Materials and methods
• 34 bunches of reed were selected due to their apparently different culm diameters (Fig. 1) and used for development and optimization of the detection algorithm in Halcon (Version 7.1.2).
• Within the algorithm, circles are searched (Houghner Transformation) and verified as culms. Culm diameter and wall thickness are determined and averaged for every bunch. The algorithm provides additional information about colouration and density of bunches.
• As a reference, diameters and wall thicknesses of selected bunches were measured manually in ImageJ and used for creating a calibration equation.
• In total, 214 reed bunches were studied for morphological properties and chemical composition.

Results
• Correlation between manually measured mean culm diameters and those estimated by the created algorithm is very high (Fig. 2).
• Concerning estimation of culm wall thickness, highest correlation was found for manually measured wall thicknesses and diameters detected by algorithm (Fig. 3).
• Diameters and wall thicknesses of all 214 examined bunches vary in a plausible range.
• Only few chemical properties exhibit considerable correlations to morphological parameters. Highest correlation was observed for blue colouration and nitrogen (r = -0.719).

Conclusions
• The created algorithm offers a non-destructive, rapid and accurate method for determination of mean culm diameter and mean culm wall thickness of a reed bunch, an objective characterization of colours and data for estimation of density.
• Correlations between morphological properties and chemical composition are low and do not enable a reliable estimation of contents of substances with anti- or pro-degradative features.
• However, methods on the basis of image analysis could be used for objective determination of important morphological properties and possibly give a contribution to preserve this traditional way of roofing.