AGRIVITA VOLUME 33 No. 2 *JUNE-2011* *ISSN : 0126-0537*

THE EFFECT OF PLANTING MEDIA AND COMPOUND FERTILIZERS ON THE GROWTH OF *Rubus pyrifolius* J. E. SMITH SEEDLING

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Received: January 28, 2010/ Accepted: March 29, 2011

ABSTRACT

The experiment was conducted from June to October 2009, at Cibodas Botanical Garden. The design used in the experiment was completely randomized block with two treatments and three replicates. The first factor was four kinds of planting media (sand + husk (2:1), sand + compost (1:1), husk + compost (1:1), compost). The second factor was three kinds of fertilizers (growmore, gandasil D, hyponex) and one treatment without fertilizer (control). The results of experiment show no interaction in almost all parameters between planting media and compound fertilizers. Statistically, all parameters observed show significance (α = 0,05 and α = 0,01) at various media. Based on the study, the best media were compost and sand + compost (1:1). These media were recommended for *R. pyrifolius* seedling growth.

Keywords :*Rubus pyrifolius,* planting media, fertilizers

INTRODUCTION

Rubus, commonly known as Raspberry or Blackberry, is one of fruit crops belonging to *Rosaceae*. *Rubus pyrifolius* belonging to the subgenus *Malachobatus* is one of Raspberry types which is distributed in mountain Indonesia. Generally, *Rubus* grows in open places like clearings, forest-edges, roadsides, landslides, grasslands, riverbanks, fallow gardens and also in shrub lands. Kalkman (1993) reported that this species was found in Sumatra, Borneo, Java, Celebes, Bali, Lombok, and Flores in the altitude of 500-1700(-2000) meters above sea level.

Rubus pyrifolius (Figure 1) is one of the collections in Cibodas Botanical Garden. This species is climbing shrubs, prickles, and stems up to 8(-30) long, the leaf was 4–16 cm in length, and 3–10 cm in width. The Flowers are bisexual type, sepals triangular to ovate, petals elliptic to obovate, ovaries 3–10 and 1–4 becoming a fruits with red color (Surya, 2009; van Steenis, 1972). Although the fruit is small and ranges from bitter to sweet, this species has a potential to be cultivated as a crop plant. Furthermore, Kalkman (1993) indicated that *Rubus* spp. had potential as fruit plant and ingredient for wine.

Currently, *Rubus pyrifolius* is not yet cultivated in Indonesia due to the lack of information related to the propagation and cultivation. In an effort to develop Raspberry originating from the mountain forests of Indonesia, a research related to the propagation and cultivation of *Rubus* spp. in Indonesia is required. Furthermore, seedling is one of the early activities of cultivation, and some of the publications reported that planting media had influence on seedling growth (Gulcu *et al*., 2010; Hassanein, 2010; Ozenc and Ozenc, 2007; Khan *et al*., 2006).

The aim of this research is to understand the influence of planting media and compound fertilizers on the seedling of *Rubus pyrifolius*.

MATERIALS AND METHODS

The research was conducted in the greenhouse at Cibodas Botanical Garden, from June to October 2009. The seed of *Rubus pyrifolius* was obtained from the plant collection in Cibodas Botanical Garden. Furthermore, seed that had been cleaned from the pulp was germinated in Petri dish using wet tissue paper. After cotyledons opened and the germinations grew well, the seed was moved to the pot tray with sand media. The seedling which grew well and had three leaves was transferred into the polybag.

Figure 1. *Rubus pyrifolius* (A). flowers, (B). fruits

Randomized complete block design with two factors and three replications were used in this experiment. The first factor was fourth type of planting media, i.e. A. sand + husk (2:1), B. sand + compost (1:1), C. compost + husk (1:1), and D. compost. The second factor was without compound fertilizers and three types of compound fertilizers i.e. Gandasil D (20%N–15%P–15%K), Hyponex (25%N–5%P–20%K), Growmore (10%N–55%P–10%K). The dose of compound fertilizers given to the seedlings was 1 g/lt. Compound fertilizers were applied five times, namely at the day of planting, 2 weeks after planting, 4 weeks after planting, 6 weeks after planting, and 8 weeks after planting.

Some parameters such as plant height, leaf numbers, leaf length, leaf width, steam diameters, and bud numbers were observed every week. The other parameters observed on 15 weeks after planting were roots length, wet weight of plant and dry weight of plant. Dry weight of plant was obtained after the plants were dried on the oven for 3 days in 80 ^{o}C.

All the data were analyzed using ANOVA (α = 5%), and the differences among the treatments were tested using Tukey test (BNJ 5%) (Gomez and Gomez, 1995).

RESULTS AND DISCUSSION

The results show that there was no intraction in almost all parameters. The significant interaction shows only on steam diameters at 12 weeks after planting. It indicates that seedling planted on compost media and without fertilizers was the biggest (2,43a), followed by compost + gandasil D (2,37 a), sand + compost + gandasil D (2,16 ab), compost + hyponex (2,10 abc), sand + compost + hyponex (2,08 abc) and sand + compost (2,01 abc) (Figure 2). Furtheremore, based on statistical analysis, the treatment of fertilizers affected the number of leaf on the fourth week after planting, but it did not have effect on the other parameters (Table 1). It may be due to the low dosage in the appplication (1 g/lt). Soedomo (2006) reported that by using Gandasil D, there was no significant on plant height and the number of buds between 1,5 g/lt, 3,0 g/lt and 4,5 g/lt.

Medium is known as one of basic factors which affects plant growth. Tukey test shows that seedling of *R. pyrifolius* planted in sand + compost media gave the highest value of growth parameter on plant height and leaf width than the other media. Furthermore, the highest value on leaf number, leaf length, steam diameter, root lenght, bud number, wet weight and dry weight of plant are shown on compost media (Table 2).

Table 1. Significancy of planting media, compound fertilizer and interaction on the growth of *Rubus pyrifolius* seedling

No.	Characters	Treatments		
		PM	CF	PM x CF
1.	Plant height (cm)			
	a. Age 4 wap	ns	ns	ns
	b. Age 8 wap	**	ns	ns
	c. Age 12 wap	**	ns	ns
	d. Age 15 wap	**	ns	ns
2.	Leaf numbers			
	a. Age 4 wap	*	*	ns
	b. Age 8 wap	**	ns	ns
	c. Age 12 wap	**	ns	ns
	d. Age 15 wap	**	ns	ns
3.	Leaf length (cm)			
	a. Age 6 wap	**	ns	ns
	b. Age 8 wap	**	ns	ns
	c. Age 12 wap	**	ns	ns
	d. Age 15 wap	**	ns	ns
4.	Leaf width (cm)			
	a. Age 6 wap	**	ns	ns
	b. Age 8 wap	**	ns	ns
	c. Age 12 wap	**	ns	ns
	d. Age 15 wap	**	ns	ns
5.	Stem diameters (cm)			
	a. Age 8 wap	**	ns	ns
	b. Age 10 wap	**	ns	ns
	c. Age 12 wap	**	ns	*
	d. Age 15 wap	**	ns	ns
6.	Root lenght (cm)	**	ns	ns
7.	Bud numbers	**	ns	ns
8.	Wet weight of plant (g)	**	ns	ns
9.	Dry weight of plant (g)	**	ns	ns

Remarks: ns = not significant; * = significant on p<0,05; ** significant on p<0,01; PM = planting media; CF = compound fertilizer; PM x CF = interaction; wap = weeks after planting

Table 2. Effect of planting media and compound fertilizers on vegetative growth of *Rubus pyrifolius* on 15 wap

Treatments	Plant Height (cm)	Leaf Numbers	Steam Diameter (mm)	Leaf Length) (cm)	Leaf width (cm)	Root length (cm)	Bud numbers	Wet weight per plant (g)	Dry weight of plant (g)
Planting Media									
Sand + husk (2:1)	38.50 b	3.50 c	1.09 b	79.17 b	28.17 b	12.33 b	0.17 b	0.91 b	0.23 b
Sand + Compost (1:1)	267.83 a	11.00 ab	2.54 a	166.67 a	66.83 a	27.08 a	5.00 a	12.99 a	2.85 a
Compost+husk (1:1)	100.17 ab	5.67 bc	1.82 ab	142.00 ab	54.17 a	19.98 ab	2.33 ab	5.40 ab	1.13 ab
Compost	261.00 a	11.17 a	2.64 a	169.33 a	66.67 a	31.98 a	6.00 a	14.05 a	3.31 a
Compound Fertilizers									
Without Fertilizer	141.42 ^{ns}	7.75 ^{ns}	2.00 ^{ns}	130.75 ^{ns}	54.92 ^{ns}	26.05 ^{ns}	2.67 ^{ns}	7.93 ^{ns}	1.563 ^{ns}
Gandasil D	210.50 ^{ns}	9.50 ^{ns}	2.21 ^{ns}	145.25 ^{ns}	53.50 ^{ns}	22.84 ^{ns}	2.92 ^{ns}	9.57 ^{ns}	1.863 ^{ns}
Hyponex	192.33 ^{ns}	7.92 ^{ns}	2.04 ^{ns}	147.83 ^{ns}	53.00 ^{ns}	25.16 ^{ns}	4.08 ^{ns}	8.75 ^{ns}	1.703 ^{ns}
Growmore	160.42 ^{ns}	9.00 ^{ns}	1.96 ^{ns}	127.83 ^{ns}	51.08 ^{ns}	20.53 ^{ns}	3.17 ^{ns}	7.50 ^{ns}	2.055 ^{ns}

Remarks : numbers followed by same letters in the same column indicate no significant difference according to 5 % BNJ, ns : not significant

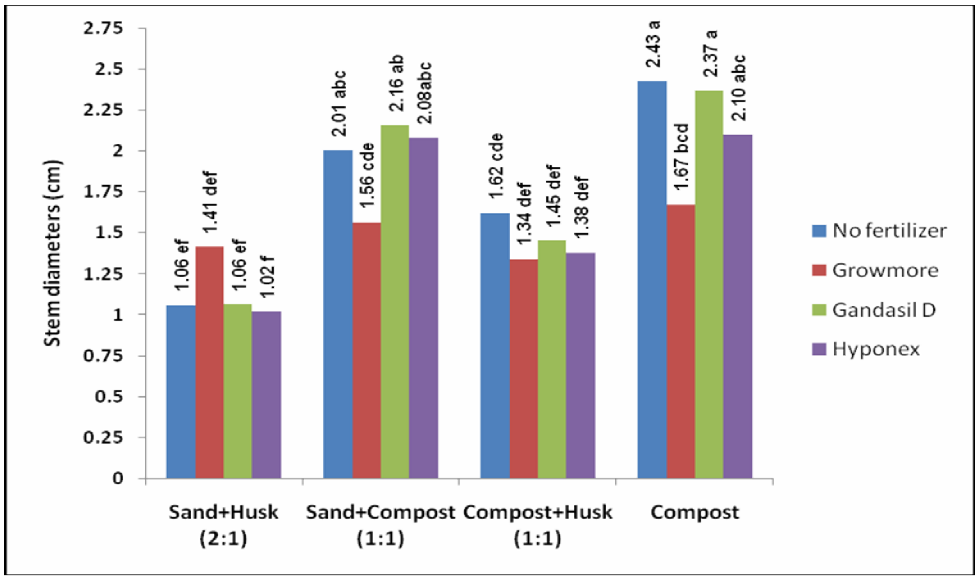

Figure 2. Effect of planting media and compound fertilizer on stem diameter at 12 weeks after planting.

The highest value of wet weight of plant (14.05 g) is shown by compost media. The increase of this value was followed by the improvement of dry weight of plant (3.31 g) in the same treatment. Those parameters were significantly affected by the increase of root length, bud number, steam diameter, plant height, leaf number and leaf size. Improvement in the number of leaves and leaf size has resulted in the increase of leaf area index (LAI). Goldsworthyand and Fisher (1996) reported that the improvement of LAI may also indicate that the ability of plant to do photosynthesis was increasing, so the product of photosynthesis which was distributed to all parts of the plant might also increase.

Compost media are a mixture of the weathering of organic materials and soil that has been decomposed through biological process (Acquaah, 2002). In addition, compost also influences the condition of soil where root, plant and microorganisms develop well (Sutedjo, *et. al.* 1991). It was also seen in this experiment, where the values of root lenght planted in the compost media (31,98 cm) were longer than those planted in the media of sand + husk (12.33 cm), sand + compost (27.08 cm) and compost + husk (19.98 cm).

Furthermore, seedling of *R. pyrifolius* planted in sand + husk shows the lowest values on all parameters compared with the other media. Hartman et. al. (2002) reported that the sand media does not contain mineral and the capacity to hold cation exchange capacity. It is also seen in this experiment that the seedling planted in sand + compost grows well than those planted in sand + husk and compost + husk (Figure 3). This result indicates that sand worked better with organic media. Hartman et. al. (2002) reported that the media used for plant propagation have several requirments in term of firmness and density, capacity to hold water, porousness, resistance to desease, high CEC (cation exchange capacity), and low salinity. Furtheremore, Lakitan (1995) reported that plant media should not be too damp, because it can stimulate fungi and diesease.

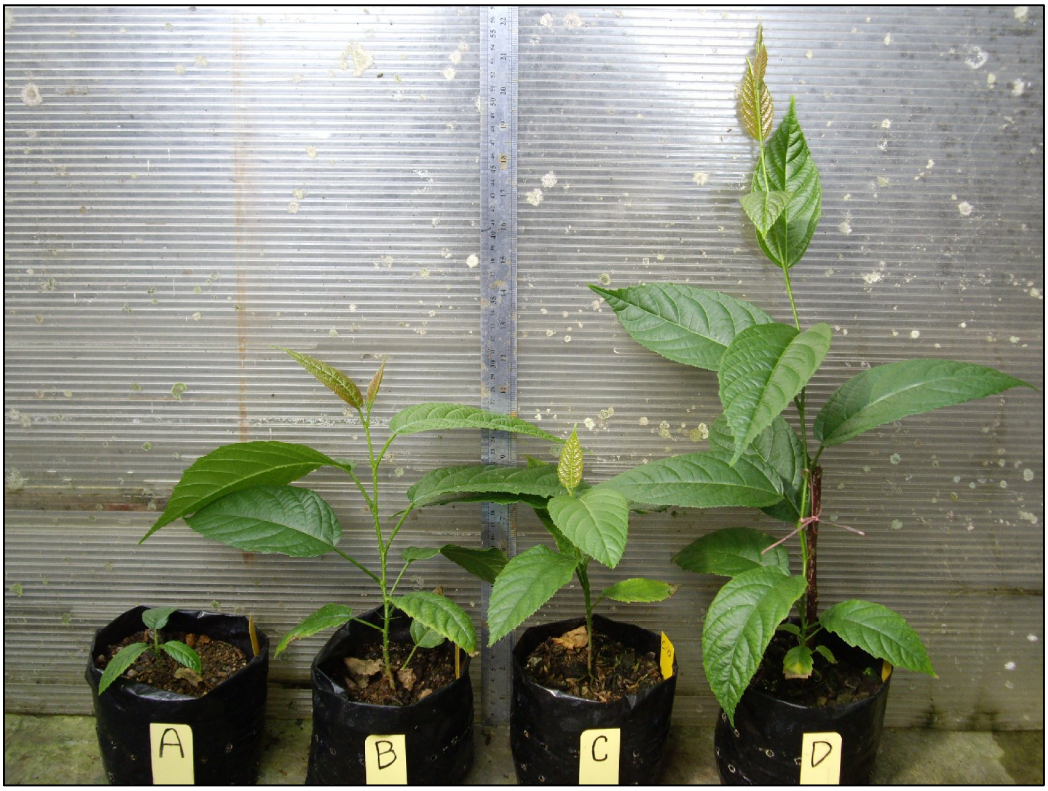

Figure 3. Effect of planting media on the growth of *Rubus pyrifolius* seedlings on 15 wap, A. sand + husk (2:1), B. sand + compost (1:1), C. compost + husk (1:1), D. compost

CONCLUSIONS AND SUGGESTIONS

The planting media had a significant effect on growth parameters of *R. pyrifolius* seedlings. However, the interaction between the types of media and compound fertilizer did not significantly affect all the seedling growth parameters. Compost was the best medium to grow the seedling *R. pyrifolius*, even statistically it was not significant compared with sand + compost media. Furthermore, compound fertilizers significantly affected only on the number of leaves at the age of for weeks after planting.

ACKNOWLEDGEMENTS

The author would like to thank Cibodas Botanical Garden-Indonesian Institute of Sciences for financial support during the experiment.

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