Manipulating plant species diversity with cover crops......recent research efforts in Finland

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Luke, Finland

PRODIVA project details

- **Work packages:**
  - **WP0:** Project coordination
    *Bo Melander (DK)*
  - **WP1:** Weed dynamics in crop rotations with cover crops
    *Jukka Salonen (FI)*
  - **WP2:** Crop mixtures for weed suppression
    *Anneli Lundkvist (SE)*
  - **WP3:** Variety mixtures for weed suppression
    *Bo Melander (DK)*
  - **WP4:** Crop diversification and weeds on farms
    *Bärbel Gerowitt (DE)*
  - **WP5:** Dissemination
    *Bärbel Gerowitt (DE)*

http://coreorganicplus.org/research-projects/prodiva/
PRODIVA project HYPOTHESES

Improved weed management with…. (WP 1)

- Selected competitive cover crop species
- Improved cover crop establishment

More project info:
http://coreorganicplus.org/research-projects/prodiva/
Cover/catch crops in field experiments in FI 2015&16

- TRFPR: Red clover (*Trifolium pratense* L.)
- TRFRE: White clover (*Trifolium repens* L.), 2 cultivars
- TRFHY: Alsike clover (*Trifolium hybridum*)
- TRFRM: Persian clover (*Trifolium resupinatum* var. majus)
- TRFSU: Subterranean clover (*Trifolium subterraneum* L.)
- TRFIN: Crimson clover (*Trifolium incarnatum*)
- MEDLU: Black medic (*Medicago lupulina* L.)
- MEUAL: White sweet clover (*Melilotus alba* Med.)
- LOLMU: Italian ryegrass (*Lolium multiflorum* Lam.)
- LOLPE: English/Perennial ryegrass (*Lolium perenne* L.)
- PLHPR: Timothy (*Phleum pratense* L.)
- FESPR: Meadow fescue (*Festuca pratensis* Huds.)
- FESAR: Tall fescue (*Festuca arundinacea* Schreb.)
- SECCE: Winter rye (*Secale cereale* L.)
- **After Harvest:**
  - VICSA: Common vetch (*Vicia sativa* L.)
  - RAPSA: Oilseed radish (*Raphanus sativus* L.)
  - LOLMW: Westerwold ryegrass (*Lolium multiflorum* Lam. var *westerwoldicum*)

PRODIVA project 2015–2018
Two fields under organic cropping (3rd year in 2015)
  ◦ 2013: Oats with undersown clover/grass mixture
  ◦ 2014: Clover/Grass mixture (ploughed autumn 2014)
  ◦ 2015: Spring Barley with cover crop mixtures (8)
    ◦ Two long-term field experiments started:
      ◦ a) Comparison of Crop Husbandry / Animal Farm
      ◦ b) Comparison of primary tillage (plough vs. stubble, 2016)
        ◦ Cover crops sown in barley (2015) either in May or early July
        ◦ Oilseed rape as model WEED in addition to the natural infestation
  ◦ 2015 Autumn: Winter Wheat
    ◦ Cover crops sown in the Spring (04&06–05–2016)
    ◦ Catch crops sown in the Autumn (25&26–08–2016)
# Cover/catch crops in field experiments in FI 2015 & 2016

<table>
<thead>
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Cover Crop Mixtures

- TRFPR (8 kg ha\(^{-1}\)) + TRFRE (4 kg ha\(^{-1}\))

- MEDLU(6) + TRFRE(2) + TRFRM(3) + TRFIN(4)

- MEUAL(2) + TRFHY(2) + TRFPR(3) + TRFRE(1) + TRFSU(2) + LOLPE(10) + PHLPR(2) + FESPR(3) + FESAR(3)

- TRFRE(8) + LOLMU(8)

- SECCE(100)
Assessments during the growing season 2015

- Emergence times and crop density
- Height
- Cover

**Heading stage** (weeks 31–32):
- Crop density
- Cover crop densities
- Weed densities
- Plant biomass
- Leaf areas (not in 2016)

**Harvest time** (week 34):
- Weed density per species
- Weed biomass
- Crop biomass
- Cover crop biomass

- YIELD, Barley 35/15, Wwheat 34/16
Assessments during the growing season 2016

• Crop/Cover Crop/Weed densities
• Height
• Cover

**Harvest time** (weeks 33–34):
• Weed density per species
• Weed biomass
• Crop biomass
• Cover crop biomass
• Cover

• **YIELD**, Wwheat 33&34/2016
• Amount & Quality

• Re–growth of CCs after harvest
Spring barley with "fellows"

Biomass proportion

Cover crop options

PRODIVA project 2015–2018
No major differences in weed biomass
Differences in barley yields....

C1 = Barley without cover crop ....... C5 = rye as cover crop
Relative growth potential of CCs

- Relative growth potential of CCs

![Bar chart showing biomass growth]

**Biomass g m⁻²**

**LOLMU**

**MEDLU**

**MEUAL**

**TRFIN**

**TRFRM**

**TRFPR**

**TRFRE**

**TRFRE**

**TRFRE**

**TRFRE**

**PRODIVA project 2015–2018**
Competition potential of CCs

PRODIVA project 2015–2018
Findings and Speculation

- CCs are too slow against spring-emerging annual weeds in spring cereals
- CCs suppress weed growth after harvest
- Red Clover, Alsike Clover and White Clover are most promising in Northern conditions
- Persian and Crimson Clover are too tall if sown in the together with spring barley
- White Sweet Clover as tall as barley
- Winter wheat gets enough lead against CCs
Cover Crop Management

- Species / Cultivars / Mixtures
- Seed rates
- Sowing time
- Cover / Catch
- Short term / Long term
- Target weed species
- Services (N, soil structure, feed)
Clover/Grass ploughed 2014

Barley sown in 2015

Cover crops sown in 2015

Barley harvested 2015
Catch crops after the harvest: LOLSWM, RAPSA, VICSA mixtures
Monitoring of "flying objects" after harvest 2016