Effects of Different Heights and Stem Diameters on Survival Rates of Jujube Suckers Transplanted in a Semi-Arid Farm in Portales

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Jujube (*Ziziphus jujuba*) belongs to family Rhamnaceae and its fruit is rich in nutrients. Although jujube fruit consumption is widespread in Asian countries it is relatively unknown to North America. Jujube tree is drought- and frost-tolerant and can be widely planted across the state of New Mexico. Recently, interest in jujube from consumers and growers is surging. The New Mexico Department of Agriculture has identified jujube as an alternative crop. The major challenge is a very limited availability of jujube trees. The objective of this project was to study the effects of heights and stem diameters on survival rates of jujube suckers transplanted in a semi-arid farm in Portales, Roosevelt County, New Mexico. A total of 72 suckers were planted in October of 2017. The heights of the suckers were less than 50, 50−100, 100−150 and above 150 cm. The stem diameters of the suckers were 0.015−0.24 cm. Observations on the suckers after one year transplantation demonstrated that the suckers with 50−100 cm height and 0.03−0.07 cm stem diameter had the highest survival rate. This result is useful for growers for planting jujubes in the semi-arid regions like New Mexico. It is expected that jujubes will become a valuable alternative fruit crop in the United States.

Keywords: Jujube, sucker height, stem diameter, survival rates

Detection and Verification of Periodontal Pathogens through Real Time PCR

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The detection and verification of *Streptococcus gordonii*, *Fusobacterium nucleatum,* and other oral bacteria is crucial to scientific research involving periodontal diseases and can be done using a Quantitative Polymerase Chain Reaction (Q-PCR) experiment. Experimentation using Q-PCR provides fast and accurate bacterial strain detection over a span of two to six hours [1] compared to traditional microbiology techniques which may take up to 48 hours or more. This research project focuses on the detection and quantification of S. gordonii, F. nucleatum, and compound biofilms of both bacteria before and after the application of an experimental antimicrobial agent. The quantification of these bacteria through Q-PCR is important in detecting contamination of the experimental samples and in verifying the specific species of bacteria present in a sample. In order to confirm that the bacteria cultures have not been contaminated, a Q-PCR thermal cycler will be used for accurate testing conditions and analyses. Two gene-specific primers for both bacteria are required to amplify the bacteria to a detectable level. Results of the Q-PCR experiments will be determined through the analysis of the graph produced by the StepOnePlus Q-PCR machine and electrophoresis of the samples. Samples that are successfully amplified and confirmed to be either S. gordonii and/or F. nucleatum are expected to fluoresce and be detected during the reaction. Samples of bacteria, following verification through Q-PCR and electrophoresis, will be used for testing in further research in developing antimicrobial oral products.

Keywords: Q-PCR, PCR, primer, DNA template, DNA polymerase, amplicon, S. gordonii, F. Nucleatum, quencher, reporter dye

The Proof, the Whole Proof, and Nothing but the Proof

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We explore geometry proofs in Euclid's Book 1, *Elements*, through rooted in-tree dependency graphs and adjacency matrices. Specifically, we look at propositions 1.45 and the more famous 1.47 (the Pythagorean Theorem). Within the last fifteen years, computer generated dependency graphs for all matter of data have been generated, e.g., world food chains and the premises of all propositions in Euclid's Book 1. Visually these graphs appear more like spaghetti than useful information, the latter being extractable almost exclusively through the power of a computer program and not the eye. Our dependency graphs are 2-D and 3-D structures of the propositions, postulates, common notions, and definitions used to prove I.45 and I.47, and they present the data clearly and unambiguously.

These graphs and matrices yield information about the "toolbox" content for the proof or the proof's "primary repertoire." Using Excel, we plot, in bar graphs, the number of appearances of each premise, the relative distances (shortest and longest) of each premise from the graph's root (the proposition being proven), and the mean, mode, and median for some data. These results allow comparison of the repertoires of Euclidian proofs in side-by-side bar graphs. We argue that they further confirm a conclusion from published research (*Bridges Proceedings*, 2016) of NNMC math student, Jesse Atkinson, that propositions I.45 and I.47 are the dual core propositions that organize Euclid's Book 1. Our bigger questions concern proofs in general and how "collaboration" might occur among the premises. In addition, we are interested in reverse engineering Euclid's method of proof in Book 1 particularly, a process already begun with what we have thus far accomplished through graphing.