

# RAPID ASSESSMENT OF EGG FRESHNESS BY HANDHELD NIR SPECTROMETER COUPLED WITH RANDOM FOREST ALGORITHM

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# **1. Introduction**



# 2. Materials and methods

A total of 150 freshly laid hen eggs (size L: 63 – 73 g) were obtained by Capriovus Ltd (Szigetcsép, Hungary).



This study aims to evaluate the feasibility of using a handheld NIR spectrometer combined with the RF algorithm to monitor egg freshness during storage

## **3. Results**

### 3.1. Qualitative analysis of egg freshness

Table 1. Classification result of eggs based on quality grades (HU)

		Training		Testing						
Mode1	Pre- processing	Hyper- parameter	Overall accuracy (%)	Overall accuracy (%)	F1-score per egg grade (%)			Average		
					AA	А	В	F1-score (%)		
PLS-DA	Raw	LV = 14	100	99.18	98.46	97.85	98.26	98.06		
	SGS	LV = 14	99.21	100	100	98.21	99.75	98.98		
	MSC	LV = 19	99.15	98.54	98.18	99.15	99.16	98.83		

### **3.2. Estimation of Haugh unit**

Fig 1. Design of experiment



	1D	LV = 13	99.10	98.91	98.46	98.45	99.26	98.86	
	2D	LV = 15	95.18	92.62	84.75	91.67	96.35	94.01	
RF-C	Raw	<b>mtry =</b> 2	97.32	96.72	96.88	91.30	98.51	95.56	
	SGS	<b>mtry = 6</b> 5	97.05	97.54	95.38	100	97.78	97.72	
	MSC	mtrx = 2	98.92	99.18	98.46	97.78	100	<b>98</b> .75	
	1D	<b>mtrx</b> = 2	97.93	96.72	93.55	100	97.10	96.88	
	2D	<b>mtry</b> = 65	90.64	92.62	87.50	93.02	94.89	91.80	

#### **4.** Conclusion

Based on the results, this study demonstrated that handheld NIR spectroscopy combined with Random Forest (RF) models and multiplicative scatter correction (MSC) is an effective, non-destructive method for accurately assessing egg freshness during storage.

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