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Evaluation of claw conformation by using two methods of measuring–by ruler and image analysis

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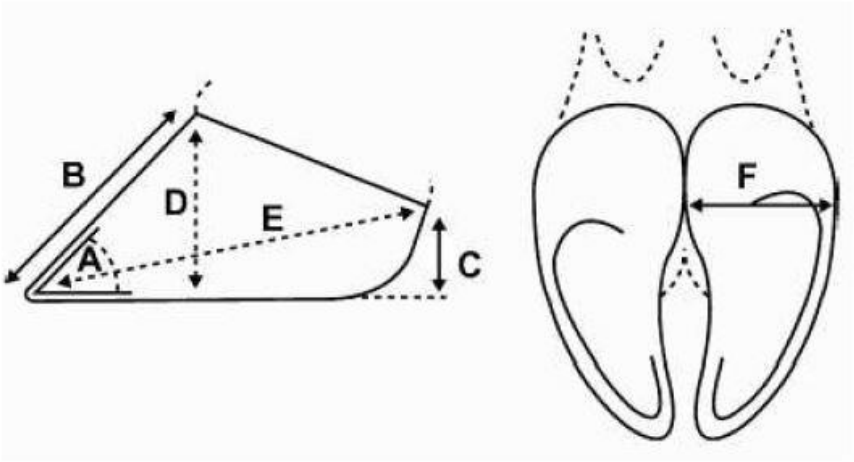
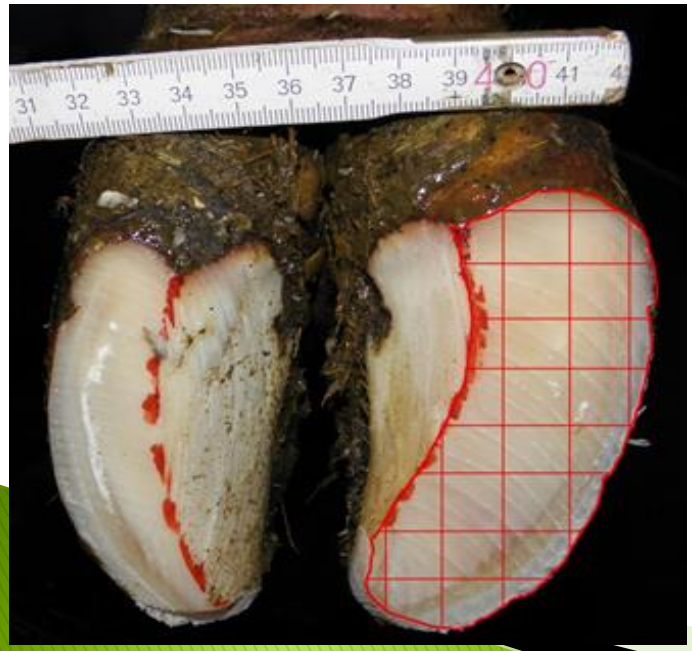
Aim

- to compare the claw parameters after functional trimming measured by ruler and by digital image analysis,
- to say if it is possible to use the digital image analysis to evaluate the claw conformation,
- to discuss the optimal claw measures for normal locomotion.

Material and methods





- 120 Slovak spotted cows from farm in west part of Slovakia
- 2 methods of measurements of lateral hind claw- by ruler and by digital image analysis DIA (2 digital images of claw- bottom and lateral side)
- new traits- total claw area and functional claw area

Material and methods

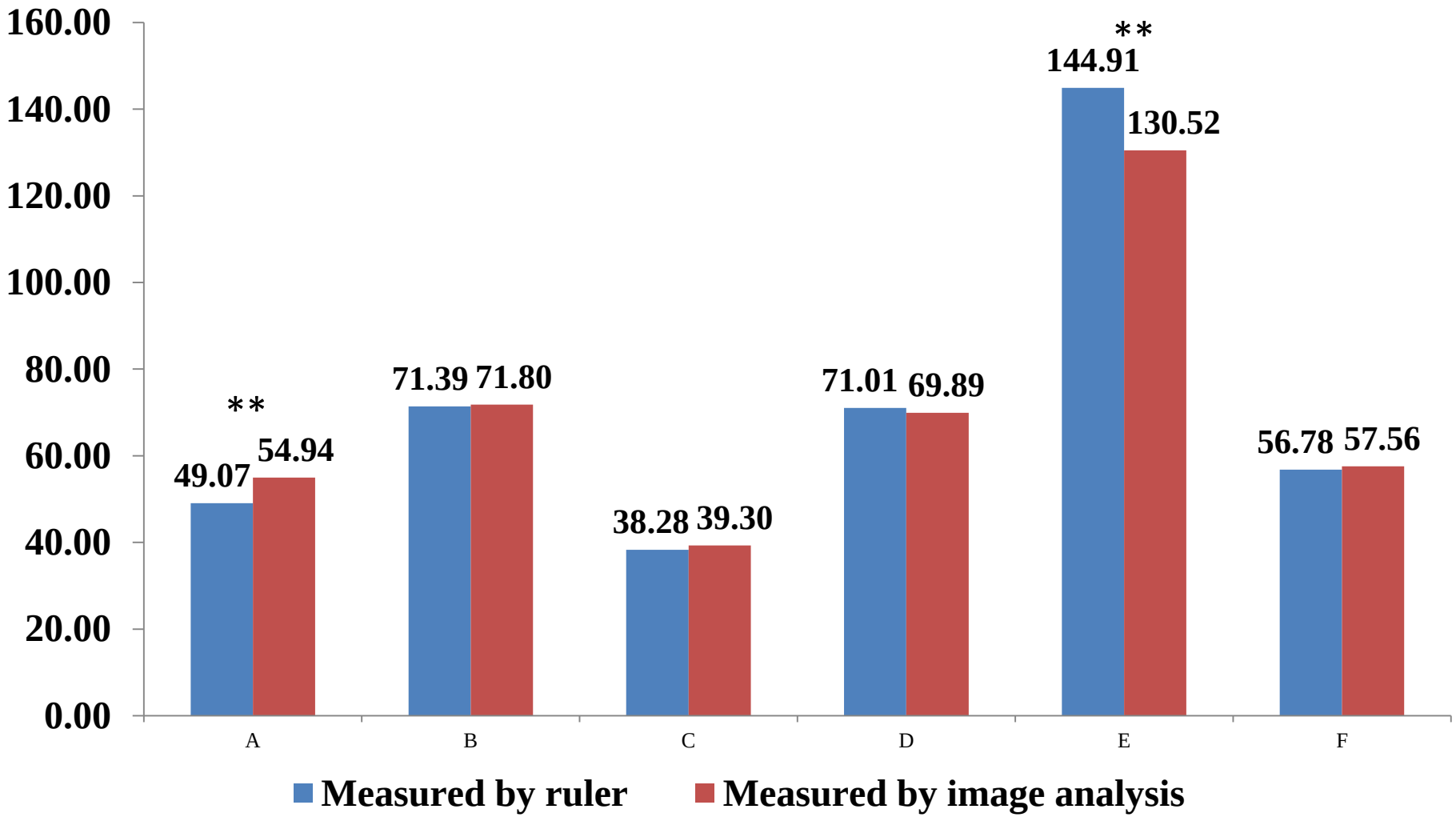
- NIS software (NIKON) for DIA
- statistical analysis
- t test
- correlations
  - in SAS

Results

Descriptive statistic

- Number of lactation 2.81±1.72
- Milk 22.27±8.92 kg
- DIM 191.74±122.84
- 31 primiparous cows (26.43±1.66 month) and 89 multiparous cows (56.85±20.16 month)

Claw measures



Phenotypic correlations

	A_r	B_r	C_r	D_r	E_r	F_r
A_dia	**0.11253**	-0.0299	0.07555	0.0475	-0.19946	0.13831
	0.2211	0.7458	0.4122	0.6064	0.029	0.1319
B_dia	-0.13781	**0.35792**	0.28349	0.3359	0.14948	0.02577
	0.1334	**<0.0001**	0.0017	0.0002	0.1032	0.7799
C_dia	0.06526	0.08495	**0.41585**	0.32105	0.3931	0.22187
	0.4788	0.3563	**<0.0001**	0.0003	<.0001	0.0149
D_dia	-0.04341	0.29337	0.31551	**0.59518**	0.2517	0.14462
	0.6378	0.0011	0.0004	**<0.0001**	0.0056	0.115
E_dia	-0.01947	0.01744	0.20343	0.22423	**0.56591**	0.13887
	0.8328	0.85	0.0259	0.0138	**<0.0001**	0.1304
F_dia	0.02243	0.0913	0.01268	0.18469	0.43668	**0.73579**
	0.8078	0.3213	0.8907	0.0434	<.0001	**<0.0001**
Total area_dia	-0.02064	0.03407	0.05492	0.15673	0.59739	0.50291
	0.8237	0.713	0.553	0.0887	<.0001	<.0001
Functional area_dia	-0.12151	0.15546	0.12131	0.19176	0.19395	0.30911
	0.188	0.0914	0.1888	0.0367	0.0346	0.0006

Primiparous cows

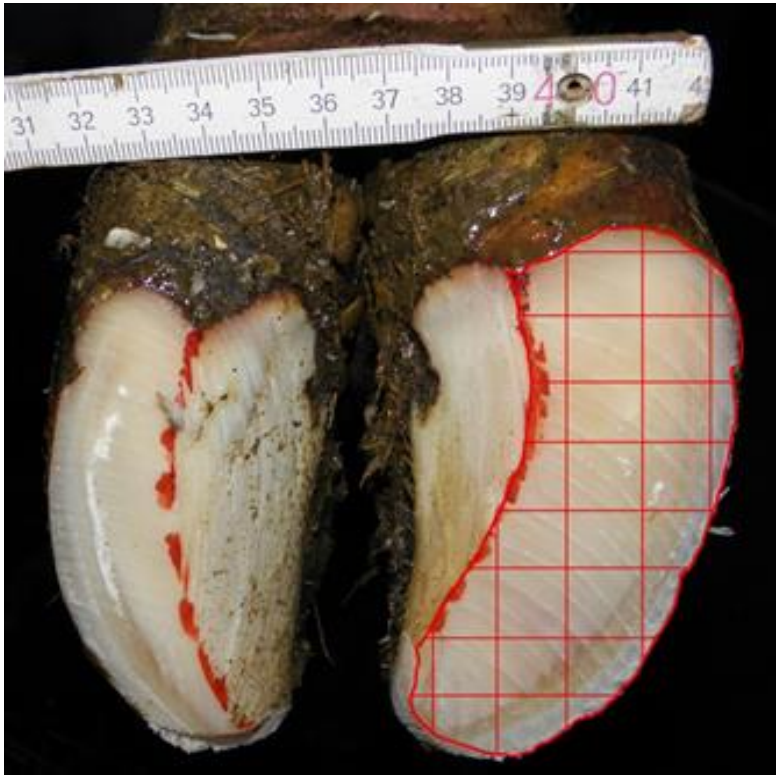
Parameter	Fore feet, lateral claw (n=34) Nuss et al.(2011)	Hind feet, lateral claw (=20) Nuss and Paulus (2006)	Hind feet, lateral claw (n=31) present study (image analysis)	Hind feet, lateral claw (n=31) present study (ruler)
Claw angle (°)	53.1±4.6	51.4±2.3	54.91±6.22	47.81±3.17
Claw length (mm)	73.9±3.7	75.6±3.5	70.19±8.23	71.19±5.04
Heel depht (mm)	41.3±3.2	33.6±2.7	35.33±3.93	36.87±4.01
Total area of claw (cm^2)	42.9±4.7	44.19±5.4	42.92±5.09	-
Claw lenght/heel depth	1.80:1	2.25:1	1.99:1	1.93:1

Multiparous cows

Parameter	Fore feet lateral claw (n=26) Nuss et al.(2011)	Hind feet, lateral claw (=20) Nuss and Paulus (2006)	Hind feet, lateral claw (n=89) present study (image analysis)	Hind feet, lateral claw (n=89) present study (ruler)
Claw angle (°)	52.4±3.8	48.2±2.7	54.96±5.84	49.51±4.68
Claw length (mm)	74.8±5.1	78.0±5.5	72.36±6.46	71.46±5.03
Heel depht (mm)	42.7±3.9	34.1±4.7	40.68±5.57	38.76±5.25
Total area of claw (cm^2)	49.1±10.2	57.72±10.0	48.23±7.33	-
Claw lenght/heel depth	1.77:1	2.28:1	1.78:1	1.84:1

Functional area of claw

- Primiparous cows
  - 26.25± 6.03 cm^2
- Multiparous cows
  - 26.97 ± 6.08 cm^2



Conclusion

- Lowest correlations- claw angle
- Highly significant diferences- claw angle and diagonal
- The mean claw length- lower than is optimal for similar breed - the sole thickness can be not enough high for protective function
  - in another claw trimming this need to be corrected
- To obtain more precise comparison repeated measurements of one parameter (for example three) and then the average values will be processed
- Overall this technique could be use as objective tool to measure claw shape as well in the future

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Thank you for your attention