e-ISSN 2795-3276
p-ISSN 2795-3270

10.5281/zenodo.12665434 Vol. 07 Issue 05 May - 2024 Manuscript ID: #01441

The Effect of Seed-Soaking in Cytokinin on the Vegetative Growth of White-Seed Melon (*Cucumeropsis mannii* Naudin)

[1]Chigozirim Uzoma-Nwachukwu, [2]K.A. Kpekot, [3]V. Wilson & [4]E.T. Jaja

[1]Plant Physiology, Department of Plant Science and Biotechnology, Rivers State University Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

[2,3,4]Department of Plant Science and Biotechnology, Rivers State University Nkpolu- Oroworukwo, Port Harcourt, Nigeria.

Corresponding author: jaja.emylia@ust.edu.ng

Abstract:

The study was conducted to investigate the effect of Cytokinin (6-Benzyl-aminopurine); BAP at two concentrations on the growth of *Cucumeropsis mannii* and was conducted at the Screen house of the Department of Plant Science and Biotechnology, Rivers State University, Port-Harcourt, Nigeria. *Cucumeropsis mannii* is a species of melon native to tropical West, Central and East Africa and cultivated widely in a number of countries including Nigeria, Benin republic and Cameroon primarily for its 'leaves' rich in nutrients and are of high medicinal value, which are consumed as vegetables in some parts of Benin republic and in some Eastern parts of Nigeria and for its white, flat and smooth seeds called 'Egusi-itoo' which serves as food and as a source of oil. Viable seeds of C*ucumeropsis mannii* sterilized in 70% ethanol solution were presoaked in 50ppm and 100ppm concentrations each of BAP for four hours. Data collection was done at an interval of two weeks. The collected data; plant height, number of leaves per plant, leaf area, internode length, fresh weight, dry weight and chlorophyll content were subjected to analysis of variance and tested for significance at 5% level of significance. BAP was effective on enhancing growth as the highest mean number of leaves (11.6), mean leaf area (73.5cm^2), mean internode length (5.1cm), mean fresh weight (17.0g), mean dry weight (2.6g) and mean chlorophyll content (35.7spad) was recorded with the use of 50ppm BAP while the highest mean plant height (43.3cm) was recorded in the control. The study established that improvement of vegetative growth of *Cucumeropsis mannii* which entails availability of healthy green leaves for consumption as vegetables, and for medicinal use, as well as the possibility of improving fruit and seed quality is achievable with the use of 50ppm BAP.

Keywords:

Cucumeropsis mannii, C. mannii, Cytokinin; 6-Benzyl-aminopurine, BAP, growth parameters.

INTRODUCTION

Cucumeropsis mannii Naudin with common name; 'white-seed melon', locally called 'Wonta' and 'Ahumbele' in Ikwerre and Etche speaking parts in Southern Nigeria belongs to the family *Cucurbitaceae* and is an excellent protein-containing vegetable grown for its nutrient rich 'leaves' that are consumed as vegetables. The leaves are of high medicinal value and its white seeds often referred to as 'Egusi-itoo' serves as food and a good source of natural antioxidants such as vitamin E and B-carotene as it consists of 44% oil and 30% protein and is rich in essential amino acids. Young leaves of *Cucumeropsis mannii* have been reportedly used as leafy vegetable in some areas in Eastern Nigeria (Okoli,1984). In French Guiana, the leaves were used as additive by Waya˜pi community during ''roucou paste'' cooking (Grenand and Pre´vost, 1994). In Gabon, the leaves are macerated and used as a laxative in constipated suckling babies (Egunjobi and Adebisi 2004). *Cucumeropsis mannii* is a good source of Potassium, Magnesium, Phosphorous, Iron, Zinc, Calcium and Minerals that regulate blood pressure.

The use of plant growth regulators (PGRs) can be dated back to the 1930s, as they have been used to improve productivity in higher plants (Piotrowska *et al.*, 2008). Cytokinin has been linked to improvement of seed germination, regulation of shoot meristem size, growth potential (pluripotency) of shoot apical meristems, stimulates cell division and elongation (Krug *et al.*, 2006) as well as leaf and shoot growth. The role of cytokinin in increasing photosynthetic capacity has been reported (Ookawa *et al.*, 2004; Song *et al.*, 2013). Cytokinin has been reported to increase tetrapyrrole biosynthesis as well as chlorophyll concentrations in plants (Yaronskaya *et al.*, 2006). This study seeks to highlight the effect of Cytokinin (6-Benzyl- aminopurine); BAP applied at two concentrations on the vegetative growth of *Cucumeropsis mannii.*

MATERIALS AND METHODS

The experiment was conducted in the Screen house, Department of Plant science and Biotechnology, Rivers State University. Seeds of *C. mannii* with 90% germination rate were soaked in 70% ethanol for 5 minutes to remove debris and impurities. The ethanol was washed off by rinsing three times with sterile distilled water at intervals of 10 minutes. The seeds were prepared for treatment application which involved the use of BAP at different concentrations; 50 and 100ppm and a control treatment which involved the use of distilled water only.

The treated seeds were planted at the rate of 3 seeds in each of the perforated nursery bags, containing 3kg loamy soil obtained from the, Rivers State University Research farm which was tested for pH level, electrolytes and presence of nutrients. The experiment was laid out in a Completely Randomized Design with four replicates and three treatments. Controlled watering commenced with 70ml of water 24hrs after planting and was subsequently done at an interval of 2 days to avoid water logging. Growth parameters were measured at an interval of two weeks.

Growth parameters such as plant height, number of leaves, leaf area, internode length, fresh weight, dry weight and chlorophyll content were determined. All data collected were subjected to Analysis of variance (ANOVA) as proposed by Wahua (1999) and tested for significance at 1% and 5% level of significance. Treatment means were separated using the Fisher's Least Significant Difference (LSD) at 5% probability where the F-test was significant.

RESULTS

Plant Height: As shown in Fig. 1, the highest plant height for *C. mannii* was recorded with the control treatment. However, 50 ppm BAP performed better than 100ppm.

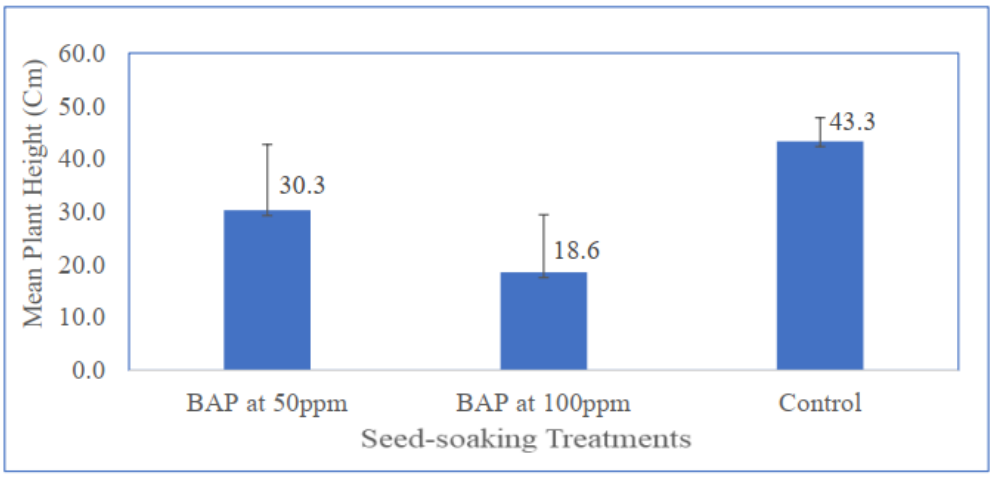

Fig.1: The Effect of Cytokinin Seed-soaking Treatment at Two Concentrations on the Plant Height of *Cucumeropsis mannii* at Eight Weeks After Planting.

Number of Leaves: As shown in Fig. 2 below, the highest number of leaves for *C. mannii* was recorded with the use of 50ppm BAP, with the least effect recorded with the use of 100ppm BAP.

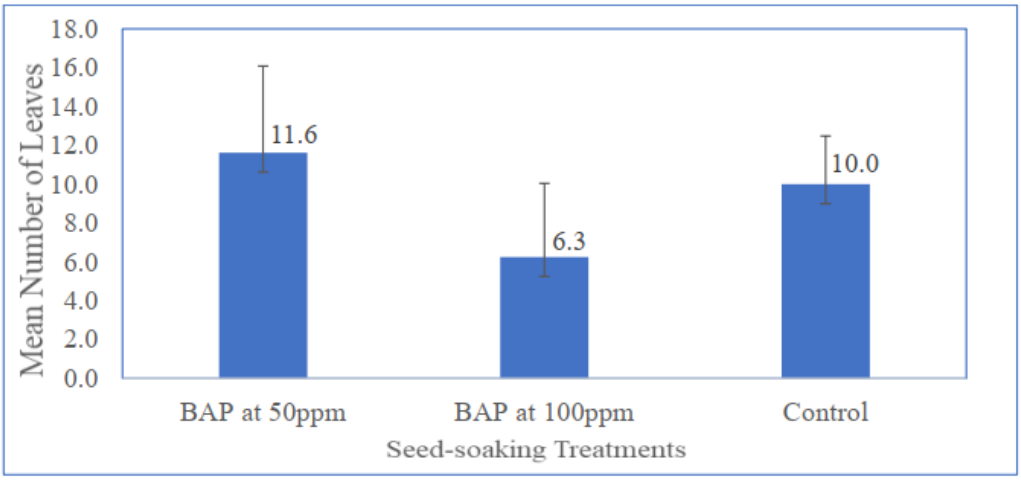

Fig.2: The Effect of Cytokinin Seed-soaking Treatment at Two Concentrations on the Number of Leaves of *Cucumeropsis mannii* at Eight Weeks After Planting.

Leaf Area: Increase in leaf area of *C. mannii* was recorded with the use of BAP at 50ppm as shown in Figure 3. BAP at 100ppm was the least effective.

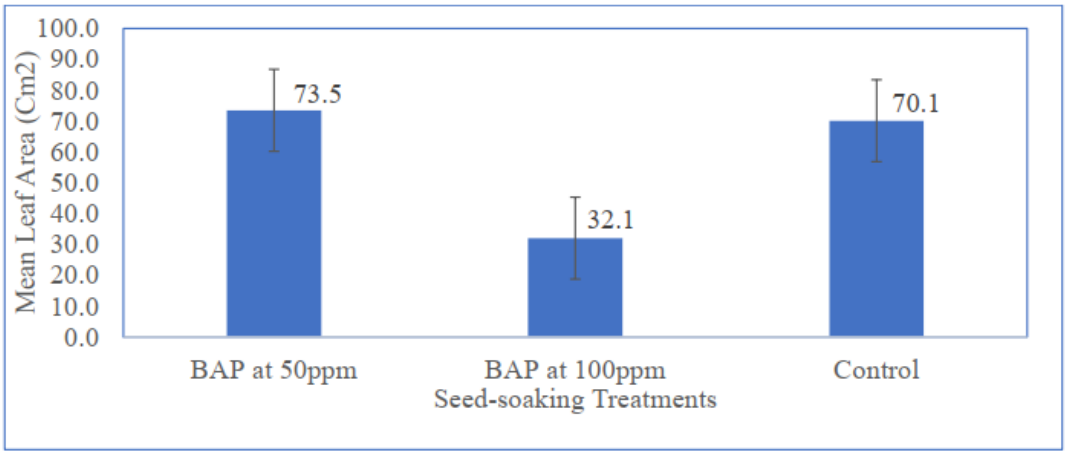

Fig.3: The Effect of Cytokinin Seed-soaking Treatment at Two Concentrations on the Leaf Area of *Cucumeropsis mannii* at Eight Weeks After Planting.

Internode Length: The highest internode length of *C. mannii* was recorded with the use of 50ppm BAP as shown in Fig. 4.

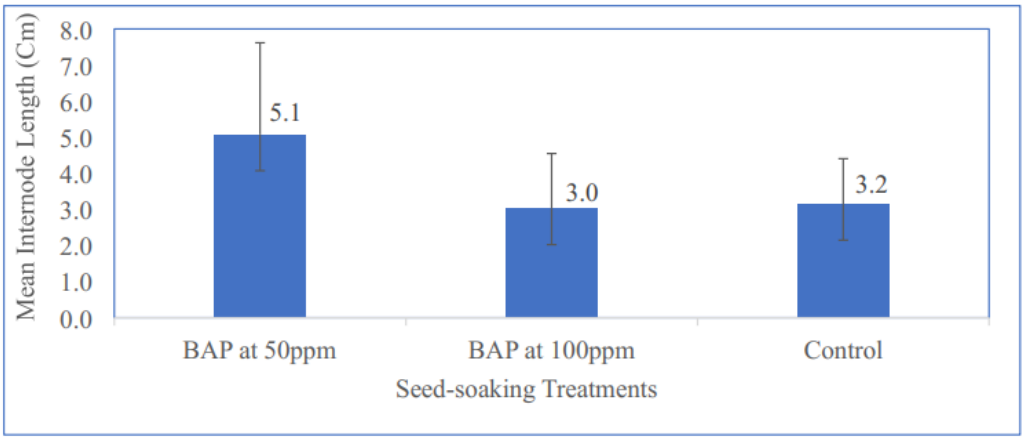

Fig.4: The Effect of Cytokinin Seed-soaking Treatment at Two Concentrations on the Internode Length of *Cucumeropsis mannii* at Eight Weeks After Planting.

There were no significant differences recorded for plant height, number of leaves, leaf area and internode length of *C. mannii* in this study as seen below in Table 1.

Table 1: Analysis of Variance for Growth Parameters at Eight Weeks After Planting.

Growth Parameter	Plant Height	Number of Leaves	Leaf Area	Internode Length	F critical (f 0.05 2,9)	F critical (f 0.01 2,9)
F- CAL	1.57^{NS}	0.25^{NS}	0.68^{NS}	0.29^{NS}		8.02
			4.26			

^{NS}: Non-significant.

Fresh Weight: BAP at both concentrations respectively attributed to an increase in fresh weight of *C. mannii* with the control being the least effective. BAP at 50ppm particularly, was the most effective followed by BAP at 100ppm with the control being the least effective as shown in Table 2.

Table 2.: Effect of BAP Seed-Soaking Treatment at Two Concentrations on The Fresh Weight of *Cucumeropsis mannii* at Eight Weeks After Planting.

Seed-soaking treatments	Mean (G) ± S.E.M
BAP at 50ppm	17.0 ±0.01
BAP at 100ppm	5.4 ±0.00
Control	2.5 ±0.10

Dry Weight: With reference to dry weight, Table 3 below shows that amongst all the treatments, 50ppm BAP had the best influence on dry weight of *C. mannii* with the control treatment being the least effective.

Table 3.: Effect of BAP Seed-Soaking Treatment at Two Concentrations on The Dry Weight of *Cucumeropsis mannii* at Eight Weeks After Planting.

Seed-soaking treatments	Mean (G) ± S.E.M.
BAP at 50ppm	2.6 ±0.02
BAP at 100ppm	0.5 ±0.00
Control	0.3±0.02

Chlorophyll Content: An increase in chlorophyll content of *C. mannii* was recorded with the use of the 50ppm GA3 with the control treatment being the least effective as seen in Table 4 below.

Table 4.: Effect of BAP Seed-Soaking Treatment at Two Concentrations on The Chlorophyll Content of *Cucumeropsis mannii* at Eight Weeks After Planting.

Seed-soaking treatments	Mean (SPAD)± S.E.M.
BAP at 50ppm	35.7 ±0.10
BAP at 100ppm	33.2 ±0.00
Control	2.6±0.13

There were significant differences recorded for Fresh weight, Dry weight and Chlorophyl content of *C. mannii* in this study as seen below in Table 5.

Table 5: Analysis of Variance for Growth Parameters at Eight Weeks After Planting.

Growth Parameter	Fresh Weight	Dry Weight	Chlorophyll Content	F critical (f 0.05 3,2)	F critical (f 0.01 3,2)
F-CAL	4360.0**	1083.3**	985.0**	9.55	30.89
LSD	0.52	0.17	1.32		

**: Highly significant.

DISCUSSION

The highest plant height for *C. mannii* was recorded with the control treatment. However, BAP at 50ppm was more impactful than 100ppm at increasing plant height of *C. mannii*. Findings from this research is in line with Krug *et al.* (2006) on the application of BAP which stimulates cell division and elongation. There were no significant differences in the effect of the treatments on the plant height of *C. mannii* in this study as seen in Table 1.

The highest number of leaves for *C. mannii* was recorded with the use of 50ppm BAP which is in line with a report by Di Benedetto *et al.* (2013; 2015) on the effect of sprayed cytokinin (BAP) on rooted cuttings of *Epipremnum aureum,* which recorded higher rates of leaf appearance. There were no significant differences in the effect of the implored treatments on the number of leaves of *C. mannii* in this study as shown in Table 1.

Increase in leaf area of *C. mannii* was recorded with the use of BAP at 50ppm, which explains that BAP at 50ppm supports spontaneous in leaf size compared to the control, thus maintaining availability of the leaves *of C. mannii* for consumption as vegetables and for medicinal use. Reports by Di Benedetto *et al*. (2013; 2015) on the effect of foliar application of 6-Benzyl-aminopurine to rooted cuttings of *Epipremnum aureum,* indicated an increase in leaf area, which is in line with findings in this study. There were no significant differences in the effect of the implored treatments on the leaf area of *C. mannii* in this study as shown in Table 1.

The highest internode length of *C. mannii* was recorded with the use of 50ppm BAP. This is in line with Krug *et al.* (2006) on the application of BAP which stimulates cell division and elongation. There were no significant differences in the effect of the treatments on the internode length of *C. mannii* in this study as shown in Table 1.

BAP at both concentrations respectively attributed to an increase in fresh weight of *C. mannii* with the control being the least effective. BAP at 50ppm particularly, was the most effective followed by BAP at 100ppm with the control being the least effective. Findings from this study is in line with Nurunnaher *et al.* (2014) who reported an increase in fresh weight of plants with the use of plant growth hormones particularly, Cytokinin. There were significant differences in the effect of the treatments on fresh weight of *C. mannii* in this study as shown in Table 5.

Amongst all the treatments, 50ppm BAP had the best influence on dry weight of *C. mannii* with the control treatment being the least effective. Findings from this study is in line with Nurunnaher *et al.* (2014) who reported an increase in dry weight of plants with the use of plant growth hormones, particularly Cytokinin. Table 5 shows that there were significant differences in the effect of the treatments on dry weight of *C. mannii* in this study.

An increase in chlorophyll content of *C. mannii* was recorded with the use of the 50ppm GA3 with the control treatment being the least effective. The greener the leaf, the healthier it is for human consumption as it is an indicator that a leaf contains substantial level of Magnesium which is a key factor in maintaining a high haemoglobin level in humans. Greater chlorophyll content leads to greater biomass production in the plant (Talebzadeh and Valeo, 2022), which affects quality of fruits and seeds. Findings in this study is in line with a report by Nurunnaher *et al.* (2014), stating that Cytokinin increases chlorophyll content. Also, reports by llanes *et al*. (2011) on foliar application of plant growth hormones on soybean recorded an increase in chlorophyll content with the use of BAP and FAP treatments irrespective of the concentrations involved. There were significant differences in the effect of the treatments on chlorophyll content of *C. mannii* in this study as shown in Table 5.

CONCLUSION

Results obtained from this study showed that the effect of Cytokinin; BAP on growth in *C. mannii* was considerably impactful compared to the control. Particularly, application of 50ppm BAP was established as being appropriate at enhancing vegetative growth, as seen in presence of matured leaves for consumption, physical appearance of leaves, fresh weight, dry weight and chlorophyll content which is a determinant of fruit and seed quality.

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