
Development of a beverage based on sweet potato peels: formula optimization

Ana Anastácio



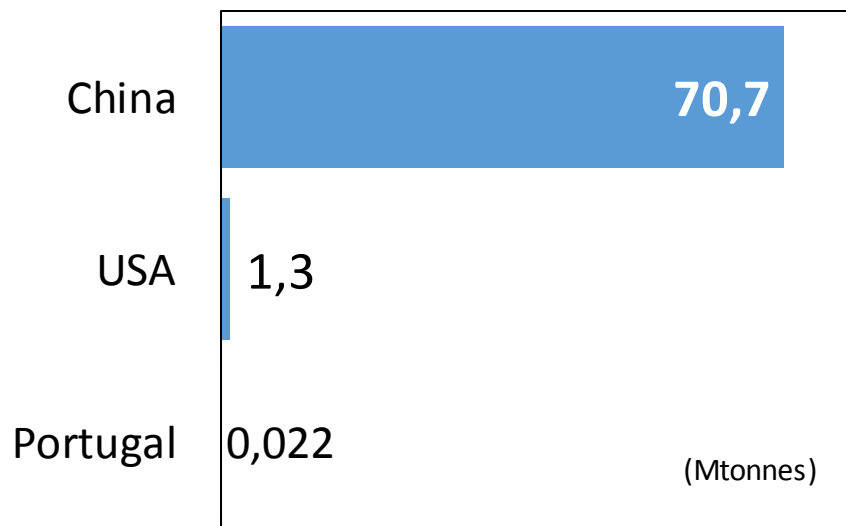
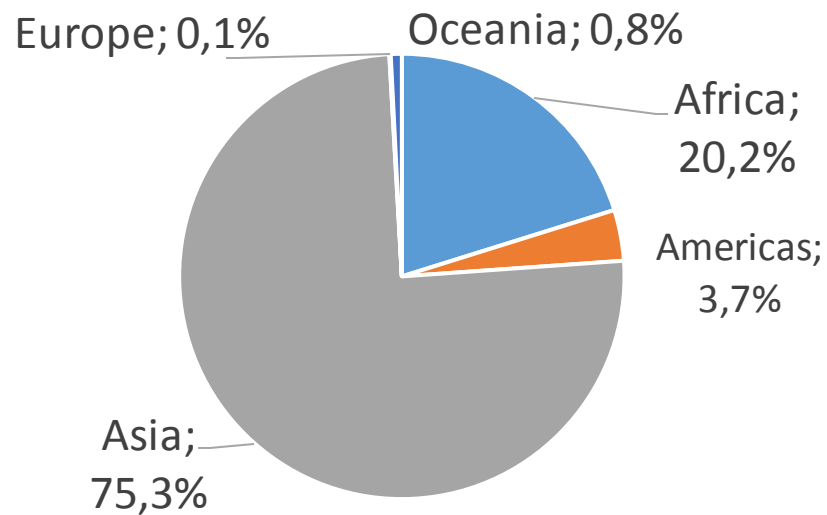
***ANTIOXIDANT AND PHENOLIC COMPOUNDS IN
SWEET POTATO PEELS AND LEAVES:
FOOD APPLICATIONS AND HEALTH BENEFITS***

Doutoramento em Ciências Biotecnológicas/Biotecnologia Alimentar

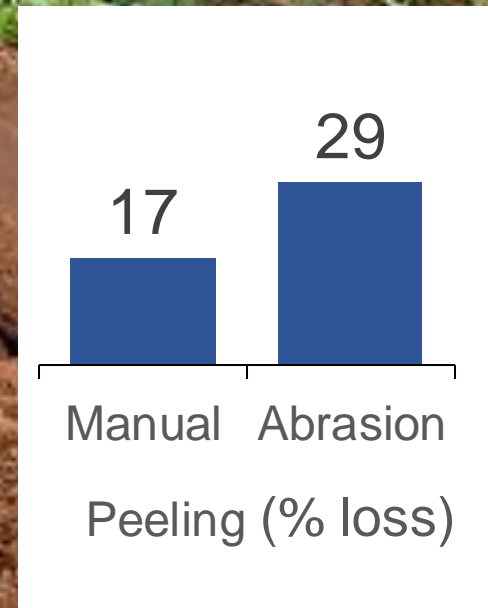
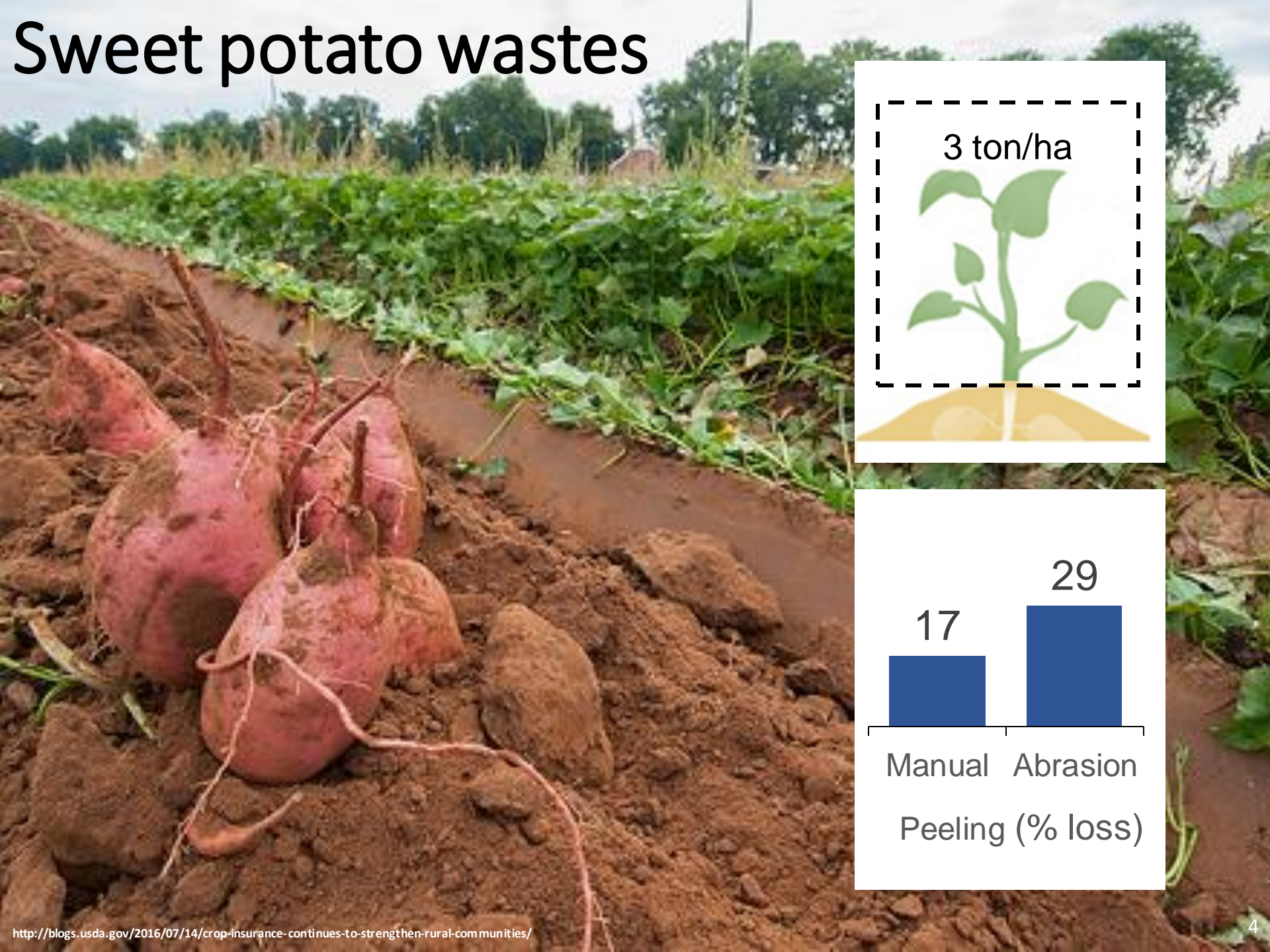
Ana Isabel Mimoso Tomás Coelho Anastácio

Orientadora: Professora Doutora Isabel Maria Marques Saraiva de Carvalho

Production 2014 104 Mtonnes

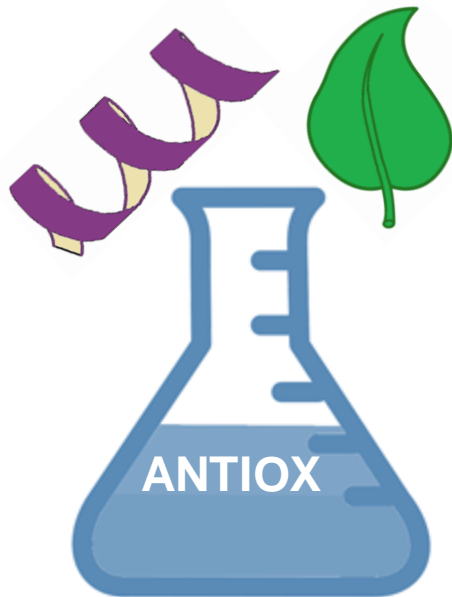


Sweet potato wastes

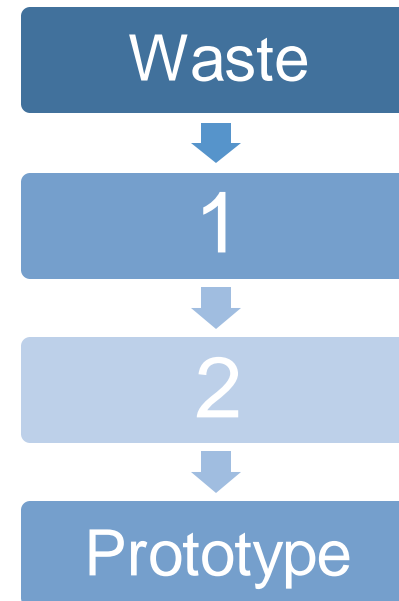


Objectives

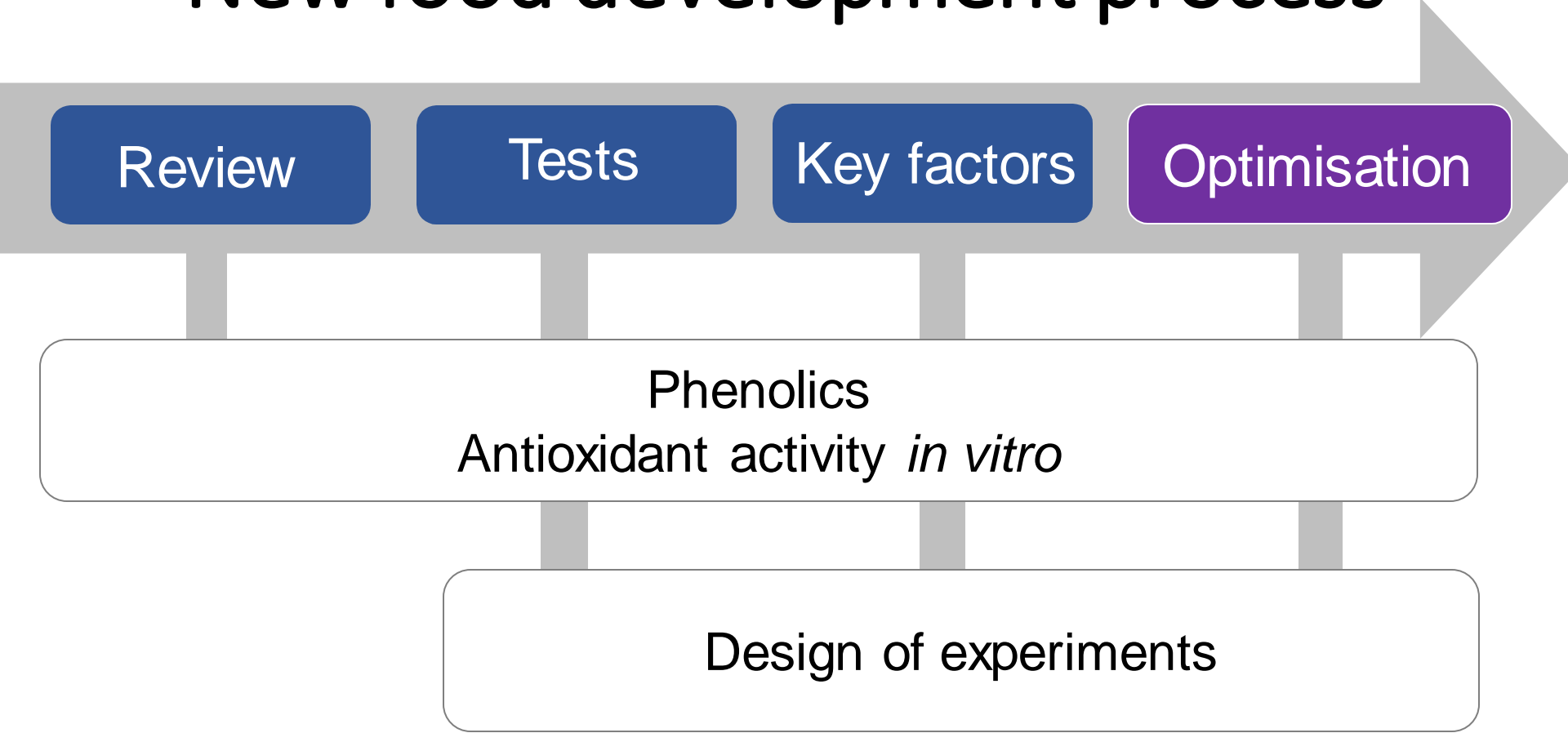
Food prototype



New food development
process



New food development process



ined by k -fold cross-validation method ($k = 6$).
outs were multiplied by weights and computed by
perbolic-tangent activation function in the hidden
er. The number of neurons in the hidden layer was
usted iteratively to maximize performance fitting
etermined by R^2 and root mean-squared error
(MSE). Optimization was performed by maximizing
e desirability function. To compare SPPE beverage
h other antioxidant beverages, data were represented
Box-Cox plots. JMP[®] Pro 10.0.2 software (www.jmp.com)
provided at no cost by SAS (www.sas.com)
s used in the design of experiments, data analysis
d creation of the graphics, except **Figure 2** which

New food development process

Optimisation

Process

Product

Extraction conditions

Beverage formulation



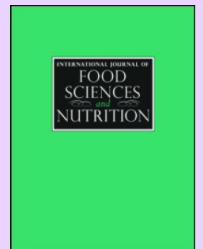


Product optimisation

Objective

- Optimisation of antioxidant beverage formula

Ana Anastácio & Isabel Saraiva de Carvalho (2016): Development of a beverage benchtop prototype based on sweet potato peels: optimization of antioxidant activity by a mixture design, International Journal of Food Sciences and Nutrition, DOI: 10.1080/09637486.2016.1174984.



Previous knowledge

- Sweet potato peels and leaves can be related to health benefits such as oxidative stress reduction.
- Optimized process for antioxidants extraction.
- No patent application on antioxidant beverage with sweet potato peels and leaves.



Product optimisation






RSM

ANN

- Mixture design

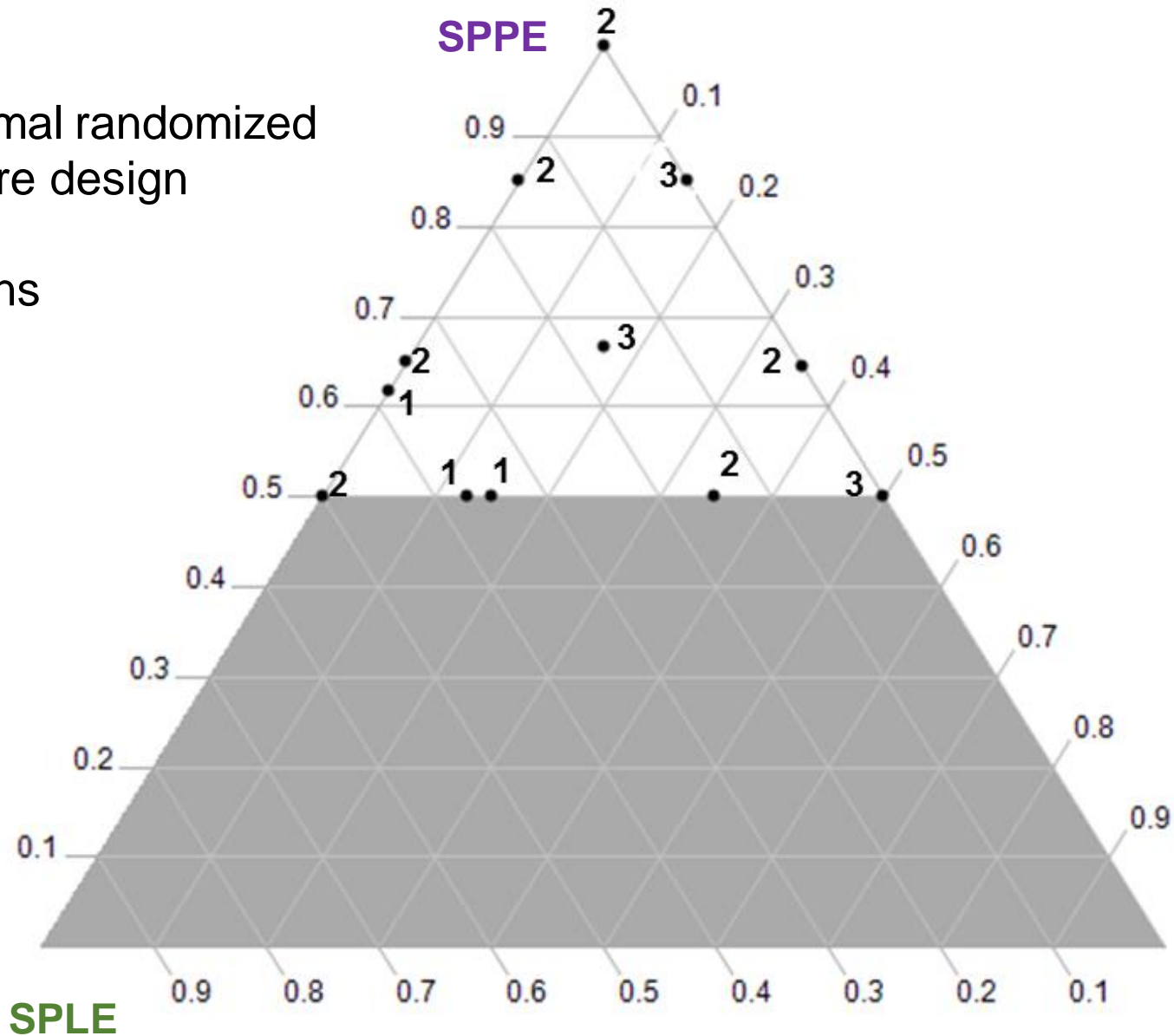
Components

SPPE		50 – 100 %
SPLE		0 – 50 %
HonS		0 – 50 %

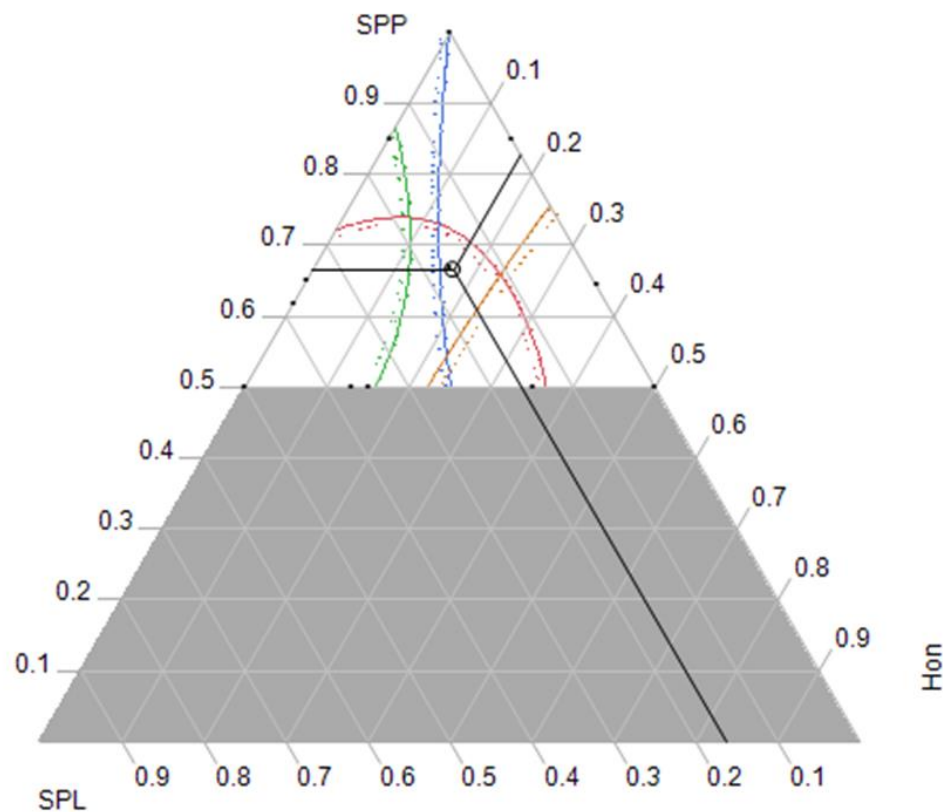
- TPC, FRAP, DPPH assays and SS

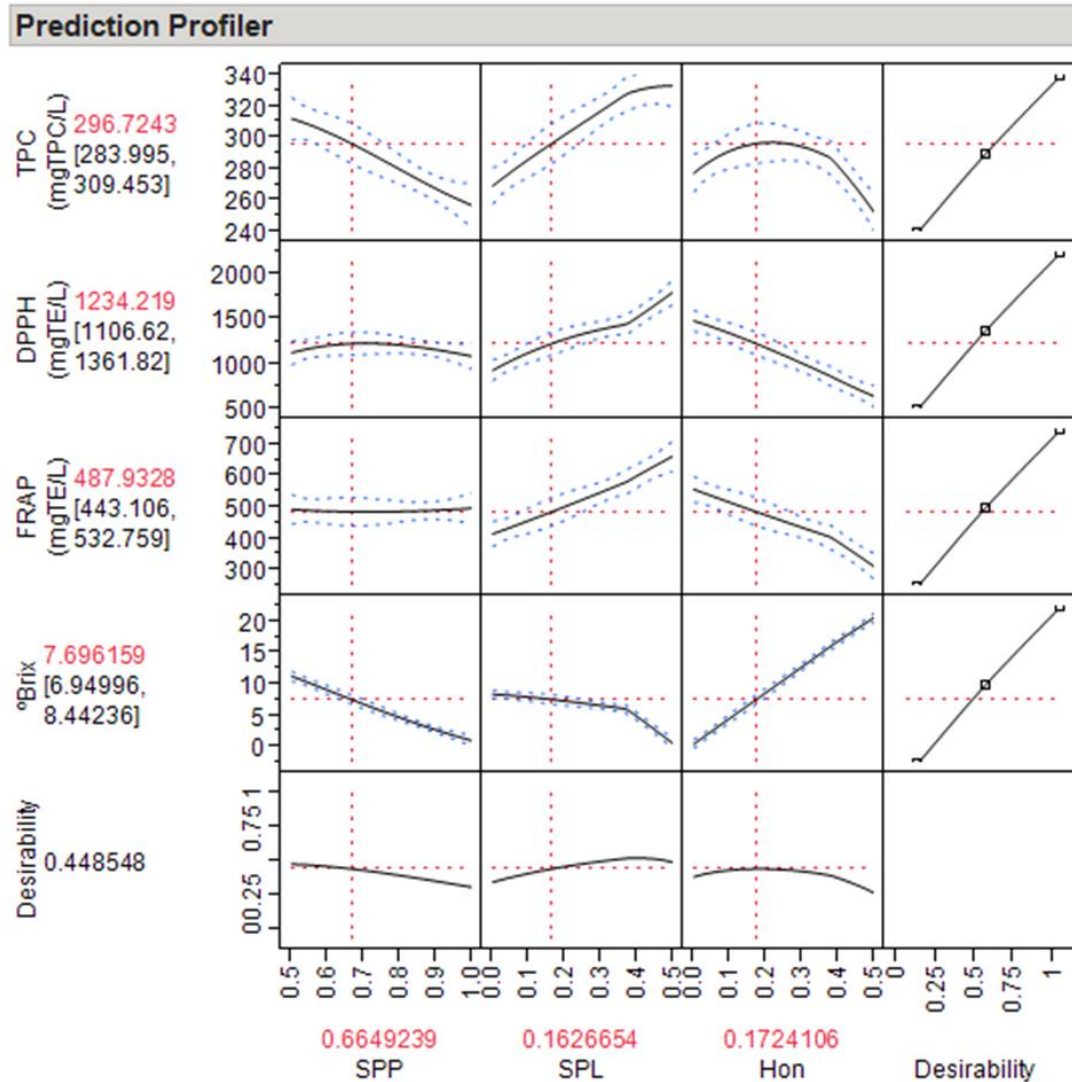
I-optimal randomized
mixture design

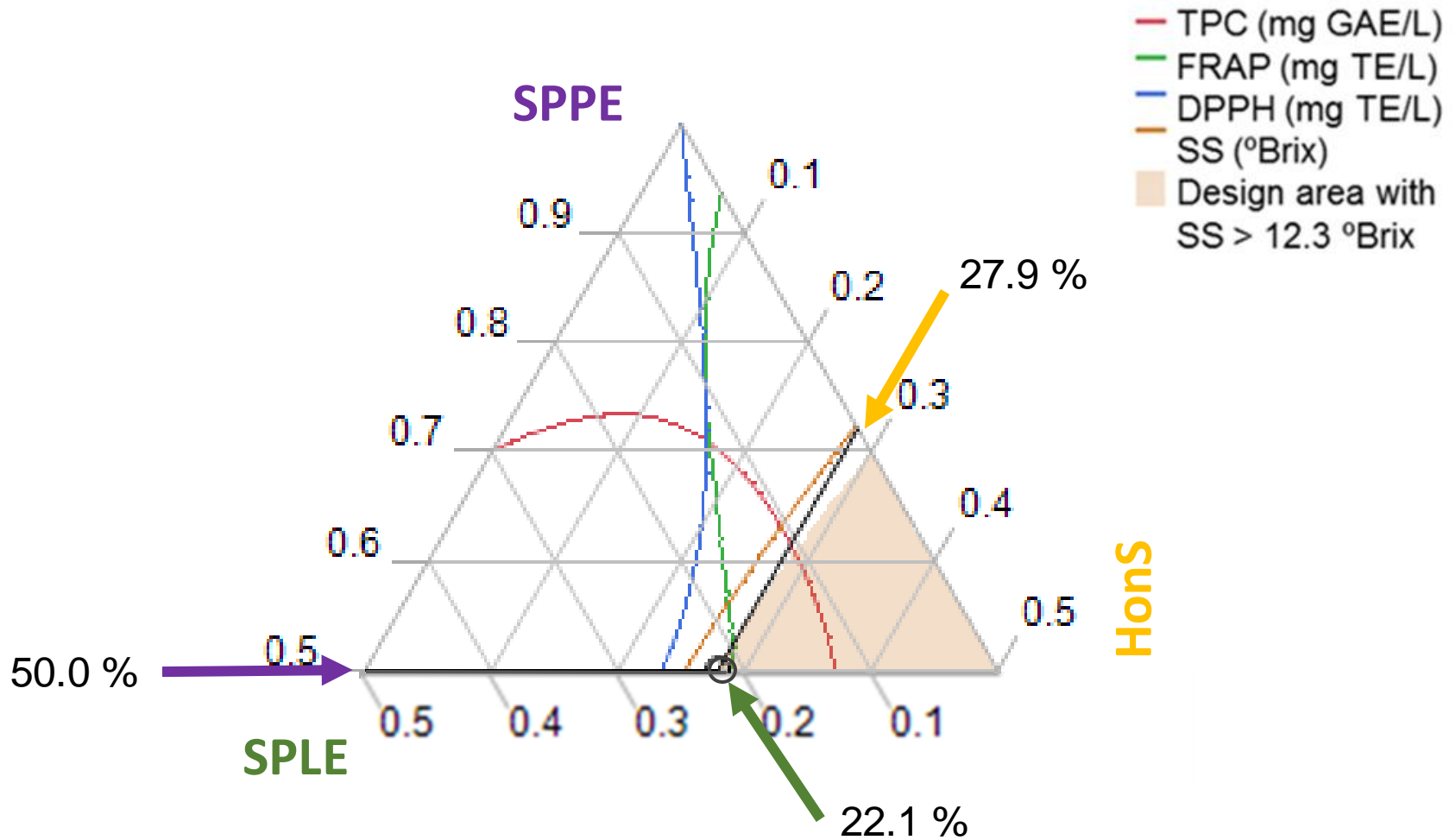
24 runs



Mixture Profiler							
T	L	R	Factor		Current X	Lo Limit	Hi Limit
⊙	○	○	SPP		0.6649239	0.5	1
○	⊙	○	SPL		0.1626654	0	0.5
○	○	⊙	Hon		0.1724106	0	0.5
Response		Contour	Current Y	Lo Limit	Hi Limit		
—	TPC (mgTPC/L)	290	296.72427	.	.		
—	DPPH (mgTE/L)	1375	1234.2194	.	.		
—	FRAP (mgTE/L)	500	487.93284	.	.		
—	°Brix	10	7.6961595	.	.		



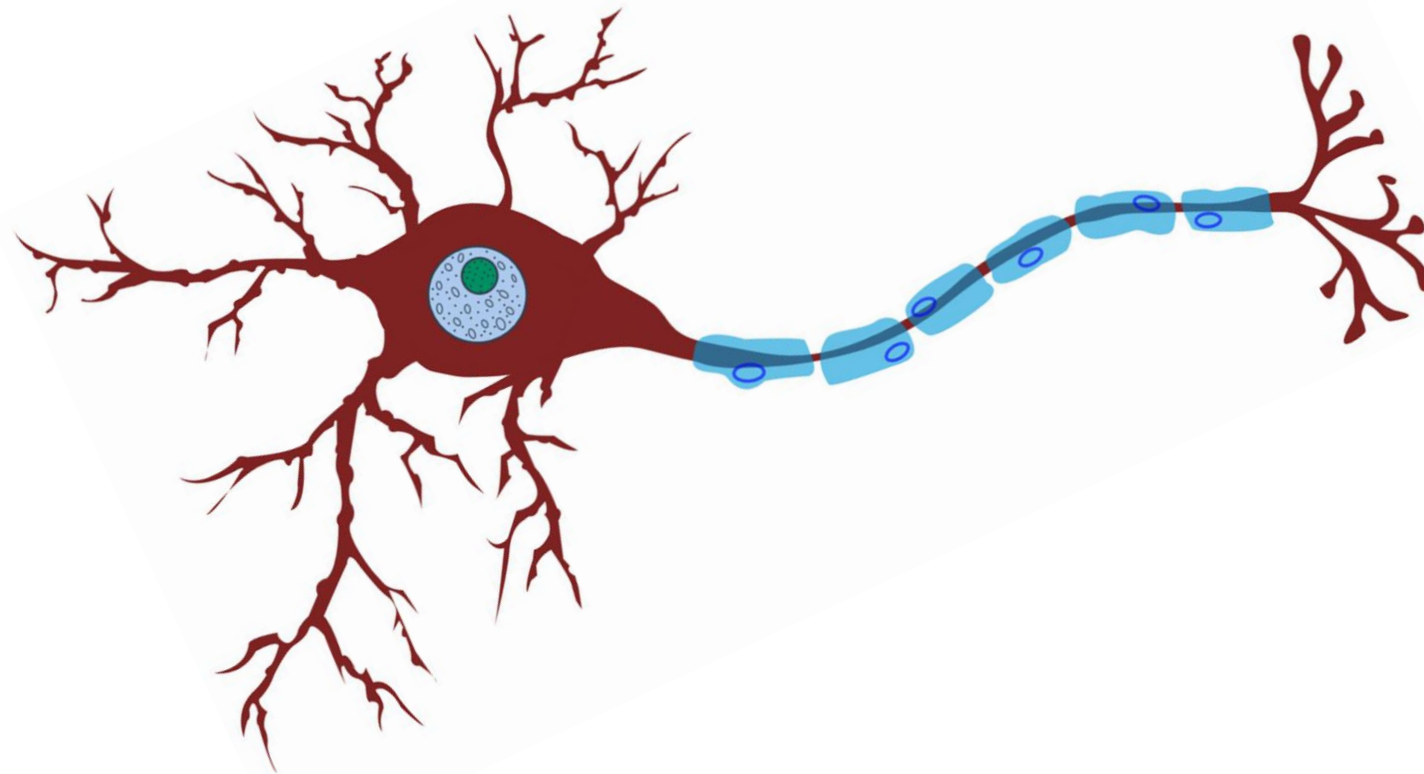




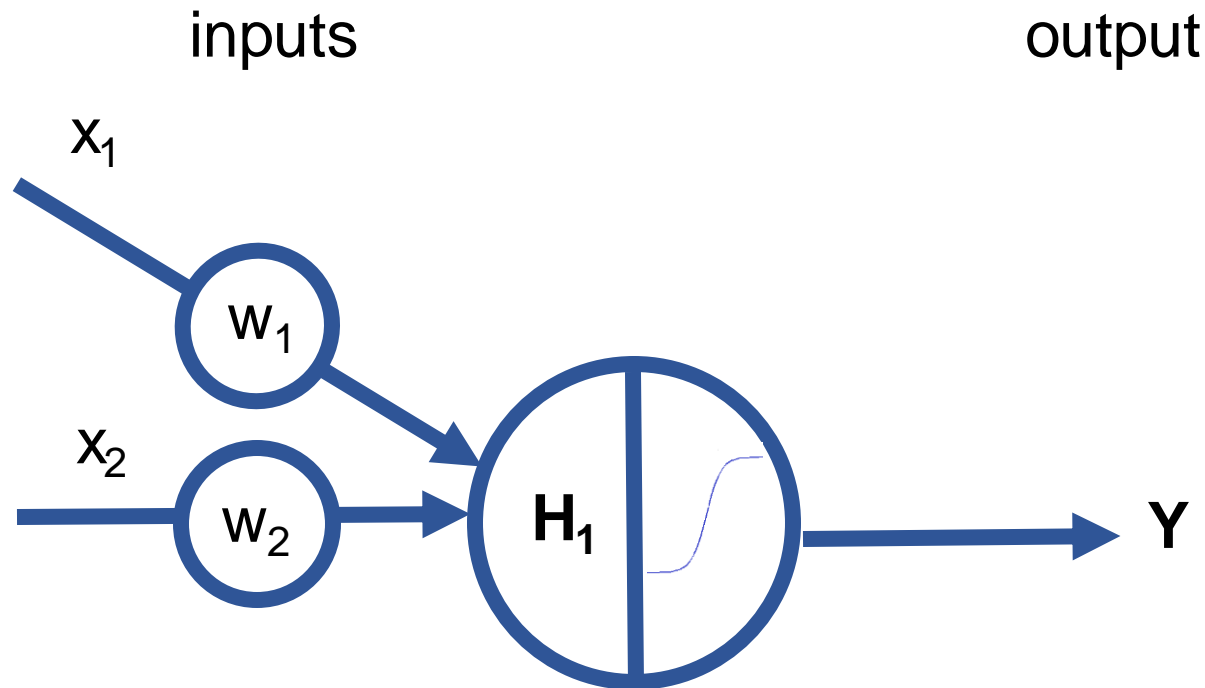
Neuron

inputs

output

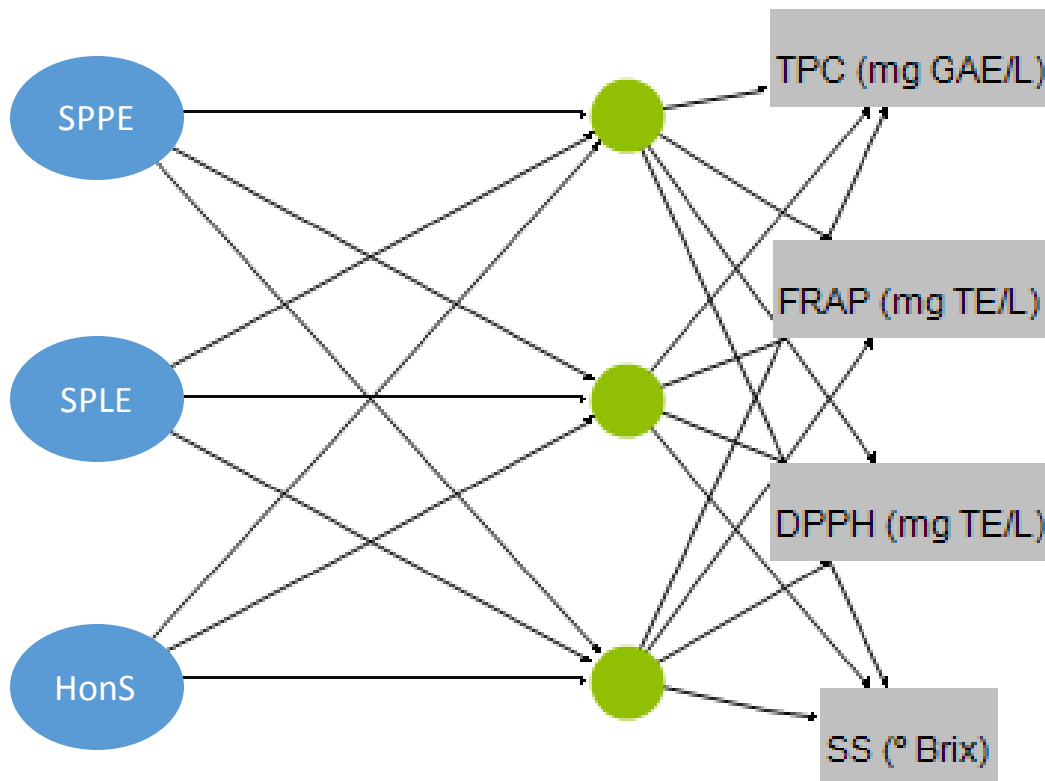


Artificial neuron



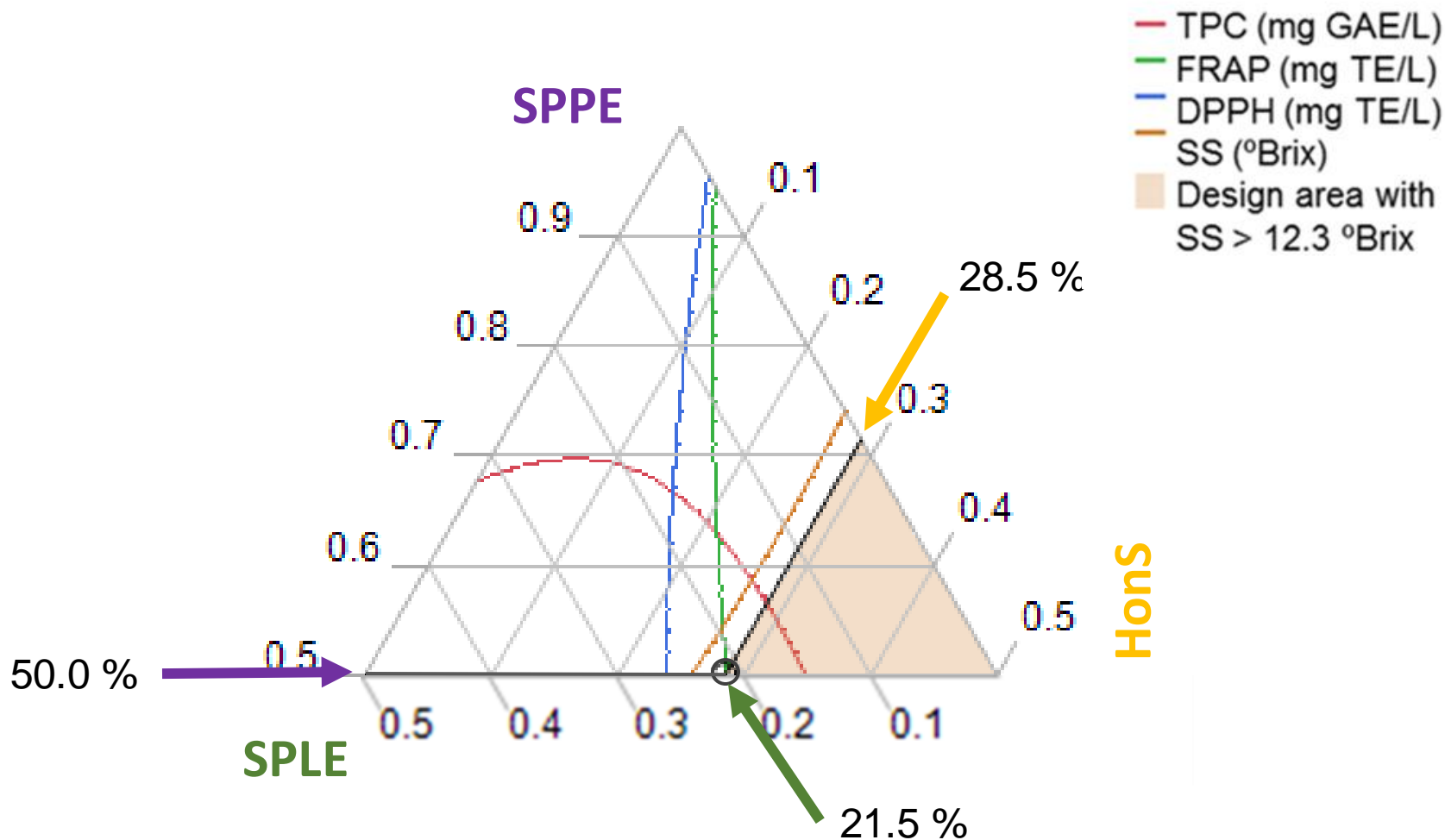
Activation: $H_1 = w_1 x_1 + w_2 x_2$

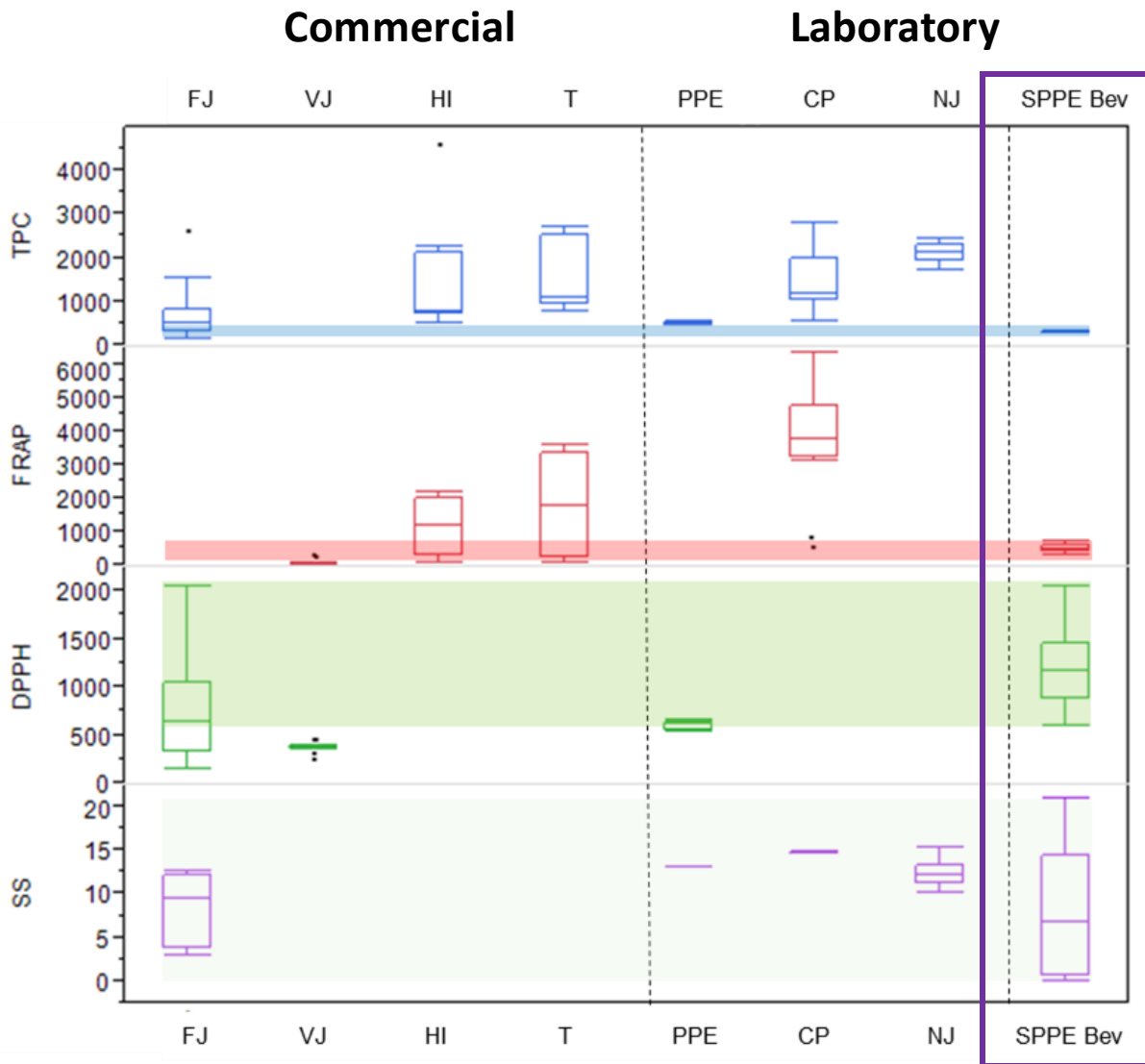
Transformation: $Y = a_0 + a_1 \tanh(0.5 * H_1) + a_2 \tanh(0.5 * H_2)$



$$H_i =$$
$$+ w_{i1} X_1$$
$$+ w_{i2} X_2$$
$$+ w_{i3} X_3$$

$$Y =$$
$$+ a_0$$
$$+ a_1 * \text{Tanh}(0.5 * H_1)$$
$$+ a_2 * \text{Tanh}(0.5 * H_2)$$
$$+ a_3 * \text{Tanh}(0.5 * H_3)$$





FJ: fruit juice

VJ: vegetable juice

HI: herbal infusion

T: tea

PPE: plum peel enriched nectar

CP: cardio protective beverage

NJ: nutraceutical juice

SPPE Bev: sweet potato peel beverage



Formula optimisation

JMP

- Design
- Data visualisation
- Modelling
- Optimisation



1 ORIGINAL ARTICLE

2 **Phenolics extraction from sweet potato peels: modelling**
3 **and optimization by response surface modelling and artificial**
4 **neural network**

5 Ana Anastácio¹ · Rúben Silva¹ · Isabel S. Carvalho¹

INTERNATIONAL JOURNAL OF FOOD SCIENCES AND NUTRITION, 2016
<http://dx.doi.org/10.1080/09637486.2016.1174984>



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RESEARCH ARTICLE

Development of a beverage benchtop prototype based on sweet potato peels: optimization of antioxidant activity by a mixture design

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Thank you.

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