A Comparison:
Bioactive Compounds in Strawberry Affected by Different Latitudes of Europe

Josuttis, M.[1)], Krüger, E.[2)], Carlen, C.[3)] Crespo, P.[3)], Diamanti, J.[4)], Mezzetti, B.[4)] , Nestby, R.[5)], Toldam-Andersen, T.B.[6)], and Dietrich, H.[7)]

1) RheinMain University of Applied Sciences, Geisenheim, Germany, 2) Geisenheim Research Center, Department of Pomology, Germany, 3) Research Centre Agroscope Changins-Wädenswill, Switzerland, 4) Marche Polytechnic University Ancona, SAPROV, Italy, 5) Bioforsk, Stjoerdal, Norway, 6) Copenhagen University, Department of Agriculture and Ecology, Denmark, 7) Geisenheim Research Center, Department of Wine Analysis and Beverage Research, Germany

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INTRODUCTION

- Content of bioactives is affected by cultivar and environment.
- Little is known about variability in bioactives affected by the growing location.
- Health-promoting substances in strawberry are mainly linked to polyphenols and ascorbic acid.

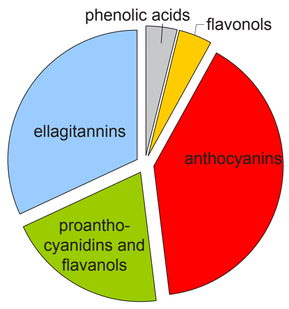


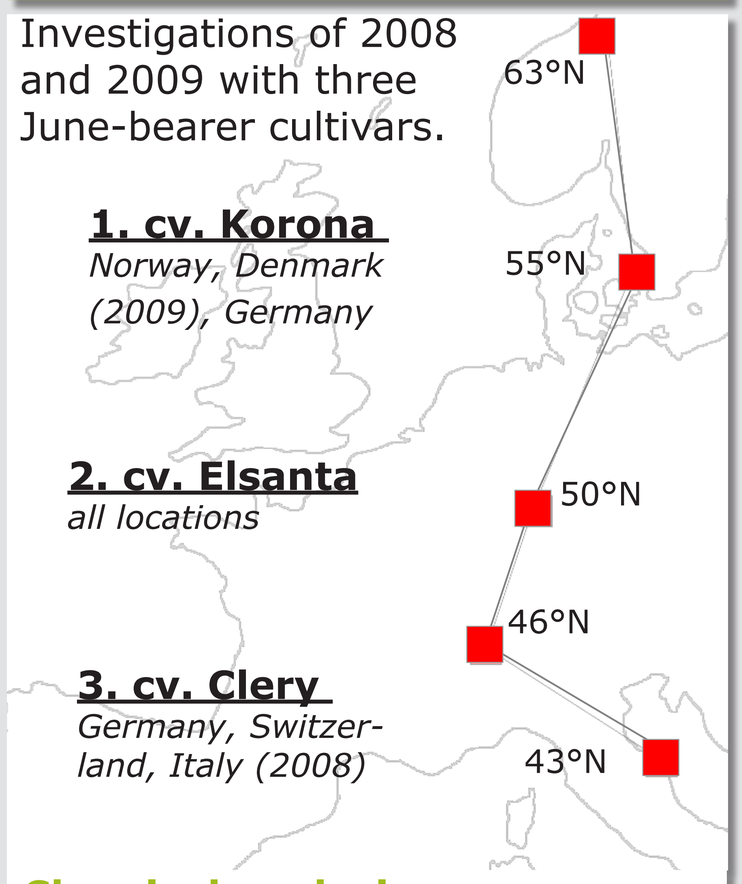
Figure 1: Example of phenolic composition in strawberry.

AIM

Within the frame of the EU-Cost network 'Euroberry 863' the effect of different climates at five locations from North to South Europe on bioactives in strawberry was investigated.

MATERIALS & METHODS

Investigations of 2008 and 2009 with three June-bearer cultivars.



1. cv. Korona
Norway, Denmark (2009), Germany

2. cv. Elsanta
all locations

3. cv. Clery
Germany, Switzerland, Italy (2008)

Chemical analysis

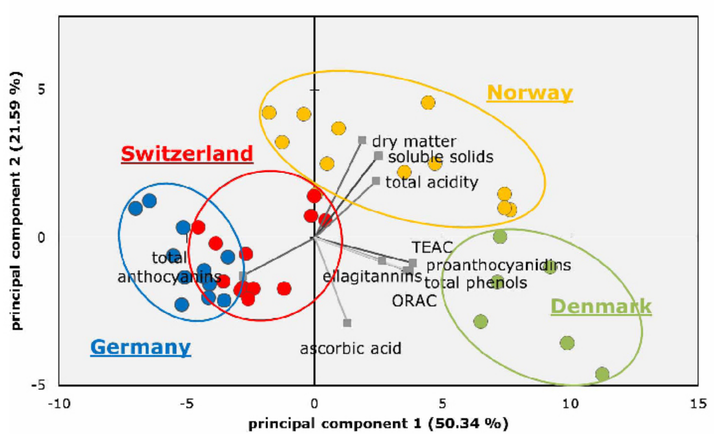
Fruits were extracted with 80% methanol for the following determinations:

- antioxidant capacity
  - TEAC (Trolox equivalent antioxidant capacity)
  - ORAC (oxygen radical absorbance capacity)
  - total phenols (Folin-Ciocalteu)
- total anthocyanins (pH-shift)
- proanthocyanidins (colorimetric with 4-dimethylaminocinnamaldehyde)
- HPLC (high performance liquid chromatography)

In addition, ascorbic acid, dry matter, total acidity and soluble solids content was determined.

RESULTS

1. Principal component analysis *cv. Elsanta*



- Enhanced antioxidant capacity, ascorbic acid, proanthocyanidins, ellagitannins in samples from Denmark
- Increased total anthocyanins in samples from Switzerland and Germany.
- Dry matter, total acidity separated samples from Norway.
- Similar result for cv. Korona but not for cv. Clery.

Figure 2: Principal component analysis cv. Elsanta of all detected parameters.

2. Anthocyanins - *enhanced in southern regions but cultivar differences*

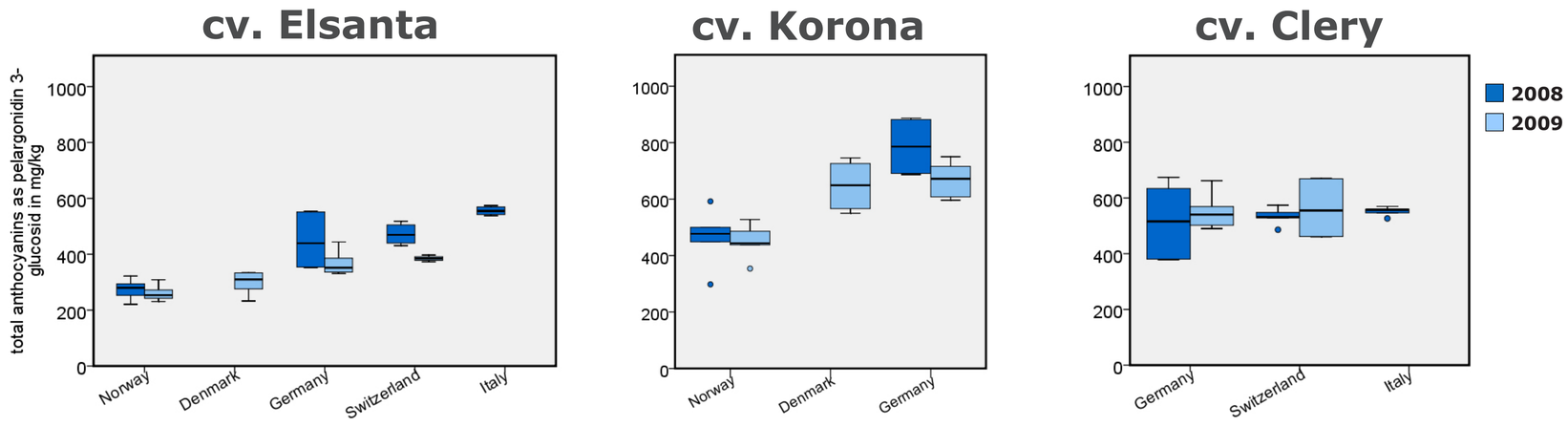


Figure 3: Total anthocyanins content of three different cultivars ('Elsanta', 'Korona', 'Clery') at different locations.

3. Antioxidant capacity - *enhanced in the North but no clear North-South divide*

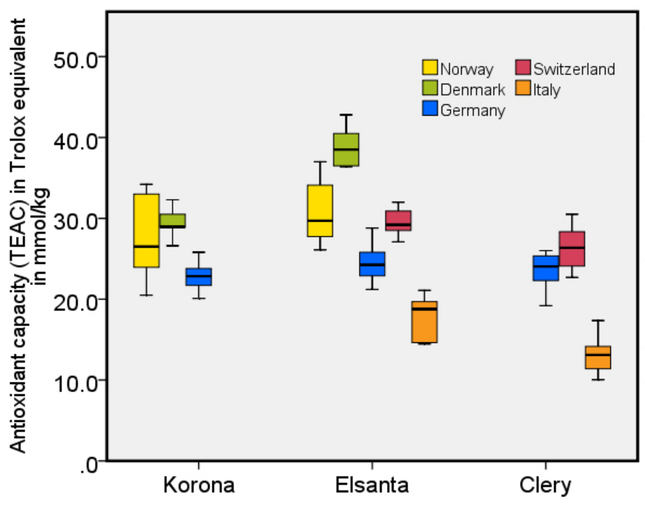
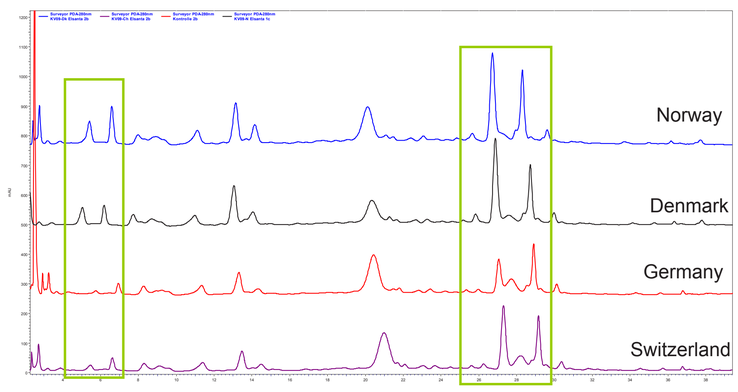


Figure 4: Antioxidant capacity of three cultivars at differrent regions. (left)

Figure 5: Phenolic profile HPLC at 280 nm of cv. Elsanta at three different locations. (right)



- main differences in the contents of proanthocyanidins and ellagitannins

CLIMATIC PARAMETERS

Table 1: Climatic conditions at all locations.

2008	Ø temperature			Ø day length [hours]	sum PAR [mol · m² per 28 days]
	mean	min	max		
Norway	13.3	8.9	18.9	20.4	1288
Germany	19.2	13.8	25.2	15.0	788
Switzerland	17.1	11.1	23	14.2	1284
Italy	-	-	-	13.4	-

2009	Ø temperature			Ø day length [hours]	sum PAR [mol · m² per 28 days]
	mean	min	max		
Norway	15.9	10.6	20.9	19.9	1181
Denmark	14.2	9.8	18.4	17.4	692
Germany	16.3	8.3	24.0	15.6	861
Switzerland	17.4	11.0	24.1	15.1	1284
Italy	17.0	7.7	27.2	14.1	-

* All data were calculated 28 days before sampling. PAR = photosynthetically active radiation.
Sampling was for Norway mid July, for Denmark end of June, for Germany and Switzerland beginning of June and for Italy mid of May.

CONCLUSION

- **The content of bioactives in strawberries was affected by climatic conditions.**
- **Cultivars reacted differently.**
- **Anthocyanins were enhanced in strawberries from southern regions.**
- **Dry matter and soluble solids content was enhanced in strawberries from Northern latitudes.**

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m.josuttis@fa-gm.de

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