Effect of different preconditioning treatments on textural and physical properties of sea buckthorn seeds

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Introduction

Sea buckthorn seed is a valuable source of highly nutritious oil. The quality of edible oils not only depends on the production method, but also from other factors e.g. the raw material and its characteristics at object time. The common mechanical compression is mainly done with the whole sea buckthorn seeds. According to other oilseed, dehulling of seeds from kernel could improve the quality of the oil and the de-oiled by-product. Information on textural and physical properties of sea buckthorn seeds and their dependency on moisture content could be useful for the design of an efficient dehulling system, equipment for mechanical expression of oil and other processes.

Methods

Two different cultivars were conditioned to five levels of moisture content from 6.26 to 24.26% for *Leikora* and 5.48 to 30.10% for *Hergo*. Methods used are listed in Table 1.

Table 1 Methods overview

	Determination	Measurement unit	Method
Textural properties	Hardness	N	Compression load (Textur analyzer, Zwick/Roell, Germany)
	Fracturability	N	
	Attended force	N	
Physical properties	Area	mm²	Image analysis (Software analySIS 5, SIS Germany)
	Outer diameter min/max	mm	
	Aspect ratio	-	
	Circumference	mm	
	1000 seed mass	g	Gravimetric analysis
	Bulk density	kg/hl	Gravimetric/volumetric analysis

Results: Physical properties

- The area and the outer diameter max and min of the *Hergo* seeds increased with increasing moisture content. *Leikora* seeds didn´t show any significant changes.
- The aspect ratios and the circumference values of *Leikora* and *Hergo* seeds were not linear related with moisture content. *Leikora* seeds had higher values of aspect ratio and circumference values than the seeds of *Hergo*.
- The thousand seed mass increased with increasing moisture content for both cultivars.
- A linear relationship and a negative correlation for the bulk density of both cultivars with the moisture content were found. *Leikora* seeds showed significant higher values of thousand seed mass and bulk density than the seeds of *Hergo* at all moisture content levels. ($p<0.05$, Fig 1 and 2)

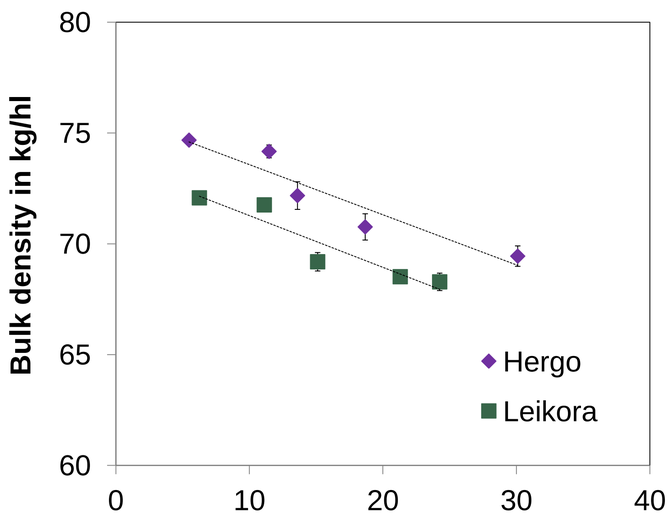

Fig 1 Effect of moisture content and cultivar on bulk density of sea buckthorn

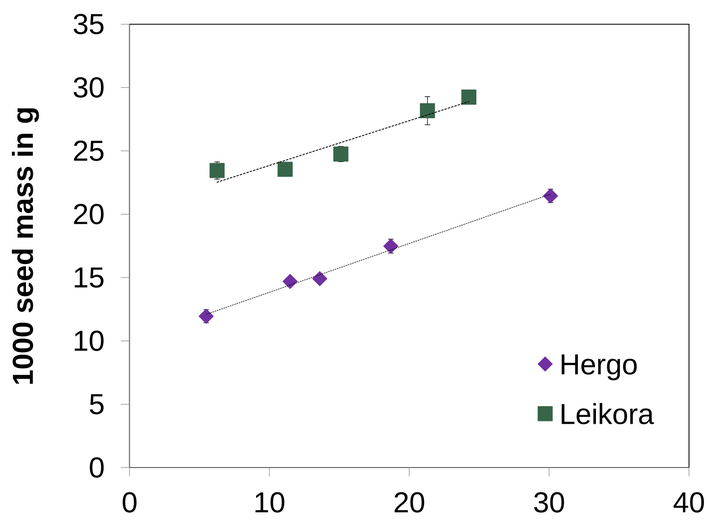

Fig 2 Effect of moisture content and cultivar on 1000 seed mass of sea buckthorn

Results: Textural properties

Fig 3 Leikora (left) and Hergo (right) sea buckthorn seeds, each square on graph paper is 1mm²

- For both cultivars the hardness decreased significant with increasing moisture content. ($p<0.05$, Fig 4)
- The force required for the maximum peak of compression was always observed higher for *Leikora* seeds as compared to *Hergo* seeds.

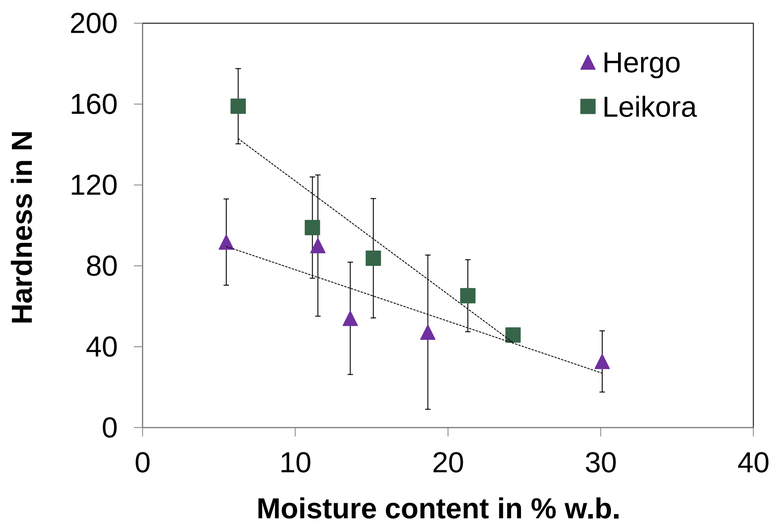

Fig 4 Effect of moisture content and cultivar on hardness of sea buckthorn seeds

- A significant decreasing of attended force was found at higher moisture content levels for both cultivars. ($p<0.05$, Fig 5)
- The seeds of *Leikora* and *Hergo* didn´t show a significant change in fracturability due to change in moisture content.

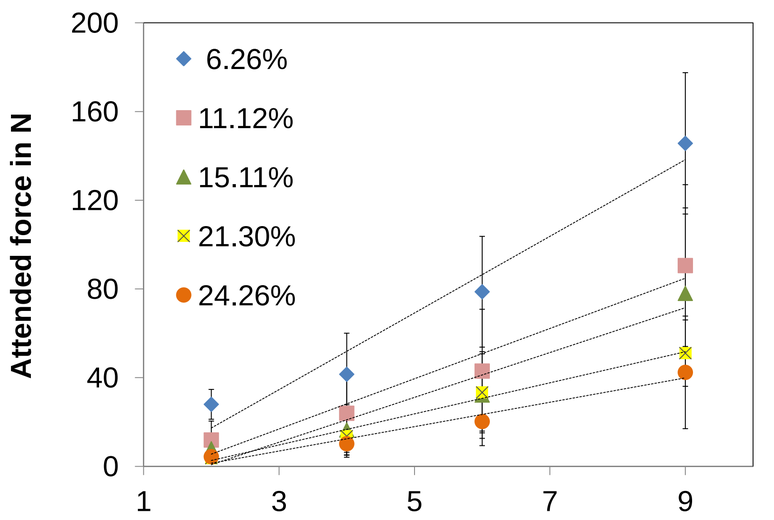

Fig 5 Effect of moisture content and attended force of compression (Leikora)

Conclusion

The knowledge of the physical and textural properties of sea buckthorn seeds is essential to facilitate the design and development of equipment for dehulling seeds and pressing seed oil. The kernel hardness is an indicator of breaking susceptibility. The fracturability and the required force could be related to dehulling properties of seeds, whereas the hardness and the required force could be associated with the oil extraction. The conditioning of sea buckthorn seeds to higher moisture can reduce the force and energy required to break the hull. Bulk density and 1000 seed mass can be valuable in sizing seed hoppers and storage facilities. The determined dimensions can be used to determine the angle of oil mills and to achieve consistent flow of materials through the chute.

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