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Characterisation of *Phytophthora infestans* isolates from Norwegian potato fields

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INTRODUCTION

Late blight accounts for over 50% of fungicide use in Norway. Mapping the pathogen presence and investigating genetic variation are important aspects of developing new control strategies. In 2025, more than 250 leaf samples infected with *Phytophthora infestans* were collected from Norwegian potato fields using FTA cards and subsequently genotyped. Work is ongoing to test a selection of isolates for aggressiveness and fungicide sensitivity.

GENOTYPIC CHARACTERISATION

Infected leaf samples were collected by the Norwegian Agricultural Advisory Service. Lesions were pressed onto FTA cards and genotyped at the James Hutton Institute using a set of 12-plex Simple Sequence Repeat (SSR) markers according to EuroBlight protocols (Fig.1). Genotyping revealed the presence of the *P. infestans* genotypes EU_41, EU_43, and EU_46 in the Norwegian population, although most isolates belonged to the category 'other' (Fig. 2).

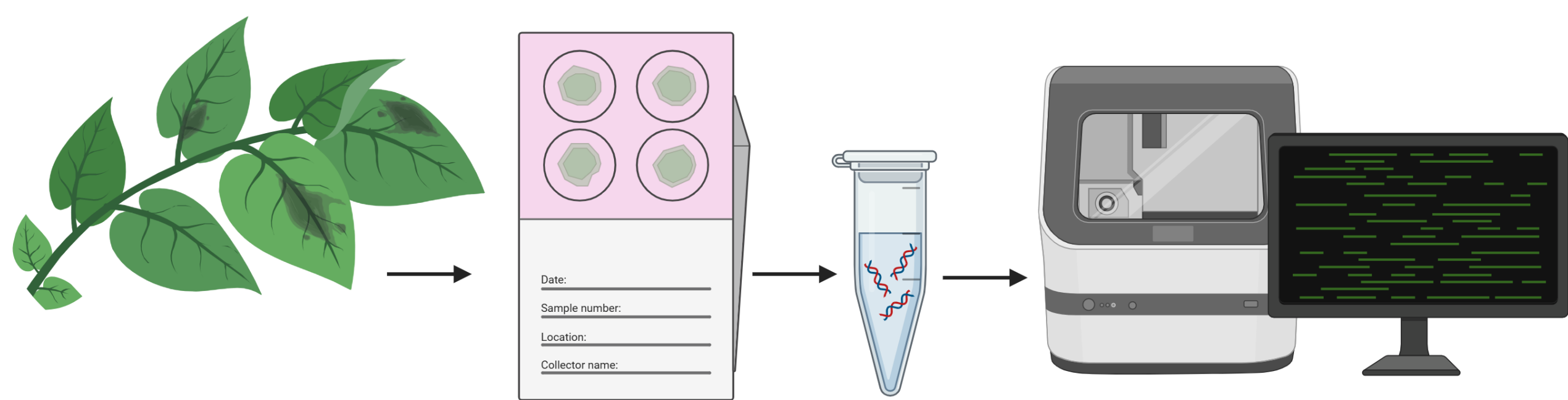


Fig. 1. Leaves infected with *P. infestans* were pressed onto FTA cards. DNA eluted from the cards was used to determine the sample genotypes.

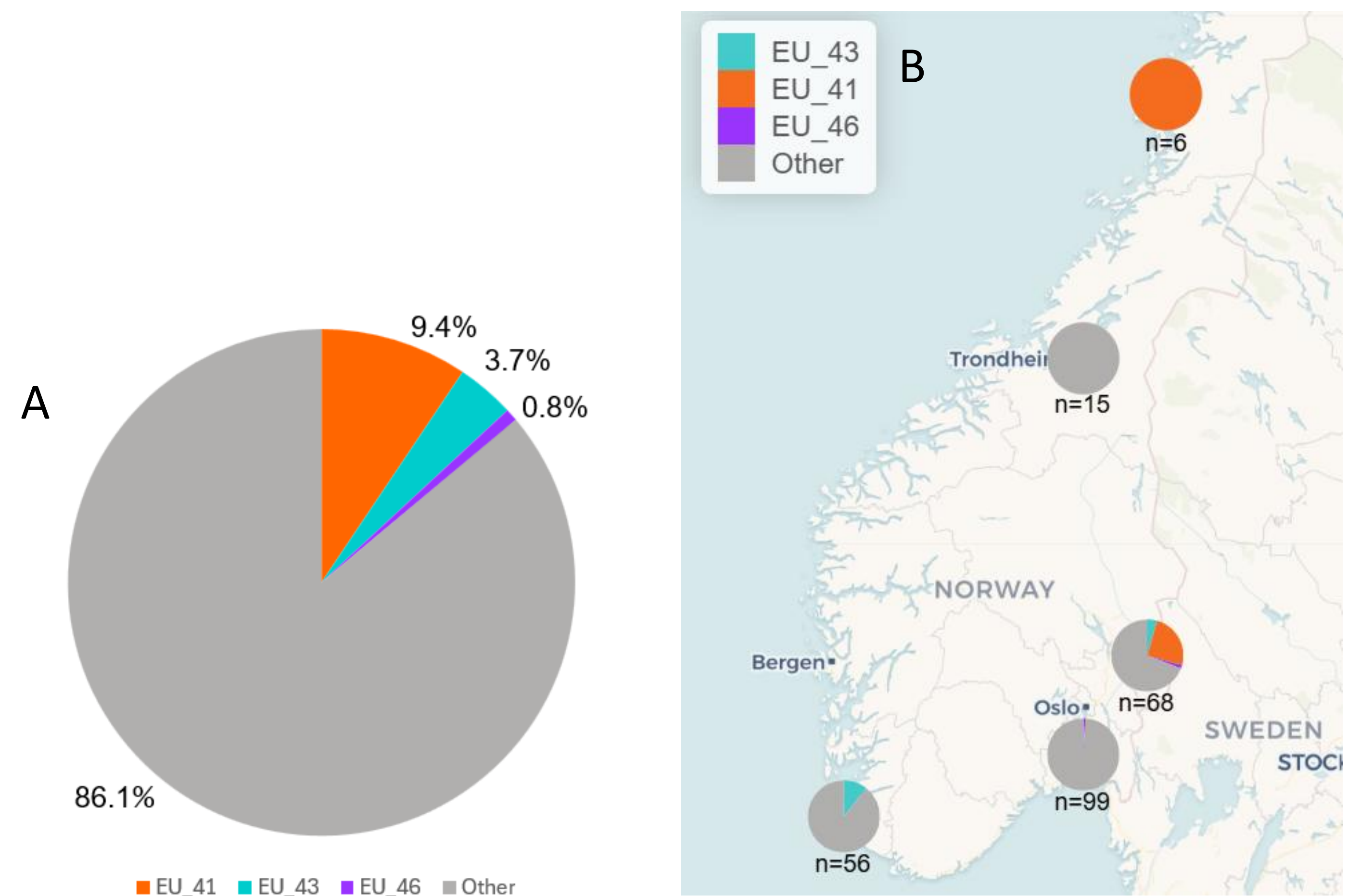
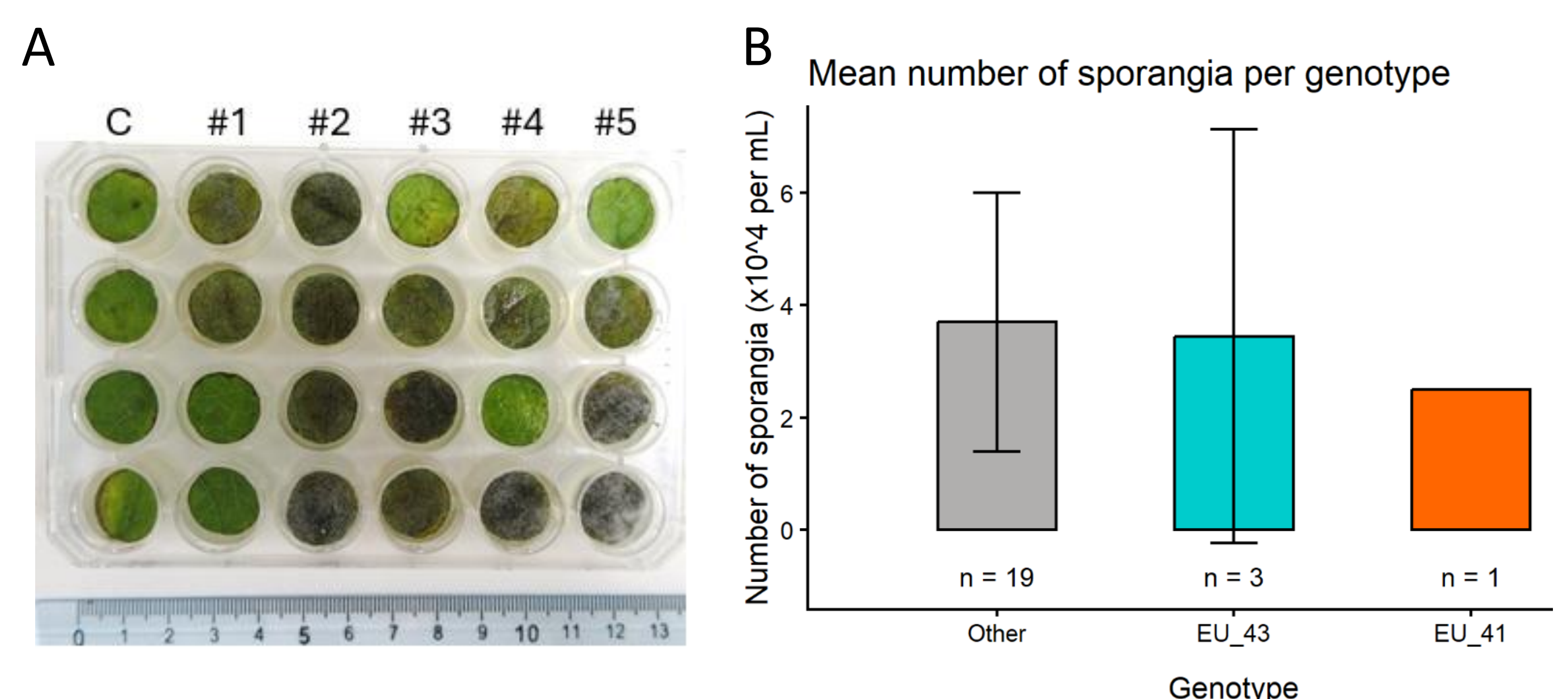


Fig. 2. A) Genotype frequency identified in 244 infected leaf samples. B) Genotype distribution of *P. infestans* in five Norwegian regions.

PHENOTYPIC CHARACTERISATION: AGGRESSIVENESS

Aggressivity testing was carried out using leaf disc assays based on the methods of Abuley & Larsen (unpublished). Leaf discs were inoculated with a sporangial suspension and monitored daily for 7 days to assess the incubation period, latency period, and lesion size (Fig. 3A). After seven days, sporangia were washed off the leaf discs and counted using a hemocytometer to assess sporulation potential. Preliminary results of 23 isolates show considerable variation within genotypes, and more isolates will be included in future assays (Fig.3B).

Fig. 3. A) Microtiter plate showing the leaf disc assay used to assess isolate aggressiveness. Control wells were inoculated with pea broth only. B) Mean number of sporangia ($\times 10^4$ /mL) between 5 different isolates \pm SD (n = 4).



PHENOTYPIC CHARACTERISATION: FUNGICIDE SENSITIVITY

A selection of 35 pure *P. infestans* isolates was tested for sensitivity to four fungicides: mandipropamid, oxathiapiprolin, amisulbrom, and cyazofamid. Fungicide testing was conducted using microplate bioassays as described by Torriani et al. (2023) (Fig. 4). Optical density was measured after 7 days. The EU_43 genotype displayed reduced sensitivity to mandipropamid (Fig. 5). Although no reduced sensitivity was identified for cyazofamid or amisulbrom, some level of reduced sensitivity to oxathiapiprolin was observed in one EU_43 isolate and one isolate belonging to the 'other' genotype. A gel-based and a qPCR-based test have been developed to rapidly detect a mutation in the cellulose synthase gene (*CES3*) associated with mandipropamid resistance, providing an additional tool for decision support strategies.

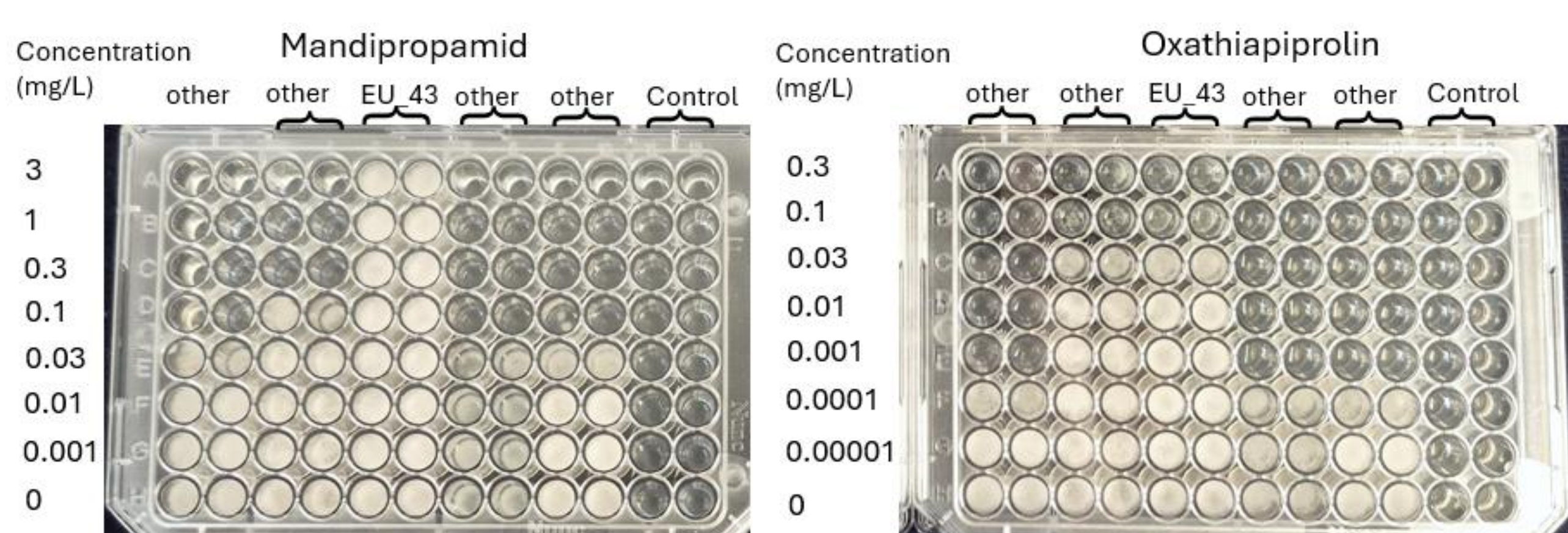


Fig. 4. Assessment of reduced fungicide sensitivity using microplate bioassays. Control wells without sporangial suspensions were included.

Growth curve analysis

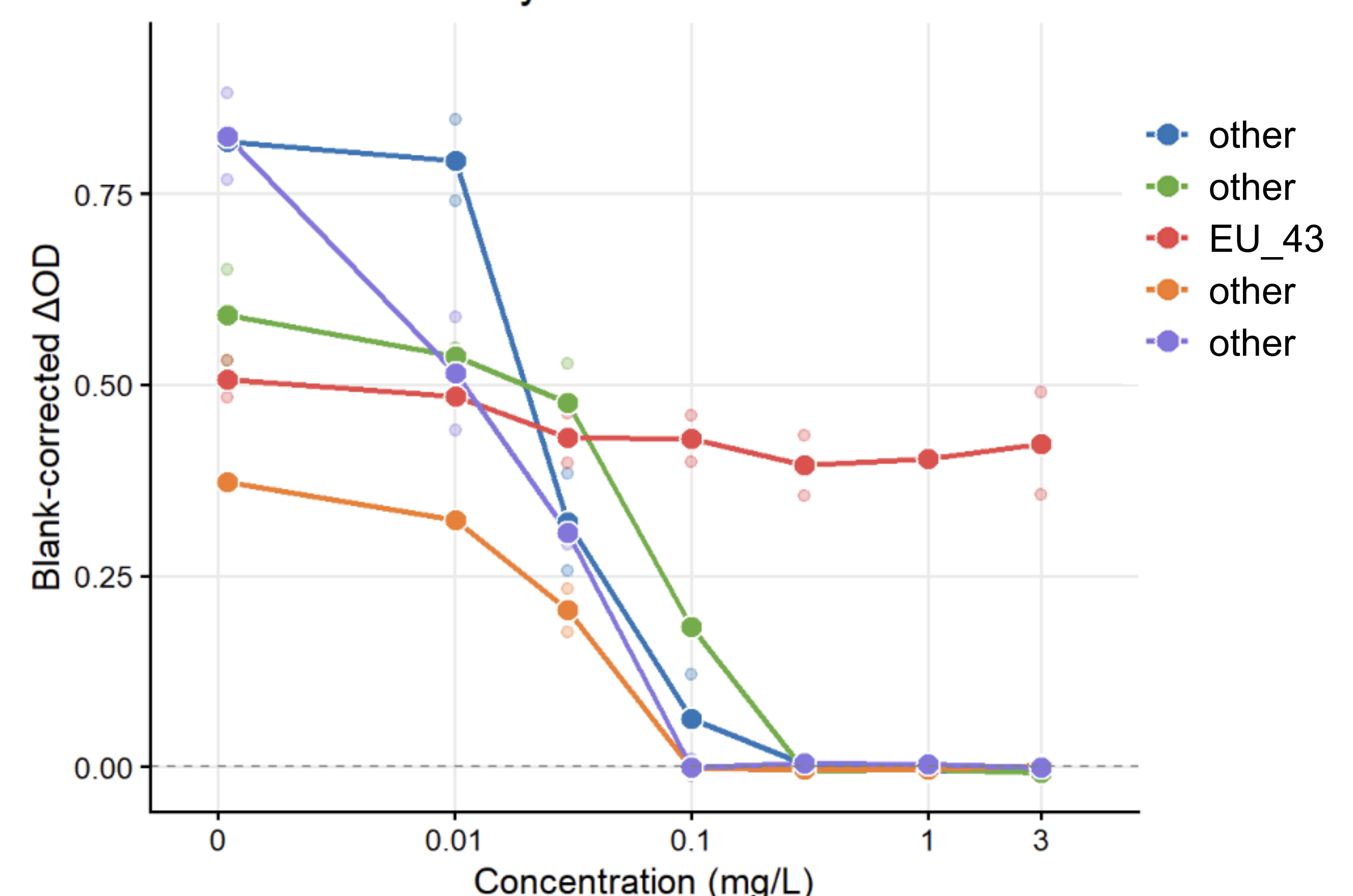


Fig. 5. Example of five isolates tested against mandipropamid (concentrations according to FRAC). The optical density of isolates was measured after seven days. Faded points = individual replicates, solid points = mean. Blank-corrected Δ OD (Day 7-day 0).

CONCLUSION

The late blight population in Norway shows high genotypic and phenotypic variability. New *P. infestans* isolates will be obtained and characterised during the 2026 potato growing season.

REFERENCES
Torriani SFF, Waldner-Zulauf M, Wullschlegel J, Cornetti L, Blum M, Blondel M, Van Hecke M, Dragos S, Borghi, L (2025). New mechanisms of resistance to CAA and OSBPI fungicides in *Phytophthora infestans*. *Plant Pathology*, 75.

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