Plum industrial by-products as a source of oil, essential fatty acids, tocopherols, tocotrienols, carotenoids and squalene: Impact of the species and genotype

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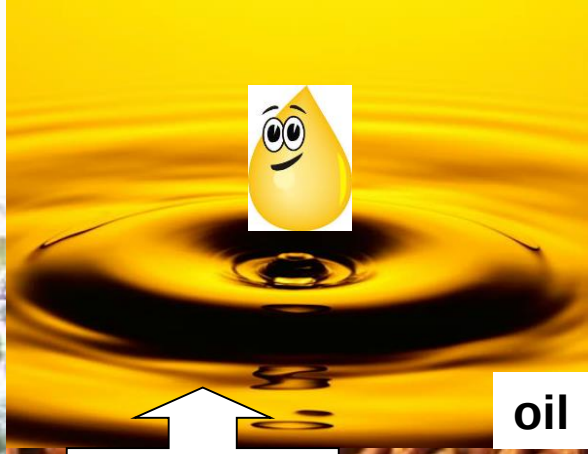
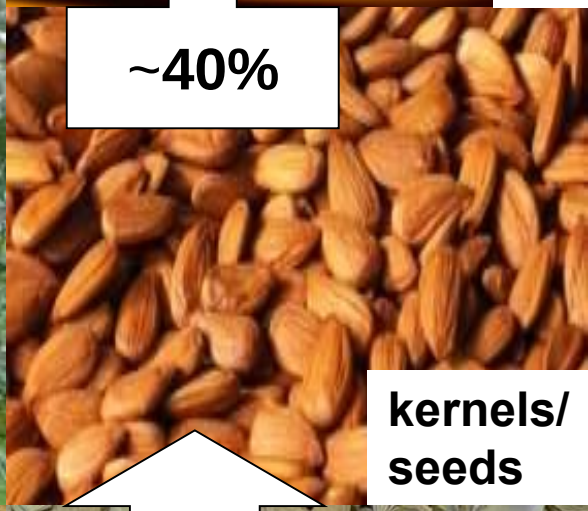


oil

~40%



kernels/
seeds

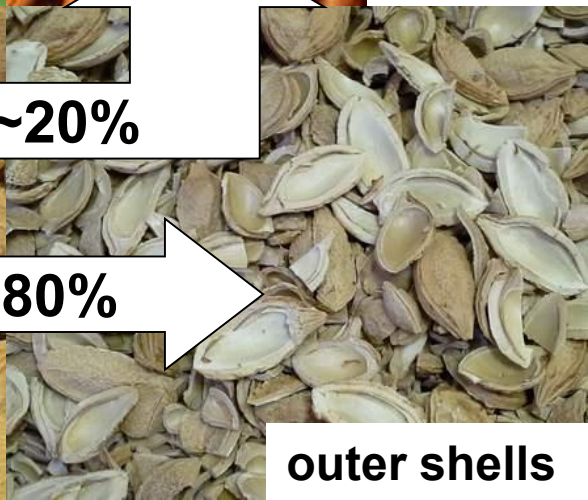
~20%

~80%

~5%

plums

plum pits



outer shells

Whether the non-waste technology of plums processing can be possible?

plum pits processing

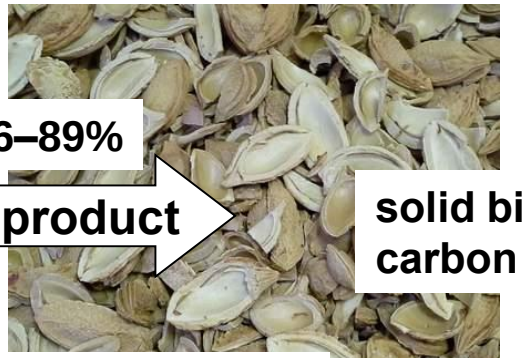
3–6%

by-product

plums processing

76–89%

1st product



solid biofuel [1]
carbon adsorbents [2]

outer shells

Did something was left?

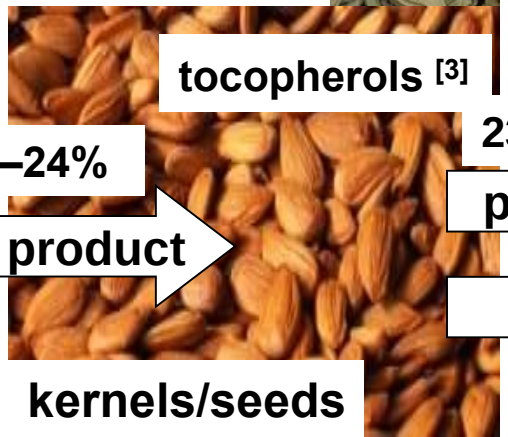
fiber
carbohydrates

by-product

tocopherols [3]

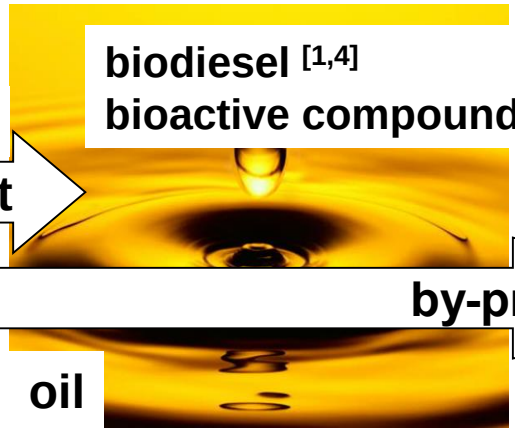
11–24%

2nd product



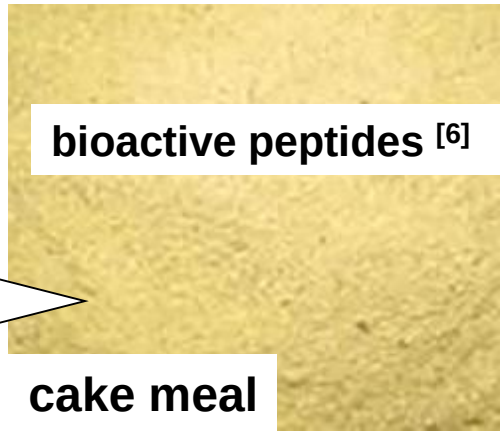
23–53%

product



biodiesel [1,4]
bioactive compounds [5]

by-product



bioactive peptides [6]

kernels/seeds

oil

cake meal

The plum genotypes, species, and origin

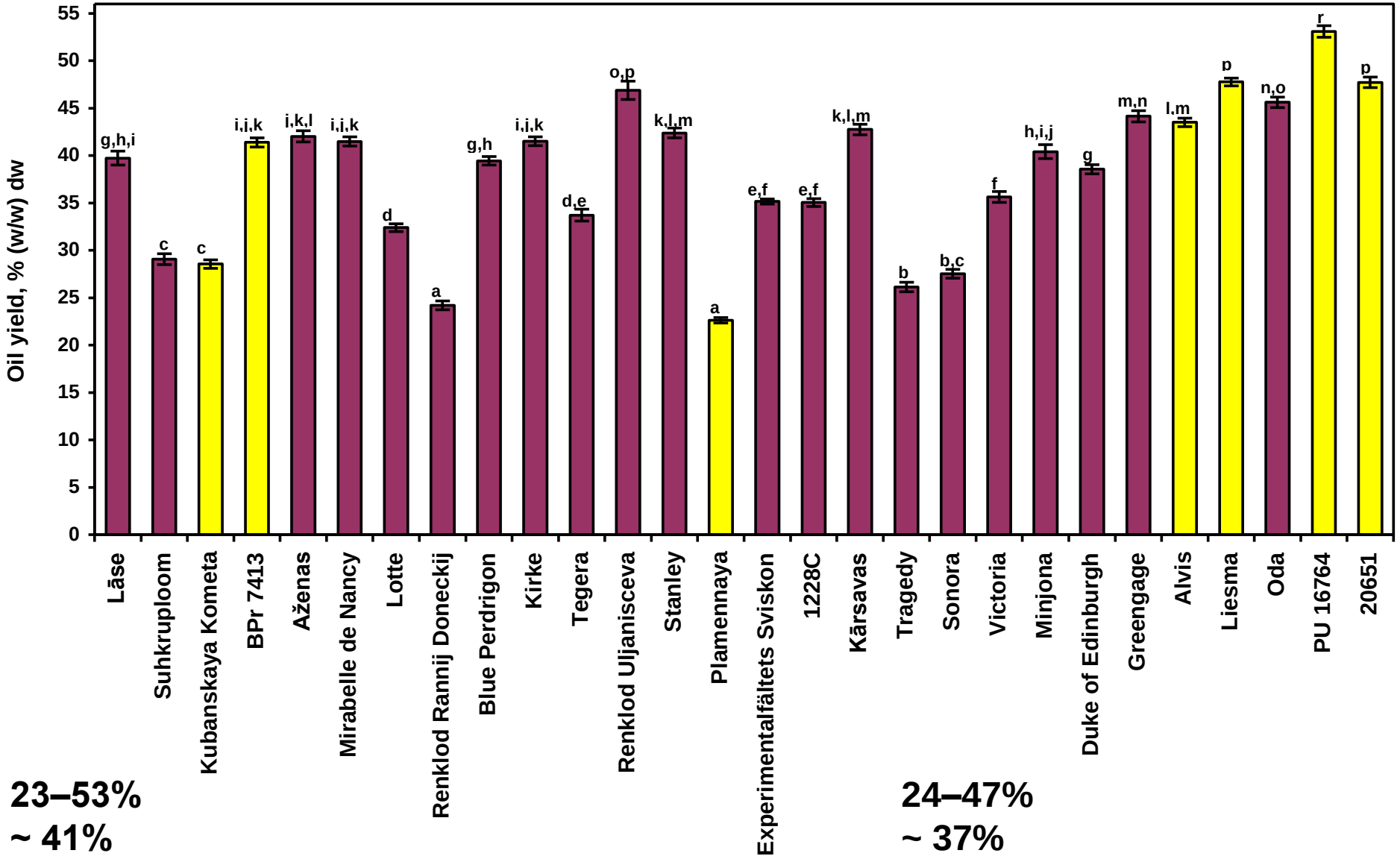
21 genotypes of *P. domestica* L.

7 genotypes of *P. cerasifera* Ehrh. and its crossbreeds

Plum genotype	Species	Variety country of origin
Lāse	*P. domestica* L.	LVA
Suhkruploom	*P. domestica* L.	EST
Kubanskaya Kometa	*P. cerasifera* Ehrh.× *P. salicina* Lindl.	RUS
BPr 7413	(*P. salicina* Lindl.× *P. americana* March.×*P. simonii* Carr.)× *P. cerasifera* var. *pissardii* Ehrh.	SWE
Aženas	*P. domestica* L.	FRA
Mirabelle de Nancy	*P. domestica* L.	FRA
Lotte	*P. domestica* L.	LVA
Renklod Rannij Doneckij	*P. domestica* L.	UKR
Blue Perdrigon	*P. domestica* L.	GBR
Kirke	*P. domestica* L.	GBR
Tegera	*P. domestica* L.	DEU
Renklod Uljanisceva	*P. domestica* L.	RUS
Stanley	*P. domestica* L.	USA
Plamennaya	*P. cerasifera* Ehrh.	RUS

Plum genotype	Species	Variety country of origin
Experimentalfältets Sviskon	*P. domestica* L.	SWE
1228C	*P. domestica* L.	SWE
Kārsavas	*P. domestica* L.	LVA
Tragedy	*P. domestica* L.	USA
Sonora	*P. domestica* L.	LVA
Victoria	*P. domestica* L.	GBR
Minjona	*P. domestica* L.	LVA
Duke of Edinburgh	*P. domestica* L.	GBR
Greengage	*P. domestica* L.	GBR
Alvis	*P. cerasifera* Ehrh.× *P. salicina ssp. ussuriensis* Koval. et Kost.	LVA
Liesma	*P. cerasifera* var. *pissardii* Ehrh.	LVA
Oda	*P. domestica* L.	UKR
PU 16764	*P. cerasifera* Ehrh.	LVA
20651	*P. cerasifera* Ehrh.	LVA

Oil yield (%, (v/v) dw) in the kernels of different plum species and genotypes



23–53%
~ 41%

24–47%
~ 37%

Prunus cerasifera Ehrh. and its crossbreeds

Prunus domestica L.

The composition of fatty acids in the kernel oils (%) of different plum species and genotypes

	C16:0	C16:1	C18:0	C18:1	C18:2	SFA	MUFA	PUFA
Prunus domestica **L.**								
Min	4.5	0.4	1.0	46.[illegible]	23.[illegible]	5.9	47.3	24.0
Max	7.5	1.4	2.3	68.4	45.1	8.5	69.2	45.1
Mean	5.4	0.9	1.5	60.2	31.7	7.1	61.1	31.8
S.D.	0.7	0.2	0.4	7.4	6.9	0.6	7.3	6.9
Prunus cerasifera **Ehrh. and its crossbreeds**								
Min	4.2	0.0	0.8	47.[illegible]	22.[illegible]	5.4	48.1	22.6
Max	5.8	0.6	1.7	70.7	45.3	6.6	71.3	45.3
Mean	4.7	0.4	1.2	62.9	30.5	6.0	63.5	30.6
S.D.	0.5	0.2	0.3	9.3	9.2	0.4	9.3	9.2

22%

21%

23%

23%

The composition of tocochromanols and levels of carotenoids
the kernel oils (mg/100 g oil) of different plum species and genoty

	α-T	β-T	γ-T	δ-T	α-T3	γ-T3	Total T+T3	Total carotenoids
Prunus domestica **L.**								
Min	5.7	0.1	76.2	2.9	0.1	0.1	89.8	0.9
Max	19.9	0.7	182.0	11.6	2.9	1.4	208.6	3.1
Mean	11.3	0.2	110.6	6.9	0.8	0.4	130.3	1.7
S.D.	4.1	0.1	29.7	2.8	0.7	0.3	34.6	0.7
Prunus cerasifera **Ehrh. and its crossbreeds**								
Min	4.3	0.1	60.5	1.7	0.1	0.1	70.7	0.4
Max	17.2	0.3	170.6	6.9	1.4	0.3	196.7	0.9
Mean	10.0	0.2	92.7	3.6	0.5	0.2	107.1	0.7
S.D.	5.0	0.1	39.8	1.8	0.5	0.1	46.4	0.2

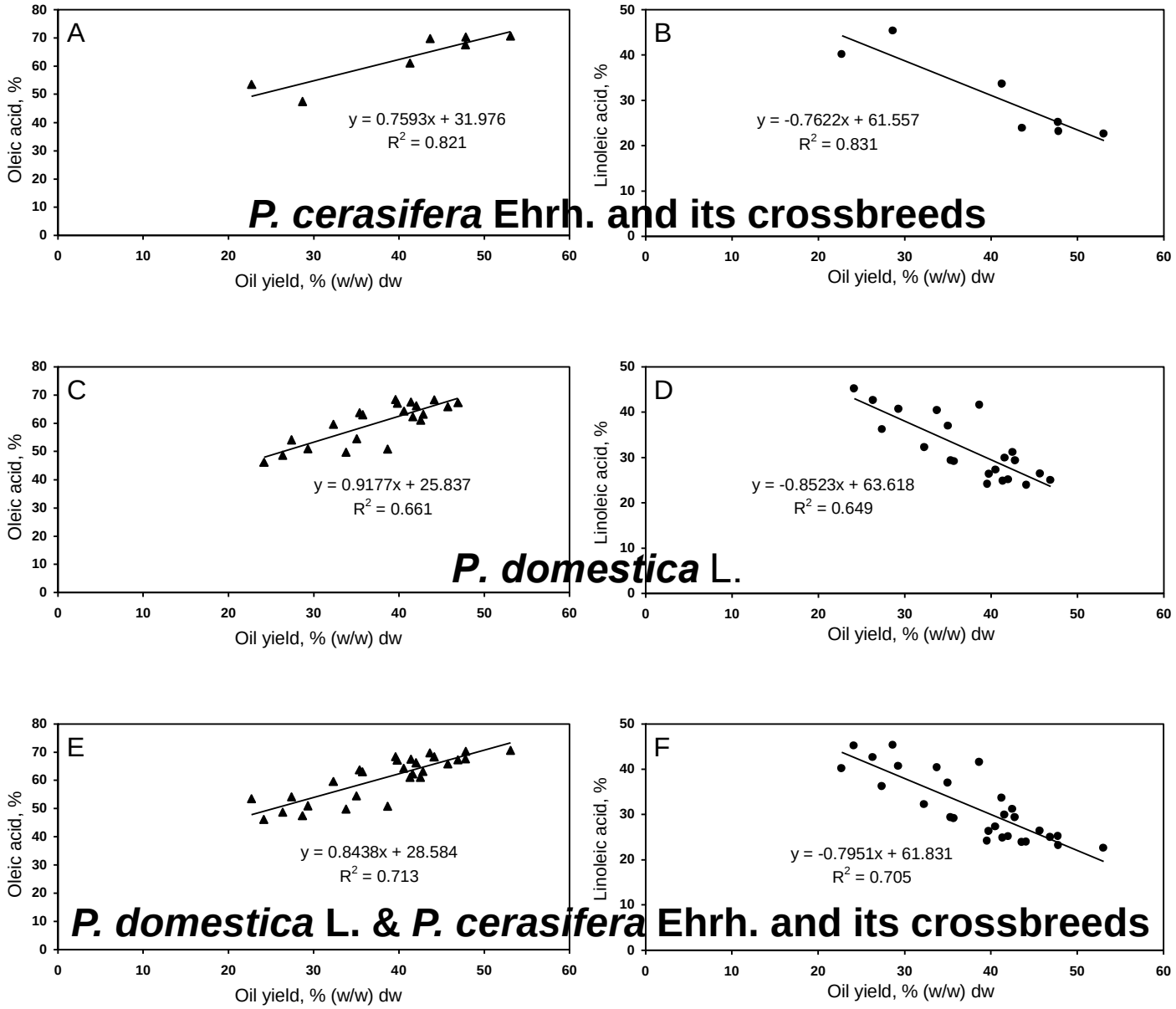
2.4 2.3 3.4 2.8 2.8 2.2

The composition of phytosterols and levels of squalene in the kernel oils (mg/100 g oil) of different plum species and genotypes

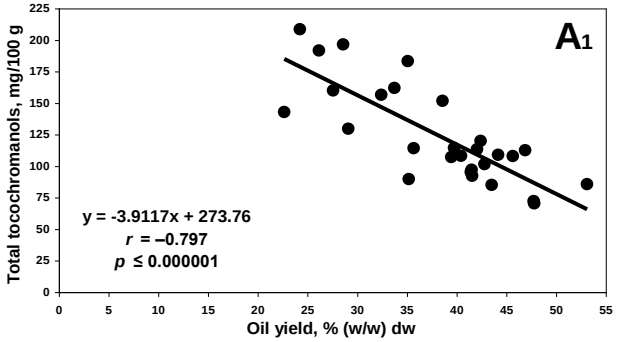
	Campesterol	β-Sitosterol	Δ5-Avenasterol	Total sterols	Squalene
Prunus domestica **L.**					
Min	12.2	247.0	16.0	327.2	26.
Max	84.7	1258.7	91.6	1569.6	80.4
Mean	32.7	497.5	45.6	658.2	42.5
S.D.	18.9	269.4	22.2	334.8	15.8
Prunus cerasifera **Ehrh. and its crossbreeds**					
Min	13.2	208.5	29.4	297.2	25.7
Max	54.7	988.3	154.8	1320.1	50.5
Mean	23.4	385.6	67.2	546.9	38.9
S.D.	16.2	293.3	41.4	379.0	10.4

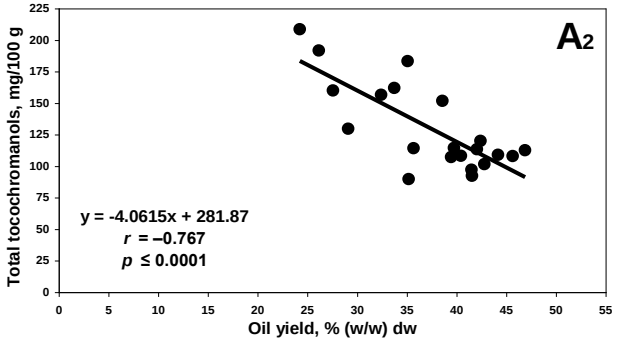
5.1 4.8 3.1 4.7 4.4 2.0

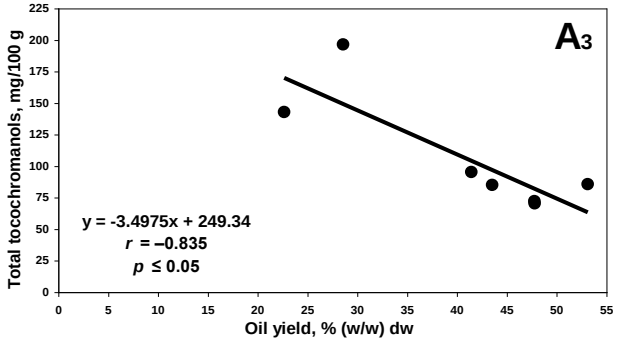
A correlation between oil yield (% (w/w) dw) in plum kernels and content of oleic acid (%) and linoleic acid (%)

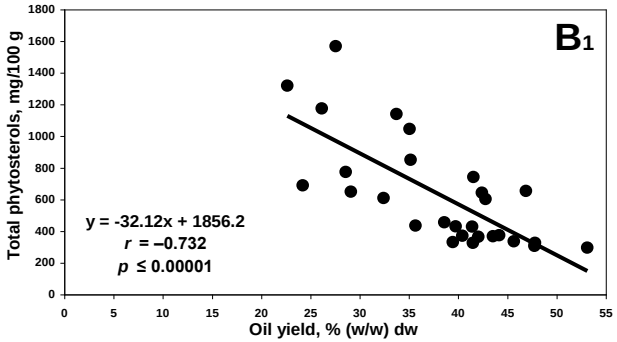


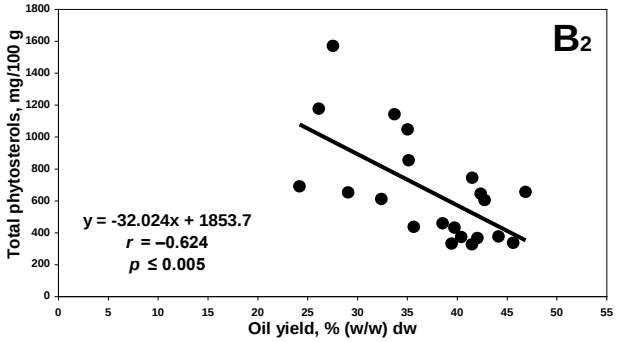
A correlation between oil yield (%, w/w dw) in plum kernels and total content of the tocochromanols, phytosterols, and carotenoids (mg/100 g oil)

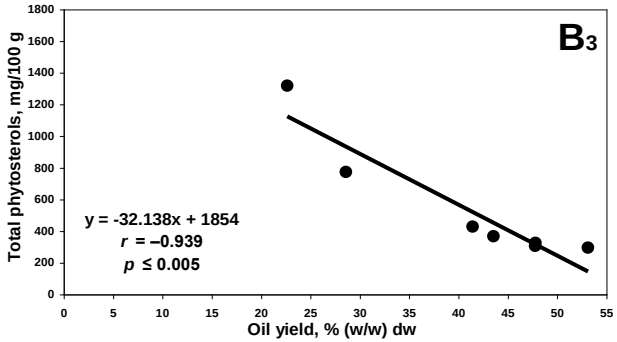


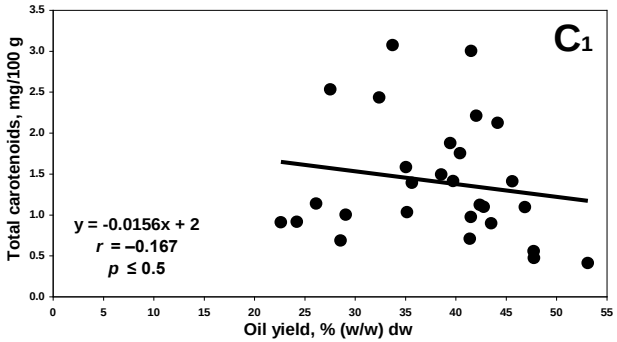


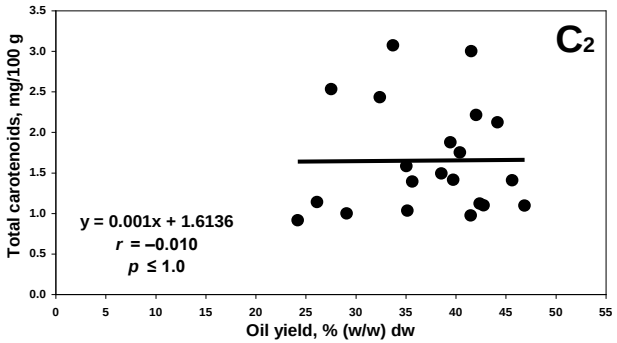


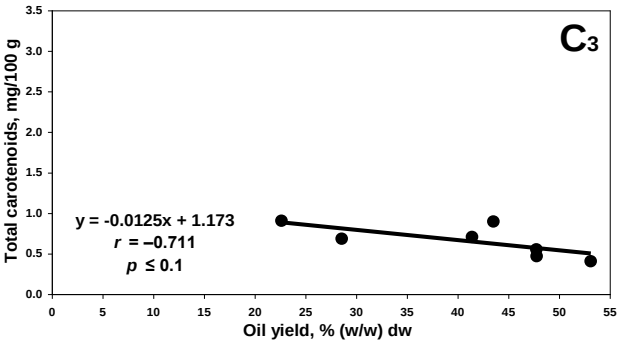












***P. domestica* L. & *P. cerasifera* Ehrh.** ***P. domestica* L.** ***P. cerasifera* Ehrh.**

Conclusions

- The impact of genotype on the oil yield of plum kernels and the oil composition – fatty acids, tocochromanol, carotenoids, sterols, and squalene – was significant.
- The impact of species on the oil yield of plum kernels and the oil composition – fatty acids, tocochromanol, carotenoids, sterols, and squalene – was not significant .
- It should be highlighted, that other factors which could influence the final results, for instance, abiotic factors, were not taken into account in the present study.

References

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Thank you!