



**A physiological approach to reduce
densities of
Colchicum autumnale L.
in extensively managed grassland**

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Background

Semi-natural grasslands belong to the most species-rich ecosystems in Europe
are maintained by extensive management

Problem: high population densities of toxic *Colchicum autumnale* (20 - 50 plants/m²)

- profits from late first mowing date in mid-June

Farmers have problems to market their hay

Risk that they intensify or abandon management

Risk of biodiversity loss



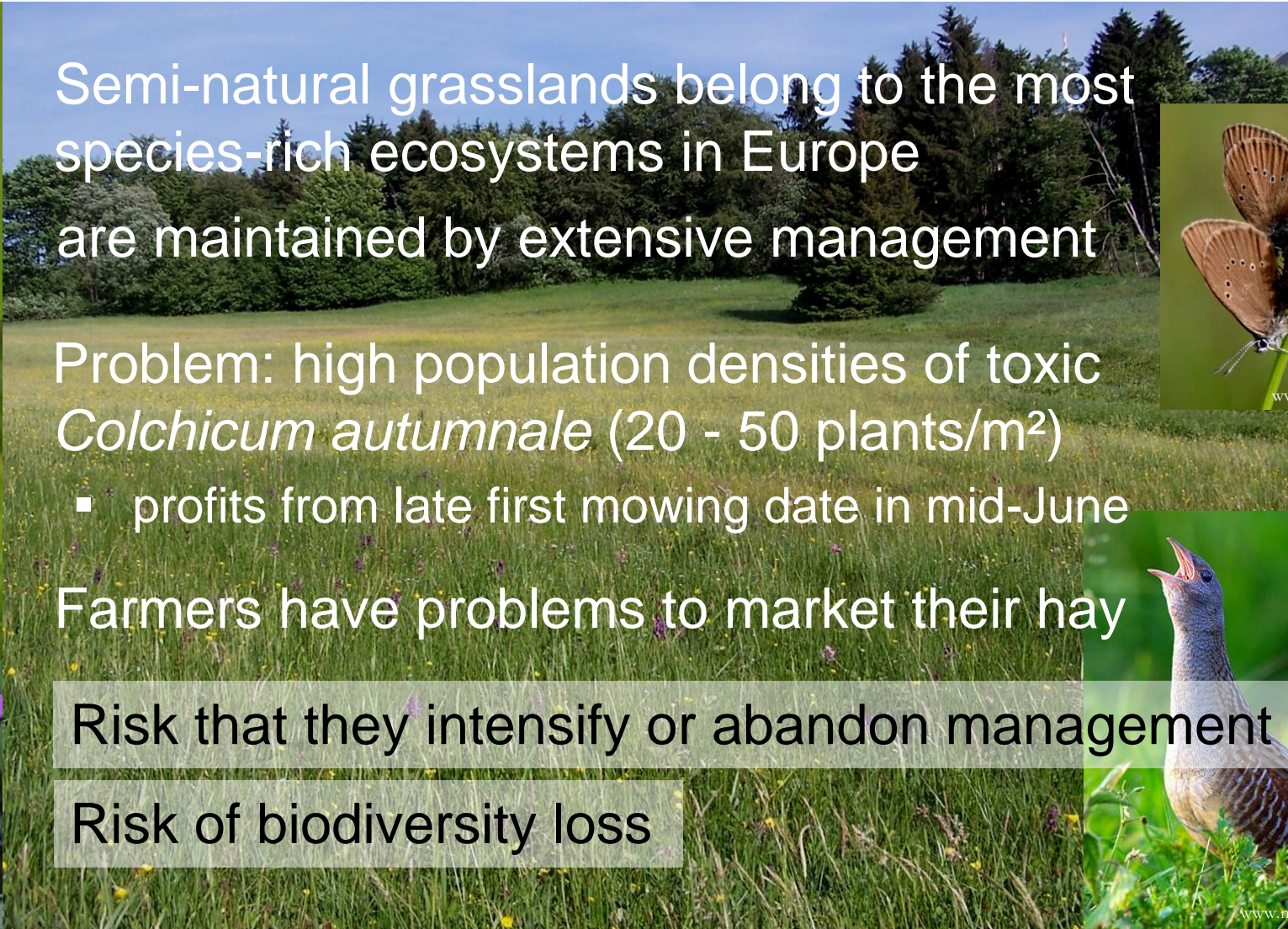
www.pbase.com



www.wildblumen.net



www.gaissmayer.de



www.eiszeitseen.de



www.nature-pictures.org



Background

For reducing densities of *C. autumnale*, authors recommend leaf-removal:

Author	Study location	Time of leaf-removal	Phenology of <i>C. autumnale</i>
Briemle & Elsässer (2008)	South-West Germany	mid-April	Plant height of ~10 cm
		end of April/ beginning of May	
Wehsarg (1929)	South-East Germany	beginning of May	
Stebler & Schröter (1981)	South-West Switzerland	mid-May	capsules start to ripen



Best time for weakening the plant remains unclear



Objective

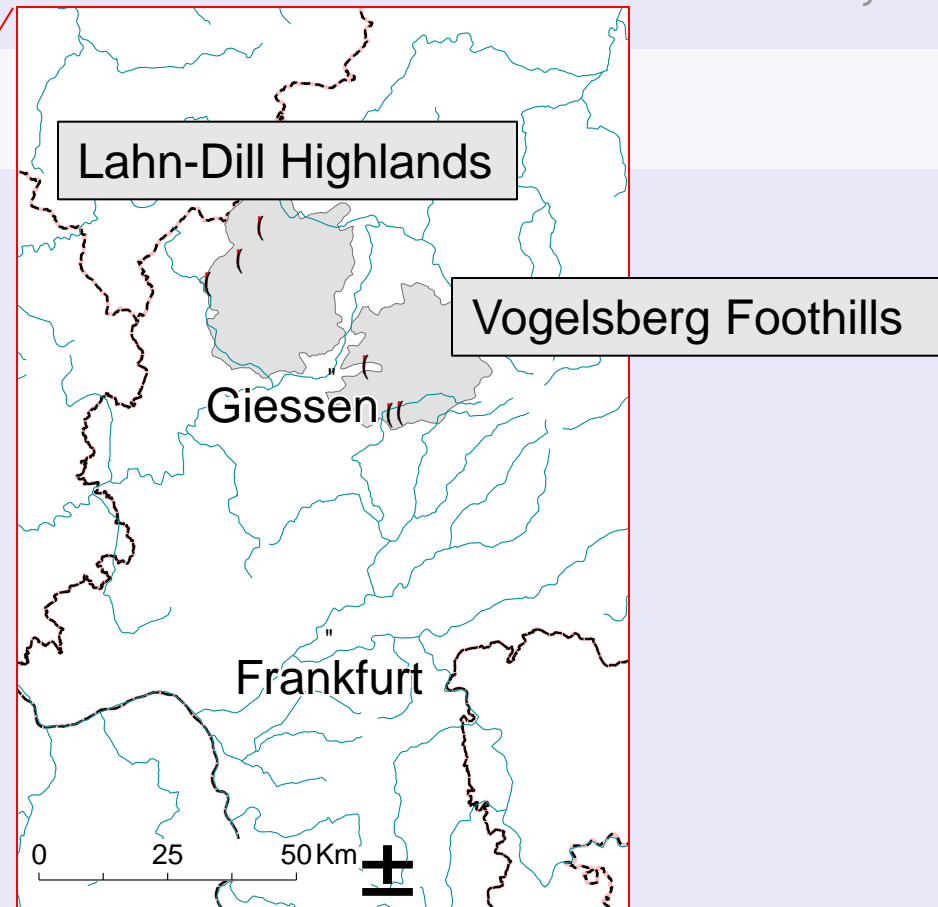
Determine the best time for leaf-removal for *C. autumnale*

Research questions

1. At what time are most plant resources removed when cutting leaves?
2. Does this point of time differ between biogeographical regions?



Study area



Region	T [°C]	d>5°C	Precipitation [mm]
VF	9-10	220-230	550-650
LD	7-8	210	850-950

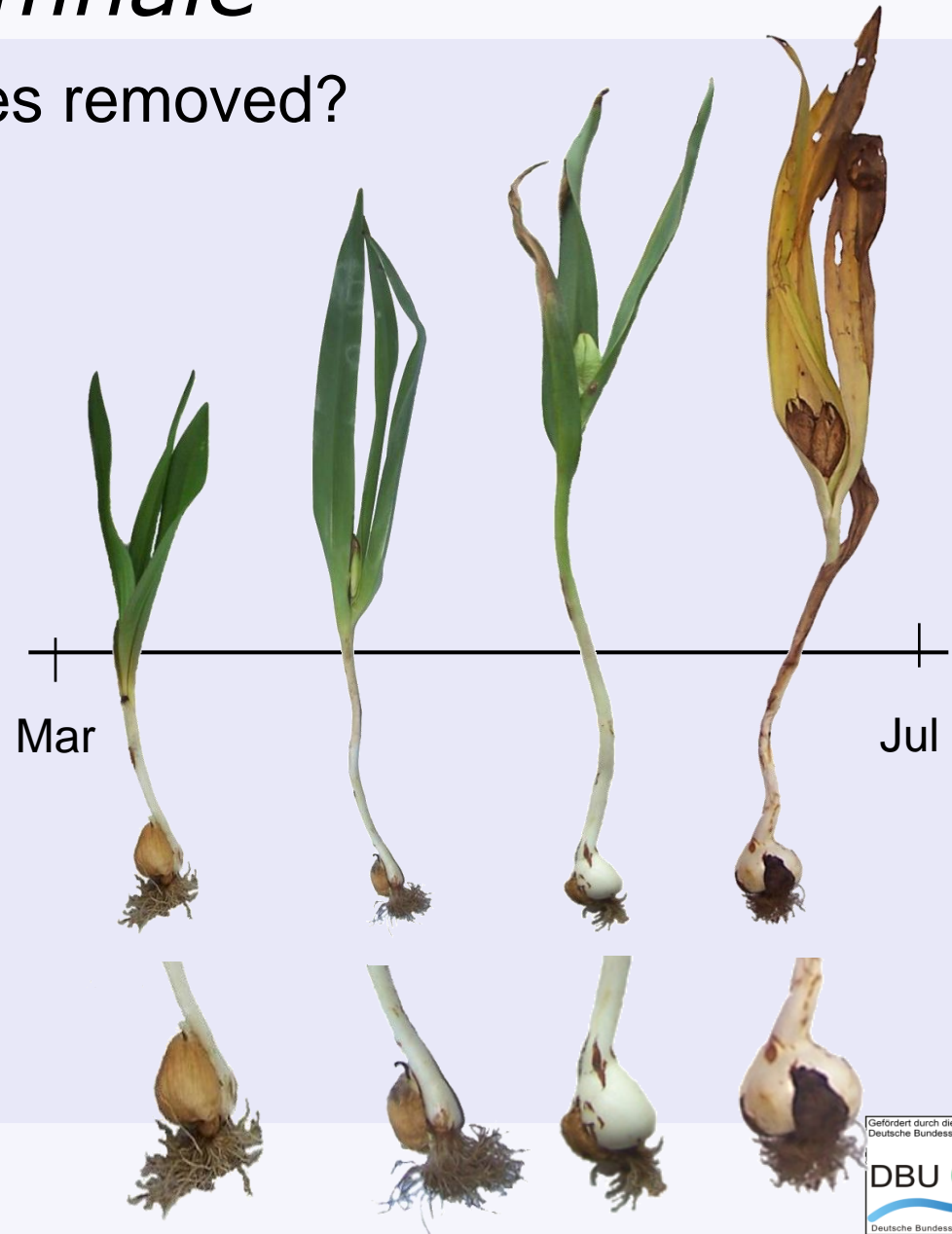
(HLUG Umweltatlas Hessen, 2009)



Colchicum autumnale

When are most resources removed?

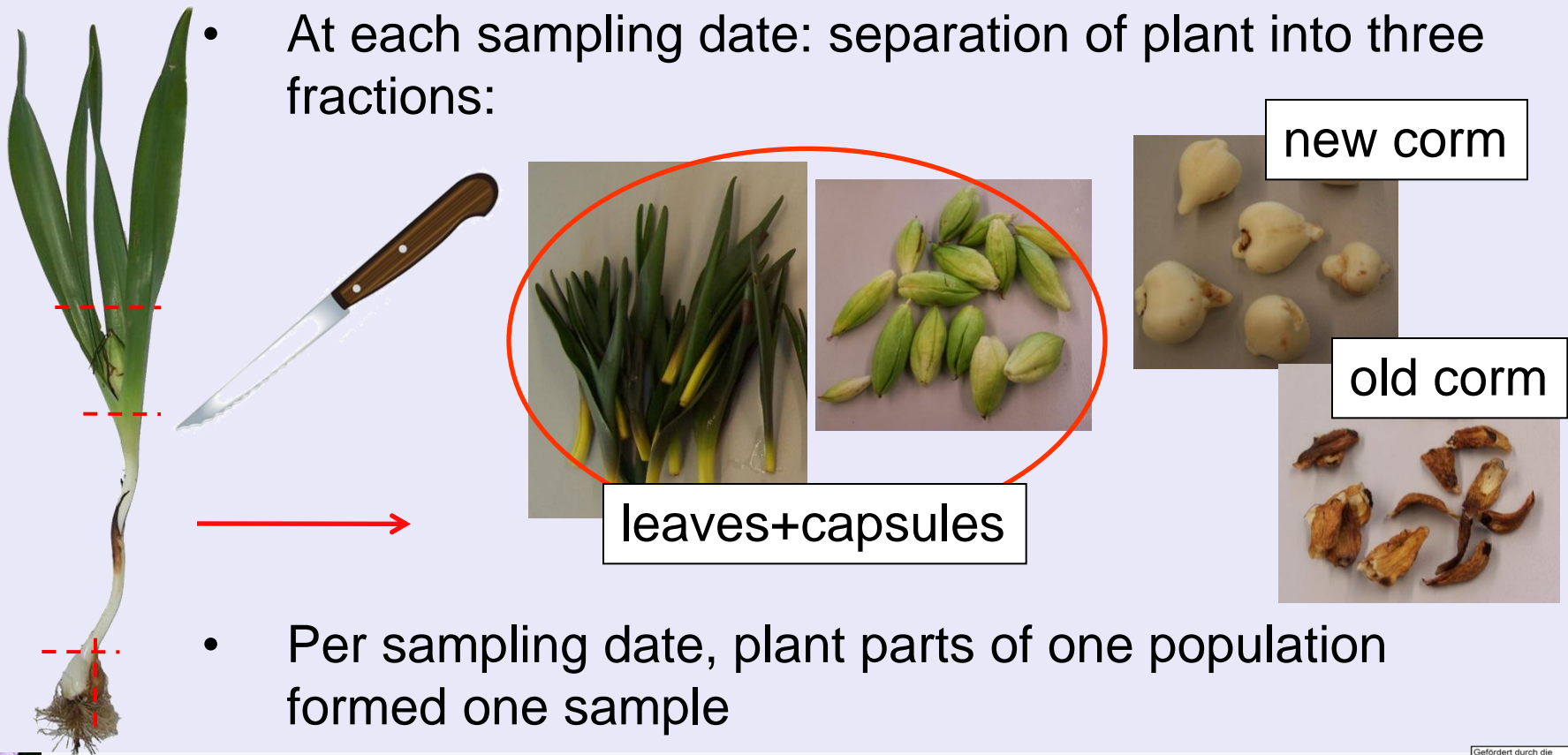
- High nutrient contents in above-ground plant parts
- Low nutrient contents in new corm and old corm



Data collection

Plant sampling

- Every 10 days from 30. March – 15. June 2009
 - 15 plants per population
- At each sampling date: separation of plant into three fractions:



- Per sampling date, plant parts of one population formed one sample



Analyses

Analyses of nutrient content:

Nutrient	Leaves & capsules	New corm	Old corm
<i>Nitrogen</i>	X	X	X
<i>Phosphorus</i>	X	X	X
<i>Potassium</i>	X	X	X
<i>Starch</i>		X	X



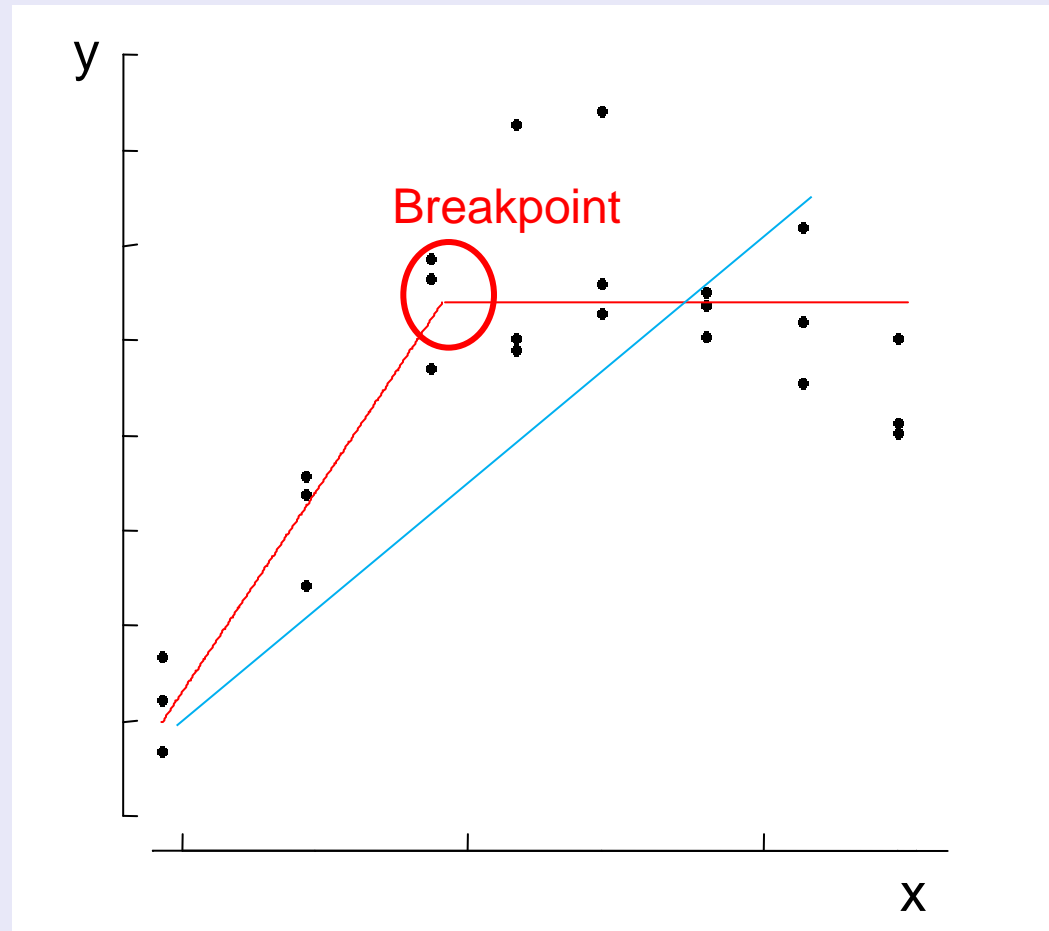
Plant phenology:

- Measuring of leaf length and capsule height on each sampling date



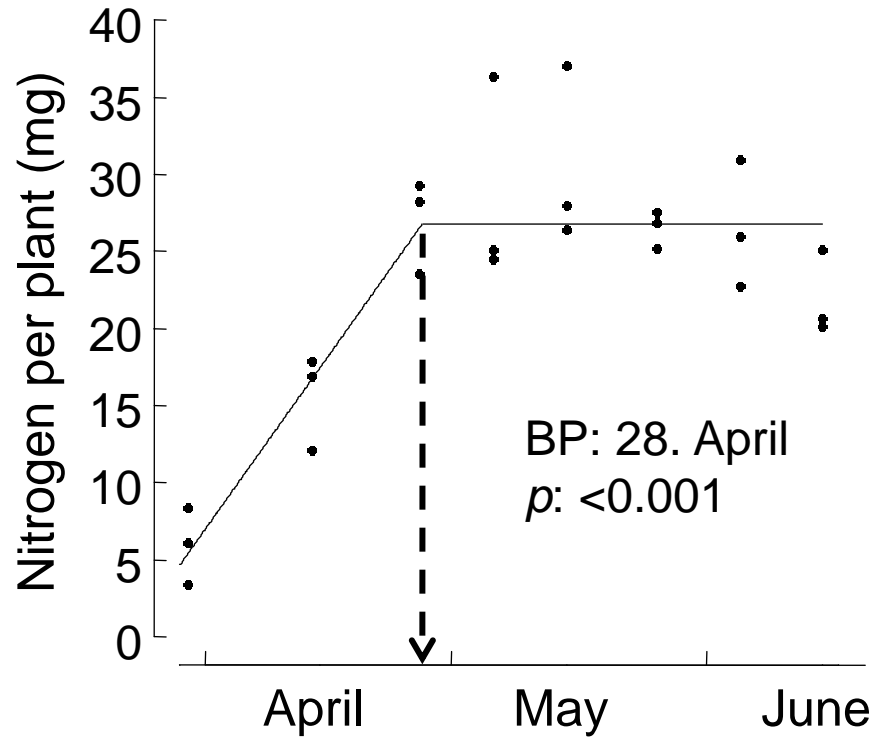
Statistical analysis

Segmented linear regression analysis:

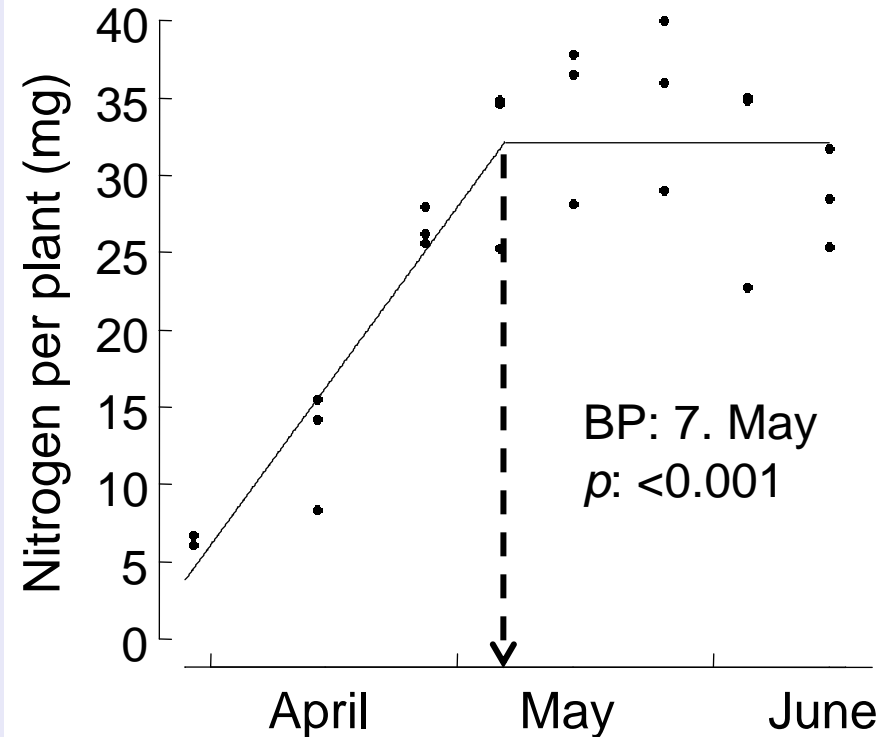


Leaves & capsules

Vogelsberg Foothills



Lahn-Dill Highland



BP: main increase of nutrient content is completed



Leaves & capsules

END OF NUTRIENT INCREASE

Nutrient	Vogelsberg	Lahn-Dill
<i>Nitrogen</i>	28. April	07. May
<i>Phosphorus</i>	11. May	15. June
<i>Potassium</i>	27. April	07. May

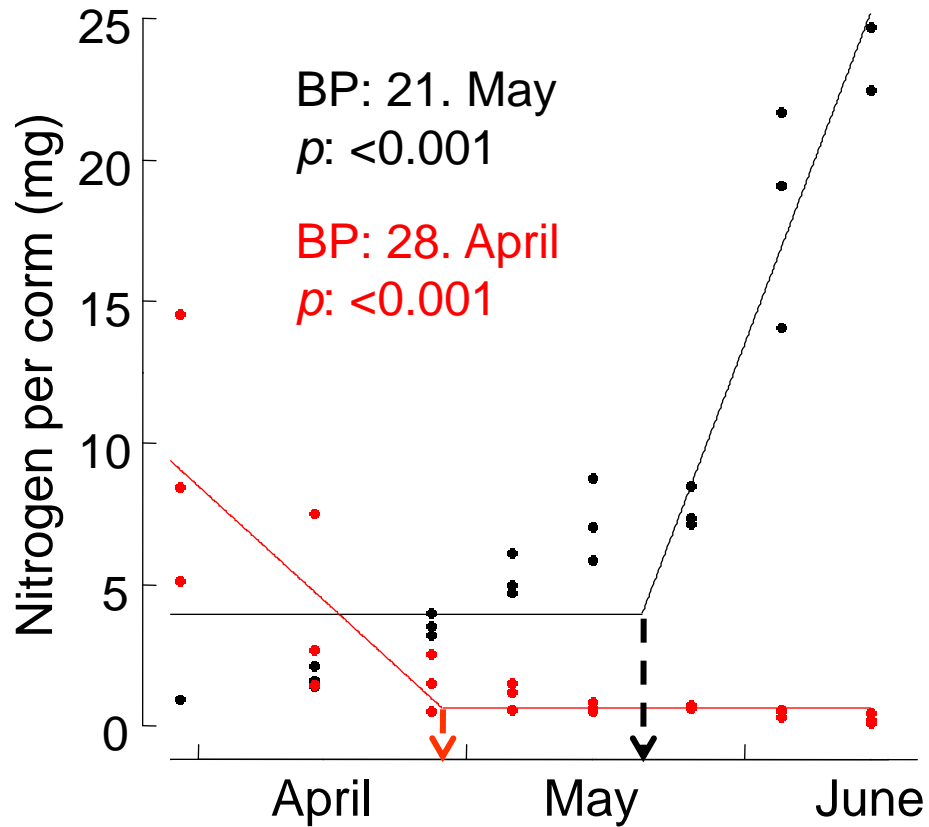
Above-ground plant parts:

In Lahn-Dill Highlands most nutrients increased longer (7. May) than in the Vogelsberg Foothills (late April).

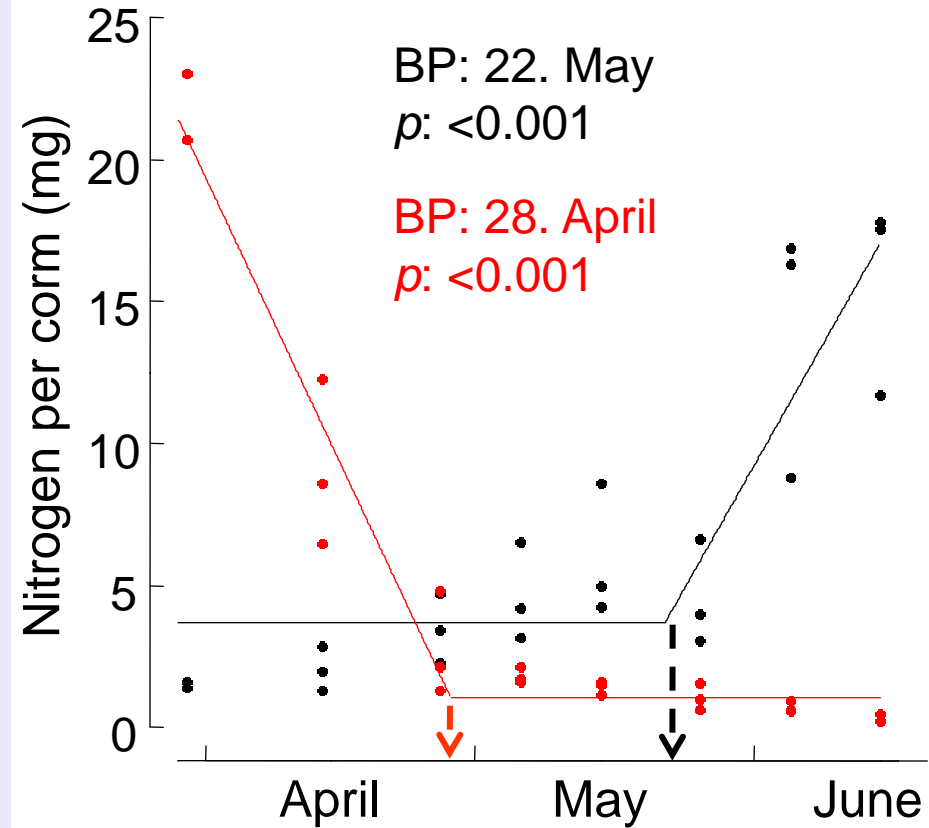


Corms

Vogelsberg Foothills



Lahn-Dill Highlands



New corm:

BP: main increase of nutrient content starts

Old corm:

BP: main decrease of nutrient content is completed

Corms

NEW CORM:

START OF NUTRIENT INCREASE

Vogelsberg	Lahn-Dill		Vogelsberg	Lahn-Dill
21. May	22. May	<i>N</i>	28. April	28. April
30. March	30. March	<i>P</i>	10. May	29. April
01. May	30. March	<i>K</i>	28. April	14. April
30. March	30. March	<i>Starch</i>	(30. March)	(30. March)

OLD CORM:

END OF NUTRIENT DECREASE

New corm:

In both regions, most nutrients started to increase from 30. March.

Old corm:

In both regions, most nutrients had decreased until late April.



Summary

Fraction	Most nutrients	Vogelsberg	Lahn-Dill
LEAVES & CAPSULES	increased until	End of April	Beginning of May
NEW CORM	increased from	End of March	
OLD CORM	decreased until	End of April	



Conclusions

Research questions

1. At what time are most plant resources removed by cutting leaves?
 - Vogelsberg Foothills: **end of April**
 - Lahn-Dill Highlands: **beginning of May**
 - Leaf length *C. autumnale*: ca. 25 cm
 - height of capsule: ca. 7 cm
 2. Does this point of time differ between biogeographical regions?
 - Yes
- ➔ When choosing the right mowing date, climatic differences must be taken into account



Thank you for your attention!

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