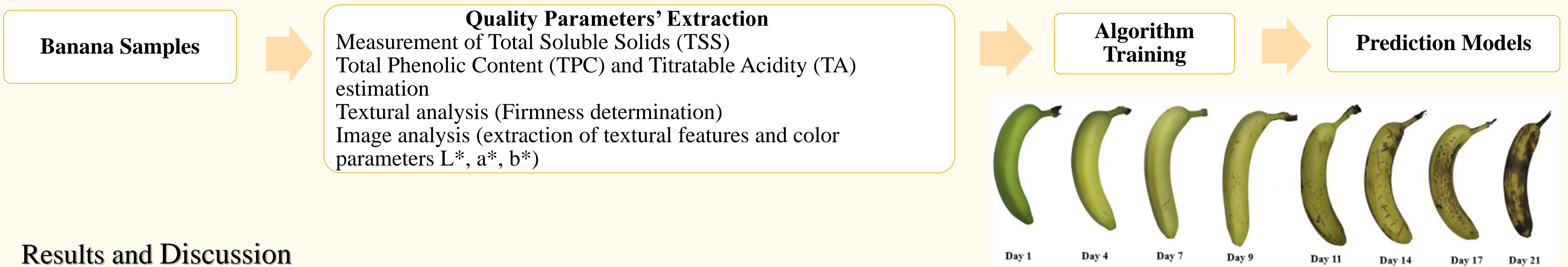


## Abstract

The fruits and vegetables' quality in relation to the ripening degree is one of the most important issues to be investigated in order to ensure consistent quality for consumers and to minimize post-harvest spoilage. Therefore, the aim of the present study was the predictive models' development in order to assess the ability of textural features, from image analysis on banana peel, to predict shelf life and fruit quality parameters during ripening. More specifically, textural features calculated from images of banana peel [a\* (redness/greenness), b\* (yellowness/blueness), mean value, standard deviation (std), skewness, contrast (con), dissimilarity (dis), energy, homogeneity, Angular Second Moment (ASM), Short Run Emphasis (SRE), Long Run Emphasis (LRE), and Run Length Non-Uniformity (RLN)] [1] were correlated with physicochemical quality parameters of banana flesh [Brix, firmness, total phenolic content (TPC), titratable acidity (TA), moisture and water activity (aw)], to estimate banana shelf life and ripening process, during storage throughout a period of 21 days. The results showed that the a\* and b\* values of banana peel are good indicators of Brix and firmness values of banana flesh ( $R^2 > 0.7$ ). Moreover, the gradient boosting regressor model was employed to predict the banana ripening degree in relation to storage day, from textural and physicochemical features multiple regression, with  $R^2$  0.999. Furthermore, using the same regressor model the quality of banana flesh was predicted, through Brix, firmness, TPC, and TA values during ripening, from the values of textural features of the banana peel by multiple regression, with  $R^2 > 0.98$ . The predictive model application, using image analysis resulting features, may be used as a tool for estimating the quality and shelf life of fruits.

## Materials and Methods



## Results and Discussion

### Prediction of quality parameters

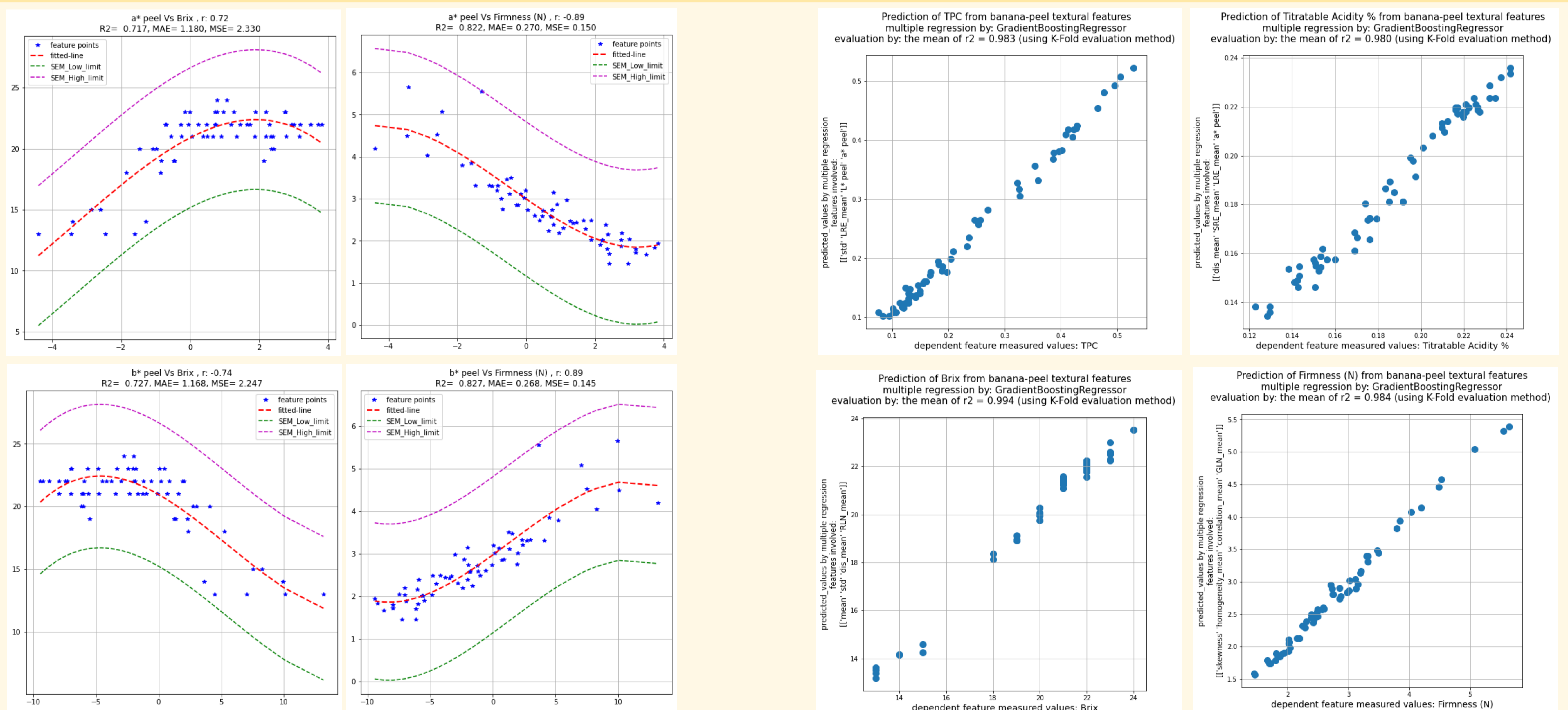


Figure 1. °Brix and firmness estimation from color values a\* and b\* of banana peel

Figure 2. Prediction of quality parameters' by image textural features

### Prediction of storage days

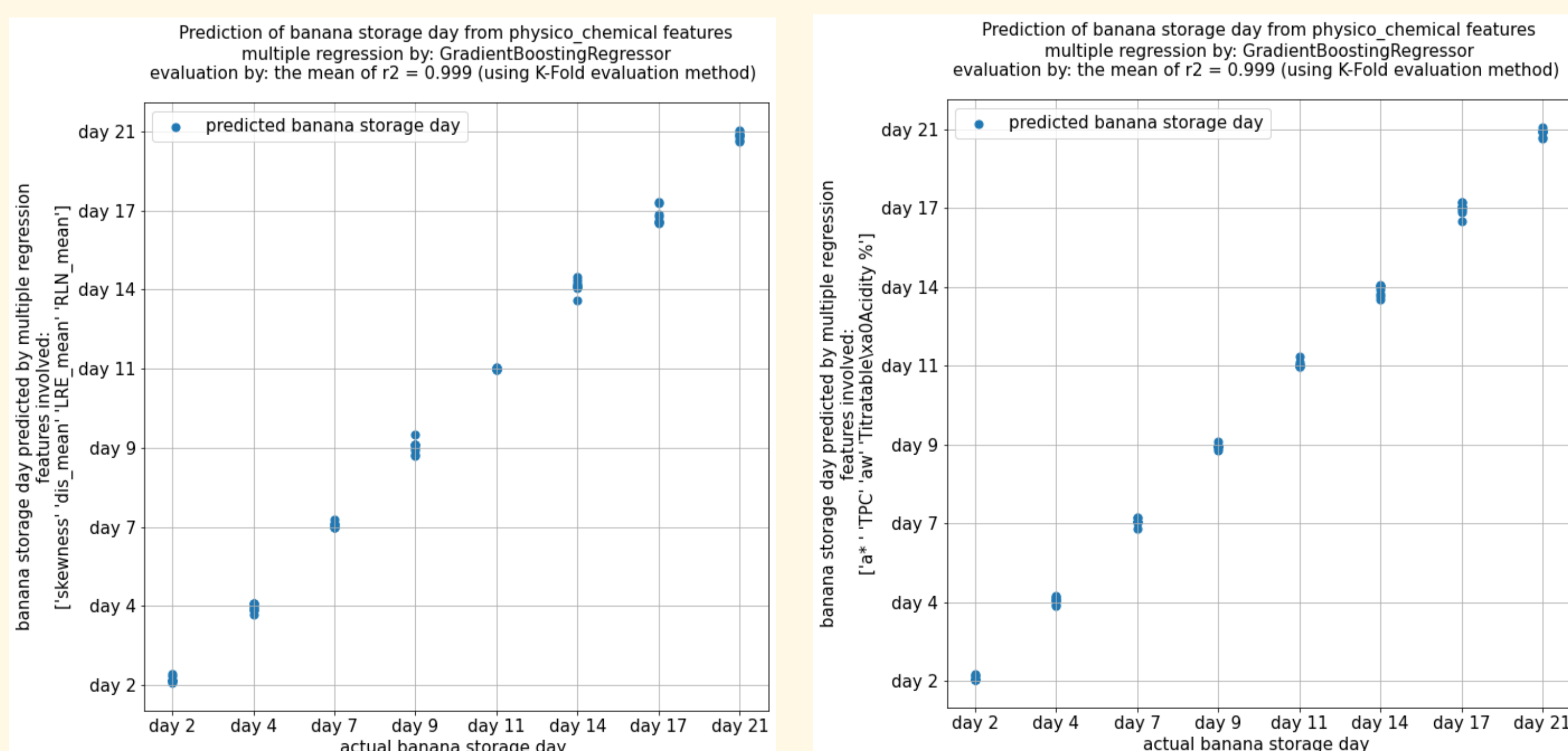


Figure 3. Prediction of day of storage of banana by image textural features

## Conclusions

- ✓ It was achieved high accuracy prediction of both quality parameters (total soluble solid content, firmness, total phenolic content, acidity) and actual storage days of banana samples.
- ✓ Image analysis is a non-destructive method, which could give information for parameters of the flesh by analysing the peel of banana.
- ✓ The predictive models may be used as a useful tool for estimating quality and shelf life of fruits and vegetables.

## References

[1] V. J. Sinanoglou, T. Tsiaka, K. Aouant, E. Mouka, G. Ladika, E. Kritsi, S. J. Konteles, A.-G. Ioannou, P. Zoumpoulakis, I. F. Strati and D. Cavouras, Applied Sciences, 13(6) (2023), 3533.

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