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THE EFFECT OF GIBBERELLIN CONCENTRATION AND COMPOSITION OF MEDIA ON THE GROWTH OF KAWISTA

Aisyah Fatwa Sari, Lagiman, Ami Suryawati*
Agrotechnology Department, Faculty of Agriculture,
Universitas Pembangunan Nasional "Veteran" Yogyakarta
Jl. SWK 104 Condong Catur Yogyakarta, Indonesia
**Email: ami_suryawati@yahoo.com*

ABSTRACT

Kawista grew well at the coast of North Java Island. It was used for food, beverages, and traditional herbal. The problems were it needs longer time for germination and growth. Seed treatment with gibberellins could improve the time and percentages of germination. This research was carried out (1) to find out the best gibberellins concentration on germination of kawista, (2) to determine the best gibberellins concentration and media composition which gave the best growth of kawista. There were 2 experiments, first experiment had 4 levels of gibberellins (GA3) concentration: 0,50, 100 and 150 ppm. It was arranged in CRD with 5 replications. Second experiment had 2 factors, the gibberellin concentrations: 0,50, 100, 150 ppm and composition of media, soil+organic fertilizer: 1:1,1:2 and 2:1, respectively. It also was arranged in CRD. The results showed that 100 ppm of gibberellin concentration gave better time and percentage of germination than 0 ppm. Combination of soil+organic fertilizer 1:1 and 100ppm of Gibberellin gave the best growth of kawista.

KEYWORDS: gibberellins, kawista, media composition, germination

INTRODUCTION

Kawista was the exotic fruit from Indonesia. They grew well at North Java Island. The common name of Kawista was Indian woodapple or elephant apple, and kawis (Bali).They was used for food and beverages for gift and export.They can use for traditional herbal to cure stomach-ache and fever (Jones, 1992).

Kawista was entirely propagated by seeds. Propagated by seed had advantages,it had the strong and depth roots of kawista , but the problems, it needed more long time for germination and growth. The time required for germination of kawista took 1 month. Seed treatment with gibberellins could improve the time and percentages of germination (Anonim,2010).

Soaking Gibberelic acid solution on cucumber promoted germination (Nelson and Sharples 1980) and broke the seed dormancy (Masimbert and Muller 1976). Susanti (2007) reported that soaking guava seeds in gibberellins solution at 100 ppm for 24 hours gave the best germination and growth, i.e. germination percentages, dry root weight and dry shoot weight. Soaking gibberellins solution at 100 ppm had better capacity germination than 25 ppm on Carpinus caroliniana seeds (Brezloff and Pellet, 1979).

Kawista seed needed the media for germination. The media for germination of kawista seed commonly used were soil, sand and organic matter. They had to produce good results and be readily available (Sarif, 1993). Subbalihorti (1991) had reported that mixing a standard ratio of 1:1:1 of soil, sand and organic matter on Manilkara kauki L, gave the best germination and growth. Ratio of 1:1 of and organic matter for Manilkara kauki L, can also give the best growth i.e seedling height,leaves square,stem diameter, root dry weight and shoot dry weight.

The research was carried out (1))to find out the best gibberellins concentration on germination of kawista, (2) to determine the best gibberellins concentration and media composition which gave the best growth of kawista.

MATERIAL AND METHODS

This study was conducted at the Experiment Station of Agricultural Faculty of UPN "Veteran" Yogyakarta, in Wedomartani, Yogyakarta. Kawista fruits were collected from a single native tree in November 2010 at Pati Central of Java.

There were 2 experiments, The first experiment had 4 levels of gibberellins (GA3) concentration: 0,50, 100 and 150 ppm. It was arranged in CRD with 5 replications. The second experiment had 2 factors, the gibberellin concentrations: 0,50, 100, 150ppm and composition of media, soil+organic fertilizer: 1:1,1:2 and 2:1, respectively. It also was arranged in CRD.Data was subyected to analysis of variance 5% and Duncan test 5%.

Seeds in kawista fruit was separated and cleaned from their aril. Then they allowed to dry at room temperature for about 2 days. Seeds was soaked in Gibberellin solution for 24 hours, and placed at room temperature for 5 hours.

The first experiment was a germination test. Five replicated of 50 seeds from each treatments were planted on small polybag with sand-filled, allowed to germinate and grow for 1 month, and then all germination test parameters measured.

Second experiment was a growth test. The normal seedlings from experiment 1 were then removed from the sand and were planted on polybag with soil+organic fertilizer-filled, allowed to grow for 60 days and growth test parameters measured.

RESULTS

Germination test. Treatment with 100 ppm gibberellins solution gave better percentage of germination, 59.69% and T50, 24 days, than 0 ppm (Table 1.) Gibberellin was a hormone, it controlled to mobilize the endosperm for germination fase, to activate cambium and dormancy (Abidin,1990; Bewley and Black,1978). It promoted synthetis enzyme i.e amylase, prothease and lipase. The enzyme hydrolysed carbohydrate, protein and gave energy for developing embryo and seed germination, so gibberellins 100 ppm could increase percentage of germination and could decrease the time of germination. There were no significant effect of 50,100,and 150 ppm gibberellins concentration on percentage of germination and T50. So, 50 ppm gibberellins more efficient than 100 and 150 ppm.

Table 1. The percentage of germination (PG),Index Vigor(IV), Potential of Growth (PGr) and T_{50}

Giberellin Concentration	The average of			
	PG (%)	IV	PGr(%)	T_{50}(days)
0 ppm (K1)	47.63 b	1.75 a	59.18 a	27 a
50 ppm (K2)	55.90 ab	1.93 a	62.81 a	26 ab
100 ppm (K3)	59.69 a	2.02 a	67.47 a	24 b
150 ppm (K4)	52.94 ab	1,76 a	64.14 a	26 ab

Note : Mean in column followed by the same letters are not significantly different at 5% level Duncan test

There were interaction between gibberellins concentration and composition of media on plant height, root length, leaves square and dry weight plant on 60 days after transplanting. At composition of media 1:1, concentration gibberellins 100 ppm had better plant height than 0, 50, and 150 ppm on 60 days after transplanting (Table 2.). Gibberellin 100 ppm was optimal concentration for kawista plant growth. It could increase the percentage of germination,leaves square, plant dry weight, plant height and decreased the time for flowering of Geranium(Sanjaya and Kristiani ,1993). At high and low gibberellins concentration, they inhibited the plant growth.

It also at 100 ppm gibberellins concentration, the composition soil and organic fertilizer 1:1 had the best plant height. That composition had optimal nutrient for division and developing plant cell and produced the best plant height.

Table 3 showed that at 100 ppm gibberellins concentration, composition soil and organic fertilizer 1:1 had better root length than media composition 1:2. Media composition 1:1 had good soil structure so the root developed well. Organic fertilizer in high dose like as media composition 1:2 made media too moist and root become lacking oxygen and rots.

Table 2. Plant height on 60 days after transplanting (cm)

Giberellin Concentration	Plant Media Composition		
	Soil, organic fertilizer 1:1 (M1)	Soil, organic fertilizer 1:2 (M2)	Soil, organic fertilizer 2:1 (M3)
0 ppm (K1)	9.86 a R	9.09 b Q	8.45 b Q
50 ppm (K2)	10.64 a Q	10.07ab P	9.48 a P
100 ppm (K3)	12.94 a P	10.23 b P	9.28 c P
150 ppm (K4)	10.19 a QR	9.72 a PQ	9.57 a P

Note : Mean in column (P,Q,R) and row (a,b,c) followed by the same letters are not significantly different at 5% level Duncan test

At media composition 1:1, 100 ppm gibberellins concentration had the best root length. Gibberellin concentration 100 ppm was the optimal concentration, it increased root formatted and initiation process of root.

Table 3. Root length on 60 days after transplanting (cm)

Giberellin Concentration	Plant Media Composition		
	Soil, organic fertilizer 1:1 (M1)	Soil, organic fertilizer 1:2 (M2)	Soil, organic fertilizer 2:1 (M3)
0 ppm (K1)	21.23 a R	20.07 a Q	18.57 b R
50 ppm (K2)	24.40 a Q	23.03 b P	20.83 c Q
100 ppm (K3)	28.87 a P	24.10 b P	23.37 b P
150 ppm (K4)	23.37 a Q	20.80 b Q	20.23 b Q

Note : Mean in column (P,Q,R) and row (a,b,c) followed by the same letters are not significantly different at 5% level Duncan test

The leaves square depended on plant height and root length (Sarief,1993). Gibberellins concentration 100 ppm and media composition 1:1 had the best plant height and root length, so it also had the best leaves square (Table 4.)

Table 4. Leaves square on 60 days after transplanting (cm^2)

Giberellin Concentration	Plant Media Composition		
	Soil, organic fertilizer 1:1 (M1)	Soil, organic fertilizer 1:2 (M2)	Soil, organic fertilizer 2:1 (M3)
0 ppm (K1)	29.22 a R	28.41 a Q	25.12 b R
50 ppm (K2)	32.35 a Q	31.72 a P	28.09 b Q
100 ppm (K3)	35.92 a P	32.46 b P	30.07 b P
150 ppm (K4)	31.83 a Q	31.96 a P	28.81 b PQ

Note : Mean in column (P,Q,R) and row (a,b,c) followed by the same letters are not significantly different at 5% level Duncan test

There was no interaction between gibberellins concentration and media composition on stem diameters (Table 5.). The 100 ppm gibberellins concentration gave the best stem diameters. Its was optimal concentration which promoted the plant growth well and produced the best stem diameters. Sumiaty (1989) reported that the optimal concentration gibberellins could increase the plant growth of Curd Brocolli. The composition soil and organic fertilizer 1:1 also gave best stem diameter, becaused of

their nutrient and their media structure promoted the plant growth and the stem developed.

Table 5. Stem diameters on 60 days after transplanting (cm)

Giberellin Concentration	Plant Media Composition			
	Soil, organic fertilizer 1:1 (M1)	Soil, organic fertilizer 1:2 (M2)	Soil, organic fertilizer 2:1 (M3)	Means
0 ppm (K1)	0.3233	0.3033	0.2867	0.3044b
50 ppm (K2)	0.3300	0.3100	0.2967	0.3122b
100 ppm (K3)	0.3633	0.3233	0.3033	0.3300a
150 ppm (K4)	0.3233	0.3100	0.3000	0.3111b
Means	0.3350P	0.3117Q	0.2967R	

Note : Mean in column (P,Q,R) and row (a,b,c) followed by the same letters are not significantly different at 5% level Duncan test

In general, as plant height, root length and leaves square increased, the plant dry weight tended to increase. At 100 ppm gibberellin concentration, the media composition 1:1 gave better plant dry weight than media composition 2:1. In composition soil and organic fertilizer 2:1, it was lack of nutrient, so it decreased fotosynthesis, plantgrowth and plant dry weight. At media composition 1:1, gibberellins concentration 100 ppm had better plant dry weight than 0,50 and 150 ppm. Gibberellin, in low and high concentration could not be applied by plant well, so they could not promoted plant growth and produced plant dry weight well.

Table 6. Plant dry weight on 60 days after transplanting (g)

Giberellin Concentration	Plant Media Composition		
	Soil, organic fertilizer 1:1 (M1)	Soil, organic fertilizer 1:2 (M2)	Soil, organic fertilizer 2:1 (M3)
0 ppm (K1)	0.417 a Q	0.357 ab Q	0.283 b Q
50 ppm (K2)	0.463 a Q	0.437 a PQ	0.330 b PQ
100 ppm (K3)	0.657 a P	0.450 b P	0.393 b P
150 ppm (K4)	0.437 a Q	0.433 a PQ	0.343 b PQ

Note : Mean in column (P,Q,R) and row (a,b,c) followed by the same letters are not significantly different at 5% level Duncan test

CONCLUSIONS

Gibberellin concentration 100 ppm gave better time and percentage of kawista seed germination than 0 ppm. Combination between composition of media 1:1 and concentration gibberellins 100 ppm had better kawista plant growth on 60 days after transplanting.

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