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Working with Plants in Breeding: our project on White Lupin

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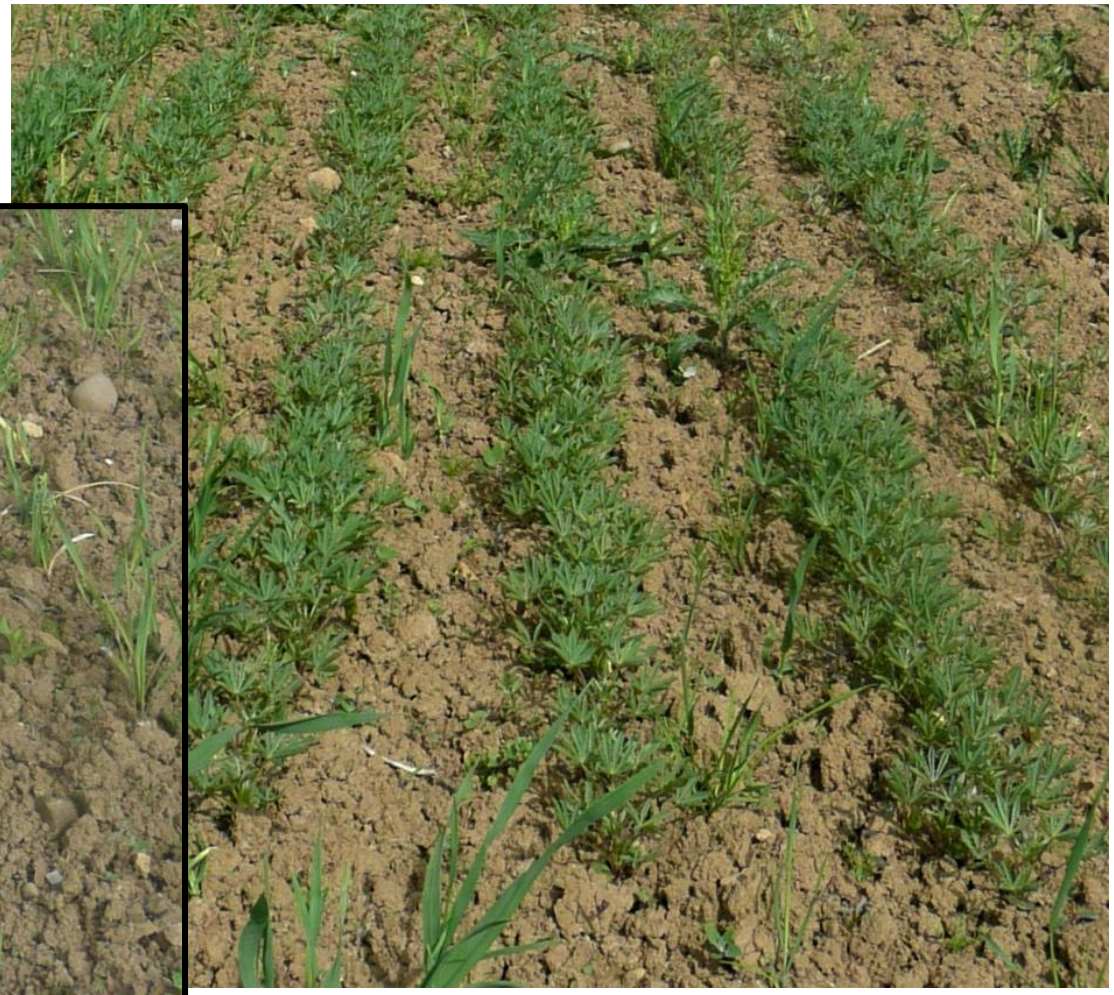
Workshop on Plant Intelligence, Basel, April 26th, 2023

Learning from plants

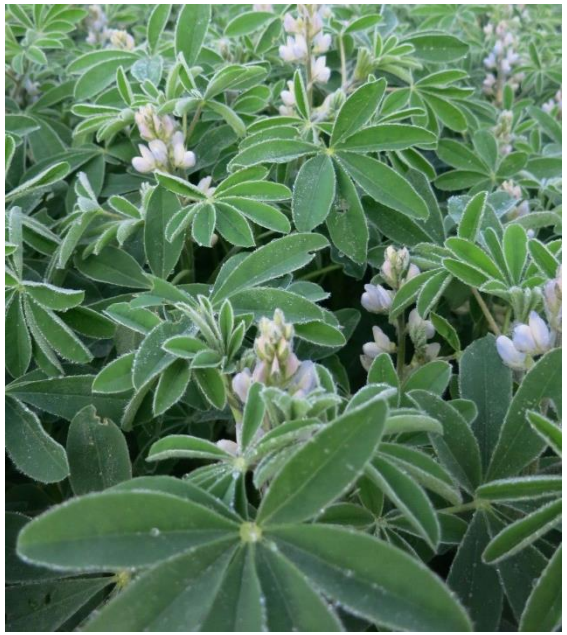
Pea/barley plot Rechberg, 14th May 2013

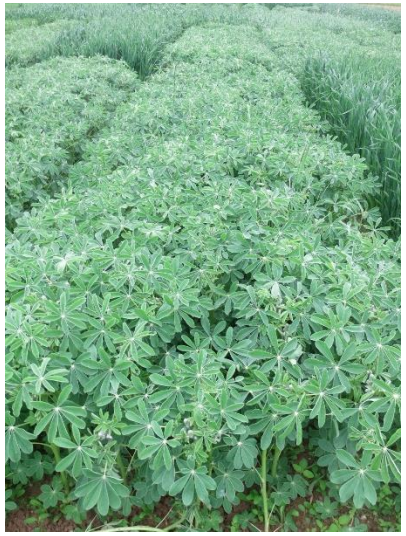


Yellow Lupin Rechberg, 14th May 2013

«robust, cold tolerant»

White Lupins





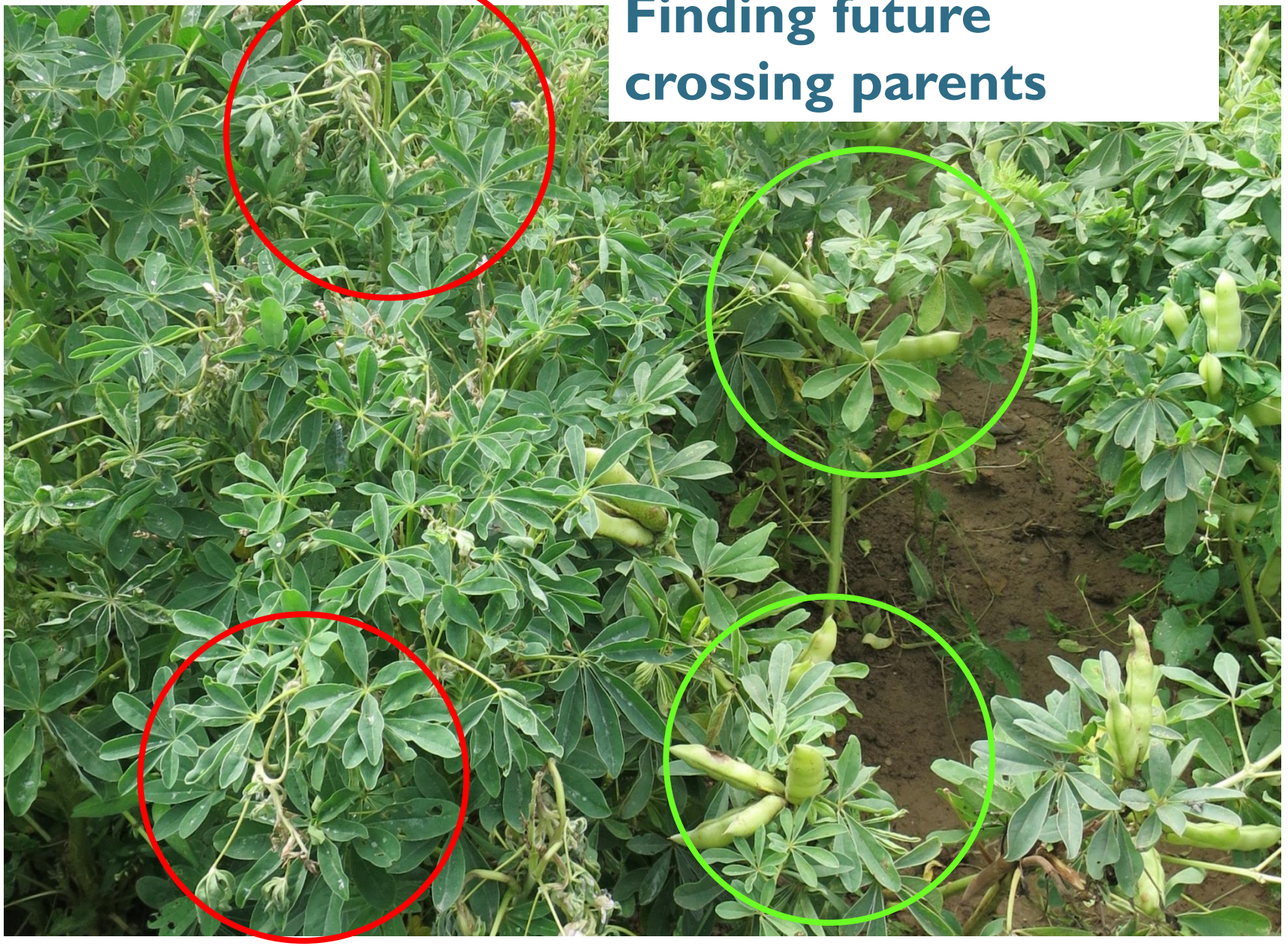
Anthraknose – biggest constraint against lupin growing in central Europe

Colletotrichum lupini




Learning to know the plant: Sowing first lupin trial in 2014

Finding future crossing parents



2014_07_29 ER25-29. rechts Csollagfürt (ER28-29), links und rechts der Fahrspur. Links daneben: ER 25-26 = MB38 (Paolo), ER 27 = (13x5)(Paolo).

screening of genetic resources to find future parents

Amiga Ethiopia Amiga Algeria Amiga

Intelligent? They defend themselves against the pathogen.
Consciously? Purposeful?

Every year since 2015:

- 100-200 new accessions from international seed banks
- single rows in mini-plots
- Between infection rows of susceptible cultivar «Amiga»
- Within 10 years, we have found ca. 20 useful, more resistant accessions
- seed treatment trials over 5 years have not rendered satisfying results.

Breeding: Crossings and Pedigrees

- Crossings enable new heritable traits
- Following generations: emerging variability
- Selection of best families and single plants reduces variability again
- Seed evaluation, selection
- testing under controlled conditions, selection
- Further field selection
- Data management!

Breeding: Crossings and Pedigrees

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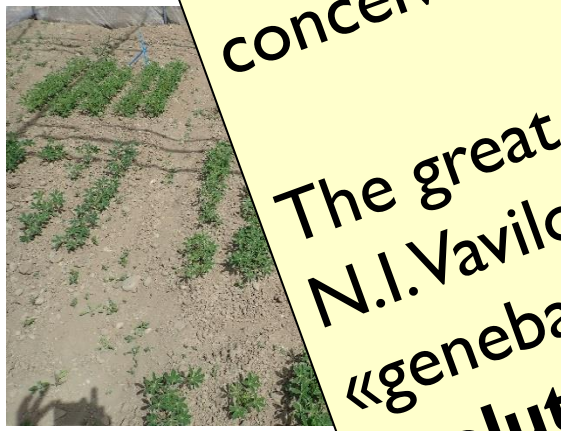
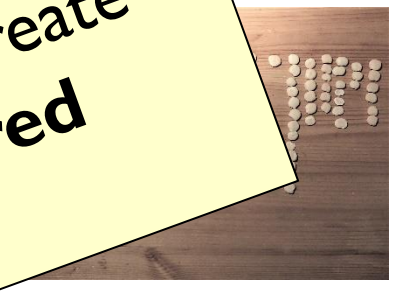
- Following g… ariability
- S… plants





Charles Darwin had knowledge of plant and animal breeding and knew about the role of selection for the formation of new races when conceiving «the origin of species».

The great Russian Agriculturalist and botanist N.I.Vavilov (the founder of the idea to create «genebanks») said: **«breeding is steered evolution».**

2019/2020: Frieda and Celina – two quite resistant varieties from Germany – a new standard. But…

2019/2020: Frieda and Celina – two more resistant varieties from Germany – a new standard. But…

Side effect of resistance breeding – among bitter plants it is easier to find robust genotypes

So, our breeding continues and we select the sweetest plants…

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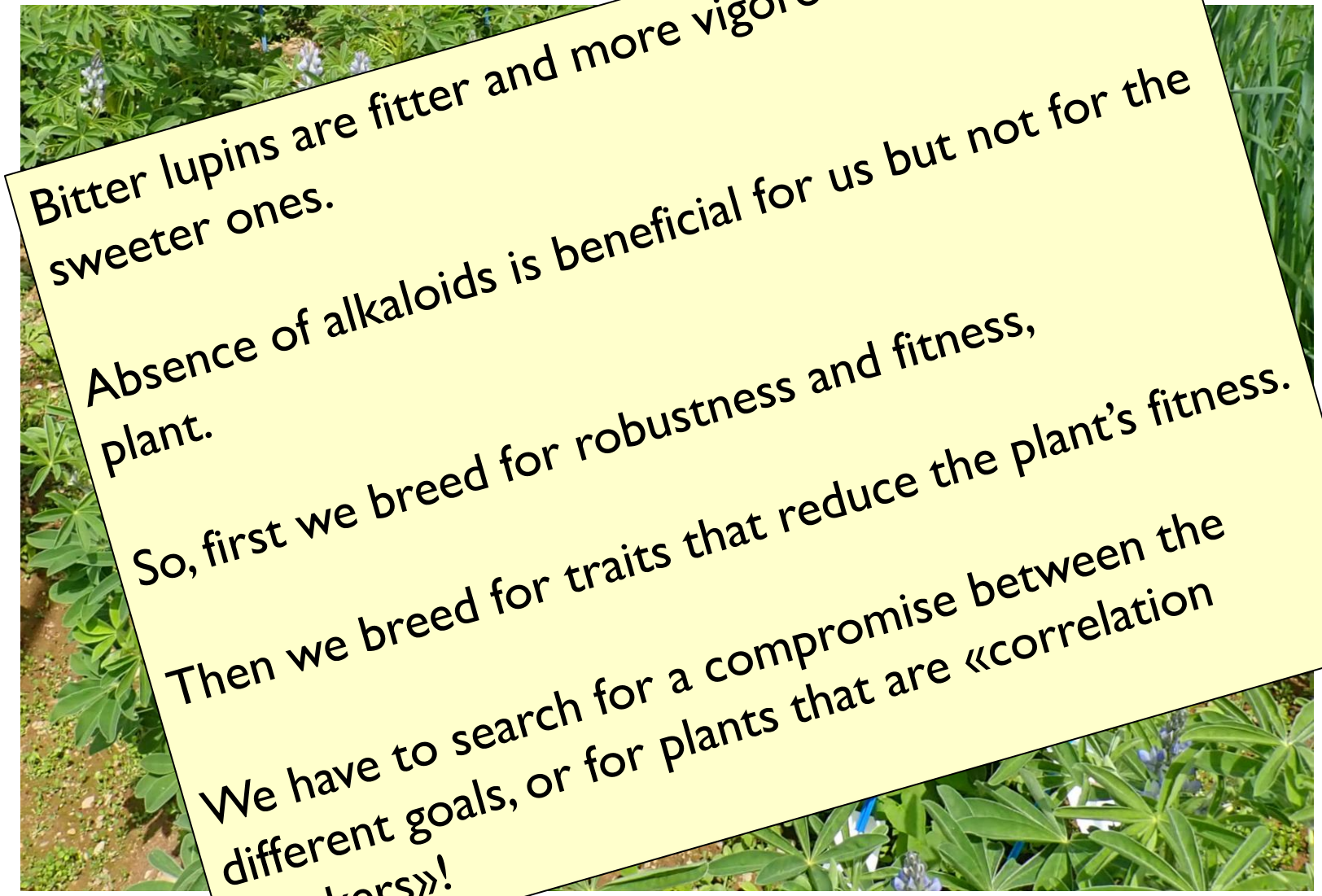


Bitter lupins are fitter and more vigorous than the sweeter ones.

Absence of alkaloids is beneficial for us but not for the plant.

So, first we breed for robustness and fitness,

Then we breed for traits that reduce the plant's fitness.

We have to search for a compromise between the different goals, or for plants that are «correlation breakers»!

Find a balance between steering the genepool and awaiting what comes up –

If breeding success is an «answer», it doesn't come from a brain-based individual

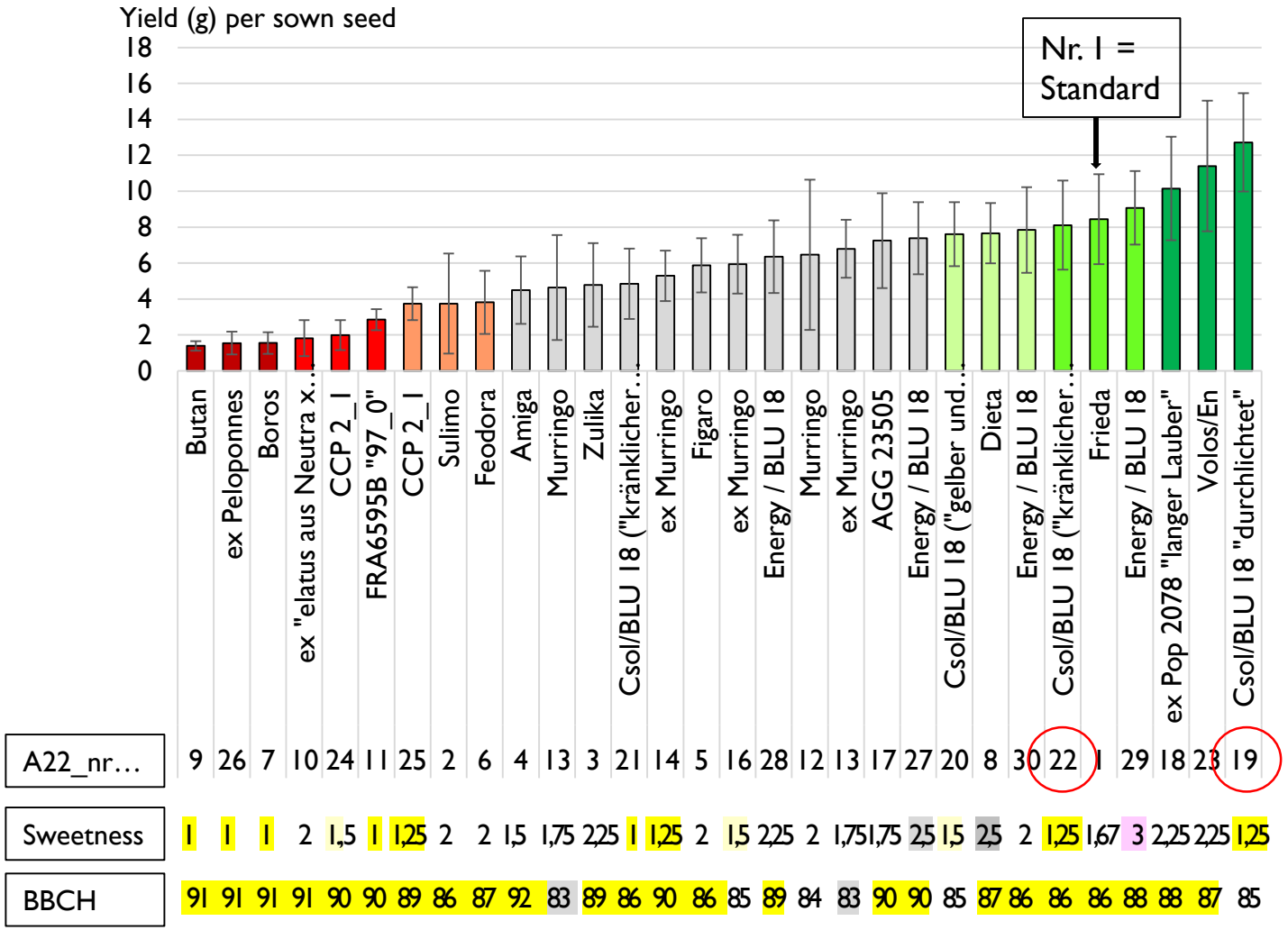
Identifying the plants that carry future potential – also under unfavourable conditions

Use human intelligence to understand which growth habit under these circumstances implies useful growth habit in other years

Yield per sown seed, ring trial, 3 sites, 2022

= best 3 genotypes, mean of all sites
= worst 3 genotypes, mean of all sites

n = 6 rows



Comparison inside tunnel /outside

n = 6 rows	n = 4 rows	n = 2 rows
rank all sites	rank only outside	rank only inside
19	19	20
23	23	17
18	18	29
29	12	22
1 *	1 *	23
22	30	28
30	29	19
8	21	18
20	13	8
27	16	27
17	22	1 *
13	8	5
12	15	3
28	27	15
16	2	30
5	20	6
14	14	4
21	17	14
3	5	16
13	4	25
4	11	12
6	28	10
2	25	7
25	3	24
11	26	21
24	24	11
10	9	13
7	6	9
26	10	2
9	7	26

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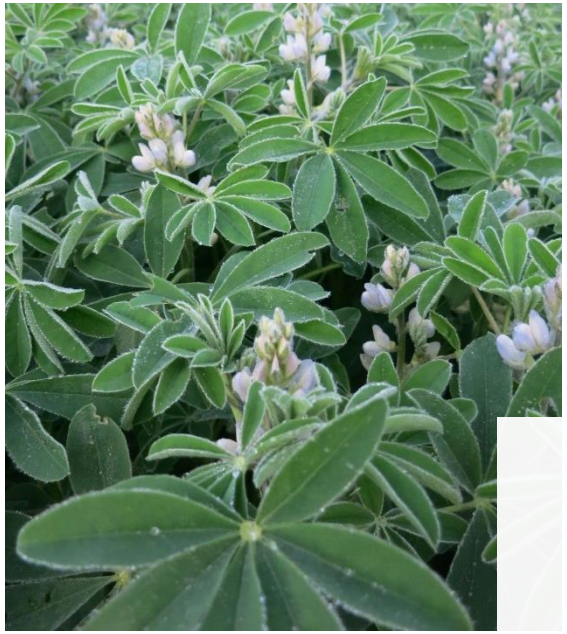
Where we are now: starting to maintain and propagate the favourite lines for yield trials



LUPINNO SUISSE

Let's do it!

Many thanks for multiple support over 9 years!

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- **Supervision**: Mariateresa Lazzaro, Pierre Hohmann, Monika Messmer

- Breeding team!! Crops team! FiBL team…
- Torsten Arncken

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