

## // RAPID PHENOTYPING OF SEED OIL CONTENT – NOVEL FULLY AUTOMATED HIGH-THROUGHPUT SORTING DEVICE

Ref-Nr: TA-15/053TLB

### HINTERGRUND

Plant research, especially breeding of oil plants, require rapid and non-destructive methods to determine the exact properties of individual seeds from a bulk of seeds. In particular, the measurements must be traceable back to the individual seeds in order to identify/sort seeds based on their properties.

### PROBLEMSTELLUNG

Various measuring methods exist for analyzing the properties of individual seeds, including solvent extraction, microwave-assisted extraction and Soxhlet extraction. Unfortunately, these methods are time-consuming and labor-intensive, while also often using chemicals which may destroy the seeds or constituents thereof. Therefore, methods which use nuclear magnetic resonance (NMR) have been developed as a quick, nondestructive and precise measuring method for determining properties of individual seeds.

However, available devices neither solve the problem of removing individual seeds from a bulk nor achieve the task of selecting and/or sorting desired seeds from a bulk of seeds.

### LÖSUNG

Inventors at the Institute of Plant Breeding of the University of Hohenheim, Germany have solved the problem of how to analyze the oil content of large numbers of seeds in a time-saving manner and, at the same time, sort the seeds based on their oil content.

The inventors have developed a fully automated high-throughput device for (i) singling, (ii) weighing and (iii) oil mass measurement using NMR and (iv) sorting of individual seeds. The device has a modular design, including a sampling device and a final module that sorts seeds according to their oil content. The seeds are moved pneumatically within the device and can finally be placed on a tray in a grid pattern. A computer tracks the placement of each individual seed and, for example, identifies the top 10 % of seeds based on their oil content. Sorting into categories is also possible, such as distinguishing haploid from diploid seeds. The device is easy to handle and fully automated, enabling for example operation



Technologie-Lizenz-Büro  
der Baden-Württembergischen  
Hochschulen GmbH

Technologie-Lizenz-Büro (TLB) der  
Baden-Württembergischen  
Hochschulen GmbH

Dr. Frank Schlotter  
+ 49 721 790 040  
fschlotter@tlb.de  
www.tlb.de

### ENTWICKLUNGSSTAND

Prototyp

### PATENTSITUATION

EP 3383558 B1 erteilt  
CA 3,008,557 anhängig  
US 2019/0003931 erteilt  
AT (EP 3383558 B1) erteilt  
CH (EP 3383558 B1) erteilt  
DE (EP 3383558 B1) erteilt  
FR (EP 3383558 B1) erteilt  
GB (EP 3383558 B1) erteilt  
NL (EP 3383558 B1) erteilt

### CATEGORIES

//Nahrungsmittel- und  
Naturstoffprodu  
ktion //Agrartechnologie //Sensorik  
und Messgeräte //Physikalische  
Technik

overnight.

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## VORTEILE

- High-throughput measuring and sorting device for seeds
    - fully automated
    - non-destructiv
    - high accuracy
    - high speed (600 seeds per hour)
  - Device uses commercially available TD-NMR equipment, but optical measuring methods such as infrared (IR) or near infrared (NIR) may also be integrated
  - Measurement of oil content of canola, castor bean, cotton, jatropha, maize, soybean and sunflower successfully tested
  - Device also works after adjustment with properties other than oil content
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## ANWENDUNGSBEREICHE

Plant research, especially breeding of oil plants, or wherever a rapid and non-destructive method is needed to determine the exact properties of individual seeds from a bulk.

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## SERVICE

TLB GmbH manages inventions until they are marketable and offers companies opportunities for license and collaboration agreements.

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## PUBLIKATIONEN & VERWEISE

Melchinger, A.E., S. Munder, F. J. Mauch, V. Mirdita, J. Böhm, J. Müller 2017. High-throughput platform for automated sorting and selection of single seeds based on time-domain nuclear magnetic resonance (TD-NMR) measurement of oil content. *Biosystems Engineering* 164: 213-220.

DOI: 10.1016/j.biosystemseng.2017.10.011

Melchinger, A.E., J. Böhm, H. F. Utz, J. Müller, S. Munder, and F. J. Mauch 2018. High-Throughput Precision Phenotyping of the Oil Content of Single Seeds of Various Oilseed Crops. *Crop Sci.* 58: 670- 678.

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