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THE EFFECT OF PLANTING MEDIUM ON THE GROWTH OF PINEAPPLE SEEDLING

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ABSTRACT

The aim of this research was to ascertain the influence of media on pineapple seedling growth. The research was conducted at the Aripan Experimental Field of Indonesian Tropical Fruit Research Institute from November 2006 until August 2007. This research was arranged in a Randomized Complete Block Design with six treatments and four replications. These treatments were (a) soil, (b) soil + manure (1:1), (c) soil + sand (1:1), (d) soil + manure + sand (1:1:1), (e) soil + manure + sand (1:1:2), and (f) soil + manure + sand (2:1:2). The results showed that the medium of soil + manure (1:1) gave higher growth of the pineapple seedlings than the other media consistently started from three months after planting. This medium was also the best medium for the growth of pineapple seedling as it gave the highest parameters in terms of plant height, leaf length, leaf width, leaf numbers, and seedling wet weight. This result suggested that soil + manure (1:1) is useful medium for accelerating the growth of pineapple seedling.

Keywords: pineapple seedling, plant growth, medium.

INTRODUCTION

Pineapple (*Ananas comosus* (L.) Merr.) can be propagated vegetatively and generatively. Plant materials for vegetative propagation can be in the form of shoot, slip, crown, and stem cutting. Different from vegetative propagation, the generative propagation tends to be intended for breeding purposes. *Ananas comosus* belongs to self-incompatible plant in which its pollen cannot function in self-fertilization (Py *et al*., 1987). Only through cross-pollination between different cultivars will seeds be produced.

Planting medium is not only as a growing place but also as a source of nutrient for plant growth. Media composition used influences the quality of seedling (Wilson *et al*., 2001). Generally, media for fruit crop seedling are composed of soil, organic matter, and sand. The soil is usually used as a basic medium because it is cheapest and easy to get. Supplementing of the sand is aimed to make media more porous while the organic matter is so as to enrich adequate nutrients for the seedling. There is better relationship between the manure and rooting rather than conventional soil mix and less pre-dispose the seedling to soil borne pests and diseases (Akanbi *et al*., 2002).

Several studies on growth media had been conducted on the various fruit commodities by previous researchers. The best growth of mangosteen seedling was reached on soil medium compared to the other media (Jawal *et al*., 1998). Lanzon seedling appeared the best growth on sand medium until 5 months old (Susiloadi *et al*., 1998). Ratna *et al*., (2006) working on banana cv. Raja Serai proved that soil and sand medium was the most suitable medium for shoot and leaf growth of this banana. *Uapaca kirkiana* Müell Arg. planted on the medium comprising 75% forest soil and 25% sawdust produced the tallest seedlings, larger root collar diameter and higher survival at 10 months after planting (Mhango *et al*., 2008). Baiyeri (2003) mentioned that the best seedling qualities of African breadfruit (*Treculia africana* Decne) were obtained when grown in medium formulated with top soil + poultry manure + river sand in 1:2:3 (v/v/v) ratios.

Nevertheless, so far there is little information is available in the effect of media on the growth of pineapple in Indonesia. The aim of the research was to ascertain the influence of media on pineapple seedling growth.

MATERIALS AND METHODS

The research was conducted at the Aripan Experimental Field of Indonesian Tropical Fruit Research Institute from November 2006 to August 2007. Pineapple seedlings generated from crossing between Queen and Green Spanish was used in this research. The research consisting of six treatments was arranged in a Randomized Complete Block Design with four replications. These six treatments were as follows:

a) Soil
b) Soil + manure (1:1, v/v)
c) Soil + sand (1:1, v/v)
d) Soil + manure + sand (1:1:1, v/v/v)
e) Soil + manure + sand (1:1:2, v/v/v)
f) Soil + manure + sand (2:1:2, v/v/v)

Each treatment was composed of five seedlings. The seedlings, eight months after germination, were transplanted to polybag (20 x 30 cm) filled with each medium tested. Observations were performed on seedling height, leaf length, leaf width, leaves number, and seedling wet weight. Height of seedling was measured from soil surface up to the highest leaf tip by straightening all leaves. Leaf length and leaf width were measured on the longest and the widest leaf. Leaves number were represented by the accumulation of all leaves that were counted from transplanting date to the last observation. Seedling wet weight was measured at the last observation.

The first observation was done one month after transplanting seedling to the treatment media and

subsequent observations were done at two months interval during eight months. All data were subjected to analysis of variance and means were separated by Honesty Significance Difference (HSD) test at $p \leq 0.05$. To know the growth pattern of each medium, regression analysis was performed between observation dates and the seedling height, leaf length, leaf width, and leaves number.

RESULTS AND DISCUSSIONS

The trends of seedling height, leaf length, leaf numbers and leaf width were still linear until 9 months old (Figure-1). These were due to the seedlings still in the phase of vegetative growth. In general, Figure-1 demonstrates that soil + manure (1:1) medium gave higher growth components compared to the other media consistently started from three months of transplanting.

The significant effect of media on leaf length was shown since 5 months after transplanting (Table-1). Both on media of soil alone and soil + sand (1:1), the leaf length was lower than on the other media. The highest growth rate of leaf length was reached on soil + manure (1:1) medium (Figure-1b).

Except at one month after transplanting, the media composition significantly affected seedling height (Table-2). In general, significant differences were found in seedling height between media with manure and media without manure. Seedlings planted on the media with manure were generally higher than those on the media without manure. This suggested that manure is necessary to be supplemented in the soil media in order to quicken the height of seedling. Since the highest increment of height took place in medium of soil + manure (1:1), i.e., 8, 02 cm in average every two months, this medium composition represented the most suitable for inducing the height of pineapple seedling.

Table-1. The effect of planting media on the leaf length of pineapple seedling at 1 through 9 months after transplanting.

Treatment	Leaf length (cm) at 1 through 9 months after transplanting planting				
	1	3	5	7	9
A. Soil	6.98 ns	11.07 ns	15.63 ab	19.64 ab	23.18 a
B. Soil + Manure (1:1)	6.85	12.13	19.79 c	28.91 c	32.80 b
C. Soil + Sand (1:1)	6.54	9.25	13.36 a	16.90 a	20.91 a
D. Soil + Manure + Sand (1:1:1)	6.48	11.03	17.85 bc	24.96 bc	30.65 b
E. Soil + Manure+ Sand (1:1:2)	6.71	11.06	17.96 bc	24.94 bc	30.27 b
F. Soil + Manure + Sand (2:1:2)	7.10	11.31	17.68 bc	27.39 c	31.07 b

Table-2. The effect of planting media on the height of pineapple seedling at 1 through 9 months after transplanting.

Treatment	Plant height (cm) at 1 through 9 months after transplanting planting				
	1	3	5	7	9
A. Soil	6.88 ns	12.28 ab	18.27 a	22.98 a	27.10 a
B. Soil + Manure (1:1)	6.98	14.47 b	23.82 b	33.98 b	39.06 b
C. Soil + Sand (1:1)	6.59	10.52 a	15.62 a	19.58 a	24.76 a
D. Soil + Manure + Sand (1:1:1)	6.57	13.19 b	21.77 b	30.39 b	37.13 b
E. Soil + Manure+ Sand (1:1:2)	6.92	12.89 b	21.75 b	29.86 b	35.34 b
F. Soil + Manure + Sand (2:1:2)	7.19	13.41 b	21.84 b	30.55 b	36.38 b

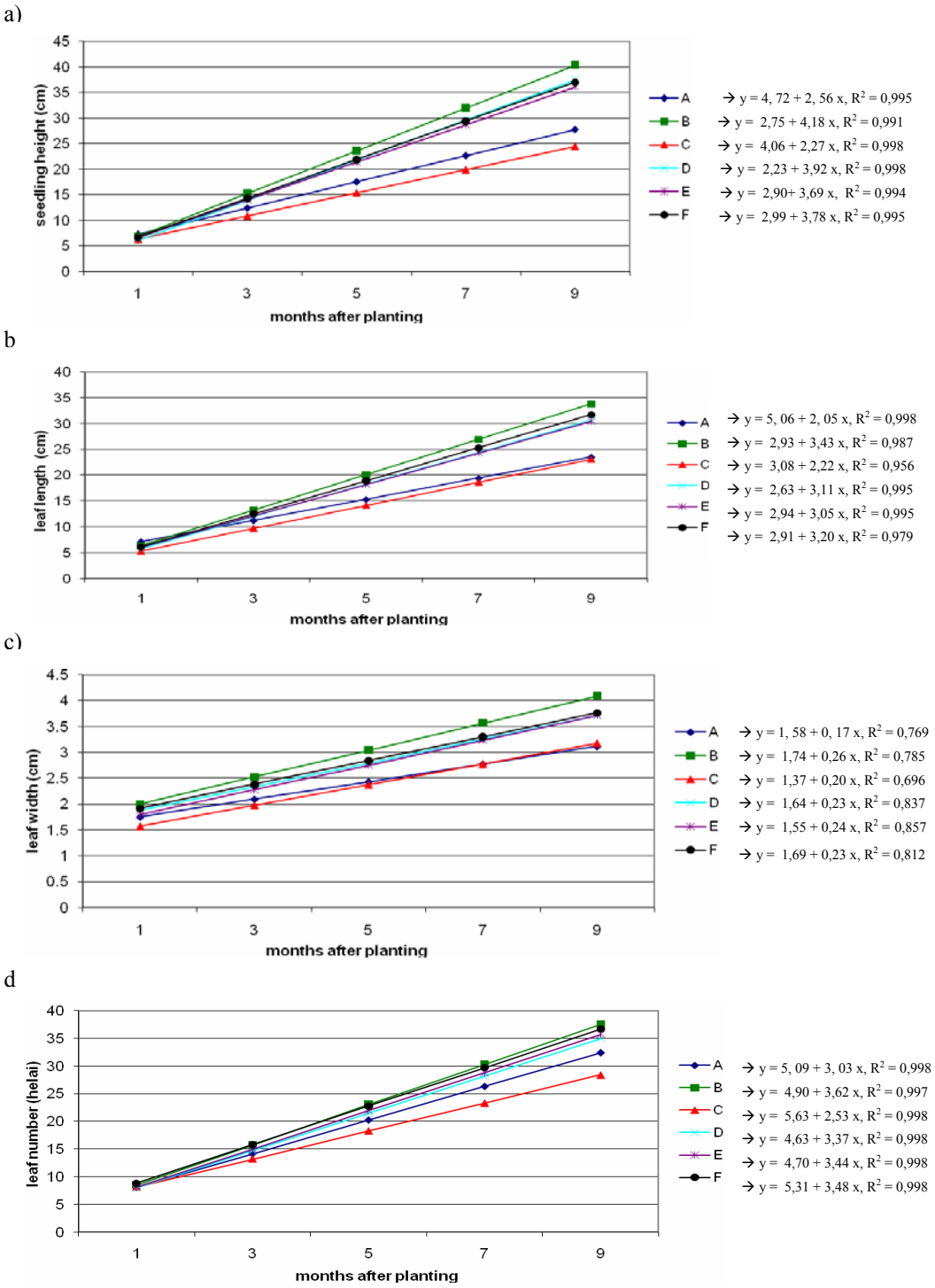

Figure-1. The growth pattern of a) height, b) leaf length, c) leaf width, and d) leaf number of pineapple seedling on some growth media

The width of leaves was also significantly influenced by the media with the exception at one month after transplanting (Table-3). The narrowest leaves of pineapple seedling were observed on the medium of soil + sand (1:1). In contrast, the widest ones were observed on the medium of soil + manure (1:1).

Table-3. The effect of growth media on the leaf width of pineapple seedling at 1 through 9 months after transplanting.

Treatment	Leaf width (cm) at 1 through 9 months after transplanting				
	1	3	5	7	9
A. Soil	1.40 ns	2.33 ab	2.72 a	2.74 ab	2.85 a
B. Soil + Manure (1:1)	1.51	2.89 c	3.58 b	3.38 c	3.87 b
C. Soil + Sand (1:1)	1.37	2.00 a	2.43 a	3.41 a	2.67 a
D. Soil + Manure + Sand (1:1:1)	1.52	2.50 bc	3.26 b	3.29 c	3.47 b
E. Soil + Manure+ Sand (1:1:2)	1.45	2.47 abc	3.19 b	3.22 bc	3.50 b
F. Soil + Manure + Sand (2:1:2)	1.53	2.61 bc	3.32 b	3.38 c	3.49 b

The effect of media on the number of leaves started to appear after three months of transplanting (Table-4). From three months through nine months after transplanting, the leaves number of pineapple seedling planted on the medium of soil + sand (1:1) were least, on the contrary, those on the medium of soil + manure (1:1) was highest. However, there were no significant differences for leaves number among media containing manure. Again this result confirmed the importance of manure in the media to make better growth of pineapple seedling.

Tabel-4. The effect of growth media on the leaves number of pineapple seedling at 1 through 9 months after transplanting.

Treatment	Leaves number at 1 through 9 months after transplanting				
	1	3	5	7	9
A. Soil	8.40 ns	13.50 ab	20.60 ab	26.50 b	32.20 b
B. Soil + Manure (1:1)	8.65	14.95 b	23.70 c	30.75 c	36.95 c
C. Soil + Sand (1:1)	8.20	12.80 a	18.70 a	23.60 a	28.10 a
D. Soil + Manure + Sand (1:1:1)	8.35	13.97 ab	21.77 bc	28.64 bc	34.75 bc
E. Soil + Manure+ Sand (1:1:2)	8.35	14.30 ab	22.35 bc	29.25 c	35.30 bc
F. Soil + Manure + Sand (2:1:2)	8.80	15.20 b	23.20 c	30.10 c	36.10 c

All media supplemented with manure significantly influenced seedling height, leaf length, leaf width, and leaves number perhaps because manure provides adequate nutrients and enhances both the physical properties and the water holding capacity (Soegiman 1982). The similar result was also reported by Supriyanto *et al*. (1990) working on orange seedling that media containing manure produced the growth and roots better than those containing sawdust and rice hulk. Purbiati *et al*. (1994) proved that soil + manure (1:1) was the best medium for the growth components of salacca cv. Pondoh and Bali.

In general, the effect of sand in the medium on seedling height, leaf length, and leaves number was not as significant as the effect of manure. However, the addition of sand did not have a negative effect on the seedling growth when the media had already contained manure.

The weight average of nine months seedling at each tested medium is presented in Table-5. There were significant differences in the effect of medium on the wet weight among media. The lowest wet weight was observed on the medium of soil + sand (1:1), while the highest wet weight was observed on the medium of soil +manure (1:1). Overall, the wet weight of seedlings on media without manure was significantly lower ($P \leq 0.05$) than those on media with manure. This lower might be explained by the fact that plant height and all leaf components in media without manure were generally lower, therefore, wet weight of seedling in media of both soil and soil + sand (1:1) was lower. This result confirmed the importance of manure for the pineapple seedling growth.

Table-5. The effect of planting media on wet weight of seedling nine months after transplanting.

Treatment	**Wet weight of seedling** (g)
A. Soil	105.00 a
B. Soil + Manure (1:1)	249.00 c
C. Soil + Sand (1:1)	76.25 a
D. Soil + Manure + Sand (1:1:1)	198.90 b
E. Soil + Manure+ Sand (1:1:2)	179.30 b
F. Soil + Manure + Sand (2:1:2)	199.00 b

The performance of nine months seedlings can be seen in Figure-1. It is obvious that seedlings on media without manure (Figures 2A and 2C) show worse performance. The best performance is exhibited by seedlings on medium of soil + manure (1:1) in Figure-2B followed by seedlings on medium of soil + manure + sand (2:1:2) and soil + manure + sand (1:1:1), respectively in Figures 2F and 2D. The quality of the seedling transplanted will influence their growth and productivity in the orchard.

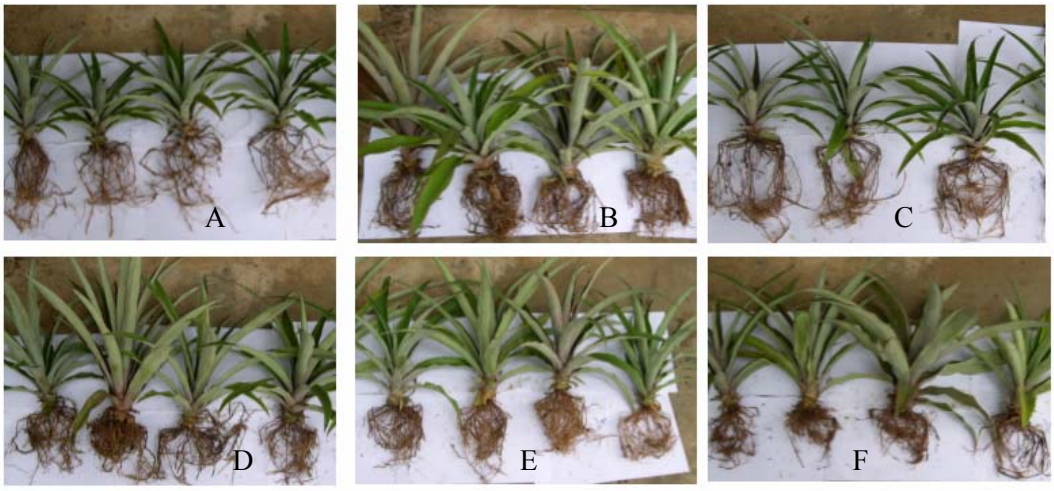

Figure-2. The performance of pineapple seedlings 9 months after transplanting.

CONCLUSIONS

a) Planting media significantly influenced the growth of pineapple seedling in which medium of soil + manure (1:1) was the best medium since the plant height and all leaf components were higher than those on the other media; and
b) The overall results revealed that media supplemented with manure gave higher parameters of growth compared to media without manure. Therefore, this result suggested that manure should be mixed in media for quickening pineapple growth.

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