, but there was not much difference between the other treatments.

4. Conclusion

Based on the research results, it shows that the Root-UP concentration treatment and planting media have a significant effect on the number of crown roots, crown root length, and crown root dry weight in Smooth Cayenne variety pineapple plants. The use of Root-UP Concentration (3.5 mg L⁻¹) had a significant effect on crown root length, and was not significantly different from crown root dry weight on Smooth Cayenne pineapple variety plants. Planting media (Soil + Husk 1 : 1) has a significant effect on the number of crown roots, crown root length and crown dry weight in Smooth Cayenne pineapple varieties. It is recommended that pineapple farmers can increase production, both quality and pineapple quality, and can improve family welfare. It is recommended for future researchers to conduct further research

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