

# The role of CACTUS PEARS for human consumption

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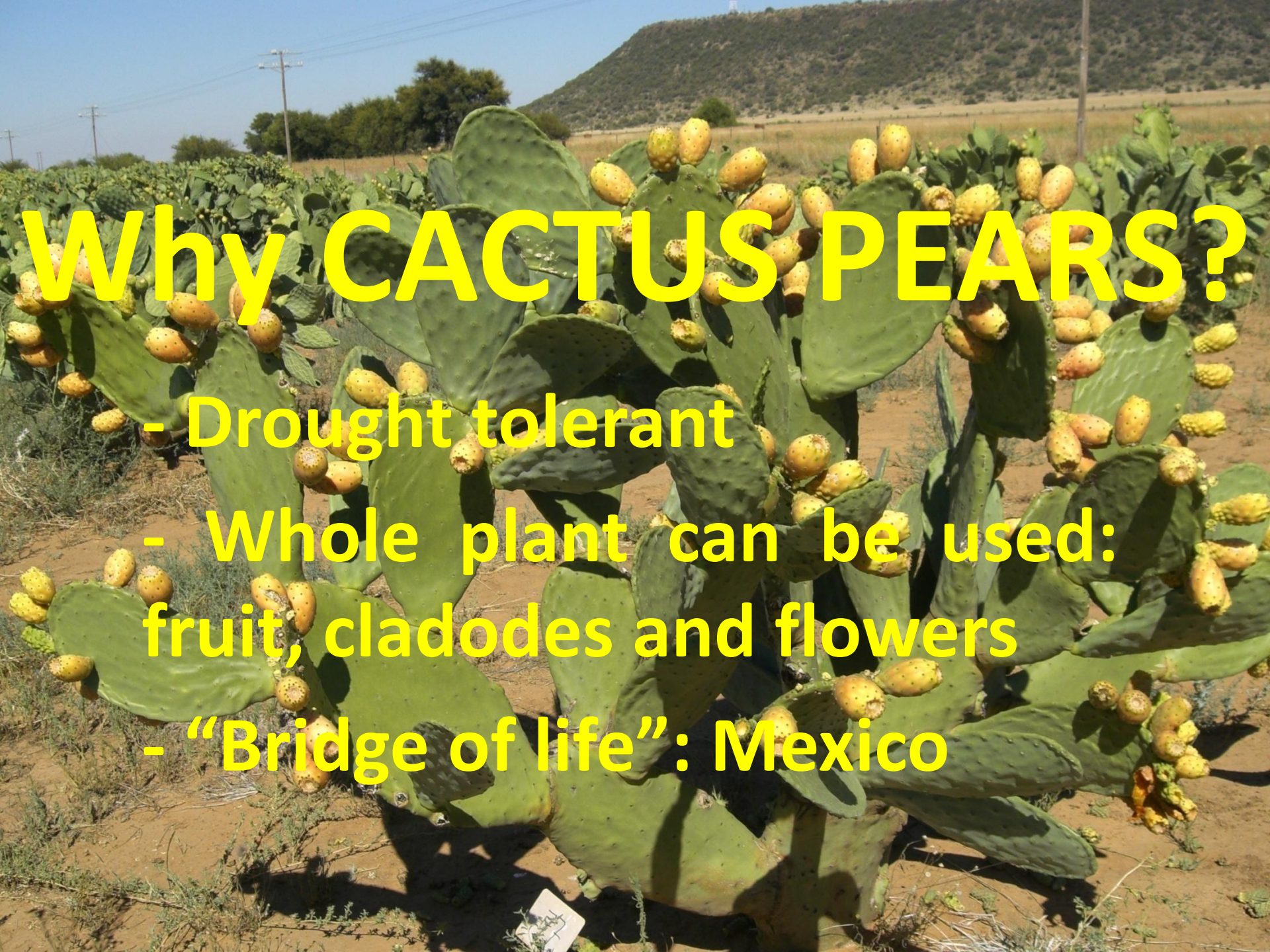
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NATUUR- EN  
LANDBOUWETENSKAPPE





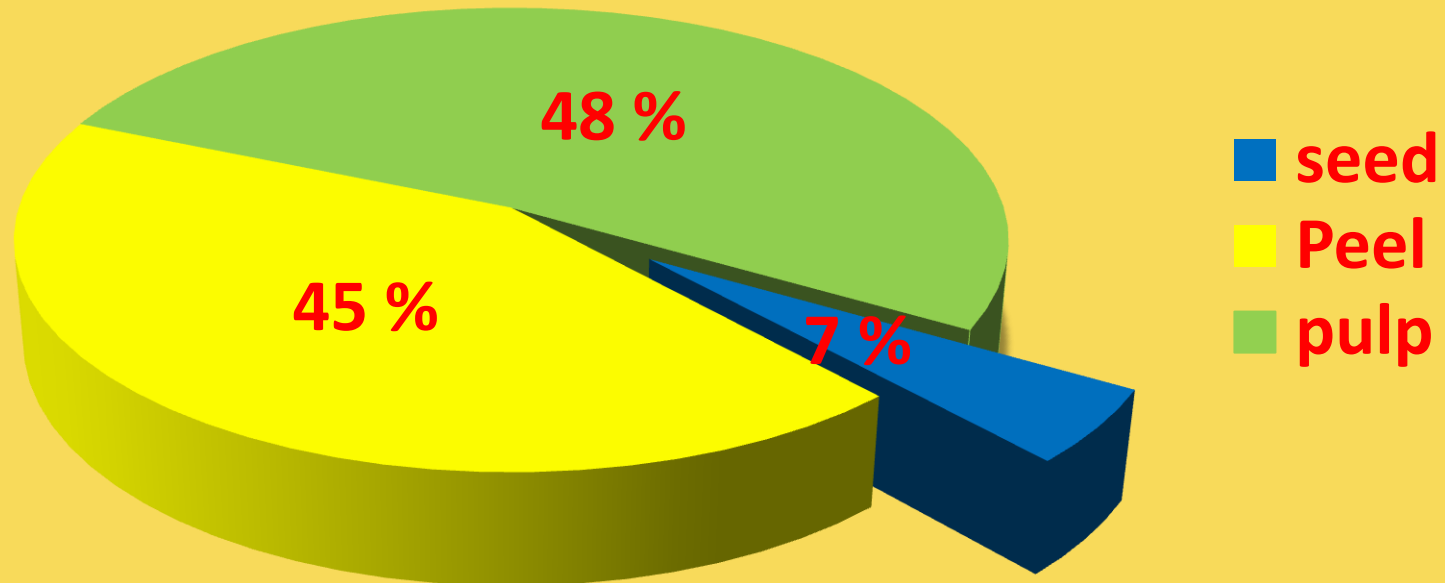
# Why CACTUS PEARS?

- Drought tolerant
- Whole plant can be used: fruit, cladodes and flowers
- “Bridge of life”: Mexico



# CHEMICAL COMPOSITION

## Fruit Composition



Fruit consists of:

- 48 % peel
- 45 % filtered pulp
- 7 % seeds



# CHEMICAL COMPOSITION

Constituent	Cladode (dry mass) (%)	Cladode (wet mass) (%)	Fruit pulp (%)
Water	-	88 - 95	84 - 90
Carbohydrates	64 - 71	3 - 7	12 - 17
Ash	19 – 23	1 - 2	0.3 - 1
Fibre	18	1 - 2	0.02 - 3.15
Proteins	4 - 10	0.5 - 1	0.21 - 1.6
Lipids	1 - 4	0.2	0.09 - 0.7
Vitamin C		7 - 22 mg	12 - 81 mg
Calcium	5.6 mg		12.8 - 59 mg
Magnesium	0.2 mg		16.1 - 98.4 mg
Potassium	2.3 mg		90 - 220 mg
Phosphorous	0.1 mg		15 - 32.8 mg
Iron	0.14 µg		0.4- 1.5 mg



# CHEMICAL COMPOSITION

Constituent	Fruit pulp (%)	Orange	Pawpaw
Water	84 - 90	87.8	88.7
<b>Carbohydrates</b>	<b>12 - 17</b>	<b>11</b>	<b>10</b>
Ash	0.3 - 1	0.4	0.6
Fibre	0.02 - 3.15	0.5	0.8
Proteins	0.21 - 1.6	0.4	0.6
Lipids	0.09 - 0.7	0.1	0.1
<b>Vitamin C</b>	<b>12 - 81 mg</b>	<b>50</b>	<b>50</b>
Calcium	12.8 - 59 mg	40	20
Magnesium	16.1 - 98.4 mg	> other fruit	
Potassium	90 - 220 mg		
Phosphorous	15 - 32.8 mg	= cherry, apricot, watermelon	
Iron	0.4 - 1.5 mg		

# CHEMICAL COMPOSITION

- Nutritional value same as other fruit
- Energy value same as apple, pear, orange, apricot
- TSS > 16 % (> as prune, apricot, peach, apple, cherry and watermelon)
- Technological properties:

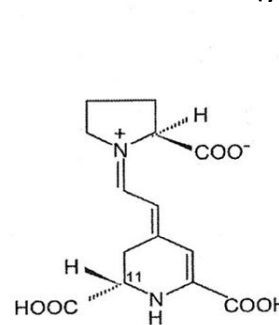
Parameters	Green pulp	Purple pulp	Importance
pH	5.3 - 7.1	5.9 - 6.2	Juice
Acidity(% citric acid)	0.01 - 0.18	0.03 - 0.04	Juice
Dissolved solids (°Brix)	12 - 17	12.8 - 14.5	
Pectin (g/100g)	0.17 - 0.19	-	Juice, marmalade, jelly
Vitamin C (mg/100g)	4.6 - 41.0	20.0 - 31.5	
Calcium (mg/100g)	12.8 - 27.6	-	



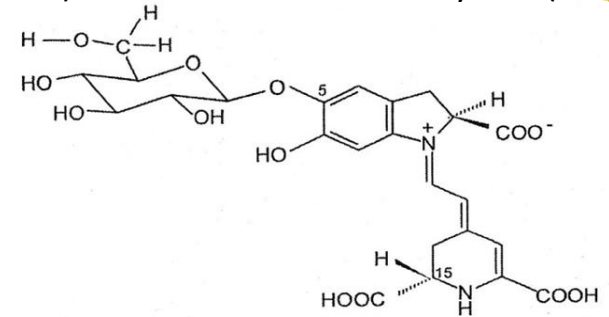
# CHEMICAL COMPOSITION

- Other components:
  - Protein (0.2 - 1.6 %), Fat (0.1 – 0.7 %), Fibre (0.02 - 3.15 %)
- Free amino acids: 257 mg/100 g
- Total sugars: 6 – 14 %, glucose and fructose
- Fruit mass: 80 – 160 g
  - 120 – 160 g = 1<sup>st</sup> class, > 160 g = extra large
- Cladodes – ‘nopalitos’
- Pigments: betalains, carotenes
- Antioxidants:
  - Vitamin C, betalains,
  - phenols, carotenes

Betaxanthin (yellow)



betacyanin (red)



# USES

- **GENERAL USES:**

- food for humans and animals
- security (fences) and control of soil-erosion
- by-products like humectants, carminic acid, additives, paper
- natural colourants
- flowers
- energy (ethanol + methane gas)
- medical applications
- cosmetics







# USES

- **A) FOOD USES:**

Cladodes	Fruit
- Fodder	- Fresh
- Food for cochineal insect ( <i>Dactylopius coccus costa</i> ) – important for carmine dye	- Fresh juice / pulp
- Nopalitos	- Jam
- Alcohol	- Alcoholic beverages
- Jam	- Tuna “cheese”
	- Dried sheets
	- Liquid sweeteners



# USES

- **A) NUTRITIONAL USES:**

Products		By-products
Fruit	Cladode	Fruit and cladode
- juice and nectar	- brine and pickled	- <b>oil from seeds</b>
- marmalade, jelly, jam	- <b>sweets</b>	- <b>mucilage from cladode</b>
- dried fruit	- marmalade, jam	- pigments from skin
- sweeteners	- <b>flour</b>	- <b>dietary fibre from cladode</b>
- alcohol and wine	- sauce	
- tinned fruit	- alcohol	
- frozen fruit	- edible films	





# USES

- **B) MEDICINAL USES:**

Cladodes	Fruit
- anti-viral	- anti- cancer (prevent proliferation of cells and suppress tumor growth)
- anti-inflammatory	-anti-oxidants (vitamin C, carotenoids, certain amino acids, betalains)
- pain killers (analgesic)	- anti-inflammatory
- anti-diabetic (lower blood glucose and haemoglobin levels)	- ulcers, allergies, fatigue, rheumatism, diureticum, “hangovers”
- high fibre	
- anti-hypercholesterolemia (lower cholesterol and change LDL)	



# USES

- **C) INDUSTRIAL USES:**

Cladodes	Fruit
- shampoo, face – and skin creams, soap, hair gel, sun screens	- pulp and skin: natural colourants (betalains)
- bio-ethanol, bio-methane gas	- juice: sweeteners and colourants
- proteins (76.6% similarity to egg proteins)	- seeds: oils especially unsaturated fatty acids, e.g. Linoleic acid
- veterinary phytotherapy	- peels: pectin
- carminic acid dye from Cochineal	- juice: single cell proteins
	- juice: fermentation substrate (tequila-like, Colonche, Pulque)
	- juice: substrate for production of red pigment by <i>Monascus</i>
	- juice: microbial oil production (poly-unsaturated fatty acids)



# RESEARCH

- Most research done on cactus pear as fodder
- Focus on alternative uses of cactus pear plant (cladodes, fruits and seeds) in food industry



# Products - Fruit

Fresh



Jellies



Preserves



Chutney





# Products - Cladodes

Chutney



Juice

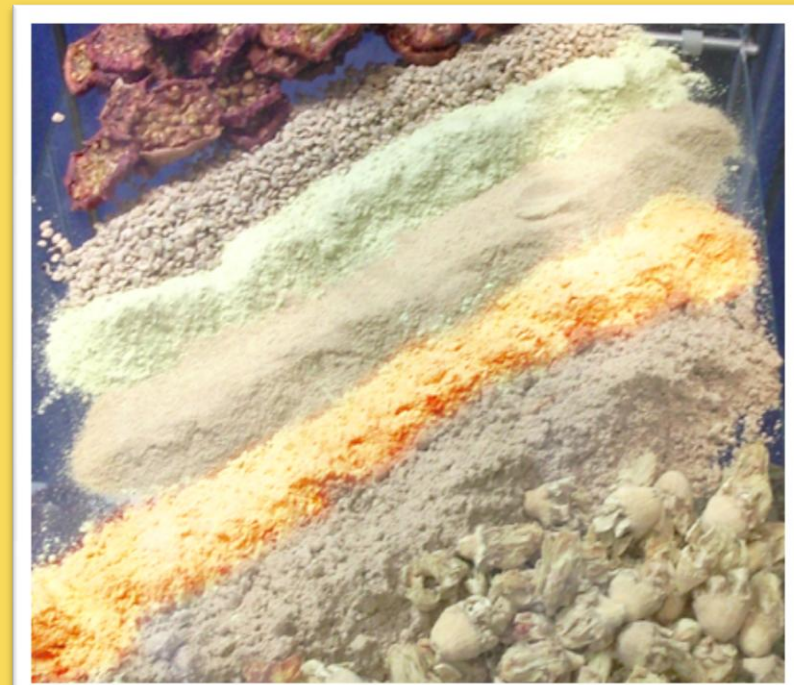
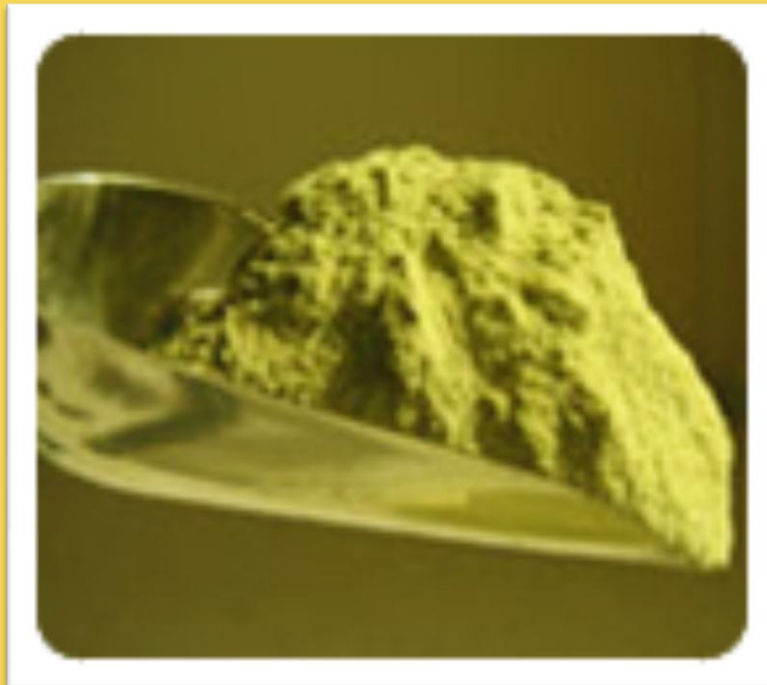


Pickles



# Flour from cladodes

(protein: 3.9% & dietary fibre: 43%)





# Flour from cladodes

## Crunchy cookie processing

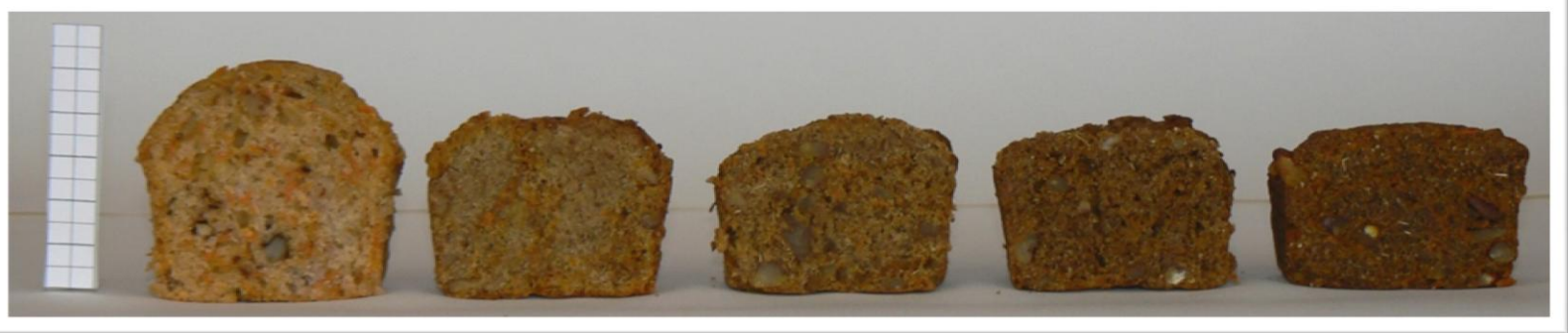
(protein: 3.9% & dietary fibre: 43%)



# Products – Cladode flour



Carrot cake



“Crunchies”





# Products – Cladode flour



Health bread



# Products – Cladode flour



Flour

Mageu



Beer





# Applications of mucilage as functional ingredients in foods.







# Products – Cladode mucilage



Health bread



Carrot cake





# Products – Cladode mucilage



Turkish Delight





# Products – Cladode mucilage

Marshmallows



# Products – Cladode mucilage



Mayonnaise

Polony





## Emulsifier in mayonnaise (replacement of egg):



## Emulsifier in mayonnaise (replacement of egg):





## Emulsifier in mayonnaise (replacement of egg):



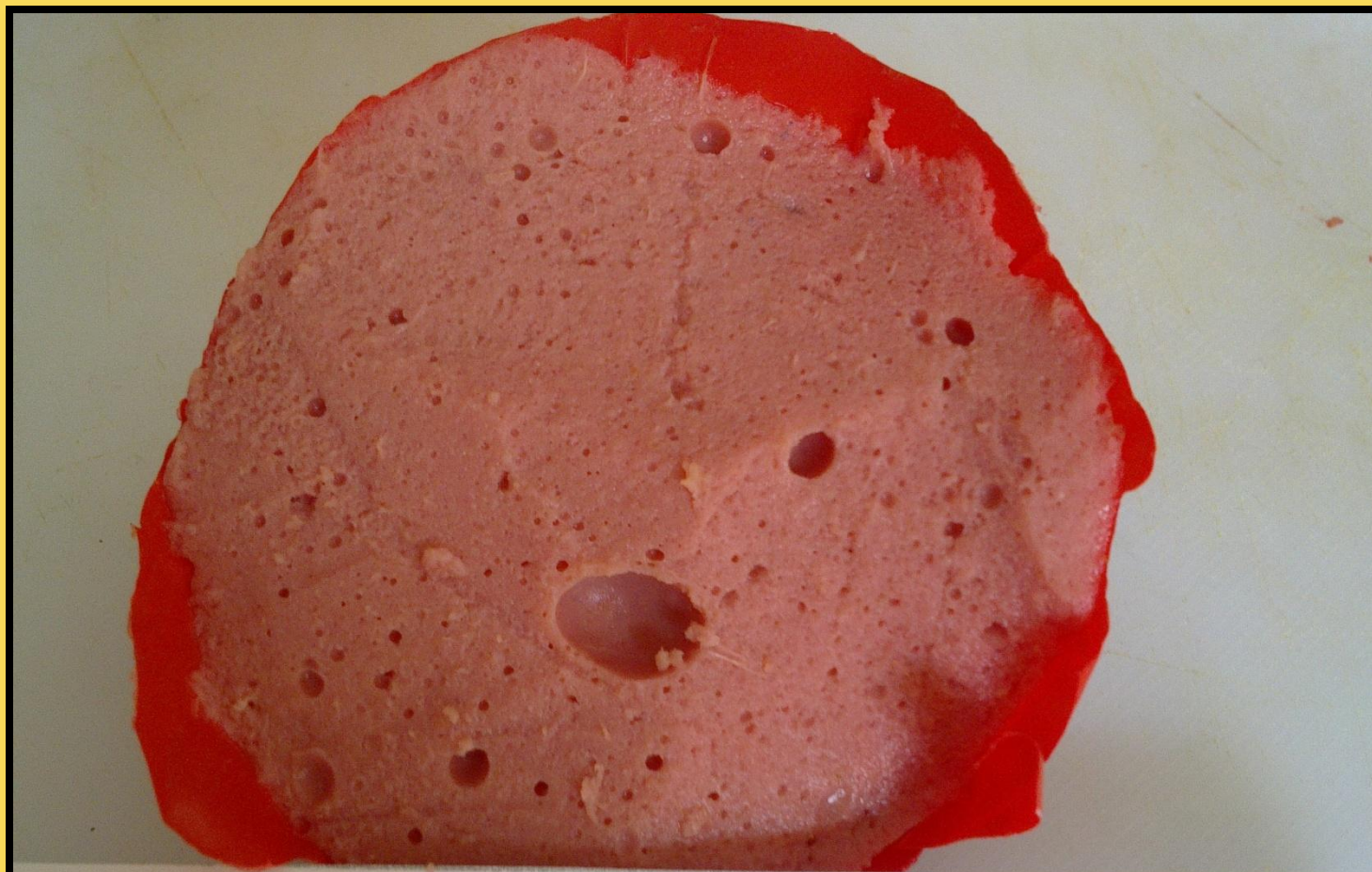
**Fat replacer in mayonnaise (replacement of oil):**





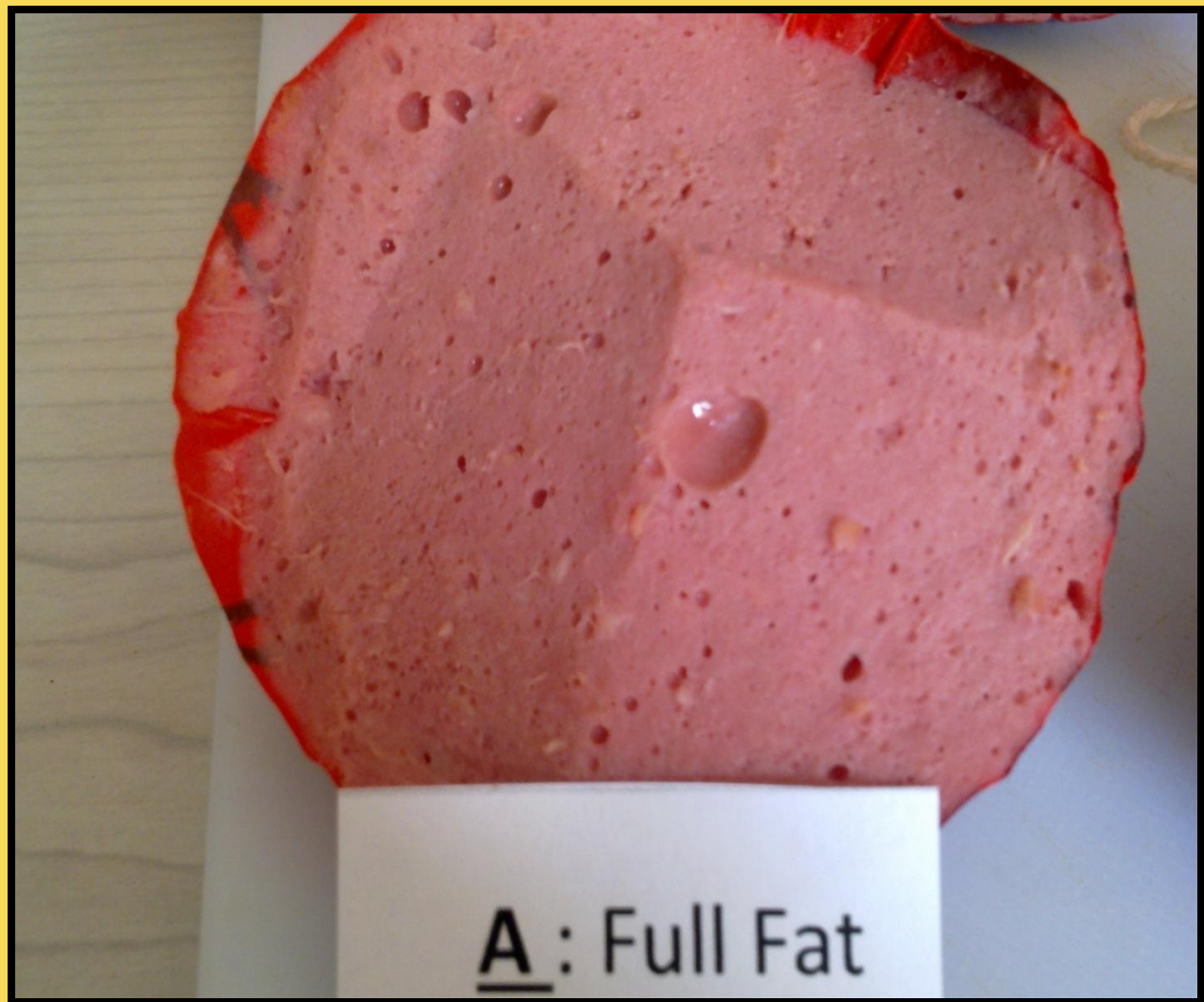






E: 100 % Mucilage as fat replacement.







Carrot cake: 100 % fat(oil) replacement with mucilage.





## Evaluation of **seeds** in terms of:

- Oils and fatty acids (nutraceuticals)
- Proteins and amino acids (nutraceutical & functional foods)



# Locally





# Internationally





# Products







Dried flowers



Seeds



# Marocco

Dried flowers



Cladode  
flour







Fresh



Vinegar



Juice, jam, oil and pickles



Juice and jam







Candy



Oil

Soap





# Chile and Argentina



Stir fry



Syrup and jam



Fresh fruit and juice

Syrup and jam



Ice cream





# Mexico

Nopalitos - vegetables







Fresh napolitos

Tortillas







Jam tarts and chilly candy



Pickles and jam







Chilly beans and nopalitos



Egg and nopalitos



Pickles and jam



# Cultivars



Algerian geskil.jpg



Algerian.jpg



American Giant geskil.jpg



American Giant.jpg



Amersfoort geskil.jpg



Amersfoort.jpg



Arbiter geskil.jpg



Arbiter.jpg



Berg x Mexican.jpg



Blue Motto geskil.jpg



Blue Motto.jpg



Carolien 2.jpg



Carolien.jpg



Copy of Algerian geskil.jpg



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Copy of American Giant geskil.jpg



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Copy of Amersfoort geskil.jpg



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Copy of Cross X geskil.jpg



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Copy of Ficus Indice geskil.jpg



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Copy of Fresno geskil.jpg



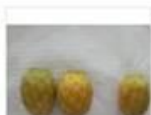
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Copy of Gymno - Carpo.jpg



Copy of Gymno Carpo rypheid geskil.jpg



Copy of Gymno Carpo rypheid.jpg



Copy of Gymno-Carpo geskil.jpg



Corfu geskil.jpg



Corfu.jpg



Cross X geskil.jpg



Cross X.jpg



Directeur geskil.jpg



Directeur.jpg



Ficus Indice geskil.jpg



Ficus Indice.jpg



Fresno geskil.jpg





Fresno.jpg



Fusicaulis geskil.jpg



Fusicaulis.jpg



Gymno - Carpo.jpg



Gymno Carpo rypheid  
geskil.jpg



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Gymno-Carpo geskil.jpg



Malta geskil.jpg



Malta.jpg



Messina geskil.jpg



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Meyers Geskil.jpg



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Monterey geskil.jpg



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Morado geskil.jpg



Morado.jpg



Muscatel geskil.jpg



Muscatel.jpg



Nepgen geskil.jpg



Nepgen.jpg



Nudosa geskil.jpg



Nudosa.jpg



Ofer geskil.jpg



Ofer.jpg



Postmasburg geskil.jpg



Postmasburg.jpg



R1251 geskil.jpg



R1251.jpg



R1259 geskil.jpg



R1259.jpg



R1260 geskil.jpg



R1260.jpg



Robusta geskil.jpg



Robusta x Castillo  
geskil.jpg



Robusta x Castillo.jpg



Robusta.jpg



Roedtan geskil.jpg



Roedtan.jpg



Roly Poly geskil.jpg



Roly Poly.jpg



Rossa geskil.jpg



Rossa.jpg



Santa Rosa geskil.jpg



Santa Rosa.jpg



Schagen geskil.jpg



Schagen.jpg



Sharsheret.jpg





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Van As geskil.jpg



Skinners Court geskil.jpg



Skinners Court.jpg



Tormentosa geskil.jpg



Tormentosa.jpg



Turpin geskil.jpg



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Van As.jpg



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