Laboratory Quality Systems Homework # 2 – Statistical Process Control

Due by Midnight on Monday, February 17, 2025

Instructions: Include one MS Word file with answers for all questions and one Excel file with an individual spreadsheet for each question.

1. Problem # 1: Descriptive Statistics (2.5 pts)

Using the data (Aflatoxin results from OTSC and Gulf Country (GC)) in the attached <u>Data</u> <u>for Homework # 2</u> file (Problem #1 worksheet), answer the following questions:

a) Conduct a paired t-test for two means on the two sets of data and calculate the t-test statistic. Please indicate the significance level.

b) Plot the two sets of data using the scatter diagram function and select the best trendline and provide the equation and coefficient of determination (R2).

c) Calculate the correlation coefficient for the two sets of data. (Follow instructions in demonstrations on activity sheet)

d) What conclusion can you draw about the relationship between the two sets of data? Briefly explain using the tests you conducted in parts a-c.

2. Problem # 2: Control Charts (2.5 pts)

Using the data in the attached <u>Data for Homework # 2</u> file (Problem #2 worksheet), answer the following questions:

a) The problem # 2 worksheet includes data for the following analytes: Monensin, CTC by JPLX, Potassium Feed by ICP and Calcium Feed by AA. Select two analytes and create x-bar and range control charts for each analyte. Follow instructions in demonstrations on activity sheet and use excel macro (Download from Canvas – Macro for creating Control Charts and Histograms.) Make sure macros are enabled – see instructions in Resources below. Please state which analytes you have chosen and use the first 100 data points. When pasting your charts for grading, you may need to take a screen shot rather than cutting and pasting.

b) Are the analytical control samples under-control or out-of-control? (Give an explanation of your conclusion.)

Note: You will create four charts - two for each analyte you choose.

Problem # 3: Frequency Histogram

(2.5 pts)

 Using the data in the attached <u>Data for Homework # 2</u> file (Problem #3 worksheet), answer the following questions, create a frequency histogram for corn protein content in the hybrids listed in Problem # 3 worksheet in Column C. Follow instructions in demonstrations on activity sheet and use excel macro (Download from Canvas – Macro for creating Control Charts and Histograms). Make sure macros are enabled – see instructions in Resources below. When pasting your charts for grading, you may need to take a screen shot rather than cutting and pasting.

Problem # 4: Comparison of Aflatoxin quick test with HPLC at three toxin levels

- Using the data (5 Aflatoxin quick tests results and HPLC test results) in the attached <u>Data</u> for Homework # 2 file (Problem #4 worksheet), answer the following questions: (2.5 pts)
- a) Calculate the mean, standard deviation, relative standard deviation, and accuracy for the 5 test kits and HPLC at each level.
- b) Calculate and use accuracy to compare the 5 test kit results with the HPLC.

Accuracy = ABS [(Test kit Result – HPLC Official Result)/HPLC Official Result] *100

State your conclusion.

Resources:

Control Charts and Histogram Macro (Tips for using Macro)

Demo 1 practice file.xls – Descriptive Statistics, Cluster Diagram and Histogram

Data for Homework # 2

Instructions for enabling macros

See Activity Sheet for Unit II for more resources