

Round-leaved sundew (*Drosera rotundifolia*) as a source of naphthoquinones for pharmacological purposes

Leila Korpela ¹⁾, Niko Silvan ²⁾, Maarit Kallio ^{2 3)} Meri-Tuulia Pelkonen ^{2 3)}, Tytti Sarjala ²⁾

¹⁾ Luke, Viikki, ²⁾ Luke, Parkano ³⁾ Tampereen Ammattikorkeakoulu

Email first name.surname@luke.fi

Aims

Round-leaved sundews (*Drosera rotundifolia*) have been used traditionally as cough medicine. They contain naphthoquinones (e.g. 7-methyljuglone) and flavonoids (e.c. quercetin) which are pharmacologically active compounds. Nutrient-poor peat bogs and bogs drained for forestry could be potential areas for sundew growth and cultivation.

- Our general aim of the study is to develop sundew cultivation on forestry drained, low-productive peatlands e.g. on *Sphagnum* moss harvested areas in Northern Satakunta region.

The study includes:

- Set up plots to grow sundew from seeds in *Sphagnum* moss harvested areas in Parkano.
- Test and develop the vegetative reproduction by tissue to accelerate the cultivation process of the perennial plant.
- Test and develop the HPLC-method to analyze the bio-active compounds of sundew.
- Find out peatland areas suitable for sundew collection and/or cultivation in Northern Satakunta region by interviewing private landowners and doing field survey of sundew on their peatlands.

Bioactive compounds (Figs. 1-2)

We have applied HPLC-method to analyze 7-methyljuglone from sundew extracts.

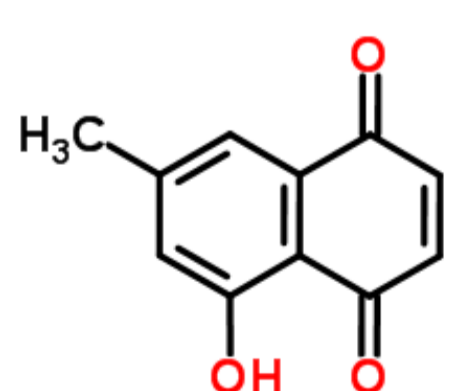


Fig. 1. 7-methyljuglone have been found to prevent the growth of *Mycobacterium tuberculosis* (Bapela et al.2006).



Fig. 3. *D. anglica* ja *D. rotundifolia* seedlings grown from winter buds (Photos:Tytti Sarjala, Meri Pelkonen).

Sundew inventory (Figs. 5-7)

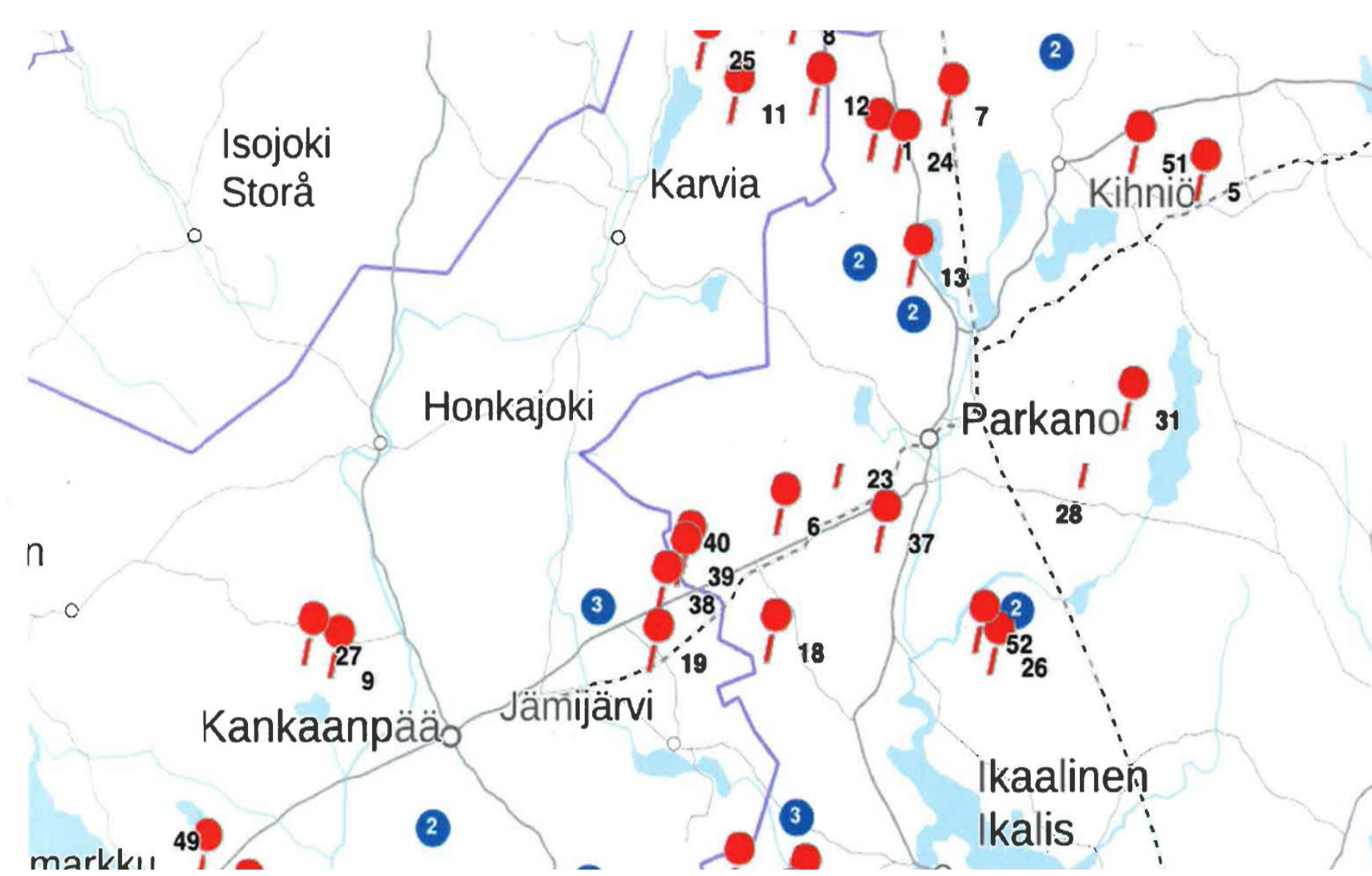


Fig. 5. Sundew inventory areas in Northern Satakunta and NW - Pirkanmaa region. Red circles indicate the location and the number of peatlands surveyed in summer 2017.

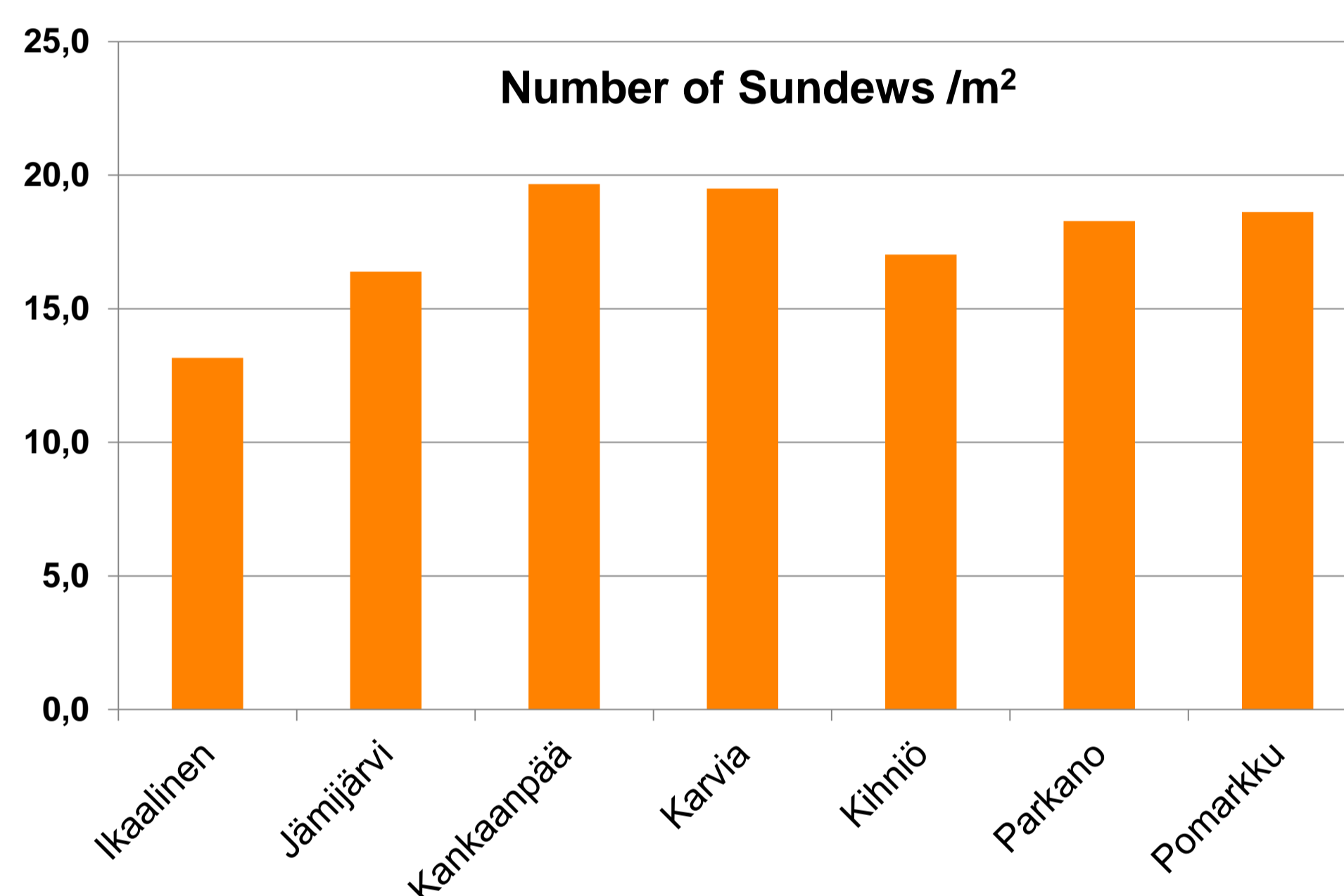


Fig. 7. The average number of *D. rotundifolia* found within one square meter on peatlands in each municipality of Northern Satakunta.

Vegetative reproduction (Figs.3-4)



Fig. 4. The early seedlings grown from the seeds (germinated in Morashige-Skoog-Agar) and then reproduced by tissue division (Photos: Tytti Sarjala).

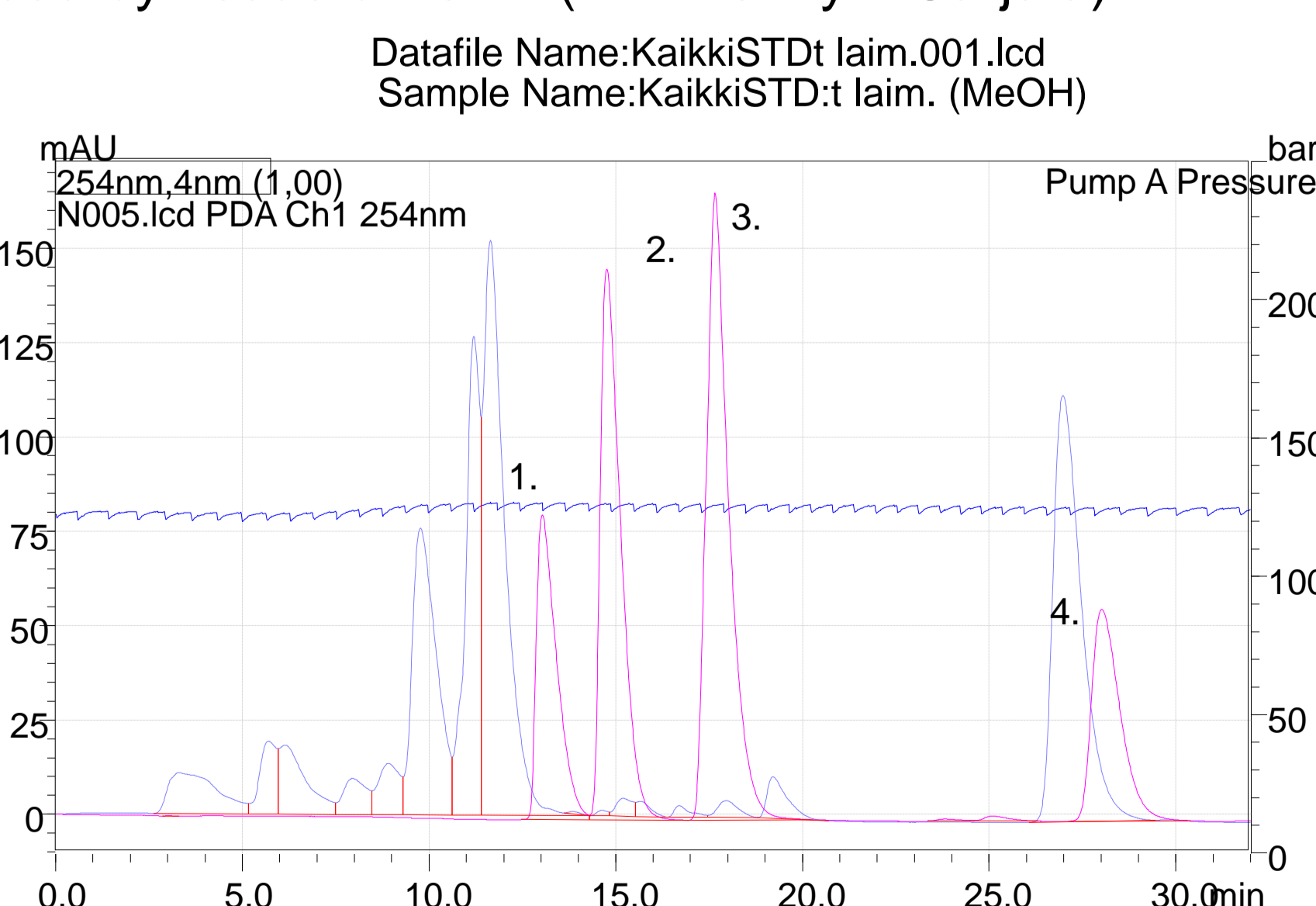


Fig. 2. HPLC-grams of *D. anglica*. (1) 2-hydroxy-1,4 naphthoquinone, (2) 1,4-naphthoquinone, (3) quercetin, (4) plumbagin



Fig.6. The number of sundews could vary from 1 up to more than 100 /1m² on the same study line within a same peatland (Photos: Maarit Kallio).

Interview of the private landowners (Fig. 8)

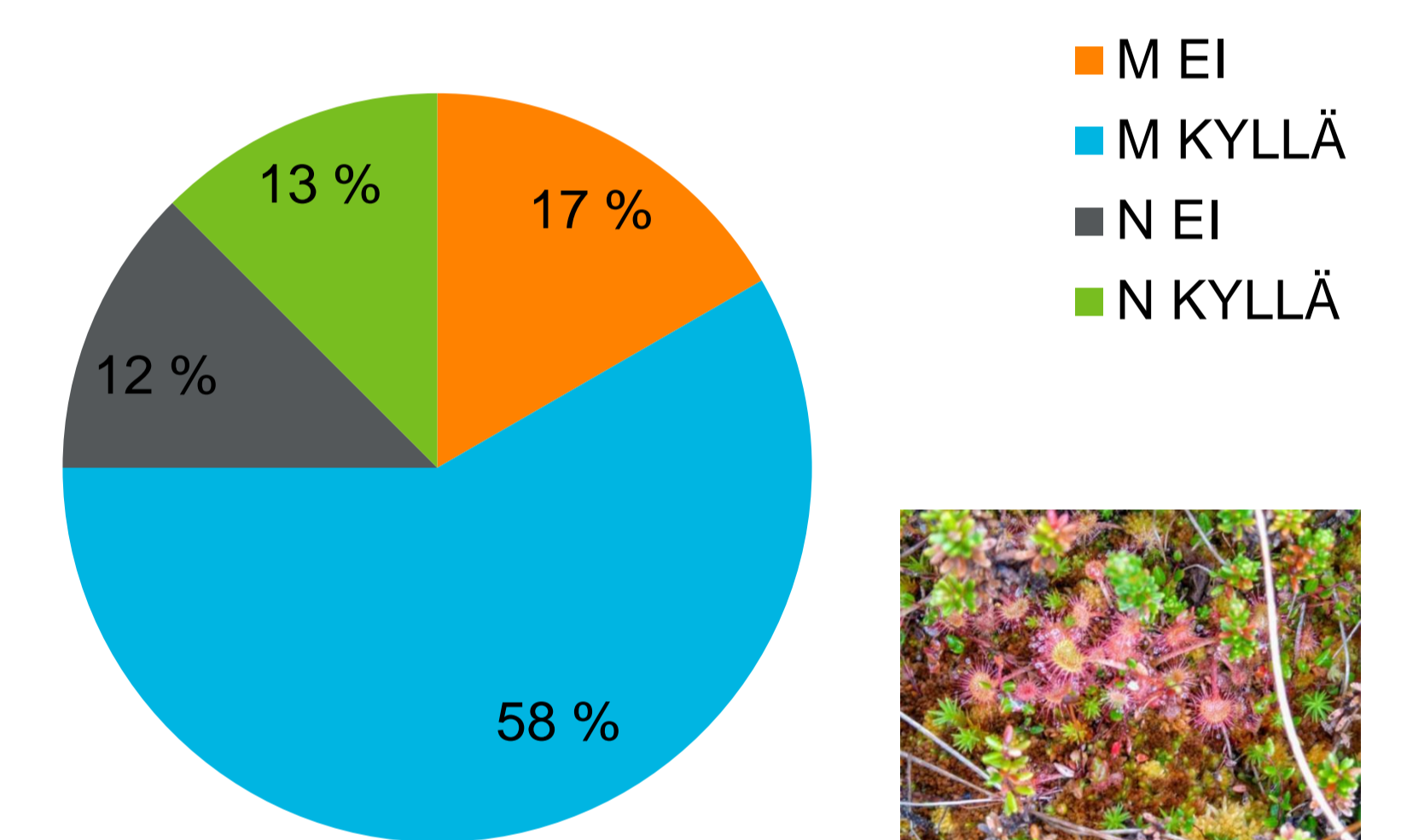


Fig. 8. The land owners attitude e.g. give permission to collect sundew on their peatlands. M EI = Men No, M KYLLÄ = Men Yes, N EI = Women No, N Kyllä = Women Yes (Total 24).

The study will continue as e.g.:

- Cultivation of sundew on new newly harvested *Sphagnum* moss areas in Northern Satakunta area and around Parkano
- Vegetatively reproduced sundew biomass will be grown in laboratory conditions and compared with the biomass production capacity in the field farming
- Chemical analysis and screening of the bioactivity will be performed from field grown and laboratory produced sundew biomass to evaluate their composition and potential as a source for valuable compounds.
- By improving the growing methods and availability of *D. rotundifolia* together with the information of the naphthoquinone content of the biomass we hope to create better possibilities to commercial utilization of sundews in Finland.

Literature

- Bapela, N.B, Lall, N., Fourie, P.B., Franzblau, S.G., Van Rensburg, C.E.J. 2006. Activity of 7-methyljuglone in combination with antituberculous drugs against *Mycobacterium tuberculosis*. *Phytomedicine* 13:630-635.
- Galambosi, B. & Galambosi, S. 2000. Growth, yield and secondary metabolite production of *Drosera* species cultivated in peat beds in Finland. *Suo* 51 (2):47-57.
- Kämäräinen, T., Uusitalo, J., Jalonen, J., Laine, K., Hohtola, A. 2003. Regional and habitat differences in 7-methyljuglone content of Finnish *Drosera rotundifolia*. *Phytochemistry* 63:309-314.



European maaseudun kehittämisen maatalousrahoitus: Eurooppa investoi maaseutualueisiin