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Assessment of plant growth performances of *Capsicum frutescens L.* (Chili plant) based on analysis of variance and ordinary differential equation model

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In plant growth-based research, significant differences are usually examined with the end result of plant growth parameters, for example, cumulative growth, total leaf area, stem diameter and root length. Under the conditions that the assumptions on parameters are met and when the experiment deals with one or two fixed factors, the analysis of variance (ANOVA) technique is commonly used to check the level of significance. However, if retrospective changes of plant growth parameters are well monitored and examined with a robust statistical test that would pave a new trajectory to reveal novel patterns in plant behavior. The model plant; *Capsicum frutescens L.* (Chili) was subjected to the study and the effects of different soil water levels i.e., 25% Water Holding Capacity (WHC), 50% WHC, 75% WHC and 100% WHC (control) were examined by using cumulative plant height. Plant height against time show the shape of the solutions of Logistic differential equation. As such, Logistic differential equation model was applied to model the model plant growth. According to the results of two methods, ANOVA and an Ordinary Differential Equation (ODE) model, there was a significant effect of water stress on chili plant growth. Also, ODE model helps to estimate plant's height at any treatment level at which data not collected (ex: 60% WHC) and at a time beyond the data collected. Therefore, it is recommended to use ODE over ANOVA whenever possible in plant growth-based researches as ODE results are more informative and reliable.

Keywords: ANOVA, Ordinary differential equation, Water holding capacity, Logistic differential equation

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