# Fast non-destructive near-infrared spectroscopic analysis associated with chemometric data analysis: an efficient tool in assisting breeding programs

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## INTRODUCTION

Near infrared spectroscopy (NIRS) is nowadays a highly-appreciated quality control technique, due to its numerous advantages such as: non-demanding sample preparation (even no sample preparation)/ easy of use/ robust/ environmental – friendly/ short analysis time. Hence, it gained an important position in laboratories, being more and more used in food industry for characterizing the quality of both food products and raw materials [1]. There are numerous researches dealing with the quality control of agricultural products, among which there are also the seeds of crop plants; the improvement in both biological and nutritional properties was and continues to be a major concern for breeding programs and in this context NIRS can bring a valuable contribution, by providing relevant data on nutritional quality in a fast way [2].

**Research objective:** testing soybeans genotypes in order to find both their quality attributes and the best candidates for the developing of new varieties.

## MATERIALS & METHODS

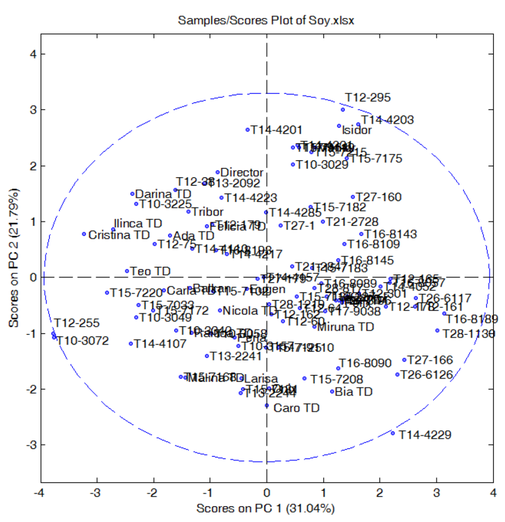
Grains of soybeans cultivars from the Research & Development Station for Agriculture, Turda were analyzed using a Tango spectrometer (Bruker, Germany). The instrument was calibrated to provide data for intact grains, on: moisture, fat, proteins, as well as for several fatty acids: stearic, oleic, linoleic and linolenic. Representative soybeans' grains were harvested in 2020 and screened for impurities, being then subjected to reflectance measurements with rotating sample cup. Data were further subjected to chemometric analysis, which was accomplished using Matlab (MathWorks Inc., USA).

## RESULTS

- The obtained quality parameters are summarized in table 1, revealing the average values, as well as the ranges of variation in each case.
- Principal component analysis (PCA) was accomplished on autoscaled preprocessed data, using six variables (the measured parameters), emphasizing both the genotypes with the best quality attributes and similarities between the studied ones (figure 1).
- This study provides a framework for new applied researches for both plant breeding programs as well as a new method for quality control of soybeans' products; the method is advantageous since the analyzed seeds can be used further, being not destroyed for analysis.
- The variability of the chemical composition within the analyzed germplasm indicates that there is potential for successful improvement of the quality parameters in soybeans; the genotypes which are most dissimilar are the best candidates that can be used for creating new hybrids with improved quality features.

Table 1. Summary of the recorded quality parameters

| Parameter | Average | Min | Max | Std.Dev |
|---|---|---|---|---|
| Protein [%] | 39.31 | 36.92 | 42.48 | 1.31 |
| Fat [%] | 22.90 | 21.16 | 24.03 | 0.78 |
| Moisture [%] | 12.27 | 10.73 | 13.47 | 0.68 |
| Stearic acid [rel.%] | 4,51 | 4.07 | 5,00 | 0,21 |
| Oleic acid [rel.%] | 23,74 | 21,47 | 25,10 | 0,82 |
| Linoleic acid [rel.%] | 54,75 | 51,83 | 58,50 | 1,60 |
| Linolenic acid [rel.%] | 5,75 | 2,50 | 8,43 | 1,62 |



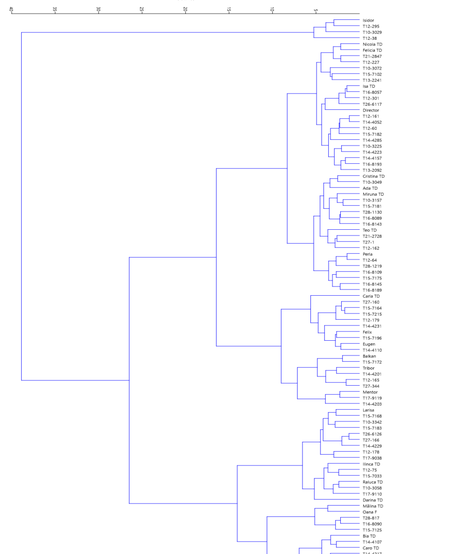



Figure 1. Scores plot and dendrogram for the six variable PCA model

## REFERENCES

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