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EFFECT OF BENZYL ADENINE ON THE VEGETATIVE AND ROOT GROWTH OF SEEDLINGS OF MYRTUS COMMUNIS L.: A REVIEW

Lanjah Mohammed Saeed AL-Dalwi
alaaalbakkar@uokirkuk.edu.iq

Alaa Hussien A.-Q. AL-Bakkar
akghm001@uokirkuk.edu.iq
University of Kirkuk - College of Agriculture
The Research is Extracted from a Master's thesis of the First Researcher

Abstract
The compound most commonly used today is Benzyl adenine (BA) due to its high efficacy, reliability, and relatively cheap price. This group also contains the compounds Kinetin (K), Topolin (T), and Pyranylbenzyladenine (PBA), and these compounds are considered synthetic cytokines because they are not found in high levels in most plants. And some of them (such as BA and PBA) is produced at high levels in some plants, so they are natural components (Van Staden and Crouch 1996). It also plays an important role in regulating plant cell division. Because it stimulates cell division and expansion, delays aging and stimulate early flowering (CareyJr., 2008), and controls the stem/root balance (Werner et al. 2003).Some studies have shown that the addition of synthetic cytokinins increases the activity of cytokinin-like compounds found in plant tissues and stimulates fruit growth, as in apples, pears, grapes, kiwis, and persimmons (Mousawinejad et al., 2014).

Keyword: Myrtus communis L., benzyl adenine, vegetative, seedlings, plant growth.

Introduction

Myrtus communis L. belongs to the family Myrtaceae of Asia, comprising 130-140 genera and about 3000 - 4000 species (Qader et al., 2017), the myrtle is generally a well-defined family of two subfamilies comprising 17 tribes, cultivated all over the world and native to Mediterranean (Jamshidi-Kia et al., 2018; Govaerts et al., 2008), myrtle plants have several names in Arabic, including myrtle, basil, Mersin, Hamblas, Elias, and its English name is Myrtle, an evergreen shrub that grows in rocky and sandy valleys on High altitudes above sea level reaches 1400 m. It grows wild in Iraq and is cultivated in gardens. Myrtle is widely cultivated as an ornamental plant for use as a shrub in gardens and parks (Jabri et al., 2016; Zohalinezhad et al., 2016; Bouzabata et al., 2016). Qader et al., 2017), Myrtle is mowable, Myrtle propagates by cuttings, budding and tissue culture (Ibrahimabadi et al., 2016), Myrtle grows successfully in soils under hot and dry environments (Şan et al., 2015), Characterized by myrtle As an aromatic shrub, stem upright, plant height Myrtle up to 1.8-3 m, its leaves are small dark green glossy oval or shaft, overlapping, smooth, shiny, leaf edge smooth leather, flowers are star-like, white or pink, and the fruit is round blue-reddish

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to the violet berries in the shape of a pear, and the fruits are eaten fresh or dried and used as a spice for flavoring food, and its fruits contain several seeds, pollination is carried out by insects (Charles, 2013); Hajiaghaee et al., 2016; Flamini et al., 2004), this plant is an important source of active substances in the pharmaceutical and medical industries. Various parts of the fruits, branches, and leaves of the myrtle are used as medicine to treat various diseases, they are used as a blood antiseptic, a treatment for diarrhea and hemorrhoids, anti-bleeding and anti-diabetic in Blood, with emetic effects and hypolipidemic activities, is also used to treat peptic ulcers, headache, palpitations, hemorrhage, inflammation, anti-hemorrhagic, wound healing, skin diseases and respiratory diseases, and is used in folk medicine, and also as a sedative-hypnotic in medicine, containing Both leaves have high levels of total phenolic content, which is responsible for their antioxidant properties. It is a rich source of minerals, such as Ca, K, Mg, Na and P (Sumbul et al., 2011; Jabri et al., 2016; Alipor and Hosseinzadeh, 2014).Plant growth regulators are non-nutritive organic compounds with low concentrations of them that can affect the physiological state of the plant, and they are either natural (endogenous (produced inside the plant) or exogenous (added to the plant) and these compounds are used to improve vegetative qualities and productivity (Bhat). et al., 2011). Plant hormones have an effect in regulating growth processes (Xu and Li, 2006), and plant growth regulators are divided according to the nature of their physiological impact into growth promoters, including Auxin, Gibberellins, and Cytokinins, and they generally work to encourage or stimulate growth within physiological concentrations. Certain Growth Inhibitors such as Abscisic acid (Taiz and Zeiger, 2006), and Benzyl adenine BA are one of the cytokinins. It was found that the synthetic form of cytokinin is represented by the growth regulator Benzyl adenine (BA), which is more effective than natural cytokinins because it is characterized by a high degree of stability. (Al-Maraqi, 2005).

Lecturer Review:

Effect of Benzyl Adenine:

Cytokinins are a group of growth regulators, which are organic compounds whose molecules contain a nitrogenous base, and a purine base. They were called kinetins (Davies, 2004), which give different effects when added to healthy plants, as they stimulate protein synthesis in particular, and participate in controlling On the cell cycle, and perhaps this makes it affects the formation and puberty of chloroplasts and delays the aging of separate leaves, and adding cytokines to one of the plant members alone, for example on one leaf, makes this organ an effective sink for amino acids that then move to other organs surrounding this organ Also, the effect of cytokinins is often observed in tissue culture after adding them with auxins together to stimulate cell division and control the morphological formation. Other biological effects of cytokinins occur due to their inhibition of auxin oxidation IAA. The cell wall increases, and thus the swelling effort of the cells increases, so the water effort becomes less negative, and here it becomes less likely to absorb water from the surrounding

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environment. The physiology of cytokines is breaking the dormancy phase in seeds, stimulating cell division in the presence of auxin, working on cell expansion, increasing stem and root diameter, differentiation of roots and buds, development of plastids, flowering and sexual expression, and working on the development of fruits and seeds and delaying senescence. Leaves and that cytokinin affects the direction of transport of organic metabolites and minerals and collects them in cells and works to reduce the effectiveness of the apical dominance, and affects the formation of callus tissue and injured tissues by regulating the formation of vascular elements, and in mature tissues it stimulates the biosynthesis of chlorophyll Regulating the distribution of nutrients, opening stomata, and delaying aging. One of the most important cytokinin compounds is benzyl adenine, which is the most commonly used today because of its high efficacy, and This group also contains a compound (Kinetin K), (Topline T), and (Pyranylbenzyladenine PBA), and some of them, such as (BA and PBA) are produced in high levels in some plants, so they are natural components, and play an important role in regulating cell division. The plant, because it stimulates the process of cell division and its expansion, delays aging and stimulates early flowering, and controls the balance of branches/root, and despite the use of natural cytokines IP and zeatin in research, they are not used in commercial fields because of their expensiveness, so chemical compounds were manufactured Similar in effect to natural cytokinins (except for Kinetin), which have been shown to be highly effective (Carey Jr., 2013; George et al., 2008; Murthy, 1987; Van et al., 1996; Werner et al. 2003; Iwamura et al., 1980)

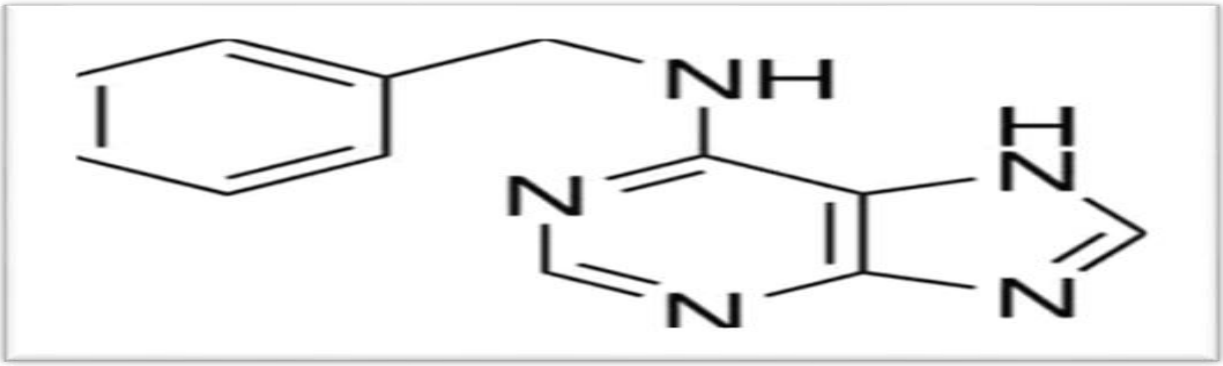

Figure (1) shows the chemical structure of benzyl adenine (Schmülling, 2004).

Effect of Benzyl Adenine on Vegetative Growth Characteristics:

Alwan (2010) concluded that the treatment of Rosa damascene plant with benzyl adenine at different concentrations (0, 50, 100, and 200 mg.l-1) where the concentrations 100 and 200 mg.l-1 led to a significant increase in plant height, length of branches and number of branches. Branches, number of leaves, chlorophyll content of leaves, and dry weight of shoots when compared with the control treatment.

Ibrahim et al. (2017) conducted a study to show the effect of spraying with benzyl adenine at a concentration of (0,1 mg.l-1) on the vegetative part of the myrtle plant, where the results showed that the treatment of spraying 1 mg.l-1 of BA was superior to

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the plant height and an increase in The number of branches, the length of the branches, the diameter of the plant stem, the wet weight of the green total, and the increase in the content of leaves from chlorophyll. Al-Hasnawi (2011) indicated in a study on the Daoudi plant, which was sprayed with three concentrations of benzyl adenine (0, 50, and 100 mg.l-1), spraying with benzyl adenine at a concentration of 50 $mg.l^{-1}$ significantly increased in all studied traits that gave the highest weight. The dry softness of shoots, stem diameter, protein, and phosphorous percentage in leaves in comparison with the control treatment.

SALEHI et al. (2014) found in a study on the latex plant Benjamin L. Ficus Benjamina L when using foliar spraying of benzyl adenine (BA) at different concentrations (0, 100, and 200 $mg.l^{-1}$) at a concentration of 200 $mg.l^{-1}$ was significantly superior in Plant height, length of branches, stem diameter, number of leaves, leaf area, chlorophyll in leaves when compared with the comparison treatment. Samani et al. (2014) concluded by using different concentrations of benzyl adenine (0, 4, 8 $mg.L^{-1}$) on enamel dendritic plant, at a concentration of 4 $mg.L^{-1}$ of BA gave the highest value for fresh weight, and at a concentration of 8 mg. L^{-1} of benzyl adenine led to a significant increase in plant height, wet and dry weight and an increase in the number of leaves when compared with the control treatment.

And Matter (2016) mentioned in the study on the plant Hibiscus sabdariffa L. when treated with two levels of benzyl adenine (0,100 $mg.L^{-1}$) when treated with 100 $mg.L^{-1}$ of BA, which gave the highest value in plant height, wet weight, Dry weight, number of leaves and the increase of chlorophyll, carbohydrates, nitrogen, phosphorous, potassium in the leaves compared to the control treatment.

Al-Atrakji (2008) confirmed in a study on Gerbera Jameson plants when using benzyl adenine at concentrations (0, 250, 500 $mg.l^{-1}$), the results obtained indicated that spraying plants with benzyl adenine at a concentration of 500 $mg.l^{-1}$ led to Significant increase in the number of branches, branch length, plant height, dry weight and chlorophyll content of leaves compared to the control treatment.

Rashid and Hamid (2019) mentioned that when BA was used at three concentrations (0, 100, 200 $mg.l^{-1}$) the concentration of 100 mg.l-1 of BA was superior in the average height increase of seedlings (27.48 cm), and at a concentration of 200 mg. l^{-1} was superior in the number of branches (3.72 bushes. Branch-1), stem diameter (4.88 mm), and dry weight, which differed significantly with most of the studied interactions.

In an experiment conducted on the Dawoodi plant by Gabrel et al. (2018) when using benzyl adenine foliar spray at four concentrations (0, 50, 100, 200 parts per million) on vegetative growth, the results showed that the use of benzyl adenine at a rate of 100-200 Parts per million led to significant increases in vegetative dry weight, and at 200 ppm it gave an increase in most of the studied traits when compared with the control treatment.

In their study, Abbas and Al-Abbasi (2013) reached to show the effect of five different concentrations of benzyl adenine (0, 10, 15, 20, 25 $mg.l^{-1}$) on the vegetative growth of

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Antirrhinum majus L. The study concluded that treatment with 20 And 25 mg.L^{-1} significantly affected plants such as plant height, stem diameter, number of branches, nitrogen, phosphorous, potassium, protein, chlorophyll, and carbohydrates content in leaves when compared with the control treatment.

El-Ghait et al. (2020) found in a study of foliar spraying of benzyl adenine on jasmine plant at four concentrations (0, 20, 40, 60 ppm) that showed the results obtained. The concentration of benzyl adenine at 60 ppm caused a significant increase in plant height and number of branches, and a significant increase in the leaf content of total carbohydrates, nitrogen, phosphorous, and potassium, respectively, while the comparison treatment gave the lowest average for most of the studied traits.

Effect of Benzyl Adenine on Root Growth Characteristics:

El-Ghait et al. (2020) indicated in a study of the foliar spraying of benzyl adenine on jasmine plant (Jasminum sambac et) at four concentrations (0, 20, 40, and 60 ppm). The results obtained showed that the concentration of benzyl adenine at 60 ppm was the reason for an increase in the fresh weight of the root system when compared with the control treatment.

Al-Atrakji (2008) noted in a study on gerbera plants when using benzyl adenine at concentrations of 250 and 500 mg.l-^{1}, the results obtained indicated that spraying plants with benzyl adenine at a concentration of 500 mg.l^{-1} led to a significant increase in plant root branches and root length. And the wet and dry weight of the total radical.

Al-Hasnawi (2011) indicated through a study on the Dawoodi plant, which was sprayed with three concentrations of benzyl adenine (0, 50, 100 mg.l^{-1}) significantly increased root length and root diameter significantly at a concentration of 100 mg.l- ^{1}, compared to the comparison treatment.

And Ehsan et al. (2014) concluded that when using different concentrations of benzyl adenine (0, 4, 8 mg.L-1) on the plant Mena shrub Lantana Camara L, the results indicated at a concentration of 4 mg.L-1 of BA that gave the highest weight value. Dry roots, and at a concentration of 8 mg.L-1 of BA, a significant increase in the number of roots was obtained when compared with the control treatment.

And Matter 2016)) mentioned in the study on the plant Hibiscus sabdariffa L. when treated with two levels of benzyl adenine (0,100 mg.L^{-1}), where it gave plants treated with BA at a concentration of 100 mg.L-1 the highest value in the number of roots.

In a study done by Ibrahim et al. (2017) to show the effect of spraying with benzyl adenine at a concentration (0,0 mg.L^{-1}) on the myrtle plant, where the results showed that the treatment of 1 mg.L^{-1} with benzyl adenine was superior to the growth of roots and increase the diameter of the roots Significantly on the comparison treatment.

In an experiment conducted on the Dawoodi plant by Gabrel et al. (2018) when using benzyl adenine for foliar spray at four concentrations (0, 50, 100, 200 ppm) on vegetative growth, the results showed that the use of benzyl adenine 200 ppm It resulted in a significant increase in the dry and wet weight of the rootstock.

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SALEHI et al. (2014) mentioned in a study on the rubber plant Benjamina. Ficus benjamina L when using foliar spraying of benzyl adenine with different concentrations (0, 100, 200 mg.L^{-1}) at a concentration of 200 mg.L-1 led to an increase in root growth and the root diameter compared to the comparison treatment.

It was shown by Samani et al. (2014) through the use of different concentrations of benzyl adenine (0, 4, 8 mg.l^{-1}) on enamel shrub plant *Lantana Camara* L, at a concentration of 8 mg.l-1 of benzyl adenine, which led to a significant increase in Plant root length and wet and dry weight of the root system when compared with the control treatment.

Conclusions:

The best results were obtained when spraying with the growth regulator benzyl adenine, which had a significant effect in improving most of the vegetative and root characteristics and its production, such as hedge plants, as the plants height, stem diameter, branch length, and the increase in the soft weight of the vegetative and root system, and the dry weight of the vegetative group And the root, as well as increasing the content of the leaves from the total chlorophyll and the percentage of nitrogen and protein.

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