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In [3]: import numpy as np
import scipy.stats as stats
from statsmodels.stats.multicomp import pairwise_tukeyhsd

# Set a random seed for reproducibility
np.random.seed(42)

# Generate hypothetical growth data for three treatments (A, B, C)
n_plants = 25
growth_A = np.random.normal(loc=10, scale=2, size=n_plants)
growth_B = np.random.normal(loc=12, scale=3, size=n_plants)
growth_C = np.random.normal(loc=15, scale=2.5, size=n_plants)

# Perform one-way ANOVA
f_statistic, p_value = stats.f_oneway(growth_A, growth_B, growth_C)

# Print results
print(f"Treatment A Mean Growth: {np.mean(growth_A):.2f}")
print(f"Treatment B Mean Growth: {np.mean(growth_B):.2f}")
print(f"Treatment C Mean Growth: {np.mean(growth_C):.2f}\n")

print(f"F-Statistic: {f_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

# Decision rule
alpha = 0.05
if p_value < alpha:
    print("Reject H0: Significant difference among treatments.")

    # Post-hoc test (Tukey's HSD)
    all_data = np.concatenate([growth_A, growth_B, growth_C])
    labels = ['A'] * n_plants + ['B'] * n_plants + ['C'] * n_plants
    tukey_results = pairwise_tukeyhsd(all_data, labels, alpha=0.05)
    print("\nTukey's HSD Results:")
    print(tukey_results)
else:
    print("Fail to reject H0: No significant difference among treatments.")

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Treatment A Mean Growth: 9.67
Treatment B Mean Growth: 11.14
Treatment C Mean Growth: 15.27

F-Statistic: 36.1214

P-Value: 0.0000

Reject H_0 : Significant difference among treatments.

Tukey's HSD Results:

Multiple Comparison of Means - Tukey HSD, FWER=0.05

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=====
group1 group2 meandiff p-adj  lower  upper  reject
-----
      A      B   1.4647 0.0877 -0.1683 3.0977  False
      A      C   5.5923   0.0  3.9593 7.2252   True
      B      C   4.1276   0.0  2.4946 5.7605   True
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```