

# ARKNOKK

Arctic nettle, from  
weed to money

*Arktinen nokkonen,  
rikasta rahaksi*

ERDF/EAKR, 3.2020-9.2023



**LAPIN AMK**  
Lapland University of Applied Sciences



Leverage from  
the EU  
2014-2020



European Union  
European Regional  
Development Fund



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- Originally native to Europe, found worldwide
- Nitrophile "weed"



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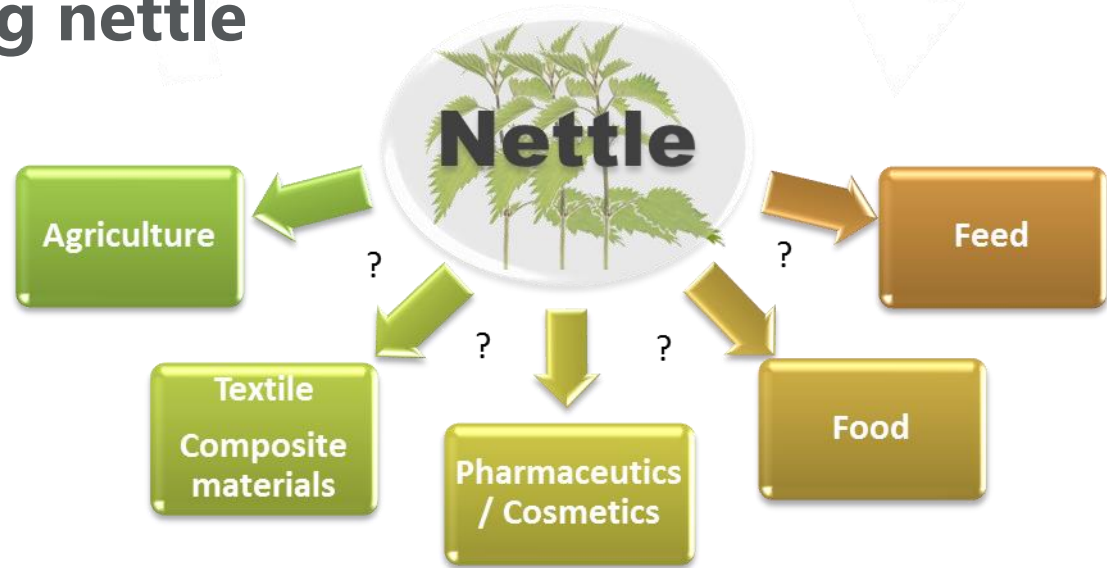
# *Urtica dioica*, stinging nettle

- Herbaceous perennial
- Originally native to Europe, found worldwide
- Nitrophile "weed"
- Dioecious
- Stinging hairs  
(*acetylcholine*,  
*histamine*,  
*serotonine*,  
*formic acid*)



# Urtica dioica, stinging nettle

- Herbaceous perennial
- Originally native to Europe, found worldwide
- Nitrophile “weed”
- Dioecious
- Stinging hairs
- Super-plant



- Culture under development in many European countries
- FIN: Former research in MTT (90's, B. Galambosi, textile)
- 2020's: Luke and Lapin AMK

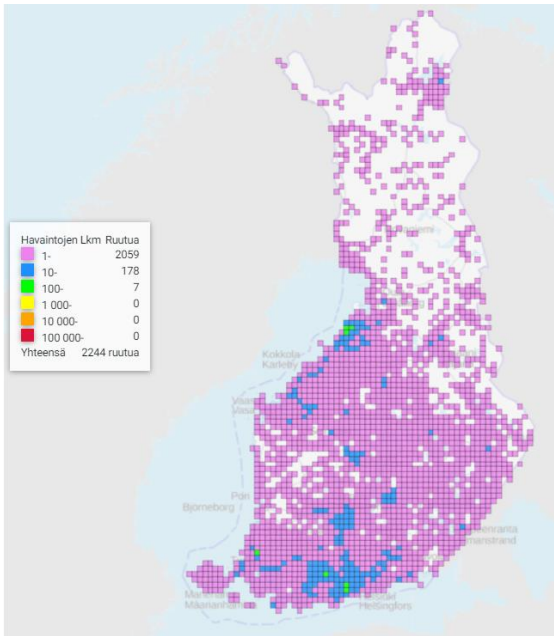
# Nettle in Finland

- Isonokkonen (***Urtica dioica***) (Stinging nettle)
- Subspecies
  - **dioica** (*etelännokkonen*): most common
  - **Sondenii** (*pohjännokkonen*): "no" hairs, more rare

# Nettle in Finland

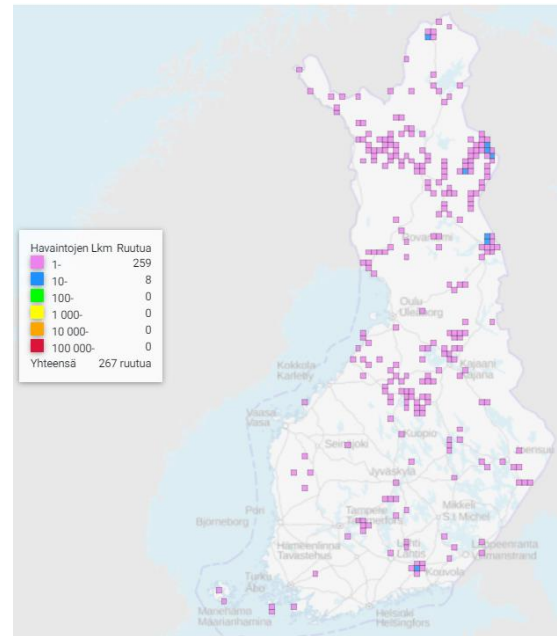
Dioica / etelännokkonen

10824 observations



Sondenii / pohjannokkonen

695 observations



Suomen  
Lajitietokeskus  
lafi.fi

# Nettle in Finland

- Nettle is **multivalorable** → all parts of the plant can be used
- Grows well under high latitudes
- Increasing interest and demand
- Cultivation is developing in EU
- In Finland: ca. 5-10 ha cultivated area (2021)  
Mainly used for food applications (functional food)  
Limited organic cultivation  
More expensive than international nettle



# ARKNOKK - Goals

- ✓ **Establish the bases for the nettle value-chain in Lapland**
- ✓ **Optimize** cultivated nettle **yield and quality** using **organic** cultivation techniques
- ✓ Ensure **regular supply** of nettle as a raw material to companies
- ✓ **Promote** the use of nettle as a raw material by companies and end-users

Which  
nettle to  
cultivate ?

How to  
cultivate nettle  
in northern  
Finland ?

Nettle for  
reindeer ?

→ *Aki's presentation*



# WP2 Selection

- **110 accessions** collected in **13 sites in 2020**
  - Planted in a common garden in Loue (Tervola) (19.8.2020)
- 
- Sondenii/pohjannokkonen (★):  
identification issues  
→ genetic analysis necessary?

- 1-2: **IN**Ari
- ★ 3: **KIT**tilä
- 4: **MUO**nio
- 5: **POS**io
- 6: **ROV**aniemi
- 7: **SAL**la
- ★ 8: **SAV**ukoski (Ainijärvi)
- ★ 9: **VÄR**riö research station
- 10: **SUO**nenjoki
- 11: **TAM**mela
- ★ 12: **TER**vola
- ★ 13: **YLL**äsjärvi



# WP2 Selection

## Sampling

July 2020 on site + soil samples  
2021, 2022 in Loue



## Growth

## Biochemical analyses



**Characterisation** and **selection**  
of the accessions for different  
applications

- 1-2: INAri
- 3: KITtilä
- 4: MUOnio
- 5: POSio
- 6: ROVaniemi
- 7: SALLa
- 8: SAVukoski (Ainijärvi)
- 9: VÄRriö research station
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# WP2 Micropropagation

- Most accession cultivated *in vitro* (Luke, Suonenjoki)



Micro plots with male and female plants

# WP2 Selection

- **Sondenii/pohjannokkonen:**
- ✓ different morphology



KIT



VAR  
Sondenii

# WP2 Selection

- **Sondenii/pohjannokkonen:**
  - ✓ different morphology
  - ✓ Good soil covering capacity after cutting
  - ✓ earlier senescence



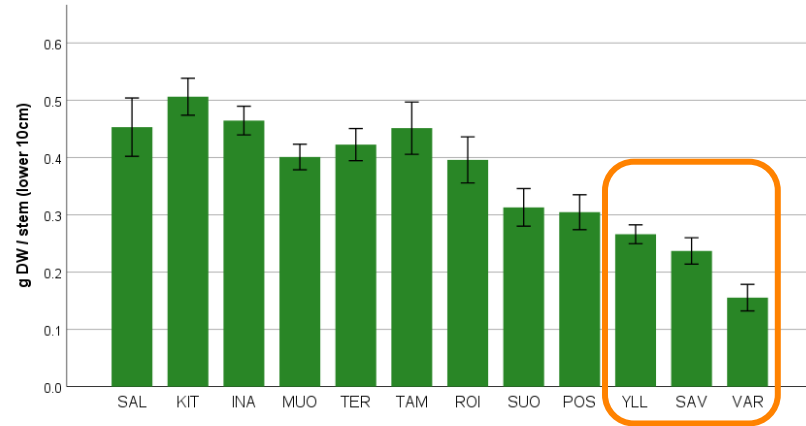
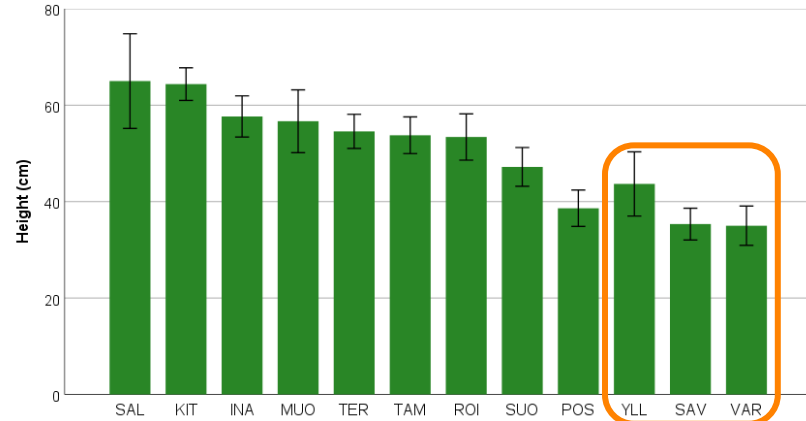
KIT



VAR  
Sondenii

# WP2 Selection

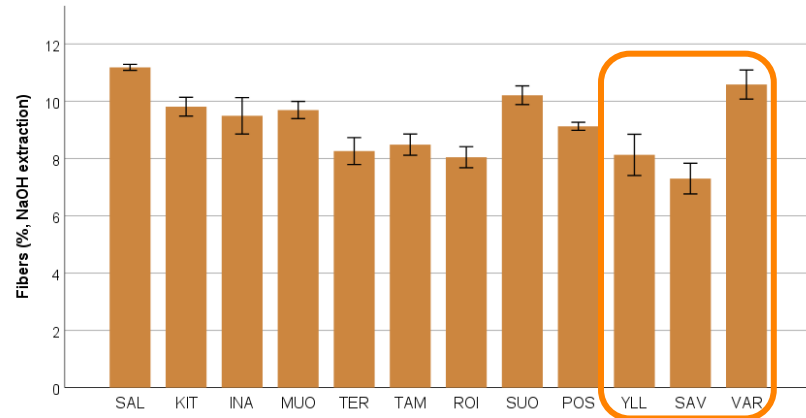
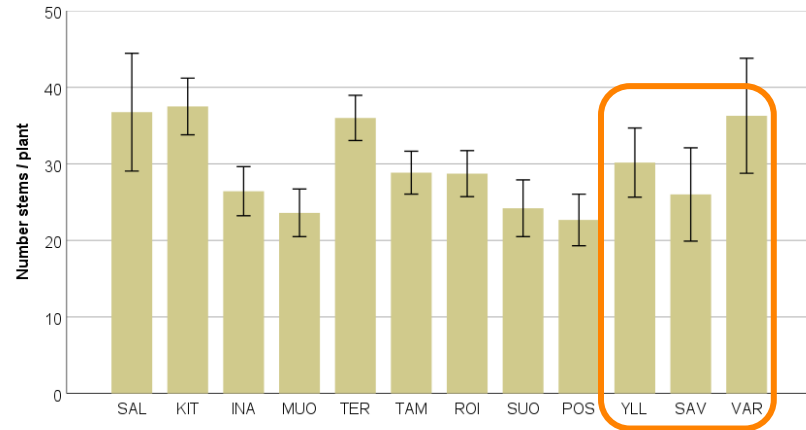
- **Sondenii/pohjannokkonen:**
  - ✓ different morphology
  - ✓ Good soil covering capacity after cutting
  - ✓ earlier senescence
  - ✓ shorter and thinner stems



Error Bars: +/- 1 SE

# WP2 Selection

- **Sondenii/pohjannokkonen:**
  - ✓ different morphology
  - ✓ Good soil covering capacity after cutting
  - ✓ earlier senescence
  - ✓ shorter and thinner stems. *VAR has high fiber content (NaOH extraction)*



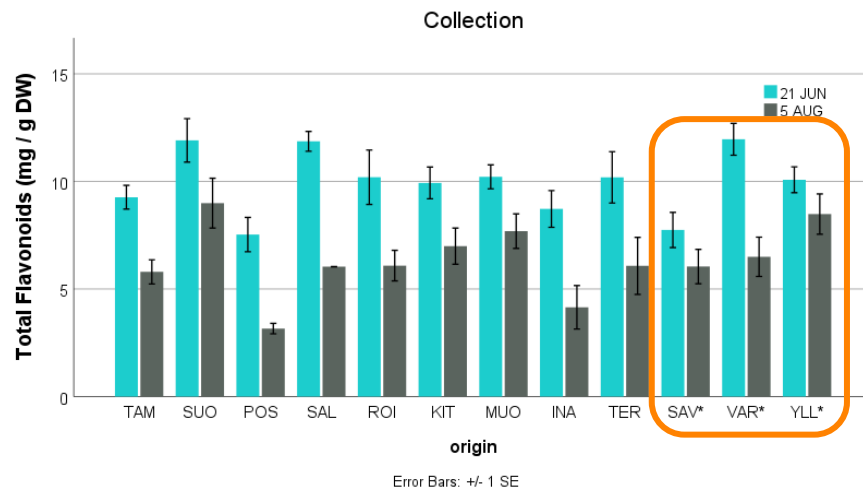
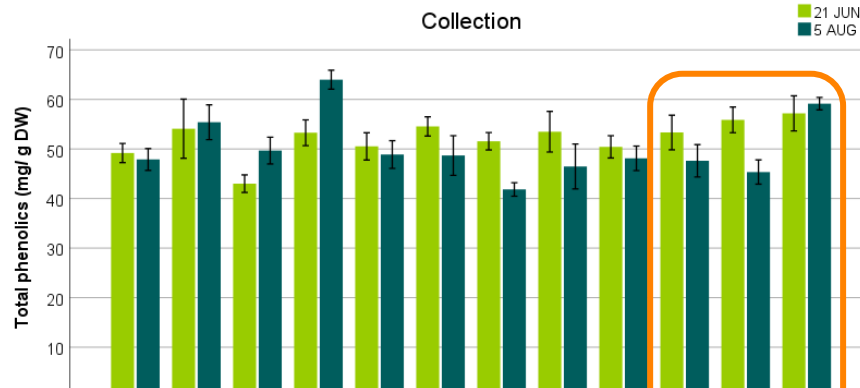
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# WP2 Selection

## Bioactive compounds/antioxidants

- ✓ Strongly correlated with the antioxidant activity (radical scavenging)
- ✓ **51.4 mg/g DW** (ca. 2x values reported in the literature)
- ✓ 80% of soluble phenolics are caffeic acid derivatives (*caffeoyl malic and chlorogenic acids*)
- ✓ 20% flavonoids (*quercetin glycosides*) (*1.5x more in younger/early season*)
- ✓ **Not huge differences between accessions/origins**



# WP2 Selection

## Best candidates *(based on 2022 data)*

⇒ seed production



- 1-2: INArI
- 3: KITtilä
- 4: MUOnio
- 5: POSio
- 6: ROVaniemi
- 7: SALla
- 8: SAVukoski (Ainijärvi)
- 9: VÄRriö research station
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# WP3 Cultivation – seedling production

- Previous work (Galambosi, Dervaux)
  - ➔ **best method for field establishment = seedlings**
- Critical parameters = no substrate compaction, constant moisture and temperature ( $> 10^{\circ}\text{C}$ )
- Ready for field planting after 8-12 weeks



# WP3 Cultivation – seedling production

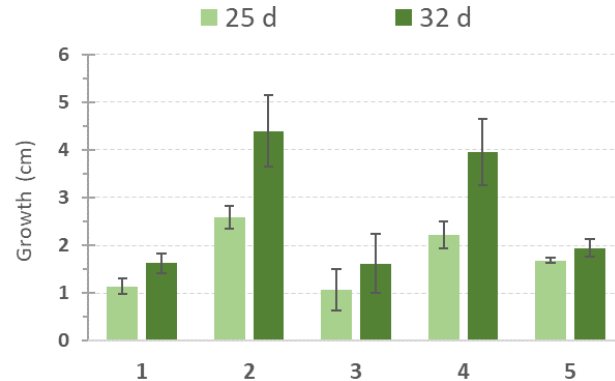
- Substrate:



#	Substrate
1	Musta multa - Biolan
2	Turve multa - Biolan
3	Kylvö ja taimi multa - Kekkilä
4	Kylvö ja taimi multa - Biolan
5	Yrtti multa - Biolan



Similar germination rates

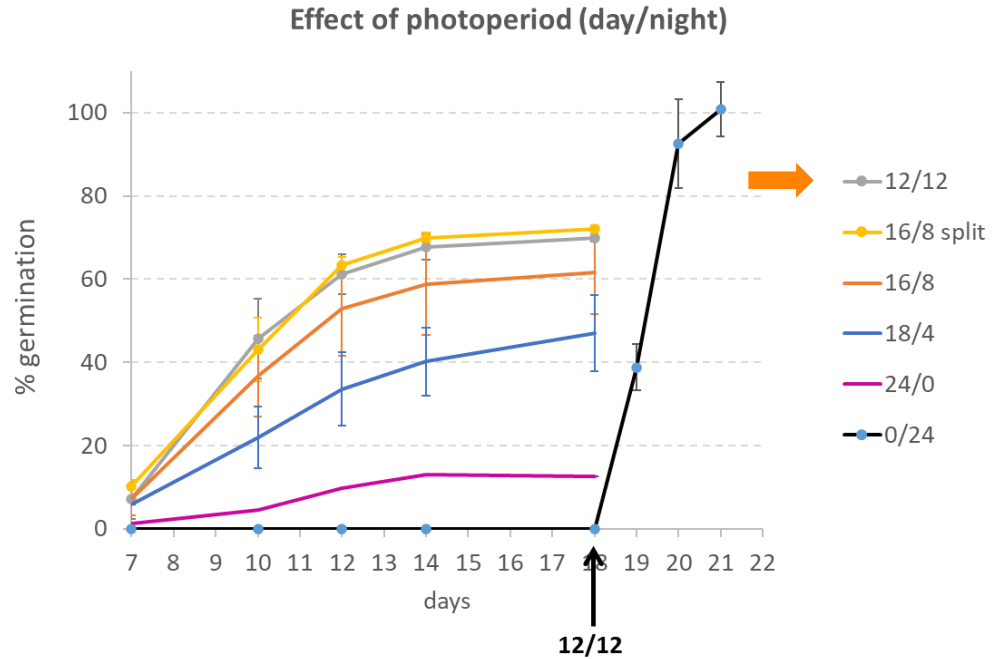


#2

#3

# WP3 Cultivation – seedling production

- Substrate: "Turve multa", loose peat-mulch mixture
- Light: photoperiod
- Seed: good germination rate after 4 years (2019-2022 tested)



# WP3 Field planting

## ▪3 planting system tested

### ➤ **strawberry bench**

*mansikkapenkki , 6.2020*

- planting density +plastic mulching/*muovikate*



### ➤ **Potato bench/**

*perunapenkki, 2020*

- Different planting fertilizers



### ➤ **No bench /tasamaa, 2021**

- mineral and organic soils with different fertilizers

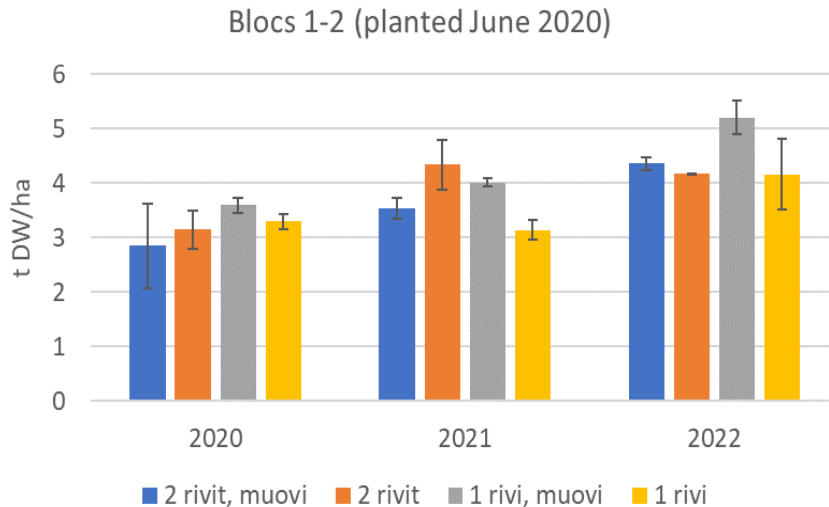


# WP3 Field planting

▪ 3 planting system established



➤ **strawberry bench** with plastic mulching/ *mansikkapenkki + muovikate*, (6.2020)



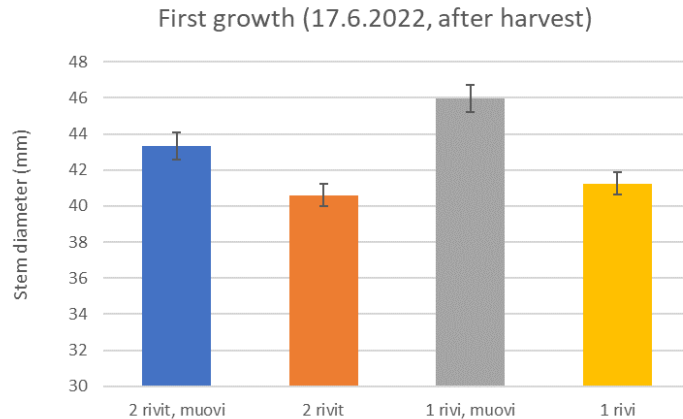
- **Yield (t DW/ha, leaves+stems):** in line with reported data in the literature
- **Best option seems to be lower planting density (lower costs) + plastic mulching**

# WP3 Field planting

## ▪3 planting system established



- **strawberry bench** with plastic mulching/ *mansikkapenkki + muovikate*, (6.2020)



- **Yield (t DW/ha, leaves+stems):** in line with reported data in the literature
- **Best option seems to be lower planting density (lower costs) + plastic mulching**
- No soil warming in spring but during dry season
- Yields could be optimized with more frequent harvest (younger leaves, better quality: *to be tested in 2023*)
- No more growth in Sept (mid-Aug?)
- **Easier weed control**



# WP3 Field planting

▪ 3 planting system established

- **strawberry bench** with plastic mulching/ *mansikkapenkki* + *muovikate* (6.2020)



# WP3 Field planting

▪ 3 planting system established

- **strawberry bench** with plastic mulching/ *mansikkapenkki + muovikate, 2020*



	Muovi kate / Plastic mulching
+	<ul style="list-style-type: none"><li>• Height growth</li><li>• Weed control</li></ul>
-	<ul style="list-style-type: none"><li>• Cost</li><li>• Fertilizer application</li><li>• Not eco-friendly (ecoplastic?)</li></ul>

# WP3 Field planting

## ▪3 planting system tested

- **Potato bench/ perunapenkki (8.2020)** + Different fertilizers at planting
- No significant effect of fertilizer type, BUT
- Major issue with **frost heaving** in spring:  
roots uplifted => not optimal growth
- Harvesting machinery (bench 20cm high) ?



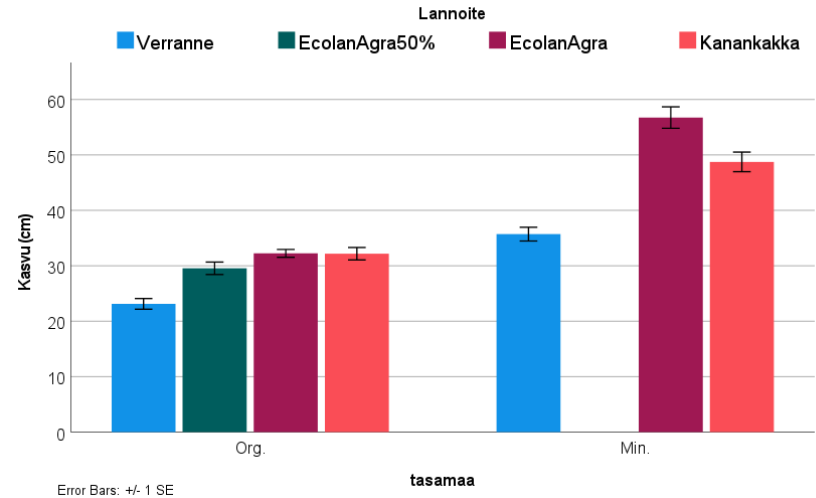
# WP3 Field planting

▪ 3 planting system tested

- **No bench /tasamaa**
- mineral and organic soils with different fertilizers, 2021
- 2022 data: better growth on mineral soil,



Lannoite	N	P	K	kg/ha
Ecolan Agra	9	4	2	<b>150</b>
Chicken manure	4	1	3	<b>150</b>
Ecolan Agra 50%	9	4	2	<b>75</b>



# WP3 Field planting

## ▪3 planting system tested

- **No bench /*tasamaa***
- mineral and organic soils with different fertilizers, 2021
- 2022 data: better growth on mineral soil, fertilizer effect
- Weed issue (ex: juolanvehnä/ couch grass) → **importance of field preparation**



# WP3 Field planting



## Take-home messages

- Efficient soil preparation the previous growing season
- Site selection: pH, no soil compaction, drained soil, **natural presence of nettle**
- Strawberry bench + plastic mulching showed best yields

**“Choose the planting system according to the harvesting and weeding equipment available”**  
*Laurent Dervaux and Alexandre Laflotte*



# Dissemination

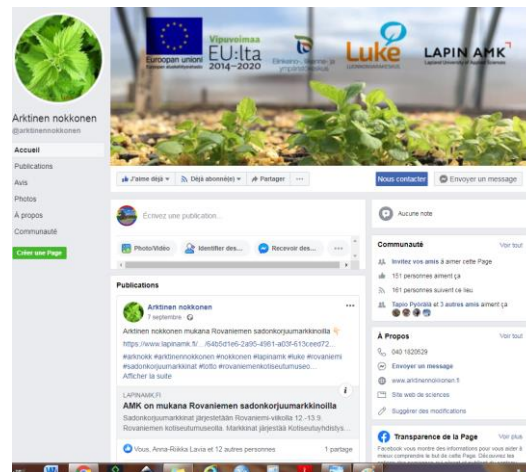
- Webpage [www.arctinennokkonen.fi](http://www.arctinennokkonen.fi) (English version)
- Social media [www.facebook.fi/arctinennokkonen](https://www.facebook.fi/arctinennokkonen)



Arctinen nokkonen (Lithospermum) -hankeessa kehitetään perinteistä ja luonnontieteellistä viilijärvä- ja otaekasvien rikastustutkimusta raaka-aineksi ja kasvien tuotosten kehittämistä varten. Lisäksi käynnistetään yhteistyö ja luodaan arvokkaita nokkonen tuotteen ja -alusteen laatu- ja turvallisuusnäytteenä. Hankeessa myös testataan alustatieteellisesti nokkonen hyödyntämistä perinteisissä lääkkeissä.

Arctinen nokkonen on perinteisesti ollut arvokas lääke- ja ruoka-ainekasvi. Hankeessa kehitetään raaka-ainetta, perinteisillä menetelmillä, perinteisillä menetelmillä ja modernilla menetelmillä. Hanke on osa Euroopan Unionin tutkimusohjelmia.

Hankkeen aikana 01.03.2020 – 28.02.2023 välisenä aikana, Hankkeen päättävänä toimii Luonnonvarakeskus ja osatehtävinä Lapin ammattikorkeakoulu. Lisäksi hankkeen toteutuksessa on mukana eri kielialueiden, maan ja perinteikköiden, luonnonvarainhoitajien, viilijärvien, hakemisten ja tieteenalan tutkijoiden.



# Thank you!



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