Selection of the best adapted legume types for relay intercropping in durum wheat

European Conference on Crop Diversification 2019
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Crop diversification
(in space and in time)
a fundamental tool for the integrated weed management

Relay intercropping
of legume in wheat
Relay intercropping of legumes in durum wheat: effects at crop rotation level

Experiment carried out at the Centre for Agro-environmental Research (CIRAA) “E. Avanzi”, Pisa, Italy. Results from 1st year experiment.

- **Trifolium incarnatum**
- **Trifolium resupinatum**
- **Trifolium alexandrinum**
- **Vicia villosa**
- **Hedysarum coronarium**
- **Trifolium repens**
- **Medicago lupulina**
- **Medicago sativa**
- **Medicago polymorpha**
- **Medicago scutellata**
- **Medicago truncatula**
- **Trifolium subturraneum** var. brachycalylicinum
- **Trifolium subturraneum** var. yanninicum
- **Trifolium subturraneum** var. subturraneum

**Crop Rotation Timeline**

- **Wheat sowing**
- **Legume sowing**
- **Wheat harvest**
- **Annual self-reseeding**
- **Dead mulch**
- **Cover crop**
- **Dead mulch + Cover crop**
- **Cover crop termination**
- **Sorghum sowing**
- **Sorghum harvest (1st cut)**

**Dates**

- 2017
- 2018
- 2019

**Crop List**

- Hordeum vulgare
- Oryza sativa
- Medicago sativa
- Medicago lupulina
- Medicago polymorpha
- Medicago scutellata
- Medicago truncatula
- Trifolium spp.
- Vicia villosa
- Soyabean
- Sorghum
Which characteristics should legumes have for this system?

**Intercropping period**
- No competition with the main crop
- Improve grain quality
- Improve weed control
- Not hinder the harvest operation

**After wheat harvest**
- Weed control
- High biomass production (perennial and self-reseeding legume)
- High re-growth capacity (self-reseeding legume)

**Following crop (sorghum)**
- Weed control
- Increase biomass production

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**Diagram**
- Wheat sowing
- Legume sowing
- Wheat harvest
- Annual legume
- Perennial
- Annual self-reseeding
- Dead mulch
- Cover crop
- Dead mulch + Cover crop
- Cover crop termination
- Sorghum sowing
- Sorghum harvest (1st cut)

**Timeline**
- Wheat sowing: Nov 2017, Jan 2018
- Legume sowing: Jan 2018
- Wheat harvest: Jul 2018
- Annual self-reseeding: Aug 2018
- Dead mulch: Sep 2018
- Cover crop: Oct 2018
- Dead mulch: Nov 2018
- Cover crop termination: Dec 2018
- Sorghum sowing: May 2019
- Sorghum harvest: Jul 2019

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Grain yield and grain quality  (durum wheat cv Minosse)

Time: wheat harvest

Hp: legumes don’t affect
grain production and improve
grain quality
**Hp:** legumes don’t hinder the mechanical harvesting of wheat

- *Vicia villosa* + durum wheat
- *Trifolium resupinatum* + durum wheat
- *Trifolium subterraneum* + durum wheat
Weed control

Time: wheat harvest

Hp: legumes improve weed control during the intercropping
**Hp:** legumes improve weed control after the wheat harvest

Following September

Following Spring

*Hedysarum coronarium*
Legume biomass

Time: Legume biomass at wheat harvest time vs Legume biomass before termination (24th April 2019)

**Hp**: annual self-reseeding legumes are able to regrow in the following year

Plot of *Medicago polymorpha*
13th February 2019

*Medicago scutellata*

*Medicago polymorpha*
**Hypothesis (Hp):** Legumes provide benefits to the following crop

Sorghum has been sown replacing the plots of the legumes in test.
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<table>
<thead>
<tr>
<th>Very promising</th>
<th>On evaluation</th>
<th>Very unsuitable</th>
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<tbody>
<tr>
<td><strong>Perennial:</strong></td>
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<tr>
<td>• <em>Medicago sativa</em></td>
<td>• <em>Medicago lupulina</em></td>
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<td><strong>Annual:</strong></td>
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<tr>
<td>• <em>Vicia villosa</em></td>
<td>• <em>Trifolium resupinatum</em></td>
<td>• <em>Trifolium alexandrinum</em></td>
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<td><strong>Annual self-reseeding:</strong></td>
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Conclusion
From plots to the farmer’s field
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