Week-04-L-04

Agricultural Statistics in Practice

Regression Path Analysis

Regression Path Coefficient Analysis

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Regression Path Coefficient Analysis

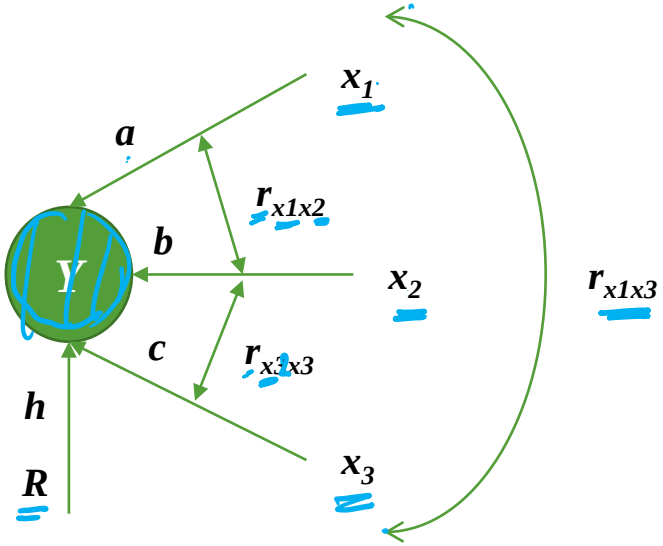
- Path analysis, proposed by Wright in 1921, was initially used for plant selection by Dewey and Lu in 1959.
- Path analysis involves partitioning correlation coefficients into standardized partial regression coefficients to assess direct and indirect effects of independent variables on the dependent variable.
- It is also known as cause and effect relationship analysis, as it helps understand the relationships between variables.

Regression Path Coefficient Analysis

- Path analysis uses correlation coefficients to determine whether the association between yield-related traits and yield is direct or indirect, guiding geneticists in trait selection for improvement.

Where:

- *x_1, x_2 and x_3 yield-related components*
- *Y is yield (effect) of the causal factors x_1, x_2 and x_3;*
- *r designate association between variables;*
- *a, b, c and h Path coefficients due to respective variables and*
- *R is residual effect.*



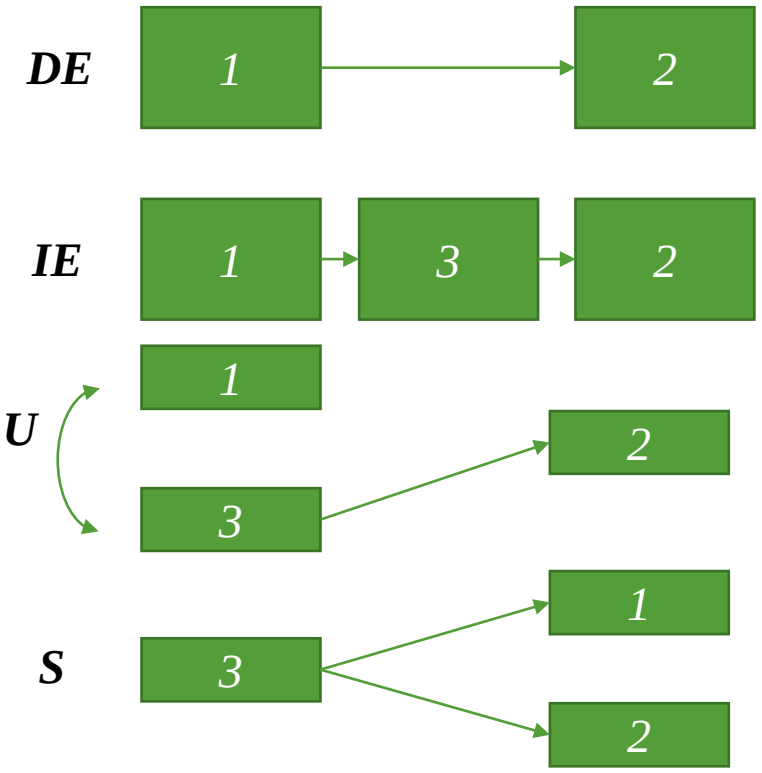
Path diagram showing cause and effect relationship

Path coefficient analysis:

- Each correlation can be decomposed into one or more of the following four types of effects:

1. ***Direct Effect (DE)*** - path coefficient from one variable to another, e.g., P_{21}.
2. ***Indirect Effect (IE)*** - sequence of paths through one or more intermediate variables, e.g., $P_{32}P_{21}$.
3. ***Unanalyzed Effect*** due to correlated causes (U) - correlation of variable with cause of the second, e.g., $P_{23}r_{13}$.
4. ***Spurious Effect*** due to common cause (S) - variable that causes both first and second variable, e.g., $P_{13}P_{12}$.

Effects relating variables 1 and 2:



Path Coefficient Analysis

1. Sum of Direct Effect (DE) and Indirect Effect (IE) = total causal part of the correlation between two variables.
2. Sum of Unanalyzed effect (U) and Spurious effect (S) = total noncausal part of the correlation between two variables.

Assumptions:

- Models exhibit linear, additive, and causal relationships, excluding curvilinear, multiplicative, or interaction relations.
- Residuals within the model are uncorrelated with all other variables.
- Causal flow follows a one-way direction (applies to recursive models).
- Variables are measured on an interval scale.
- Predictor variables are measured without error.

Thank You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