Hosted by

Perhimpunan Penggiat
Pangan Fungsional
dan Nutrasetikal
Indonesia (P3FNI, ISFFN)

In collaboration with

CERTIFICATE

THIS CERTIFICATE IS PROUDLY PRESENTED TO

Victoria Kristina Ananingsih

In recognition and appreciation of your contribution as

Oral Presenter

at International Seminar Virtual

TRADITIONAL ROOTS OF FUNCTIONAL FOODS AND NUTRACEUTICALS TO SERVE HUMAN WELLBEING

in celebrating the World Food Day

October 16, 2021

Prof. Dr. C. Hanny Wijaya

Chairperson of Indonesian Society for Functional Food and Nutraceutical (ISFFN)

Perhimpunan Penggiat Pangan Fungsional dan Nutrasetikal Indonesia (P3FNI – ISFFN)
Department of Food Science and Technology, Universitas Bakrie
Kawasan Epicentrum, Jl HR Rasuna Said Kav C.22, Jakarta, INDONESIA 12920
Telp : (021) 5261448 (Ext. 208) - Fax : (021) 5263191
Website: http://p3fni.org/

No : 71/ISV-P3FNI/X/2021
Attachment : Seminar schedule overview

Jakarta, 13 October 2021

To:
Ibu Victoria Kristina Ananingsih

Dear Ibu Victoria Kristina Ananingsih

Greeting from Indonesian Society for Functional Food and Nutraceutical (ISNFF). Hoping everything is well with you.

ISNFF in celebrating World Food Day 2021 will host an International Virtual Seminar focusing on the research & development, technical aspect, and regulation of functional foods and nutraceuticals. The virtual seminar will be a content-rich agenda with the opportunity to interact with functional food & nutraceutical international professionals in the world. The theme of seminar is "**Traditional Roots of Functional Foods and Nutraceuticals to Serve Human Wellbeing**". We are very grateful for your willingness to be Registered Oral Presenter at this seminar.

Detail of the seminar is as follow:

Day/Date : Saturday / 16 October 2021
Time : 08.00 – 16.00 Jakarta Time (GMT+7)
Zoom Meeting : https://us02web.zoom.us/j/82297091725?pwd=RTFHZndNVk03Njc4TEwyeFhGMmdCdz09
Meeting ID : 822 9709 1725
Passcode : 583085

The time allocation for a Registered Oral Presenter is 15 minutes (10 minutes presentation and 5 minutes discussion). Your presentation is scheduled for **Parallel Session 2 at Room D** that will be held at **12:45-14:45 Jakarta Time** (GMT+7). The seminar guideline and schedule overview is attached with this letter and we are greatly looking forward to meeting you in the virtual seminar.

Thank you very much in advance.

With best regards,

Prof. Dr. Hanny Wijaya, M.Agr
President

Dr. Ardiansyah
Secretary

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INTERNATIONAL VIRTUAL SEMINAR GUIDELINE

Meeting ID & Passcode

International Virtual Seminar will be held virtually on October 16, 2021. This seminar consist of Plenary and Parallel sessions with zoom meeting ID and Passcode as follows:

Meeting ID : 822 9709 1725
Passcode : 583085

Main Room & Break Out Room

Main Room is the virtual venue for Opening Remark, Plenary Sessions, and Closing Session.
Break Out Room is the venue for Parallel Sessions, where the Invited Speakers, Lead Speakers, and Registered Oral Presenters to presenting their scientific papers, which is divided into 4 Rooms i.e. Room A, Room B, Room C, and Room D; each consisted of 2 sessions assigned as Session A1, A2, B1, B2, C1, C2, D1, and D2.

Displacing the participants from one session to another session will be organize with breakout room system. There is a sign on the screen with a room code labels that you can find and click to join the room you intended to attend the parallel session. To return to the Main Room you simply find and press 'Leave Breakout Room' option on the right corner of the screen.

Presentation Allocation Time

There are 4 types of Presenter in this Seminar: (1) Keynote Speaker; (2) Invited Speaker; (3) Lead Speaker; and (4) Registered Oral Presenter. The allocation time for each Lead Speaker to presenting their paper is 25 minutes including Q&A. The allocation time for each Invited Speaker to presenting their paper is 15 minutes and will be followed by a Panel Discussion after all the Invited Speakers have finished their presentation. **The allocation time** for each **Registered Oral Presenter is 15 minutes including Q&A (10 minutes for presentation and 5 minutes for discussion).**

Username of Registered Oral Presenter

The Registered Oral Presenters should use a formatted username that equipped with they Paper ID. For example, Luki Permana will present his paper with paper ID B1-5, so his user name should be written as B1-1_Luki Permana. The paper ID for each presenter is listed in IVS Book Program (Attached)

Instruction for Submitting Presentation Slide and/or Video (optional)

To anticipate network failure during the presentation, all Speakers and Registered Oral Presenters should load the ppt or pdf file of their talk or pre-recorded video to https://forms.gle/1YUaRcW5E4zMXk987.When the network interruption take place during the presentation, the committee can take over the slides share or the recorded video of the presentation. Your file title should be named with this following format: Paper ID_Presenter Name (example A1-1_Luki Permana). Please make sure that the files you shared is able to be downloaded before you submit your link.

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SEMINAR SCHEDULE OVERVIEW

Meeting ID and Passcode (Zoom)
Meeting ID : 822 9709 1725
Passcode : 583085
Virtual Background : https://drive.google.com/file/d/1kUi-t-DFX7KZdxYXqh7ZnRe170ePUT51/view?usp=sharing

Saturday, October 16, 2021	
Jakarta Time (GMT+7)	**Plenary Session 1**
07:45-08:00	Zoom meeting is opened for waiting room
08:00-08:03	National Anthem "Indonesia Raya"
08:03-08:07	Opening by MC Dr. Maria DPT Gunawan Puteri
08:07-08:10	Prayer
08:10-08.12	Introduction to next session (MC)
08:12-08:15	Greeting from Indah Epriliati, Ph.D Chairwoman of IVS 2021
	OPENING REMARKS
08:15-08:17	Introduction to next session (MC)
08:17-08:27	Prof. Dr. C. Hanny Wijaya, M.Agr President of Indonesian Society for Functional Foods and Nutraceuticals
08:27-08.35	Introduction to next session and introducing to the Moderator of Plenary Session (MC)
08:35-08:37	Hand over to Moderator: Prof. Dr. Nyoman Semadi Antara
08:37-08:40	Moderator introduction to Keynote Presentation 1
08.40-08.43	Moderator introduction to Keynote Presentation 2
08.43-08.45	Photo session and hand over to Keynote Speaker 1
08.45-09.05	**KEYNOTE SPEECH 1** **Prof. Bradley W. Bolling, Ph.D** Department of Food Science, University of Wisconsin-Madison, USA NORTH AMERICAN BERRY POLYPHENOLS FOR PREVENTING CHRONIC INFLAMMATION
09:05-09:07	Hand over to Keynote Speaker 2
09:07-09:27	**KEYNOTE SPEECH 2** **Prof. Takuya Sugahara, Ph.D** Graduate School of Agriculture, Ehime University, Japan IMMUNOSTIMULATORY FUNCTION OF CITRUS PEEL COMPONENTS
09:27-09:30	Moderator pins pointing the key issues and start handling the discussion
09:30-09:40	Discussion Session
09:40-09:45	Conclusion by Moderator
09:45-09:50	MC Introduction to Next Session and Participant Admission to Breakout Room

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Jakarta Time (GMT+7)	**Parallel Session 1**			
Rooms & Topics	Room A Regulation for Functional Food	Room B Food Science and Technology	Room C Food Engineering	Room D Culture, Local Wisdom, Myths
Moderator	Dias Erfan, STP MTPn	Prof. Dr. Made Astawan	Prof. Dr. Elisa Julianti	Prof. Nyoman Semadi Antara
Lead Speaker 09:50-10:15	Anadi Nithitamyong, Ph.D (Food Science and Technology Association of Thailand)	Dr. Widyastuti Setyaningsih (Universitas Gadjah Mada, Indonesia)	Dr.-Ing. Azis Boing Sitanggang (IPB University, Indonesia)	Prof. Ni Luh Sutjiati Beratha (Udayana University, Indonesia)
10:15-10:30	Invited A1-1 Dra. Rita Endang Apt., M.Kes (NADFC, Indonesia)	B1-1 Prof. Dr. Made Astawan	C1-1 Zaid Abdurrasyid	D1-1 Juan Carlos Carmona Hernandez
10:30-10:45	Invited A1-2 Danar A. Susanto (BSN, Indonesia)	B1-2 Amalia Mar'atun Nadhifa	C1-2 Dr. Sitti Rahmawati	D1-2 Ngurah Indra Pradhana
10:45-11:00	Invited A1-3 Ir. Yunawati Gandasasmita, MSc. (GAPMMI)	B1-3 Prof. Ir. Usman Pato, MSc, Ph.D	C1-3 Dr. Ir. Luh Suriati, MSi	D1-3 Adrian Feandy
11:00-11:15	Panel Discussion	B1-4 Dr. Gusti Setiavani, STP, MP	C1-4 Augusto Arindra	D1-4 Andi Early Febrinda
11:15-11:30	Panel Discussion	B1-5 Retno Dwi Astuti	C1-5 Jovita Aurelia	D1-5 Mirna Isyanti
11:30-11:45	Panel Discussion	B1-6 Laras Cempaka	C1-6 M. Ghoyatul	D1-6 Edrick Alvaro Oslo
11:45-11:50	Closing by Moderator	Closing by Moderator	Closing by Moderator	Closing by Moderator
11:50-12:30	Break			
12:30-12:45	Networking Session			

Jakarta Time (GMT+7)	**Parallel Session 2**			
	Room A Regulation for Nutraceuticals	Room B Nutraceutical Science and Technology	Room C Bioactive Compounds	Room D Wellness
Moderator	Dr. Eduan Effendi	Dr. Maria DPT Gunawan Puteri	Prof. Dr. C. Hanny Wijaya	Dr. Ardiansyah
Lead Speaker 12:45-13:10	Dr. Gloria A. Otunola (University of Fort Hare, South Africa)	Dr. M. Yusuf Abduh (Institut Teknologi Bandung, Indonesia)	Dr. Phumon Sookwong (Chiang Mai University, Thailand)	Prof. Dr. Endang S. Rahayu (Universitas Gadjah Mada, Indonesia)
13:10-13:25	Invited A2-1 Erni Rahmawati, SSi, Apt. M.Biomed, Ph.D (NADFC, Indonesia)	B2-1 Monica Irma Gurning	C2-1 Aisyah Tri Septiana	D2-1 Indah Kuswardani

13:25-13:40	Invited A2-2 Prof. Hesham R. El Seedi (Uppsala University, Sweden)	B2-2 Dr. Olawale P. Olatidoye	C2-2 Anak Agung Made Dewi Anggreni	D2-2 Sumarto
13:40-13:55	Invited A2-3 Prof. Dr. Mae S.H. Wahyuningsih, Apt. M.Si (Universitas Gadjah Mada, Indonesia)	B2-3 dr. Martha Ardiaria, M.Si.Med.	C2-3 Wahyu Dwi Saputra	D2-3 **Victoria Kristina Ananingsih**
13:55-14:10	Invited A2-4 Diani Savitri (SOHO Global Health, Indonesia)	B2-4 Monica Jupiter Arung Pandang	C2-4 Maya Indra Rasyid	D2-4 Nurul Isnaeni Fitriana
14:10-14:25	Invited A2-5 Apt. Agung Sofyan Efendi, S.Farm (APSKI)	B2-5 Afifah Zahra Agita	C2-5 Murni Patricia	D2-5 Ni Nyoman Puspawati
14:25-14:40	Panel Discussion	B2-6 Vincent Satya Surya	C2-6 Evelyn Adela Nathania	D2-6 Dr. Olawale P. Olatidoye
14:40-14:45	Closing by Moderator	Closing by Moderator	Closing by Moderator	Closing by Moderator
14:45-14:50	Break			

Jakarta Time (GMT+7)	**Plenary Session 2**
14:50-14:52	MC introduction to Next Session
	Moderator: Prof. Dr. Eni Harmayani
14:52-14:55	Moderator Introduction to Keynote Speaker 3 and 4
14:55-14:57	Photo session and hand over to Keynote Speaker 3
14:57-15:17	**KEYNOTE SPEECH 3** **Prof. Dr. Hitoshi Shirakawa** Laboratory of Nutrition, Graduate School of Agricultural Science, Tohoku University, Japan THE EFFECT OF FOOD INGREDIENT IN MICE MODEL OF NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD)
15:17-15:19	Hand over to Keynote Speaker 4
15:19-15:39	**KEYNOTE SPEECH 4** **Prof. Chin-Kun Wang** Department of Nutrition, Chung San Medical University, Taiwan IMPROVEMENT OF GAC FRUIT ARIL OIL ON EYES AND SKINS
15:39-15:45	Moderator pins pointing the key issues and start handling the discussion
15:45-16:05	Discussion Session
16:05-16:10	Conclusion by Moderator
16:10-16:20	Young Scientist Award Announcement and Closing Ceremony

Physicochemical Characteristics of Microencapsulated Nutmeg Seed (*Myristica fragrans*) Oleoresin Using Foam Mat Drying

.

Victoria Kristina Ananingsih, Bernadine Agatha A.K., B. Soedarini
Food Technology Department, Universitas Katolik Soegijapranata

International Seminar Virtual TRADITIONAL ROOTS OF FUNCTIONAL FOODS AND NUTRACEUTICALSTO SERVE HUMAN WELLBEING
16 October 2021

Outlines

- Research Background
- Methods
- Results & Discussions
- Conclusions

Research Background

Nutmeg spice
native Maluku Indonesia

Indonesia, center of nutmeg species diversity & biggest producer of nutmeg mace & oil

great economic value, **excel** in **world market** by distinctive **aroma** and high in **oil yield**
(Nuryati & Yasin, 2016)

Processing into **dried simplicia** → **unstandardized** qualities & high microbial contamination

Oleoresin, pale yellow thick liquid product of nutmeg processing

Similar taste & aroma as the original material

Mixture of **essential oils**, resins and other non-volatile compounds

Standardized flavor & aroma, **hygienic**, **antioxidants**, free of enzymes
(Nurdjannah, 2007)

Food & Beverage: **flavor, aromatic**
(Nuryati & Yasin, 2016)

Susceptible to **heat, oxygen, and light**

Encapsulation, coating to protect oleoresin

Maltodextrin

good stability in oil & water emulsions, inhibit oxidation, ease of handling during the process (Ezhilarasi et al, 2013).

β-cyclodextrin

Forming cavity, good encapsulation, hydrophilic & hydrophobic properties to encapsulate lipophilic materials
(Hadian et al, 2018; Crini et al, 2018)

Foam Mat Drying
suitable for high temperature sensitive materials (Qadri et al, 2019)

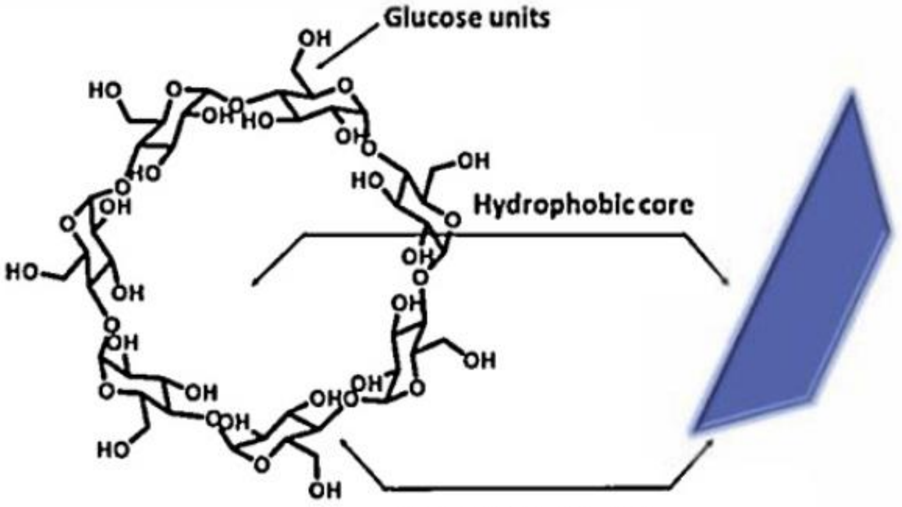
Oven Drying

Vacuum Drying

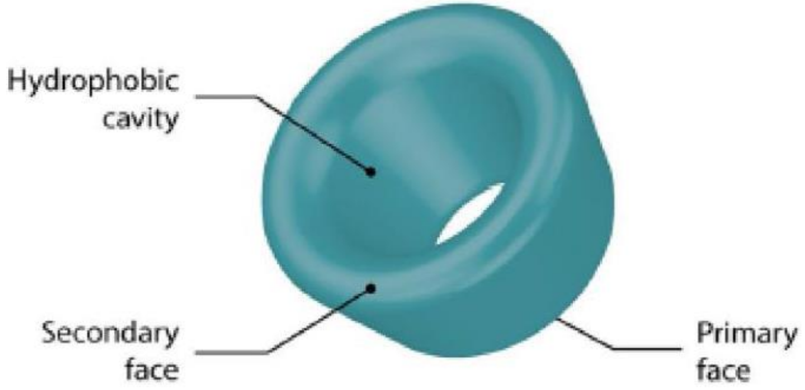
-**Maintain taste & nutritional value** (Rezvankhah et al, 2019)

-**Partial pressure** influence **drying rate**, faster with **lower temperature** compared to normal pressure (Asgar et al, 2013)

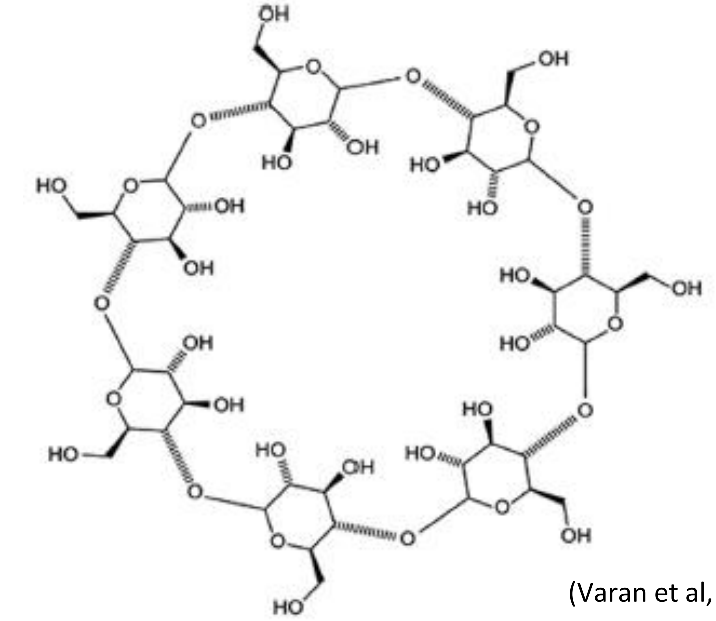
β-cyclodextrin Cavities

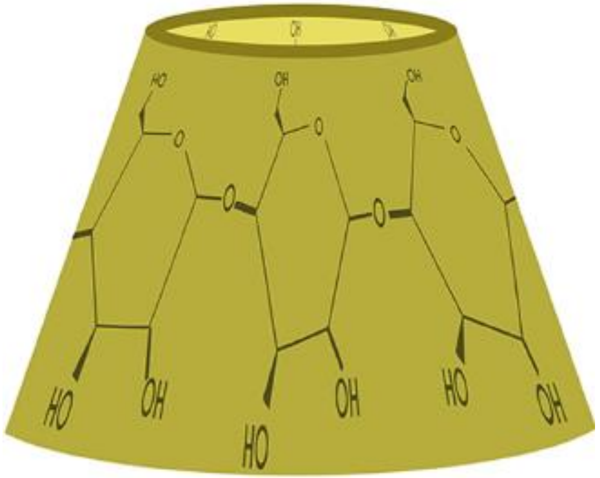


(Tanwar et al, 2019)



(Crini et al, 2018)





(Varan et al, 2017)

(Crini et al, 2018)

Aim of the Research

Determine the **comparison** of nutmeg oleoresin **encapsulation** with **maltodextrin** and **β-cyclodextrin** as encapsulants with **encapsulant amount** and **stirring time** variations using **foam mat drying** in normal and vacuum pressure

Oleoresin Extraction Method

Nutmeg

Drying 50˚C 24 hours

Dried Nutmeg Seed

Ground & shieved

Nutmeg powder

Dissolved in ethanol
Powder : solvent (1:10)

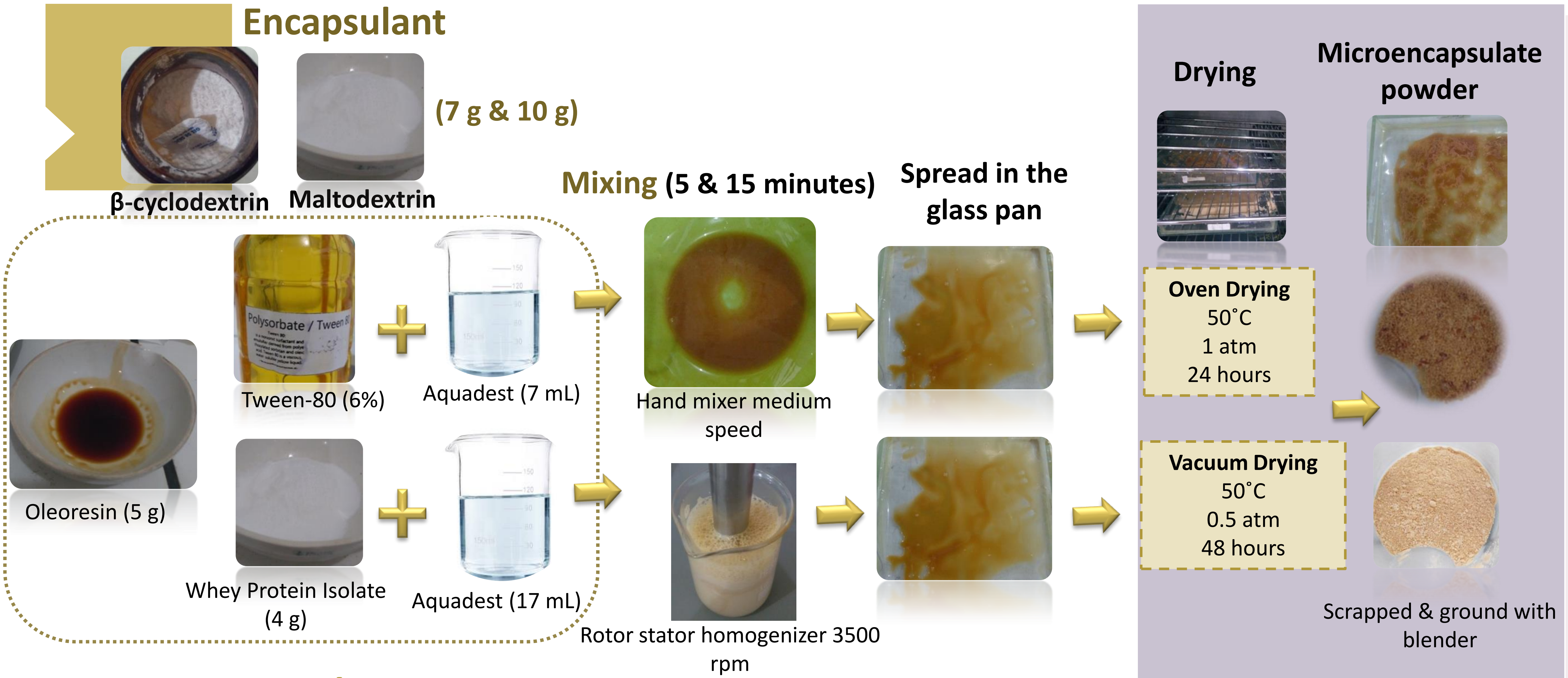
Ultrasound Extraction
37.5 min; 50˚C; 45 kHz

Filtration

Filtrate

Rotary Vacuum Evaporator

Oleoresin



Encapsulation Method

Physicochemical Characteristics Analysis

1. Moisture Content (Moisture Analyzer)
2. Trapped Oil

Trapped Oil = Total oil – Surface oil

$$\% \text{ Trapped oil} = \frac{\text{trapped oil (g)}}{\text{sample used (g)}} \text{ x } 100\%$$

Total Oil

Total oil = final weight of cup – initial weight of cup

$$\% \text{ Total oil} = \frac{\text{total oil (g)}}{\text{sample used (g)}} \text{ x } 100\%$$

Surface Oil

Surface oil = final weight of cup – initial weight of cup

$$\% \text{ Surface oil} = \frac{\text{surface oil (g)}}{\text{sample used (g)}} \text{ x } 100\%$$

3. Antioxidant Activity (DPPH assay)

$$(\%inhibition) = \frac{control\ absorbance - sample\ absorbance}{control\ absorbance} \text{ x } 100\%$$

4. Morphology (Scanning Electron Microscopy)

Moisture Analyzer

Total oil & Surface oil method

UV-Vis Spectrophotometer for DPPH assay (517 nm)


RESULTS & DISCUSSIONS

Significance Table of Statistical Analysis

Parameters	Significance (p value)					
	Encapsulant Type		Encapsulant Amount		Stirring Time	
	Oven Drying	**Vacuum Drying**	**Oven Drying**	**Vacuum Drying**	**Oven Drying**	**Vacuum Drying**
Moisture Content	**0.000**	**0.000**	0.816	0.683	0.720	0.622
Trapped Oil	**0.001**	**0.017**	0.830	0.779	0.249	0.643
Antioxidant Activity	0.191	**0.000**	**0.000**	0.937	0.964	0.869

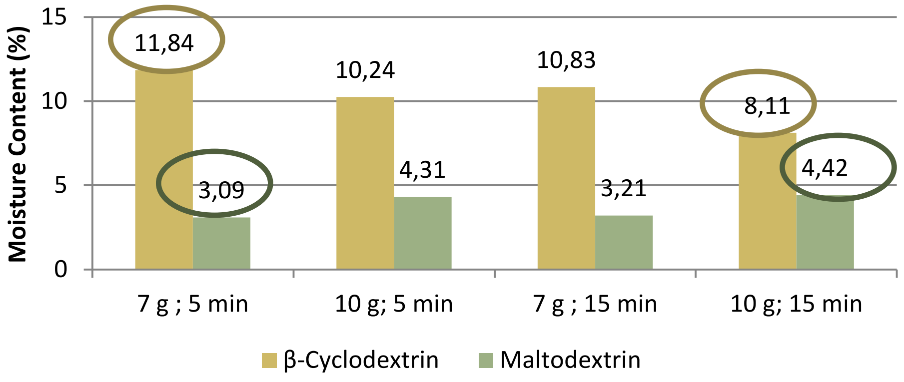
- **P value < 0.05** showed **significative difference** between treatments according to **independent sample t-test.**

Significant difference:

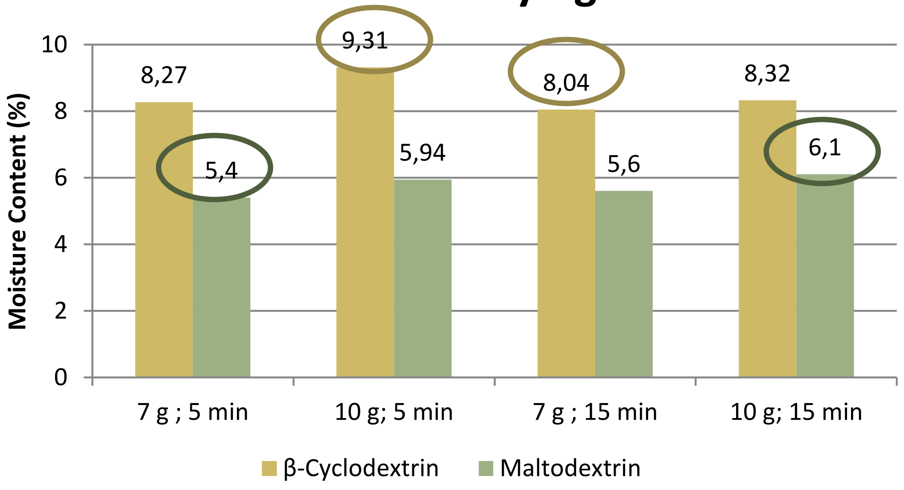
- **Encapsulant types: moisture content** & **trapped oil → (oven-dried** microencapsulates)
- **Encapsulant types: water content, trapped oil, and antioxidant activity →** (**vacuum-dried)**
- **Amount of encapsulant: antioxidant activity →** (**oven-dried** microencapsulates)
- Stirring time: no significant difference

Moisture Content (%)

Oven Drying



Vacuum Drying



Treatments		Oven Drying		Vacuum Drying	
Encapsulant Amount (g)	Stirring Time (minute)	β-Cyclodextrin	Maltodextrin	β-Cyclodextrin	Maltodextrin
7	5	11.84 ± 1.81	3.09 ± 0.83	8.27±0.83	5.4±0.56
10	5	10.24 ± 0.28	4.31 ± 1.49	9.31±1.29	5.94±0.08
7	15	10.83 ± 4.85	3.21 ± 1.41	8.04±0.64	5.6±0.84
10	15	8.11 ± 1.62	4.42 ± 1.70	8.32±0.14	6.1±0.42

The results comprise **mean ± standard deviation** of **two replicates**

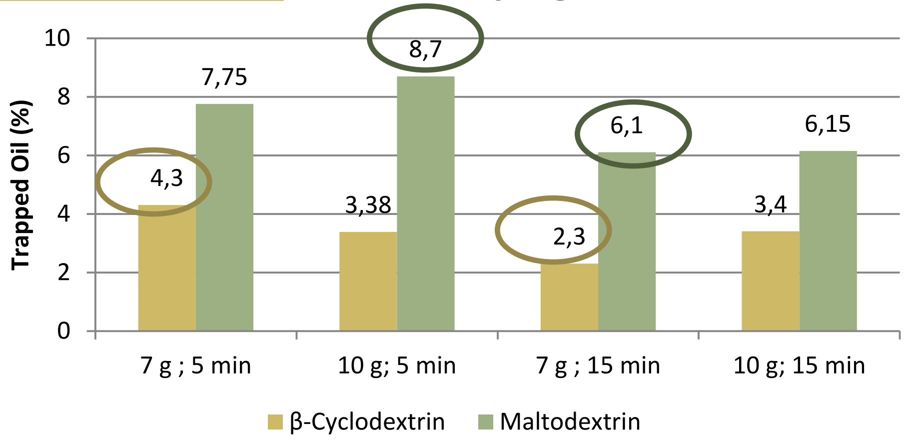
- **Significant difference**: on encapsulant (**maltodextrin & β-cyclodextrin**)
- **Maltodextrin:** results in **lower water content**
- **Oven drying**: maltodextrin was lower (**3.09%-4.42%**) than β-cyclodextrin (**8.11%-11.84%)**
- **Vacuum drying**: maltodextrin was lower (**5.4%-6.1%**) than β-cyclodextrin (**8.04%-9.31%**)
- Results fulfilled the requirements of moisture content < 12% (SNI 01-3709-1995 for spice powder)

- **β-cyclodextrin: Higher moisture content**
  - **Hydrophobic** part of β-cyclodextrin cavity: occupied by **less polar guest** molecules → water inside the cavity becomes more **difficult to evaporate** (Duchene & Bochot, 2016).
  - **Cyclodextrin** easily **absorbs water** from the atmosphere (Mahmudah, 2015).
- **Maltodextrin: Lower moisture content**
  - **Lower hygroscopicity** (Azari, 2020)
  - **Higher water evaporation rate** → water is easier to evaporate (Santoso et al, 2020)

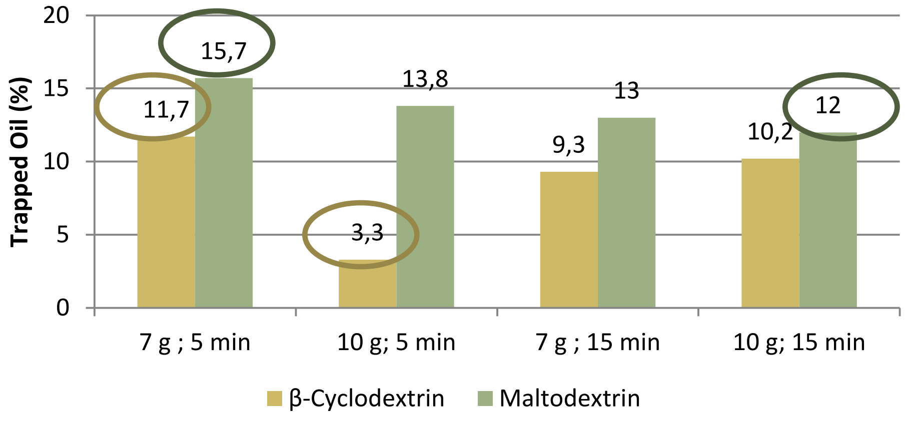
- **Stirring time:** did not show any significant difference
- moisture content: was more affected by **encapsulants treatment** rather than stirring time variation (Muchtadi et al, 2015)
- **Drying process** & **storage conditions** → affect moisture content (Muchtadi et al, 2015)

Trapped Oil (%)

Oven Drying



Vacuum Drying



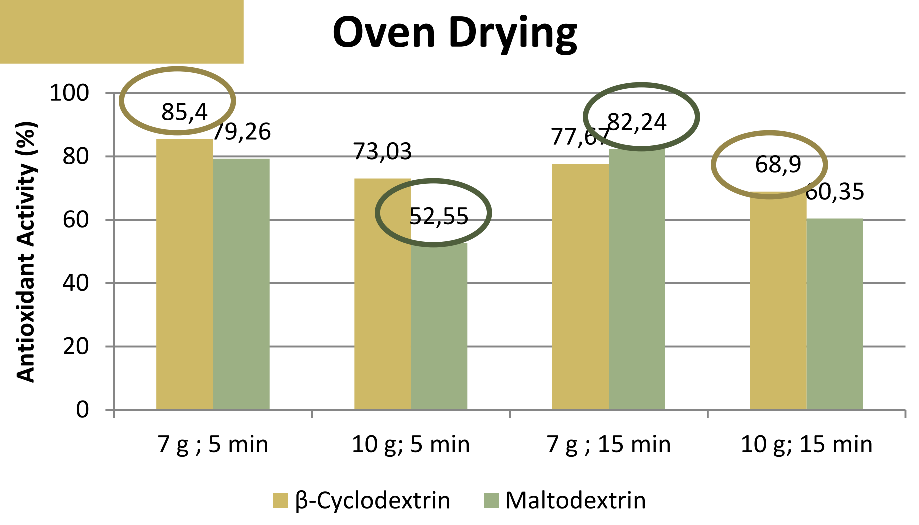
Treatments		Oven Drying		Vacuum Drying	
Encapsulant Amount (g)	Stirring Time (minute)	β-Cyclodextrin	Maltodextrin	β-Cyclodextrin	Maltodextrin
7	5	4.30 ± 0.57	7.75 ± 2.05	11.7 ±4.74	15.7 ±2.48
10	5	3.38 ± 2.66	8.70 ± 2.69	3.3 ±0.42	13.8 ±4.03
7	15	2.30 ± 2.83	6.10 ± 1.27	9.3 ±0.28	13 ±5.45
10	15	3.40 ± 0.57	6.15 ± 0.92	10.2 ±10.4	12 ±6.22

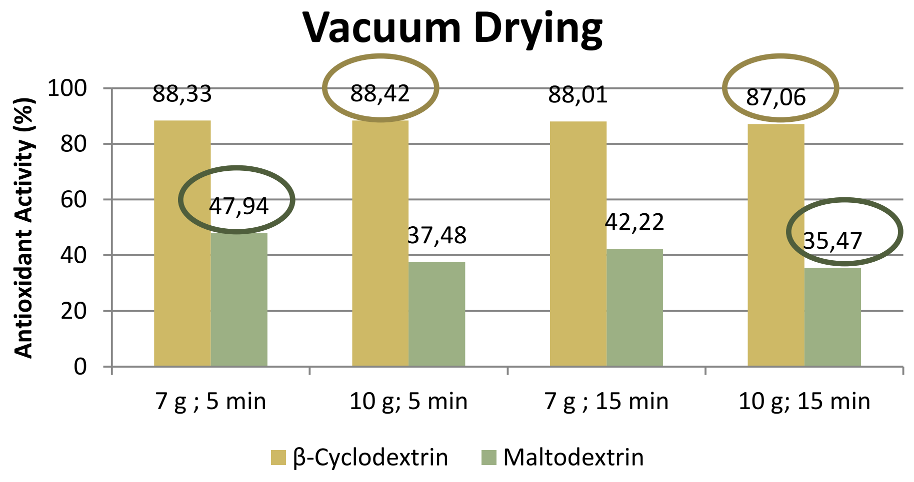
The results comprise **mean ± standard deviation** of **two replicates**

- **Significant difference**: on encapsulant (**maltodextrin & β-cyclodextrin**)
- **Maltodextrin: higher value of trapped oil**
  - with a range of 12% to 15.7% (for vacuum drying) and 6.10% to 8.70% (for oven drying)
- while β-cyclodextrin encapsulation: results in lower trapped oil
  - with a range of 3.3% to 11.7% (for vacuum drying) and 2.30% to 4.30% (for oven drying)
- **Maltodextrin: higher value of trapped oil**
  - Due to **higher viscosity** of maltodextrin (Akhilesh et al, 2012 in Yonata, 2020)
  - **High viscosity** emulsion → **thick microencapsulates** walls → **prevent migration** of oleoresin (Jayanudin et al, 2017)

- On the other hand:
- In **low-viscosity materials**: drying rate occurs **more slowly** → The longer process of **wall formation** → oil can **not be completely** encapsulated (Layuk et al, 2018)
- In both **vacuum & oven drying**: **Stirring time** → **did not** show **significant differences** in trapped oil

Antioxidant Activity (%)





Treatments		Oven Drying		Vacuum Drying	
Encapsulant Amount (g)	Stirring Time (minute)	β-Cyclodextrin	Maltodextrin	β-Cyclodextrin	Maltodextrin
7	5	85.40 ± 5.59	79.26 ± 2.86	88.33 ±0.14	47.94 ±5.54
10	5	73.03 ± 4.70	52.55 ± 4.63	88.42 ±0.04	37.48 ±0.38
7	15	77.67 ± 2.77	82.24 ± 2.93	88.01 ±0.96	42.22 ±4.75
10	15	68.90 ± 8.69	60.35 ± 3.28	87.06 ±1.82	35.47 ±0.06

The results comprise **mean ± standard deviation** of **two replicates**

- **Significant difference**:
- **Oven** drying: on **type** of encapsulant (**maltodextrin & β-cyclodextrin**)
- **Vacuum** drying: on **amount** of encapsulant **(7 g & 10 g)**

- In **oven drying**: **7 grams encapsulants → higher antioxidant activity**
  - **Amount** of encapsulants → affect the **thickness** of microencapsulates wall
  - **Higher amount** of encapsulants → **Higher emulsion** viscosity → **Thicker encapsulates** walls → The the more difficult oleoresin to migrate out from microencapsulate to dissolve in methanol extract (Jayanudin et al, 2017; Santoso, 2020)
- In **vacuum drying**: Antioxidant activity of **β-cyclodextrin** encapsulation **was higher (87.06% to 88.42%)** than maltodextrin (35.47% to 47.94%).
  - β-cyclodextrin forms **cavities** in microencapsulates (Crini et al, 2018).
  - β-cyclodextrin forms **covalently stable complex bonds** → protect oleoresins (Yonata, 2020).
  - Better **thermal stability** of β-cyclodextrin → protect antioxidant compounds (Vikas et al, 2018).

- **Stirring time:** did not show any significant difference

500x Magnification

Microencapsulates Morphology

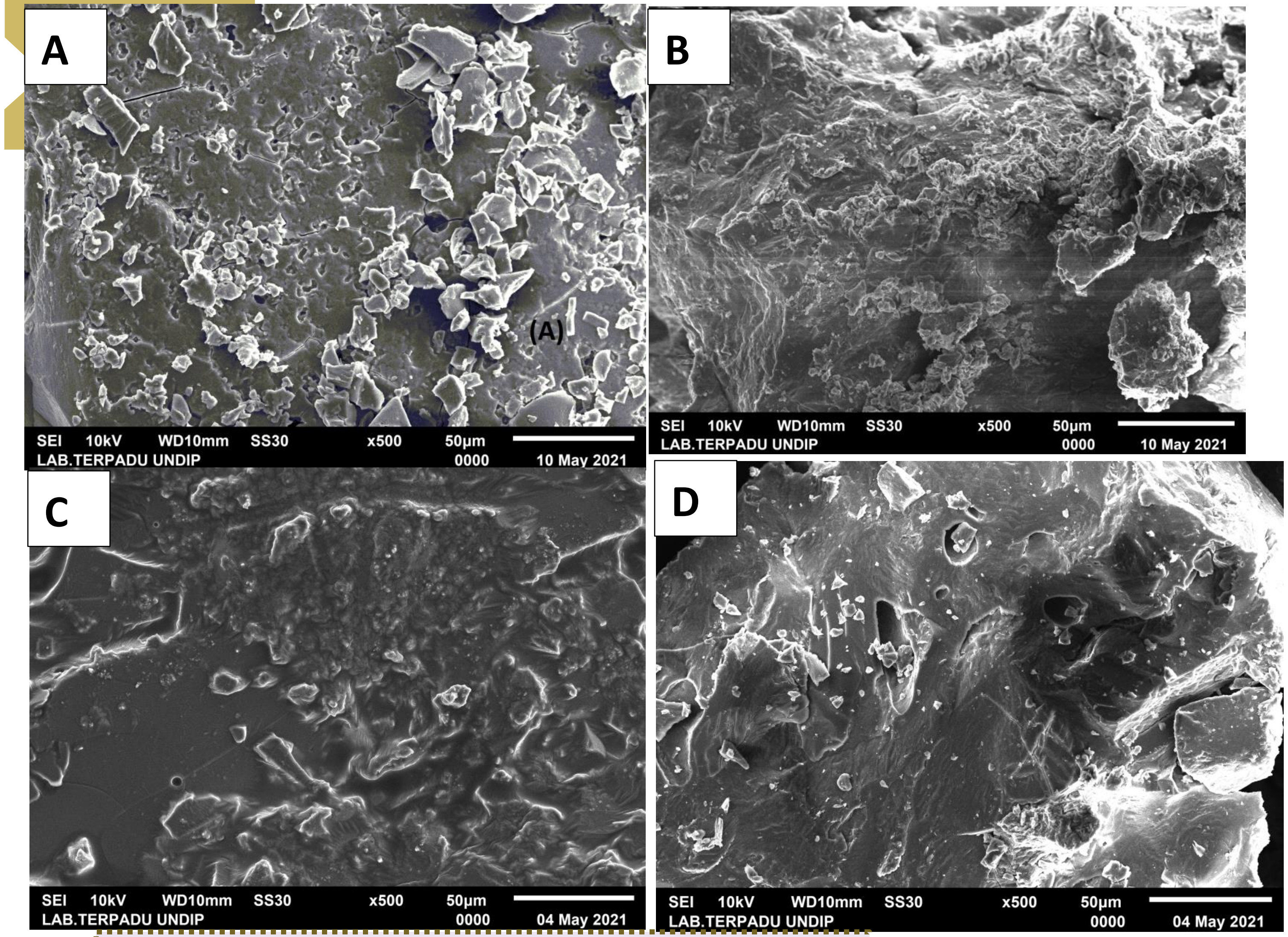


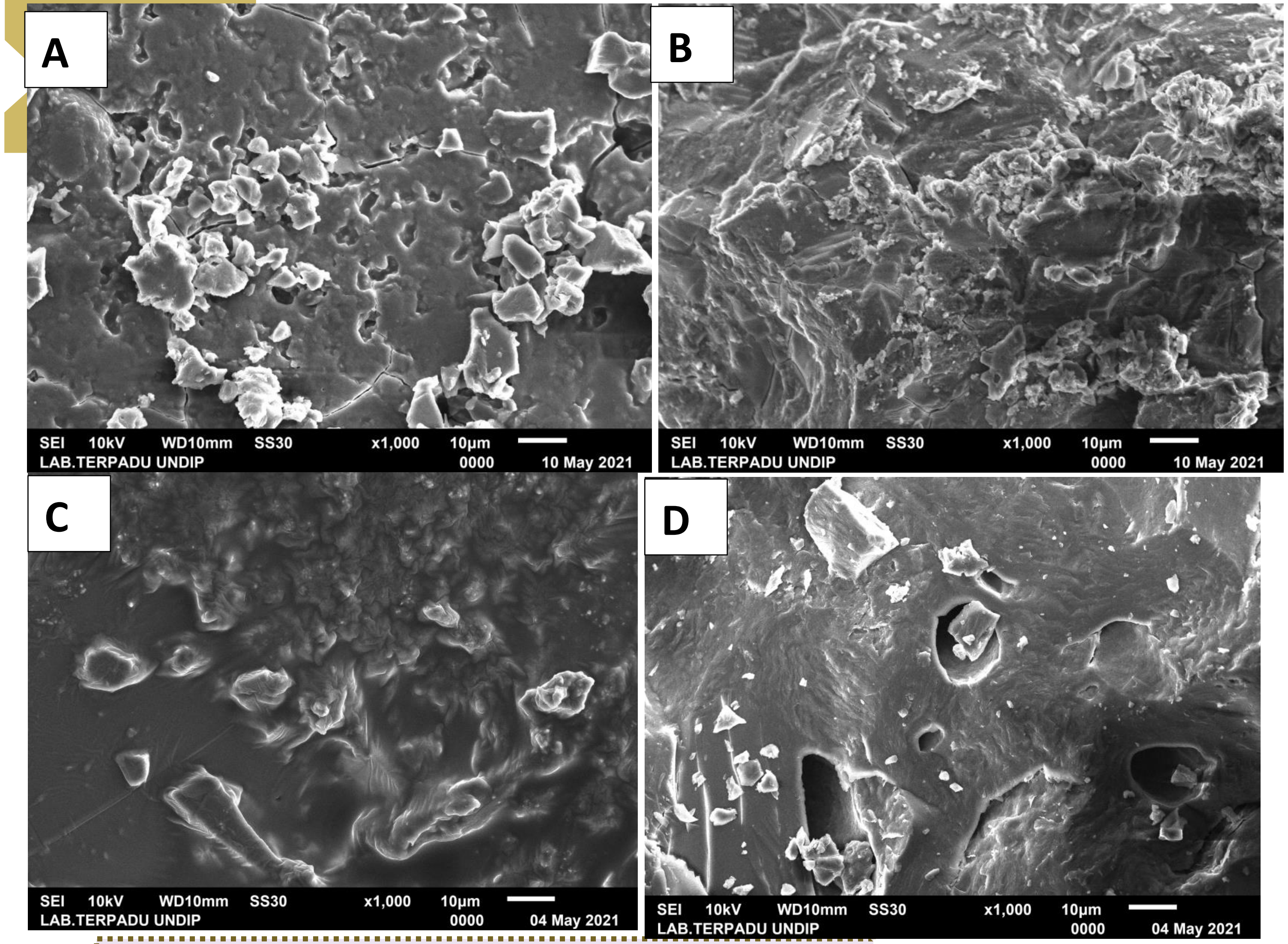
Figure 1. SEM micrograph of microencapsulated nutmeg oleoresin. (**A**) **Vacuum** drying of **maltodextrin**, (**B**) **Vacuum** drying of **β-cyclodextrin**, (**C**) **Oven** drying of **maltodextrin**, and (**D**) **Oven** drying of **β-cyclodextrin**.

Sample of **7 grams maltodextrin** in **5 minutes** stirring (**A, C**);
7 grams of **β-cyclodextrin** in **15 minutes** stirring (**B, D**).

- Particle size obtained between **10 µm to 50 µm** (<100 µm) → **microencapsulates** (Huang et al, 2020)
- **Cracks:**
  - **Maltodextrin: Vacuum & Oven** drying (Fig. **A & C**)
  - **Low foam stability** → can not maintain structure during drying (Darniadi et al, 2020)
- **Shrinkage:**
  - **Vacuum** drying: **Maltodextrin & β-cyclodextrin** (Fig. **A and B**)
  - Due to → **Water evaporation** during drying (Huang et al, 2020).
- **Smoother surface:**
  - **β-cyclodextrin: Vacuum & Oven** drying (**Fig. B and D**)
- **Pores:**
  - **β-cyclodextrin: Oven** drying (**Fig. D**)
  - Due to → **Air bubbles** in the foam when **dried** (Franco et al, 2016)
  - **Water vapor** of foam released during drying → foam bubbles with **high stability** & **low density** form pores with the same shape & size as the foam (Darniadi et al, 2020).

1000x Magnification

Microencapsulates Morphology



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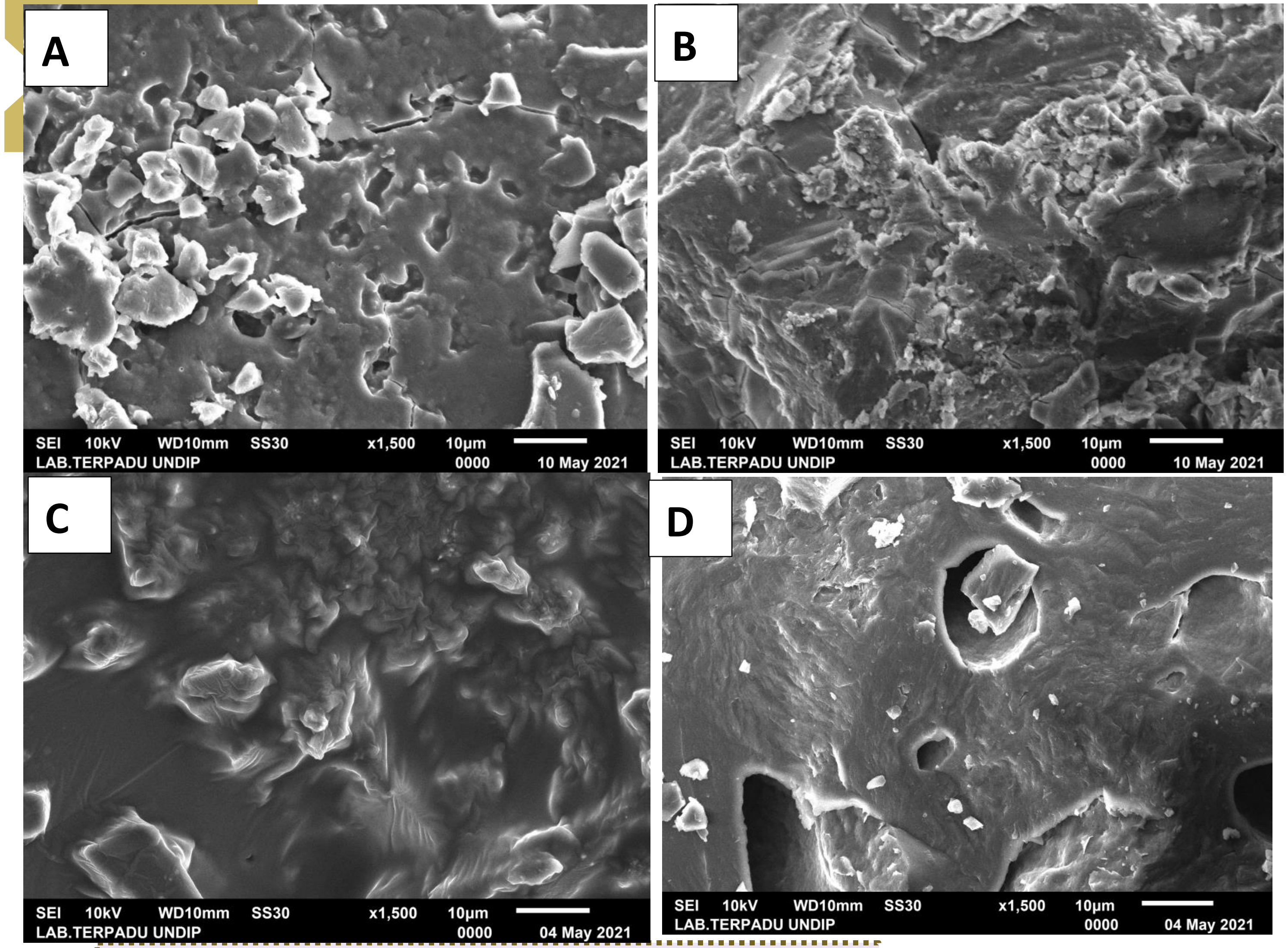
  - Due to → **Water evaporation** during drying (Huang et al, 2020).
- **Smoother surface:**
  - **β-cyclodextrin: Vacuum & Oven** drying (**Fig. B and D**)
- **Pores:**
  - **β-cyclodextrin: Oven** drying (**Fig. D**)
  - Due to → **Air bubbles** in the foam when **dried** (Franco et al, 2016)
  - **Water vapor** of foam released during drying → foam bubbles with **high stability** & **low density** form pores with the same shape & size as the foam (Darniadi et al, 2020).

1500x Magnification

Microencapsulates Morphology



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  - **Water vapor** of foam released during drying → foam bubbles with **high stability** & **low density** form pores with the same shape & size as the foam (Darniadi et al, 2020).

Conclusions (1)

- **Oven-dried** microencapsulates:
  - **Encapsulant types** → significant difference between treatments in
    - **Moisture content**
    - **Trapped oil**
  - **Encapsulant amount** → significant difference in
    - **Antioxidant activity**
- **Vacuum-dried** microencapsulates:
  - **Encapsulant type** → significant difference in
    - **Moisture content**,
    - **Trapped oil**
    - **Antioxidant activity**
- **Stirring time** variations → no significant difference in parameters.

Conclusions (2)

- **Moisture content** of **maltodextrin** microencapsulates was **lower** than β-cyclodextrin
  - **Maltodextrin**
    - 3.09% - 4.42%: for oven drying
    - 5.4% - 6.1%: for vacuum drying
  - **β-cyclodextrin**
    - 8.11% - 11.84%: for oven drying
    - 8.04% - 9.31% : for vacuum drying
- **Trapped oil** was **higher** on **maltodextrin** encapsulation than β-cyclodextrin
  - **Maltodextrin**
    - 6.10% - 8.70%: for oven drying
    - 12% - 15.7% : for vacuum drying
  - **β-cyclodextrin**
    - 2.30% - 4.30%: for oven drying
    - 3.3% - 11.7%: for vacuum drying

Conclusions (3)

- **Antioxidant activity:**
- In **oven** drying:
  - the **antioxidant activity** of microencapsulates was **higher** at **7 g**
  - 7 g encapsulant: 77.67% - 85.40%
  - 10 g encapsulant: 52.55% - 73.03%
- In **vacuum** drying:
  - the **antioxidant** activity of microencapsulates was **higher** in **β-cyclodextrin**
  - β-cyclodextrin encapsulant: 86.28% - 88.42%
  - maltodextrin encapsulant: 35.47% - 47.94%

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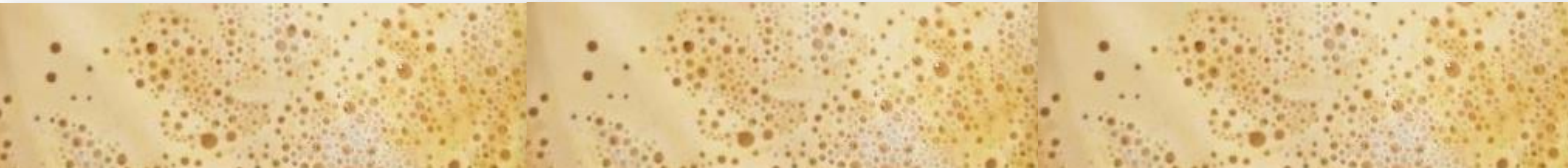

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Graduate School of Agriculture, Ehime University, Japan
Expert in Evaluation of food functions & functional food development
Prof. Dr. Chin-Kun Wang
Chung Shan Medical University
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