PROYECTO DE BITTER PIT

DETERMINACION DE LAS CAUSAS NUTRICIONALES Y FISOLOGICAS DE BITTER PIT EN LA VARIEDAD GOLDEN DELICIOUS.

Proyecto de Investigación de UNIFRUT y La Facultad de Agronomía de la Universidad de Stelenbosch, Sudáfrica

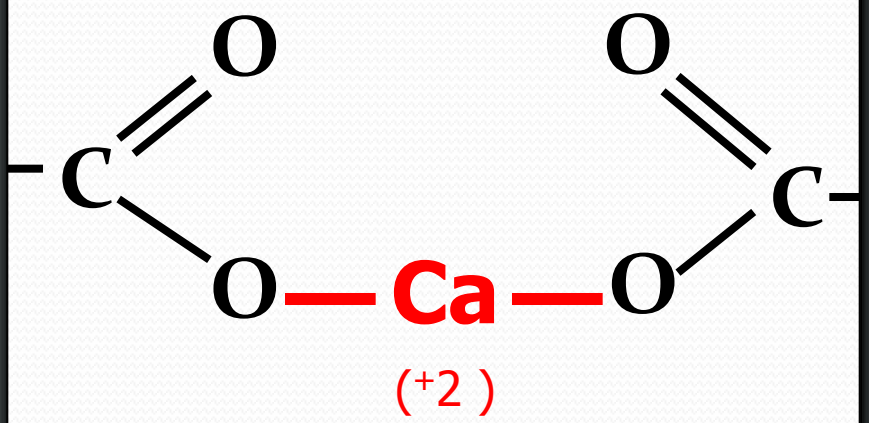
AVANCES DE RESULTADOS DEL PROYECTO DE INVESTIGACION SOBRE LAS CAUSAS DE LA ENFERMEDAD BITTER PIT

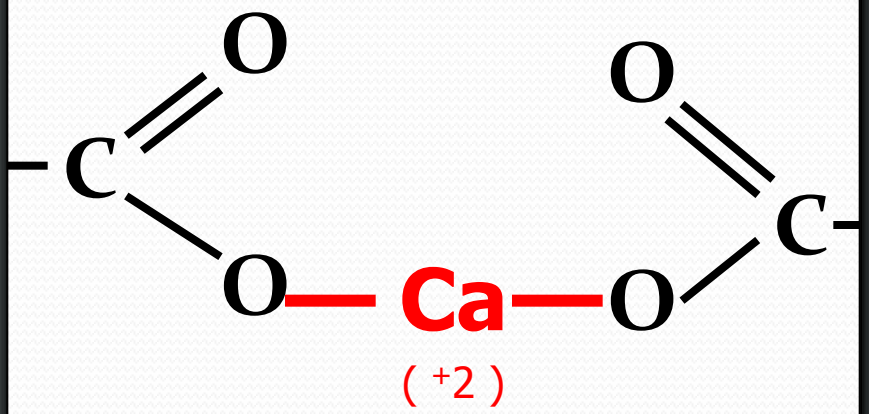
El estudio se desarrolló de la siguiente manera:

Se analizaron 5 huertos
De cada huerta:

- **Análisis de contenido de nutrientes en manzanas por separado**
- **Análisis de promedio de contenido de nutrientes de 10 manzanas**
- **Análisis de manzanas mitad sanas y mitad enfermas**
- **Análisis Numérico**
- **Promedios del contenido y sus relaciones**
- **Análisis por DDI**

PECTINAS

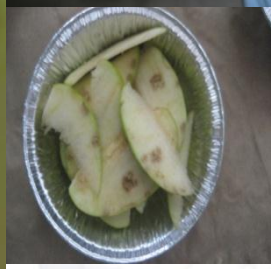




PECTINAS





NUTRIENTES EN mg/100 gr. DE FRUTO FRESCO DE 7 HUERTOS VARIEDAD GOLGEN DELICIOUS CON BITTER PIT Y SIN BITTER PIT											
HRTA. LA CAMPANA	mg/100F K	mg/100F Ca	mg/100F Mg	mg/100F Na	mg/100F Zn	mg/100F Fe	mg/100F Cu	mg/100F Mn	mg/100F B	mg/100F P	mg/100F N
P. CBP 12F (1)	93.1	1.43	4.34	0.47	0.02	0.09	0.04	0.03	0.11	7.04	34.63
P. SBP 12F (2)	129.2	3.55	5.68	0.96	0.08	0.22	0.05	0.05	0.20	7.18	41.62
P. CBP 10F (3)	142.2	2.42	6.34	0.85	0.06	0.21	0.10	0.05	0.32	9.57	60.28
P.SBP 10F (4)	128.6	3.41	5.61	1.09	0.07	0.16	0.10	0.04	0.31	6.00	44.30
HRTA. LA NORTEÑITA											
P. CBP 12F (1)	122.3	2.95	7.66	0.40	0.04	0.20	0.05	0.06	0.28	32.28	82.50
P. SBP 12F (2)	161.3	4.88	7.06	0.49	0.05	0.15	0.03	0.09	0.33	41.69	66.42
P. CBP 8F (3)	153.3	3.83	7.31	0.43	0.04	0.18	0.07	0.07	0.35	14.71	67.37
P.SBP 13F (4)	133.8	4.83	6.71	0.47	0.05	0.24	0.05	0.08	0.28	11.57	64.67

(1) Promedio de 12 frutas CON Bitter Pit
(2) Promedio de 12 frutas SIN Bitter Pit
(3) Promedio de Resultado de 10 frutos CON Bitter Pit
(4) Promedio de Resultado de 10 frutos CON Bitter Pit

RELACION DE NUTRIENTES EN mg/100 gr. CON BITTER PIT Y SIN BITTER PIT					
		N/Ca	K/Ca	K+Mg/Ca	Mg/Ca
H. LA CAMPANA	P. CBP 12F (1)	24.25	65.18	68.22	3.04
	P. SBP 12F (2)	11.71	36.36	37.96	1.60
	P. CBP 10F (3)	24.89	58.71	61.33	2.62
	P.SBP 10F (4)	12.98	37.66	39.31	1.64
H. LA NORTEÑITA	P. CBP 12F (1)	12.53	41.43	44.02	2.59
	P. SBP 12F (2)	7.58	33.06	34.50	1.45
	P. CBP 8F (3)	9.66	40.02	41.93	1.91
	P.SBP 13F (4)	7.66	27.71	29.10	1.39

(1) Promedio de 12 frutas CON Bitter Pit
(2) Promedio de 12 frutas SIN Bitter Pit
(3) Promedio de Resultado de 10 frutos CON Bitter Pit
(4) Promedio de Resultado de 10 frutos CON Bitter Pit

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CONTENIDO DE NUTRIENTES EN mg/100 gr. DE FRUTO FRESCO DE 7 HUERTOS VARIEDAD GOLGEN DELICIOUS CON BITTER PIT Y SIN BITTER PIT

HUETRTA		mg/100F K	mg/100F Ca	mg/100F Mg	mg/100F Na	mg/100F Zn	mg/100F Fe	mg/100F Cu	mg/100F Mn	mg/100F B	mg/100F P	mg/100F N
H. A. LEON	M. PROM. CBP 11F	130.72	3.01	6.29	0.79	0.057	0.249	0.024	0.077	0.587	16.34	53.3
	M. PROM. SBP 11F	121.71	3.74	5.71	1.17	0.064	0.162	0.02	0.113	0.553	12.17	45.58
	PROM. CBP 10F A. APAR	135.48	2.41	6.64	0.82	0.06	1.49	0.02	0.09	0.60	14.93	54.02
	PROM.SBP 10F A. APAR	129.61	3.26	5.16	0.71	0.05	0.16	0.02	0.09	0.48	12.49	47.71
H. LA CAMPANA	M. PROM. CBP 12F	93.11	1.43	4.34	0.47	0.02	0.09	0.04	0.03	0.11	7.04	34.63
	M. PROM. SBP 12F	129.18	3.55	5.68	0.96	0.08	0.22	0.05	0.05	0.20	7.18	41.62
	PROM. CBP 10F A. APAR	142.17	2.42	6.34	0.85	0.06	0.21	0.10	0.05	0.32	9.57	60.28
	PROM.SBP 10F A. APAR	128.56	3.41	5.61	1.09	0.07	0.16	0.10	0.04	0.31	6.00	44.30
H. LA CAMPANA	M. PROM. CBP 10F	157.367	2.510	7.703	3.139	0.031	0.122	0.035	0.051	0.440	8.360	57.035
INJERTOS	M. PROM. SBP 10F	127.011	3.780	5.876	2.802	0.041	0.093	0.026	0.064	0.331	3.269	43.325
	PROM. CBP 8F A. APAR	120.848	2.813	8.094	1.712	0.054	0.137	0.225	0.057	0.314	5.701	49.786
	PROM.SBP 8F A. APAR	128.139	4.540	6.356	2.469	0.047	0.128	0.056	0.073	0.386	5.883	46.121
H. LA NORTEÑITA	M. PROM. CBP 12F	122.313	2.952	7.662	0.398	0.037	0.197	0.048	0.061	0.280	32.277	82.503
	M. PROM. SBP 12F	161.270	4.878	7.056	0.495	0.048	0.154	0.026	0.092	0.325	41.692	66.420
	PROM. CBP 8F A. APAR	153.299	3.830	7.307	0.429	0.043	0.183	0.070	0.067	0.347	14.706	67.366
	PROM.SBP 13F A. APAR	133.800	4.829	6.714	0.466	0.053	0.241	0.046	0.084	0.279	11.567	64.672
H. LUIS PERES L.	M. PROM. CBP 10F	137.946	2.098	7.810	2.747	0.053	0.215	0.045	0.053	0.398	14.200	64.701
PARMO	M. PROM. SBP 10F	129.071	3.171	6.436	2.194	0.047	0.194	0.039	0.056	0.526	16.672	56.136
	PROM. CBP 13F A. APAR	138.251	2.023	7.844	1.742	0.042	0.261	0.030	0.063	0.480	14.191	65.599
	PROM.SBP 13F A. APAR	128.773	3.097	6.157	2.709	0.059	0.425	0.031	0.065	0.617	15.526	50.521
H. LUIS PERES L.	M. PROM. CBP 10F	108.480	2.065	5.462	0.684	0.042	0.142	0.021	0.058	0.460	10.952	49.018
CAPILLA	M. PROM. SBP 10F	98.632	3.255	4.966	0.607	0.049	0.148	0.015	0.046	0.384	9.958	64.067
	PROM. CBP 13F A. APAR	138.631	1.912	6.193	0.608	0.044	0.152	0.028	0.051	0.528	12.550	62.407
	PROM.SBP 13F A. APAR	104.716	3.318	4.966	0.793	0.057	0.154	0.020	0.054	0.397	12.468	52.063

RELACION DE NUTRIENTES EN mg/100 gr. CON BITTER PIT Y SIN BITTER PIT

HUETRTA		N/Ca	K/Ca	K+Mg/Ca	Mg/Ca	% N/Ca	%K/Ca	%K+Mg/Ca	%Mg/Ca
H. A. LEON	M. PROM. CBP 11F	17.71	43.43	45.52	2.09	68.82	74.93	74.85	73.06
	M. PROM. SBP 11F	12.19	32.54	34.07	1.53				
	PROM. CBP 10F A. APAR	22.44	56.29	59.04	2.76	65.11	70.53	69.91	57.37
	PROM.SBP 10F A. APAR	14.61	39.70	41.28	1.58				
H. LA CAMPANA	M. PROM. CBP 12F	24.25	65.18	68.22	3.04	48.32	55.79	55.65	52.67
	M. PROM. SBP 12F	11.71	36.36	37.96	1.60				
	PROM. CBP 10F A. APAR	24.89	58.71	61.33	2.62	52.14	64.15	64.09	62.73
	PROM.SBP 10F A. APAR	12.98	37.66	39.31	1.64				
H. LA CAMPANA INJERTOS	M. PROM. CBP 10F	22.72	62.70	65.76	3.07	50.43	53.59	53.45	50.65
	M. PROM. SBP 10F	11.46	33.60	35.15	1.55				
	PROM. CBP 8F A. APAR	17.70	42.96	45.84	2.88	57.40	65.69	64.62	48.65
	PROM.SBP 8F A. APAR	10.16	28.22	29.62	1.40				
H. LA NORTEÑITA	M. PROM. CBP 12F	12.53	41.43	44.02	2.59	60.52	79.80	78.38	55.73
	M. PROM. SBP 12F	7.58	33.06	34.50	1.45				
	PROM. CBP 8F A. APAR	9.66	40.02	41.93	1.91	79.32	69.23	69.40	72.89
	PROM.SBP 13F A. APAR	7.66	27.71	29.10	1.39				
H. LUIS PERES L. PARAMO	M. PROM. CBP 10F	30.85	65.76	69.49	3.72	57.39	61.90	61.50	54.52
	M. PROM. SBP 10F	17.70	40.71	42.74	2.03				
	PROM. CBP 13F A. APAR	33.31	71.34	75.35	4.01	49.70	58.58	58.12	49.95
	PROM.SBP 13F A. APAR	16.56	41.80	43.80	2.00				
H. LUIS PERES L. CAPILLA	M. PROM. CBP 10F	23.73	52.53	55.17	2.64	82.93	57.69	57.69	57.69
	M. PROM. SBP 10F	19.68	30.30	31.83	1.53				
	PROM. CBP 13F A. APAR	32.63	72.49	75.73	3.24	48.09	43.54	43.65	46.22
	PROM.SBP 13F A. APAR	15.69	31.56	33.06	1.50				

DDI (DIGNOSTICO DIFERENCIAL INTEGRADO). Es la diferencia entre dos situaciones (una situación sana y una situación enferma).

RESULTADO

SITUACION FISIOLOGICA.- Cuando el resultado de dividir el contenido de un nutriente enfermo con uno sano es de 1.41 hacia arriba tenemos una deficiencia fisiológica.

SITUACION NUTRICIONAL.- Cuando el resultado de dividir un nutriente de una manzana enferma entre el resultado de una manzana sana y el resultado es de 0.50 se trata de una deficiencia nutricional.

Ejemplo:

P/Ca de enferma / P/Ca de sana = 1.41 Deficiencia Fisiológica ó
0.50 Deficiencia Nutricional

RESULTADO DE DIAGNOSTICO DIFERENCIAL INTEGRADO

AL S	P	CMP S	P	CMA I S	P	NOR S	P	LP P S	P	LP C S	P
P/Ca = 1.67	P/Ca = 1.62	P/Ca = 2.44	P/Ca = 2.25	P/Ca = 3.85	N/Ca = 1.74	N/Ca = 2.05	P/Ca = 1.60	N/Ca = 1.74	N/Ca = 1.98	K/Ca = 1.77	K/Ca = 2.30
N/Ca = 1.45	N/Ca = 1.53	N/Ca = 2.07	N/Ca = 1.92	P/K = 2.06	P/Ca = 1.56	N/K = 1.64	K/Ca = 1.44	K/Ca = 1.62	K/Ca = 1.66	P/Ca = 1.73	N/Ca = 2.08
K/Ca = 1.33	K/Ca = 1.42	K/Ca = 1.79	K/Ca = 1.56	N/Ca = 1.98	K/Ca = 1.52	N/P = 1.60	N/Ca = 1.31	N/P = 1.35	N/P = 1.42	N/Ca = 1.21	P/Ca = 1.75
P/K = 1.25	P/K = 1.14	P/K = 1.36	P/K = 1.44	P/Mg = 1.95	N/K = 1.14	P/Ca = 1.28	P/Mg = 1.17	P/Ca = 1.29	P/Ca = 1.39	K/Mg = 1.02	N/P = 1.19
P/Mg = 1.22	N/K = 1.08	P/Mg = 1.29	P/Mg = 1.41	K/Ca = 1.87	N/P = 1.11	K/Ca = 1.25	P/K = 1.11	N/K = 1.08	N/K = 1.19	P/Mg = 1.00	K/Mg = 1.06
N/K = 1.09	N/P = 0.95	N/K = 1.15	N/K = 1.23	N/K = 1.06	P/K = 1.03	N/Mg = 1.14	K/Mg = 1.05	N/Mg = 0.95	N/Mg = 1.02	P/K = 0.98	N/Mg = 0.96
N/Mg = 1.06	P/Mg = 0.93	N/Mg = 1.09	N/Mg = 1.20	N/Mg = 1.00	N/Mg = 0.85	P/K = 1.02	N/Mg = 0.96	K/Mg = 0.88	K/Mg = 0.86	N/P = 0.70	N/K = 0.91
K/Mg = 0.97	N/Mg = 0.88	K/Mg = 0.95	K/Mg = 0.98	K/Mg = 0.95	P/Mg = 0.76	P/Mg = 0.71	N/K = 0.91	P/K = 0.80	P/K = 0.84	N/Mg = 0.70	P/Mg = 0.81
N/P = 0.87	K/Mg = 0.81	N/P = 0.85	N/P = 0.85	N/P = 0.51	K/Mg = 0.74	K/Mg = 0.70	N/P = 0.82	P/Mg = 0.70	P/Mg = 0.72	N/K = 0.68	P/K = 0.76
Ca/Mg= 0.73	Ca/Mg= 0.57	Ca/Mg= 0.53	Ca/Mg= 0.63	Ca/Mg= 0.51	Ca/Mg= 0.49	Ca/Mg= 0.56	Ca/Mg= 0.73	Ca/Mg= 0.55	Ca/Mg= 0.51	Ca/Mg= 0.58	Ca/Mg= 0.46