in-homogeneity in seed lots as a source of variation in seed testing results

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Examples of Segregation

Differences in density
Differences in size
Differences in surfaces
Differences in shape
Differences in density

Experimental design

Silo 1
1st transport

Silo 2
2nd transport

Silo 3

Silo 5
4th transport

Silo 4
3rd transport

certified seed

Cleaning section

Bagging device

Delivery point

greenware

submitted sample
Analyses

- Purity
- Other seeds by number
- Thousand seed mass
- Size grading
- Germination
Analyse of systematic effects in the data

Regression estimated by the model:

\[ y_i = \mu + \beta_1 x_i + \beta_2 x_i^2 + \ldots + \varepsilon_i \]

\( X_i = \) Sample number (indep. Variable)
\( Y_i = \) Proportion pure seeds (dep. Variable)
\( \beta = \) Regression coefficients

Each term will be proved by least square error
Variation of the proportion of pure seeds (%) in a wheat lot during the process

- Delivery point: $r^2 = 0.0$ n.s.
- 1st transport: $r^2 = 0.66^{**}$
- 4th transport: $r^2 = 0.0$ n.s.
- Bagging device: $r^2 = 0.21^*$
Expected variance of different seed quality traits

Germination, purity, size grading:
Binomial-distribution: $\sigma^2 = \frac{(p*(p-1))}{n}$

Other seed by number:
Poisson-distribution: $\sigma^2 = \frac{\Sigma x_i}{n}$

Thousand seed mass:
Normal-distribution: $\sigma^2 = \frac{\Sigma (x_i - \mu)^2}{n}$;

Variance is independent from mean
in-homogeneity of proportion of pure seeds(%) in three wheat lots during processing

Lots/ Stations

Variance-Proportion $s_b^2/s_e^2$

0 1 2 3 4 5 6 7 8 9 10

Delivery 1 Transport 4 Transport Bagging Delivery 1 Transport 4 Transport Bagging Delivery 1 Transport 4 Transport Bagging

1. Lot 2 Lot 3. Lot

6.1 12.3 0.8 1.0 28.4 3.5 2.7 229.6 5.0

Sign.Level
Variance between and within composed samples of constant size using different numbers, size and sampling schemes of primery samples
(interim) Conclusions

- Without gradient in a lot there is no difference in the variance of systematic and random sampling.
- If a gradient exists and sampling intensities are lower than 20 primary samples/lot then the variance of systematic sampling is lower than that of random sampling.
- At a sampling, intensity of \( \geq 20 \) samples the variance of random and systematic are almost the same.