



T.C.

**ÇANAKKALE ONSEKİZ MART UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

DEPARTMENT OF MOLECULAR BIOLOGY AND GENETICS

**THE INFLUENCE OF *HB24* AND *LACS4* GENES ON
ADVENTITIOUS ROOT FORMATION IN *ARABIDOPSIS
THALIANA***

MASTER OF SCIENCE THESIS

Ali YARIKKAYA

**Thesis Supervisor
Asst. Prof. Fatih SEZER**

ÇANAKKALE – 2024



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ETİK BEYAN

Çanakkale Onsekiz Mart Üniversitesi Lisansüstü Eğitim Enstitüsü Tez Yazım Kuralları'na uygun olarak hazırladığım bu tez çalışmasında; tez içinde sunduğum verileri, bilgileri ve dokümanları akademik ve etik kurallar çerçevesinde elde ettiğimi, tüm bilgi, belge, değerlendirme ve sonuçları bilimsel etik ve ahlak kurallarına uygun olarak sunduğumu, tez çalışmasında yararlandığım eserlerin tümüne uygun atıfta bulunarak kaynak gösterdiğimi, kullanılan verilerde herhangi bir değişiklik yapmadığımı, bu tezde sunduğum çalışmanın özgün olduğunu, bildirir, aksi bir durumda aleyhime doğabilecek tüm hak kayıplarını kabullendiğimi taahhüt ve beyan ederim.

ETHICAL STATEMENT

I declare that all the information and results offered in visual, audio, and written form are obtained by myself observing the academic and ethical rules. Moreover, all other results and information referred to in the thesis but not specific to this study are cited.

Ali YARIKKAYA

09/08/2024

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Ali YARIKKAYA
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ABSTRACT

THE INFLUENCE OF *HB24* AND *LACS4* GENES ON ADVENTITIOUS ROOT FORMATION IN *ARABIDOPSIS THALIANA*

Ali YARIKKAYA

Çanakkale Onsekiz Mart University

School of Graduate Studies

Master of Science Thesis in Molecular Biology and Genetic

Supervisor: Asst. Prof. Fatih SEZER

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Vegetative propagation is one of the common methods in the agricultural field to propagate plant. Vegetative propagation usually involves cutting parts of the plants like stems and induce rooting. This root formation from non root tissues like stems is referred as adventitious rooting (AR). And efficiency of this propagation methods are directly related to the AR ability of the plants to be propagated. The ability to induce AR varies between plant species and even within the same species. It is known that hormones have significant effects on plant development including AR. Auxin like IBA and IAA are commonly used hormones in plant propagation by cuttings. Some research suggests that IBA shows its effect by its conversion into IAA. Therefore, these study aims to uncover the roles of key genes involved in IBA-IAA conversion on adventitious rooting in *A. thaliana*. It is known that *HB24* and *LACS4* genes are involved in the rooting process in *Arabidopsis thaliana* and control the IBA-IAA conversion, however, their effects on adventitious rooting have not been fully investigated. Therefore, in this thesis study the effects of *HB24* and *LACS4* genes on AR were investigated. Adventitious root development in insertional TDNA mutant lines of *HB24* and *LACS4* genes was analyzed in comparison with wild-type *A. thaliana* plants. It was observed that AR formation was reduced in *HB24* mutant plants compared to wild-type plants. In this thesis, the effects of the *HB24* and *LACS4* genes on AR formation were investigated, and it was demonstrated for the first time that they play a role in AR formation.

Keywords: Adventitious rooting, *HB24*, *LACS4*, IBA-IAA transformation

ÖZET

HB24 VE LACS4 GENLERİNİN ARABIDOPSIS THALIANA'DA ADVENTİF KÖKLENME ÜZERİNDEKİ ETKİSİ

Ali YARIKKAYA

Çanakkale Onsekiz Mart Üniversitesi

Lisansüstü Eğitim Enstitüsü

Moleküler Biyoloji ve Genetik Anabilim Dalı Yüksek Lisans Yeterlik Tezi

Danışman: Dr. Öğretim Üyesi Fatih SEZER

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Vejetatif üreme, tarım alanında bitki çoğaltmak için yaygın yöntemlerden biridir. Vejetatif çoğaltım genellikle bitkilerin sap gibi kısımlarının kesilmesini ve köklendirilmesini içerir. Sap gibi kök olmayan dokulardan kök oluşumu adventif köklenme (AR) olarak adlandırılır. Bu çoğaltma yöntemlerinin verimliliği, çoğaltılacak bitkilerin AR yeteneği ile doğrudan ilişkilidir. AR indüklemeye yeteneği, bitki türleri arasında ve hatta aynı tür içinde bile değişiklik gösterir. Hormonların, AR dahil olmak üzere bitki gelişimi üzerinde önemli etkileri olduğu bilinmektedir. IBA ve IAA gibi oksinler, kesimler yoluyla bitki çoğaltımında yaygın olarak kullanılan hormonlardır. Bazı araştırmalar, IBA'nın etkisini IAA'ya dönüşümü yoluyla gösterdiğini öne sürmektedir. Bu nedenle, bu çalışma *A. thaliana*'da IBA-IAA dönüşümüne dahil olan kilit genlerin adventif köklenme üzerindeki rollerini ortaya çıkarmayı amaçlamaktadır. *HB24* ve *LACS4* genlerinin *Arabidopsis thaliana*'da köklenme sürecine dahil olduğu ve IBA-IAA dönüşümünü kontrol ettiği bilinmektedir, ancak adventif köklenme üzerindeki etkileri tam olarak araştırılmamıştır. Bu nedenle, bu tez çalışmasında *HB24* ve *LACS4* genlerinin AR üzerindeki etkileri araştırılmıştır. *HB24* ve *LACS4* genlerinin girişimsel TDNA mutant hatlarında adventif kök gelişimi, yabani tip *A. thaliana* bitkileri ile karşılaştırılarak analiz edilmiştir. *HB24* mutant bitkilerinde yabani tipe kıyasla AR oluşumunun azaldığı gözlemlenmiştir. Bu tezde, *HB24* ve *LACS4* genlerinin AR oluşumu üzerindeki etkileri araştırılmış ve ilk kez AR oluşumunda rol oynadıkları gösterilmiştir.

Anahtar Kelimeler: Adventif köklenme, *HB24*, *LACS4*, IBA-IAA dönüşümü

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ABBREVIATIONS

AR	Adventitious root
PR	Primary root
LR	Lateral root
PCR	Polymerase chain reaction
TUBİTAK	The Scientific and Technological Research Council Of Türkiye
IBA	Indole 3-butyric acid
IAA	Indole 3-acetic acid
NAA	Naphthaleneacetic
Kb	Kilobase
Bp	Base pair
ER	Endoplasmic reticulum
µL	Microliter
mL	Milliliter
µM	Micromolar
MS	Murashige and Skoog medium
dH ₂ O	Distilled water

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CHAPTER ONE

INTRODUCTION

Agricultural plants meet most of the nutritional needs today. Therefore, agricultural developments have a crucial role in the humanity survival. Research in the field of agriculture aims to obtain more productive plants in a shorter time and with less costs. Plants are propagated in the agricultural field using a variety of techniques (Yadav and Singh, 2018). One of these methods is vegetative propagation (Pierik, 1997). Vegetative propagation is a method of plant reproduction that enables the development of new plants without the need for seeds from the parents, instead plant's vegetative elements, such as roots, or leaves used for reproduction (Preece, 2003). In this way, clones that contain the same genetic materials as the desired plants can be produced (Preece, 2003). It is faster than seed production and provides the opportunity to avoid unwanted traits (Preece, 2003). Vegetative propagation can be carried out in different ways (Pierik, 1997). One of the ways is the method of bending the plant (Yadav and Singh, 2018). In this method a part of the plant is bent and a connection is established with the soil (Yadav and Singh, 2018). Then, the area in contact with the soil is rooted. After rooting, the bended part is separated from the main plant and continues to be grown as a separate plant. Another way for vegetative propagation is dividing plant into small pieces and planted in the soil (Yadav and Singh, 2018). After the parts are rooted, plants that have same genotype to the parent plant are obtained. Another way to achieve propagation is by grafting a part of the plant that wants to grow onto a plant that has already formed roots (Yadav and Singh, 2018). In addition to these methods, tissue culture is also an important method in vegetative propagation (Preece, 2003). Small parts obtained from the parent plant were grown using the cell culture method (Preece, 2003). Root and stem formation is achieved with the help of hormones (Preece, 2003). In this way, new plants identical to the parent plant are obtained (Preece, 2003). Vegetative propagation can be carried out in different ways (Yadav and Singh, 2018). Which method to choose is determined by the type of plants, resources, and time limitations. Adventitious root (AR) formation is of the utmost importance in vegetative reproduction methods. For improved AR, several hormones are used. Indole 3-butyric acid (IBA), Indole 3-acetic acid (IAA), and naphthaleneacetic acid (NAA) are commonly used hormones (Thimann and Went, 1934). It is thought that IBA shows its effect by turning into IAA (Zolman et al., 2007). Therefore, IBA-IAA conversion plays a key role in adventitious root formation. It is known that the

(HOMEODOMAIN PROTEIN 24) *HB24* is involved in the rooting process and controls the IBA-IAA conversion in *Arabidopsis* species (H. Zhao et al., 2021). Recent studies show that Long chain acyl CoA synthetase 4 (*LACS4*) has an key role in IBA-IAA transformation (Jawahir and Zolman, 2021). However, its effects on AR formation have not been comprehensively investigated. This study aimed to investigate the effects of the *HB24* and *LACS4* genes on AR formation.

1.1 Adventitious Root

In the cultivation of many agricultural plants, the development and health of the roots are crucial. The root has many important roles such as anchoring the plant to the soil and ensuring water and mineral intake (Maurel et al., 2010). Roots are divided into different classes like primary root (PR), lateral root (LR), or AR. LR roots originate from PR roots, whereas PR is the initial root that appears during embryonic development (Gonin et al., 2019). AR is the formation of roots in different parts of the stems or leaves outside the normal rooting areas of plants (Gonin et al., 2019). Adventitious rooting is the roots formation in locations other than the normal root zone of a plant, such as on stems or leaves (Gonin et al., 2019). ARs can start in the interfascicular cambium cells near the phloem cells, immature secondary phloem cells, xylem or phloem parenchyma cells, or hypocotyl pericycle cells (Bellini et al., 2014). Most of the time, ARs emerge in reaction to certain stressful situations, such as injury and waterlogging (Geiss et al., 2018). Many forestry and horticultural plants can multiply via AR propagation, which is made possible by the plants' sensitivity to wounds or cuts (Steffens and Rasmussen, 2016). In *Arabidopsis*, AR develops from the stem through hypocotyls or cuttings separated from the old primary roots, where secondary growth begins (Gonin et al., 2019). Dark-light treatment also can induce AR development in *A. thaliana*. In addition to cutting and injury, hormone applications may be required for AR formation at the wounded/cutting site (Gonin et al., 2019). Auxins are known as one of the important hormones for root growth. Natural auxins, like IAA, and some synthetic auxins, like NAA and IBA, have an impact on cell elongation and division, which is crucial for the propagation of AR (Pacurar et al., 2014). Conversely, hormones like ethylene and cytokinin inhibit the growth of roots (Gonin et al., 2019).

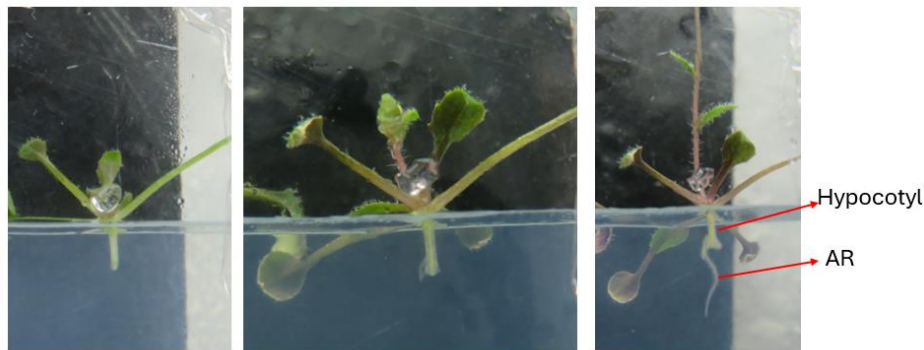


Figure 1. A schematic representation of adventitious root development in *A. thaliana*.

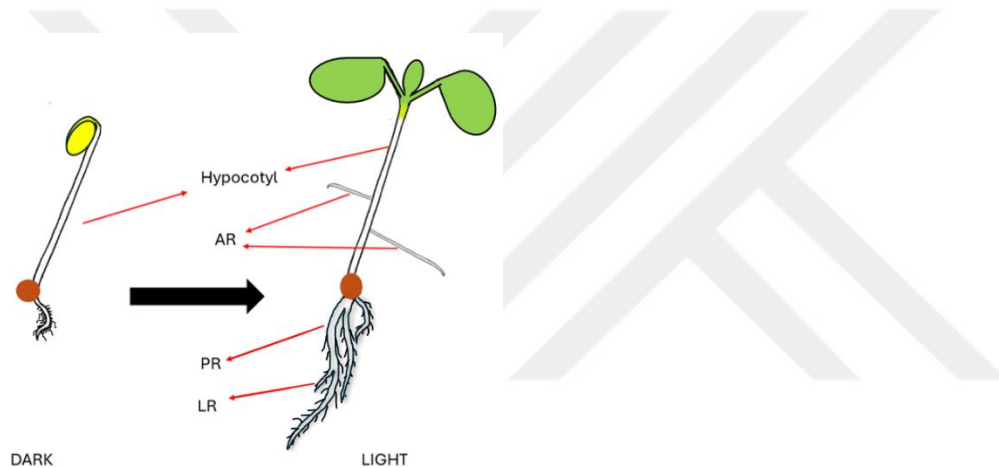


Figure 2. A schematic representation of adventitious root development in etiolation procedure.

AR development consists of three different phases: the induction, initiation, and expression phases (de Klerk et al., 1999). The induction phase is the name given to the first stage in plant development when the necessary signals and conditions are created to start a certain process . In AR development, this stage covers the period before events such as cell division or tissue formation . During the initiation phase, the actual development of root primordia is the period when dense cell clusters that will eventually become roots are formed (de Klerk et al., 1999). When plant tissue is stimulated, cells in the cambium layer of the stem begin to divide and develop into root primordia. The extension stage is the phase where ARs grow longer and become fully functional (de Klerk et al., 1999). During this stage, the cells of root primordia elongate and mature, allowing root tissues to become visible in the stem. In the stem, some species of *Populus*, *Jasminum* or *Salix* have preformed AR initials (Geiss et al., 2018). However, for AR rooting to occur, the stem must be wounded at specific

regions and suitable conditions for rooting must be provided. Otherwise, the AR initials remain dormant until the appropriate conditions are met (Geiss et al., 2018). In other plants, there are no preformed structures to create AR. Therefore, an additional step called dedifferentiation is needed before the induction phase, where cells acquire the ability to differentiate and proliferate (Geiss et al., 2018; Pijut et al., 2011). In *Arabidopsis*, ARs, like LRs, launch from hypocotyl pericyclic cells adjoining to the xylem pole (Boerjan et al., 1995). It also occurs from the cambium and surrounding vascular tissues in uprooted hypocotyls or stem cuttings of former seedlings (da Rocha Correa et al., 2012). It is known that hormones also play a role in the formation of ARs (Gonin et al., 2019).

1.2.1 Auxin

Hormones such as auxin are essential for plant growth and development. It is one of the important hormones that control cell division and the effects of elongation of cells and root development (Li et al., 2009). Auxins can be synthetic, such as IBA, or natural, such as IAA. IBA and IAA are two of the most studied hormones. Although IAA was the first auxin used to stimulate AR, IBA is more preferred (Bellini et al., 2014; Cooper, 1935). In many plant species, IBA is an effective exogenous AR promoter (Kurepin et al., 2011; Schlicht et al., 2013; Strader and Bartel, 2011). It is thought that IBA shows its effect by transforming into IAA. However, in stem cuttings, IBA stimulates AR initiation more effectively than IAA. The reason for this is thought to be that IBA may use transporters different from IAA in long-distance transport in plants, or because IBA does not convert to IAA during transport, hence it can have site-specific effects (Bellini et al., 2014; Strader and Bartel, 2011).

1.2.2 Auxin's function in AR

The root-inducing effect of auxin is summarized by scientists (Haissig and Davis, 1994). The rhizogenic activity of IAA was reported after its discovery (Thimann and Went, 1934). Subsequently, researchers chemically synthesized IBA and NAA and explored their potential to stimulate root formation (Zimmerman and Wilcoxon, 1935). Phytohormones such as IBA, NAA, and IAA play important roles in promoting adventitious rooting (Botanicae et al., 2021). These hormones can increase AR formation when applied to cut plant materials (such as leaves, and stems). These hormones can accelerate the rooting of cut

plant material by stimulating plant cell division and root formation. Some studies suggest that IBA shows its effect without turning into IAA (Ludwig-Müller, 2000). However, many studies are arguing that IBA has transformed into IAA (Zolman et al., 2007). Some studies conducted on mutants of the *A. thaliana* species suggest that IBA shows its effect by transforming into IAA (Nordström et al., 1991). The concentration of hormones applied also have a crucial role in the AR formation. High auxin concentrations prevent root extension and promote cellular differentiation, which is likely why they become inhibitory during root expression (Li et al., 2009). In research on ornamental plants, it has been found that more than 8g/L⁻¹ IAA harms the plant, however, the optimal endogenous concentration varies between species even clones (Baraldi et al., 1993; Blakesley et al., 1991). It is thought that auxin derivatives affect AR formation, AR formation may be negative or positive depending on the concentration applied, and these concentrations may differ depending on plant species (Li et al., 2009). The effect of auxin on AR formation is made possible by various genes. These genes are responsible for multiple functions, such as the synthesis and expression of hormones.

1.3 *HB24* gene

Several transcription factors have a 60-amino acid DNA-binding domain (BD) called the homeodomain (HD) (Wang et al., 2023). The 14 members of the zinc finger homeodomain family (ZF-HD family), a subfamily of the homeobox genes, are important factors in several *Arabidopsis* developmental processes. *HB24* is a part of the ZF-HD family and transcription factor that can regulate IBA to IAA transformations (Wang et al., 2023). It is thought that IBA shows its effect by transforming into IAA (Zolman et al., 2007). Acyl-CoA dehydrogenase/oxidase-like INDOLE-3-BUTYRIC ACID RESPONSE 3 (IBR3), IBR10, and IBR1 that have a role in this transformation (Zolman et al., 2007, 2008). The metabolic pathway of IBA occurs through the activity of several genes in the *A. thaliana*. The IBR1 gene encodes a short-chain dehydrogenase/reductase (SDR) that plays a key role in the transformation of IBA to IAA (Zolman et al., 2008). IBR3 may be responsible for the second step of the conversion of IBA to IAA, and this metabolic pathway is similar to β -oxidation (H. Zhao et al., 2021). While IBR10 is involved in the breakdown of unsaturated fatty acids, it may be part of an alternative pathway that converts IBA to IAA (Zolman et al.,

2008). *HB24* regulates the expression of *IBR1* as a transcription factor so it affects the transformation (H. Zhao et al., 2021). Auxin has a positive impact on root hair elongation, leading to the theory that *HB24* might react to auxin by promoting *IBR1* expression (H. Zhao et al., 2021). It also affects the transformation of IBA to IAA. As a result, IBA-derived IAA can boost *HB24* expression and create a feedback loop that promotes root hair elongation (H. Zhao et al., 2021). Nevertheless, the impact of *HB24* on AR have not been fully examined.

1.4. *LACS4* gene

LACSs are a gene family encoding important enzymes for the activation of long-chain fatty acids in plants. These genes have many important roles in plants (L. Zhao et al., 2019). The LACS genes encode the enzymes needed to convert long-chain fatty acids into active forms in cellular metabolism (L. Zhao et al., 2019). This process involves the activation of fatty acids by combining them with CoA (Coenzyme A). They also take part in the transportation of fatty acids as in the activation process. The activated long-chain fatty acids provide transmission to different parts of the cell, however, the LACS genes are involved in plant development, flowering, and seed formation. The LACS genes are known to play a role in the mechanisms of response to stress (Shockey et al., 2002). LACS genes have lots of missions in *A. thaliana* (L. Zhao et al., 2019). In terms of the mutations investigated in some studies, scientists can conclude that *LACS1* plays a key role in cuticular wax production and *LACS2* and *LACS4* also play a role in wax metabolism (Lü et al., 2009; Weng et al., 2010; L. Zhao et al., 2019). Similarly, *LACS2* acts a key part in cuticle biosynthesis, *LACS1* and *LACS4* contribute (Weng et al., 2010). Both *LACS1* and *LACS4* have a role in tryphine lipid metabolism and, as a result, male fertility (Jessen et al., 2015; L. Zhao et al., 2019). *LACS1*, *LACS4*, and *LACS9* are involved in the biosynthesis of oil (L. Zhao et al., 2010). Finally, proper vegetative development necessitates the presence of *LACS4*, *LACS8*, and *LACS9* (L. Zhao et al., 2010, 2019). Another study also reported that *LACS4* and *LACS6* have an important role in IBA-IAA transformation (Jawahir and Zolman, 2021). The following three *LACS4* activation models may influence the transformation of IBA into IAA (Jawahir and Zolman, 2021) :

1. The peroxisome contains *LACS4* and *LACS6*, which work consecutively to charge the IBA with CoA. *LACS4* can be found in the cytoplasm, ER, or both in addition to the peroxisome.

2. *LACS4* is present in the cytoplasm, where it creates a cytoplasmic pool of IBA-CoA and is loosely linked to peroxisomes but does not go inside the organelle. CoA can be reintroduced into the IBA by *LACS6* after IBA-CoA is moved into the peroxisome.

3. *LACS4* localized in the ER can create an IBA-CoA pool, which is either present in pre-peroxisome structures that develop into mature peroxisomes or actively transported to peroxisomes. The *LACS6* in the peroxisome reabsorbs the CoA that was dissociated during import.

It is known that the *LACS4* and *HB24* genes are involved in the conversion of IBA to IAA. It is believed that IBA shows its effects by converting to IAA, and this conversion is thought to play a significant role in AR formation. However, the effects of these genes on adventitious rooting have not been fully investigated. Therefore, in this project, mutant lines of *lacs4* and *hb24* genes were used under different IBA concentrations to investigate the effects of *lacs4* and *hb24* genes on adventitious rooting.

CHAPTER TWO

PREVIOUS STUDIES

Štefančič et al., 2005 conducted a study to search for the effects of IBA and IAA on the root formation of *Prunus* 'GiSela 5'. This study analyzed the effect of IAA and IBA hormones on the root and shoot development of leafy cuttings in 'GiSela 5' dwarfing cherry rootstocks. IBA inhibited callus formation during the early stages of root growth and promoted earlier root growth compared to IAA. Additionally, it influenced better shoot growth and triggered the advancement of the acrobasal type of root system, resulting in a higher number of roots. It was observed that neither of the two hormone applications affected the final percentage of rooted cuttings, yet they increased the percentage of rooted cuttings without calluses. It was concluded that the root system with calluses was of lower quality based on root numbers and shoot lengths. In summary, externally applied auxins were found not to be vital for root formation, but their implementation resulted in obtaining higher quality and a larger percentage of leafy cuttings of 'GiSela 5'. IBA was proven to have greater effective than IAA on 'GiSela 5'.

Different rooting protocols used for adventitious rooting studies of *A. thaliana* have been described as models in the literature, and the results have generally been found to be comparable. da Rocha Correa et al., 2012 have stated that different methods have their advantages and disadvantages, and they have comparatively evaluated three of these methods. These methods include detached leaves, de-rooted plants, and etiolated seedlings. They used the same parameters in their experiments and conducted tests with temporary IAA applications. Due to the differences in their experiments, they did not observe callus formation despite the tissues where roots formed being different in each case. Control groups in all three different experiments formed adventitious roots. Although IAA suppressed adventitious rooting in plants from which roots were removed, it promoted adventitious rooting in detached leaves. Mutants with high auxin production could not be used in the cut leaf experiment because they aged prematurely. Researchers have highlighted that *A. thaliana* is an important model system for studies of AR formation, but physiological and developmental outcomes vary significantly depending on the methods used. Therefore, they

stated that the rooting responses obtained from various experimental systems need to be evaluated separately for each experimental system.

In a study conducted by Ludwig-Müller, 2000 , using molecular techniques, they managed to isolate several genes induced during adventitious rooting triggered by IBA. Additionally, they discovered that microsomal membranes obtained from maize could convert IAA to IBA with the help of cofactors such as acetyl-CoA. They characterized the enzyme catalyzing this reaction in maize and achieved relative purification. They emphasized that the biosynthesis of IBA is affected by various internal and external factors.

- I. While dark-grown maize plants produced an unidentified reaction product that was subsequently converted to IBA, microsomal membranes from light-grown maize seedlings revealed that they directly synthesized IBA.
- II. Drought and osmotic stress boost the biosynthesis of IBA, which may be due to the increase in abscisic acid (ABA) as the implementation of ABA also causes an increase in IBA.
- III. IBA synthesis can be especially boosted by sethoxydim group herbicides.
- IV. There is an increase in both IBA and IBA synthesizing activity when the mycorrhizal fungus *Glomus intraradices* colonize maize roots.

Shockey et al., 2002 worked on LACSs. The researchers aim to identify and characterize the presence of genes encoding LACSs in *Arabidopsis*. They tested 9 different cDNAs in *Saccharomyces cerevisiae* yeast, which does not have LACSs. As a result of the experiments, it was observed that seven of the 9 cDNAs had the ability to correct the LACSs absence, but two cDNAs could not correct the absence of it. The enzymes were overexpressed in *Escherichia coli* to test their substrate specificity. Researchers examined these genes tissue-based for their profiles of expression and identified a flower-based isoform. They concluded that these nine cDNAs could form the whole LACS family in *A. thaliana* and could be an important tool in investigating acyl-CoA metabolism in oilseeds.

Jawahir and Zolman, 2021 focused on the relation between LACS genes and IBA-IAA transformation. During *Arabidopsis thaliana*'s main root elongation, they detected *LACS4* increased IBA resistance. Substrates are activated by LACSs which catalyzes the addition of CoA so that it can participate in metabolic pathways such as β -oxidation of fatty acids. Vanessa Jawahir and colleagues hypothesized that *LACS4* participates in the first step of β -oxidation by catalyzing the addition of CoA to IBA. They also found out that *LACS4* mutants were resistant to the effects of IBA on primary root elongation and dark-grown hypocotyl elongation and had reduced lateral root density. However, they reported that the mutants were sensitive to IAA. Based on this, they suggested that the *LACS4* gene plays an important role in the formation of IBA-derived IAA.

H. Zhao et al., 2021 focused on *HB24*'s effect on IBA-IAA transformation. They observed that defective growth of root hairs occurred in the absence of *HB24* function. They determined that *HB24* directly targets INDOLE-3-BUTYRIC ACID RESPONSE 1 (IBR1), which encodes an enzyme involved in the IBA-IAA conversion. They showed that the root hair growth phenotype in *hb24* mutants was restored with the application of exogenous IAA or NAA, but not with IBA. From these experiments, they proposed that *HB24* upregulates IBR1 expression, which in turn facilitates root hair elongation by converting IBA to IAA. Additionally, they found that IAA boosts *HB24* expression, indicating a feedback loop in root hair elongation mediated by the conversion of IBA to IAA.

In another study (Huang et al., 2020), shown that reactive oxygen species (ROS) rapidly form upon excision of the primary root of *A. thaliana*, spreading throughout the hypocotyl cutting. However, this propagation was not observed in the absence of NADPH oxidase inhibitor (diphenylene iodonium chloride) or in mutants lacking the NADPH oxidase gene respiratory burst oxidase homolog protein D (RBOHD). RBOHD was upregulated in the hypocotyl 30 minutes after excision. Based on these findings, researchers have proposed that RBOHD mediates ROS propagation in hypocotyl cuttings. It was observed that 5 hours after injury, auxin levels increased at the shoot apex, and significantly at the injury site after 6 hours. However, this increase was inhibited when ROS scavengers were applied. Transcript levels of genes responsible for auxin biosynthesis generally

increased between 1 and 6 hours. As a result, researchers have added that ROS generated from wounds has a key in the AR formation to the literature.



CHAPTER THREE

MATERIALS AND METHODS

3.1. Plant Material

The *A. thaliana* *LACS4* mutant lines, *lacs4-1* (CS65779), *lacs4-2* (CS65780) , *HB24* mutant line *hb96C* (SALK_205096C) mutant lines and *A. thaliana* Columbia (Col) ecotypes were provided from the Arabidopsis Biological Resource Center (ABRC).

3.1.1. Seed Sterilization and Growth Conditions

A. thaliana seeds were sterilized for 8 min in 8% bleach and 2 min in 70% ethanol then washed 3 times with autoclaved distilled water. After sterilization, the seeds are placed on ½ MS media. To prepare 100 ml of ½ MS medium, 50 mL of distilled water was measured and transferred to a glass autoclave bottle. A magnetic fish is placed inside, and it is allowed to stir at a slow speed on a magnetic stirrer. The 0.22 g of Murashige and Skoog medium (including vitamins)(M0222.0050-Duchefa Biochemie) and 3 g of sucrose (S0809.5000-Duchefa Biochemie) are added to the bottle, and then a pH meter is used to adjust the medium pH to 5.7-5.8 using 0.1 M NaOH. After removing the magnetic stirrer, the total volume is brought to 100 mL. Then 0.8 g of plant agar (P101.100- Duchefa Biochemie) is added, and the bottle is autoclaved with the cap slightly open (15 minutes at 2 atm pressure and 121°C). After autoclaving, before the temperature of the medium drops below 50°C the medium is distributed into sterile Petri dishes, allowing it to solidify. After the media solidifies, the seeds are planted in the petri dishes. Petri dishes are wrapped with two layers of aluminum foil and left to vernalize at +4°C degrees for 3 days. Then seedlings were transferred into a plant growth chamber for approximately 15 days. Plants were grown under 16 h of light, and 8 h dark at 21°C degrees.

3.2. DNA Isolation

DNA isolation is performed following the Edward DNA isolation (Edwards et al., 1991) method. Extraction Buffer (200 mM Tris-HCl, 250 mM NaCl, 25 mM EDTA, %10 SDS) is prepared. For 100 mL Extraction Buffer:

Table 1.

The amounts of chemicals needed to prepare an extraction buffer.

Component	Concentration	Amount
Tris-HCl	200 mM	2.4 g
NaCl	250 mM	1.46 g
EDTA	25 mM	0.93 g
10% SDS		0.25 g

Dissolve Tris with 70 mL dH₂O. Then, NaCl is added and dissolved. After EDTA is added and dissolved, 1 N HCl solution is added until the pH is fixed at 7.5. Finally, SDS is added and the volume is made up to 100 mL.

Plant roots that are transferred into 1.5 mL microcentrifuge ground into a powder using liquid nitrogen, ensuring all materials used prior are cooled with liquid nitrogen. Following this, 400 μ L of extraction buffer is added to the plant tissue and homogenized using a vortex, then left to incubate at room temperature for 2 minutes. Afterward, the sample is centrifuged at 12,000 rpm for 1 minute, and the supernatant is transferred to a new tube where an equal volume of phenol:chloroform:isoamyl alcohol (25:24:1) is added and inverted. Subsequently, the sample is centrifuged at 12,000 rpm for 1 minute, and the upper phase is moved to a fresh tube. Then, 500 μ L of cold 96% ethanol is gently added, followed by centrifugation at 12,000 rpm for 5 minutes. The pellet is washed with 70% ethanol, centrifuged at 12,000 rpm for 2 minutes, and the supernatant is removed. Tubes are left

upside down open on drying paper for 5 minutes to dry. Finally, the pellet is dissolved in 50 μL of nuclease-free dH_2O . The isolated DNA is stored at $+4^\circ\text{C}$.

3.3. Mutant Detection Polymerase Chain Reactions (PCR)

For the mutant detection PCR reactions, Taq DNA polymerase enzyme (MO320L – New England BioLabs Inc.) was used. The reaction components can be found in Table 2. In order to perform the detection, two reactions are prepared for each DNA sample. One of the reactions contains the right and left primers of the gene of interest, and the other reaction contains the right primer of the gene of interest and the Lb1.3 primer. The primers used are given in Table 3 and thermocycling conditions for PRC are given in Table 4.

Table 2

Components of Polymerase Chain Reaction

Reaction Components	25 μL rxn
10X PCR Buffer	2.5 μl
10 mM dNTPs	0.5 μl
Forward primer	0.5 μl
Reverse primer	0.5 μl
Template DNA	1 μl
Taq DNA Polymerase	0.125 μl
dH_2O	19.875 μl

The mutant lines created by T-DNA insertion are used as plant material. Suitable mutant lines were selected using the TAIR database. Primers for SALK-coded mutant lines were designed using the Salk T-DNA Primer Design Program (<http://signal.salk.edu/tdnaprimers.2.html>) and primers for CS-coded mutant lines were designed using the GABI-Kat Primer Program (<https://www.gabi->

kat.de/db/primerdesign.php). While designing primers, care was taken to ensure the T_m value is between 55-63°C, the primer length is 21-28 bp, and the GC content is 40-60%.

Table 3

Primers used in Mutant Detection PCR

Gene	Primer	Sequence
HB24	SALK_205096C_HB24_LP	TGTTTAGATCCTCCGTCGATG
HB24	SALK_205096C_HB24_RP	GGCACTGTCTGCTACAAGTCCP
LACS4	CS65779_LACS4-1_LP	GAAGAAGCTTTCTGATGGTGG
LACS4	CS65779_LACS4-1_RP	TTCTATGTTCTCCACCGCAAC
LACS4	CS65780_LACS4-2.2_LP	CAGGAGCCAGTACACTATCCG
LACS4	CS65780_LACS4-2.2_RP	GAAATTAAGAACAGGAGCCGG
	LBb1.3	ATTTTGCCGATTTTCGGAAC

Table 4

Temperature and Cycles of PCR reaction

PCR Cycles	Temperature	Time	Cycle
Initial denaturation	94 °C	30 second	1
Denaturation	94 °C	30 second	
Annealing	55 °C	30 seconds	35
Extension	68 °C	90 second	
Final extension	68 °C	5 min	1

3.4. Agarose Gel Electrophoresis and Buffers

3.4.1. Agarose Gel Electrophoresis

To prepare 200 mL of 1% gel, 2 g of agarose is weighed and dissolved in TAE buffer. For a 1% 200 mL gel, 2 grams of agarose is weighed, and 200 mL of 1X TAE buffer is measured and added to an Erlenmeyer flask along with the agarose. The agarose/buffer mixture is placed in a microwave and heated till the agarose is totally dissolved in the buffer. when boiling gel is slightly cooled, and ethidium bromide is added to a final concentration of 0.2-0.5 $\mu\text{g/mL}$. The gel with ethidium bromide is poured into the gel casting tray, and a suitable comb is placed in the tray to form wells. The gel is allowed to solidify. As the gel is totally solidified, the gel tray is transferred into the electrophoresis tank, and 1X TAE buffer is put into the tank until it covers the gel completely. The wells of the gel should be oriented towards the negative electrode of the tank. On a piece of parafilm, 10 μL of each sample is mixed with a small amount (approximately 1 μL) of loading dye and then loaded into the wells of the gel. After loading all the samples, 5 μL of 1 KB ladder (Fermentas DNA Ladder SM0633) is loaded into the first well. After setting the power supply, the electrophoresis run is started, with the power supply set to 100 volts and 120 amperes for 60 minutes.

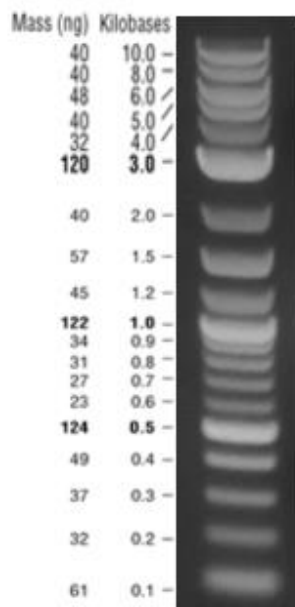


Figure 3. 1kb plus DNA Ladder visualized by ethidium bromide staining on 1% TAE agarose gel.

3.4.2. Ethidium Bromide Stock Solution

10 ml of dH₂O was added to dissolve 0.1 g of EtBr. The aluminum foil-covered stock solution was left at room temperature.

3.4.3. 10X TAE Buffer Preparation

For the preparation of 10X TAE buffer, 48.4 g of TRIS BASE and 3.72 g of EDTA were dissolved in 900 ml of distilled water (dH₂O). The pH was then adjusted to 8.0 using acetic acid, and the solution was raised up to a final volume of 1 liter with dH₂O. This 10X TAE buffer was stored at room temperature. To make 1X TAE buffer, 100 ml of the 10X TAE buffer was diluted with 900 ml of dH₂O.

3.4.4. DNA Ladder Preparation

To prepare DNA Ladder solution combine 100 µl of DNA Ladder, 100 µl of 6X DNA Loading Dye, and 400 µl of distilled water (dH₂O). First, 100 µl of DNA Ladder was added to a clean microcentrifuge tube. Next, 100 µl of DNA Loading Dye was added to the same tube. Finally, 400 µl of dH₂O was put into the mixture. The solution is mixed by pipetting to make sure each component is evenly combined. The solution was kept at the +4 °C.

3.5. Scoring of Adventitious Roots

The roots of 15-day-old plants are removed and transferred to a new media so that the hypocotyl parts contact with the ½ MS media. ½ MS media is adjusted to the determined IBA concentrations (1µM, 10 µM, 50 µM) before being poured into the petri dishes. After the media solidifies, it is divided in half with the help of a sterile scalpel and half of the media is removed from the petri dish (Figure 4a). The roots of the 15 days old plants were removed (Figure 4b, Figure 4c). Petri dishes are placed vertically and the plants are placed in a 180-degree angle to the petri dish (Figure 4d). 4 plants are placed in each petri dish. Then petri dishes were transferred into a plant growth chamber for 10 days. Plants were incubated under 16 h of light, and 8 h dark at 21°C degrees. Plants were photographed daily

at the same time of the day at 16.00 and the number of adventitious roots formed daily for 10 days is recorded.

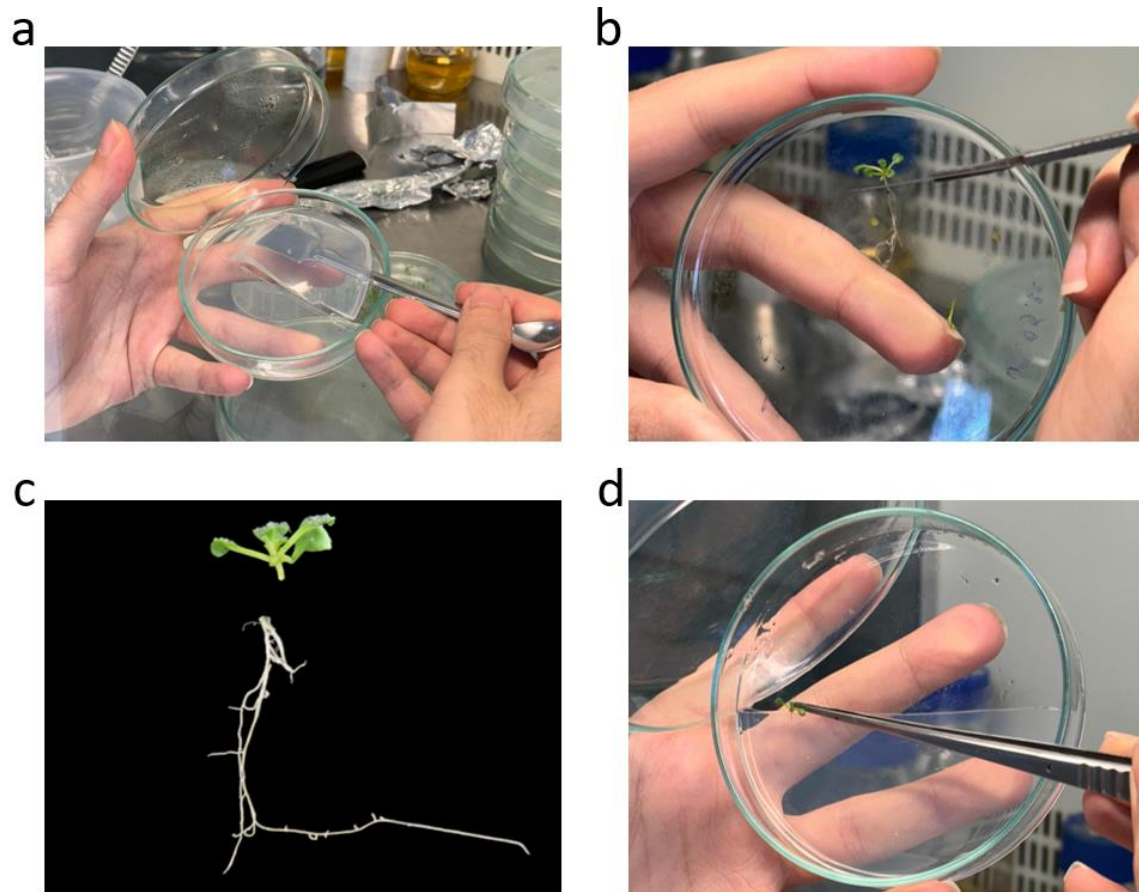


Figure 4. Representation of transferring root removed plants new media. (a) removing half of the media. (b) cutting between hypocotyl and roots. (c) removing roots from plants. (d) placing the root-removed plant in the medium.

3.6. Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 19.0 was used for statistical analysis. To perform an ANOVA test in SPSS, first open the data sets or enter the data directly into SPSS. Then, go to the Analyze menu, select Compare Means, and then One-Way ANOVA. Add the dependent variable to the Dependent List section and the independent variable to the Factor section. For Post Hoc tests, click the Post Hoc button and

choose Tukey for Equal variances assumed and Dunnett's T3 for Equal variances not assumed. To specify statistical options, click the Options button and check Descriptive and Homogeneity of variance. Click OK to run the ANOVA test. SPSS will display the results in the output section. The choice of Post Hoc test depends on the Homogeneity of the groups. If the p-value is less than 0.05, there is a significant difference between the groups.



CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. DNA Isolation

DNA isolation from root tissues was performed as suggested by Edwards et al., (1991). The quality of the extracted DNA was verified using agarose gel electrophoresis indicating they were suitable for PCR reactions (Figure 5). Primers for the *ACTIN2* gene were used to verify that the DNA could be successfully used in PCR without any issues (Figure 6). Primers for the *ACTIN2* gene (*AT3G18780*), known to be expressed in the plant's tissues, were used as a positive control. A 270 bp DNA band was expected from these primers. A negative control reaction without template DNA was also set up to demonstrate the absence of contamination.

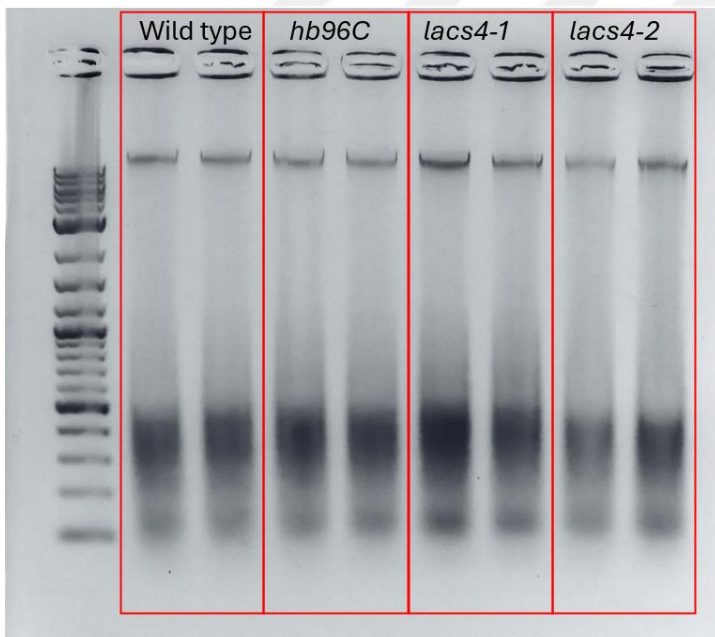


Figure 5. Electrophoresis image of the DNA isolation results.

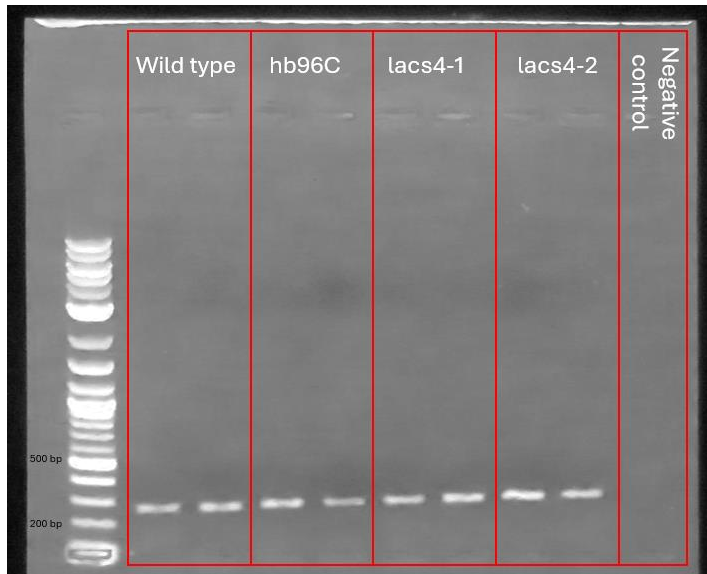


Figure 6. Electrophoresis image of the PCR results with ACTIN2 primers for all mutant lines and wild type.

4.2. Determination of the Genotypes of Mutant Plants

Two different PCR reactions were used to determine the genotypes of the mutants. In the first reaction (PCRI), primers named LBb1.3, which can bind to the T-DNA, were used along with the mutant RP primers. In the second reaction (PCRII), the mutants' own RP and LP-coded primers were used. The LBb1.3 primer can bind to the T-DNA, while the RP and LP-coded primers bind to the corresponding gene region in the plant genome. This results in three different outcomes:

1. When only PCRI generates a product of the planned size, the plant is a homozygous mutant (HM).
2. When only PCRII generates a product of the planned size, the plant is wild type (WT).
3. When both PCRI and PCRII produce bands of the expected size, the plant is heterozygous (HZ).

An example of identifying a mutant plant is illustrated in Figure 7. The PCR products prepared using the RP and LP primers (PCRII) vary according to the mutants. These

values are 1113 bp for *hb96C*, 1138 bp for *lacs4-1*, and 1143 bp for *lacs4-2*. These values are 410+N bp (N = 0 – 300 bp) for PCRI.



Figure 7. A figure that shows how mutant plant phenotypes are determined. WT represent *A. thaliana* wild type, HZ represent heterozygote mutants and HM represents homozygote mutants. (modified from <http://signal.salk.edu/tdnaprimers.2.html>)

For each DNA sample obtained from the plants, two different PCR (PCRI and PCRII) samples were prepared as specified. The PCR samples were visualized using the agarose gel method.

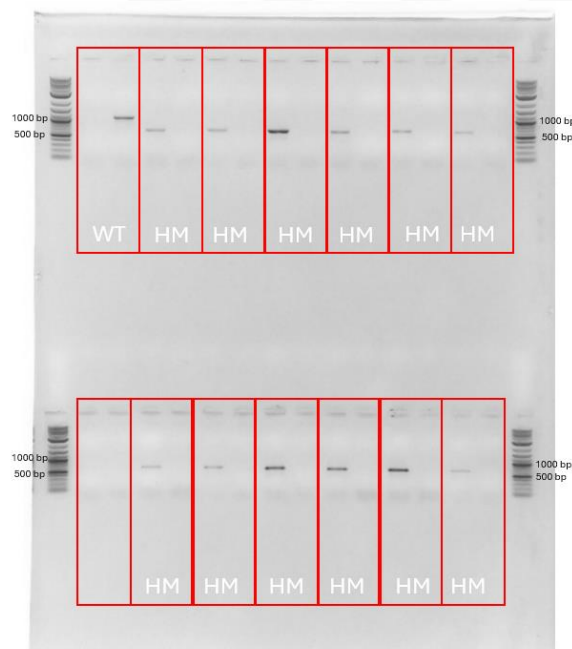


Figure 8. Electrophoresis image of the PCR results for the *hb96C* mutant lines. WT represent *A. thaliana* wild type and HM represents homozygote mutants.

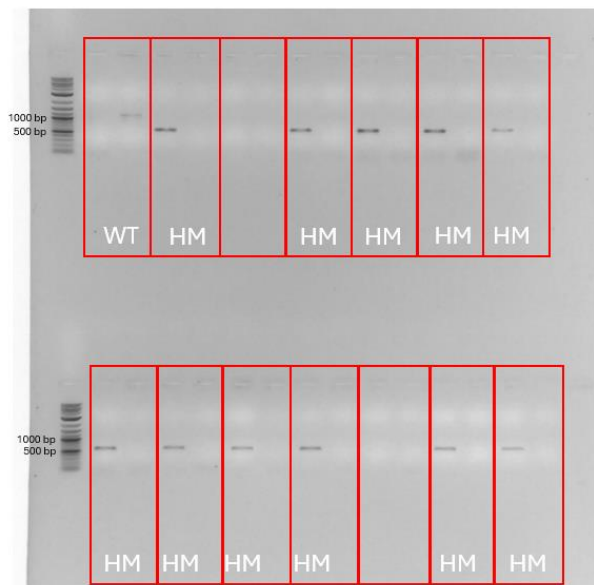


Figure 9. Electrophoresis image of the PCR results for the *lacs4-1* mutant lines. WT represent *A. thaliana* wild type and HM represents homozygote mutants.

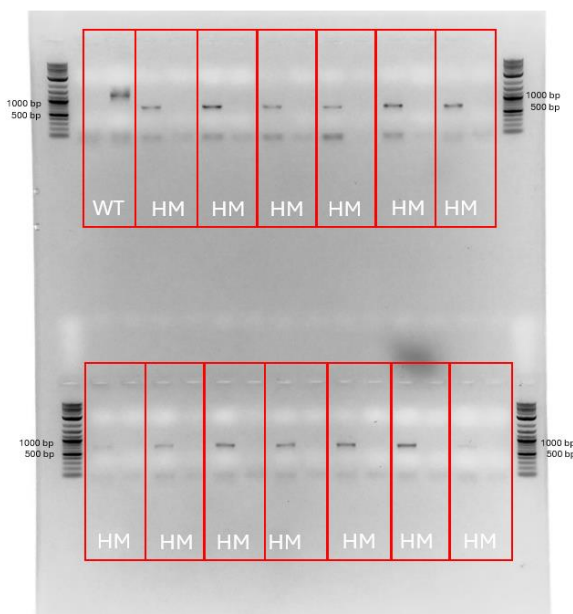


Figure 10. Electrophoresis image of the PCR results for the *lacs4-2* mutant lines. WT represents *A. thaliana* wild type and HM represents homozygote mutants.

4.3. Adventitious root formation

In this study, experiments were set up to determine the roles of *HB24* and *LACS4* genes in the adventitious rooting process using mutant lines of the relevant genes and hormone applications. The results of the experiments were organized and graphed in various

ways to provide explanations. These include comparisons between *A. thaliana* wild type and mutants at the same concentration and comparisons between IBA-treated and untreated groups of both mutants and wild type.

4.3.1 Adventitious root formation in wild-type *Arabidopsis thaliana*

To understand the responses of *A. thaliana* wild type to different IBA concentrations, a comparison was made between untreated *A. thaliana* plants and those treated with IBA. The formation of AR under various IBA concentrations was recorded in wild-type *A. thaliana*. Plants without IBA treatment were chosen as the control. For IBA treatments, root-removed plants were planted in media containing the specified IBA concentrations (1 μ M, 10 μ M, and 50 μ M). After planting, AR numbers were recorded for 10 days. At least 20 plants were used for each group.

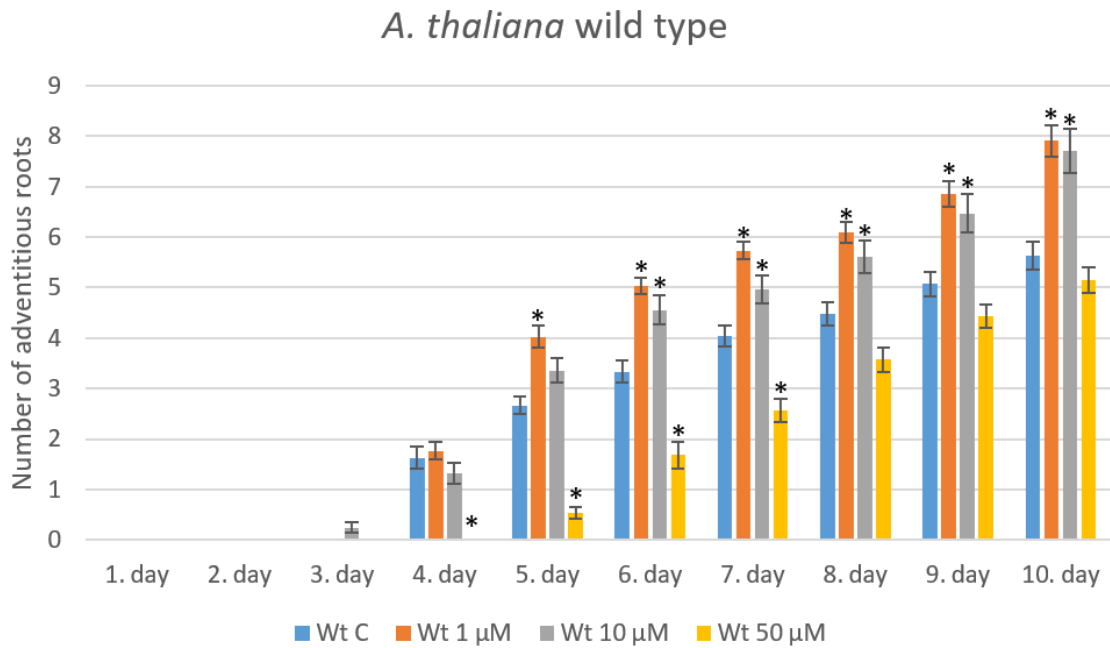


Figure 11. The graphic of wild-type plants treated with different IBA concentrations. (*) shows a significant difference compared to the control group on the same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

The comparison of wild-type plants treated with 1 μ M, 10 μ M, and 50 μ M IBA concentrations with control wild-type plants is presented in the Figure 11. Based on the obtained data of *A. thaliana* (Col), a significant increase was observed in the group treated with 1 μ M IBA on day 5, while significant increases were observed in the groups treated with 1 μ M and 10 μ M IBA from day 6 onwards. In contrast, the group treated with 50 μ M IBA showed a significant decrease on days 4, 5, 6, and 7. 1 μ M and 10 μ M IBA increased AR formation, while 50 μ M IBA delayed AR formation.

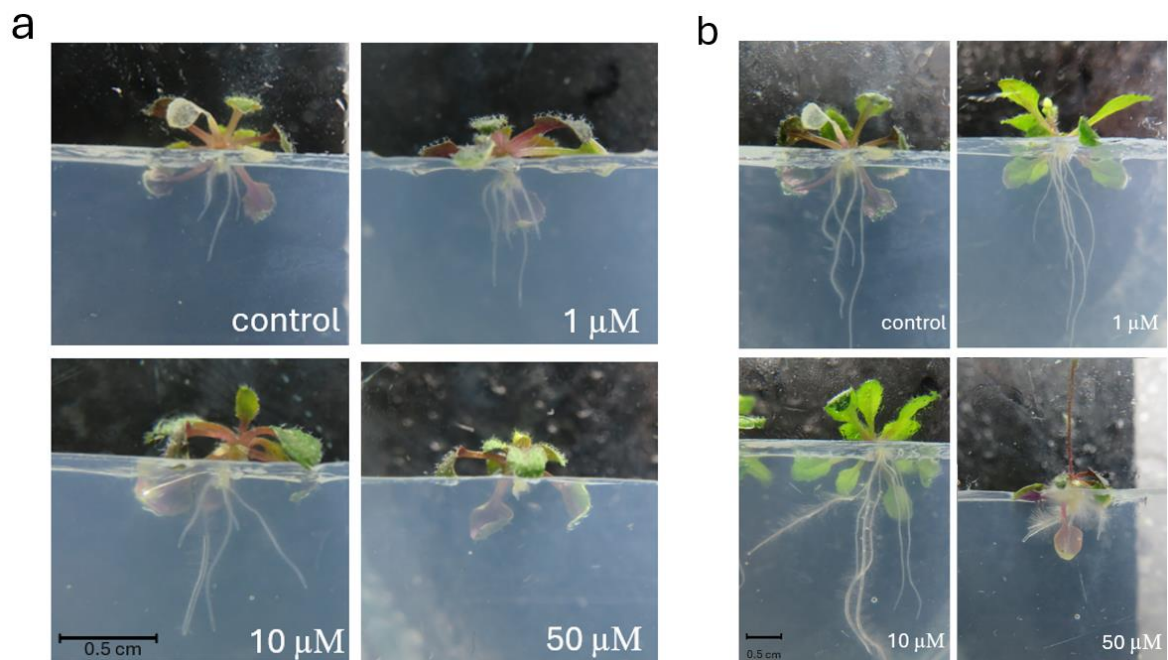


Figure 12. *A. thaliana* wild type photos on the 7th day (a) and 10th day (b) in different concentrations.

After ten days, all the *A. thaliana* wild type plants were taken out of the medium without causing any damage to the roots and photographed (Figure 13, Figure 14, Figure 15, Figure 16).



Figure 13. *A. thaliana* wild type photos on day 10 without IBA treatment.



Figure 14. *A. thaliana* wild type photos on day 10 at 1 μ M IBA concentration.



Figure 15. *A. thaliana* wild type photos on day 10 at 10 μ M IBA concentration.



Figure 16. *A. thaliana* wild type photos on day 10 at 50 μ M IBA concentration.

When wild-type *A. thaliana* was compared across different concentrations, plants treated with 50 μM IBA started developing adventitious roots more slowly. However, from the 7th day onward, they approached the wild type and maintained this until the 10th day. When comparing plants treated with 1 μM IBA and 10 μM IBA, it was observed that the 1 μM IBA treatment induced a significant difference earlier. The experiments concluded that 1 μM IBA and 10 μM IBA treatments positively affected AR formation in wild-type plants, whereas the 50 μM IBA treatment delayed AR formation but did not lead to a significant change in AR number in the long term.

4.3.2. Adventitious root formation in *HB24* mutants

Adventitious root formation under different IBA concentrations was recorded in *hb96C* mutants. The mutants were compared both with themselves without treatment and with wild types at the indicated concentrations. For IBA treatments, root-removed plants were planted in media containing the specified IBA concentrations (1 μM , 10 μM , and 50 μM). After planting, AR numbers were recorded for 10 days. At least 20 plants were used for each group.

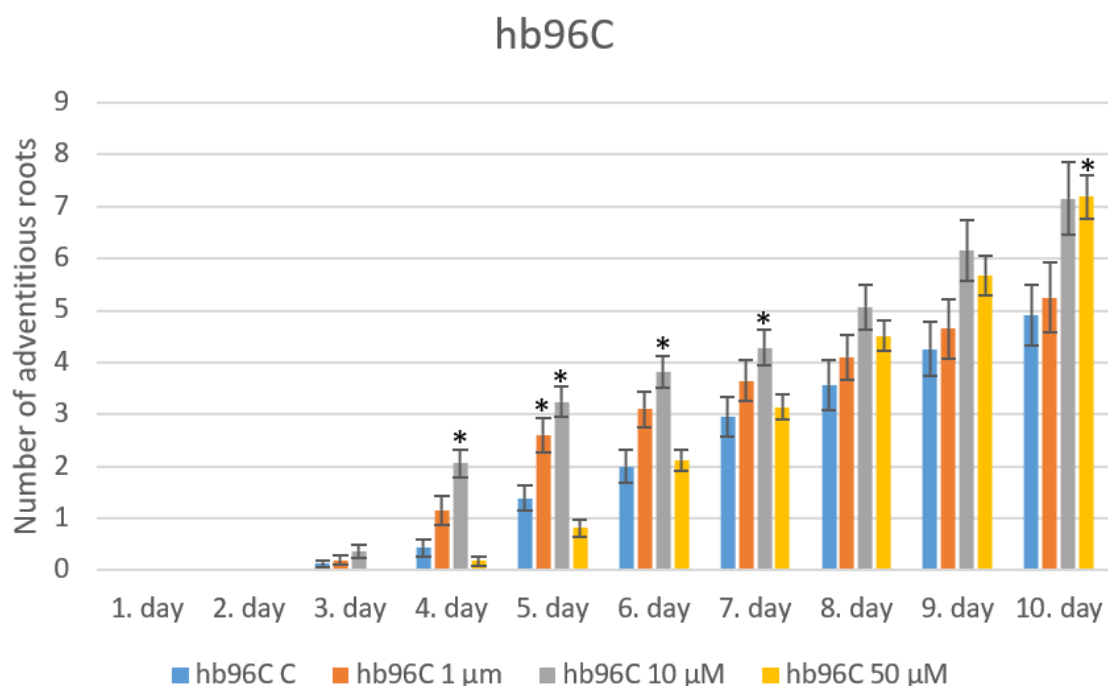


Figure 17. The graphic of *hb96C* plants treated with different IBA concentrations. (*) shows a significant difference compared to the control group on the same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

The comparison of *hb96C* treated with 1 µM, 10 µM, and 50 µM IBA concentrations with control *hb96C* plants is presented in the Figure 17. Based on the obtained data about *hb96C*, the first significant increase was observed in the group treated with 10 µM IBA on day 4, while significant increases were observed in the groups treated with 1 µM and 10 µM IBA from day onwards when compared with itself. In contrast, the group treated with 50 µM IBA showed a significant increase only on 10. day. 1 µM and 10 µM IBA increased AR formation in the early stage of the experiment, while 50 µM IBA significantly increased AR formation end of the experiment.

When *hb96C* was compared across different concentrations of itself, low concentration (1 µM IBA) application does not lead to a significant increase in the number of ARs in the early stages when *HB24* is absent. Medium concentration (10 µM IBA) application, on the other hand, causes the first significant increase on the 4th day in *hb96C*, and this increase continues throughout the experiment. This indicates that medium IBA concentrations promote rooting in the absence of *HB24*. High concentration (50 µM IBA)

application results in a significant increase only on the 10th day in *hb96C*, suggesting that the effect of high IBA concentrations manifests over a longer period. After ten days, all the *hb96C* were taken out of the medium without causing any damage to the roots and photographed (Figure 18, Figure 19, Figure 20, Figure 21).



Figure 18. *hb96C* photos on day 10 without IBA treatment.



Figure 19. *hb96C* photos on day 10 at 1 μ M IBA concentration.



Figure 20. *hb96C* photos on day 10 at 10 μ M IBA concentration.

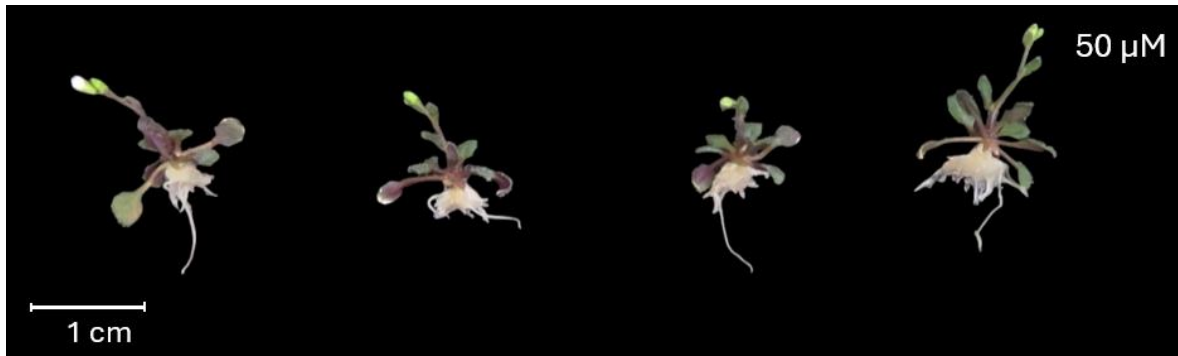


Figure 21. *hb96C* photos on day 10 at 50 μ M IBA concentration.

4.3.3. Adventitious root formation in *LACS4* mutants

Adventitious root formation under different IBA concentrations was recorded in *lacs4-1* and *lacs4-2* mutants. The mutants were compared both with themselves without treatment and with wild types at the indicated concentrations. For IBA treatments, root-removed plants were planted in media containing the specified IBA concentrations (1 μ M, 10 μ M and 50 μ M). After planting, AR numbers were recorded for 10 days. At least 20 plants were used for each group.

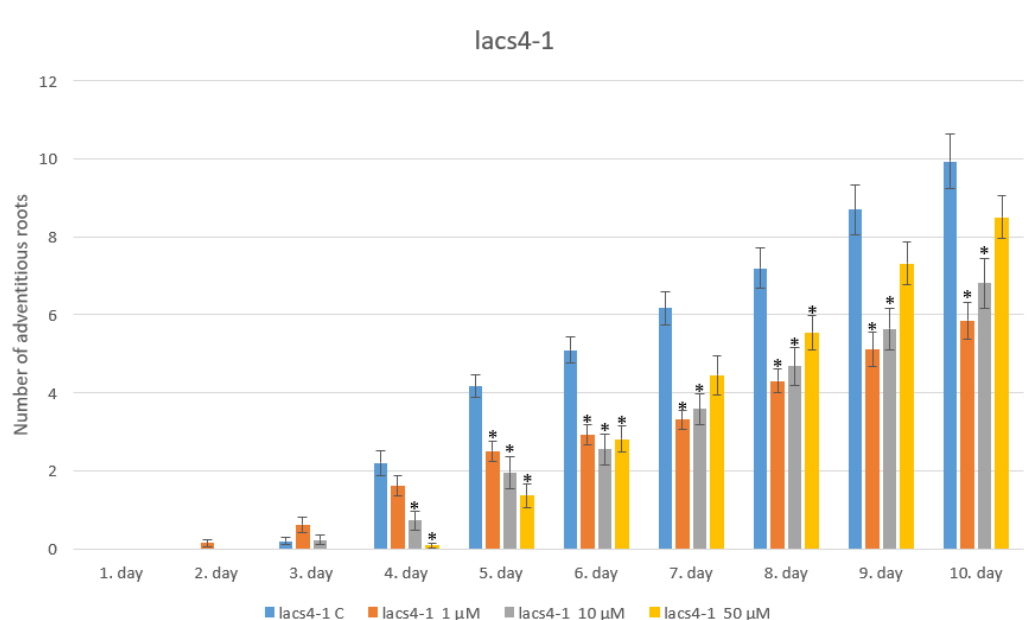


Figure 22. The graphic of *lacs4-1* plants treated with different IBA concentrations. (*) shows a significant difference compared to the control group on the same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

The comparison of *lacs4-1* treated with 1 μ M, 10 μ M, and 50 μ M IBA concentrations with control *lacs4-1* plants is presented in the Figure 22. Based on the obtained data about *lacs4-1*, the first significant decline was seen in the group treated with 10 μ M and 50 μ M IBA on day 4, while no significant increases were observed in the groups treated with 1 μ M, 10 μ M and 50 μ M IBA. The group treated with 50 μ M IBA did not show a significant difference on 9. and 10. days. All concentrations of IBA decreased AR formation in the early stage of the experiment, but 50 μ M IBA showed no significant differences in AR formation end of the experiment. After ten days, all the *lacs4-1* plants were taken out of the medium and photographed (Figure 23, Figure 24, Figure 25, Figure 26).



Figure 23. *lacs4-1* photos on day 10 without IBA treatment.



Figure 24. *lacs4-1* photos on day 10 at 1 μ M IBA concentration.



Figure 25. *lacs4-1* photos on day 10 at 10 μ M IBA concentration.



Figure 26. *lacs4-1* photos on day 10 at 50 μ M IBA concentration.

The *lacs4-1* and *lacs4-2* mutants produce more AR contrasted to the wild type when no IBA is applied. It has been hypothesized that the *LACS4* plays an inhibitory role in the adventitious rooting process.

The mutants lacking the *LACS4* gene exhibit different responses to various IBA concentrations when compared to *LACS4* mutants that have no IBA treatment:

- I. At 1 μ M IBA, the number of AR significantly decreases in the *lacs4-1* and *lacs4-2* mutants. This indicates that in the absence of *LACS4*, low concentrations of IBA suppress the rooting process.
- II. At 10 μ M IBA, the AR numbers still decrease, but not as much as with 1 μ M IBA. This suggests that medium concentrations of IBA have some promotive effect on rooting, though it is not as pronounced due to the absence of *LACS4*.

III. At 50 μ M IBA, an initial decrease in AR is observed, but by the end of the experiment, this decrease is no longer evident. This implies that at high concentrations, the effect of IBA on rooting is balanced out over time, minimizing the impact of *LACS4* absences.

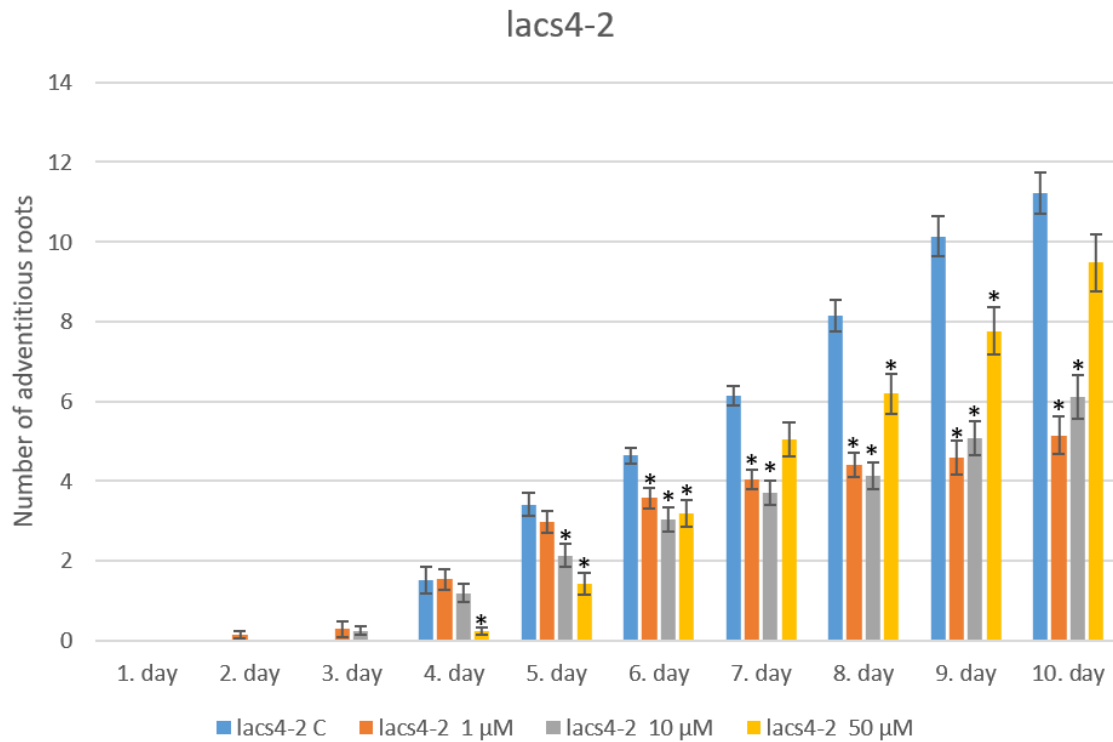


Figure 27. The graphic of *lacs4-2* plants treated with different IBA concentrations. (*) shows a significant difference compared to the control group on the same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

The comparison of *lacs4-2* treated with 1 μ M, 10 μ M, and 50 μ M IBA concentrations with control *lacs4-2* plants is presented in the Figure 27. Based on the obtained data about *lacs4-2*, the first significant decrease was seen in the group treated with 50 μ M IBA on day 4, while no significant increases were seen in the groups treated with 1 μ M 10 μ M and 50 μ M IBA. The group treated with 50 μ M IBA did not show a significant difference on 7. and 10. days. All concentrations of IBA decreased AR formation in the early stage of the experiment, but 50 μ M IBA showed no significant differences in AR formation end of the experiment. After ten days, all the *lacs4-2* plants were taken out of the medium without

causing any damage to the roots and photographed (Figure 28, Figure 29, Figure 30, Figure 31).

The number of ARs in *lacs4-1* and *lacs4-2* mutants experienced a significant decrease when IBA was first applied. However, as the IBA concentration increased, the number of ARs also increased, reaching the level of the wild type by the 10th day of the highest concentration treatment. This situation can be explained in several ways:

- I. The possibility that the *LACS4* gene plays a role in regulating hormone levels was considered. The absence of *LACS4* may lead to an inability to process auxins like IBA normally within the plant. This could cause hormonal imbalances when IBA is applied, leading to a sudden drop in the rooting process.
- II. The *LACS4* gene plays a crucial role in lipid metabolism. The lack of *LACS4* may alter the cellular lipid composition, influencing cell membranes and signaling pathways. When IBA is applied, these metabolic disturbances might become more severe, adversely affecting the AR formation process.
- III. Related to the II. point, *LACS4* may affect signaling pathways that are crucial for AR formation. The absence of the gene might disrupt this signaling system, leading to adverse effects on AR formation when IBA is applied.
- IV. In *Arabidopsis* wild type, as the IBA concentration increased, the number of AR initially increased and then decreased. In contrast, the AR numbers in *lacs4* mutants increased with higher IBA concentrations (except for the initial decrease). This indicates that *lacs4* mutants are more resistant to high IBA concentrations in adventitious rooting.



Figure 28. *lacs4-2* photos on day 10 without IBA treatment.



Figure 29. *lacs4-2* photos on day 10 at 1 μ M IBA concentration



Figure 30. *lacs4-2* photos on day 10 at 10 μ M IBA concentration



Figure 31. *lacs4-2* photos on day 10 at 50 μ M IBA concentration

4.3.4. Adventitious root formation under different IBA concentrations

First, graphs comparing *A. thaliana* wild type with mutants for each treatment were prepared. Formation of AR in wild-type *A. thaliana* was recorded under different concentrations of IBA. *A. thaliana* wild type served as the control group. For the experimental groups receiving IBA treatments, plants had their roots removed before being transplanted into media containing specific concentrations of IBA (1 μ M, 10 μ M, and 50 μ M). Following transplantation, the number of AR was systematically recorded over a period of 10 days. To ensure the reliability and statistical significance of the results, a minimum of 20 plants were included in each treatment group. This comprehensive approach enabled a detailed analysis of the impact of different IBA concentrations on AR formation in *A. thaliana*.

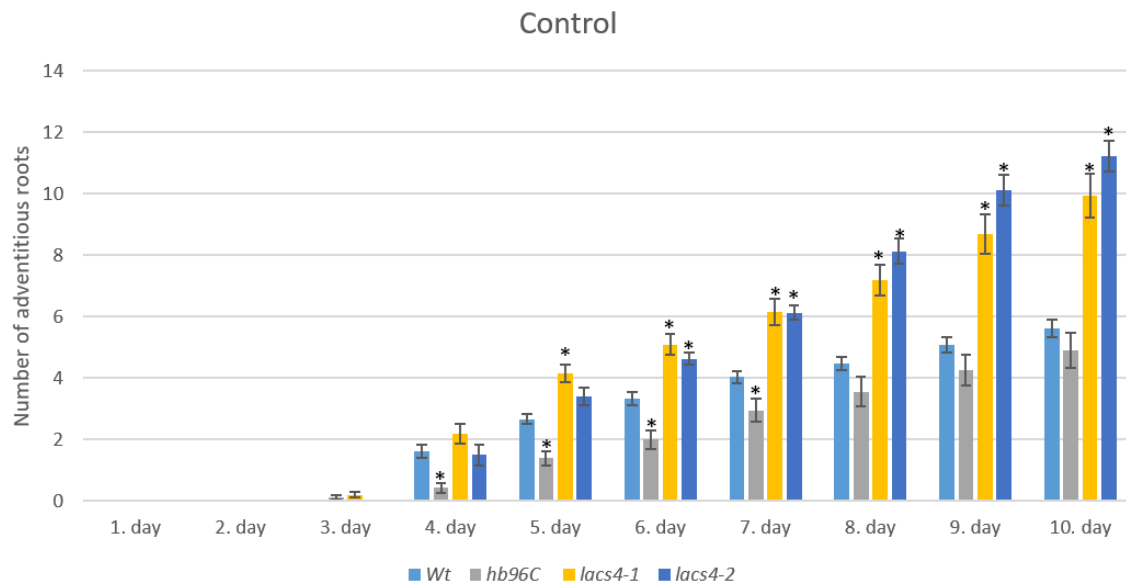


Figure 32. The graphic of wild-type and all mutant plants without IBA treatment. *A. thaliana* wild type (Wt) chosen as a control group. (*) shows significant difference compared to the control group at same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

As a result of the experiment, the AR of plants without IBA treatment were counted. The comparison of wild-type and all mutant plants without IBA treatment represent on Figure 32. The *lacs4-1* mutants generated significantly more AR than the wild type starting from the 5th day, and the *lacs4-2* mutants produced more AR starting from the 6th day. On the 4th, 5th, 6th and 7th days, the *hb96C* mutant of *A. thaliana* produced significantly fewer AR as an opposed to the wild type. After the 7th day, no significant difference was observed between the *hb96C* and the wild type. On the 5th day, no significant difference was observed between *lacs4-1* and *lacs4-2*.

HB24 is a member of the ZF-HD family and a transcription factor that can regulate the transformation of IBA to IAA (Wang et al., 2023). In the absence of this transcription factor, the number of AR increases more slowly compared to the wild type. However, this difference disappears from the 7th day onward. Depending on those information's hypothesized that the *HB24* gene has a positive effect on AR formation during the first 6 days of wounding, but this effect does not result in a significant difference in the following days.

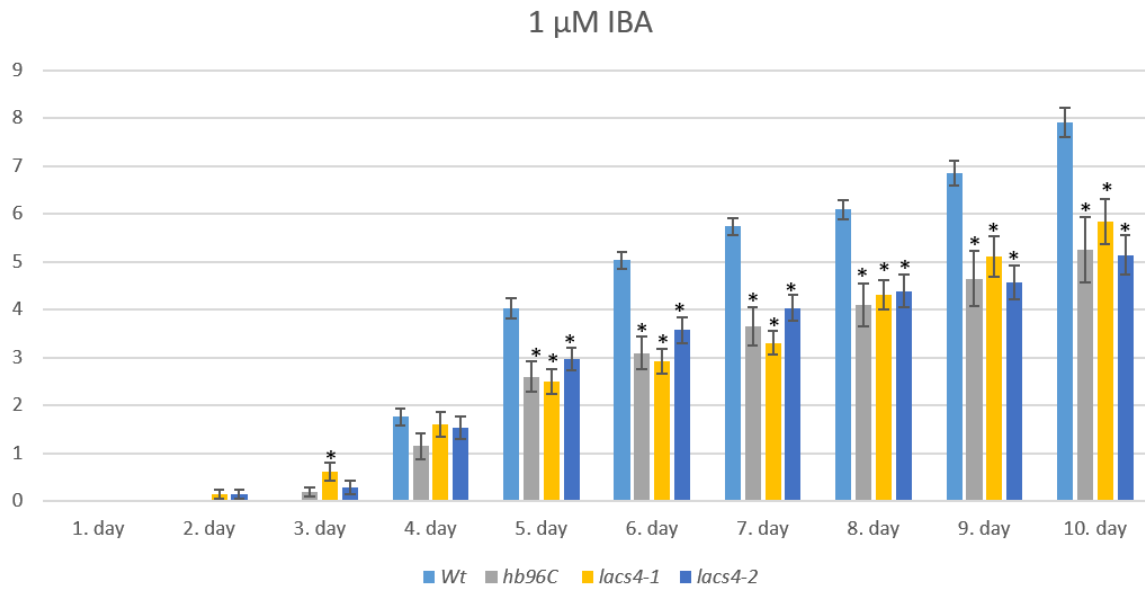


Figure 33. The graphic of wild-type and all mutant plants with 1 μ M IBA treatment. *A. thaliana* wild type which was treated with 1 μ M IBA chosen as a control group. (*) shows significant difference compared to the control group at same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

As a result of the experiment, the AR of plants treated with 1 μ M IBA were counted. The comparison of wild-type and all mutant plants with 1 μ M IBA treatment represent on Figure 33. From the 5th day onward, all mutants produced significantly less AR compared to the wild type.

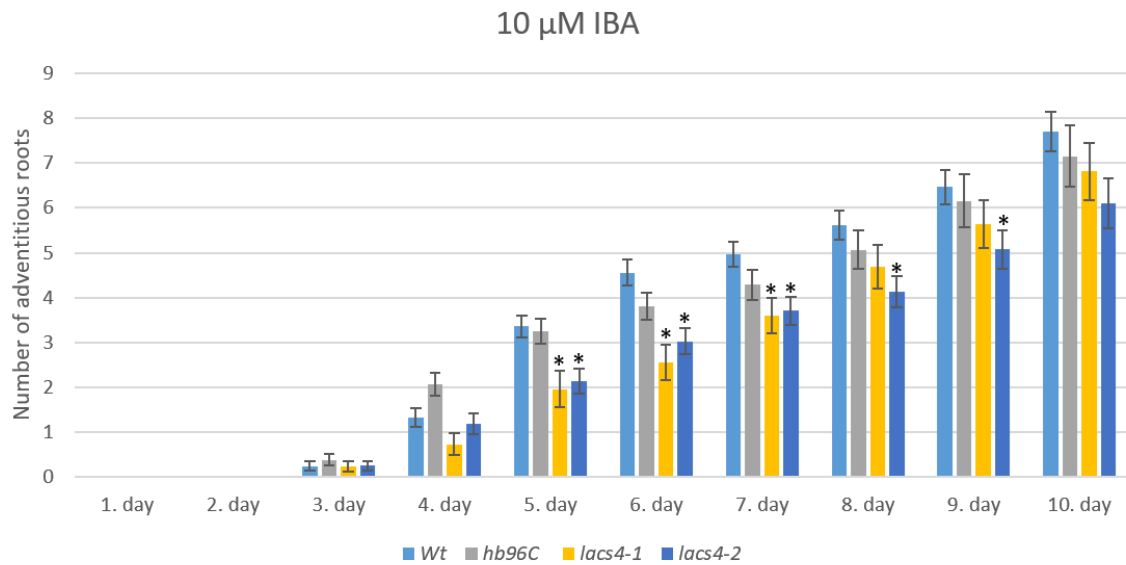


Figure 34. The comparison of wild-type and all mutant plants with 10 μ M IBA treatment. *A. thaliana* wild type which was treated with 10 μ M IBA chosen as a control group. (*) shows significant difference compared to the control group at same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

As a result of the obtained data, the AR of plants treated with 10 μ M IBA were counted. The comparison of wild-type and all mutant plants with 10 μ M IBA treatment shows on Figure 34. Throughout the experiment, the *hb96C* mutant showed no significant difference compared to the wild type. Both *lacs4-1* and *lacs4-2* had significantly less AR than the wild type starting from the 5th day, and this difference continued on the 6th and 7th days. On the 8th and 9th days, only *lacs4-2* showed a significant difference. No significant differences were observed on the 10th day.

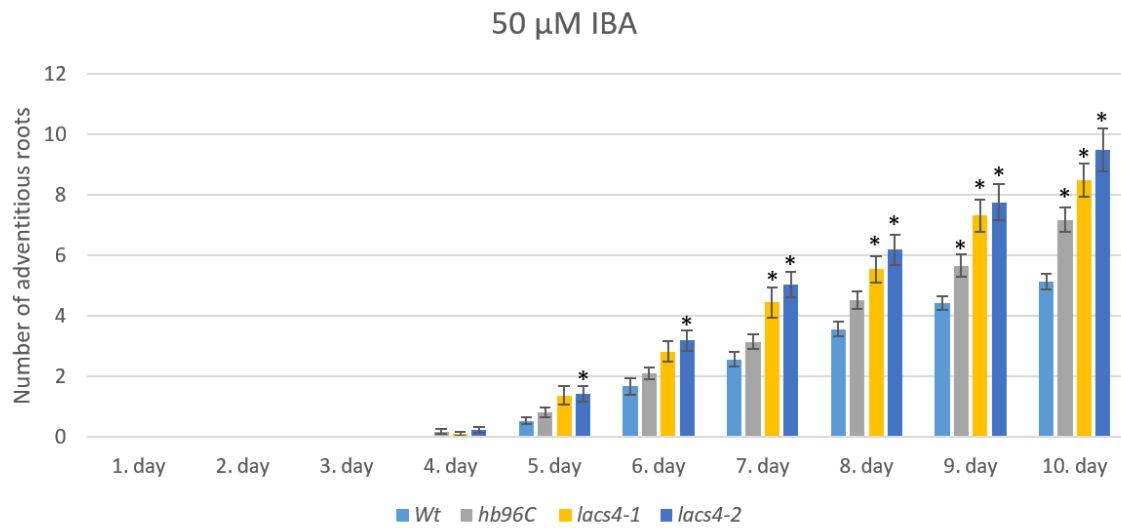


Figure 35. The graphic of wild-type and all mutant plants with 50 μ M IBA treatment. *A. thaliana* wild type which treated with 50 μ M IBA chosen as a control group. (*) shows a significant difference compared to the control group on the same day ($P < 0.05$) using Tukey or Dunnett T3 tests depending on the homogeneity of variance test. (Error bars show standard error)

As a result of the obtained data, the AR of plants treated with 50 μ M IBA were counted. The comparison of wild-type and all mutant plants with 50 μ M IBA treatment is shown in Figure 35. The *lacs4-2* mutant showed a significant difference from the wild type for the first time on the 5th day. Starting from the 7th day, both *lacs4-1* and *lacs4-2* had significantly more AR compared to the wild type, and this difference persisted until the end of the experiment. The *hb96C* mutant showed a significant difference only on the 9th and 10th days.

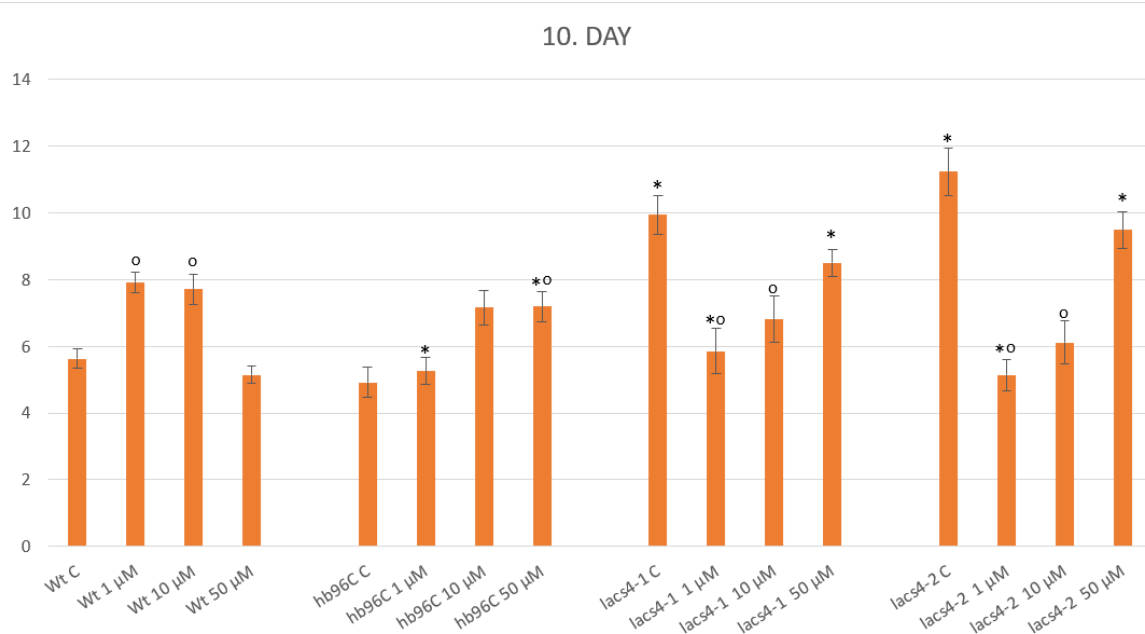


Figure 36. The average numbers of AR roots in plants on day 10 are as shown in the graph. (*) shows a significant difference with the *A. thaliana* (Col) control group at the corresponding concentration, and (o) shows a significant difference within mutants compared to its own IBA-untreated group. Tukey or Dunnett T3 tests were used depending on the homogeneity of variance test. ($P < 0.05$). (Error bars show standard error)

Compared to *A. thaliana* (Col), all other application concentrations of *A. thaliana* showed significant differences. When *A. thaliana* treated with 1 µM IBA was compared with mutants treated with 1 µM IBA, all mutants showed significant differences. However, at the 10 µM IBA concentration, only the *lacs4-1* and *lacs4-2* mutants exhibited significant differences compared to *A. thaliana*. This pattern was also observed at the 50 µM IBA concentration, where again, only *lacs4-1* and *lacs4-2* mutants showed significant differences.

For the *hb96C* group, only the 10 µM IBA treatment showed a significant difference when compared to the untreated *hb96C*. In the case of *lacs4-1*, significant differences were observed at both 1 µM and 10 µM IBA concentrations compared to the untreated group. Similarly, the *lacs4-2* group exhibited significant differences at 1 µM and 10 µM IBA concentrations when compared to the untreated *lacs4-2*.

Among the mutant groups, significant changes in root development were observed in the *hb96C*, *lacs4-1*, and *lacs4-2* groups. Especially, the *lacs4-1* and *lacs4-2* mutants showed notable responses to high IBA concentrations. The results in this graph illustrate the impact of IBA on adventitious root development and how various mutants respond to these effects.



CHAPTER FIVE

CONCLUSION

The effects of the *LACS4* and *HB24* genes on AR formation under different concentrations of IBA were investigated using *A. thaliana* wild type, *lacs4-1*, *lacs4-2*, and *hb96C* mutants. To test adventitious rooting 15 days old plants were cut from their hypocotyls and transferred into a medium that contained different concentrations of IBA. In these experiments, a total of three different concentrations were tested: control (without IBA application), 1 μ M, 10 μ M, and 50 μ M IBA applications. The plants were grown for 10 days in this medium and the AR numbers of each plant were recorded day by day.

This study shows that in the absence of the *HB24* gene (*HB24* knockout mutants), the adventitious rooting process slows down compared with *A. thaliana* wild type. Application of 10 μ M concentration of IBA showed a higher number of AR in *hb96C* during the 4th to 7th days compared to *hb96C* mutants without IBA application. 50 μ M concentrations of IBA only showed an increase in AR number on the 10th day when compared with *hb96C* without IBA application. These results show that *HB24* gene has a role in promoting AR formation following wounding. This thesis also showed that *HB24* mutants are continuing to increase their AR number different than wild type at 50 μ M IBA concentration. The reason for this could be that the IBA to IAA conversion in *hb96C* occurs less efficiently compared to the wild type, resulting in lower levels of IAA in *hb96C* mutants, which may not be sufficient to negatively impact AR formation as it does in the wild type. Previous studies have also shown that the *HB24* gene plays a role in primary root length at different IBA concentrations (H. Zhao et al., 2021).

In this thesis study, a significant decrease in AR number was observed when IBA was applied to *lacs4-1* and *lacs4-2* mutants. As the IBA concentration increased, the AR number also increased and reached approximately the same AR numbers as the *LACS4* mutants without IBA application. There are a few possible explanations for these results.

The *LACS4* gene is known to have many effects on plant growth and development due to its impact on seed oil accumulation, fertility, lipid metabolism and vegetative growth (Jawahir and Zolman, 2021; Jessen et al., 2015). So, the absence of *LACS4* may disrupt the regulation of hormone levels within the plant, causing hormonal imbalances and a sudden decrease in the rooting process when IBA is applied. Lipids play crucial roles in plants not only in growth and developmental processes such as seed germination, pollination, and organ differentiation but also in responses to biotic and abiotic stresses (Wallis and Browse, 2002; Welti and Wang, 2004). Furthermore, considering the role of the *LACS4* gene in lipid metabolism and stresses, its absence may negatively affect the AR formation process when IBA is administered by altering the cellular lipid composition and signal transduction pathways.

Previous studies have shown that *LACS4* mutants are resistant to IBA in primary root formation (Jawahir and Zolman, 2021). In the experiments conducted for this thesis, compared to *A. thaliana* wild types, the *LACS4* mutants showed an increase in AR number when treated with 50 μ M IBA, whereas wild types showed a decrease in AR number. While 50 μ M IBA slows down AR formation in wild-type plants, but IBA continues to have a positive effect on AR formation in *LACS4* mutants. Unlike previous studies, the data obtained in this thesis demonstrate that *LACS4* mutants are affected by IBA. However, while previous research focused on primary root formation, the data in this thesis are collected on AR formation. When addressing this contradiction, the differences between primary root and AR formation should be considered.

The growth and health of the roots are vital in the production of many agricultural plants, and AR formation plays an essential part in vegetative propagation. Many forestry and horticultural plants can be propagated via ARs, which is facilitated by the plants' sensitivity to wounds or cuts (Steffens and Rasmussen, 2016). ARs often emerge in response to stressful conditions such as injury or waterlogging (Geiss et al., 2018). For these reasons, investigating AR formation is of great importance in the agricultural field. This study has revealed the effects of the *LACS4* and *HB24* genes on adventitious rooting. The results of this thesis can help optimize plant production and propagation methods in agriculture. The effects of the *LACS4* and *HB24* genes on AR formation can improve plant propagation

processes and guide genetic modifications. Additionally, the result of this thesis could be helpful in biotechnology and tissue culture applications.

In the future, it would be beneficial to explore the interactions of hormones in more detail to better understand the roles of *LACS4* and *HB24* genes in adventitious rooting. Investigating the effects of other hormones (such as cytokinin and ethylene) on rooting could yield interesting results. Additionally, cross-species analyses to understand how these genes function in different plant species could provide valuable insights. Studying how plants respond to environmental stress, especially things like drought and high temperatures, is also very important. Such research could enhance our understanding of how hormones and genetic factors influence plant adaptation and rooting processes, potentially leading to the development of new strategies for improving rooting processes in agriculture.

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APPENDICES

APPENDIX 1

DESCRIPTIVES TABLE OF CONTROL GROUPS

Descriptives									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1.day	at control	28	,00	,000	,000	,00	,00	0	0
	hb96C control	23	,00	,000	,000	,00	,00	0	0
	laes4-1 control	30	,00	,000	,000	,00	,00	0	0
	laes4-2 control	22	,00	,000	,000	,00	,00	0	0
	Total	103	,00	,000	,000	,00	,00	0	0
2.day	at control	28	,00	,000	,000	,00	,00	0	0
	hb96C control	23	,00	,000	,000	,00	,00	0	0
	laes4-1 control	30	,00	,000	,000	,00	,00	0	0
	laes4-2 control	22	,00	,000	,000	,00	,00	0	0
	Total	103	,00	,000	,000	,00	,00	0	0
3.day	at control	28	,00	,000	,000	,00	,00	0	0
	hb96C control	23	,13	,344	,072	-,02	,28	0	1
	laes4-1 control	30	,20	,484	,088	,02	,38	0	2
	laes4-2 control	22	,00	,000	,000	,00	,00	0	0
	Total	103	,09	,316	,031	,03	,15	0	2
4.day	at control	28	1,61	1,100	,208	1,18	2,03	0	4
	hb96C control	23	,43	,788	,164	,09	,78	0	3
	laes4-1 control	30	2,20	1,769	,323	1,54	2,86	0	5
	laes4-2 control	22	1,50	1,566	,334	,81	2,19	0	5
	Total	103	1,50	1,501	,148	1,20	1,79	0	5
5.day	at control	28	2,64	,870	,164	2,31	2,98	1	5
	hb96C control	23	1,39	1,158	,241	,89	1,89	0	4
	laes4-1 control	30	4,17	1,577	,288	3,58	4,76	1	8
	laes4-2 control	22	3,41	1,368	,292	2,80	4,02	1	6
	Total	103	2,97	1,624	,160	2,65	3,29	0	8
6.day	at control	28	3,29	1,117	,211	2,85	3,72	1	6
	hb96C control	23	2,00	1,508	,314	1,35	2,65	0	6
	laes4-1 control	30	5,10	1,882	,344	4,40	5,80	2	10
	laes4-2 control	22	4,64	,953	,203	4,21	5,06	3	7
	Total	103	3,82	1,862	,183	3,45	4,18	0	10
7.day	at control	28	3,96	1,105	,209	3,54	4,39	2	6
	hb96C control	23	2,96	1,821	,380	2,17	3,74	0	7
	laes4-1 control	30	6,17	2,321	,424	5,30	7,03	2	12
	laes4-2 control	22	6,14	1,082	,231	5,66	6,62	4	8
	Total	103	4,84	2,168	,214	4,42	5,27	0	12
8.day	at control	28	4,39	1,227	,232	3,92	4,87	2	6
	hb96C control	23	3,57	2,313	,482	2,57	4,57	0	8
	laes4-1 control	30	7,20	2,759	,504	6,17	8,23	3	13
	laes4-2 control	22	8,14	1,859	,396	7,31	8,96	5	13
	Total	103	5,83	2,802	,276	5,28	6,37	0	13
9.day	at control	28	4,96	1,374	,260	4,43	5,50	2	8
	hb96C control	23	4,26	2,454	,512	3,20	5,32	2	10
	laes4-1 control	30	8,70	3,466	,633	7,41	9,99	4	15
	laes4-2 control	22	10,14	2,356	,502	9,09	11,18	7	14
	Total	103	7,00	3,487	,344	6,32	7,68	2	15
10.day	at control	28	5,50	1,599	,302	4,88	6,12	2	8
	hb96C control	23	4,91	2,762	,576	3,72	6,11	2	10
	laes4-1 control	30	9,93	3,877	,708	8,49	11,38	4	16
	laes4-2 control	22	11,23	2,409	,514	10,16	12,30	7	15
	Total	103	7,88	3,871	,381	7,13	8,64	2	16

APPENDIX 2

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF CONTROL GROUPS

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	.	3	.	.
3.day	15,304	3	99	,000
4.day	8,236	3	99	,000
5.day	2,685	3	99	,051
6.day	2,289	3	99	,083
7.day	5,660	3	99	,001
8.day	5,307	3	99	,002
9.day	9,270	3	99	,000
10.day	9,772	3	99	,000

APPENDIX 3

THE ANOVA TABLE OF CONTROL GROUPS

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	99	,000		
	Total	,000	102			
2.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	99	,000		
	Total	,000	102			
3.day	Between Groups	,805	3	,268	2,823	,043
	Within Groups	9,409	99	,095		
	Total	10,214	102			
4.day	Between Groups	41,117	3	13,706	7,193	,000
	Within Groups	188,631	99	1,905		
	Total	229,748	102			
5.day	Between Groups	107,521	3	35,840	21,985	,000
	Within Groups	161,392	99	1,630		
	Total	268,913	102			
6.day	Between Groups	147,990	3	49,330	23,764	,000
	Within Groups	205,505	99	2,076		
	Total	353,495	102			
7.day	Between Groups	192,836	3	64,279	22,198	,000
	Within Groups	286,678	99	2,896		
	Total	479,515	102			
8.day	Between Groups	349,133	3	116,378	25,505	,000
	Within Groups	451,722	99	4,563		
	Total	800,854	102			
9.day	Between Groups	591,710	3	197,237	30,120	,000
	Within Groups	648,290	99	6,548		
	Total	1240,000	102			
10.day	Between Groups	734,046	3	244,682	30,487	,000
	Within Groups	794,556	99	8,026		
	Total	1528,602	102			

APPENDIX 4

THE POST HOC TEST TABLE OF CONTROL GROUPS

Multiple Comparisons

Dependent Variable (I) V1 (J) V1			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
3. Tukey day HSD	at control	hb96C control	-,130	,087	,439	-,36	,10
		lacs4-1 control	-,200	,081	,071	-,41	,01
		lacs4-2 control	,000	,088	1,000	-,23	,23
	hb96C control	at control	,130	,087	,439	-,10	,36
		lacs4-1 control	-,070	,085	,848	-,29	,15
		lacs4-2 control	,130	,092	,491	-,11	,37
	lacs4-1 control	at control	,200	,081	,071	-,01	,41
		hb96C control	,070	,085	,848	-,15	,29
		lacs4-2 control	,200	,087	,102	-,03	,43
	lacs4-2 control	at control	,000	,088	1,000	-,23	,23
		hb96C control	-,130	,092	,491	-,37	,11
		lacs4-1 control	-,200	,087	,102	-,43	,03
	Dunnett T3	at control	-,130	,072	,383	-,34	,08
		lacs4-1 control	-,200	,088	,167	-,45	,05
		lacs4-2 control	,000	,000	.	,00	,00
	hb96C control	at control	,130	,072	,383	-,08	,34
		lacs4-1 control	-,070	,114	,990	-,38	,24
		lacs4-2 control	,130	,072	,383	-,08	,34
	lacs4-1 control	at control	,200	,088	,167	-,05	,45
		hb96C control	,070	,114	,990	-,24	,38
		lacs4-2 control	,200	,088	,167	-,05	,45
	lacs4-2 control	at control	,000	,000	.	,00	,00
		hb96C control	-,130	,072	,383	-,34	,08
		lacs4-1 control	-,200	,088	,167	-,45	,05
4. Tukey day HSD	at control	hb96C control	1,172*	,388	,017	,16	2,19
		lacs4-1 control	-,593	,363	,364	-1,54	,35
		lacs4-2 control	,107	,393	,993	-,92	1,13
	hb96C control	at control	-1,172*	,388	,017	-2,19	-,16
		lacs4-1 control	-1,765*	,383	,000	-2,76	-,77
		lacs4-2 control	-1,065	,412	,053	-2,14	,01

Continuation of APPENDIX 4

		lacs4-1 control	at control	,593	,363	,364	-,35	1,54
			hb96C control	1,765*	,383	,000	,77	2,76
			lacs4-2 control	,700	,387	,276	-,31	1,71
		lacs4-2 control	at control	-,107	,393	,993	-1,13	,92
			hb96C control	1,065	,412	,053	-,01	2,14
			lacs4-1 control	-,700	,387	,276	-1,71	,31
	Dunnett T3	at control	hb96C control	1,172*	,265	,000	,45	1,90
			lacs4-1 control	-,593	,384	,551	-1,64	,46
			lacs4-2 control	,107	,393	1,000	-,98	1,20
		hb96C control	at control	-1,172*	,265	,000	-1,90	-,45
			lacs4-1 control	-1,765*	,362	,000	-2,76	-,77
			lacs4-2 control	-1,065*	,372	,043	-2,11	-,02
		lacs4-1 control	at control	,593	,384	,551	-,46	1,64
			hb96C control	1,765*	,362	,000	,77	2,76
			lacs4-2 control	,700	,465	,578	-,57	1,97
		lacs4-2 control	at control	-,107	,393	1,000	-1,20	,98
			hb96C control	1,065*	,372	,043	,02	2,11
			lacs4-1 control	-,700	,465	,578	-1,97	,57
5.	Tukey day HSD	at control	hb96C control	1,252*	,359	,004	,31	2,19
			lacs4-1 control	-1,524*	,336	,000	-2,40	-,65
			lacs4-2 control	-,766	,364	,158	-1,72	,18
		hb96C control	at control	-1,252*	,359	,004	-2,19	-,31
			lacs4-1 control	-2,775*	,354	,000	-3,70	-1,85
			lacs4-2 control	-2,018*	,381	,000	-3,01	-1,02
		lacs4-1 control	at control	1,524*	,336	,000	,65	2,40
			hb96C control	2,775*	,354	,000	1,85	3,70
			lacs4-2 control	,758	,358	,156	-,18	1,69
		lacs4-2 control	at control	,766	,364	,158	-,18	1,72
			hb96C control	2,018*	,381	,000	1,02	3,01
			lacs4-1 control	-,758	,358	,156	-1,69	,18
	Dunnett T3	at control	hb96C control	1,252*	,292	,001	,45	2,06
			lacs4-1 control	-1,524*	,332	,000	-2,43	-,61
			lacs4-2 control	-,766	,335	,154	-1,70	,17
		hb96C control	at control	-1,252*	,292	,001	-2,06	-,45
			lacs4-1 control	-2,775*	,376	,000	-3,80	-1,75
			lacs4-2 control	-2,018*	,379	,000	-3,06	-,97

Continuation of APPENDIX 4

		lacs4-1 control	at control	1,524*	,332	,000	,61	2,43
			hb96C control	2,775*	,376	,000	1,75	3,80
		lacs4-2 control		,758	,410	,347	-,36	1,88
		lacs4-2 control	at control	,766	,335	,154	-,17	1,70
			hb96C control	2,018*	,379	,000	,97	3,06
		lacs4-1 control		-,758	,410	,347	-1,88	,36
6.	Tukey	at control	hb96C control	1,286*	,405	,011	,23	2,35
day	HSD		lacs4-1 control	-1,814*	,379	,000	-2,80	-,82
		lacs4-2 control		-1,351*	,410	,007	-2,42	-,28
		hb96C control	at control	-1,286*	,405	,011	-2,35	-,23
			lacs4-1 control	-3,100*	,399	,000	-4,14	-2,06
		lacs4-2 control		-2,636*	,430	,000	-3,76	-1,51
		lacs4-1 control	at control	1,814*	,379	,000	,82	2,80
			hb96C control	3,100*	,399	,000	2,06	4,14
		lacs4-2 control		,464	,404	,662	-,59	1,52
		lacs4-2 control	at control	1,351*	,410	,007	,28	2,42
			hb96C control	2,636*	,430	,000	1,51	3,76
		lacs4-1 control		-,464	,404	,662	-1,52	,59
	Dunnett	at control	hb96C control	1,286*	,379	,009	,24	2,33
	T3		lacs4-1 control	-1,814*	,403	,000	-2,92	-,71
		lacs4-2 control		-1,351*	,293	,000	-2,15	-,55
		hb96C control	at control	-1,286*	,379	,009	-2,33	-,24
			lacs4-1 control	-3,100*	,466	,000	-4,37	-1,83
		lacs4-2 control		-2,636*	,374	,000	-3,67	-1,60
		lacs4-1 control	at control	1,814*	,403	,000	,71	2,92
			hb96C control	3,100*	,466	,000	1,83	4,37
		lacs4-2 control		,464	,399	,813	-,63	1,56
		lacs4-2 control	at control	1,351*	,293	,000	,55	2,15
			hb96C control	2,636*	,374	,000	1,60	3,67
		lacs4-1 control		-,464	,399	,813	-1,56	,63
7.	Tukey	at control	hb96C control	1,008	,479	,159	-,24	2,26
day	HSD		lacs4-1 control	-2,202*	,447	,000	-3,37	-1,03
		lacs4-2 control		-2,172*	,485	,000	-3,44	-,91
		hb96C control	at control	-1,008	,479	,159	-2,26	,24
			lacs4-1 control	-3,210*	,472	,000	-4,44	-1,98
		lacs4-2 control		-3,180*	,507	,000	-4,51	-1,85

Continuation of APPENDIX 4

		lacs4-1 control	at control	2,202*	,447	,000	1,03	3,37
			hb96C control	3,210*	,472	,000	1,98	4,44
			lacs4-2 control	,030	,478	1,000	-1,22	1,28
		lacs4-2 control	at control	2,172*	,485	,000	,91	3,44
			hb96C control	3,180*	,507	,000	1,85	4,51
			lacs4-1 control	-,030	,478	1,000	-1,28	1,22
	Dunnett T3	at control	hb96C control	1,008	,433	,142	-,20	2,21
			lacs4-1 control	-2,202*	,472	,000	-3,50	-,90
			lacs4-2 control	-2,172*	,311	,000	-3,03	-1,32
		hb96C control	at control	-1,008	,433	,142	-2,21	,20
			lacs4-1 control	-3,210*	,569	,000	-4,76	-1,66
			lacs4-2 control	-3,180*	,444	,000	-4,41	-1,95
		lacs4-1 control	at control	2,202*	,472	,000	,90	3,50
			hb96C control	3,210*	,569	,000	1,66	4,76
			lacs4-2 control	,030	,482	1,000	-1,30	1,36
		lacs4-2 control	at control	2,172*	,311	,000	1,32	3,03
			hb96C control	3,180*	,444	,000	1,95	4,41
			lacs4-1 control	-,030	,482	1,000	-1,36	1,30
8.	Tukey day HSD	at control	hb96C control	,828	,601	,517	-,74	2,40
			lacs4-1 control	-2,807*	,561	,000	-4,27	-1,34
			lacs4-2 control	-3,744*	,609	,000	-5,33	-2,15
		hb96C control	at control	-,828	,601	,517	-2,40	,74
			lacs4-1 control	-3,635*	,592	,000	-5,18	-2,09
			lacs4-2 control	-4,571*	,637	,000	-6,24	-2,91
		lacs4-1 control	at control	2,807*	,561	,000	1,34	4,27
			hb96C control	3,635*	,592	,000	2,09	5,18
			lacs4-2 control	-,936	,600	,405	-2,50	,63
		lacs4-2 control	at control	3,744*	,609	,000	2,15	5,33
			hb96C control	4,571*	,637	,000	2,91	6,24
			lacs4-1 control	,936	,600	,405	-,63	2,50
	Dunnett T3	at control	hb96C control	,828	,535	,552	-,67	2,32
			lacs4-1 control	-2,807*	,555	,000	-4,34	-1,28
			lacs4-2 control	-3,744*	,459	,000	-5,02	-2,47
		hb96C control	at control	-,828	,535	,552	-2,32	,67
			lacs4-1 control	-3,635*	,697	,000	-5,54	-1,73
			lacs4-2 control	-4,571*	,624	,000	-6,29	-2,85

Continuation of APPENDIX 4

9. day	Tukey HSD	lacs4-1 control	at control	2,807*	,555	,000	1,28	4,34
			hb96C control	3,635*	,697	,000	1,73	5,54
			lacs4-2 control	-,936	,641	,611	-2,69	,82
		lacs4-2 control	at control	3,744*	,459	,000	2,47	5,02
			hb96C control	4,571*	,624	,000	2,85	6,29
			lacs4-1 control	,936	,641	,611	-,82	2,69
		hb96C control	at control	,703	,720	,763	-1,18	2,59
			lacs4-1 control	-3,736*	,672	,000	-5,49	-1,98
			lacs4-2 control	-5,172*	,729	,000	-7,08	-3,27
		lacs4-1 control	at control	-,703	,720	,763	-2,59	1,18
			lacs4-1 control	-4,439*	,709	,000	-6,29	-2,59
			lacs4-2 control	-5,875*	,763	,000	-7,87	-3,88
		lacs4-2 control	at control	3,736*	,672	,000	1,98	5,49
			hb96C control	4,439*	,709	,000	2,59	6,29
			lacs4-2 control	-1,436	,718	,195	-3,31	,44
		lacs4-1 control	at control	5,172*	,729	,000	3,27	7,08
			hb96C control	5,875*	,763	,000	3,88	7,87
			lacs4-1 control	1,436	,718	,195	-,44	3,31
10. day	Tukey HSD	at control	hb96C control	,703	,574	,773	-,90	2,30
			lacs4-1 control	-3,736*	,684	,000	-5,63	-1,84
			lacs4-2 control	-5,172*	,565	,000	-6,75	-3,59
		hb96C control	at control	-,703	,574	,773	-2,30	,90
			lacs4-1 control	-4,439*	,814	,000	-6,66	-2,22
			lacs4-2 control	-5,875*	,717	,000	-7,85	-3,90
		lacs4-1 control	at control	3,736*	,684	,000	1,84	5,63
			hb96C control	4,439*	,814	,000	2,22	6,66
			lacs4-2 control	-1,436	,808	,390	-3,65	,77
		lacs4-2 control	at control	5,172*	,565	,000	3,59	6,75
			hb96C control	5,875*	,717	,000	3,90	7,85
			lacs4-1 control	1,436	,808	,390	-,77	3,65
		at control	hb96C control	,587	,797	,882	-1,50	2,67
			lacs4-1 control	-4,433*	,744	,000	-6,38	-2,49
			lacs4-2 control	-5,727*	,807	,000	-7,84	-3,62
		hb96C control	at control	-,587	,797	,882	-2,67	1,50
			lacs4-1 control	-5,020*	,785	,000	-7,07	-2,97
			lacs4-2 control	-6,314*	,845	,000	-8,52	-4,11

Continuation of APPENDIX 4

Dunnett T3	lacs4-1 control	at control	4,433*	,744	,000	2,49	6,38
		hb96C control	5,020*	,785	,000	2,97	7,07
		lacs4-2 control	-1,294	,795	,368	-3,37	,78
	lacs4-2 control	at control	5,727*	,807	,000	3,62	7,84
		hb96C control	6,314*	,845	,000	4,11	8,52
		lacs4-1 control	1,294	,795	,368	-,78	3,37
	at control	hb96C control	,587	,650	,931	-1,22	2,40
		lacs4-1 control	-4,433*	,770	,000	-6,56	-2,31
		lacs4-2 control	-5,727*	,596	,000	-7,38	-4,07
	hb96C control	at control	-,587	,650	,931	-2,40	1,22
		lacs4-1 control	-5,020*	,913	,000	-7,51	-2,53
		lacs4-2 control	-6,314*	,772	,000	-8,44	-4,19
	lacs4-1 control	at control	4,433*	,770	,000	2,31	6,56
		hb96C control	5,020*	,913	,000	2,53	7,51
		lacs4-2 control	-1,294	,875	,597	-3,69	1,10
	lacs4-2 control	at control	5,727*	,596	,000	4,07	7,38
		hb96C control	6,314*	,772	,000	4,19	8,44
		lacs4-1 control	1,294	,875	,597	-1,10	3,69

The mean difference is significant at the 0.05 level

APPENDIX 5

THE DESCRIPTIVES TABLE OF GROUPS THAT ARE TREATED WITH 1 μ M IBA

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1.day	at 1 micromolar	34	,00	,000	,000	,00	,00	0	0
	hb96C 1 micromolar	20	,00	,000	,000	,00	,00	0	0
	laes4-1 1 micromolar	26	,00	,000	,000	,00	,00	0	0
	laes4-2 1 micromolar	28	,00	,000	,000	,00	,00	0	0
	Total	108	,00	,000	,000	,00	,00	0	0
2.day	at 1 micromolar	34	,00	,000	,000	,00	,00	0	0
	hb96C 1 micromolar	20	,00	,000	,000	,00	,00	0	0
	laes4-1 1 micromolar	26	,15	,464	,091	-,03	,34	0	2
	laes4-2 1 micromolar	28	,14	,525	,099	-,06	,35	0	2
	Total	108	,07	,354	,034	,01	,14	0	2
3.day	at 1 micromolar	34	,00	,000	,000	,00	,00	0	0
	hb96C 1 micromolar	20	,20	,410	,092	,01	,39	0	1
	laes4-1 1 micromolar	26	,62	,983	,193	,22	1,01	0	4
	laes4-2 1 micromolar	28	,29	,713	,135	,01	,56	0	3
	Total	108	,26	,661	,064	,13	,39	0	4
4.day	at 1 micromolar	34	1,76	1,046	,179	1,40	2,13	0	4
	hb96C 1 micromolar	20	1,15	1,226	,274	,58	1,72	0	4
	laes4-1 1 micromolar	26	1,62	1,329	,261	1,08	2,15	0	5
	laes4-2 1 micromolar	28	1,54	1,261	,238	1,05	2,02	0	4
	Total	108	1,56	1,210	,116	1,32	1,79	0	5
5.day	at 1 micromolar	34	4,03	1,243	,213	3,60	4,46	1	7
	hb96C 1 micromolar	20	2,60	1,429	,320	1,93	3,27	0	5
	laes4-1 1 micromolar	26	2,50	1,364	,267	1,95	3,05	0	5
	laes4-2 1 micromolar	28	2,96	1,232	,233	2,49	3,44	0	5
	Total	108	3,12	1,439	,138	2,85	3,39	0	7
6.day	at 1 micromolar	34	5,03	,969	,166	4,69	5,37	3	7
	hb96C 1 micromolar	20	3,10	1,518	,340	2,39	3,81	0	6
	laes4-1 1 micromolar	26	2,92	1,294	,254	2,40	3,45	1	5
	laes4-2 1 micromolar	28	3,57	1,425	,269	3,02	4,12	0	6
	Total	108	3,79	1,541	,148	3,49	4,08	0	7
7.day	at 1 micromolar	34	5,74	1,053	,181	5,37	6,10	4	8
	hb96C 1 micromolar	20	3,65	1,755	,393	2,83	4,47	0	6
	laes4-1 1 micromolar	26	3,31	1,225	,240	2,81	3,80	1	5
	laes4-2 1 micromolar	28	4,04	1,427	,270	3,48	4,59	2	6
	Total	108	4,32	1,657	,159	4,01	4,64	0	8
8.day	at 1 micromolar	34	6,09	1,215	,208	5,66	6,51	4	9
	hb96C 1 micromolar	20	4,10	1,971	,441	3,18	5,02	1	7
	laes4-1 1 micromolar	26	4,31	1,569	,308	3,67	4,94	2	8
	laes4-2 1 micromolar	28	4,39	1,812	,342	3,69	5,10	2	9
	Total	108	4,85	1,808	,174	4,51	5,20	1	9
9.day	at 1 micromolar	34	6,85	1,459	,250	6,34	7,36	4	11
	hb96C 1 micromolar	20	4,65	2,560	,573	3,45	5,85	1	10
	laes4-1 1 micromolar	26	5,12	2,179	,427	4,24	6,00	2	10
	laes4-2 1 micromolar	28	4,57	1,814	,343	3,87	5,27	2	9
	Total	108	5,44	2,176	,209	5,02	5,85	1	11
10. day	at 1 micromolar	34	7,91	1,815	,311	7,28	8,55	6	13
	hb96C 1 micromolar	20	5,25	3,041	,680	3,83	6,67	1	11
	laes4-1 1 micromolar	26	5,85	2,395	,470	4,88	6,81	3	11
	laes4-2 1 micromolar	28	5,14	2,206	,417	4,29	6,00	2	9
	Total	108	6,20	2,579	,248	5,71	6,70	1	13

APPENDIX 6

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF GROUPS TREATED WITH 1 μ M IBA

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	7,577	3	104	,000
3.day	17,160	3	104	,000
4.day	,569	3	104	,637
5.day	,547	3	104	,651
6.day	3,391	3	104	,021
7.day	4,376	3	104	,006
8.day	5,465	3	104	,002
9.day	5,102	3	104	,002
10.day	4,062	3	104	,009

APPENDIX 7

THE ANOVA TEST TABLE OF GROUPS THAT ARE TREATED WITH 1 μ M IBA

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000		
	Within Groups	,000	104	,000		
	Total	,000	107			
2.day	Between Groups	,594	3	,198	1,608	,192
	Within Groups	12,813	104	,123		
	Total	13,407	107			
3.day	Between Groups	5,673	3	1,891	4,788	,004
	Within Groups	41,068	104	,395		
	Total	46,741	107			
4.day	Between Groups	4,881	3	1,627	1,115	,347
	Within Groups	151,786	104	1,459		
	Total	156,667	107			
5.day	Between Groups	44,200	3	14,733	8,645	,000
	Within Groups	177,235	104	1,704		
	Total	221,435	107			
6.day	Between Groups	82,628	3	27,543	16,705	,000
	Within Groups	171,474	104	1,649		
	Total	254,102	107			
7.day	Between Groups	105,987	3	35,329	19,578	,000
	Within Groups	187,670	104	1,805		
	Total	293,657	107			
8.day	Between Groups	76,877	3	25,626	9,771	,000
	Within Groups	272,752	104	2,623		
	Total	349,630	107			
9.day	Between Groups	104,221	3	34,740	8,980	,000
	Within Groups	402,326	104	3,869		
	Total	506,546	107			
10.day	Between Groups	152,220	3	50,740	9,435	,000
	Within Groups	559,298	104	5,378		
	Total	711,519	107			

APPENDIX 8

THE POST HOC TEST TABLE OF GROUPS TREATED WITH 1 μ M IBA

Multiple Comparisons								
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
2.day	Tukey HSD	at 1 μ M	hb96C 1 μ M	,000	,099	1,000	-,26	,26
			lacs4-1 1 μ M	-,154	,091	,338	-,39	,08
			lacs4-2 1 μ M	-,143	,090	,386	-,38	,09
		hb96C 1 μ M	at 1 μ M	,000	,099	1,000	-,26	,26
			lacs4-1 1 μ M	-,154	,104	,457	-,43	,12
			lacs4-2 1 μ M	-,143	,103	,508	-,41	,13
		lacs4-1 1 μ M	at 1 μ M	,154	,091	,338	-,08	,39
			hb96C 1 μ M	,154	,104	,457	-,12	,43
			lacs4-2 1 μ M	,011	,096	,999	-,24	,26
		lacs4-2 1 μ M	at 1 μ M	,143	,090	,386	-,09	,38
			hb96C 1 μ M	,143	,103	,508	-,13	,41
			lacs4-1 1 μ M	-,011	,096	,999	-,26	,24
	Dunnett T3	at 1 μ M	hb96C 1 μ M	,000	,000	.	,00	,00
			lacs4-1 1 μ M	-,154	,091	,458	-,41	,10
			lacs4-2 1 μ M	-,143	,099	,628	-,42	,14
		hb96C 1 μ M	at 1 μ M	,000	,000	.	,00	,00
			lacs4-1 1 μ M	-,154	,091	,458	-,41	,10
			lacs4-2 1 μ M	-,143	,099	,628	-,42	,14
		lacs4-1 1 μ M	at 1 μ M	,154	,091	,458	-,10	,41
			hb96C 1 μ M	,154	,091	,458	-,10	,41
			lacs4-2 1 μ M	,011	,135	1,000	-,36	,38
		lacs4-2 1 μ M	at 1 μ M	,143	,099	,628	-,14	,42
			hb96C 1 μ M	,143	,099	,628	-,14	,42
			lacs4-1 1 μ M	-,011	,135	1,000	-,38	,36
3.day	Tukey HSD	at 1 μ M	hb96C 1 μ M	-,200	,177	,672	-,66	,26
			lacs4-1 1 μ M	-,615*	,164	,002	-1,04	-,19
			lacs4-2 1 μ M	-,286	,160	,288	-,70	,13
		hb96C 1 μ M	at 1 μ M	,200	,177	,672	-,26	,66
			lacs4-1 1 μ M	-,415	,187	,124	-,90	,07
			lacs4-2 1 μ M	-,086	,184	,966	-,57	,39

Continuation of APPENDIX 8

			lacs4-1 1 μ M	at 1 μ M	,615*	,164	,002	,19	1,04
				hb96C 1 μ M	,415	,187	,124	-,07	,90
				lacs4-2 1 μ M	,330	,171	,223	-,12	,78
			lacs4-2 1 μ M	at 1 μ M	,286	,160	,288	-,13	,70
				hb96C 1 μ M	,086	,184	,966	-,39	,57
				lacs4-1 1 μ M	-,330	,171	,223	-,78	,12
	Dunnett T3	at 1 μ M		hb96C 1 μ M	-,200	,092	,213	-,47	,07
				lacs4-1 1 μ M	-,615*	,193	,022	-1,16	-,07
				lacs4-2 1 μ M	-,286	,135	,223	-,67	,09
		hb96C 1 μ M		at 1 μ M	,200	,092	,213	-,07	,47
				lacs4-1 1 μ M	-,415	,213	,298	-1,01	,18
				lacs4-2 1 μ M	-,086	,163	,995	-,53	,36
		lacs4-1 1 μ M		at 1 μ M	,615*	,193	,022	,07	1,16
				hb96C 1 μ M	,415	,213	,298	-,18	1,01
				lacs4-2 1 μ M	,330	,235	,654	-,32	,98
		lacs4-2 1 μ M		at 1 μ M	,286	,135	,223	-,09	,67
				hb96C 1 μ M	,086	,163	,995	-,36	,53
				lacs4-1 1 μ M	-,330	,235	,654	-,98	,32
4.day	Tukey HSD	at 1 μ M		hb96C 1 μ M	,615	,340	,277	-,27	1,50
				lacs4-1 1 μ M	,149	,315	,965	-,67	,97
				lacs4-2 1 μ M	,229	,308	,880	-,58	1,03
		hb96C 1 μ M		at 1 μ M	-,615	,340	,277	-1,50	,27
				lacs4-1 1 μ M	-,465	,359	,568	-1,40	,47
				lacs4-2 1 μ M	-,386	,354	,696	-1,31	,54
		lacs4-1 1 μ M		at 1 μ M	-,149	,315	,965	-,97	,67
				hb96C 1 μ M	,465	,359	,568	-,47	1,40
				lacs4-2 1 μ M	,080	,329	,995	-,78	,94
		lacs4-2 1 μ M		at 1 μ M	-,229	,308	,880	-1,03	,58
				hb96C 1 μ M	,386	,354	,696	-,54	1,31
				lacs4-1 1 μ M	-,080	,329	,995	-,94	,78
	Dunnett T3	at 1 μ M		hb96C 1 μ M	,615	,328	,336	-,30	1,53
				lacs4-1 1 μ M	,149	,316	,997	-,72	1,02
				lacs4-2 1 μ M	,229	,298	,968	-,59	1,04
		hb96C 1 μ M		at 1 μ M	-,615	,328	,336	-1,53	,30
				lacs4-1 1 μ M	-,465	,378	,770	-1,51	,58
				lacs4-2 1 μ M	-,386	,363	,866	-1,39	,61

Continuation of APPENDIX 8

5.day	Tukey HSD	lacs4-1 1 μ M	at 1 μ M	-,149	,316	,997	-1,02	,72
			hb96C 1 μ M	,465	,378	,770	-,58	1,51
			lacs4-2 1 μ M	,080	,353	1,000	-,89	1,04
		lacs4-2 1 μ M	at 1 μ M	-,229	,298	,968	-1,04	,59
			hb96C 1 μ M	,386	,363	,866	-,61	1,39
			lacs4-1 1 μ M	-,080	,353	1,000	-1,04	,89
		hb96C 1 μ M	at 1 μ M	1,429*	,368	,001	,47	2,39
			lacs4-1 1 μ M	1,529*	,340	,000	,64	2,42
			lacs4-2 1 μ M	1,065*	,333	,010	,20	1,93
		lacs4-1 1 μ M	at 1 μ M	-1,429*	,368	,001	-2,39	-,47
			lacs4-1 1 μ M	,100	,388	,994	-,91	1,11
			lacs4-2 1 μ M	-,364	,382	,776	-1,36	,63
		lacs4-2 1 μ M	at 1 μ M	-1,529*	,340	,000	-2,42	-,64
			hb96C 1 μ M	-,100	,388	,994	-1,11	,91
			lacs4-2 1 μ M	-,464	,356	,561	-1,39	,46
		lacs4-2 1 μ M	at 1 μ M	-1,065*	,333	,010	-1,93	-,20
			hb96C 1 μ M	,364	,382	,776	-,63	1,36
			lacs4-1 1 μ M	,464	,356	,561	-,46	1,39
6.day	Dunnett T3	at 1 μ M	hb96C 1 μ M	1,429*	,384	,004	,36	2,50
			lacs4-1 1 μ M	1,529*	,342	,000	,60	2,46
			lacs4-2 1 μ M	1,065*	,316	,008	,21	1,92
		hb96C 1 μ M	at 1 μ M	-1,429*	,384	,004	-2,50	-,36
			lacs4-1 1 μ M	,100	,417	1,000	-1,05	1,25
			lacs4-2 1 μ M	-,364	,395	,925	-1,46	,73
		lacs4-1 1 μ M	at 1 μ M	-1,529*	,342	,000	-2,46	-,60
			hb96C 1 μ M	-,100	,417	1,000	-1,25	1,05
			lacs4-2 1 μ M	-,464	,355	,718	-1,43	,50
		lacs4-2 1 μ M	at 1 μ M	-1,065*	,316	,008	-1,92	-,21
			hb96C 1 μ M	,364	,395	,925	-,73	1,46
			lacs4-1 1 μ M	,464	,355	,718	-,50	1,43
6.day	Tukey HSD	at 1 μ M	hb96C 1 μ M	1,929*	,362	,000	,98	2,87
			lacs4-1 1 μ M	2,106*	,335	,000	1,23	2,98
			lacs4-2 1 μ M	1,458*	,328	,000	,60	2,31
		hb96C 1 μ M	at 1 μ M	-1,929*	,362	,000	-2,87	-,98
			lacs4-1 1 μ M	,177	,382	,967	-,82	1,17
			lacs4-2 1 μ M	-,471	,376	,594	-1,45	,51
		lacs4-1 1 μ M	at 1 μ M	-2,106*	,335	,000	-2,98	-1,23
			hb96C 1 μ M	-,177	,382	,967	-1,17	,82
			lacs4-2 1 μ M	-,648	,350	,254	-1,56	,26

Continuation of APPENDIX 8

				lacs4-2 1 μ M	at 1 μ M	-1,458*	,328	,000	-2,31	-,60
					hb96C 1 μ M	,471	,376	,594	-,51	1,45
					lacs4-1 1 μ M	,648	,350	,254	-,26	1,56
Dunnett T3	at 1 μ M	hb96C 1 μ M			lacs4-1 1 μ M	1,929*	,378	,000	,87	2,99
					lacs4-2 1 μ M	2,106*	,303	,000	1,27	2,94
					lacs4-2 1 μ M	1,458*	,316	,000	,59	2,33
	hb96C 1 μ M	at 1 μ M			lacs4-1 1 μ M	-1,929*	,378	,000	-2,99	-,87
					lacs4-2 1 μ M	,177	,424	,999	-1,00	1,35
					lacs4-2 1 μ M	-,471	,433	,853	-1,67	,73
	lacs4-1 1 μ M	at 1 μ M			hb96C 1 μ M	-2,106*	,303	,000	-2,94	-1,27
					lacs4-2 1 μ M	-,177	,424	,999	-1,35	1,00
					lacs4-2 1 μ M	-,648	,370	,406	-1,66	,36
	lacs4-2 1 μ M	at 1 μ M			hb96C 1 μ M	-1,458*	,316	,000	-2,33	-,59
					lacs4-1 1 μ M	,471	,433	,853	-,73	1,67
					lacs4-1 1 μ M	,648	,370	,406	-,36	1,66
7.day	Tukey HSD	at 1 μ M	hb96C 1 μ M		lacs4-1 1 μ M	2,085*	,379	,000	1,10	3,07
					lacs4-2 1 μ M	2,428*	,350	,000	1,51	3,34
					lacs4-2 1 μ M	1,700*	,343	,000	,80	2,59
		hb96C 1 μ M	at 1 μ M		lacs4-1 1 μ M	-2,085*	,379	,000	-3,07	-1,10
					lacs4-2 1 μ M	,342	,400	,827	-,70	1,39
					lacs4-2 1 μ M	-,386	,393	,761	-1,41	,64
		lacs4-1 1 μ M	at 1 μ M		hb96C 1 μ M	-2,428*	,350	,000	-3,34	-1,51
					lacs4-2 1 μ M	-,342	,400	,827	-1,39	,70
					lacs4-2 1 μ M	-,728	,366	,198	-1,68	,23
		lacs4-2 1 μ M	at 1 μ M		hb96C 1 μ M	-1,700*	,343	,000	-2,59	-,80
					lacs4-1 1 μ M	,386	,393	,761	-,64	1,41
					lacs4-1 1 μ M	,728	,366	,198	-,23	1,68
	Dunnett T3	at 1 μ M	hb96C 1 μ M		lacs4-1 1 μ M	2,085*	,432	,000	,87	3,31
					lacs4-2 1 μ M	2,428*	,301	,000	1,61	3,25
					lacs4-2 1 μ M	1,700*	,325	,000	,81	2,59
		hb96C 1 μ M	at 1 μ M		lacs4-1 1 μ M	-2,085*	,432	,000	-3,31	-,87
					lacs4-2 1 μ M	,342	,460	,972	-,94	1,63
					lacs4-2 1 μ M	-,386	,476	,958	-1,71	,94

Continuation of APPENDIX 8

lacs4-1 1 μ M at 1 μ M				-2,428*	,301	,000	-3,25	-1,61
hb96C 1 μ M				-,342	,460	,972	-1,63	,94
lacs4-2 1 μ M				-,728	,361	,254	-1,71	,26
lacs4-2 1 μ M at 1 μ M				-1,700*	,325	,000	-2,59	-,81
hb96C 1 μ M				,386	,476	,958	-,94	1,71
lacs4-1 1 μ M				,728	,361	,254	-,26	1,71
8.day	Tukey HSD	at 1 μ M	hb96C 1 μ M	1,988*	,456	,000	,80	3,18
			lacs4-1 1 μ M	1,781*	,422	,000	,68	2,88
			lacs4-2 1 μ M	1,695*	,413	,000	,62	2,77
		hb96C 1 μ M	at 1 μ M	-1,988*	,456	,000	-3,18	-,80
			lacs4-1 1 μ M	-,208	,482	,973	-1,47	1,05
			lacs4-2 1 μ M	-,293	,474	,926	-1,53	,95
		lacs4-1 1 μ M	at 1 μ M	-1,781*	,422	,000	-2,88	-,68
			hb96C 1 μ M	,208	,482	,973	-1,05	1,47
			lacs4-2 1 μ M	-,085	,441	,997	-1,24	1,07
	Dunnett T3	at 1 μ M	hb96C 1 μ M	-1,695*	,413	,000	-2,77	-,62
			hb96C 1 μ M	,293	,474	,926	-,95	1,53
			lacs4-1 1 μ M	,085	,441	,997	-1,07	1,24
		hb96C 1 μ M	at 1 μ M	1,988*	,487	,002	,61	3,36
			lacs4-1 1 μ M	1,781*	,372	,000	,76	2,80
			lacs4-2 1 μ M	1,695*	,401	,001	,60	2,80
		lacs4-1 1 μ M	at 1 μ M	-1,988*	,487	,002	-3,36	-,61
			lacs4-1 1 μ M	-,208	,537	,999	-1,70	1,28
			lacs4-2 1 μ M	-,293	,558	,995	-1,84	1,25
9.day	Tukey HSD	at 1 μ M	hb96C 1 μ M	-1,781*	,372	,000	-2,80	-,76
			hb96C 1 μ M	,208	,537	,999	-1,28	1,70
			lacs4-2 1 μ M	-,085	,460	1,000	-1,34	1,17
		hb96C 1 μ M	at 1 μ M	-1,695*	,401	,001	-2,80	-,60
			hb96C 1 μ M	,293	,558	,995	-1,25	1,84
			lacs4-1 1 μ M	,085	,460	1,000	-1,17	1,34
		lacs4-1 1 μ M	at 1 μ M	2,203*	,554	,001	,76	3,65
			lacs4-1 1 μ M	1,738*	,512	,005	,40	3,08
			lacs4-2 1 μ M	2,282*	,502	,000	,97	3,59
		hb96C 1 μ M	at 1 μ M	-2,203*	,554	,001	-3,65	-,76
			lacs4-1 1 μ M	-,465	,585	,856	-1,99	1,06
			lacs4-2 1 μ M	,079	,576	,999	-1,42	1,58
		lacs4-1 1 μ M	at 1 μ M	-1,738*	,512	,005	-3,08	-,40
			hb96C 1 μ M	,465	,585	,856	-1,06	1,99
			lacs4-2 1 μ M	,544	,536	,741	-,85	1,94

Continuation of APPENDIX 8

				lacs4-2 1 μ M	at 1 μ M	-2,282*	,502	,000	-3,59	-,97
					hb96C 1 μ M	-,079	,576	,999	-1,58	1,42
					lacs4-1 1 μ M	-,544	,536	,741	-1,94	,85
Dunnett T3	at 1 μ M				hb96C 1 μ M	2,203*	,625	,009	,43	3,97
					lacs4-1 1 μ M	1,738*	,495	,007	,37	3,10
					lacs4-2 1 μ M	2,282*	,424	,000	1,12	3,44
	hb96C 1 μ M				at 1 μ M	-2,203*	,625	,009	-3,97	-,43
					lacs4-1 1 μ M	-,465	,714	,986	-2,44	1,51
					lacs4-2 1 μ M	,079	,667	1,000	-1,79	1,94
	lacs4-1 1 μ M				at 1 μ M	-1,738*	,495	,007	-3,10	-,37
					hb96C 1 μ M	,465	,714	,986	-1,51	2,44
					lacs4-2 1 μ M	,544	,548	,899	-,95	2,04
	lacs4-2 1 μ M				at 1 μ M	-2,282*	,424	,000	-3,44	-1,12
					hb96C 1 μ M	-,079	,667	1,000	-1,94	1,79
					lacs4-1 1 μ M	-,544	,548	,899	-2,04	,95
10.day	Tukey HSD	at 1 μ M			hb96C 1 μ M	2,662*	,654	,001	,96	4,37
					lacs4-1 1 μ M	2,066*	,604	,005	,49	3,64
					lacs4-2 1 μ M	2,769*	,592	,000	1,22	4,31
		hb96C 1 μ M			at 1 μ M	-2,662*	,654	,001	-4,37	-,96
					lacs4-1 1 μ M	-,596	,690	,823	-2,40	1,20
					lacs4-2 1 μ M	,107	,679	,999	-1,67	1,88
		lacs4-1 1 μ M			at 1 μ M	-2,066*	,604	,005	-3,64	-,49
					hb96C 1 μ M	,596	,690	,823	-1,20	2,40
					lacs4-2 1 μ M	,703	,632	,682	-,95	2,35
		lacs4-2 1 μ M			at 1 μ M	-2,769*	,592	,000	-4,31	-1,22
					hb96C 1 μ M	-,107	,679	,999	-1,88	1,67
					lacs4-1 1 μ M	-,703	,632	,682	-2,35	,95
		Dunnett T3	at 1 μ M		hb96C 1 μ M	2,662*	,748	,008	,55	4,77
					lacs4-1 1 μ M	2,066*	,563	,004	,52	3,61
					lacs4-2 1 μ M	2,769*	,520	,000	1,35	4,19
		hb96C 1 μ M	at 1 μ M		hb96C 1 μ M	-2,662*	,748	,008	-4,77	-,55
					lacs4-1 1 μ M	-,596	,826	,976	-2,89	1,70
					lacs4-2 1 μ M	,107	,798	1,000	-2,12	2,33
		lacs4-1 1 μ M	at 1 μ M		hb96C 1 μ M	-2,066*	,563	,004	-3,61	-,52
					hb96C 1 μ M	,596	,826	,976	-1,70	2,89
					lacs4-2 1 μ M	,703	,628	,837	-1,01	2,42

Continuation of APPENDIX 8

lacs4-2 1 µM	at 1 µM	-2,769*	,520	,000	-4,19	-1,35
	hb96C 1 µM	-,107	,798	1,000	-2,33	2,12
	lacs4-1 1 µM	-,703	,628	,837	-2,42	1,01

The mean difference is significant at the 0.05 level



APPENDIX 9

THE DESCRIPTIVES TABLE OF GROUPS THAT ARE TREATED WITH 10 μ M IBA

Descriptives									
	N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum	
					Lower Bound	Upper Bound			
1.day									
at 10 micromolar	33	,00	,000	,000	,00	,00	0	0	
hb96 10 micromolar	32	,00	,000	,000	,00	,00	0	0	
laes4-1 10 micromolar	22	,00	,000	,000	,00	,00	0	0	
laes4-2 10 micromolar	37	,00	,000	,000	,00	,00	0	0	
Total	124	,00	,000	,000	,00	,00	0	0	
2.day									
at 10 micromolar	33	,00	,000	,000	,00	,00	0	0	
hb96 10 micromolar	32	,00	,000	,000	,00	,00	0	0	
laes4-1 10 micromolar	22	,00	,000	,000	,00	,00	0	0	
laes4-2 10 micromolar	37	,00	,000	,000	,00	,00	0	0	
Total	124	,00	,000	,000	,00	,00	0	0	
3.day									
at 10 micromolar	33	,24	,614	,107	,02	,46	0	2	
hb96 10 micromolar	32	,38	,707	,125	,12	,63	0	2	
laes4-1 10 micromolar	22	,23	,528	,113	-,01	,46	0	2	
laes4-2 10 micromolar	37	,24	,548	,090	,06	,43	0	2	
Total	124	,27	,603	,054	,17	,38	0	2	
4.day									
at 10 micromolar	33	1,36	1,220	,212	,93	1,80	0	4	
hb96 10 micromolar	32	2,06	1,480	,262	1,53	2,60	0	5	
laes4-1 10 micromolar	22	,73	1,120	,239	,23	1,22	0	4	
laes4-2 10 micromolar	37	1,19	1,175	,193	,80	1,58	0	4	
Total	124	1,38	1,329	,119	1,14	1,62	0	5	
5.day									
at 10 micromolar	33	3,33	1,429	,249	2,83	3,84	0	6	
hb96 10 micromolar	32	3,25	1,626	,288	2,66	3,84	0	6	
laes4-1 10 micromolar	22	1,95	1,889	,403	1,12	2,79	0	5	
laes4-2 10 micromolar	37	2,14	1,398	,230	1,67	2,60	0	6	
Total	124	2,71	1,661	,149	2,41	3,01	0	6	
6.day									
at 10 micromolar	33	4,58	1,659	,289	3,99	5,16	1	9	
hb96 10 micromolar	32	3,81	1,712	,303	3,20	4,43	1	8	
laes4-1 10 micromolar	22	2,55	1,870	,399	1,72	3,37	0	6	
laes4-2 10 micromolar	37	3,03	1,481	,243	2,53	3,52	0	7	
Total	124	3,56	1,805	,162	3,24	3,88	0	9	
7.day									
at 10 micromolar	33	5,00	1,620	,282	4,43	5,57	2	9	
hb96 10 micromolar	32	4,28	1,922	,340	3,59	4,97	1	9	
laes4-1 10 micromolar	22	3,59	1,843	,393	2,77	4,41	1	7	
laes4-2 10 micromolar	37	3,70	1,579	,260	3,18	4,23	1	8	
Total	124	4,18	1,799	,162	3,86	4,50	1	9	
8.day									
at 10 micromolar	33	5,67	1,898	,330	4,99	6,34	3	11	
hb96 10 micromolar	32	5,06	2,409	,426	4,19	5,93	1	10	
laes4-1 10 micromolar	22	4,68	2,276	,485	3,67	5,69	1	10	
laes4-2 10 micromolar	37	4,14	1,702	,280	3,57	4,70	1	8	
Total	124	4,88	2,117	,190	4,50	5,26	1	11	
9.day									
at 10 micromolar	33	6,52	2,252	,392	5,72	7,31	3	11	
hb96 10 micromolar	32	6,16	3,313	,586	4,96	7,35	1	14	
laes4-1 10 micromolar	22	5,64	2,536	,541	4,51	6,76	2	10	
laes4-2 10 micromolar	37	5,08	2,165	,356	4,36	5,80	2	10	
Total	124	5,84	2,624	,236	5,37	6,31	1	14	
10.day									
at 10 micromolar	33	7,79	2,583	,450	6,87	8,70	4	14	
hb96 10 micromolar	32	7,16	3,903	,690	5,75	8,56	1	16	
laes4-1 10 micromolar	22	6,82	3,002	,640	5,49	8,15	3	13	
laes4-2 10 micromolar	37	6,11	2,757	,453	5,19	7,03	2	13	
Total	124	6,95	3,123	,280	6,40	7,51	1	16	

APPENDIX 10

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF GROUPS TREATED WITH 10 μ M IBA

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	.	3	.	.
3.day	1,390	3	120	,249
4.day	1,845	3	120	,143
5.day	2,025	3	120	,114
6.day	1,258	3	120	,292
7.day	1,020	3	120	,386
8.day	1,185	3	120	,318
9.day	3,200	3	120	,026
10.day	2,872	3	120	,039

APPENDIX 11

THE ANOVA TEST TABLE OF GROUPS THAT ARE TREATED WITH 10 μ M IBA

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	120	,000		
	Total	,000	123			
2.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	120	,000		
	Total	,000	123			
3.day	Between Groups	,442	3	,147	,400	,753
	Within Groups	44,235	120	,369		
	Total	44,677	123			
4.day	Between Groups	25,635	3	8,545	5,353	,002
	Within Groups	191,551	120	1,596		
	Total	217,185	123			
5.day	Between Groups	46,936	3	15,645	6,416	,000
	Within Groups	292,612	120	2,438		
	Total	339,548	123			
6.day	Between Groups	69,242	3	23,081	8,358	,000
	Within Groups	331,363	120	2,761		
	Total	400,605	123			
7.day	Between Groups	38,580	3	12,860	4,292	,006
	Within Groups	359,517	120	2,996		
	Total	398,097	123			
8.day	Between Groups	42,880	3	14,293	3,374	,021
	Within Groups	508,305	120	4,236		
	Total	551,185	123			
9.day	Between Groups	40,465	3	13,488	2,007	,117
	Within Groups	806,309	120	6,719		
	Total	846,774	123			
10.day	Between Groups	51,135	3	17,045	1,781	,154
	Within Groups	1148,574	120	9,571		
	Total	1199,710	123			

APPENDIX 12

THE POST HOC TEST TABLE OF GROUPS TREATED WITH 10 µM IBA

Multiple Comparisons										
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval			
							Lower Bound	Upper Bound		
3.day Tukey HSD	at 10 μM	hb96 10 μM		-,133	,151	,815	-,53	,26		
			lacs4-1 10 μM		,015	,167	1,000	-,42	,45	
			lacs4-2 10 μM		-,001	,145	1,000	-,38	,38	
		hb96 10 μM	at 10 μM		,133	,151	,815	-,26	,53	
				lacs4-1 10 μM		,148	,168	,816	-,29	,59
				lacs4-2 10 μM		,132	,147	,805	-,25	,51
		lacs4-1 10 μM	at 10 μM		-,015	,167	1,000	-,45	,42	
				hb96 10 μM		-,148	,168	,816	-,59	,29
				lacs4-2 10 μM		-,016	,163	1,000	-,44	,41
		lacs4-2 10 μM	at 10 μM		,001	,145	1,000	-,38	,38	
				hb96 10 μM		-,132	,147	,805	-,51	,25
				lacs4-1 10 μM		,016	,163	1,000	-,41	,44
	Dunnett T3	at 10 μM	hb96 10 μM		-,133	,164	,960	-,58	,31	
				lacs4-1 10 μM		,015	,155	1,000	-,41	,44
				lacs4-2 10 μM		-,001	,140	1,000	-,38	,38
		hb96 10 μM	at 10 μM		,133	,164	,960	-,31	,58	
				lacs4-1 10 μM		,148	,168	,941	-,31	,61
				lacs4-2 10 μM		,132	,154	,948	-,29	,55
		lacs4-1 10 μM	at 10 μM		-,015	,155	1,000	-,44	,41	
				hb96 10 μM		-,148	,168	,941	-,61	,31
				lacs4-2 10 μM		-,016	,144	1,000	-,41	,38
		lacs4-2 10 μM	at 10 μM		,001	,140	1,000	-,38	,38	
				hb96 10 μM		-,132	,154	,948	-,55	,29
				lacs4-1 10 μM		,016	,144	1,000	-,38	,41
4.day Tukey HSD	at 10 μM	hb96 10 μM		-,699	,313	,121	-1,52	,12		
		lacs4-1 10 μM		,636	,348	,264	-,27	1,54		
		lacs4-2 10 μM		,174	,303	,939	-,61	,96		
	hb96 10 μM	at 10 μM		,699	,313	,121	-,12	1,52		
		lacs4-1 10 μM		1,335*	,350	,001	,42	2,25		
		lacs4-2 10 μM		,873*	,305	,025	,08	1,67		

Continuation of APPENDIX 12

			lacs4-1 10 µM	at 10 µM	-,636	,348	,264	-1,54	,27
				hb96 10 µM	-1,335*	,350	,001	-2,25	-,42
				lacs4-2 10 µM	-,462	,340	,528	-1,35	,42
			lacs4-2 10 µM	at 10 µM	-,174	,303	,939	-,96	,61
				hb96 10 µM	-,873*	,305	,025	-1,67	-,08
				lacs4-1 10 µM	,462	,340	,528	-,42	1,35
	Dunnett T3	at 10 µM		hb96 10 µM	-,699	,337	,224	-1,61	,22
				lacs4-1 10 µM	,636	,320	,268	-,24	1,51
				lacs4-2 10 µM	,174	,287	,990	-,60	,95
		hb96 10 µM		at 10 µM	,699	,337	,224	-,22	1,61
				lacs4-1 10 µM	1,335*	,354	,003	,37	2,30
				lacs4-2 10 µM	,873	,325	,054	-,01	1,76
		lacs4-1 10 µM		at 10 µM	-,636	,320	,268	-1,51	,24
				hb96 10 µM	-1,335*	,354	,003	-2,30	-,37
				lacs4-2 10 µM	-,462	,307	,580	-1,30	,38
		lacs4-2 10 µM		at 10 µM	-,174	,287	,990	-,95	,60
				hb96 10 µM	-,873	,325	,054	-1,76	,01
				lacs4-1 10 µM	,462	,307	,580	-,38	1,30
5.day	Tukey HSD	at 10 µM		hb96 10 µM	,083	,387	,996	-,93	1,09
				lacs4-1 10 µM	1,379*	,430	,009	,26	2,50
				lacs4-2 10 µM	1,198*	,374	,009	,22	2,17
		hb96 10 µM		at 10 µM	-,083	,387	,996	-1,09	,93
				lacs4-1 10 µM	1,295*	,432	,017	,17	2,42
				lacs4-2 10 µM	1,115*	,377	,019	,13	2,10
		lacs4-1 10 µM		at 10 µM	-1,379*	,430	,009	-2,50	-,26
				hb96 10 µM	-1,295*	,432	,017	-2,42	-,17
				lacs4-2 10 µM	-,181	,420	,973	-1,28	,91
		lacs4-2 10 µM		at 10 µM	-1,198*	,374	,009	-2,17	-,22
				hb96 10 µM	-1,115*	,377	,019	-2,10	-,13
				lacs4-1 10 µM	,181	,420	,973	-,91	1,28
	Dunnett T3	at 10 µM		hb96 10 µM	,083	,380	1,000	-,95	1,12
				lacs4-1 10 µM	1,379*	,473	,035	,07	2,69
				lacs4-2 10 µM	1,198*	,339	,004	,28	2,11
		hb96 10 µM		at 10 µM	-,083	,380	1,000	-1,12	,95
				lacs4-1 10 µM	1,295	,495	,070	-,07	2,66
				lacs4-2 10 µM	1,115*	,368	,021	,12	2,11
		lacs4-1 10 µM		at 10 µM	-1,379*	,473	,035	-2,69	-,07
				hb96 10 µM	-1,295	,495	,070	-2,66	,07
				lacs4-2 10 µM	-,181	,464	,999	-1,47	1,11

Continuation of APPENDIX 12

6.day	Tukey HSD	lacs4-2 10 μ M	at 10 μ M	-1,198*	,339	,004	-2,11	-,28
			hb96 10 μ M	-1,115*	,368	,021	-2,11	-,12
			lacs4-1 10 μ M	,181	,464	,999	-1,11	1,47
		at 10 μ M	hb96 10 μ M	,763	,412	,255	-,31	1,84
			lacs4-1 10 μ M	2,030*	,457	,000	,84	3,22
			lacs4-2 10 μ M	1,549*	,398	,001	,51	2,59
		hb96 10 μ M	at 10 μ M	-,763	,412	,255	-1,84	,31
			lacs4-1 10 μ M	1,267*	,460	,034	,07	2,47
			lacs4-2 10 μ M	,785	,401	,210	-,26	1,83
	Dunnett T3	lacs4-1 10 μ M	at 10 μ M	-2,030*	,457	,000	-3,22	-,84
			hb96 10 μ M	-1,267*	,460	,034	-2,47	-,07
			lacs4-2 10 μ M	-,482	,447	,705	-1,65	,68
		lacs4-2 10 μ M	at 10 μ M	-1,549*	,398	,001	-2,59	-,51
			hb96 10 μ M	-,785	,401	,210	-1,83	,26
			lacs4-1 10 μ M	,482	,447	,705	-,68	1,65
		at 10 μ M	hb96 10 μ M	,763	,418	,358	-,37	1,90
			lacs4-1 10 μ M	2,030*	,492	,001	,67	3,39
			lacs4-2 10 μ M	1,549*	,378	,001	,53	2,57
	Dunnett T3	hb96 10 μ M	at 10 μ M	-,763	,418	,358	-1,90	,37
			lacs4-1 10 μ M	1,267	,501	,086	-,11	2,64
			lacs4-2 10 μ M	,785	,388	,248	-,27	1,84
		lacs4-1 10 μ M	at 10 μ M	-2,030*	,492	,001	-3,39	-,67
			hb96 10 μ M	-1,267	,501	,086	-2,64	,11
			lacs4-2 10 μ M	-,482	,467	,881	-1,78	,81
		lacs4-2 10 μ M	at 10 μ M	-1,549*	,378	,001	-2,57	-,53
			hb96 10 μ M	-,785	,388	,248	-1,84	,27
			lacs4-1 10 μ M	,482	,467	,881	-,81	1,78
7.day	Tukey HSD	at 10 μ M	hb96 10 μ M	,719	,429	,342	-,40	1,84
			lacs4-1 10 μ M	1,409*	,476	,019	,17	2,65
			lacs4-2 10 μ M	1,297*	,414	,012	,22	2,38
		hb96 10 μ M	at 10 μ M	-,719	,429	,342	-1,84	,40
			lacs4-1 10 μ M	,690	,479	,477	-,56	1,94
			lacs4-2 10 μ M	,579	,418	,511	-,51	1,67
		lacs4-1 10 μ M	at 10 μ M	-1,409*	,476	,019	-2,65	-,17
			hb96 10 μ M	-,690	,479	,477	-1,94	,56
			lacs4-2 10 μ M	-,112	,466	,995	-1,33	1,10
		lacs4-2 10 μ M	at 10 μ M	-1,297*	,414	,012	-2,38	-,22
			hb96 10 μ M	-,579	,418	,511	-1,67	,51
			lacs4-1 10 μ M	,112	,466	,995	-1,10	1,33

Continuation of APPENDIX 12

Dunnett T3	at 10 μM	hb96 10 μM	,719	,442	,489	-,48	1,92
		lacs4-1 10 μM	1,409*	,484	,034	,08	2,74
		lacs4-2 10 μM	1,297*	,383	,007	,26	2,34
	hb96 10 μM	at 10 μM	-,719	,442	,489	-1,92	,48
		lacs4-1 10 μM	,690	,519	,705	-,73	2,11
		lacs4-2 10 μM	,579	,428	,688	-,58	1,74
	lacs4-1 10 μM	at 10 μM	-1,409*	,484	,034	-2,74	-,08
		hb96 10 μM	-,690	,519	,705	-2,11	,73
		lacs4-2 10 μM	-,112	,471	1,000	-1,41	1,19
	lacs4-2 10 μM	at 10 μM	-1,297*	,383	,007	-2,34	-,26
		hb96 10 μM	-,579	,428	,688	-1,74	,58
		lacs4-1 10 μM	,112	,471	1,000	-1,19	1,41
8.day Tukey HSD	at 10 μM	hb96 10 μM	,604	,511	,639	-,73	1,93
		lacs4-1 10 μM	,985	,566	,308	-,49	2,46
		lacs4-2 10 μM	1,532*	,493	,012	,25	2,82
	hb96 10 μM	at 10 μM	-,604	,511	,639	-1,93	,73
		lacs4-1 10 μM	,381	,570	,909	-1,10	1,87
		lacs4-2 10 μM	,927	,497	,248	-,37	2,22
	lacs4-1 10 μM	at 10 μM	-,985	,566	,308	-2,46	,49
		hb96 10 μM	-,381	,570	,909	-1,87	1,10
		lacs4-2 10 μM	,547	,554	,757	-,90	1,99
	lacs4-2 10 μM	at 10 μM	-1,532*	,493	,012	-2,82	-,25
		hb96 10 μM	-,927	,497	,248	-2,22	,37
		lacs4-1 10 μM	-,547	,554	,757	-1,99	,90
	Dunnett T3	at 10 μM	,604	,539	,836	-,86	2,07
		lacs4-1 10 μM	,985	,587	,459	-,64	2,61
		lacs4-2 10 μM	1,532*	,433	,005	,36	2,70
	hb96 10 μM	at 10 μM	-,604	,539	,836	-2,07	,86
		lacs4-1 10 μM	,381	,646	,992	-1,39	2,15
		lacs4-2 10 μM	,927	,510	,362	-,46	2,32
	lacs4-1 10 μM	at 10 μM	-,985	,587	,459	-2,61	,64
		hb96 10 μM	-,381	,646	,992	-2,15	1,39
		lacs4-2 10 μM	,547	,560	,904	-1,01	2,10
	lacs4-2 10 μM	at 10 μM	-1,532*	,433	,005	-2,70	-,36
		hb96 10 μM	-,927	,510	,362	-2,32	,46
		lacs4-1 10 μM	-,547	,560	,904	-2,10	1,01

Continuation of APPENDIX 12

9.day	Tukey HSD	at 10 µM	hb96 10 µM	,359	,643	,944	-1,32	2,03
			lacs4-1 10 µM	,879	,713	,608	-,98	2,74
			lacs4-2 10 µM	1,434	,621	,101	-,18	3,05
		hb96 10 µM	at 10 µM	-,359	,643	,944	-2,03	1,32
			lacs4-1 10 µM	,520	,718	,887	-1,35	2,39
			lacs4-2 10 µM	1,075	,626	,319	-,56	2,71
		lacs4-1 10 µM	at 10 µM	-,879	,713	,608	-2,74	,98
			hb96 10 µM	-,520	,718	,887	-2,39	1,35
			lacs4-2 10 µM	,555	,698	,856	-1,26	2,37
		lacs4-2 10 µM	at 10 µM	-1,434	,621	,101	-3,05	,18
			hb96 10 µM	-1,075	,626	,319	-2,71	,56
			lacs4-1 10 µM	-,555	,698	,856	-2,37	1,26
	Dunnett T3	at 10 µM	hb96 10 µM	,359	,705	,996	-1,56	2,28
			lacs4-1 10 µM	,879	,668	,714	-,96	2,72
			lacs4-2 10 µM	1,434*	,529	,050	,00	2,87
		hb96 10 µM	at 10 µM	-,359	,705	,996	-2,28	1,56
			lacs4-1 10 µM	,520	,797	,986	-1,66	2,70
			lacs4-2 10 µM	1,075	,685	,532	-,80	2,95
		lacs4-1 10 µM	at 10 µM	-,879	,668	,714	-2,72	,96
			hb96 10 µM	-,520	,797	,986	-2,70	1,66
			lacs4-2 10 µM	,555	,647	,946	-1,23	2,34
		lacs4-2 10 µM	at 10 µM	-1,434*	,529	,050	-2,87	,00
			hb96 10 µM	-1,075	,685	,532	-2,95	,80
			lacs4-1 10 µM	-,555	,647	,946	-2,34	1,23
10.day	Tukey HSD	at 10 µM	hb96 10 µM	,632	,768	,844	-1,37	2,63
			lacs4-1 10 µM	,970	,852	,666	-1,25	3,19
			lacs4-2 10 µM	1,680	,741	,111	-,25	3,61
		hb96 10 µM	at 10 µM	-,632	,768	,844	-2,63	1,37
			lacs4-1 10 µM	,338	,857	,979	-1,89	2,57
			lacs4-2 10 µM	1,048	,747	,500	-,90	2,99
		lacs4-1 10 µM	at 10 µM	-,970	,852	,666	-3,19	1,25
			hb96 10 µM	-,338	,857	,979	-2,57	1,89
			lacs4-2 10 µM	,710	,833	,829	-1,46	2,88
		lacs4-2 10 µM	at 10 µM	-1,680	,741	,111	-3,61	,25
			hb96 10 µM	-1,048	,747	,500	-2,99	,90
			lacs4-1 10 µM	-,710	,833	,829	-2,88	1,46

Continuation of APPENDIX 12

Dunnett T3	at 10 μ M	hb96 10 μ M	,632	,824	,968	-1,61	2,88
		lacs4-1 10 μ M	,970	,782	,764	-1,19	3,13
		lacs4-2 10 μ M	1,680	,638	,061	-,05	3,41
	hb96 10 μ M	at 10 μ M	-,632	,824	,968	-2,88	1,61
		lacs4-1 10 μ M	,338	,941	,999	-2,23	2,91
		lacs4-2 10 μ M	1,048	,825	,745	-1,20	3,30
	lacs4-1 10 μ M	at 10 μ M	-,970	,782	,764	-3,13	1,19
		hb96 10 μ M	-,338	,941	,999	-2,91	2,23
		lacs4-2 10 μ M	,710	,784	,931	-1,45	2,87
	lacs4-2 10 μ M	at 10 μ M	-1,680	,638	,061	-3,41	,05
		hb96 10 μ M	-1,048	,825	,745	-3,30	1,20
		lacs4-1 10 μ M	-,710	,784	,931	-2,87	1,45

The mean difference is significant at the 0.05 level

APPENDIX 13

THE DESCRIPTIVES TABLE OF GROUPS THAT ARE TREATED WITH 50 µM IBA

Descriptives									
		N	Mean	Std. Deviation	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1.day	at 50 micromolar	28	,00	,000	,000	,00	,00	0	0
	hb96C 50 micromolar	27	,00	,000	,000	,00	,00	0	0
	laes4-1 50 micromolar	22	,00	,000	,000	,00	,00	0	0
	laes4-2 50 micromolar	21	,00	,000	,000	,00	,00	0	0
	Total	98	,00	,000	,000	,00	,00	0	0
2.day	at 50 micromolar	28	,00	,000	,000	,00	,00	0	0
	hb96C 50 micromolar	27	,00	,000	,000	,00	,00	0	0
	laes4-1 50 micromolar	22	,00	,000	,000	,00	,00	0	0
	laes4-2 50 micromolar	21	,00	,000	,000	,00	,00	0	0
	Total	98	,00	,000	,000	,00	,00	0	0
3.day	at 50 micromolar	28	,00	,000	,000	,00	,00	0	0
	hb96C 50 micromolar	27	,00	,000	,000	,00	,00	0	0
	laes4-1 50 micromolar	22	,00	,000	,000	,00	,00	0	0
	laes4-2 50 micromolar	21	,00	,000	,000	,00	,00	0	0
	Total	98	,00	,000	,000	,00	,00	0	0
4.day	at 50 micromolar	28	,00	,000	,000	,00	,00	0	0
	hb96C 50 micromolar	27	,19	,483	,093	-,01	,38	0	2
	laes4-1 50 micromolar	22	,09	,294	,063	-,04	,22	0	1
	laes4-2 50 micromolar	21	,24	,436	,095	,04	,44	0	1
	Total	98	,12	,359	,036	,05	,19	0	2
5.day	at 50 micromolar	28	,54	,637	,120	,29	,78	0	2
	hb96C 50 micromolar	27	,81	,834	,160	,48	1,14	0	3
	laes4-1 50 micromolar	22	1,36	1,432	,305	,73	2,00	0	5
	laes4-2 50 micromolar	21	1,43	1,248	,272	,86	2,00	0	5
	Total	98	,99	1,098	,111	,77	1,21	0	5
6.day	at 50 micromolar	28	1,68	1,442	,272	1,12	2,24	0	5
	hb96C 50 micromolar	27	2,11	1,050	,202	1,70	2,53	0	4
	laes4-1 50 micromolar	22	2,82	1,593	,340	2,11	3,52	0	5
	laes4-2 50 micromolar	21	3,19	1,504	,328	2,51	3,88	1	7
	Total	98	2,38	1,496	,151	2,08	2,68	0	7
7.day	at 50 micromolar	28	2,57	1,230	,232	2,09	3,05	0	5
	hb96C 50 micromolar	27	3,15	1,292	,249	2,64	3,66	1	6
	laes4-1 50 micromolar	22	4,45	2,365	,504	3,41	5,50	1	9
	laes4-2 50 micromolar	21	5,05	1,910	,417	4,18	5,92	2	9
	Total	98	3,68	1,951	,197	3,29	4,07	0	9
8.day	at 50 micromolar	28	3,57	1,260	,238	3,08	4,06	1	5
	hb96C 50 micromolar	27	4,52	1,528	,294	3,91	5,12	1	7
	laes4-1 50 micromolar	22	5,55	2,087	,445	4,62	6,47	2	10
	laes4-2 50 micromolar	21	6,19	2,272	,496	5,16	7,22	2	9
	Total	98	4,84	2,019	,204	4,43	5,24	1	10
9.day	at 50 micromolar	28	4,43	1,230	,232	3,95	4,91	1	6
	hb96C 50 micromolar	27	5,67	2,000	,385	4,88	6,46	2	10
	laes4-1 50 micromolar	22	7,32	2,533	,540	6,19	8,44	4	12
	laes4-2 50 micromolar	21	7,76	2,737	,597	6,52	9,01	3	12
	Total	98	6,13	2,494	,252	5,63	6,63	1	12
10.day	at 50 micromolar	28	5,14	1,353	,256	4,62	5,67	2	7
	hb96C 50 micromolar	27	7,19	2,131	,410	6,34	8,03	3	11
	laes4-1 50 micromolar	22	8,50	2,596	,553	7,35	9,65	5	13
	laes4-2 50 micromolar	21	9,48	3,250	,709	8,00	10,96	4	14
	Total	98	7,39	2,838	,287	6,82	7,96	2	14

APPENDIX 14

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF GROUPS TREATED WITH 50 μ M IBA

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	.	3	.	.
3.day	.	3	.	.
4.day	11,443	3	94	,000
5.day	6,486	3	94	,000
6.day	1,663	3	94	,180
7.day	5,341	3	94	,002
8.day	4,422	3	94	,006
9.day	6,832	3	94	,000
10.day	9,128	3	94	,000

APPENDIX 15

THE ANOVA TEST TABLE OF GROUPS THAT ARE TREATED WITH 50 μ M IBA

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	94	,000		
	Total	,000	97			
2.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	94	,000		
	Total	,000	97			
3.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	94	,000		
	Total	,000	97			
4.day	Between Groups	,829	3	,276	2,219	,091
	Within Groups	11,702	94	,124		
	Total	12,531	97			
5.day	Between Groups	13,718	3	4,573	4,162	,008
	Within Groups	103,272	94	1,099		
	Total	116,990	97			
6.day	Between Groups	33,746	3	11,249	5,769	,001
	Within Groups	183,285	94	1,950		
	Total	217,031	97			
7.day	Between Groups	94,522	3	31,507	10,783	,000
	Within Groups	274,671	94	2,922		
	Total	369,194	97			
8.day	Between Groups	97,097	3	32,366	10,199	,000
	Within Groups	298,291	94	3,173		
	Total	395,388	97			
9.day	Between Groups	173,836	3	57,945	12,684	,000
	Within Groups	429,439	94	4,569		
	Total	603,276	97			
10.day	Between Groups	261,025	3	87,008	15,721	,000
	Within Groups	520,241	94	5,534		
	Total	781,265	97			

APPENDIX 16

THE POST HOC TEST TABLE OF GROUPS TREATED WITH 50 μ M IBA

Multiple Comparisons

Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
4.day	Tukey HSD	at 50 μ M	hb96C 50 μ M	-,185	,095	,216	-,43	,06
			lacs4-1 50 μ M	-,091	,101	,803	-,35	,17
			lacs4-2 50 μ M	-,238	,102	,097	-,50	,03
		hb96C 50 μ M	at 50 μ M	,185	,095	,216	-,06	,43
			lacs4-1 50 μ M	,094	,101	,789	-,17	,36
			lacs4-2 50 μ M	-,053	,103	,955	-,32	,22
		lacs4-1 50 μ M	at 50 μ M	,091	,101	,803	-,17	,35
			hb96C 50 μ M	-,094	,101	,789	-,36	,17
			lacs4-2 50 μ M	-,147	,108	,523	-,43	,13
		lacs4-2 50 μ M	at 50 μ M	,238	,102	,097	-,03	,50
			hb96C 50 μ M	,053	,103	,955	-,22	,32
			lacs4-1 50 μ M	,147	,108	,523	-,13	,43
	Dunnnett T3	at 50 μ M	hb96C 50 μ M	-,185	,093	,283	-,45	,08
			lacs4-1 50 μ M	-,091	,063	,624	-,27	,09
			lacs4-2 50 μ M	-,238	,095	,114	-,51	,04
		hb96C 50 μ M	at 50 μ M	,185	,093	,283	-,08	,45
			lacs4-1 50 μ M	,094	,112	,951	-,21	,40
			lacs4-2 50 μ M	-,053	,133	,999	-,42	,31
		lacs4-1 50 μ M	at 50 μ M	,091	,063	,624	-,09	,27
			hb96C 50 μ M	-,094	,112	,951	-,40	,21
			lacs4-2 50 μ M	-,147	,114	,731	-,46	,17
		lacs4-2 50 μ M	at 50 μ M	,238	,095	,114	-,04	,51
			hb96C 50 μ M	,053	,133	,999	-,31	,42
			lacs4-1 50 μ M	,147	,114	,731	-,17	,46
5.day	Tukey HSD	at 50 μ M	hb96C 50 μ M	-,279	,283	,757	-1,02	,46
			lacs4-1 50 μ M	-,828*	,299	,033	-1,61	-,05
			lacs4-2 50 μ M	-,893*	,303	,021	-1,68	-,10
		hb96C 50 μ M	at 50 μ M	,279	,283	,757	-,46	1,02
			lacs4-1 50 μ M	-,549	,301	,269	-1,34	,24
			lacs4-2 50 μ M	-,614	,305	,191	-1,41	,18

Continuation of APPENDIX 16

			lacs4-1 50 µM	at 50 µM	,828*	,299	,033	,05	1,61
				hb96C 50 µM	,549	,301	,269	-,24	1,34
				lacs4-2 50 µM	-,065	,320	,997	-,90	,77
			lacs4-2 50 µM	at 50 µM	,893*	,303	,021	,10	1,68
				hb96C 50 µM	,614	,305	,191	-,18	1,41
				lacs4-1 50 µM	,065	,320	,997	-,77	,90
	Dunnett T3	at 50 µM		hb96C 50 µM	-,279	,201	,661	-,83	,27
				lacs4-1 50 µM	-,828	,328	,098	-1,75	,10
				lacs4-2 50 µM	-,893*	,298	,033	-1,73	-,05
		hb96C 50 µM	at 50 µM		,279	,201	,661	-,27	,83
				lacs4-1 50 µM	-,549	,345	,521	-1,51	,41
				lacs4-2 50 µM	-,614	,316	,301	-1,49	,27
		lacs4-1 50 µM	at 50 µM		,828	,328	,098	-,10	1,75
				hb96C 50 µM	,549	,345	,521	-,41	1,51
				lacs4-2 50 µM	-,065	,409	1,000	-1,19	1,06
		lacs4-2 50 µM	at 50 µM		,893*	,298	,033	,05	1,73
				hb96C 50 µM	,614	,316	,301	-,27	1,49
				lacs4-1 50 µM	,065	,409	1,000	-1,06	1,19
6.day	Tukey HSD	at 50 µM		hb96C 50 µM	-,433	,377	,661	-1,42	,55
				lacs4-1 50 µM	-1,140*	,398	,026	-2,18	-,10
				lacs4-2 50 µM	-1,512*	,403	,002	-2,57	-,46
		hb96C 50 µM	at 50 µM		,433	,377	,661	-,55	1,42
				lacs4-1 50 µM	-,707	,401	,298	-1,76	,34
				lacs4-2 50 µM	-1,079*	,406	,045	-2,14	-,02
		lacs4-1 50 µM	at 50 µM		1,140*	,398	,026	,10	2,18
				hb96C 50 µM	,707	,401	,298	-,34	1,76
				lacs4-2 50 µM	-,372	,426	,818	-1,49	,74
		lacs4-2 50 µM	at 50 µM		1,512*	,403	,002	,46	2,57
				hb96C 50 µM	1,079*	,406	,045	,02	2,14
				lacs4-1 50 µM	,372	,426	,818	-,74	1,49
	Dunnett T3	at 50 µM		hb96C 50 µM	-,433	,339	,741	-1,36	,50
				lacs4-1 50 µM	-1,140	,435	,069	-2,34	,06
				lacs4-2 50 µM	-1,512*	,427	,006	-2,69	-,34
		hb96C 50 µM	at 50 µM		,433	,339	,741	-,50	1,36
				lacs4-1 50 µM	-,707	,395	,388	-1,81	,39
				lacs4-2 50 µM	-1,079*	,385	,048	-2,15	-,01

Continuation of APPENDIX 16

				lacs4-1 50 μ M	at 50 μ M	1,140	,435	,069	-,06	2,34
					hb96C 50 μ M	,707	,395	,388	-,39	1,81
					lacs4-2 50 μ M	-,372	,472	,963	-1,67	,93
				lacs4-2 50 μ M	at 50 μ M	1,512*	,427	,006	,34	2,69
					hb96C 50 μ M	1,079*	,385	,048	,01	2,15
					lacs4-1 50 μ M	,372	,472	,963	-,93	1,67
7.day	Tukey HSD	at 50 μ M			hb96C 50 μ M	-,577	,461	,596	-1,78	,63
					lacs4-1 50 μ M	-1,883*	,487	,001	-3,16	-,61
					lacs4-2 50 μ M	-2,476*	,493	,000	-3,77	-1,19
		hb96C 50 μ M			at 50 μ M	,577	,461	,596	-,63	1,78
					lacs4-1 50 μ M	-1,306*	,491	,045	-2,59	-,02
					lacs4-2 50 μ M	-1,899*	,497	,001	-3,20	-,60
		lacs4-1 50 μ M			at 50 μ M	1,883*	,487	,001	,61	3,16
					hb96C 50 μ M	1,306*	,491	,045	,02	2,59
					lacs4-2 50 μ M	-,593	,522	,668	-1,96	,77
		lacs4-2 50 μ M			at 50 μ M	2,476*	,493	,000	1,19	3,77
					hb96C 50 μ M	1,899*	,497	,001	,60	3,20
					lacs4-1 50 μ M	,593	,522	,668	-,77	1,96
	Dunnett T3	at 50 μ M			hb96C 50 μ M	-,577	,340	,444	-1,51	,35
					lacs4-1 50 μ M	-1,883*	,555	,012	-3,44	-,33
					lacs4-2 50 μ M	-2,476*	,477	,000	-3,81	-1,14
		hb96C 50 μ M			at 50 μ M	,577	,340	,444	-,35	1,51
					lacs4-1 50 μ M	-1,306	,562	,145	-2,88	,27
					lacs4-2 50 μ M	-1,899*	,485	,003	-3,25	-,55
		lacs4-1 50 μ M			at 50 μ M	1,883*	,555	,012	,33	3,44
					hb96C 50 μ M	1,306	,562	,145	-,27	2,88
					lacs4-2 50 μ M	-,593	,654	,931	-2,40	1,21
		lacs4-2 50 μ M			at 50 μ M	2,476*	,477	,000	1,14	3,81
					hb96C 50 μ M	1,899*	,485	,003	,55	3,25
					lacs4-1 50 μ M	,593	,654	,931	-1,21	2,40
8.day	Tukey HSD	at 50 μ M			hb96C 50 μ M	-,947	,480	,206	-2,20	,31
					lacs4-1 50 μ M	-1,974*	,508	,001	-3,30	-,65
					lacs4-2 50 μ M	-2,619*	,514	,000	-3,96	-1,27
		hb96C 50 μ M			at 50 μ M	,947	,480	,206	-,31	2,20
					lacs4-1 50 μ M	-1,027	,512	,193	-2,37	,31
					lacs4-2 50 μ M	-1,672*	,518	,009	-3,03	-,32

Continuation of APPENDIX 16

9.day	Dunnett T3	lacs4-1 50 μM	at 50 μM	1,974*	,508	,001	,65	3,30	
			hb96C 50 μM	1,027	,512	,193	-,31	2,37	
			lacs4-2 50 μM	-,645	,543	,637	-2,07	,78	
		lacs4-2 50 μM	at 50 μM	2,619*	,514	,000	1,27	3,96	
			hb96C 50 μM	1,672*	,518	,009	,32	3,03	
			lacs4-1 50 μM	,645	,543	,637	-,78	2,07	
		at 50 μM	hb96C 50 μM	-,947	,378	,088	-1,98	,09	
			lacs4-1 50 μM	-1,974*	,505	,003	-3,38	-,57	
			lacs4-2 50 μM	-2,619*	,550	,000	-4,16	-1,07	
		hb96C 50 μM	at 50 μM	,947	,378	,088	-,09	1,98	
			lacs4-1 50 μM	-1,027	,533	,307	-2,50	,45	
			lacs4-2 50 μM	-1,672*	,576	,038	-3,28	-,07	
		lacs4-1 50 μM	at 50 μM	1,974*	,505	,003	,57	3,38	
			hb96C 50 μM	1,027	,533	,307	-,45	2,50	
			lacs4-2 50 μM	-,645	,666	,908	-2,48	1,19	
		lacs4-2 50 μM	at 50 μM	2,619*	,550	,000	1,07	4,16	
			hb96C 50 μM	1,672*	,576	,038	,07	3,28	
			lacs4-1 50 μM	,645	,666	,908	-1,19	2,48	
		at 50 μM	hb96C 50 μM	-1,238	,577	,146	-2,75	,27	
			lacs4-1 50 μM	-2,890*	,609	,000	-4,48	-1,30	
			lacs4-2 50 μM	-3,333*	,617	,000	-4,95	-1,72	
		hb96C 50 μM	at 50 μM	1,238	,577	,146	-,27	2,75	
			lacs4-1 50 μM	-1,652*	,614	,041	-3,26	-,05	
			lacs4-2 50 μM	-2,095*	,622	,006	-3,72	-,47	
		lacs4-1 50 μM	at 50 μM	2,890*	,609	,000	1,30	4,48	
			hb96C 50 μM	1,652*	,614	,041	,05	3,26	
			lacs4-2 50 μM	-,444	,652	,904	-2,15	1,26	
		lacs4-2 50 μM	at 50 μM	3,333*	,617	,000	1,72	4,95	
			hb96C 50 μM	2,095*	,622	,006	,47	3,72	
			lacs4-1 50 μM	,444	,652	,904	-1,26	2,15	
		Dunnett T3	at 50 μM	hb96C 50 μM	-1,238*	,450	,050	-2,48	,00
			lacs4-1 50 μM	-2,890*	,588	,000	-4,54	-1,24	
			lacs4-2 50 μM	-3,333*	,641	,000	-5,15	-1,52	
		hb96C 50 μM	at 50 μM	1,238*	,450	,050	,00	2,48	
			lacs4-1 50 μM	-1,652	,663	,096	-3,48	,18	
			lacs4-2 50 μM	-2,095*	,711	,033	-4,07	-,12	

Continuation of APPENDIX 16

10.day	Tukey HSD	lacs4-1 50 µM	at 50 µM	2,890*	,588	,000	1,24	4,54
			hb96C 50 µM	1,652	,663	,096	-,18	3,48
			lacs4-2 50 µM	-,444	,805	,994	-2,67	1,78
		lacs4-2 50 µM	at 50 µM	3,333*	,641	,000	1,52	5,15
			hb96C 50 µM	2,095*	,711	,033	,12	4,07
			lacs4-1 50 µM	,444	,805	,994	-1,78	2,67
		at 50 µM	hb96C 50 µM	-2,042*	,635	,009	-3,70	-,38
			lacs4-1 50 µM	-3,357*	,670	,000	-5,11	-1,60
			lacs4-2 50 µM	-4,333*	,679	,000	-6,11	-2,56
		hb96C 50 µM	at 50 µM	2,042*	,635	,009	,38	3,70
			lacs4-1 50 µM	-1,315	,676	,216	-3,08	,45
			lacs4-2 50 µM	-2,291*	,684	,006	-4,08	-,50
		lacs4-1 50 µM	at 50 µM	3,357*	,670	,000	1,60	5,11
			hb96C 50 µM	1,315	,676	,216	-,45	3,08
			lacs4-2 50 µM	-,976	,718	,527	-2,85	,90
		lacs4-2 50 µM	at 50 µM	4,333*	,679	,000	2,56	6,11
			hb96C 50 µM	2,291*	,684	,006	,50	4,08
			lacs4-1 50 µM	,976	,718	,527	-,90	2,85
	Dunnett T3	at 50 µM	hb96C 50 µM	-2,042*	,483	,001	-3,37	-,71
			lacs4-1 50 µM	-3,357*	,610	,000	-5,07	-1,65
			lacs4-2 50 µM	-4,333*	,754	,000	-6,47	-2,19
		hb96C 50 µM	at 50 µM	2,042*	,483	,001	,71	3,37
			lacs4-1 50 µM	-1,315	,689	,315	-3,21	,59
			lacs4-2 50 µM	-2,291*	,819	,049	-4,58	-,01
		lacs4-1 50 µM	at 50 µM	3,357*	,610	,000	1,65	5,07
			hb96C 50 µM	1,315	,689	,315	-,59	3,21
			lacs4-2 50 µM	-,976	,900	,854	-3,46	1,51
		lacs4-2 50 µM	at 50 µM	4,333*	,754	,000	2,19	6,47
			hb96C 50 µM	2,291*	,819	,049	,01	4,58
			lacs4-1 50 µM	,976	,900	,854	-1,51	3,46

The mean difference is significant at the 0.05 level

APPENDIX 17

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF *A. THALIANA* (COL) IN DIFFERENT CONCENTRATIONS

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	.	3	.	.
3.day	23,951	3	120	,000
4.day	24,456	3	120	,000
5.day	4,972	3	120	,003
6.day	2,552	3	120	,059
7.day	1,591	3	120	,195
8.day	4,166	3	120	,008
9.day	7,409	3	120	,000
10.day	6,993	3	120	,000

APPENDIX 18

THE ANOVA TEST TABLE OF *A. THALIANA* (COL) IN DIFFERENT CONCENTRATIONS

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	120	,000		
	Total	,000	123			
2.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	120	,000		
	Total	,000	123			
3.day	Between Groups	1,366	3	,455	4,510	,005
	Within Groups	12,118	120	,101		
	Total	13,484	123			
4.day	Between Groups	56,311	3	18,770	19,050	,000
	Within Groups	118,237	120	,985		
	Total	174,548	123			
5.day	Between Groups	205,614	3	68,538	55,523	,000
	Within Groups	148,128	120	1,234		
	Total	353,742	123			
6.day	Between Groups	204,076	3	68,025	39,025	,000
	Within Groups	209,174	120	1,743		
	Total	413,250	123			
7.day	Between Groups	170,615	3	56,872	34,924	,000
	Within Groups	195,410	120	1,628		
	Total	366,024	123			
8.day	Between Groups	120,692	3	40,231	19,287	,000
	Within Groups	250,300	120	2,086		
	Total	370,992	123			
9.day	Between Groups	125,121	3	41,707	15,326	,000
	Within Groups	326,557	120	2,721		
	Total	451,677	123			
10.day	Between Groups	192,511	3	64,170	17,180	,000
	Within Groups	448,223	120	3,735		
	Total	640,734	123			

APPENDIX 19

THE POST HOC TEST TABLE OF *A. THALIANA* (COL) IN DIFFERENT CONCENTRATIONS

Multiple Comparisons								
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
3.day	Tukey HSD	at control	at 1 µM	,000	,081	1,000	-,21	,21
			at 10 µM	-,235*	,081	,023	-,45	-,02
			at 50 µM	,000	,085	1,000	-,22	,22
		at 1 µM	at control	,000	,081	1,000	-,21	,21
			at 10 µM	-,235*	,077	,015	-,44	-,03
			at 50 µM	,000	,081	1,000	-,21	,21
		at 10 µM	at control	,235*	,081	,023	,02	,45
			at 1 µM	,235*	,077	,015	,03	,44
			at 50 µM	,235*	,081	,023	,02	,45
		at 50 µM	at control	,000	,085	1,000	-,22	,22
			at 1 µM	,000	,081	1,000	-,21	,21
			at 10 µM	-,235*	,081	,023	-,45	-,02
	Dunnett T3	at control	at 1 µM	,000	,000	.	,00	,00
			at 10 µM	-,235	,104	,163	-,53	,05
			at 50 µM	,000	,000	.	,00	,00
		at 1 µM	at control	,000	,000	.	,00	,00
			at 10 µM	-,235	,104	,163	-,53	,05
			at 50 µM	,000	,000	.	,00	,00
		at 10 µM	at control	,235	,104	,163	-,05	,53
			at 1 µM	,235	,104	,163	-,05	,53
			at 50 µM	,235	,104	,163	-,05	,53
		at 50 µM	at control	,000	,000	.	,00	,00
			at 1 µM	,000	,000	.	,00	,00
			at 10 µM	-,235	,104	,163	-,53	,05
4.day	Tukey HSD	at control	at 1 µM	-,158	,253	,925	-,82	,50
			at 10 µM	,284	,253	,678	-,38	,94
			at 50 µM	1,607*	,265	,000	,92	2,30

Continuation of APPENDIX 19

		at 1 μ M	at control	,158	,253	,925	-,50	,82
			at 10 μ M	,441	,241	,263	-,19	1,07
			at 50 μ M	1,765*	,253	,000	1,10	2,42
		at 10 μ M	at control	-,284	,253	,678	-,94	,38
			at 1 μ M	-,441	,241	,263	-1,07	,19
			at 50 μ M	1,324*	,253	,000	,66	1,98
		at 50 μ M	at control	-1,607*	,265	,000	-2,30	-,92
			at 1 μ M	-1,765*	,253	,000	-2,42	-1,10
			at 10 μ M	-1,324*	,253	,000	-1,98	-,66
	Dunnett T3	at control	at 1 μ M	-,158	,275	,993	-,90	,59
			at 10 μ M	,284	,295	,913	-,52	1,09
			at 50 μ M	1,607*	,208	,000	1,02	2,19
		at 1 μ M	at control	,158	,275	,993	-,59	,90
			at 10 μ M	,441	,276	,510	-,31	1,19
			at 50 μ M	1,765*	,179	,000	1,26	2,26
		at 10 μ M	at control	-,284	,295	,913	-1,09	,52
			at 1 μ M	-,441	,276	,510	-1,19	,31
			at 50 μ M	1,324*	,210	,000	,74	1,91
		at 50 μ M	at control	-1,607*	,208	,000	-2,19	-1,02
			at 1 μ M	-1,765*	,179	,000	-2,26	-1,26
			at 10 μ M	-1,324*	,210	,000	-1,91	-,74
5.day	Tukey HSD	at control	at 1 μ M	-1,387*	,284	,000	-2,13	-,65
			at 10 μ M	-,710	,284	,064	-1,45	,03
			at 50 μ M	2,107*	,297	,000	1,33	2,88
		at 1 μ M	at control	1,387*	,284	,000	,65	2,13
			at 10 μ M	,676	,269	,063	-,03	1,38
			at 50 μ M	3,494*	,284	,000	2,75	4,23
		at 10 μ M	at control	,710	,284	,064	-,03	1,45
			at 1 μ M	-,676	,269	,063	-1,38	,03
			at 50 μ M	2,817*	,284	,000	2,08	3,56
		at 50 μ M	at control	-2,107*	,297	,000	-2,88	-1,33
			at 1 μ M	-3,494*	,284	,000	-4,23	-2,75
			at 10 μ M	-2,817*	,284	,000	-3,56	-2,08
	Dunnett T3	at control	at 1 μ M	-1,387*	,269	,000	-2,12	-,65
			at 10 μ M	-,710	,293	,104	-1,51	,09
			at 50 μ M	2,107*	,204	,000	1,55	2,66

Continuation of APPENDIX 19

6.day	Tukey HSD	at 1 μ M	at control	1,387*	,269	,000	,65	2,12
			at 10 μ M	,676	,323	,213	-,20	1,55
			at 50 μ M	3,494*	,245	,000	2,83	4,16
		at 10 μ M	at control	,710	,293	,104	-,09	1,51
			at 1 μ M	-,676	,323	,213	-1,55	,20
			at 50 μ M	2,817*	,270	,000	2,08	3,56
		at 50 μ M	at control	-2,107*	,204	,000	-2,66	-1,55
			at 1 μ M	-3,494*	,245	,000	-4,16	-2,83
			at 10 μ M	-2,817*	,270	,000	-3,56	-2,08
		at control	at 1 μ M	-1,744*	,337	,000	-2,62	-,87
			at 10 μ M	-1,273*	,337	,001	-2,15	-,40
			at 50 μ M	1,607*	,353	,000	,69	2,53
		at 1 μ M	at control	1,744*	,337	,000	,87	2,62
			at 10 μ M	,471	,320	,459	-,36	1,30
			at 50 μ M	3,351*	,337	,000	2,47	4,23
		at 10 μ M	at control	1,273*	,337	,001	,40	2,15
			at 1 μ M	-,471	,320	,459	-1,30	,36
			at 50 μ M	2,880*	,337	,000	2,00	3,76
		at 50 μ M	at control	-1,607*	,353	,000	-2,53	-,69
			at 1 μ M	-3,351*	,337	,000	-4,23	-2,47
			at 10 μ M	-2,880*	,337	,000	-3,76	-2,00
7.day	Dunnett T3	at control	at 1 μ M	-1,744*	,269	,000	-2,48	-1,01
			at 10 μ M	-1,273*	,351	,004	-2,23	-,32
			at 50 μ M	1,607*	,345	,000	,67	2,55
		at 1 μ M	at control	1,744*	,269	,000	1,01	2,48
			at 10 μ M	,471	,326	,624	-,42	1,36
			at 50 μ M	3,351*	,319	,000	2,48	4,23
		at 10 μ M	at control	1,273*	,351	,004	,32	2,23
			at 1 μ M	-,471	,326	,624	-1,36	,42
			at 50 μ M	2,880*	,391	,000	1,82	3,94
		at 50 μ M	at control	-1,607*	,345	,000	-2,55	-,67
			at 1 μ M	-3,351*	,319	,000	-4,23	-2,48
			at 10 μ M	-2,880*	,391	,000	-3,94	-1,82
	Tukey HSD	at control	at 1 μ M	-1,771*	,326	,000	-2,62	-,92
			at 10 μ M	-1,006*	,326	,013	-1,85	-,16
			at 50 μ M	1,393*	,341	,000	,50	2,28

Continuation of APPENDIX 19

		at 1 μ M	at control	1,771*	,326	,000	,92	2,62
			at 10 μ M	,765	,309	,070	-,04	1,57
			at 50 μ M	3,164*	,326	,000	2,32	4,01
		at 10 μ M	at control	1,006*	,326	,013	,16	1,85
			at 1 μ M	-,765	,309	,070	-1,57	,04
			at 50 μ M	2,399*	,326	,000	1,55	3,25
		at 50 μ M	at control	-1,393*	,341	,000	-2,28	-,50
			at 1 μ M	-3,164*	,326	,000	-4,01	-2,32
			at 10 μ M	-2,399*	,326	,000	-3,25	-1,55
	Dunnett T3	at control	at 1 μ M	-1,771*	,276	,000	-2,52	-1,02
			at 10 μ M	-1,006*	,345	,030	-1,95	-,07
			at 50 μ M	1,393*	,312	,000	,54	2,24
		at 1 μ M	at control	1,771*	,276	,000	1,02	2,52
			at 10 μ M	,765	,329	,132	-,13	1,66
			at 50 μ M	3,164*	,294	,000	2,36	3,97
		at 10 μ M	at control	1,006*	,345	,030	,07	1,95
			at 1 μ M	-,765	,329	,132	-1,66	,13
			at 50 μ M	2,399*	,360	,000	1,42	3,38
		at 50 μ M	at control	-1,393*	,312	,000	-2,24	-,54
			at 1 μ M	-3,164*	,294	,000	-3,97	-2,36
			at 10 μ M	-2,399*	,360	,000	-3,38	-1,42
8.day	Tukey HSD	at control	at 1 μ M	-1,695*	,369	,000	-2,66	-,74
			at 10 μ M	-1,225*	,369	,006	-2,19	-,26
			at 50 μ M	,821	,386	,150	-,18	1,83
		at 1 μ M	at control	1,695*	,369	,000	,74	2,66
			at 10 μ M	,471	,350	,537	-,44	1,38
			at 50 μ M	2,517*	,369	,000	1,56	3,48
		at 10 μ M	at control	1,225*	,369	,006	,26	2,19
			at 1 μ M	-,471	,350	,537	-1,38	,44
			at 50 μ M	2,046*	,369	,000	1,09	3,01
		at 50 μ M	at control	-,821	,386	,150	-1,83	,18
			at 1 μ M	-2,517*	,369	,000	-3,48	-1,56
			at 10 μ M	-2,046*	,369	,000	-3,01	-1,09
	Dunnett T3	at control	at 1 μ M	-1,695*	,312	,000	-2,54	-,85
			at 10 μ M	-1,225*	,399	,019	-2,31	-,14
			at 50 μ M	,821	,332	,094	-,08	1,73

Continuation of APPENDIX 19

9.day	Tukey HSD	at 1 μ M	at control	1,695*	,312	,000	,85	2,54
			at 10 μ M	,471	,386	,777	-,58	1,52
			at 50 μ M	2,517*	,316	,000	1,66	3,38
		at 10 μ M	at control	1,225*	,399	,019	,14	2,31
			at 1 μ M	-,471	,386	,777	-1,52	,58
			at 50 μ M	2,046*	,402	,000	,95	3,14
		at 50 μ M	at control	-,821	,332	,094	-1,73	,08
			at 1 μ M	-2,517*	,316	,000	-3,38	-1,66
			at 10 μ M	-2,046*	,402	,000	-3,14	-,95
	Dunnett T3	at control	at 1 μ M	-1,889*	,421	,000	-2,99	-,79
			at 10 μ M	-1,506*	,421	,003	-2,60	-,41
			at 50 μ M	,536	,441	,619	-,61	1,68
		at 1 μ M	at control	1,889*	,421	,000	,79	2,99
			at 10 μ M	,382	,400	,775	-,66	1,42
			at 50 μ M	2,424*	,421	,000	1,33	3,52
		at 10 μ M	at control	1,506*	,421	,003	,41	2,60
			at 1 μ M	-,382	,400	,775	-1,42	,66
			at 50 μ M	2,042*	,421	,000	,95	3,14
		at 50 μ M	at control	-,536	,441	,619	-1,68	,61
			at 1 μ M	-2,424*	,421	,000	-3,52	-1,33
			at 10 μ M	-2,042*	,421	,000	-3,14	-,95
		at control	at 1 μ M	-1,889*	,361	,000	-2,87	-,91
			at 10 μ M	-1,506*	,463	,011	-2,77	-,25
			at 50 μ M	,536	,349	,555	-,41	1,49
		at 1 μ M	at control	1,889*	,361	,000	,91	2,87
			at 10 μ M	,382	,457	,953	-,86	1,63
			at 50 μ M	2,424*	,342	,000	1,50	3,35
		at 10 μ M	at control	1,506*	,463	,011	,25	2,77
			at 1 μ M	-,382	,457	,953	-1,63	,86
			at 50 μ M	2,042*	,448	,000	,82	3,26
		at 50 μ M	at control	-,536	,349	,555	-1,49	,41
			at 1 μ M	-2,424*	,342	,000	-3,35	-1,50
			at 10 μ M	-2,042*	,448	,000	-3,26	-,82

Continuation of APPENDIX 19

10.day	Tukey HSD	at control	at 1 μ M	-2,412*	,493	,000	-3,70	-1,13
			at 10 μ M	-2,206*	,493	,000	-3,49	-,92
			at 50 μ M	,357	,517	,900	-,99	1,70
		at 1 μ M	at control	2,412*	,493	,000	1,13	3,70
			at 10 μ M	,206	,469	,972	-1,02	1,43
			at 50 μ M	2,769*	,493	,000	1,48	4,05
		at 10 μ M	at control	2,206*	,493	,000	,92	3,49
			at 1 μ M	-,206	,469	,972	-1,43	1,02
			at 50 μ M	2,563*	,493	,000	1,28	3,85
		at 50 μ M	at control	-,357	,517	,900	-1,70	,99
			at 1 μ M	-2,769*	,493	,000	-4,05	-1,48
			at 10 μ M	-2,563*	,493	,000	-3,85	-1,28
	Dunnnett T3	at control	at 1 μ M	-2,412*	,434	,000	-3,59	-1,23
			at 10 μ M	-2,206*	,537	,001	-3,67	-,74
			at 50 μ M	,357	,396	,933	-,72	1,44
		at 1 μ M	at control	2,412*	,434	,000	1,23	3,59
			at 10 μ M	,206	,542	,999	-1,27	1,68
			at 50 μ M	2,769*	,403	,000	1,67	3,86
		at 10 μ M	at control	2,206*	,537	,001	,74	3,67
			at 1 μ M	-,206	,542	,999	-1,68	1,27
			at 50 μ M	2,563*	,512	,000	1,16	3,96
		at 50 μ M	at control	-,357	,396	,933	-1,44	,72
			at 1 μ M	-2,769*	,403	,000	-3,86	-1,67
			at 10 μ M	-2,563*	,512	,000	-3,96	-1,16

*. The mean difference is significant at the 0.05 level.

APPENDIX 20

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF *hb96C* IN DIFFERENT CONCENTRATIONS.

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	.	3	.	.
3.day	19,540	3	98	,000
4.day	12,461	3	98	,000
5.day	6,040	3	98	,001
6.day	2,173	3	98	,096
7.day	1,458	3	98	,231
8.day	1,969	3	98	,124
9.day	3,355	3	98	,022
10.day	4,238	3	98	,007

APPENDIX 21

THE ANOVA TEST TABLE OF *hb96C* IN DIFFERENT CONCENTRATIONS

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	98	,000		
	Total	,000	101			
2.day	Between Groups	,000	3	,000	.	.
	Within Groups	,000	98	,000		
	Total	,000	101			
3.day	Between Groups	2,152	3	,717	3,299	,024
	Within Groups	21,309	98	,217		
	Total	23,461	101			
4.day	Between Groups	61,810	3	20,603	17,383	,000
	Within Groups	116,151	98	1,185		
	Total	177,961	101			
5.day	Between Groups	103,295	3	34,432	20,043	,000
	Within Groups	168,352	98	1,718		
	Total	271,647	101			
6.day	Between Groups	62,119	3	20,706	9,512	,000
	Within Groups	213,342	98	2,177		
	Total	275,461	101			
7.day	Between Groups	29,764	3	9,921	3,360	,022
	Within Groups	289,383	98	2,953		
	Total	319,147	101			
8.day	Between Groups	32,246	3	10,749	2,438	,069
	Within Groups	432,068	98	4,409		
	Total	464,314	101			
9.day	Between Groups	60,375	3	20,125	2,813	,043
	Within Groups	701,204	98	7,155		
	Total	761,578	101			
10.day	Between Groups	110,886	3	36,962	3,879	,011
	Within Groups	933,869	98	9,529		
	Total	1044,755	101			

APPENDIX 22

THE POST HOC TEST TABLE OF *hb96C* IN DIFFERENT CONCENTRATIONS

Multiple Comparisons								
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
3.day	Tukey HSD	hb96C control	hb96C 1 μ M	-,070	,143	,962	-,44	,30
			hb96C 10 μ M	-,245	,127	,227	-,58	,09
			hb96C 50 μ M	,130	,132	,758	-,22	,48
		hb96C 1 μ M	hb96C control	,070	,143	,962	-,30	,44
			hb96C 10 μ M	-,175	,133	,555	-,52	,17
			hb96C 50 μ M	,200	,138	,469	-,16	,56
		hb96C 10 μ M	hb96C control	,245	,127	,227	-,09	,58
			hb96C 1 μ M	,175	,133	,555	-,17	,52
			hb96C 50 μ M	,375*	,122	,014	,06	,69
		hb96C 50 μ M	hb96C control	-,130	,132	,758	-,48	,22
			hb96C 1 μ M	-,200	,138	,469	-,56	,16
			hb96C 10 μ M	-,375*	,122	,014	-,69	-,06
	Dunnett T3	hb96C control	hb96C 1 μ M	-,070	,117	,991	-,39	,25
			hb96C 10 μ M	-,245	,144	,444	-,64	,15
			hb96C 50 μ M	,130	,072	,383	-,08	,34
		hb96C 1 μ M	hb96C control	,070	,117	,991	-,25	,39
			hb96C 10 μ M	-,175	,155	,832	-,60	,25
			hb96C 50 μ M	,200	,092	,213	-,07	,47
		hb96C 10 μ M	hb96C control	,245	,144	,444	-,15	,64
			hb96C 1 μ M	,175	,155	,832	-,25	,60
			hb96C 50 μ M	,375*	,125	,031	,03	,72
		hb96C 50 μ M	hb96C control	-,130	,072	,383	-,34	,08
			hb96C 1 μ M	-,200	,092	,213	-,47	,07
			hb96C 10 μ M	-,375*	,125	,031	-,72	-,03
4.day	Tukey HSD	hb96C control	hb96C 1 μ M	-,715	,333	,145	-1,59	,15
			hb96C 10 μ M	-1,628*	,298	,000	-2,41	-,85
			hb96C 50 μ M	,250	,309	,851	-,56	1,06
		hb96C 1 μ M	hb96C control	,715	,333	,145	-,15	1,59
			hb96C 10 μ M	-,913*	,310	,021	-1,72	-,10
			hb96C 50 μ M	,965*	,321	,018	,13	1,80

Continuation of APPENDIX 22

			hb96C 10 µM	hb96C control	1,628*	,298	,000	,85	2,41
				hb96C 1 µM	,913*	,310	,021	,10	1,72
				hb96C 50 µM	1,877*	,284	,000	1,13	2,62
			hb96C 50 µM						
				hb96C control	-,250	,309	,851	-1,06	,56
				hb96C 1 µM	-,965*	,321	,018	-1,80	-,13
				hb96C 10 µM	-1,877*	,284	,000	-2,62	-1,13
	Dunnett T3	hb96C control		hb96C 1 µM	-,715	,320	,173	-1,61	,18
				hb96C 10 µM	-1,628*	,309	,000	-2,47	-,78
				hb96C 50 µM	,250	,189	,710	-,27	,77
		hb96C 1 µM		hb96C control	,715	,320	,173	-,18	1,61
				hb96C 10 µM	-,913	,379	,112	-1,95	,13
				hb96C 50 µM	,965*	,289	,017	,14	1,79
		hb96C 10 µM		hb96C control	1,628*	,309	,000	,78	2,47
				hb96C 1 µM	,913	,379	,112	-,13	1,95
				hb96C 50 µM	1,877*	,278	,000	1,11	2,64
		hb96C 50 µM		hb96C control	-,250	,189	,710	-,77	,27
				hb96C 1 µM	-,965*	,289	,017	-1,79	-,14
				hb96C 10 µM	-1,877*	,278	,000	-2,64	-1,11
	5.day	Tukey HSD	hb96C control	hb96C 1 µM	-1,209*	,401	,017	-2,26	-,16
				hb96C 10 µM	-1,859*	,358	,000	-2,80	-,92
				hb96C 50 µM	,576	,372	,412	-,40	1,55
			hb96C 1 µM	hb96C control	1,209*	,401	,017	,16	2,26
				hb96C 10 µM	-,650	,374	,309	-1,63	,33
				hb96C 50 µM	1,785*	,387	,000	,77	2,80
			hb96C 10 µM	hb96C control	1,859*	,358	,000	,92	2,80
				hb96C 1 µM	,650	,374	,309	-,33	1,63
				hb96C 50 µM	2,435*	,343	,000	1,54	3,33
			hb96C 50 µM	hb96C control	-,576	,372	,412	-1,55	,40
				hb96C 1 µM	-1,785*	,387	,000	-2,80	-,77
				hb96C 10 µM	-2,435*	,343	,000	-3,33	-1,54
	Dunnett T3	hb96C control		hb96C 1 µM	-1,209*	,400	,027	-2,32	-,10
				hb96C 10 µM	-1,859*	,375	,000	-2,88	-,83
				hb96C 50 µM	,576	,290	,273	-,22	1,38
		hb96C 1 µM		hb96C control	1,209*	,400	,027	,10	2,32
				hb96C 10 µM	-,650	,430	,574	-1,83	,53
				hb96C 50 µM	1,785*	,358	,000	,78	2,79

Continuation of APPENDIX 22

6.day	Tukey HSD	hb96C 10 µM	hb96C control	1,859*	,375	,000	,83	2,88
			hb96C 1 µM	,650	,430	,574	-,53	1,83
			hb96C 50 µM	2,435*	,329	,000	1,53	3,34
		hb96C 50 µM	hb96C control	-,576	,290	,273	-1,38	,22
			hb96C 1 µM	-1,785*	,358	,000	-2,79	-,78
			hb96C 10 µM	-2,435*	,329	,000	-3,34	-1,53
	Dunnett T3	hb96C control	hb96C 1 µM	-1,100	,451	,077	-2,28	,08
			hb96C 10 µM	-1,813*	,403	,000	-2,87	-,76
			hb96C 50 µM	-,111	,419	,993	-1,21	,98
		hb96C 1 µM	hb96C control	1,100	,451	,077	-,08	2,28
			hb96C 10 µM	-,712	,421	,332	-1,81	,39
			hb96C 50 µM	,989	,435	,112	-,15	2,13
		hb96C 10 µM	hb96C control	1,813*	,403	,000	,76	2,87
			hb96C 1 µM	,712	,421	,332	-,39	1,81
			hb96C 50 µM	1,701*	,386	,000	,69	2,71
		hb96C 50 µM	hb96C control	,111	,419	,993	-,98	1,21
			hb96C 1 µM	-,989	,435	,112	-2,13	,15
			hb96C 10 µM	-1,701*	,386	,000	-2,71	-,69
		hb96C control	hb96C 1 µM	-1,100	,463	,123	-2,38	,18
			hb96C 10 µM	-1,813*	,436	,001	-3,00	-,62
			hb96C 50 µM	-,111	,374	1,000	-1,14	,92
		hb96C 1 µM	hb96C control	1,100	,463	,123	-,18	2,38
			hb96C 10 µM	-,712	,455	,535	-1,96	,54
			hb96C 50 µM	,989	,395	,098	-,11	2,09
7.day	Tukey HSD	hb96C control	hb96C 1 µM	-,693	,525	,553	-2,07	,68
			hb96C 10 µM	-1,325*	,470	,029	-2,55	-,10
			hb96C 50 µM	-,192	,488	,979	-1,47	1,08
		hb96C 1 µM	hb96C control	,693	,525	,553	-,68	2,07
			hb96C 10 µM	-,631	,490	,572	-1,91	,65
			hb96C 50 µM	,502	,507	,756	-,82	1,83

Continuation of APPENDIX 22

		hb96C 10 μ M	hb96C control	1,325*	,470	,029	,10	2,55
			hb96C 1 μ M	,631	,490	,572	-,65	1,91
			hb96C 50 μ M	1,133	,449	,063	-,04	2,31
		hb96C 50 μ M	hb96C control	,192	,488	,979	-1,08	1,47
			hb96C 1 μ M	-,502	,507	,756	-1,83	,82
			hb96C 10 μ M	-1,133	,449	,063	-2,31	,04
	Dunnett T3	hb96C control	hb96C 1 μ M	-,693	,546	,745	-2,20	,81
			hb96C 10 μ M	-1,325	,509	,070	-2,72	,07
			hb96C 50 μ M	-,192	,454	,999	-1,45	1,06
		hb96C 1 μ M	hb96C control	,693	,546	,745	-,81	2,20
			hb96C 10 μ M	-,631	,519	,780	-2,06	,80
			hb96C 50 μ M	,502	,465	,856	-,79	1,80
		hb96C 10 μ M	hb96C control	1,325	,509	,070	-,07	2,72
			hb96C 1 μ M	,631	,519	,780	-,80	2,06
			hb96C 50 μ M	1,133	,421	,054	-,01	2,28
		hb96C 50 μ M	hb96C control	,192	,454	,999	-1,06	1,45
			hb96C 1 μ M	-,502	,465	,856	-1,80	,79
			hb96C 10 μ M	-1,133	,421	,054	-2,28	,01
	8.day Tukey HSD	hb96C control	hb96C 1 μ M	-,535	,642	,839	-2,21	1,14
			hb96C 10 μ M	-1,497	,574	,051	-3,00	,00
			hb96C 50 μ M	-,953	,596	,383	-2,51	,60
		hb96C 1 μ M	hb96C control	,535	,642	,839	-1,14	2,21
			hb96C 10 μ M	-,963	,599	,379	-2,53	,60
			hb96C 50 μ M	-,419	,619	,906	-2,04	1,20
		hb96C 10 μ M	hb96C control	1,497	,574	,051	,00	3,00
			hb96C 1 μ M	,963	,599	,379	-,60	2,53
			hb96C 50 μ M	,544	,549	,755	-,89	1,98
		hb96C 50 μ M	hb96C control	,953	,596	,383	-,60	2,51
			hb96C 1 μ M	,419	,619	,906	-1,20	2,04
			hb96C 10 μ M	-,544	,549	,755	-1,98	,89
	Dunnett T3	hb96C control	hb96C 1 μ M	-,535	,653	,956	-2,34	1,27
			hb96C 10 μ M	-1,497	,643	,133	-3,26	,26
			hb96C 50 μ M	-,953	,565	,453	-2,52	,61
		hb96C 1 μ M	hb96C control	,535	,653	,956	-1,27	2,34
			hb96C 10 μ M	-,963	,613	,532	-2,64	,72
			hb96C 50 μ M	-,419	,530	,963	-1,89	1,05

Continuation of APPENDIX 22

9.day	Tukey HSD	hb96C 10 μ M	hb96C control	1,497	,643	,133	-,26	3,26
			hb96C 1 μ M	,963	,613	,532	-,72	2,64
			hb96C 50 μ M	,544	,518	,872	-,87	1,96
		hb96C 50 μ M	hb96C control	,953	,565	,453	-,61	2,52
			hb96C 1 μ M	,419	,530	,963	-1,05	1,89
			hb96C 10 μ M	-,544	,518	,872	-1,96	,87
		hb96C control	hb96C 1 μ M	-,389	,818	,964	-2,53	1,75
			hb96C 10 μ M	-1,895	,731	,053	-3,81	,02
			hb96C 50 μ M	-1,406	,759	,256	-3,39	,58
		hb96C 1 μ M	hb96C control	,389	,818	,964	-1,75	2,53
			hb96C 10 μ M	-1,506	,762	,204	-3,50	,49
			hb96C 50 μ M	-1,017	,789	,573	-3,08	1,05
		hb96C 10 μ M	hb96C control	1,895	,731	,053	-,02	3,81
			hb96C 1 μ M	1,506	,762	,204	-,49	3,50
			hb96C 50 μ M	,490	,699	,897	-1,34	2,32
		hb96C 50 μ M	hb96C control	1,406	,759	,256	-,58	3,39
			hb96C 1 μ M	1,017	,789	,573	-1,05	3,08
			hb96C 10 μ M	-,490	,699	,897	-2,32	1,34
9.day	Dunnett T3	hb96C control	hb96C 1 μ M	-,389	,768	,996	-2,51	1,73
			hb96C 10 μ M	-1,895	,778	,102	-4,02	,23
			hb96C 50 μ M	-1,406	,640	,181	-3,17	,36
		hb96C 1 μ M	hb96C control	,389	,768	,996	-1,73	2,51
			hb96C 10 μ M	-1,506	,819	,352	-3,75	,74
			hb96C 50 μ M	-1,017	,690	,603	-2,93	,90
		hb96C 10 μ M	hb96C control	1,895	,778	,102	-,23	4,02
			hb96C 1 μ M	1,506	,819	,352	-,74	3,75
			hb96C 50 μ M	,490	,701	,980	-1,42	2,40
		hb96C 50 μ M	hb96C control	1,406	,640	,181	-,36	3,17
			hb96C 1 μ M	1,017	,690	,603	-,90	2,93
			hb96C 10 μ M	-,490	,701	,980	-2,40	1,42
10.day	Tukey HSD	hb96C control	hb96C 1 μ M	-,337	,944	,984	-2,80	2,13
			hb96C 10 μ M	-2,243*	,844	,045	-4,45	-,04
			hb96C 50 μ M	-2,272	,876	,053	-4,56	,02
		hb96C 1 μ M	hb96C control	,337	,944	,984	-2,13	2,80
			hb96C 10 μ M	-1,906	,880	,140	-4,21	,39
			hb96C 50 μ M	-1,935	,911	,152	-4,32	,45

Continuation of APPENDIX 22

Dunnett T3	hb96C 10 μ M	hb96C control	2,243*	,844	,045	,04	4,45
		hb96C 1 μ M	1,906	,880	,140	-,39	4,21
		hb96C 50 μ M	-,029	,807	1,000	-2,14	2,08
	hb96C 50 μ M	hb96C control	2,272	,876	,053	-,02	4,56
		hb96C 1 μ M	1,935	,911	,152	-,45	4,32
		hb96C 10 μ M	,029	,807	1,000	-2,08	2,14
	hb96C control	hb96C 1 μ M	-,337	,891	,999	-2,80	2,13
		hb96C 10 μ M	-2,243	,899	,089	-4,69	,21
		hb96C 50 μ M	-2,272*	,707	,015	-4,22	-,32
	hb96C 1 μ M	hb96C control	,337	,891	,999	-2,13	2,80
		hb96C 10 μ M	-1,906	,969	,280	-4,56	,75
		hb96C 50 μ M	-1,935	,794	,113	-4,15	,28
	hb96C 10 μ M	hb96C control	2,243	,899	,089	-,21	4,69
		hb96C 1 μ M	1,906	,969	,280	-,75	4,56
		hb96C 50 μ M	-,029	,803	1,000	-2,22	2,17
	hb96C 50 μ M	hb96C control	2,272*	,707	,015	,32	4,22
		hb96C 1 μ M	1,935	,794	,113	-,28	4,15
		hb96C 10 μ M	,029	,803	1,000	-2,17	2,22

The mean difference is significant at the 0.05 level

APPENDIX 23

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF *lacs4-1* IN DIFFERENT CONCENTRATIONS

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	13,189	3	96	,000
3.day	14,317	3	96	,000
4.day	14,657	3	96	,000
5.day	1,328	3	96	,270
6.day	,983	3	96	,404
7.day	3,292	3	96	,024
8.day	2,472	3	96	,066
9.day	2,858	3	96	,041
10.day	3,529	3	96	,018

APPENDIX 24

THE ANOVA TEST TABLE OF *lacs4-1* IN DIFFERENT CONCENTRATIONS

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000		
	Within Groups	,000	96	,000		
	Total	,000	99			
2.day	Between Groups	,455	3	,152	2,706	,050
	Within Groups	5,385	96	,056		
	Total	5,840	99			
3.day	Between Groups	4,893	3	1,631	4,252	,007
	Within Groups	36,817	96	,384		
	Total	41,710	99			
4.day	Between Groups	66,104	3	22,035	12,967	,000
	Within Groups	163,136	96	1,699		
	Total	229,240	99			
5.day	Between Groups	116,598	3	38,866	15,762	,000
	Within Groups	236,712	96	2,466		
	Total	353,310	99			
6.day	Between Groups	115,637	3	38,546	13,641	,000
	Within Groups	271,273	96	2,826		
	Total	386,910	99			
7.day	Between Groups	138,482	3	46,161	11,586	,000
	Within Groups	382,478	96	3,984		
	Total	520,960	99			
8.day	Between Groups	138,344	3	46,115	9,174	,000
	Within Groups	482,566	96	5,027		
	Total	620,910	99			
9.day	Between Groups	217,773	3	72,591	9,458	,000
	Within Groups	736,817	96	7,675		
	Total	954,590	99			
10.day	Between Groups	267,286	3	89,095	9,399	,000
	Within Groups	910,024	96	9,479		
	Total	1177,310	99			

APPENDIX 25

THE POST HOC TEST TABLE OF *lacs4-1* IN DIFFERENT CONCENTRATIONS

Multiple Comparisons								
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
2.day	Tukey HSD	lacs4-1 control	lacs4-1 1 µM	-,154	,063	,079	-,32	,01
			lacs4-1 10 µM	,000	,066	1,000	-,17	,17
			lacs4-1 50 µM	,000	,066	1,000	-,17	,17
		lacs4-1 1 µM	lacs4-1 control	,154	,063	,079	-,01	,32
			lacs4-1 10 µM	,154	,069	,119	-,03	,33
			lacs4-1 50 µM	,154	,069	,119	-,03	,33
		lacs4-1 10 µM	lacs4-1 control	,000	,066	1,000	-,17	,17
			lacs4-1 1 µM	-,154	,069	,119	-,33	,03
			lacs4-1 50 µM	,000	,071	1,000	-,19	,19
		lacs4-1 50 µM	lacs4-1 control	,000	,066	1,000	-,17	,17
			lacs4-1 1 µM	-,154	,069	,119	-,33	,03
			lacs4-1 10 µM	,000	,071	1,000	-,19	,19
	Dunnnett T3	lacs4-1 control	lacs4-1 1 µM	-,154	,091	,458	-,41	,10
			lacs4-1 10 µM	,000	,000	.	,00	,00
			lacs4-1 50 µM	,000	,000	.	,00	,00
		lacs4-1 1 µM	lacs4-1 control	,154	,091	,458	-,10	,41
			lacs4-1 10 µM	,154	,091	,458	-,10	,41
			lacs4-1 50 µM	,154	,091	,458	-,10	,41
		lacs4-1 10 µM	lacs4-1 control	,000	,000	.	,00	,00
			lacs4-1 1 µM	-,154	,091	,458	-,41	,10
			lacs4-1 50 µM	,000	,000	.	,00	,00
		lacs4-1 50 µM	lacs4-1 control	,000	,000	.	,00	,00
			lacs4-1 1 µM	-,154	,091	,458	-,41	,10
			lacs4-1 10 µM	,000	,000	.	,00	,00
3.day	Tukey HSD	lacs4-1 control	lacs4-1 1 µM	-,415	,166	,066	-,85	,02
			lacs4-1 10 µM	-,027	,174	,999	-,48	,43
			lacs4-1 50 µM	,200	,174	,659	-,25	,65
		lacs4-1 1 µM	lacs4-1 control	,415	,166	,066	-,02	,85
			lacs4-1 10 µM	,388	,179	,141	-,08	,86
			lacs4-1 50 µM	,615*	,179	,005	,15	1,08

Continuation of APPENDIX 25

		lacs4-1 10 μ M	lacs4-1 control	,027	,174	,999	-,43	,48
			lacs4-1 1 μ M	-,388	,179	,141	-,86	,08
			lacs4-1 50 μ M	,227	,187	,618	-,26	,72
		lacs4-1 50 μ M	lacs4-1 control	-,200	,174	,659	-,65	,25
			lacs4-1 1 μ M	-,615*	,179	,005	-1,08	-,15
			lacs4-1 10 μ M	-,227	,187	,618	-,72	,26
	Dunnett T3	lacs4-1 control	lacs4-1 1 μ M	-,415	,212	,291	-1,00	,17
			lacs4-1 10 μ M	-,027	,143	1,000	-,42	,37
			lacs4-1 50 μ M	,200	,088	,167	-,05	,45
		lacs4-1 1 μ M	lacs4-1 control	,415	,212	,291	-,17	1,00
			lacs4-1 10 μ M	,388	,223	,419	-,23	1,00
			lacs4-1 50 μ M	,615*	,193	,022	,07	1,16
		lacs4-1 10 μ M	lacs4-1 control	,027	,143	1,000	-,37	,42
			lacs4-1 1 μ M	-,388	,223	,419	-1,00	,23
			lacs4-1 50 μ M	,227	,113	,278	-,10	,55
4.day	Tukey HSD	lacs4-1 50 μ M	lacs4-1 control	-,200	,088	,167	-,45	,05
			lacs4-1 1 μ M	-,615*	,193	,022	-1,16	-,07
			lacs4-1 10 μ M	-,227	,113	,278	-,55	,10
		lacs4-1 control	lacs4-1 1 μ M	,585	,349	,343	-,33	1,50
			lacs4-1 10 μ M	1,473*	,366	,001	,52	2,43
			lacs4-1 50 μ M	2,109*	,366	,000	1,15	3,07
		lacs4-1 1 μ M	lacs4-1 control	-,585	,349	,343	-1,50	,33
			lacs4-1 10 μ M	,888	,378	,094	-,10	1,88
			lacs4-1 50 μ M	1,524*	,378	,001	,54	2,51
	Dunnett T3	lacs4-1 10 μ M	lacs4-1 control	-1,473*	,366	,001	-2,43	-,52
			lacs4-1 1 μ M	-,888	,378	,094	-1,88	,10
			lacs4-1 50 μ M	,636	,393	,373	-,39	1,66
		lacs4-1 50 μ M	lacs4-1 control	-2,109*	,366	,000	-3,07	-1,15
			lacs4-1 1 μ M	-1,524*	,378	,001	-2,51	-,54
			lacs4-1 10 μ M	-,636	,393	,373	-1,66	,39
		lacs4-1 control	lacs4-1 1 μ M	,585	,415	,649	-,55	1,72
			lacs4-1 10 μ M	1,473*	,402	,004	,37	2,57
			lacs4-1 50 μ M	2,109*	,329	,000	1,19	3,03
		lacs4-1 1 μ M	lacs4-1 control	-,585	,415	,649	-1,72	,55
			lacs4-1 10 μ M	,888	,354	,088	-,08	1,86
			lacs4-1 50 μ M	1,524*	,268	,000	,77	2,28

Continuation of APPENDIX 25

5.day	Tukey HSD	lacs4-1 10 μ M	lacs4-1 control	-1,473*	,402	,004	-2,57	-,37
			lacs4-1 1 μ M	-,888	,354	,088	-1,86	,08
			lacs4-1 50 μ M	,636	,247	,092	-,07	1,34
		lacs4-1 50 μ M	lacs4-1 control	-2,109*	,329	,000	-3,03	-1,19
			lacs4-1 1 μ M	-1,524*	,268	,000	-2,28	-,77
			lacs4-1 10 μ M	-,636	,247	,092	-1,34	,07
		lacs4-1 1 μ M	lacs4-1 control	1,667*	,421	,001	,57	2,77
			lacs4-1 10 μ M	2,212*	,441	,000	1,06	3,36
			lacs4-1 50 μ M	2,803*	,441	,000	1,65	3,96
	Dunnett T3	lacs4-1 10 μ M	lacs4-1 control	-1,667*	,421	,001	-2,77	-,57
			lacs4-1 10 μ M	,545	,455	,629	-,64	1,73
			lacs4-1 50 μ M	1,136	,455	,067	-,05	2,33
		lacs4-1 50 μ M	lacs4-1 control	-2,212*	,441	,000	-3,36	-1,06
			lacs4-1 1 μ M	-,545	,455	,629	-1,73	,64
			lacs4-1 50 μ M	,591	,473	,598	-,65	1,83
		lacs4-1 1 μ M	lacs4-1 control	-2,803*	,441	,000	-3,96	-1,65
			lacs4-1 1 μ M	-1,136	,455	,067	-2,33	,05
			lacs4-1 10 μ M	-,591	,473	,598	-1,83	,65
6.day	Tukey HSD	lacs4-1 control	lacs4-1 1 μ M	1,667*	,393	,001	,60	2,74
			lacs4-1 10 μ M	2,212*	,495	,000	,85	3,58
			lacs4-1 50 μ M	2,803*	,420	,000	1,65	3,95
		lacs4-1 1 μ M	lacs4-1 control	-1,667*	,393	,001	-2,74	-,60
			lacs4-1 10 μ M	,545	,484	,831	-,79	1,88
			lacs4-1 50 μ M	1,136*	,406	,044	,02	2,25
	Dunnett T3	lacs4-1 10 μ M	lacs4-1 control	-2,212*	,495	,000	-3,58	-,85
			lacs4-1 1 μ M	-,545	,484	,831	-1,88	,79
			lacs4-1 50 μ M	,591	,505	,808	-,81	1,99
		lacs4-1 50 μ M	lacs4-1 control	-2,803*	,420	,000	-3,95	-1,65
			lacs4-1 1 μ M	-1,136*	,406	,044	-2,25	-,02
			lacs4-1 10 μ M	-,591	,505	,808	-1,99	,81
6.day	Tukey HSD	lacs4-1 control	lacs4-1 1 μ M	2,177*	,450	,000	1,00	3,35
			lacs4-1 10 μ M	2,555*	,472	,000	1,32	3,79
			lacs4-1 50 μ M	2,282*	,472	,000	1,05	3,52
		lacs4-1 1 μ M	lacs4-1 control	-2,177*	,450	,000	-3,35	-1,00
			lacs4-1 10 μ M	,378	,487	,865	-,90	1,65
			lacs4-1 50 μ M	,105	,487	,996	-1,17	1,38

Continuation of APPENDIX 25

		lacs4-1 10 μ M	lacs4-1 control	-2,555*	,472	,000	-3,79	-1,32
			lacs4-1 1 μ M	-,378	,487	,865	-1,65	,90
			lacs4-1 50 μ M	-,273	,507	,950	-1,60	1,05
		lacs4-1 50 μ M	lacs4-1 control	-2,282*	,472	,000	-3,52	-1,05
			lacs4-1 1 μ M	-,105	,487	,996	-1,38	1,17
			lacs4-1 10 μ M	,273	,507	,950	-1,05	1,60
	Dunnett T3	lacs4-1 control	lacs4-1 1 μ M	2,177*	,427	,000	1,01	3,34
			lacs4-1 10 μ M	2,555*	,526	,000	1,11	4,00
			lacs4-1 50 μ M	2,282*	,483	,000	,96	3,60
		lacs4-1 1 μ M	lacs4-1 control	-2,177*	,427	,000	-3,34	-1,01
			lacs4-1 10 μ M	,378	,473	,961	-,93	1,69
			lacs4-1 50 μ M	,105	,424	1,000	-1,06	1,27
		lacs4-1 10 μ M	lacs4-1 control	-2,555*	,526	,000	-4,00	-1,11
			lacs4-1 1 μ M	-,378	,473	,961	-1,69	,93
			lacs4-1 50 μ M	-,273	,524	,996	-1,72	1,17
7.day	Tukey HSD	lacs4-1 50 μ M	lacs4-1 control	-2,282*	,483	,000	-3,60	-,96
			lacs4-1 1 μ M	-,105	,424	1,000	-1,27	1,06
			lacs4-1 10 μ M	,273	,524	,996	-1,17	1,72
		lacs4-1 control	lacs4-1 1 μ M	2,859*	,535	,000	1,46	4,26
			lacs4-1 10 μ M	2,576*	,560	,000	1,11	4,04
			lacs4-1 50 μ M	1,712*	,560	,015	,25	3,18
		lacs4-1 1 μ M	lacs4-1 control	-2,859*	,535	,000	-4,26	-1,46
			lacs4-1 10 μ M	-,283	,578	,961	-1,80	1,23
			lacs4-1 50 μ M	-1,147	,578	,201	-2,66	,36
		lacs4-1 10 μ M	lacs4-1 control	-2,576*	,560	,000	-4,04	-1,11
			lacs4-1 1 μ M	,283	,578	,961	-1,23	1,80
			lacs4-1 50 μ M	-,864	,602	,481	-2,44	,71
		lacs4-1 50 μ M	lacs4-1 control	-1,712*	,560	,015	-3,18	-,25
			lacs4-1 1 μ M	1,147	,578	,201	-,36	2,66
			lacs4-1 10 μ M	,864	,602	,481	-,71	2,44
	Dunnett T3	lacs4-1 control	lacs4-1 1 μ M	2,859*	,487	,000	1,52	4,20
			lacs4-1 10 μ M	2,576*	,578	,000	1,00	4,16
			lacs4-1 50 μ M	1,712	,659	,072	-,10	3,52
		lacs4-1 1 μ M	lacs4-1 control	-2,859*	,487	,000	-4,20	-1,52
			lacs4-1 10 μ M	-,283	,461	,989	-1,56	1,00
			lacs4-1 50 μ M	-1,147	,559	,249	-2,71	,42

Continuation of APPENDIX 25

8.day	Tukey HSD	lacs4-1 10 μ M	lacs4-1 control	-2,576*	,578	,000	-4,16	-1,00
			lacs4-1 1 μ M	,283	,461	,989	-1,00	1,56
			lacs4-1 50 μ M	-,864	,639	,690	-2,63	,90
		lacs4-1 50 μ M	lacs4-1 control	-1,712	,659	,072	-3,52	,10
			lacs4-1 1 μ M	1,147	,559	,249	-,42	2,71
			lacs4-1 10 μ M	,864	,639	,690	-,90	2,63
	Dunnett T3	lacs4-1 control	lacs4-1 1 μ M	2,892*	,601	,000	1,32	4,46
			lacs4-1 10 μ M	2,518*	,629	,001	,87	4,16
			lacs4-1 50 μ M	1,655*	,629	,048	,01	3,30
		lacs4-1 1 μ M	lacs4-1 control	-2,892*	,601	,000	-4,46	-1,32
			lacs4-1 10 μ M	-,374	,649	,939	-2,07	1,32
			lacs4-1 50 μ M	-1,238	,649	,232	-2,94	,46
		lacs4-1 10 μ M	lacs4-1 control	-2,518*	,629	,001	-4,16	-,87
			lacs4-1 1 μ M	,374	,649	,939	-1,32	2,07
			lacs4-1 50 μ M	-,864	,676	,579	-2,63	,90
9.day	Tukey HSD	lacs4-1 50 μ M	lacs4-1 control	-1,655*	,629	,048	-3,30	-,01
			lacs4-1 1 μ M	1,238	,649	,232	-,46	2,94
			lacs4-1 10 μ M	,864	,676	,579	-,90	2,63
		lacs4-1 control	lacs4-1 1 μ M	2,892*	,590	,000	1,27	4,51
			lacs4-1 10 μ M	2,518*	,699	,004	,61	4,43
			lacs4-1 50 μ M	1,655	,672	,098	-,18	3,49
		lacs4-1 1 μ M	lacs4-1 control	-2,892*	,590	,000	-4,51	-1,27
			lacs4-1 10 μ M	-,374	,575	,986	-1,97	1,22
			lacs4-1 50 μ M	-1,238	,541	,151	-2,73	,26
	Dunnett T3	lacs4-1 10 μ M	lacs4-1 control	-2,518*	,699	,004	-4,43	-,61
			lacs4-1 1 μ M	,374	,575	,986	-1,22	1,97
			lacs4-1 50 μ M	-,864	,658	,717	-2,68	,95
		lacs4-1 50 μ M	lacs4-1 control	-1,655	,672	,098	-3,49	,18
			lacs4-1 1 μ M	1,238	,541	,151	-,26	2,73
			lacs4-1 10 μ M	,864	,658	,717	-,95	2,68
	Tukey HSD	lacs4-1 control	lacs4-1 1 μ M	3,585*	,742	,000	1,64	5,53
			lacs4-1 10 μ M	3,064*	,778	,001	1,03	5,10
			lacs4-1 50 μ M	1,382	,778	,291	-,65	3,42
		lacs4-1 1 μ M	lacs4-1 control	-3,585*	,742	,000	-5,53	-1,64
			lacs4-1 10 μ M	-,521	,803	,916	-2,62	1,58
			lacs4-1 50 μ M	-2,203*	,803	,036	-4,30	-,10

Continuation of APPENDIX 25

		lacs4-1 10 μ M	lacs4-1 control	-3,064*	,778	,001	-5,10	-1,03
			lacs4-1 1 μ M	,521	,803	,916	-1,58	2,62
			lacs4-1 50 μ M	-1,682	,835	,190	-3,87	,50
		lacs4-1 50 μ M	lacs4-1 control	-1,382	,778	,291	-3,42	,65
			lacs4-1 1 μ M	2,203*	,803	,036	,10	4,30
			lacs4-1 10 μ M	1,682	,835	,190	-,50	3,87
	Dunnett T3	lacs4-1 control	lacs4-1 1 μ M	3,585*	,763	,000	1,50	5,67
			lacs4-1 10 μ M	3,064*	,832	,003	,79	5,34
			lacs4-1 50 μ M	1,382	,832	,468	-,89	3,66
		lacs4-1 1 μ M	lacs4-1 control	-3,585*	,763	,000	-5,67	-1,50
			lacs4-1 10 μ M	-,521	,689	,970	-2,42	1,38
			lacs4-1 50 μ M	-2,203*	,689	,016	-4,10	-,31
		lacs4-1 10 μ M	lacs4-1 control	-3,064*	,832	,003	-5,34	-,79
			lacs4-1 1 μ M	,521	,689	,970	-1,38	2,42
			lacs4-1 50 μ M	-1,682	,764	,179	-3,79	,42
10.day	Tukey HSD	lacs4-1 50 μ M	lacs4-1 control	-1,382	,832	,468	-3,66	,89
			lacs4-1 1 μ M	2,203*	,689	,016	,31	4,10
			lacs4-1 10 μ M	1,682	,764	,179	-,42	3,79
		lacs4-1 control	lacs4-1 1 μ M	4,087*	,825	,000	1,93	6,24
			lacs4-1 10 μ M	3,115*	,864	,003	,86	5,37
			lacs4-1 50 μ M	1,433	,864	,351	-,83	3,69
		lacs4-1 1 μ M	lacs4-1 control	-4,087*	,825	,000	-6,24	-1,93
			lacs4-1 10 μ M	-,972	,892	,697	-3,30	1,36
			lacs4-1 50 μ M	-2,654*	,892	,019	-4,99	-,32
	Dunnett T3	lacs4-1 10 μ M	lacs4-1 control	-3,115*	,864	,003	-5,37	-,86
			lacs4-1 1 μ M	,972	,892	,697	-1,36	3,30
			lacs4-1 50 μ M	-1,682	,928	,274	-4,11	,75
		lacs4-1 50 μ M	lacs4-1 control	-1,433	,864	,351	-3,69	,83
			lacs4-1 1 μ M	2,654*	,892	,019	,32	4,99
			lacs4-1 10 μ M	1,682	,928	,274	-,75	4,11
		lacs4-1 control	lacs4-1 1 μ M	4,087*	,849	,000	1,76	6,41
			lacs4-1 10 μ M	3,115*	,954	,012	,51	5,72
			lacs4-1 50 μ M	1,433	,898	,514	-1,02	3,89
		lacs4-1 1 μ M	lacs4-1 control	-4,087*	,849	,000	-6,41	-1,76
			lacs4-1 10 μ M	-,972	,794	,774	-3,16	1,22
			lacs4-1 50 μ M	-2,654*	,726	,004	-4,65	-,66

Continuation of APPENDIX 25

lacs4-1 10 µM	lacs4-1 control	-3,115*	,954	,012	-5,72	-,51
	lacs4-1 1 µM	,972	,794	,774	-1,22	3,16
	lacs4-1 50 µM	-1,682	,846	,273	-4,01	,65
lacs4-1 50 µM	lacs4-1 control	-1,433	,898	,514	-3,89	1,02
	lacs4-1 1 µM	2,654*	,726	,004	,66	4,65
	lacs4-1 10 µM	1,682	,846	,273	-,65	4,01

The mean difference is significant at the 0.05 level



APPENDIX 26

THE TEST OF HOMOGENEITY OF VARIANCES TABLE OF *lacs4-2* IN DIFFERENT CONCENTRATIONS

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
1.day	.	3	.	.
2.day	9,273	3	104	,000
3.day	13,213	3	104	,000
4.day	8,915	3	104	,000
5.day	,193	3	104	,901
6.day	1,374	3	104	,255
7.day	1,790	3	104	,154
8.day	2,137	3	104	,100
9.day	2,448	3	104	,068
10.day	1,907	3	104	,133

APPENDIX 27

THE ANOVA TEST TABLE OF *lacs4-2* IN DIFFERENT CONCENTRATIONS

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
1.day	Between Groups	,000	3	,000		
	Within Groups	,000	104	,000		
	Total	,000	107			
2.day	Between Groups	,423	3	,141	1,975	,122
	Within Groups	7,429	104	,071		
	Total	7,852	107			
3.day	Between Groups	1,799	3	,600	2,543	,060
	Within Groups	24,525	104	,236		
	Total	26,324	107			
4.day	Between Groups	24,375	3	8,125	5,711	,001
	Within Groups	147,949	104	1,423		
	Total	172,324	107			
5.day	Between Groups	53,167	3	17,722	10,141	,000
	Within Groups	181,750	104	1,748		
	Total	234,917	107			
6.day	Between Groups	38,758	3	12,919	6,780	,000
	Within Groups	198,159	104	1,905		
	Total	236,917	107			
7.day	Between Groups	94,531	3	31,510	13,528	,000
	Within Groups	242,237	104	2,329		
	Total	336,769	107			
8.day	Between Groups	265,418	3	88,473	24,947	,000
	Within Groups	368,832	104	3,546		
	Total	634,250	107			
9.day	Between Groups	502,986	3	167,662	33,275	,000
	Within Groups	524,014	104	5,039		
	Total	1027,000	107			
10.day	Between Groups	614,569	3	204,856	28,865	,000
	Within Groups	738,098	104	7,097		
	Total	1352,667	107			

APPENDIX 28

THE POST HOC TEST TABLE OF *lacs4-2* IN DIFFERENT CONCENTRATIONS

Multiple Comparisons								
Dependent Variable (I) V1 (J) V1				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
2.day	Tukey HSD	lacs4-2 control	lacs4-2 1 µM	-,143	,076	,245	-,34	,06
			lacs4-2 10 µM	,000	,072	1,000	-,19	,19
			lacs4-2 50 µM	,000	,082	1,000	-,21	,21
		lacs4-2 1 µM	lacs4-2 control	,143	,076	,245	-,06	,34
			lacs4-2 10 µM	,143	,067	,149	-,03	,32
			lacs4-2 50 µM	,143	,077	,255	-,06	,34
		lacs4-2 10 µM	lacs4-2 control	,000	,072	1,000	-,19	,19
			lacs4-2 1 µM	-,143	,067	,149	-,32	,03
			lacs4-2 50 µM	,000	,073	1,000	-,19	,19
		lacs4-2 50 µM	lacs4-2 control	,000	,082	1,000	-,21	,21
			lacs4-2 1 µM	-,143	,077	,255	-,34	,06
			lacs4-2 10 µM	,000	,073	1,000	-,19	,19
	Dunnett T3	lacs4-2 control	lacs4-2 1 µM	-,143	,099	,628	-,42	,14
			lacs4-2 10 µM	,000	,000	.	,00	,00
			lacs4-2 50 µM	,000	,000	.	,00	,00
		lacs4-2 1 µM	lacs4-2 control	,143	,099	,628	-,14	,42
			lacs4-2 10 µM	,143	,099	,628	-,14	,42
			lacs4-2 50 µM	,143	,099	,628	-,14	,42
		lacs4-2 10 µM	lacs4-2 control	,000	,000	.	,00	,00
			lacs4-2 1 µM	-,143	,099	,628	-,42	,14
			lacs4-2 50 µM	,000	,000	.	,00	,00
		lacs4-2 50 µM	lacs4-2 control	,000	,000	.	,00	,00
			lacs4-2 1 µM	-,143	,099	,628	-,42	,14
			lacs4-2 10 µM	,000	,000	.	,00	,00
3.day	Tukey HSD	lacs4-2 control	lacs4-2 1 µM	-,286	,138	,171	-,65	,08
			lacs4-2 10 µM	-,243	,131	,251	-,58	,10
			lacs4-2 50 µM	,000	,148	1,000	-,39	,39
		lacs4-2 1 µM	lacs4-2 control	,286	,138	,171	-,08	,65
			lacs4-2 10 µM	,042	,122	,985	-,28	,36
			lacs4-2 50 µM	,286	,140	,181	-,08	,65

Continuation of APPENDIX 28

		lacs4-2 10 μ M	lacs4-2 control	,243	,131	,251	-,10	,58
			lacs4-2 1 μ M	-,042	,122	,985	-,36	,28
			lacs4-2 50 μ M	,243	,133	,264	-,10	,59
		lacs4-2 50 μ M	lacs4-2 control	,000	,148	1,000	-,39	,39
			lacs4-2 1 μ M	-,286	,140	,181	-,65	,08
			lacs4-2 10 μ M	-,243	,133	,264	-,59	,10
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	-,286	,135	,223	-,67	,09
			lacs4-2 10 μ M	-,243	,090	,060	-,49	,01
			lacs4-2 50 μ M	,000	,000	.	,00	,00
		lacs4-2 1 μ M	lacs4-2 control	,286	,135	,223	-,09	,67
			lacs4-2 10 μ M	,042	,162	1,000	-,40	,49
			lacs4-2 50 μ M	,286	,135	,223	-,09	,67
		lacs4-2 10 μ M	lacs4-2 control	,243	,090	,060	-,01	,49
			lacs4-2 1 μ M	-,042	,162	1,000	-,49	,40
			lacs4-2 50 μ M	,243	,090	,060	-,01	,49
		lacs4-2 50 μ M	lacs4-2 control	,000	,000	.	,00	,00
			lacs4-2 1 μ M	-,286	,135	,223	-,67	,09
			lacs4-2 10 μ M	-,243	,090	,060	-,49	,01
4.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	-,036	,340	1,000	-,92	,85
			lacs4-2 10 μ M	,311	,321	,768	-,53	1,15
			lacs4-2 50 μ M	1,262*	,364	,004	,31	2,21
		lacs4-2 1 μ M	lacs4-2 control	,036	,340	1,000	-,85	,92
			lacs4-2 10 μ M	,347	,299	,653	-,43	1,13
			lacs4-2 50 μ M	1,298*	,344	,002	,40	2,20
		lacs4-2 10 μ M	lacs4-2 control	-,311	,321	,768	-1,15	,53
			lacs4-2 1 μ M	-,347	,299	,653	-1,13	,43
			lacs4-2 50 μ M	,951*	,326	,022	,10	1,80
		lacs4-2 50 μ M	lacs4-2 control	-1,262*	,364	,004	-2,21	-,31
			lacs4-2 1 μ M	-1,298*	,344	,002	-2,20	-,40
			lacs4-2 10 μ M	-,951*	,326	,022	-1,80	-,10
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	-,036	,410	1,000	-1,17	1,10
			lacs4-2 10 μ M	,311	,386	,959	-,76	1,38
			lacs4-2 50 μ M	1,262*	,347	,008	,27	2,25
		lacs4-2 1 μ M	lacs4-2 control	,036	,410	1,000	-1,10	1,17
			lacs4-2 10 μ M	,347	,307	,832	-,49	1,18
			lacs4-2 50 μ M	1,298*	,257	,000	,58	2,01

Continuation of APPENDIX 28

		lacs4-2 10 μ M	lacs4-2 control	-,311	,386	,959	-1,38	,76
			lacs4-2 1 μ M	-,347	,307	,832	-1,18	,49
			lacs4-2 50 μ M	,951*	,215	,000	,36	1,54
		lacs4-2 50 μ M	lacs4-2 control	-1,262*	,347	,008	-2,25	-,27
			lacs4-2 1 μ M	-1,298*	,257	,000	-2,01	-,58
			lacs4-2 10 μ M	-,951*	,215	,000	-1,54	-,36
5.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	,445	,377	,640	-,54	1,43
			lacs4-2 10 μ M	1,274*	,356	,003	,34	2,20
			lacs4-2 50 μ M	1,981*	,403	,000	,93	3,03
		lacs4-2 1 μ M	lacs4-2 control	-,445	,377	,640	-1,43	,54
			lacs4-2 10 μ M	,829	,331	,065	-,04	1,69
			lacs4-2 50 μ M	1,536*	,382	,001	,54	2,53
		lacs4-2 10 μ M	lacs4-2 control	-1,274*	,356	,003	-2,20	-,34
			lacs4-2 1 μ M	-,829	,331	,065	-1,69	,04
			lacs4-2 50 μ M	,707	,361	,211	-,24	1,65
	Dunnett T3	lacs4-2 50 μ M	lacs4-2 control	-1,981*	,403	,000	-3,03	-,93
			lacs4-2 1 μ M	-1,536*	,382	,001	-2,53	-,54
			lacs4-2 10 μ M	-,707	,361	,211	-1,65	,24
		lacs4-2 control	lacs4-2 1 μ M	,445	,373	,794	-,58	1,47
			lacs4-2 10 μ M	1,274*	,371	,008	,25	2,29
			lacs4-2 50 μ M	1,981*	,399	,000	,88	3,08
		lacs4-2 1 μ M	lacs4-2 control	-,445	,373	,794	-1,47	,58
			lacs4-2 10 μ M	,829	,327	,079	-,06	1,72
			lacs4-2 50 μ M	1,536*	,358	,001	,55	2,52
		lacs4-2 10 μ M	lacs4-2 control	-1,274*	,371	,008	-2,29	-,25
			lacs4-2 1 μ M	-,829	,327	,079	-1,72	,06
			lacs4-2 50 μ M	,707	,356	,273	-,27	1,68
		lacs4-2 50 μ M	lacs4-2 control	-1,981*	,399	,000	-3,08	-,88
			lacs4-2 1 μ M	-1,536*	,358	,001	-2,52	-,55
			lacs4-2 10 μ M	-,707	,356	,273	-1,68	,27
6.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	1,065*	,393	,039	,04	2,09
			lacs4-2 10 μ M	1,609*	,372	,000	,64	2,58
			lacs4-2 50 μ M	1,446*	,421	,005	,35	2,55
		lacs4-2 1 μ M	lacs4-2 control	-1,065*	,393	,039	-2,09	-,04
			lacs4-2 10 μ M	,544	,346	,398	-,36	1,45
			lacs4-2 50 μ M	,381	,398	,775	-,66	1,42

Continuation of APPENDIX 28

		lacs4-2 10 μ M	lacs4-2 control	-1,609*	,372	,000	-2,58	-,64
			lacs4-2 1 μ M	-,544	,346	,398	-1,45	,36
			lacs4-2 50 μ M	-,163	,377	,973	-1,15	,82
		lacs4-2 50 μ M	lacs4-2 control	-1,446*	,421	,005	-2,55	-,35
			lacs4-2 1 μ M	-,381	,398	,775	-1,42	,66
			lacs4-2 10 μ M	,163	,377	,973	-,82	1,15
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	1,065*	,337	,016	,14	1,99
			lacs4-2 10 μ M	1,609*	,317	,000	,75	2,47
			lacs4-2 50 μ M	1,446*	,386	,004	,37	2,52
		lacs4-2 1 μ M	lacs4-2 control	-1,065*	,337	,016	-1,99	-,14
			lacs4-2 10 μ M	,544	,363	,582	-,44	1,53
			lacs4-2 50 μ M	,381	,425	,934	-,79	1,55
		lacs4-2 10 μ M	lacs4-2 control	-1,609*	,317	,000	-2,47	-,75
			lacs4-2 1 μ M	-,544	,363	,582	-1,53	,44
			lacs4-2 50 μ M	-,163	,409	,999	-1,29	,96
		lacs4-2 50 μ M	lacs4-2 control	-1,446*	,386	,004	-2,52	-,37
			lacs4-2 1 μ M	-,381	,425	,934	-1,55	,79
			lacs4-2 10 μ M	,163	,409	,999	-,96	1,29
7.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	2,101*	,435	,000	,97	3,24
			lacs4-2 10 μ M	2,434*	,411	,000	1,36	3,51
			lacs4-2 50 μ M	1,089	,466	,096	-,13	2,30
		lacs4-2 1 μ M	lacs4-2 control	-2,101*	,435	,000	-3,24	-,97
			lacs4-2 10 μ M	,333	,382	,820	-,67	1,33
			lacs4-2 50 μ M	-1,012	,441	,105	-2,16	,14
		lacs4-2 10 μ M	lacs4-2 control	-2,434*	,411	,000	-3,51	-1,36
			lacs4-2 1 μ M	-,333	,382	,820	-1,33	,67
			lacs4-2 50 μ M	-1,345*	,417	,009	-2,43	-,26
		lacs4-2 50 μ M	lacs4-2 control	-1,089	,466	,096	-2,30	,13
			lacs4-2 1 μ M	1,012	,441	,105	-,14	2,16
			lacs4-2 10 μ M	1,345*	,417	,009	,26	2,43
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	2,101*	,355	,000	1,13	3,07
			lacs4-2 10 μ M	2,434*	,347	,000	1,49	3,38
			lacs4-2 50 μ M	1,089	,476	,157	-,24	2,42
		lacs4-2 1 μ M	lacs4-2 control	-2,101*	,355	,000	-3,07	-1,13
			lacs4-2 10 μ M	,333	,374	,937	-,68	1,35
			lacs4-2 50 μ M	-1,012	,496	,251	-2,39	,37

Continuation of APPENDIX 28

		lacs4-2 10 μ M	lacs4-2 control	-2,434*	,347	,000	-3,38	-1,49
			lacs4-2 1 μ M	-,333	,374	,937	-1,35	,68
			lacs4-2 50 μ M	-1,345	,491	,055	-2,71	,02
		lacs4-2 50 μ M	lacs4-2 control	-1,089	,476	,157	-2,42	,24
			lacs4-2 1 μ M	1,012	,496	,251	-,37	2,39
			lacs4-2 10 μ M	1,345	,491	,055	-,02	2,71
8.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	3,744*	,537	,000	2,34	5,14
			lacs4-2 10 μ M	4,001*	,507	,000	2,68	5,33
			lacs4-2 50 μ M	1,946*	,575	,005	,45	3,45
		lacs4-2 1 μ M	lacs4-2 control	-3,744*	,537	,000	-5,14	-2,34
			lacs4-2 10 μ M	,258	,472	,947	-,97	1,49
			lacs4-2 50 μ M	-1,798*	,544	,007	-3,22	-,38
		lacs4-2 10 μ M	lacs4-2 control	-4,001*	,507	,000	-5,33	-2,68
			lacs4-2 1 μ M	-,258	,472	,947	-1,49	,97
			lacs4-2 50 μ M	-2,055*	,515	,001	-3,40	-,71
	Dunnett T3	lacs4-2 50 μ M	lacs4-2 control	-1,946*	,575	,005	-3,45	-,45
			lacs4-2 1 μ M	1,798*	,544	,007	,38	3,22
			lacs4-2 10 μ M	2,055*	,515	,001	,71	3,40
		lacs4-2 control	lacs4-2 1 μ M	3,744*	,524	,000	2,30	5,18
			lacs4-2 10 μ M	4,001*	,485	,000	2,66	5,34
			lacs4-2 50 μ M	1,946*	,635	,023	,19	3,70
		lacs4-2 1 μ M	lacs4-2 control	-3,744*	,524	,000	-5,18	-2,30
			lacs4-2 10 μ M	,258	,442	,992	-,95	1,46
			lacs4-2 50 μ M	-1,798*	,603	,029	-3,47	-,13
		lacs4-2 10 μ M	lacs4-2 control	-4,001*	,485	,000	-5,34	-2,66
			lacs4-2 1 μ M	-,258	,442	,992	-1,46	,95
			lacs4-2 50 μ M	-2,055*	,569	,006	-3,64	-,47
		lacs4-2 50 μ M	lacs4-2 control	-1,946*	,635	,023	-3,70	-,19
			lacs4-2 1 μ M	1,798*	,603	,029	,13	3,47
			lacs4-2 10 μ M	2,055*	,569	,006	,47	3,64
9.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	5,565*	,640	,000	3,90	7,23
			lacs4-2 10 μ M	5,055*	,604	,000	3,48	6,63
			lacs4-2 50 μ M	2,374*	,685	,004	,59	4,16
		lacs4-2 1 μ M	lacs4-2 control	-5,565*	,640	,000	-7,23	-3,90
			lacs4-2 10 μ M	-,510	,562	,801	-1,98	,96
			lacs4-2 50 μ M	-3,190*	,648	,000	-4,88	-1,50

Continuation of APPENDIX 28

		lacs4-2 10 μ M	lacs4-2 control	-5,055*	,604	,000	-6,63	-3,48
			lacs4-2 1 μ M	,510	,562	,801	-,96	1,98
			lacs4-2 50 μ M	-2,681*	,613	,000	-4,28	-1,08
		lacs4-2 50 μ M	lacs4-2 control	-2,374*	,685	,004	-4,16	-,59
			lacs4-2 1 μ M	3,190*	,648	,000	1,50	4,88
			lacs4-2 10 μ M	2,681*	,613	,000	1,08	4,28
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	5,565*	,608	,000	3,88	7,25
			lacs4-2 10 μ M	5,055*	,616	,000	3,36	6,75
			lacs4-2 50 μ M	2,374*	,780	,024	,22	4,53
		lacs4-2 1 μ M	lacs4-2 control	-5,565*	,608	,000	-7,25	-3,88
			lacs4-2 10 μ M	-,510	,494	,882	-1,85	,83
			lacs4-2 50 μ M	-3,190*	,689	,000	-5,11	-1,27
		lacs4-2 10 μ M	lacs4-2 control	-5,055*	,616	,000	-6,75	-3,36
			lacs4-2 1 μ M	,510	,494	,882	-,83	1,85
			lacs4-2 50 μ M	-2,681*	,695	,003	-4,62	-,75
		lacs4-2 50 μ M	lacs4-2 control	-2,374*	,780	,024	-4,53	-,22
			lacs4-2 1 μ M	3,190*	,689	,000	1,27	5,11
			lacs4-2 10 μ M	2,681*	,695	,003	,75	4,62
10.day	Tukey HSD	lacs4-2 control	lacs4-2 1 μ M	6,084*	,759	,000	4,10	8,07
			lacs4-2 10 μ M	5,119*	,717	,000	3,25	6,99
			lacs4-2 50 μ M	1,751	,813	,143	-,37	3,87
		lacs4-2 1 μ M	lacs4-2 control	-6,084*	,759	,000	-8,07	-4,10
			lacs4-2 10 μ M	-,965	,667	,474	-2,71	,78
			lacs4-2 50 μ M	-4,333*	,769	,000	-6,34	-2,33
		lacs4-2 10 μ M	lacs4-2 control	-5,119*	,717	,000	-6,99	-3,25
			lacs4-2 1 μ M	,965	,667	,474	-,78	2,71
			lacs4-2 50 μ M	-3,368*	,728	,000	-5,27	-1,47
		lacs4-2 50 μ M	lacs4-2 control	-1,751	,813	,143	-3,87	,37
			lacs4-2 1 μ M	4,333*	,769	,000	2,33	6,34
			lacs4-2 10 μ M	3,368*	,728	,000	1,47	5,27
	Dunnett T3	lacs4-2 control	lacs4-2 1 μ M	6,084*	,662	,000	4,27	7,90
			lacs4-2 10 μ M	5,119*	,685	,000	3,25	6,99
			lacs4-2 50 μ M	1,751	,876	,269	-,68	4,18
		lacs4-2 1 μ M	lacs4-2 control	-6,084*	,662	,000	-7,90	-4,27
			lacs4-2 10 μ M	-,965	,616	,532	-2,64	,70
			lacs4-2 50 μ M	-4,333*	,823	,000	-6,63	-2,04

Continuation of APPENDIX 28

lacs4-2 10 µM	lacs4-2 control	-5,119*	,685	,000	-6,99	-3,25
	lacs4-2 1 µM	,965	,616	,532	-,70	2,64
	lacs4-2 50 µM	-3,368*	,842	,002	-5,70	-1,03
lacs4-2 50 µM	lacs4-2 control	-1,751	,876	,269	-4,18	,68
	lacs4-2 1 µM	4,333*	,823	,000	2,04	6,63
	lacs4-2 10 µM	3,368*	,842	,002	1,03	5,70

The mean difference is significant at the 0.05 level

