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

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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*)
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)
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PRODIVA project 2015–2018
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

Cover Crop Mixtures

PRODIVA project 2015–2018
Differences in barley yields...

C1 = Barley without cover crop .... C5 = rye as cover crop

PRODIVA project 2015–2018
Relative growth potential of CCs

- TRFRE
- TRFRE
- MEDLU
- MEUAL
- TRFIN
- TRFRM
- TRFPR
- LOLMU

Biomass g m⁻²
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: LOLMW, RAPSA, VICSA mixtures
Monitoring of "flying objects" after harvest 2016
Kiitos
Thank You