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EFFECT OF BENZYL AMINOPURINE AND KINETIN HORMONES ON VEGETATIVE AND REPRODUCTIVE GROWTH OF TWO SRI LANKAN TRADITIONAL RICE VARIETIES (*Oryza Sativa* L.); SUWADAL AND KAHATA WEE

Dahanayake Nilanthi*, KPI Inoka and DMP Dissanayaka
Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka.Mapalana
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ABSTRACT

The study was carried out as a pot experiment in the green house condition to observe the effect of BAP and Kinetin on the growth and yield performances of Sri Lankan traditional Rice varieties (Oryza sativa L) Suwadal and Kahata wee. At the time of applying fertilizer applications to the plants, each pot was treated by 200 ml of BAP and Kinetin in different concentrations (0, 0.1, 0.3, 0.5 and 0.8 mgL-1) separately. Each pot was treated by one hormone; BAP or Kinetin throughout the experiment was over. Plant height in vegetative stage, number of tillers plant-1, number of panicles plant-1, number of seeds panicle-1 and weight of thousand seeds were measured. The experiment was conducted in a Complete Randomized Design (CRD) with 3 replications. The best vegetative growth and yield performances were observed in 0.3 mgL-1 BAP and 0.8 mgL-1 Kinetin in traditional rice varieties Kahata wee and Suwadal. The effect of BAP and Kinetin for two rice varieties was simillar in plant growth and development. Number of tillers plant-1 and thousand grain weight significantly increased in both varieties with hormones BAP or Kinetin whereas number of tillers plant-1 increased by 10-17% compared to control. Therefore it is possible; BAP or Kinetin (cytokinin) extracting plants could be integrated into rice ecosystem for better productivity.
Key words;; Suwadal , Kahata wee, BAP, Kinetin

INTRODUCTION

Rice (*Oryza sativa* L., Poaceae) is a major staple food in the tropics (Ogutu *et al,* 2012). It is the most important crop occupying 34% (0.77 / million ha) of the total cultivated area in Sri Lanka. Sri Lanka currently produces 2.7 million tons of rough rice annually and satisfies around 95% of the domestic requirement (Department of Agriculture, 2006). Rice production can be increased through the large-scale adoption of modern high-yielding rice varieties and improved cultural practices.

There are several traditional rice varieties in Sri Lanka and Traditional varieties could withstand the adverse varieties could withstand the adverse weather conditions such as drought, heavy rainfall or floods and improves the soil Phosphorous (P), Potassium (K) and organic matter and some physical properties. Even though, new improved paddy varieties are with short life time and high yielding when compared to traditional rice plants (Chatura Rodrigo, 2013). The traditional varieties could be kept in seedlings nurseries for as long as three month while the new varieties don't last longer than four weeks. Therefore in a case of drought, heavy rainfall, or floods, the traditional varieties are capable of surviving in the nursery until the field conditions are favorable for planting. Traditional varieties are tall with a strong stem compared to the new improved varieties. This factor helps traditional varieties to withstand heavy rains, winds, and droughts with heavy evaporations. Furthermore, even if the stem bends during heavy winds, rains, and floods, the plant still has a higher probability of survival. Seeds of traditional varieties are also more vigorous. The shell of the seed can withstand water logging and drought conditions. Therefore, overall, traditional varieties have been found to be better suited for changes in climate such as heavy rains, floods, winds, and droughts (Rathnabharathi, 2009).

A plant growth regulator is defined as organic substance produced naturally in the higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts (Thinmann, 1934). Same plant growth regulator be active
in a different way in different stage of the same crop. There are five major classes of plant hor-

*Corresponding author: nilanthi@agbio.ruh.ac.lk

mones. They are auxin, cytokines, gibberellins, abscisic acid and ethylene. Kinetine and 6-benzyloaminopurine (BAP) are two synthetic Cytokinins. Among the plant growth regulators Cytokinins proved to stimulate cell division, induce shoot formation and axillary shoot proliferation and to retard root formation. Cytokinines have been reported to induce the development of axillary buds and adventitious buds through breaking apical dominance (Taji *et al*, 1995). The quantitative and qualitative responses of plants to different Cytokinines, such as kinetin (Kin) and Benzyl AminoPurine (BAP) may differ considerably (Muhammad I and Muhammad A, 2005). Therefore the objectives of this study were to evaluate the growth and yield performances of Suwadal and Kahatawee varieties at different concentrations of Kinetin and BAP.

MATERIALS AND METHODS

Experimental location

Study was conducted at Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya. Sri Lanka is located in the low country wet zone (WL_2) where the annual rainfall is >1900 mm. The mean monthly temperature is 27.5°C and relative humidity is around 72%.

Suwadal and Kahatawee seeds were obtained by Department of Agriculture. Pots (0.5x0.5x0.5 ft^3) were filled with paddy soil After 14 days of nursery period; both healthy same size 2 seedlings (7cm) were transplanted in the pots.

The amount of fertilizers added to pots based on the recommendation of agriculture department. A 200ml of BAP and Kinetin of different concentrations (T1-0 mgL^{-1} T2-0.1mgL^{-1}, T3-0.3$mgL^{-1,}$ T4 0.5-mgL^{-1} T5- 0.8gL^{-1}) were added separately to each pot at the time of fertilizer application. Each treatment was replicated three times.

Shoot length was measured in vegetative stage and After 3 month paddy plants were in reproductive stage. In that time, number of panicles $plant^{-1}$, number of tillers $plant^{-1}$ was measured. After harvesting number of seeds $panical^{-1}$, thousand seed weight were measured.

Statistical analysis was carried out using the SAS program (9.1.3) and the mean separation was done by Duncan's multiple range tests.

RESULTS AND DISCUSSION

The data in the Table 1 indicated all observed parameters in 0.3, 0.5, 0.8mgl^{-1} BAP treatments were not significantly different. Highest mean number of tillers $plant^{-1}$ (3.5), number of panicles $plant^{-1}$ (3.5), number of seeds $panicle^{-1}$ (372,6) and thousand grain weights (12.8g)

Table 1: Effect of BAP on vegetative and reproductive growth of Kahata wee

BAP Concentration mgL^{-1}	No. of tillers $plant^{-1}$	No. of panicles $plant^{-1}$	No. of seeds $panicle^{-1}$	1000 grain weight (g)	Plant height (cm)
0.0	1.32 b	1.32 b	172.8 c	09.14 c	85.0 a
0.1	2.2 b	2.2 b	224.5 bc	12.1 b	76.3 a
0.3	3.5 a	3.5 a	372. 6 a	12.8 a	92.5 a
0.5	2.9 ab	2.9 ab	291.5 ab	12.6 ab	87.5 a
0.8	2.8 ab	2.8 ab	255.5 ab	12.6 ab	87.5 a
CV %	16.3	16.3	32.64	2.82	14.84

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test

The data in the Table 2 indicated number of tillers $plant^{-1}$, number of panicles $plant^{-1}$ and thousand grain weights were not significantly different in 0.3, 0.5 and 0.8mgL^{-1} BAP treated Suwadal rice plants. 0.3mgL^{-1} BAP treated Suwadal were showed highest mean value for the all observed parameters; number of tillers $plant^{-1}$ (2.5), number of panicles $plant^{-1}$ (2.5), number of seeds panicle-^{1} (260.8) and thousand grain weights (13.8). The effect of BAP on vegetative and reproductive growth parameters of two varieties; Suwadal and

and Kahata wee was similar.

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05).

Table 2: Effect of BAP on vegetative and reproductive growth of Suwadal.

BAP Concentration mgL $^{-1}$	No. of tillers plant^{-1}	No. of panicles plant^{-1}	No. of seeds panicle^{-1}	1000 grain weight (g)	Plant height (cm)
0.0	1.2 b	1.2 b	98.0 b	09.7 b	87.5 a
0.1	1.5 b	1.5 b	141.5 ab	11.9 b	72.3 a
0.3	2.5 a	2.5 a	260.8 a	13.8 a	95.0 a
0.5	1.9 ab	1.9 ab	144.5 ab	11.6 b	83.8 a
0.8	1.8 ab	1.8 ab	155.8 ab	12.3 ab	72.5 a
CV %	30.8	30.8	37.83	3.84	13.4

Table 3: Effect of Kinetin on vegetative and reproductive growth of Kahata wee.

Kinetin Concentration mgL^{-1}	No. of tillers plant^{-1}	No. of panicles plant^{-1}	No. of seeds panicle^{-1}	1000 grain weight (g)	Plant height (cm)
0.0	1.2 b	1.2 b	0 98.3 c	09.8 c	81.2 a
0.1	1.5 b	1.5 b	136.3 bc	11.8 bc	91.2 a
0.3	2.8 a	2.8 a	240.0 ab	12.5 ab	87.5 a
0.5	2.9 a	2.9 a	241.3 ab	12.6 ab	91.2 a
0.8	3.0 a	3.0 a	275.8 a	13.3 a	97.5 a
CV %	32.03	32.03	26.28	4.79	12.39

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (p=0.05).

Table 4: Effect of Kinetin on vegetative and reproductive growth of Suwadal.

Kinetin Concentration mgL^{-1}	No. of tillers plant^{-1}	No. of panicles plant^{-1}	No. of seeds panicle^{-1}	1000 grain weight (g)	Plant height (cm)
0.0	1.2 b	1.2 b	108.3 c	09.0 c	87.5 a
0.1	1.5 b	1.5 b	139.0 bc	11.8 bc	80.0 a
0.3	2.5 a	2.5 a	239.7 ab	12.4 ab	92.5 a
0.5	2.6 a	2.6 a	240.8 ab	12.5 ab	73.6 a
0.8	2.7 a	2.7 a	261.3 a	13.5 a	96.3 a
CV %	31.86	31.86	32.92	4.89	11.65

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05).Values in same column with same letter denoted non- significant difference

The data in Table 3 and 4 revealed that plant height in vegetative stage of Kahata wee and Suwadal were not significantly different from control and kinetin treatments. However maximum mean numbers of seeds in a panicle (275.8 and 261.3) were observed from 0.8mgl $^{-1}$ kinetin treated Kahata wee and Suwadal. The data in the Table 3 and 4 indicated that 0.8mgL^{-1} Kinetin treated both rice varieties was showed highest mean value for number of tillers plant^{-1}, number of panicles plant^{-1} and thousand grain weights. But there were not significantly different among 0.8, 0.3, 0.5, mgL^{-1} Kinetin. Lowest mean numbers of tillers plant^{-1} (1.2, 1.2), number of panicles plant^{-1} (1.2, 1.2), number of seeds panicle^{-1} (105.3, 108.3) were observed from control in both varieties Kahata wee and Suwadal respectively.

According to the data the highest no of seeds/ panicles were observed in 0.3 mgl^{-1} BAP treatment in Kahata wee. In both varieties the best performance of yield components was observed in 0.3mgL^{-1} BAP and 0.8 mgL^{-1} kinetin. As reported by, Thomas *et al*. (1975) demonstrated that BAP is more active than any other Cytokinins in germination, as well

as in breaking the dormancy of celery and lettuce seeds.

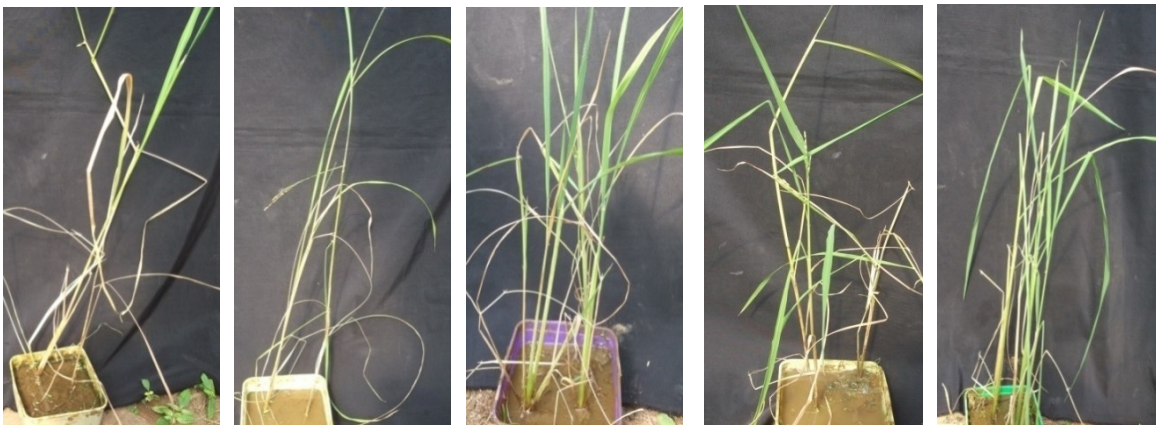

Figure 1: Effect of BAP on Kahata rice plants (a) control (b) 0.1 (c) 0.3 (d) 0.5 (e) 0.8 mg/l BAP treated Kahata rice plants

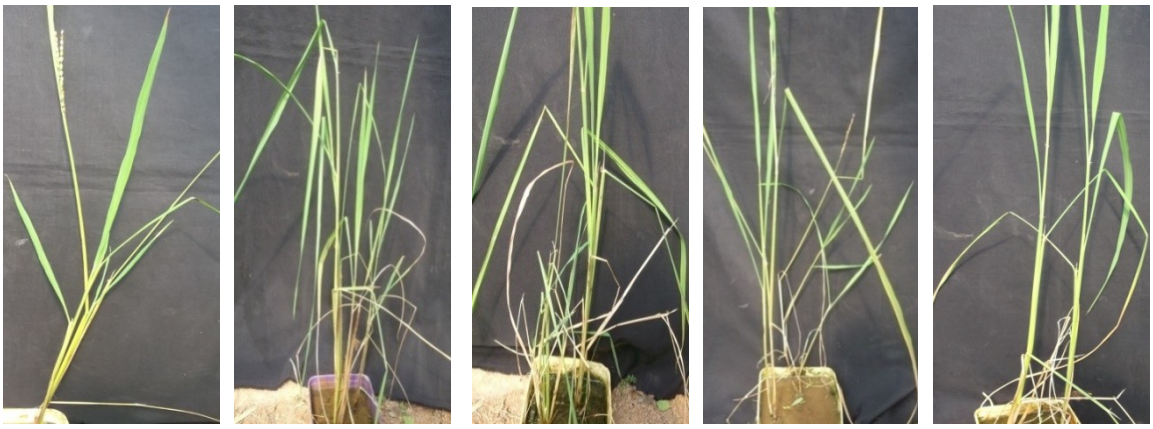

Figure 2: Effect of BAP on Suwedal rice plants (a) control (b) 0.1 (c) 0.3 (d) 0.5 (e) 0.8 mg/l BAP treated Suwadal rice plants

Figure 3: Effect of Kinetin on Kahata rice plants (a) control (b) 0.1 (c) 0.3 (d) 0.5 (e) 0.8 mg/l kinetin treated Kahata rice plants

Figure 4: Effect of Kinetin on Suwadal rice plants (a) control (b) 0.1 (c) 0.3 (d) 0.5 (e) 0.8 mg/l kinetin treated Suwadal rice plants.

CONCLUSION

The best vegetative growth and yield parameters of traditional rice varieties Kahata wee and Suwadal were observed in $0.3mgl^{-1}$ and $0.8mgl^{-1}$. BAP or Kinetin hormone concentrations did not significantly affect for the height of the selected rice plants.

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