

GC-IMS screening to assess Salmon authenticity

Linda Monaci^{1**}, Simone Guidotti², Antonio Fornaro², Cesare Rossini^{2*}

¹ CNR-ISPAs, Bari, Italy,

² LabService Analytica s.r.l, Anzola Emilia (Bologna), Italy

*cesare.rossini@labservice.com

**linda.monaci@ispa.cnr.it

OVERVIEW

Gas chromatography coupled to ion mobility spectrometry is a potential tool exploited if food authenticity assessment as documented by several investigations^{1,2,3}. In this work, the analysis of the volatile fraction of salmon harvested under different living conditions was investigated by exploiting the coupling between gas chromatography and ion mobility spectrometer by using FlavourSPec (GAS) instrument equipped with a tritium source. The method allowed to discriminate wild-type from farmed salmon collected in Canada without requiring an extraction step.

MATERIALS AND METHODS

Samples



NO sample preparation

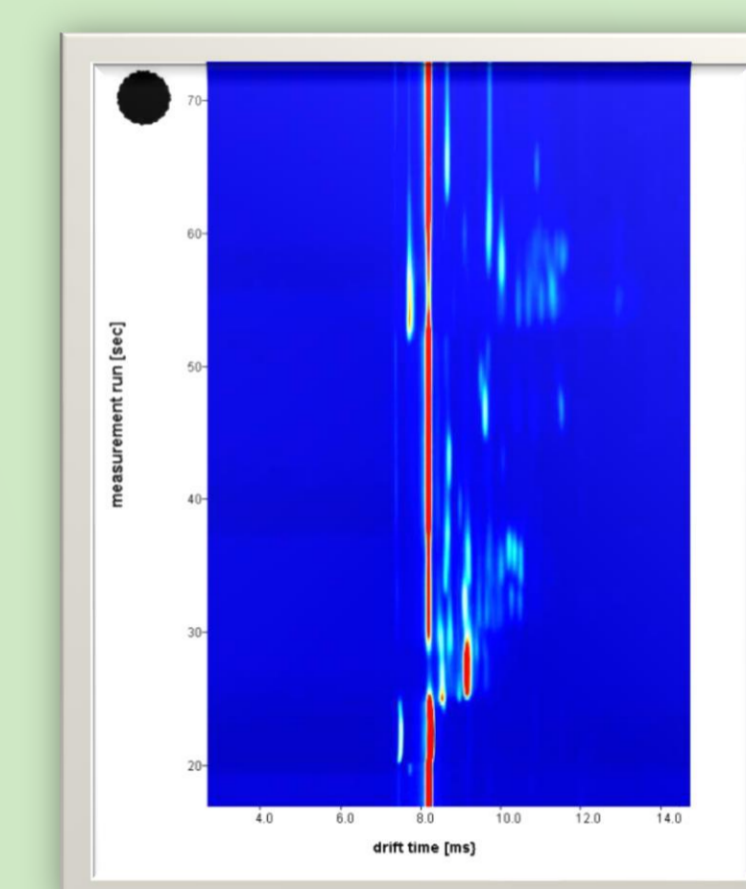


- 2 g of each sample
- injected by a headspace device
- conditions: T = 40 C for 5 min

GC-IMS analysis and data processing



Gas Chromatography - IMS
SpectraFlavour (Gas Dortmund, Germany)



RESULTS

A total of 51 salmon samples distinguished in farmed and wild-type samples (collected in Canada) already analysed by DART-HRMS method⁴ were analysed for the volatile fraction by Gas Chromatography and Ion Mobility Spectrometry in order to find spots able to discriminate *farmed* from *wild-type* samples. The spectral data collected from the spots detected (after exposing samples at 40° C for 20 minutes), were analysed by PCA as shown in Figure 1, after normalizing the area intensities of a total of five selected spots. Results showed a good separation of three different clusters relative to wild-type, farmed and blank samples and approximately 95% of variance was explained by the first two components (PC1 and PC2).

As a second approach, a supervised method was applied to the whole dataset. In this case it was used Linear Discriminant Analysis (LDA) by using Statistica v. 7 software, on the normalized intensities of five spots detected.

According to the results obtained one discriminant analysis function was obtained (root 1) whose values for each sample are reported in Figure 2. As appearing from the graphical representation a clear separation of two groups (*farmed* vs *wild-type*) was highlighted accounting for 88% of variance explained.

CONCLUSIONS

The method developed based on the analysis of the volatile compounds by gas chromatography coupled to ion mobility spectrometry appears very promising for its application to food authentication. In particular, in this note we demonstrated the feasibility of such method to the discrimination of living conditions of Canadian salmon samples also opening for marker discovery able to trace the leaving conditions of wild type salmon samples.

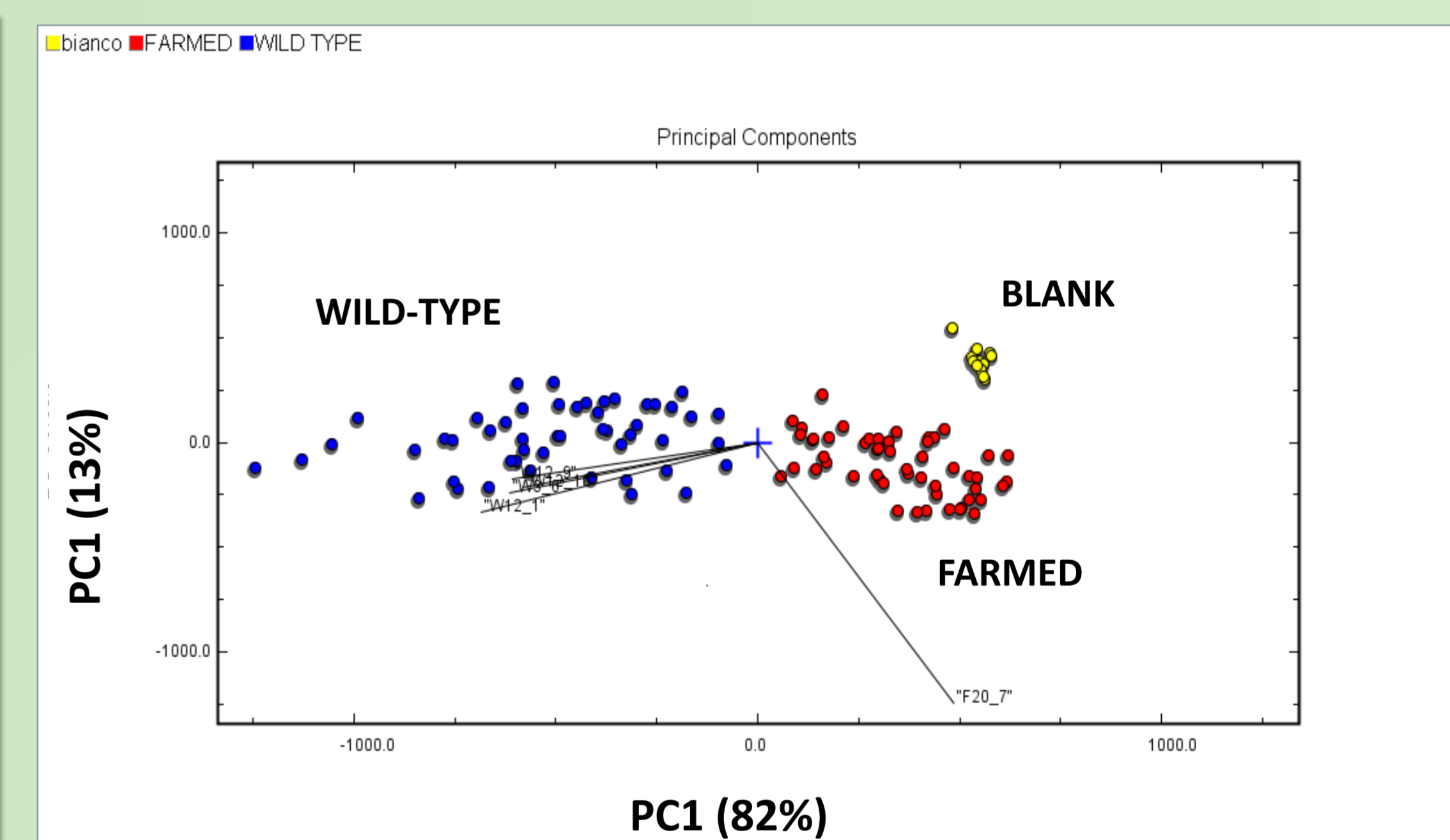


Figure 1. Score plot obtained from PCA of data arising from the GC-IMS analysis of 51 salmon Canadian samples in colored circles (blue = WT; red = F; yellow = B) Canadian salmon samples. Analysis were run in two or three replicates for each salmon sample.

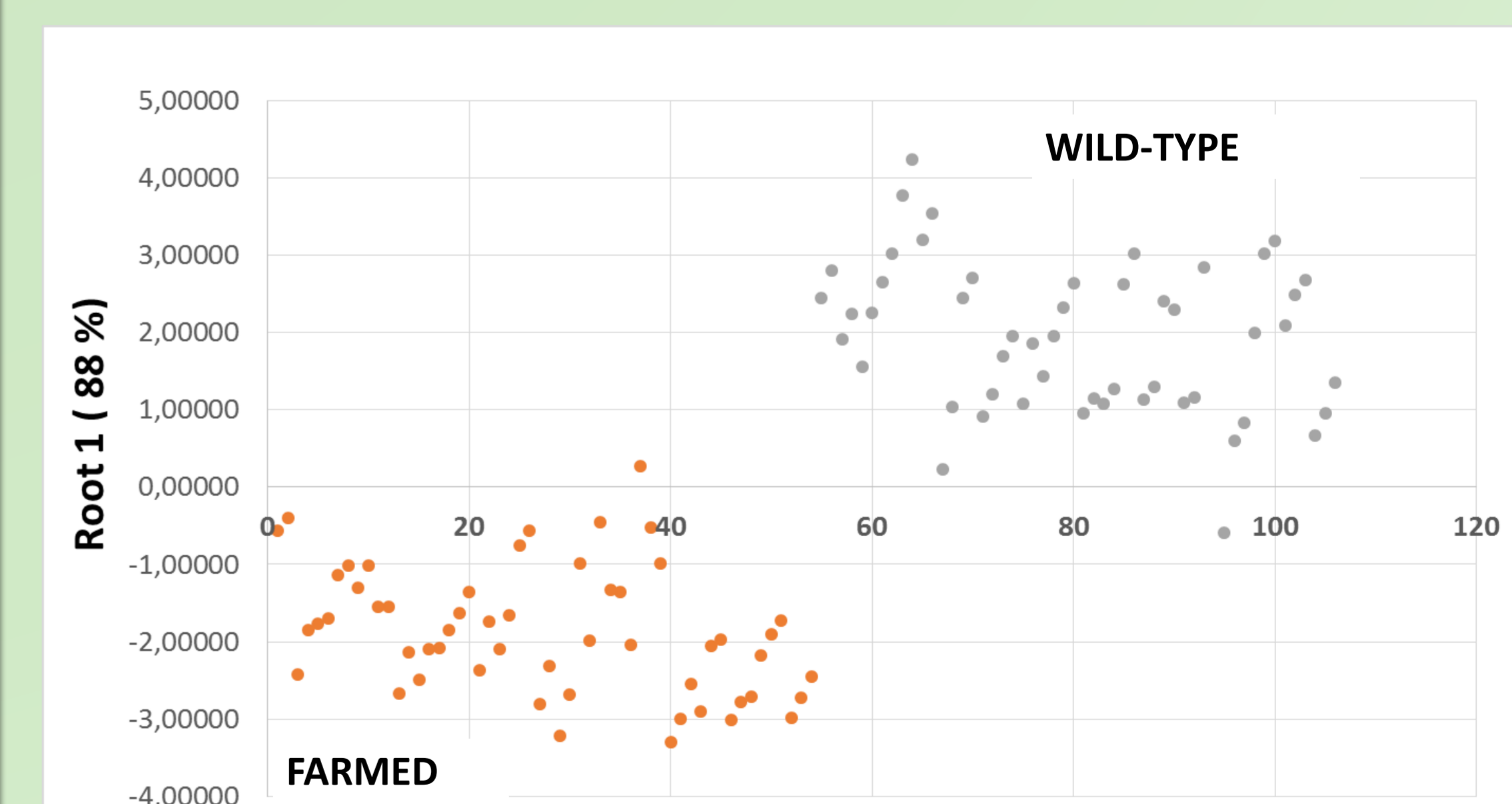


Figure 2. Graphical representation of the values of Root 1 obtained after applying Linear Discriminant Analysis to normalized intensities of 5 selected spots detected by GC-IMS.

REFERENCES

- Gerhardt, N., Birkenmeier, M., Schwolow, S., Rohn, S., Weller, P. Volatile-Compound Fingerprinting by Headspace-Gas-Chromatography Ion-Mobility Spectrometry (HS-GC-IMS) as a Benchtop Alternative to 1H NMR Profiling for Assessment of the Authenticity of Honey, *Analytical Chemistry*, 2018, 90, pp. 1777-1785.
- Arroyo-Manzanares, N., Martín-Gómez, A., Jurado-Campos, N., Garrido-Delgado R, Arce, C., Arce, L. Target vs spectral fingerprint data analysis of Iberian ham samples for avoiding labelling fraud using headspace – gas chromatography–ion mobility spectrometry, *Food Chemistry*, 2018, 246, pp. 65-73
- Cavanna, D., Zanardi, S., Dall'Asta, C., Suman, M. Ion mobility spectrometry coupled to gas chromatography: A rapid tool to assess eggs freshness, *Food Chemistry*, 2019, 271, pp. 691-696
- Fiorino, G.M., Losito, I., De Angelis, E., Arlorio M., Logrieco, A.F., Monaci, L., Assessing fish authenticity by direct analysis in real time-high resolution mass spectrometry and multivariate analysis: discrimination between wild-type and farmed salmon, 2018, *Food Research International*, in press