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WP 3

Crop diversity and heterogeneity needs to be described and measured if it is to be used effectively in breeding programmes

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WP 3

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- **Participants:**
  - **KIS Slovenia**
  - **UNEW Great Britain**
  - **UP Hungary**
  - **IHAR Poland**

- **Potato** *Solanum tuberosum*
- **Difficult plant in organic production**
  - **Vegetatively propagated** – tubers are „containers" for large number of pathogens
  - **Susceptibility to late blight** caused by *Phytophthora infestans* – main biotic factor limiting organic potato production
  - lack of success in breeding potato **varieties with good quality and resistant to late blight**

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Objectives

- **Detailed phenotypic analysis of potato genotypes (from core collection) for identyfying traits suited to organic potato production**
- **Improve the quality of organic potato production (ware and seed production)**
- **Production of new potato cultivars and breeding materials suitable for organic production**
- **Produce superior elite breeding lines with durable field resistance to late blight**

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Tasks

1. Screening of genetic resources and breeding material — WP 1
2. AMF-compatibility screening
3. Improving seed tuber quality and vigour via the use of cover crops
4. Colorado potato beetle and wireworm control strategies
5. Marker assisted selection in organic breeding — WP 1
6. Production of elite varities and advanced breeding lines — WP 1

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TASK 3.1

Screening of genetic resources and breeding material (months 13-36).

TASK 3.1 Screening of genetic resources

- **Plant material**
  - **Core collection of potato genotypes**
- **Phenotypying (conventional approach)**
  - **in the field trials**
    - Plant height/vigour
    - Shoot habit (?)
    - No of days to flowering (?)
    - No of days to maturity
    - Tolerance/resistance to biotic/abiotic stresses

TASK 3.1 Screening of genetic resources

- **Phenotypying**
  - **Yield**
    - **Total**
    - **Tuber number**
    - **Tuber size**
    - **Tuber appearance**
    - **Depth of eyes, regularity of tuber shape**
    - **Skin colour and appearance**
  - **Presence of skin diseases**
  - **% of DM**
  - **Taste and cooking type**

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TASK 3.1 Screening of genetic resources

- **A new approach - high throughput phenotypying**

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TASK 3.2

AMF-compatibility screening (months 13-36)

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TASK 3.3

Improving seed tuber quality and vigour via the use of cover crops

(months 25-48)

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TASK 3.4

Colorado potato beetle and wireworm control strategies

(months 25-48)

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TASK 3.5

Marker assisted selection in organic breeding (months 13-48)

TASK 3.5 MAS

- **Plant material**
  - **Genotypes from core collection**
  - **Progeny populations and advanced clones derived from Sarpo Mira and other PVY and late blight resistant germplasm at KIS, IHAR and UP**
- **Markers for R-genes:**
  - *Rysto, Rychc, R1-R9, Rpi-Blb1, Rpi-Blb2, Rpi-Smira1, Rpi-Smira2*

TASK 3.5 MAS

- **MAS for resistance to *P.infestans* (and PVY) and maintaining progeny with good quality traits**
  - **Cooking quality**
  - **Improved nutritional value**
- **The result:**
  - breeding lines for selection of new potato varieties suitable for organic agriculture in the near future

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TASK 3.6

Production of elite varieties and advanced breeding lines

(months 13-48)

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TASK 3.6 New varieties and advanced breeding lines

- **Plant material**
  - **Core collection of potato genotypes**
  - **Progeny populations and advanced clones derived from Sarpo Mira and other PVY and late blight resistant germplasm at KIS, IHAR and UP**

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TASK 3.6 New varieties and advanced breeding lines

- **Crossing** the best advanced clones –
  - Creation of **new populations with pyramidizng** R-genes for late blight
- **Application markers** for PVY and late blight on prepared populations
- **Selection** carried out in **Participatory Trials** in PO, HU and Sl **(WP6)**
- **The result:**
  - **elite lines suitable for breeding for organic production.**

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WP 3

- **Short time to achieve breeding aims**
  - **Are our aims too ambitious?**
- **Low reproduction rate**
  - **Multienvironmental trials (locations, countries)**
- **Tubers exchanging**
  - **Quarantine regulations not prepared for exchanging breeding materials**