



Aquaphotomics: a new tool for food control



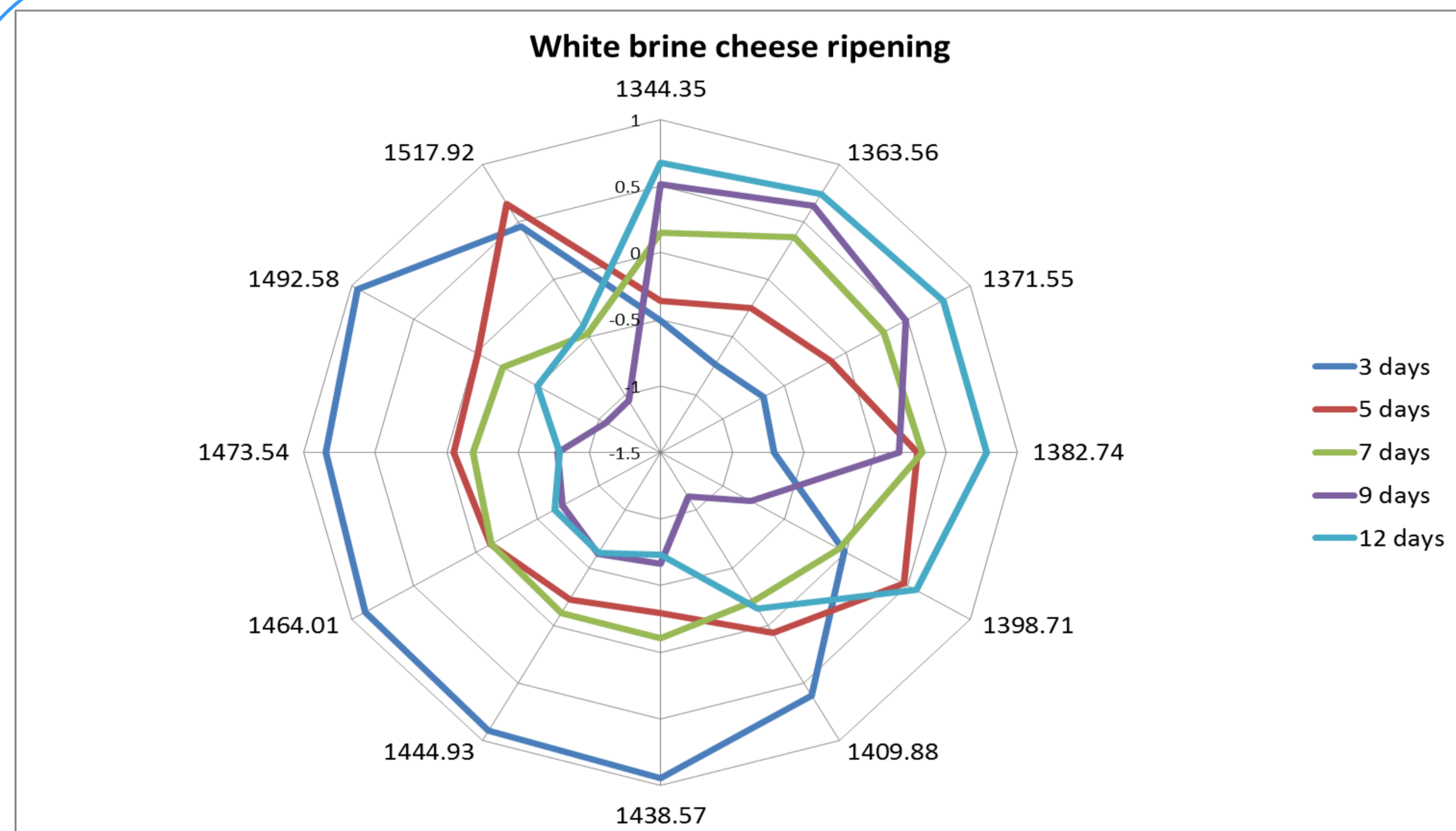
Stefka Atanassova

Trakia University, Department of Physics, Stara Zagora 6000, Bulgaria

Aquaphotomics is a new approach to study water molecular systems in biology, biotechnology, food science, environmental science etc. The aim of this investigation was to investigate the feasibility of near-infrared spectroscopy and aquaphotomics for rapid determination and indicating quality or safety of different food products.

NIR measurements and analysis

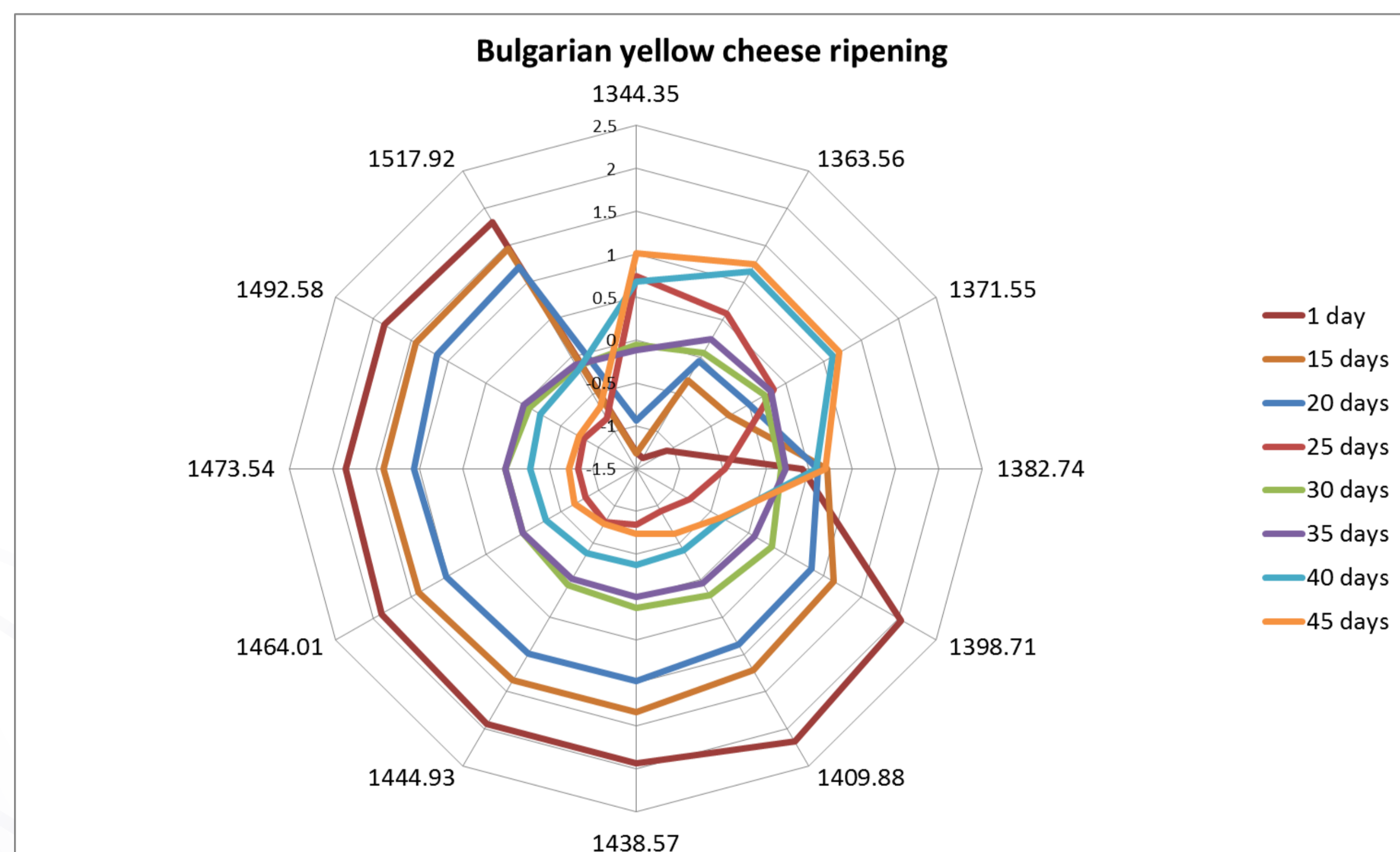
Diffuse reflection spectra of all tested food samples were obtained with a scanning NIRQuest 512 instrument in the range 900-1700 nm. Aquagrams were calculated using transformed by MSC spectral data.



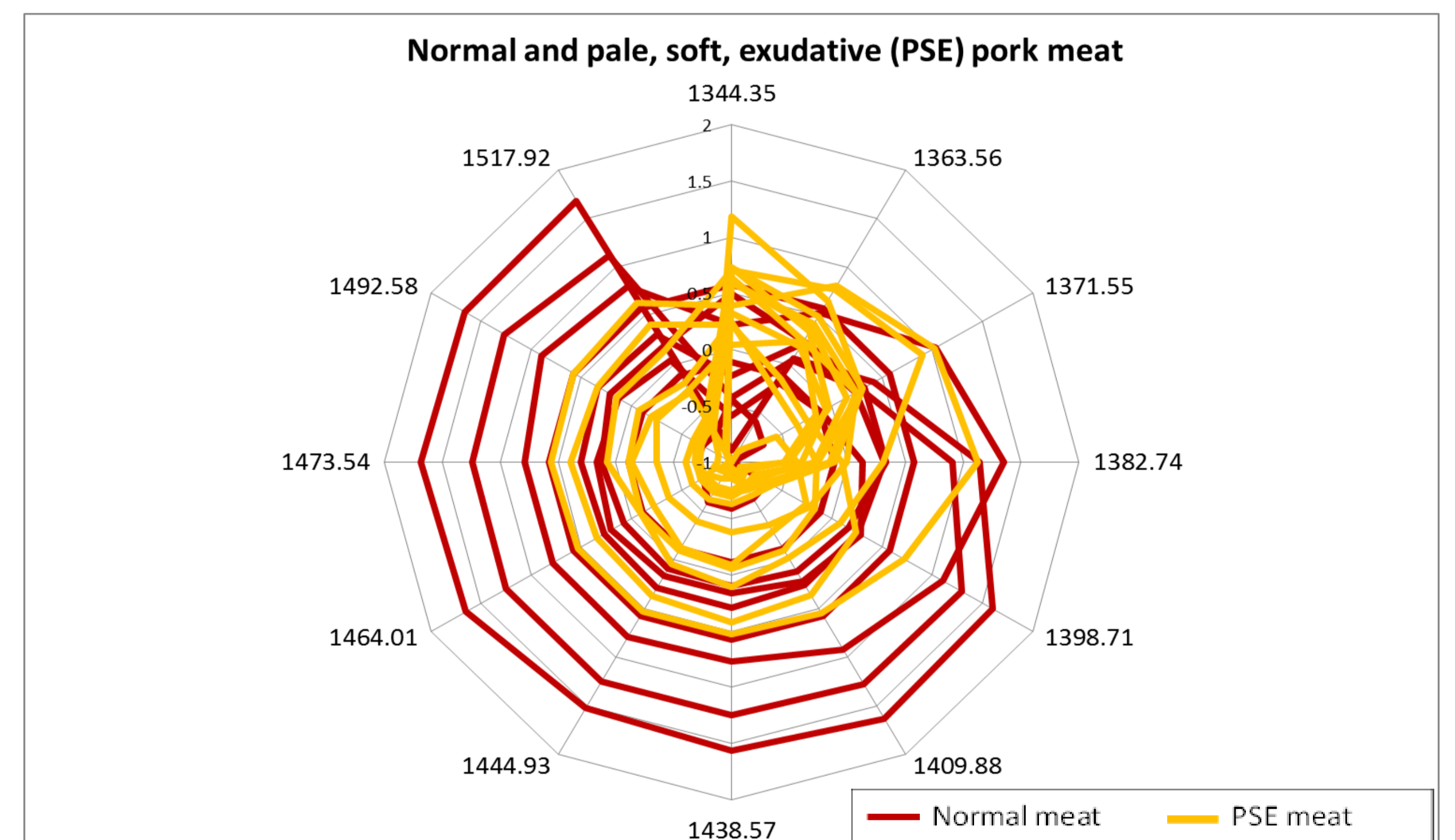
The cheeses were made using a classical white brine cheese making scheme, according to Bulgarian national standard from cow milk. Samples for analysis were taken after 3, 5, 7, 9 and 12 days of ripening.



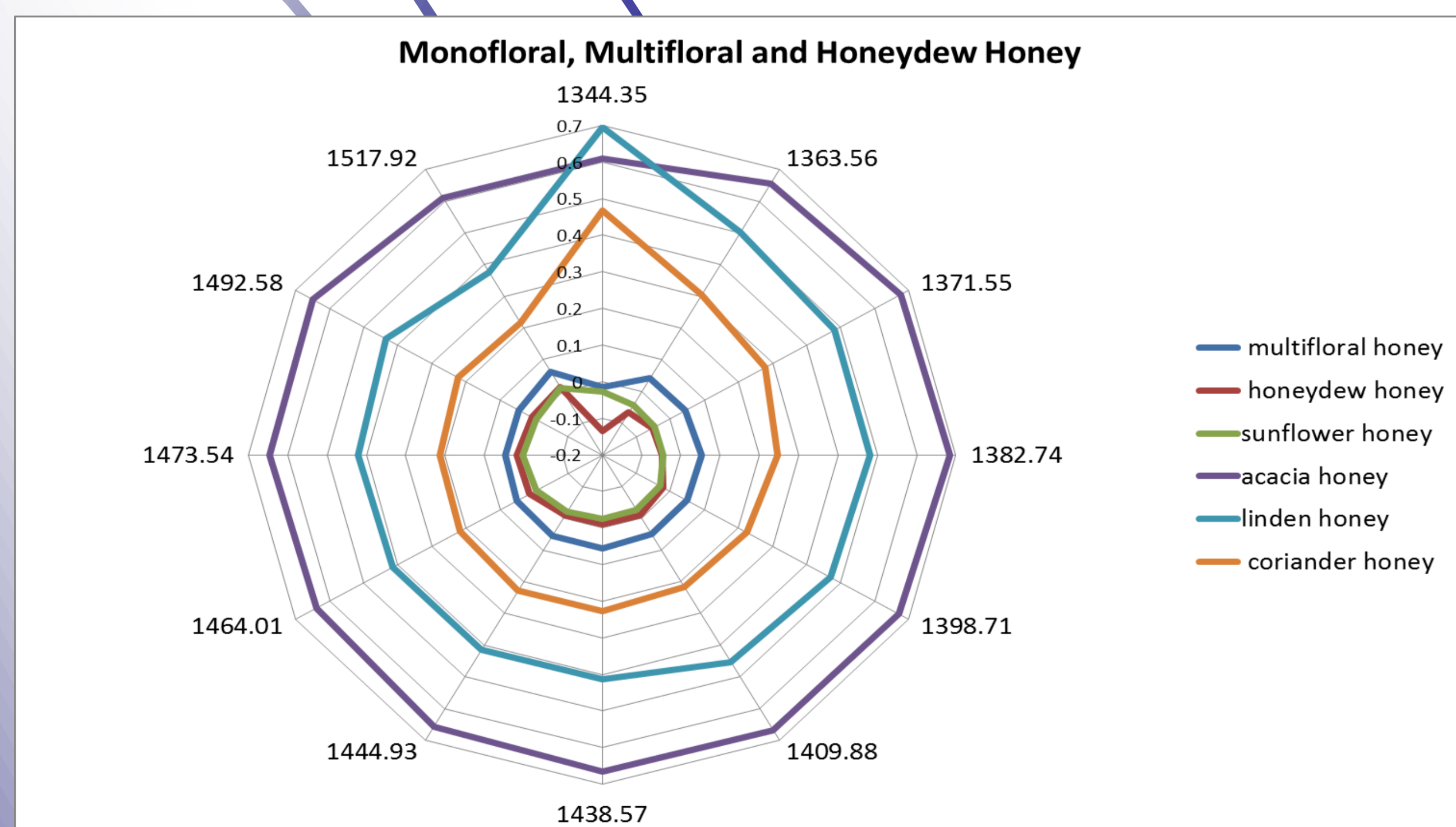
Fresh chilled pork meat samples (slice thick 1-1,5 cm, weighing 45-55 g) were placed at a temperature of $6 \pm 0,3^\circ$ C for storage of 3, 7 or 10 days. Total bacterial count was determined according standard ISO 4833. Formed colonies in the agar are presented as \log_{10} CFU/g product.



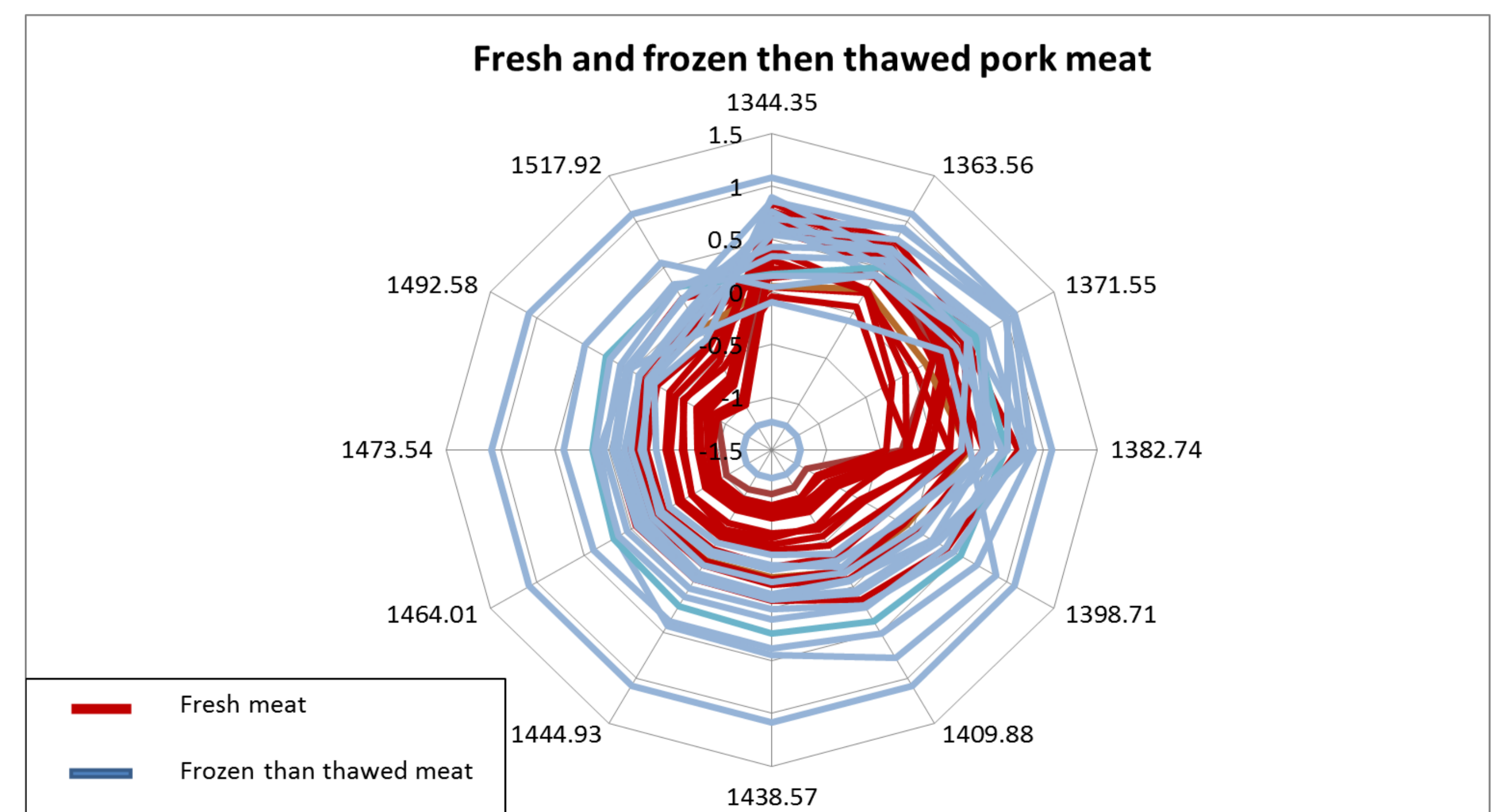
The cheeses were made using a classical semi-hard cheese making scheme, according to Bulgarian national standard for Bulgarian yellow cheese from cow milk. Samples for analysis were taken after 1, 15, 20, 25, 30, 35, 40 and 45 days of ripening.



Meat samples were collected from cross-breed pigs. The pH of muscle samples was measured directly at 45 minutes post-mortem. Carcasses were divided into two classes according to pH values: normal meat with pH_{45} values higher than 5.8, and PSE meat with pH_{45} values lower than 5.8. Porcine muscle (*Longissimus thoracis et lumborum*) samples were taken 24 h after slaughter from the 12th to 13th ribs.



Representative samples of unifloral (sunflower, acacia, linden and coriander), multifloral and honeydew honey were investigated. The origin of the honey samples was determined by pollen analysis.



Porcine muscle (*Longissimus thoracis et lumborum*) samples were taken 24 h after slaughter and divided into two parts. One part of each sample was scanned immediately, with a second part packed and sealed in a plastic bag to be deep frozen at -32° C for 6 h and kept at -21° C. Samples were thawed after one month and measured again.

Conclusion

Aquagrams for all tested food products showed clear differences, connected with quality of meat, degree of spoilage of meat, stage of cheese ripening and type of honey. These results demonstrate the potential of near-infrared spectroscopy for monitoring food quality through observation of water absorbance bands.