



# Investigations of the Usability of Siberian and Romanian Seabuckthorn Varieties for cultivation in Germany

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## A) Siberian Varieties - Background

- long tradition of sea buckthorn breeding at the Lisavenko Institute Barnaul (>70 years)
- current varieties with very interesting properties:
  - bushes slightly almost thornless
  - very large fruits,
  - very high oil content
- Often problems with diseases in middle Europe, esp. *Verticillium dahliae* KLEB.



# Project Aims

- Testing of new, Siberian sea buckthorn varieties for the suitability of the cultivation in Central European climate
- Improvement of the resistance by grafting on German seabuckthorn rootstocks
- Assessment of quality and components

# Experimental setup



rooted cuttings 11/2011



Potted cuttings 12/2011



- 11/2011 - potting of 10 rooted cuttings of each variety (Gramoflor Potting substrate+Clay+Fe)
- Overwintering in unheated greenhouse
- 03/2013 – cutting back of 3 plants/variety, grafting of the cuttings on one year old, rooted rootstocks of the variety 'Leikora' (tongue graft)
- Graftings cultivated up to 05/2013 in plastic tunnel, ungrafted shrubs from 3/2013 in open field
- 06/2013 planting of all shrubs in open field, planting distance 0.5 m
- 03/2014 transplanting all row spacing 3.5 m, planting distance 0.7 m



# Experimental setup

## Varieties

Клавдия  
Этиа  
Росйика  
Сударушка  
Чуйская  
Алтайская  
Жемчужийца  
Ажуриая  
Ессель  
Гиом ♂  
Августийа  
Елизавета  
125-90-3  
Ботайцеская Люйтепская

Klavdia  
Etna  
Rosinka  
Cudaruschka  
Chuyskaja  
Altaiskaja  
Jemchuschniza  
Aschurnaja  
Essel  
Gnom ♂  
Avgustina  
Elisaveta  
125-90-3  
Botanicheskaja Ljubitelskaja

## Bonitures

### Shrubs

- Plant failures
- Height of growth
- Vitality

### Fruits

- 100-fruit-weight
- Sugar-acid-ratio
- Content of carotenoides

# Results

Number of plants 03/2013



Variety	Plants after overwintering	Uncutted plants	cutted plants	Grafted plants	Total number
Klavdia	7	4	3	3	10
Etna	7	4	3	3	10
Rosinka	5	2	3	3	8
Cudaruschka	8	5	3	3	11
Chuyskaja	8	5	3	3	11
Altaiskaja	8	5	3	3	11
Jemchuschniza	5	2	3	3	8
Aschurnaja	6	3	3	3	9
Essel	10	7	3	3	13
Gnom	7	4	3	3	10
Avgustina	6	3	3	3	9
Elisaveta	6	3	3	3	9
Klon 125-90-3	6	3	3	3	9
Number of Plants	89	50	39	39	128



J u1	J u2	J v2	J s3	J s1	G s2	R v1	R v3	R s3	R s1	R v2	R s2	Es u6	Es u5	Es u4	Es u1	Es u2	Es u7	Es u3	Es v1	Es v3	Es v2	Es s2	Es s1	Es s3	B	
G s3	G u1	1 u1	1 u2	1 u3	1 v1	1 v2	1 v3	1 s1	1 s2	1 s3	Et u1	Et u2	Et u4	Et v1	Et v2	Et v3	Et s1	As s2	As u2	As v1	As v2	As v3	As s1	As s3	B B	
Ch u5	Ch u1	Ch u2	Ch v1	Ch v2	Ch v3	Al u1	Al u2	Al u3	Al u4	Al v1	Al v2	Al v3	Al s2	Al s3	G	G u2	El u1	El u2	El u3	El v1	El v2	Av u1	Av u2	Av u3	Av s1	Av v1
Cu u1	Cu u3	Cu u4	Cu v1	Cu v2	Cu s2	G u3	G u4	K u1	K u2	K u3	K u4	K v1	K v2	K v3	K s1	K s2	K s3	B	B	B	B	B				

Клавдия  
 Этиа  
 Росинка  
 Сударушка  
 Чуйская  
 Алтайская  
 Жемчужийца  
 Ажуриая  
 Ессель  
 Гиом  
 Августийа  
 Елизавета  
 125-90-3

Klavdia  
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K  
Et  
R  
Cu  
Ch  
Al  
J  
As  
Es  
G  
Av  
El  
1

uncutted bushes  
 cutted bushes  
 grafted bushes

u  
s  
v

Plantation 03/2014

(Вотайческая Любителская Botaniceskaja Lubitelskaja B)

14  
m

N



23

m

14  
m

N

← → ↑ ↓

J u1	J u2	J v2	J s3	J s1	G s1	G s2	R v1	R v3	R s3	R s1	R v2	R s2	Es u6	Es u5	Es u4	Es u1	Es u2	Es u7	Es u3	Es v1	Es v3	Es v2	Es s2	Es s1	Es s3	B	
G s3	G u1	1 u2	1 u3	1 v1	1 v2	1 v3	s1	s2	1 s3	1 s3	Et u1	Et u2	Et u4	Et v1	Et v2	Et v3	Et s1	Et s2	As u2	As v1	As v2	As v3	As s1	As s3	B	B	
Ch u5	Ch u1	Ch u2	Ch v1	Ch v2	Ch v3	Al u1	Al u2	Al u3	Al u4	Al v1	Al v2	Al v3	Al s2	Al s3	G u2	G u1	El u2	El u3	El v1	El v2	Av u1	Av u2	Av u3	Av s1	Av v1		
Cu u1	Cu u3	Cu u4	Cu v1	Cu v2	Cu s2	G u3	G u4	K u1	K u2	K u3	K u4	K v1	K v2	K v3	K s1	K s2	K s3	B	B	B	B	B					

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K  
Et  
R  
Cu  
Ch  
Al  
J  
As  
Es  
G  
Av  
El  
1

uncutted bushes  
cutted bushes  
grafted bushes

u  
s  
v

2017 died



J u1	J u2	J v2	J s3	J s1	G s1	G s2	R v1	R v3	R s3	R s1	R v2	R s2	Es u6	Es u5	Es u4	Es u1	Es u2	Es u7	Es u3	Es v1	Es v3	Es v2	Es s2	Es s1	Es s3	B	
G s3	G s3	1 u1	1 u2	1 u3	1 v1	1 v2	1 v3	1 s1	1 s2	1 s3	P5	Et v4	Et v5	Et v1	Et v2	Et v3	Et s1	Et s2	As u1	As u2	P5	As v2	As v3	As s1	As s3	B	
Ch u5	Ch u1	Ch u2	Ch v1	Ch v2	Ch v3	Al u1	Al u2	Al u3	Al u4	Al v1	Al v2	Al v3	Al s2	Al s3	G	G u2	El u1	El u2	El u3	El v1	El v2	Av u1	Av u2	Av u3	Av s1	Av v1	
Cu u1	Cu u3	Cu u4	Cu v1	Cu v2	Cu s2	G u3	G u4	1 v4	1 v5	K u3	K u4	K v1	K v2	K v3	K s1	K s2	K s3	B	B	B	B	B	B	B	B	B	

Клавдия

Этиа

Росйика

Сударушка

Чуйская

Алтайская

Жемчужийца

Ажуриая

Ессель

Гиом

Августийя

Елизавета

125-90-3

Вотайческая Любителская

Klavdia

Etna

Rosinka

Cudaruschka

Chuyskaya

Altaiskaja

Jemchuschniza

Aschurnaja

Essel

Gnom

Avgustina

Elisaveta

125-90-3

Botaniceskaja Lubitelskaja B

K

Et

R

Cu

Ch

Al

J

As

Es

G

Av

El

1

uncutted bushes

cutted bushes

grafted bushes

new grafted bushes 2019

new planted Pollmix 5 (2018)

u

s

v

v4, v5

P5

## Plant scoring

**08/2021**

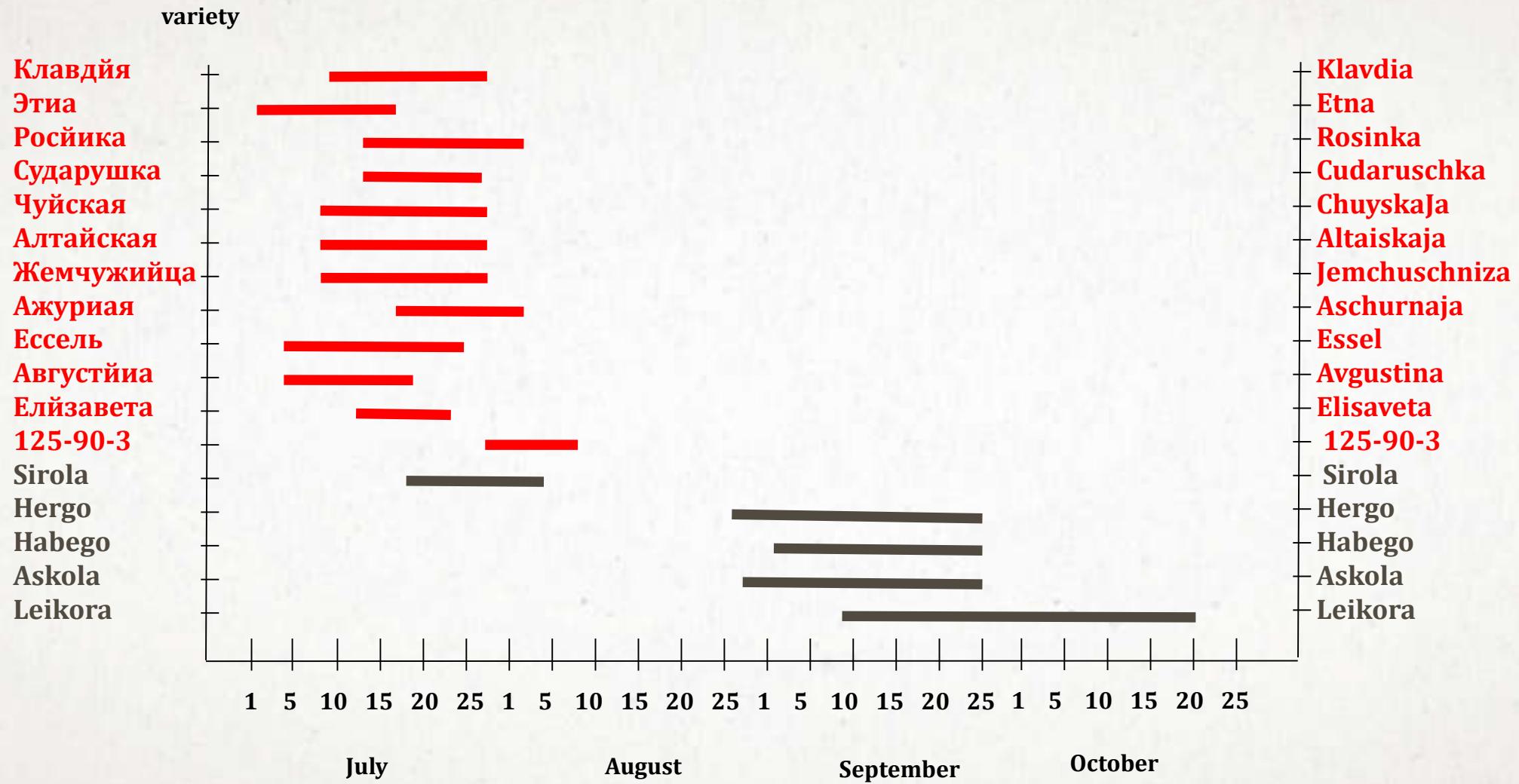
**dead shrub**

**weak growth (new shoot < 20 cm)**

**good growth (new shoot 20-40 cm)**

**very good growth (new shoot >40 cm)**

# Harvesting periods 2016 - 2021 compared with german varieties



## Scoring 08/2021



### *Elisaveta*

- plant height 250 - 350 cm
- new shoots 70 - 80 cm
- grafted plants somewhat larger
- few fruits

## Scoring 08/2021



***Etna***

- grafted plants height 210-230 cm
- new shoots grafted plants 40-50 cm
- good fruit set
- only one non-grafted plant (weak growth)



**not  
grafted**



## Scoring 08/2021



*Klavdia*

- grafted plants height 160 - 240 cm
- new shoots grafted plants 30-60 cm
- low fruit set
- Branches overhanging



## Scoring 08/2021



*Chuyskaya*

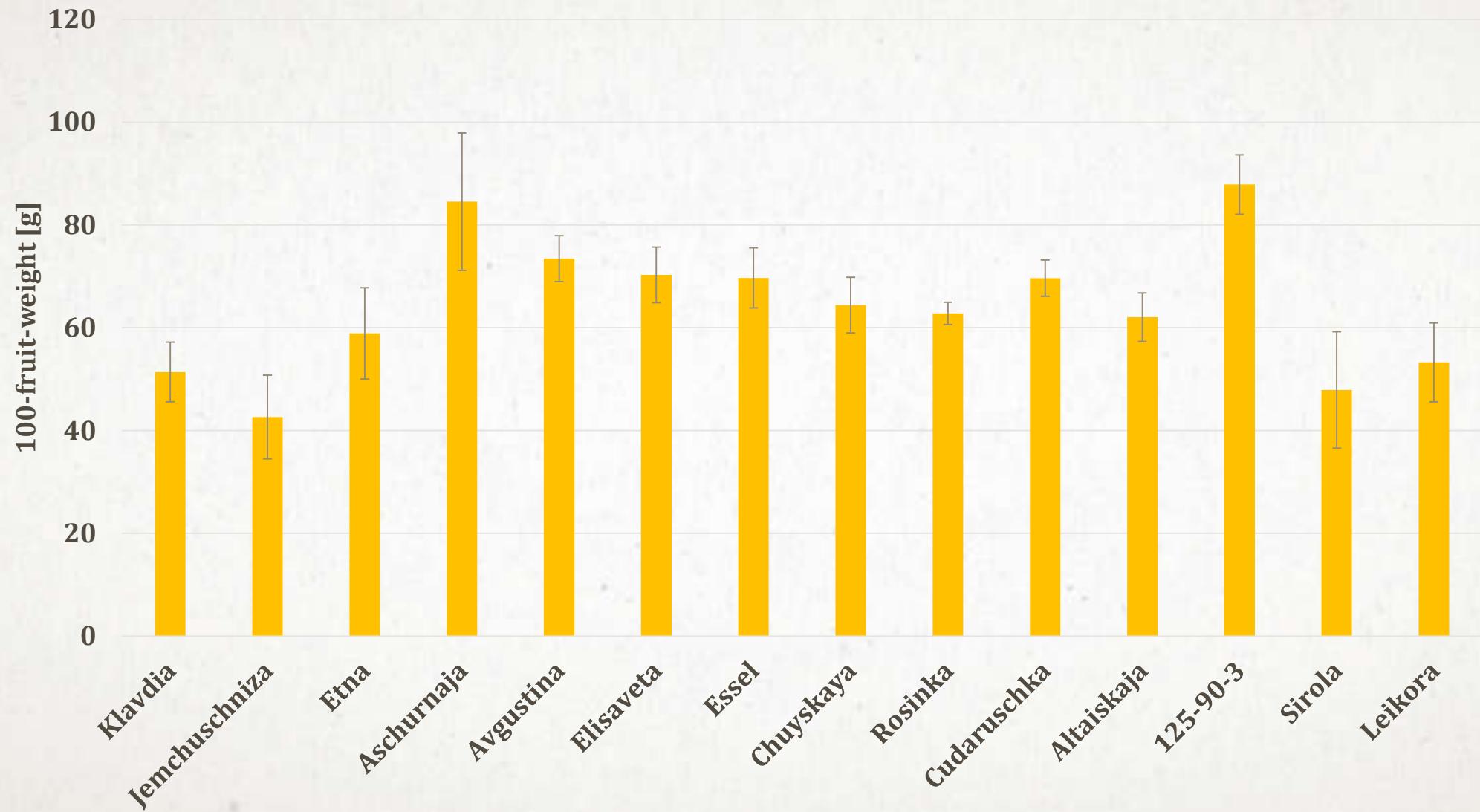
grafted

- grafted plants height 210-260 cm
- new shoots grafted plants 40-55 cm
- medium fruit set
- one non-grafted plant with good growth



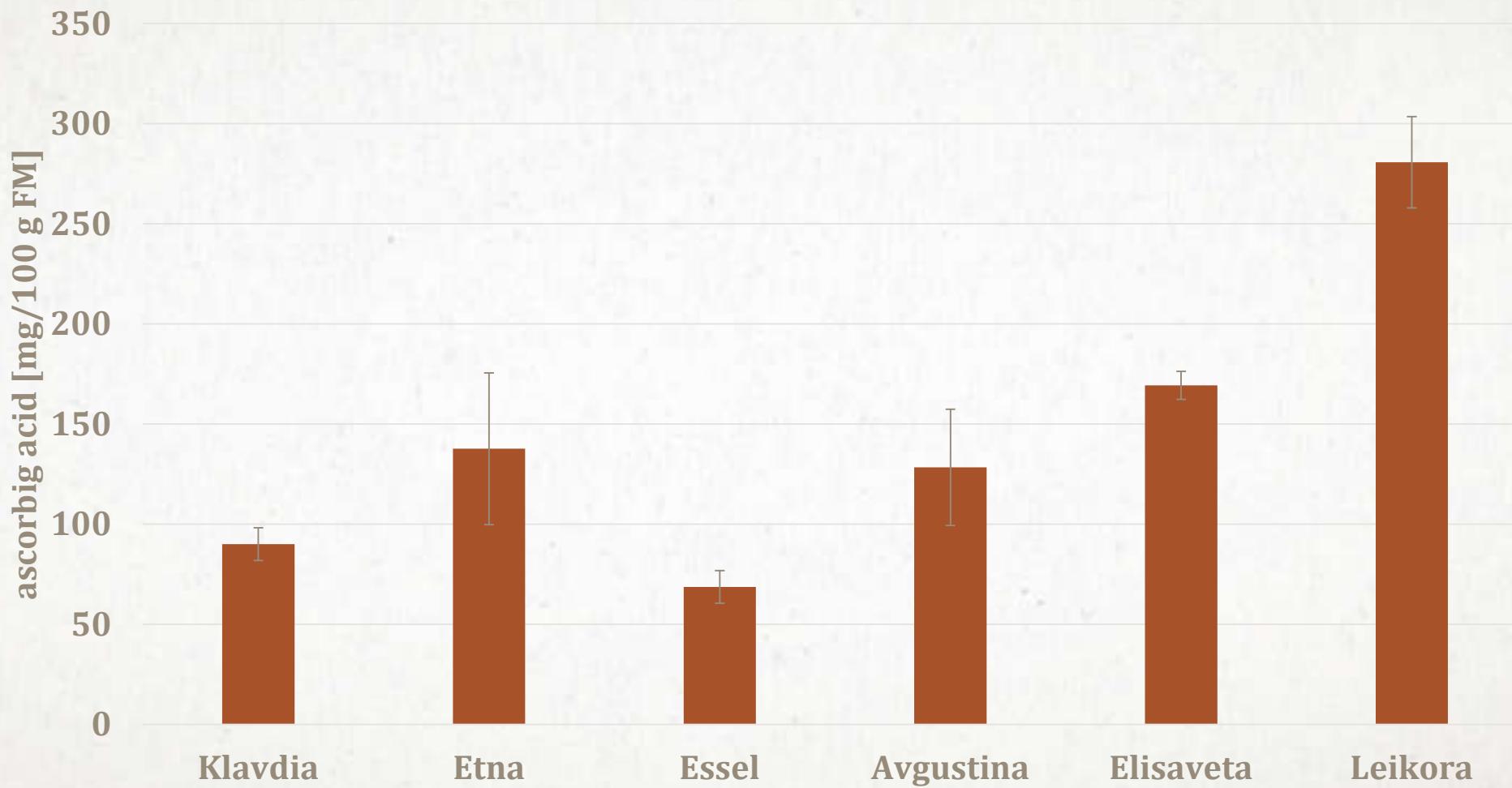


# 100-fruit weight (average of 2016-2020)



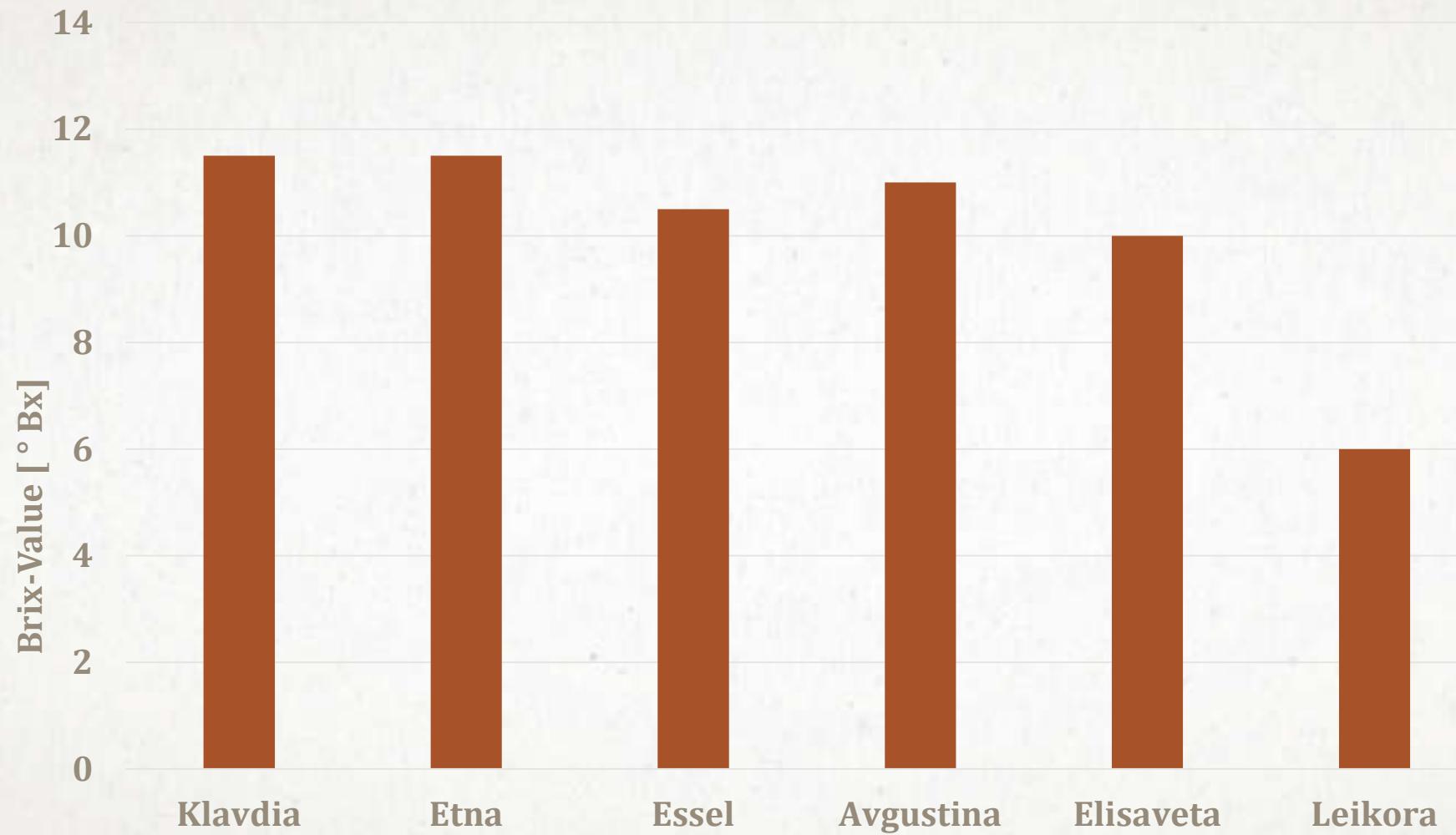


## Fruit analysis – Ascorbic acid (average 2014-2019)



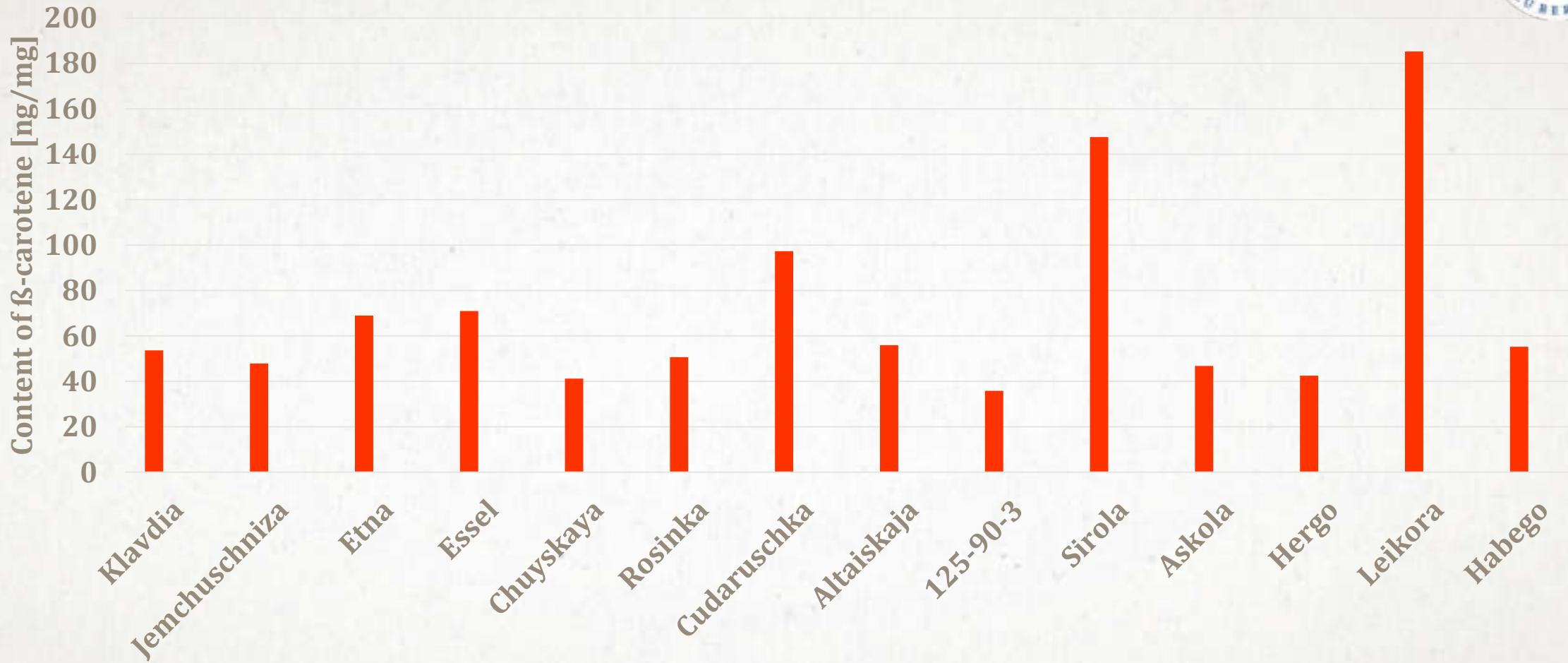


## Fruit analysis - Brix-Value (average 2014/2015)



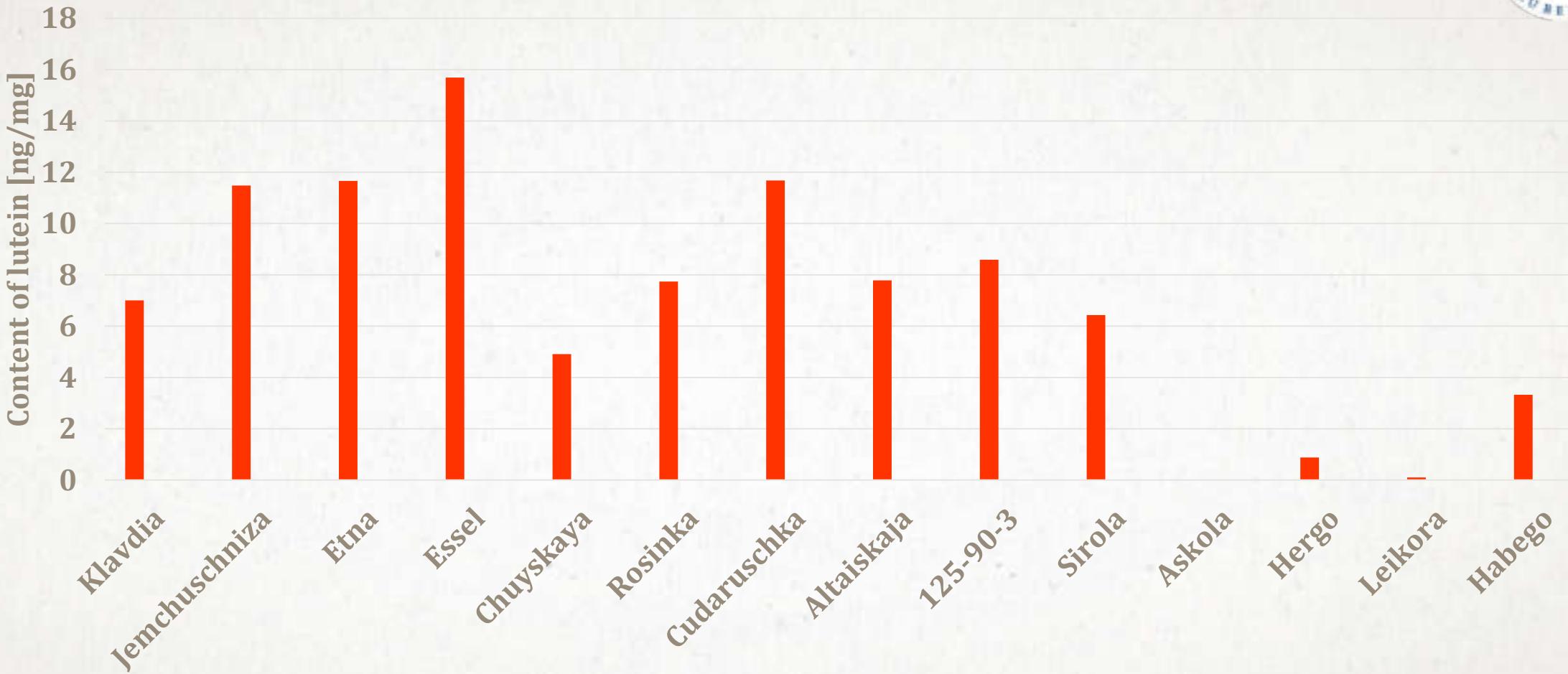


## Content of $\beta$ -carotene 2016





## Content of Lutein 2016





# Summary

- The varieties grafted on 'Leikora' are generally more vigorous than non-grafted shrubs. After 10 years, 72 % of the grafted shrubs survived, but only 56 % of the non-grafted shrubs.
- The grafted varieties 'Etna', 'Chuskaya' and 'Klavdia' showed very good growth performance. There were no losses of the shrubs here.
- The harvest time of the tested varieties in Berlin is already in the middle of July and thus clearly ahead of the German varieties.
- The total carotenoid content is strongly variety-dependent. But the lutein content of the Siberian varieties is clearly higher.

## B) Romanian Varieties - Background

- first appearance of the seabuckthorn fruit fly in Germany 2012
- rapid spread in sea buckthorn plantations
- project to develop control strategies since October 2018, including variety testing



Pupae of the fruit fly in the soil



Sea buckthorn fruit fly  
*Rhagoletis batava*



Larva changing the fruit



Infested sea buckthorn fruits of the variety 'Habego', Berlin, 2020

## B) Romanian Varieties - Background

*Hippophae rhamnoides* L. ssp. *carpatica* Rousi:

- dry, warm sites of pre-alpine types of area
- growing height 1-4m
- fruits roundish, yellow to red
- high ascorbic acid content



Source: <https://www.terra.hu/fak/html/hippophae.rhamnoides.html>



variety 'Victoria'



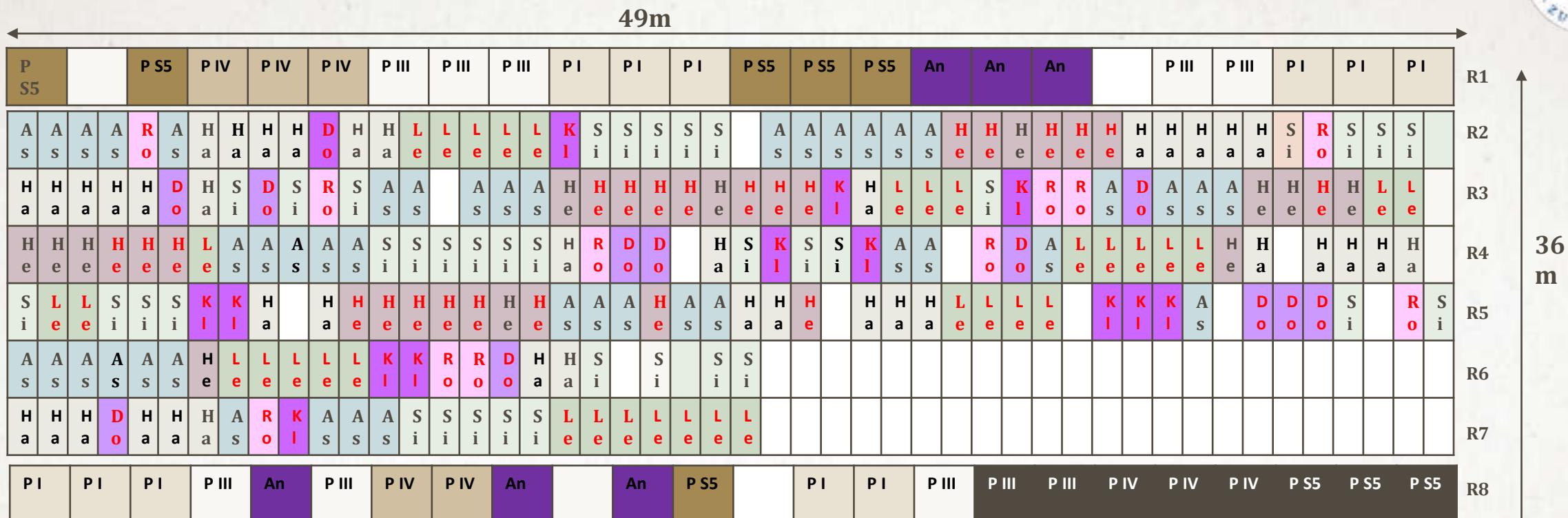
variety 'Silvia' ('Serbanesti 4')

Source: Pop RM et.al. (2014): Carotenoid composition of berries and leaves from six Romanian sea buckthorn (*Hippophae rhamnoides* L.) varieties. Food Chem. 147:1-9



Source: <https://www.catinadearad.ro/catina-cultura-si-exploatare/>

# Romanian Varieties - Experimental setup



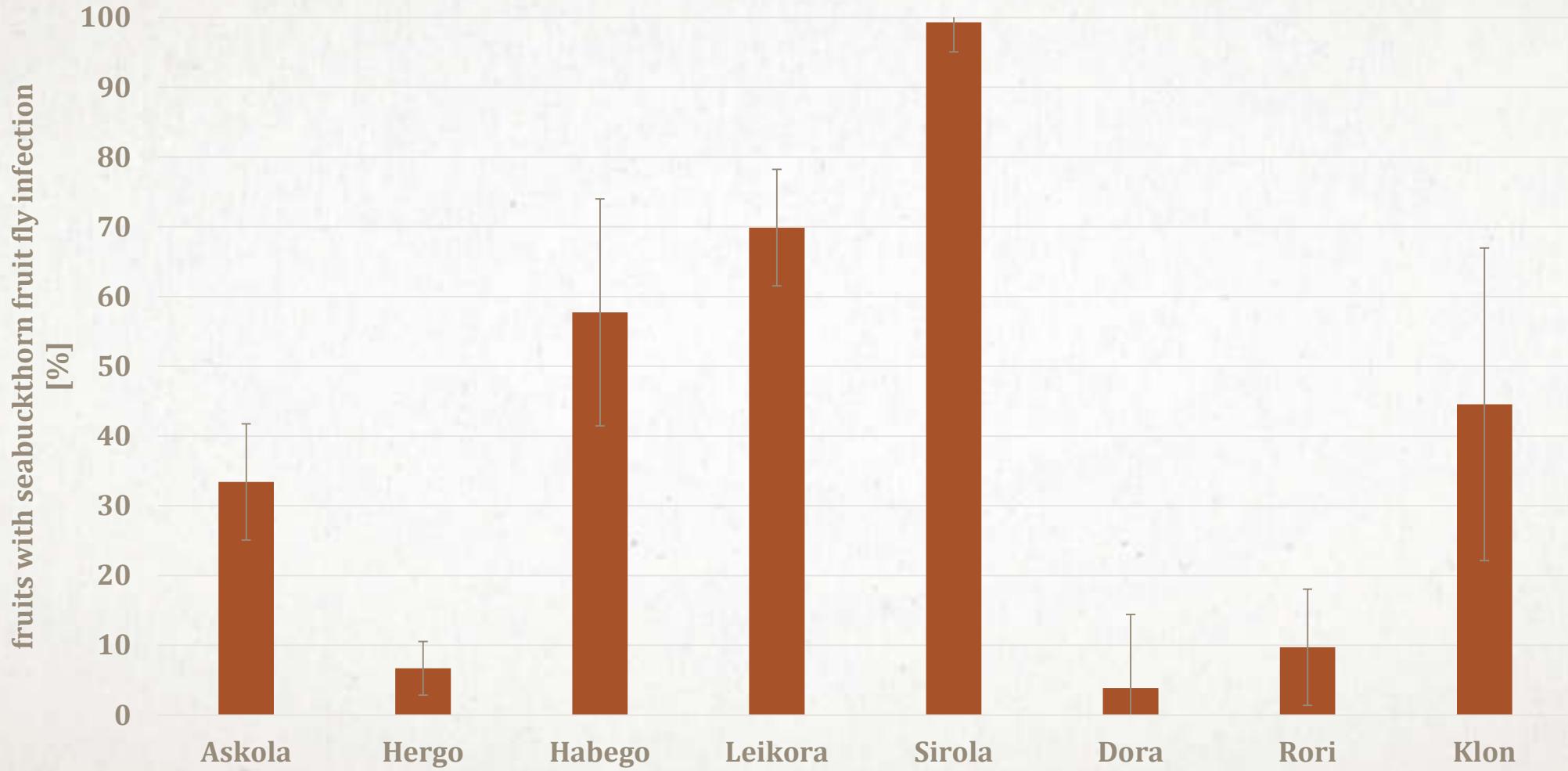
As	Askola	44
Ha	Habego	40
He	Hergo	35
Si	Sirola	38
Le	Leikora	34
Ro	Rori	11
Do	Dora	12
Kl	Klon II-18	13

Complete 227 female plants

PI	Pollmix I	11
P III	Pollmix III	8
PIV	Pollmix IV	5
PS5	Pollmix S5	6
An	Andros	6



# first results – fruits with seabuckthorn fly-infections 2020



# First results – Romanian varieties



Rori:

- slow-growing
- round, red fruits
- very high ascorbic acid content
- less seabuckthorn-fly infections



# First results – Romanian varieties



Dora:

- slightly better growing than Rori,
- firm round red fruits
- very less seabuckthorn-fly infections



# First results – Romanian varieties

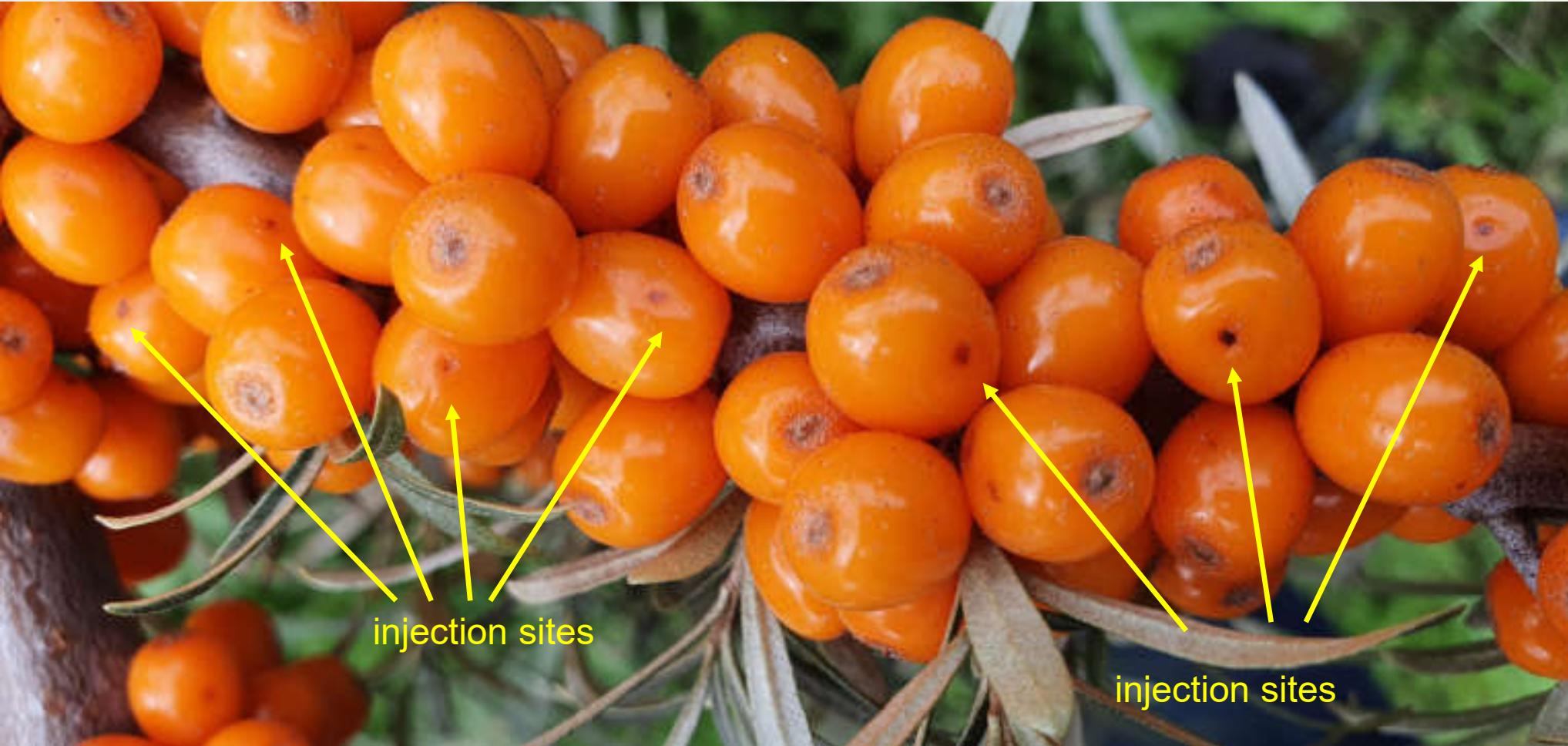


## Klon 18-2

- very good growth
- very high fruit set
- much bigger fruits
- softer fruit skin
- more seabuckthorn-fly infections

# First results – Romanian varieties

Klon 18-2



# Summary

- Romanian varieties with round fruits and a firm fruit skin are less sensitive to the buckthorn fruit fly (preliminary result)





Thanks for your attention!

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