PECTIN OPTIMIZATION EXTRACTION FROM WATERMELLON WASTE

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WHERE WE ARE?


Brasil
ACRE
RONDÔNIA
MATO GROSSO
TOCANTINS
PIAUÍ
CEARÁ
PERNAMBUCO
BAHIA
SERGIPE
Salvador
GOIÁS
Brasília
MINAS GERAIS
ESPÍRITO SANTO
MATO GROSSO DO SUL
SÃO PAULO
RIO DE JANEIRO
PARANÁ
SANTA CATARINA
RIO GRANDE
Peru
Lima
Bolívia
Paraguai
Assunção
Chile

RIO VERDE - GO


Helena
de Goiás
GO-407
GO-210
Rio Verde
Santa Helena
de Goiás
GO-210
060
060
452
GO-164
452
GO-174
GO-164
GO-501
Google

RIO VERDE – GO

POPULATION: 229,651

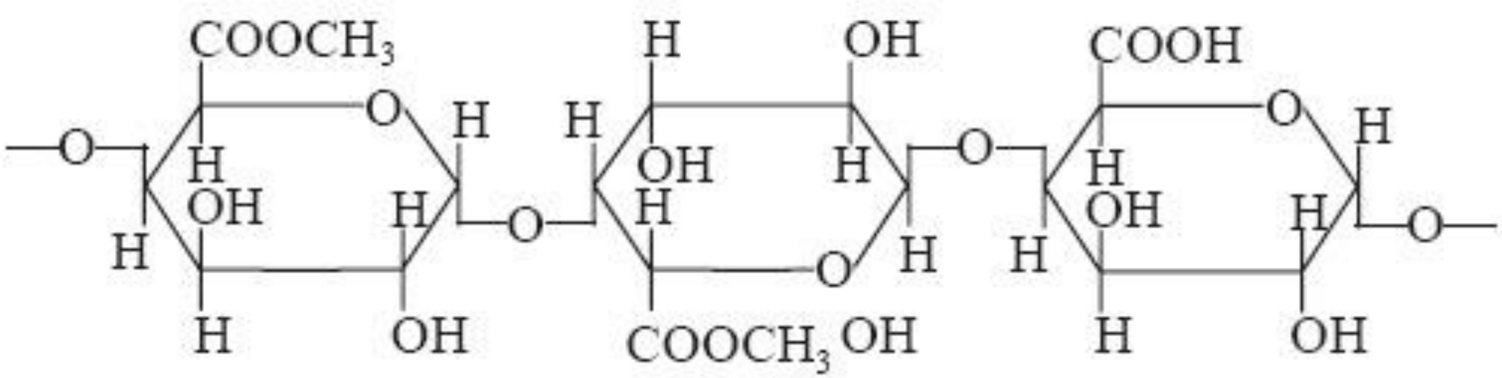
GDP = U$ 2 BILLIONS (112º - 0,13%)

AGROBUSINESS:

- SOY, CORN, RICE, COTTON, BEANS, SUNFLOWER, SWINES, POULTRY, CATTLE.

WATERMELLON WASTE
2 MILLON TONS PER YEAR

PECTIN



Pectin Galacturonan

- Complex polysaccaharide
- Mostly: Homogalacturonan
- Occurrence in plant cell walls
- Application in Food Industry
- Market Price: U$ 12-16/ton

GOAL

EXPLORE WATERMELLON WASTE AS SOURCE OF PECTIN

MATERIAL AND METHODS

Waste collection

Sanitization

Drying

Milled

Sieved

Obtained Watermellon Flour

used for pectin extracion: Box-Behnken

Physico-chemical Analysis

RESULTS AND DISCUSSION

Table 1. Mean values for Moisture content (Tu), ash content (Tcz), ethereal extract (Tee), Total Protein content (Tpb), and total soluble solids (TSS) . Values are means ± SD.

Sample	Tu (%)	Tcz (%)	Tee (%)	Tpb (%)	TSS (%)
WF	6,70 ± 0,03	8,87 ± 0,08	0,67 ± 0,10	4,49 ± 0,18	1,8 ± 0,00

RESULTS AND DISCUSSION

Table 2. Mean values of β-carotene, lycopene, chlorophyll a and b analysis for flour samples (mg 100 mg^{-1} DM).

Values are means ± SD.

Sample	b-carotene	Licopene	Chlorophyll a	Chlorophyll b
WF	62 ± 0	96 ± 0	284 ± 0	44 ± 0

Table 3. Colorimetry (L *, a *, b *) of FW sample by CIELab system.

Sample	Color			Picture
	L*	a*	b*	
WF	79.06 ± 0.00	3.50 ± 0.00	18.00 ± 0.01	

Where L* stands for lightness, **a*** green-red and **b*** blue-yellow components.

Values are means ± SD for five different measures.

Table 4. pH and HCV for WF sample. Values are means ± SD.

Sample	pH	HCV (KJ Kg^{-1})
WF	4.40 ± 0.00	14,987 ± 0

Table 5. Flour gel formation for WF samples. Signs indicate (-) No gel formation, (±) Weak gel formation and (+) Resistant Gel Formation.

Sample	Flour Gel Formation (% m/v)						
WF	2%	6%	10%	14%	18%	22%	26%
	±	±	+	+	+	+	+

PECTIN EXTRACTION OPTIMIZATION

Box-Behnken Design

Variables:
Citrc Acid Concentration: 0.5 – 1.0 M
Time: 10 – 90 min
Temperature: 15 – 45 °C

12 Experimental conditions + Central Point

ANOVA

Model

Linear– Citric Acid Concentration and Temperature were significant (p value < 0,05)

Quadratic - Linear– Citric Acid Concentration and Temperature were significant(p value < 0,05)

2-way Interactions:

Only Acid*Temperature was significant

MODEL SUMARY

S	R2	R2(aj)	R2(pred)
3,29	91,08%	87,06%	78,42%

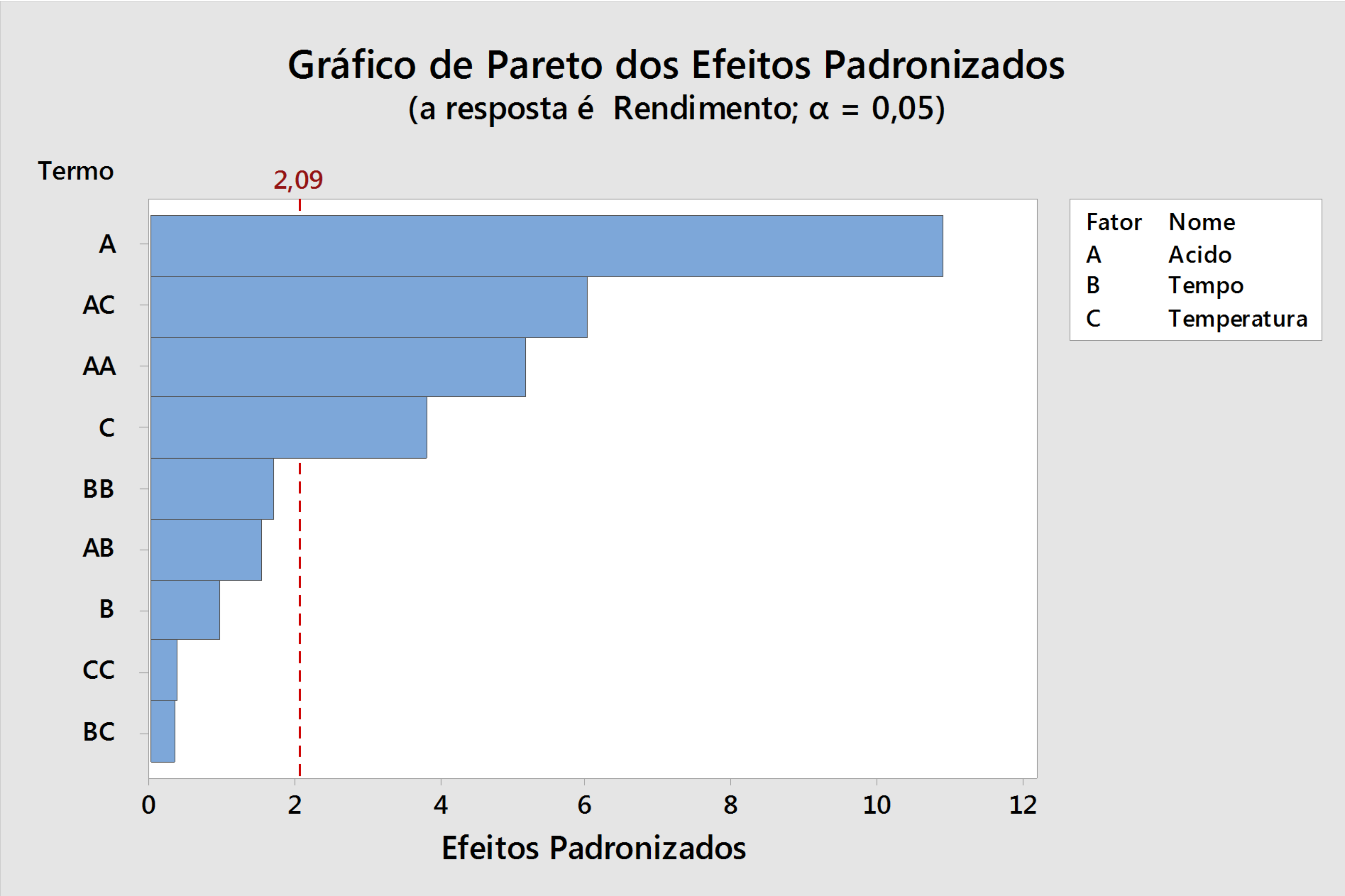


Gráfico de Pareto dos Efeitos Padronizados
(a resposta é Rendimento; α = 0,05)
Termo
2,09
A
AC
AA
C
BB
AB
B
CC
BC
0
2
4
6
8
10
12
Efeitos Padronizados
Fator Nome
A Acido
B Tempo
C Temperatura

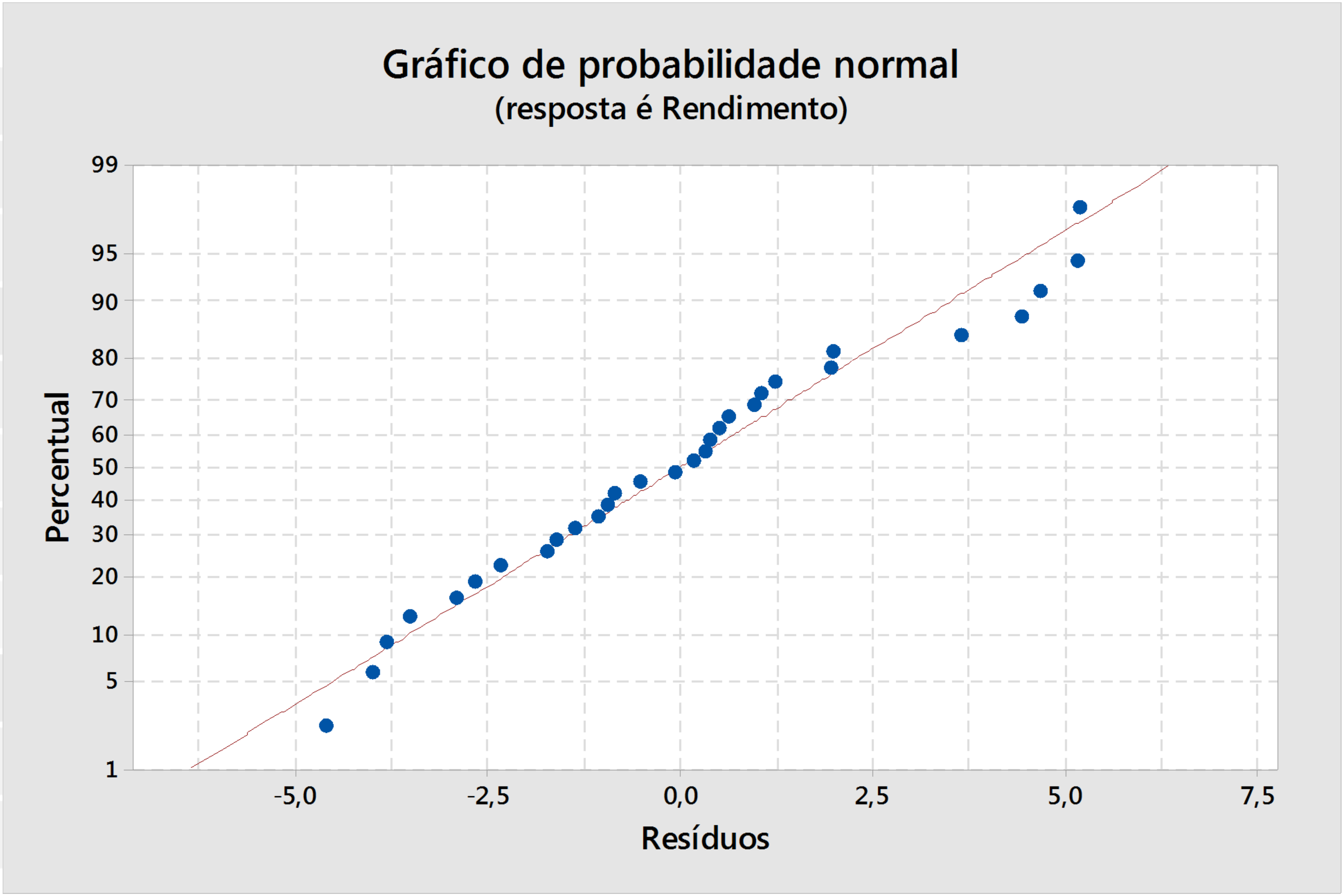


Gráfico de probabilidade normal
(resposta é Rendimento)
Percentual
99
95
90
80
70
60
50
40
30
20
10
5
1
-5,0
-2,5
0,0
2,5
5,0
7,5
Resíduos

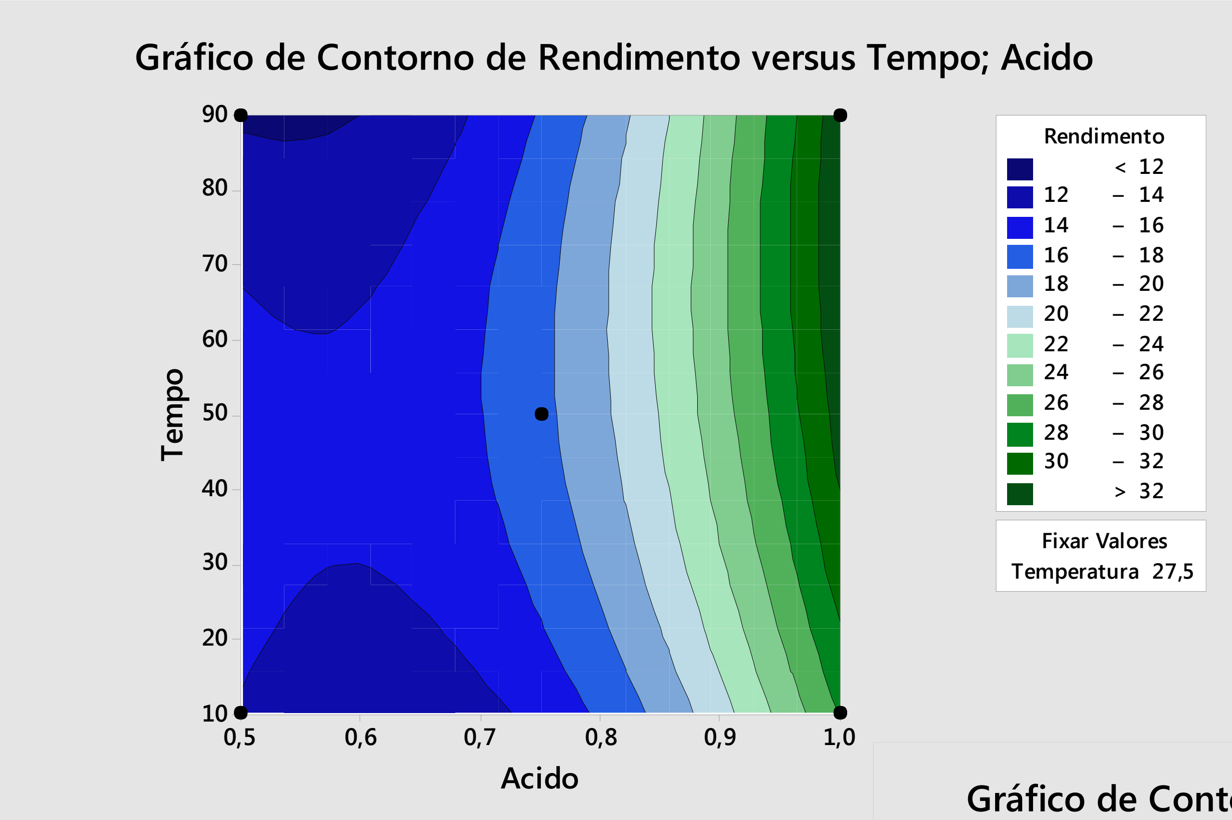


Gráfico de Contorno de Rendimento versus Tempo; Acido
Tempo
Acido
90
80
70
60
50
40
30
20
10
0,5
0,6
0,7
0,8
0,9
1,0
Rendimento
< 12
12 – 14
14 – 16
16 – 18
18 – 20
20 – 22
22 – 24
24 – 26
26 – 28
28 – 30
30 – 32
> 32
Fixar Valores
Temperatura 27,5

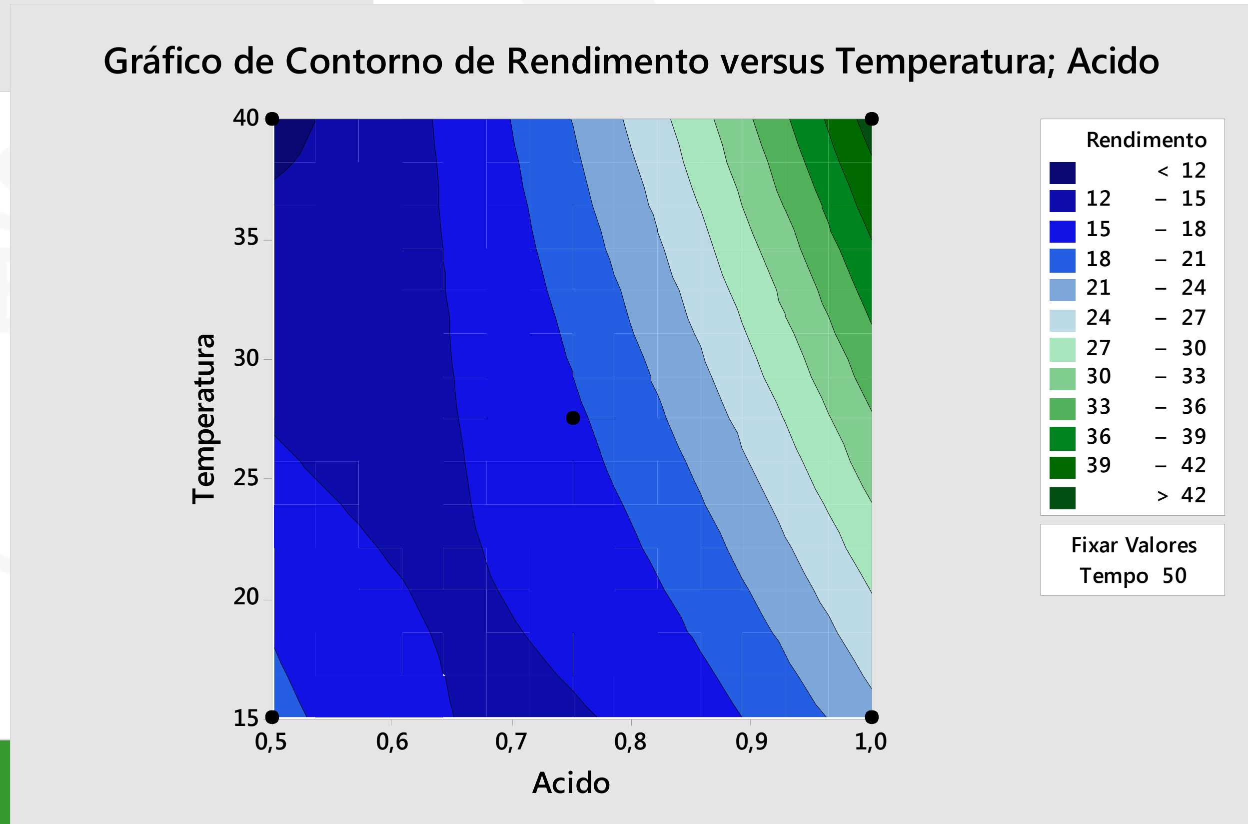
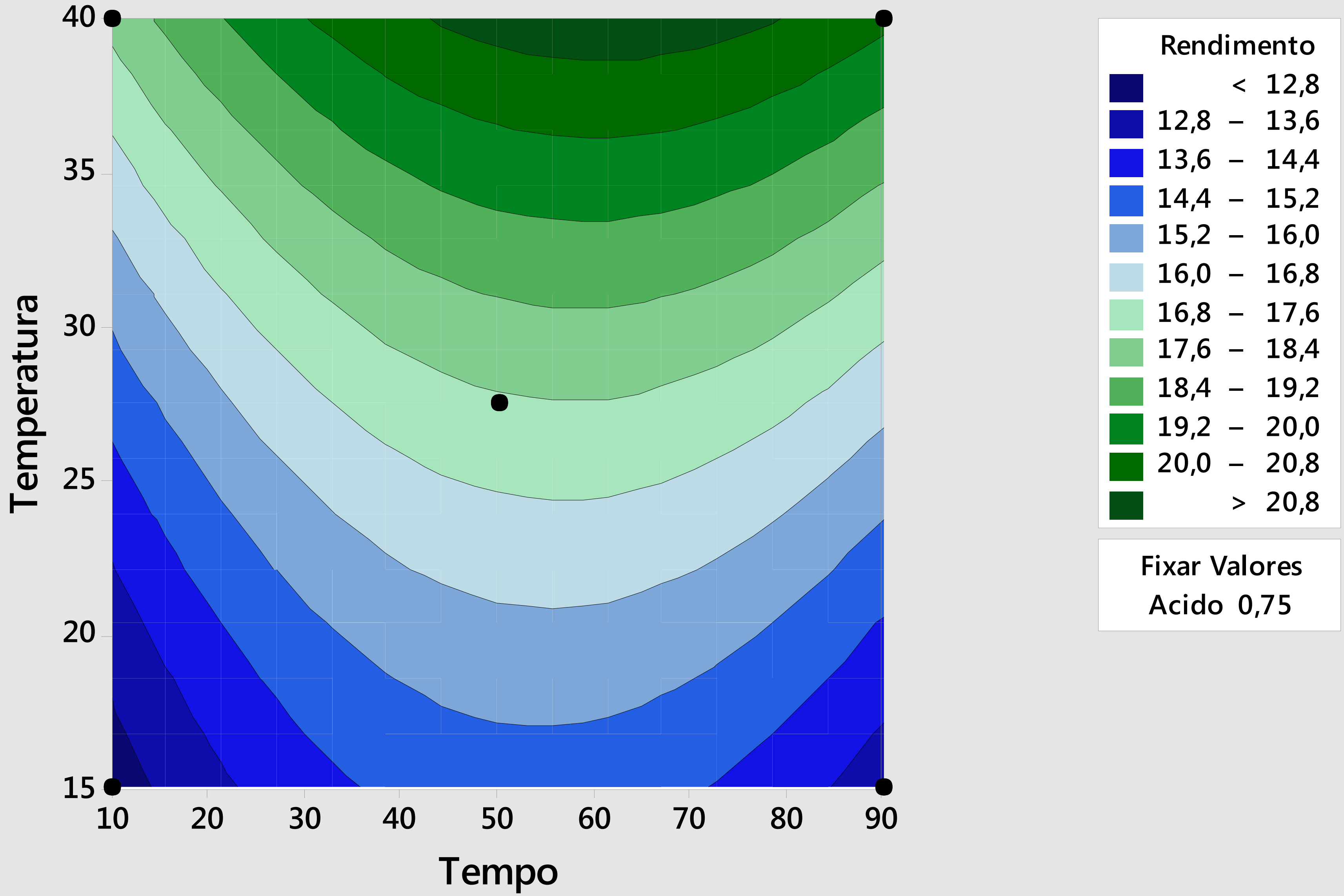


Gráfico de Contorno de Rendimento versus Temperatura; Acido
Temperatura
Acido
40
35
30
25
20
15
0,5
0,6
0,7
0,8
0,9
1,0
Rendimento
< 12
12 – 15
15 – 18
18 – 21
21 – 24
24 – 27
27 – 30
30 – 33
33 – 36
36 – 39
39 – 42
> 42
Fixar Valores
Tempo 50

Gráfico de Contorno de Rendimento versus Temperatura; Tempo



Solutions for maximum extration yield.
Solution 1 indicates citric acid concentration of citric acid of 1 M with a extraction time of 78.6 minutes at 40 ° C, and a predicted mass yield of 44.3%.
Solution 2 uses the same values for acid concentration and temperature, but with a time greater than 89.8 minutes, with a predicted yield extraction efficiency of 44.2%.

Table 6 – Extracted and Commercial Pectin Physico –chemical Analysis

Analysis	Watermelon Pectin	Comercial Citrus Pectin
Z (mEq.)	412,92	2672,83
AUA %	42,6	6,6
MeO	0,3	0,7
AC	42,9	7,3
NF	57,1	92,7
DE %	3,76	59,46
pH	2,53 ± 0,02	3,37 ± 0,01

CONCLUSIONS AND PERSPECTIVES

1. Watermellon waste can be used as pectin source (Yield > 44%).
2. Extracted pectin can be used as gellifing food aditive.

Low cost – Low tech procedure for small farmers

ACKNOWLEDGEMENTS

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FINEP

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CAPES

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THANK YOU

QUITEC

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