



Agricultural Institute of Slovenia

AUTOMATIZATION OF ABDOMINAL COLOR ASSESSMENT IN HONEY BEES

Jernej Bubnič, Janez Prešern

Agricultural Institute of Slovenia

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Background

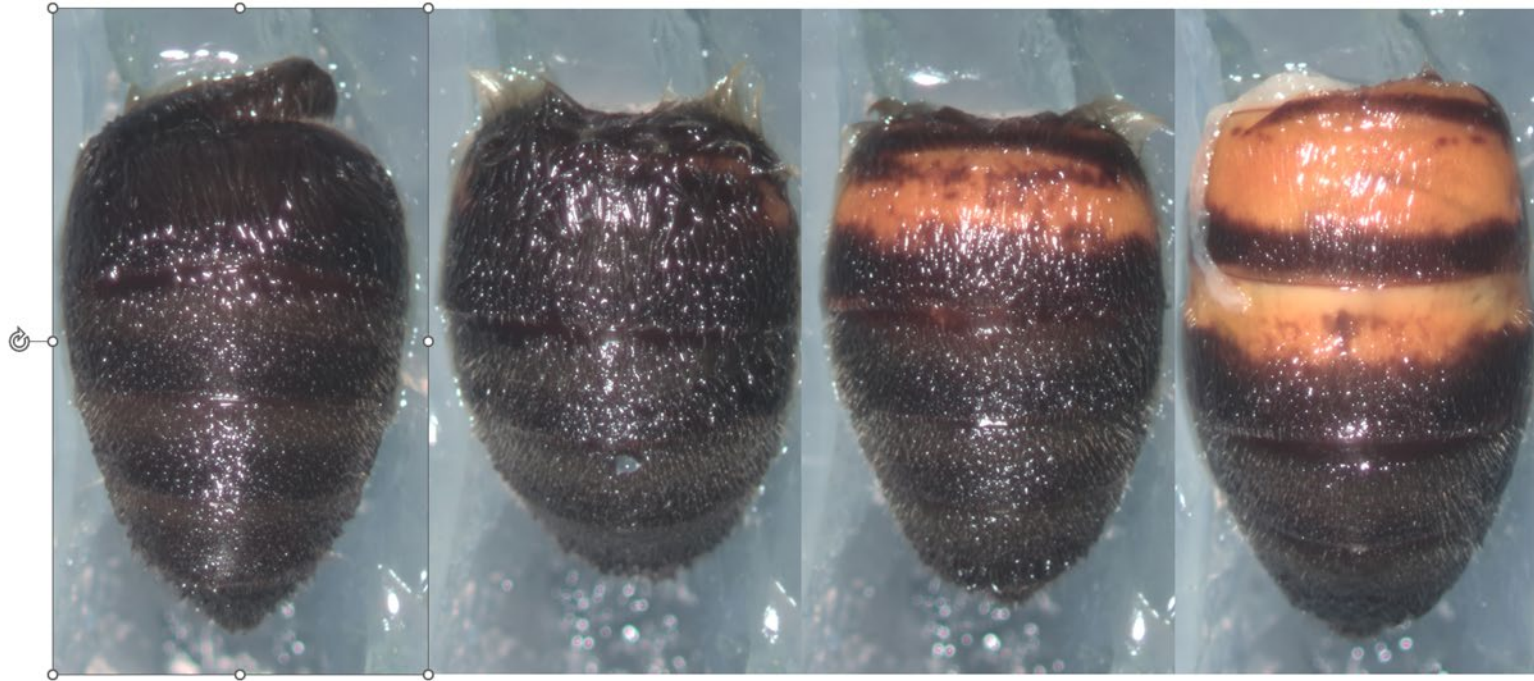
- More than 30 subspecies within *Apis mellifera*
- Morphometric determination
- Abdominal coloration is one of the first traits used

Background

- Strong environmental impact
- Temperature on coloration and cubital index

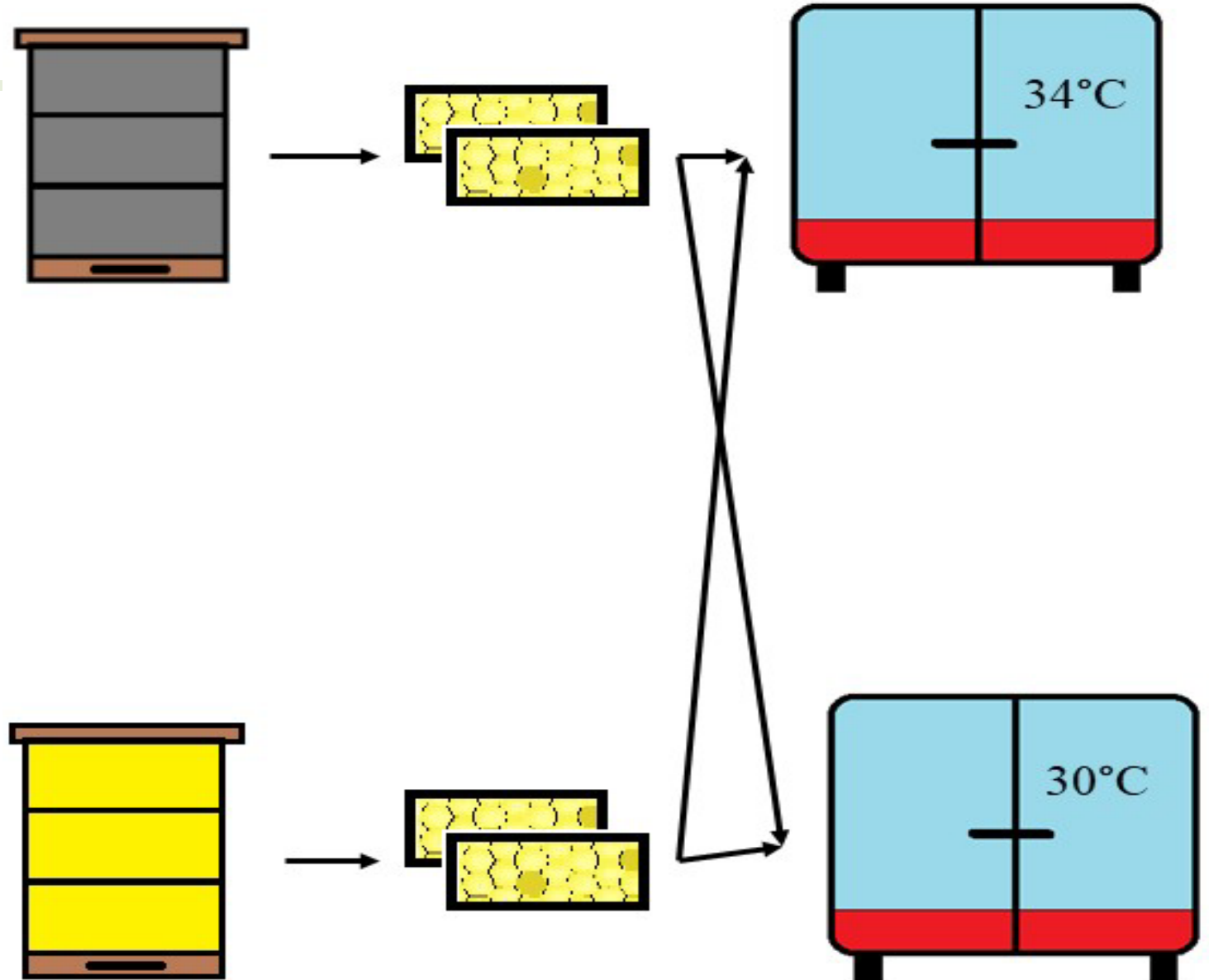
Background

- Scales with different number of grades



Methods: experiment

- Two different colonies
- Two different temperatures

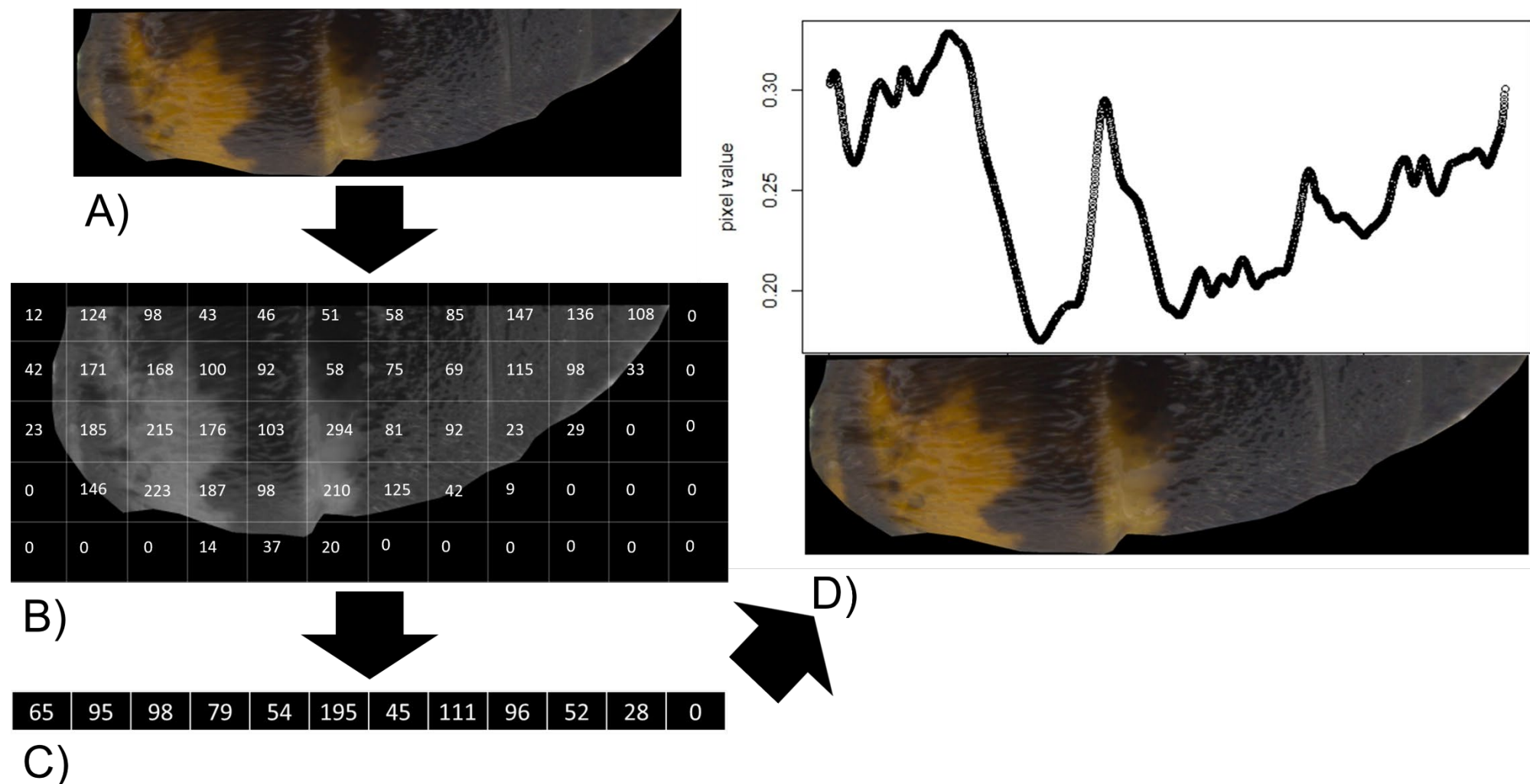


Methods: sample processing

- Abdomens were separated from the honeybees
- Fixed in a Petri dish with agarose
- Constant magnification and illumination
- 200 samples



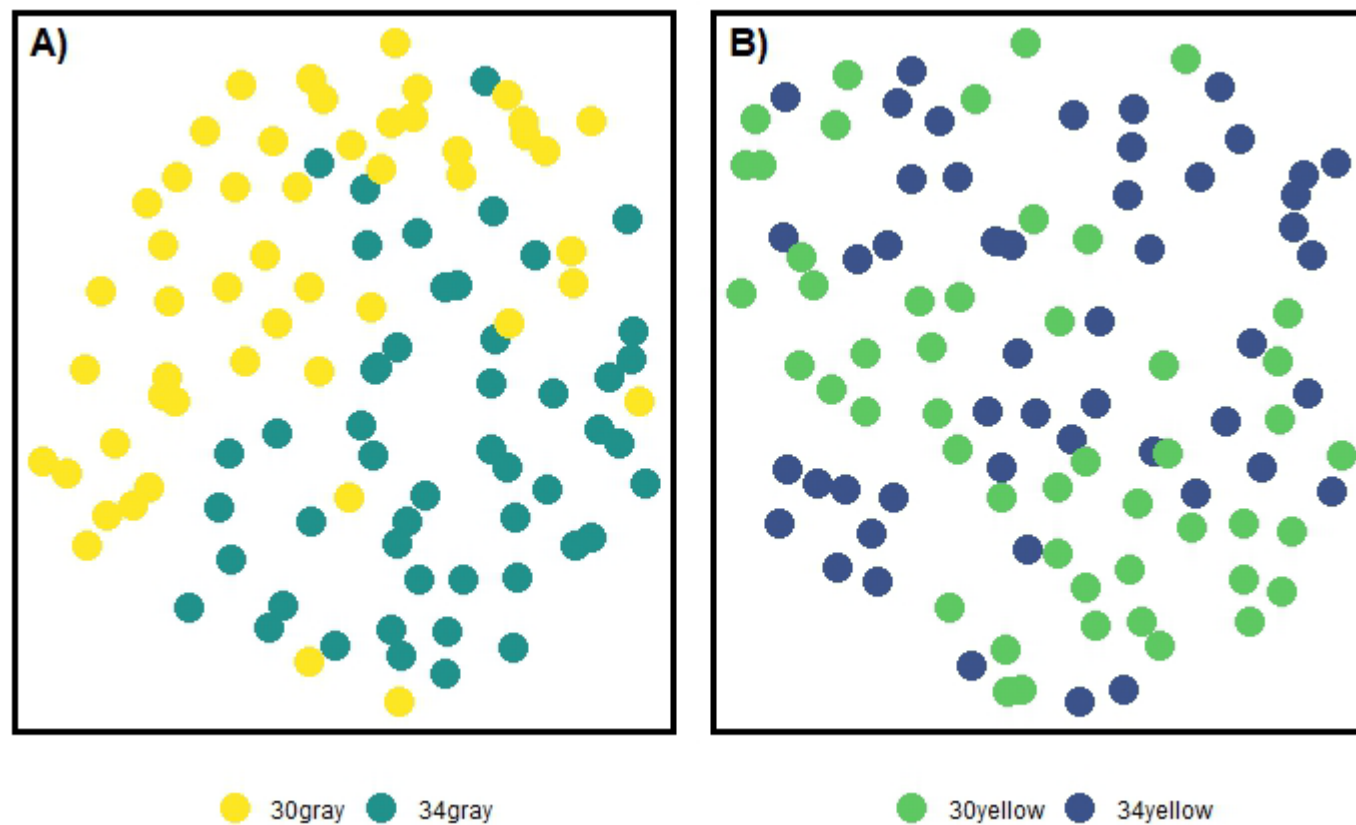
Methods: image processing



Methods: data analysis

- We used vectors to perform UMAP and classification using SVM
- A simple index was developed to explore differences in coloration
- ANOVA was used to analyze coloration index

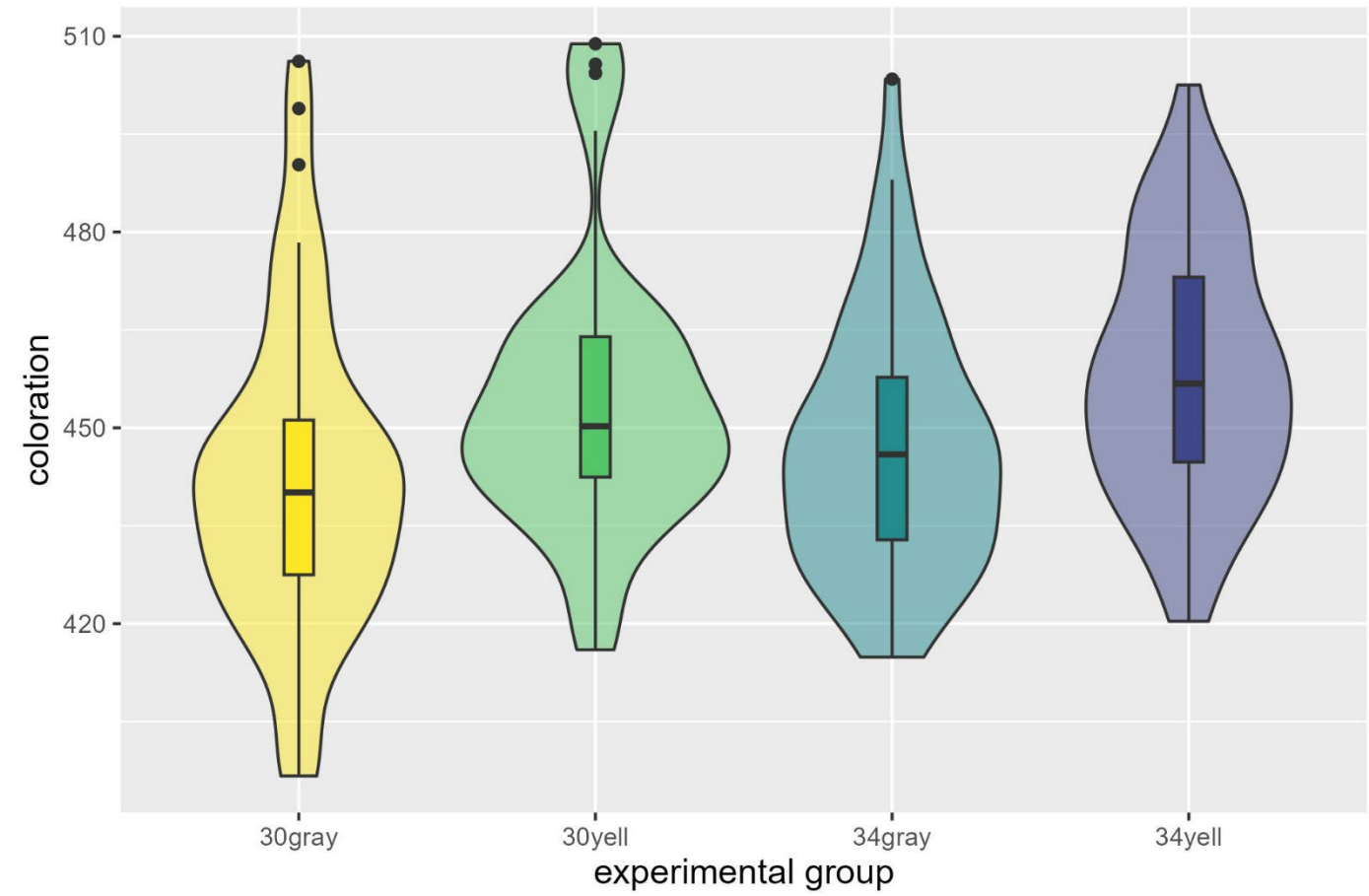
Results: UMAP



Results: classification

Group/Metric	Precision	Recall	F1	AUC
Gray raw	0.80	0.67	0.73	0.75
Yellow raw	0.69	0.75	0.72	0.71
Gray UMAP	0.80	0.68	0.74	0.76
Yellow UMAP	0.91	0.83	0.87	0.88

Results: distribution of coloration index



Discussion

- We analyzed images on entire length of abdomens
- Obtained data is on continuous scale: detecting more variability and more statistical power, good input for further analysis
- Vectors are good input for machine learning

Discussion

- We used narrower temperature range than Tsuruta et al.,(1989) in his study
- The performance of tested methods could be significant if wider temperature range would be used
- Origin of the brood has greater influence on coloration than temperature

Conclusion

- Quality phenotypic data is required
- Further studies are needed to confirm the influence of environmental temperature on abdominal coloration



Article

Quantifying Abdominal Coloration of Worker Honey Bees

Jernej Bubnič ^{1,2,*} and Janez Prešern ¹

¹ Animal Production Department, Agricultural Institute of Slovenia, 1000 Ljubljana, Slovenia; janez.presern@kis.si

² Biotechnical Faculty, University of Ljubljana, 1000 Ljubljana, Slovenia

* Correspondence: jernej.bubnic@kis.si

