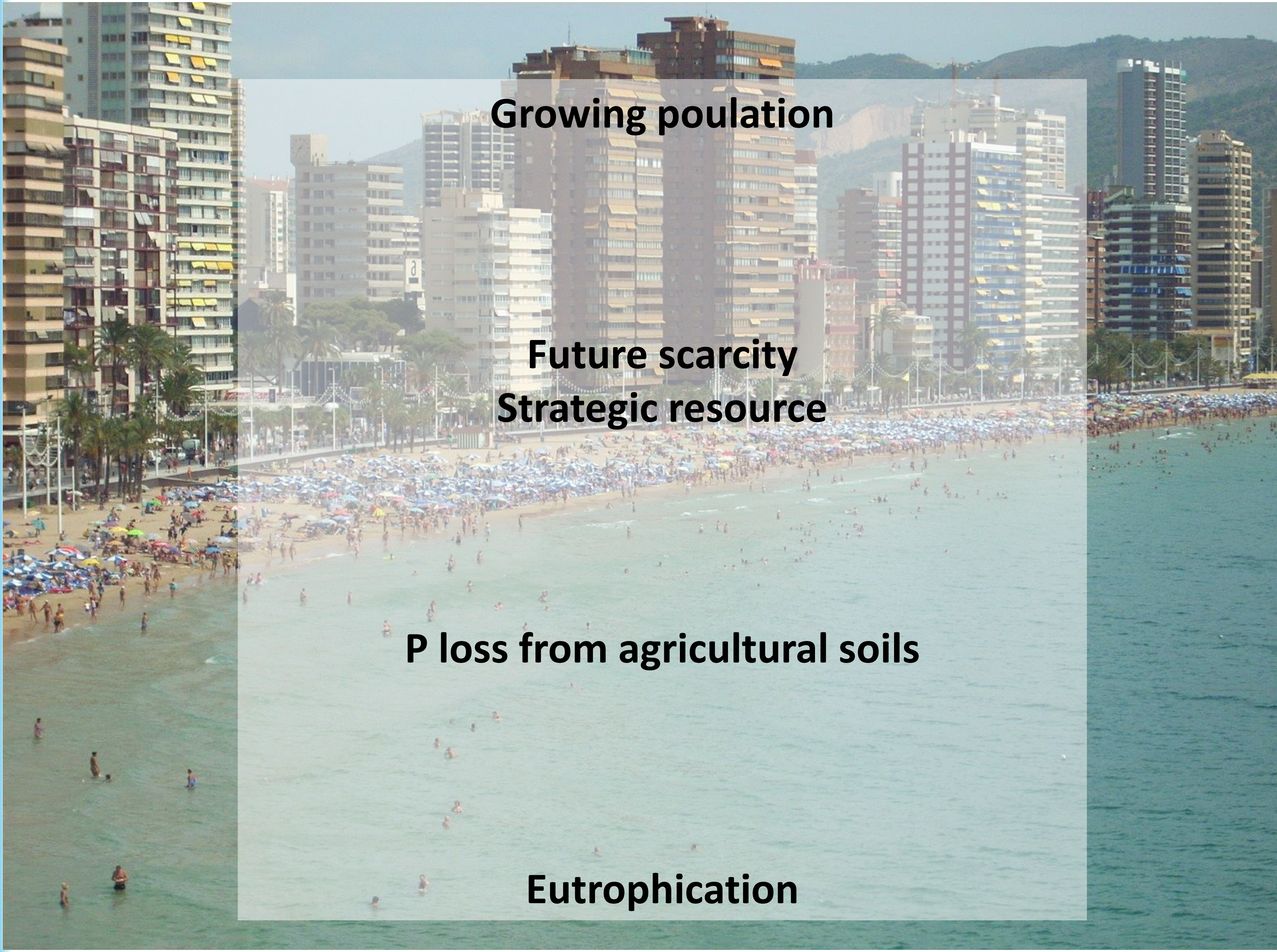
Problemáticas de Fertilización Fosfórica excesiva en Cítricos


Growing poulation
Future scarcity
Strategic resource
P loss from agricultural soils
Eutrophication

168Mt phosphate rock (2000)

80% as fertilizer and a small fraction of applied P fertilizer is known to remain available for crops (Delgado et al., 2002; Saavedera et al., 2007)

Only 15% from applied P to final constumer (Cordell et al., 2009).

Demand of P is expected to grow from 50 to 100 % by 2050 (EFMA, 2000; Cordell et al., 2009)

Introduction

Available P is not a constant fraction of total P; potential available P for crops is a small fraction of total P

between 10 and 70 % of total P in soils in Europe
(Delgado and Torrent, 1997)

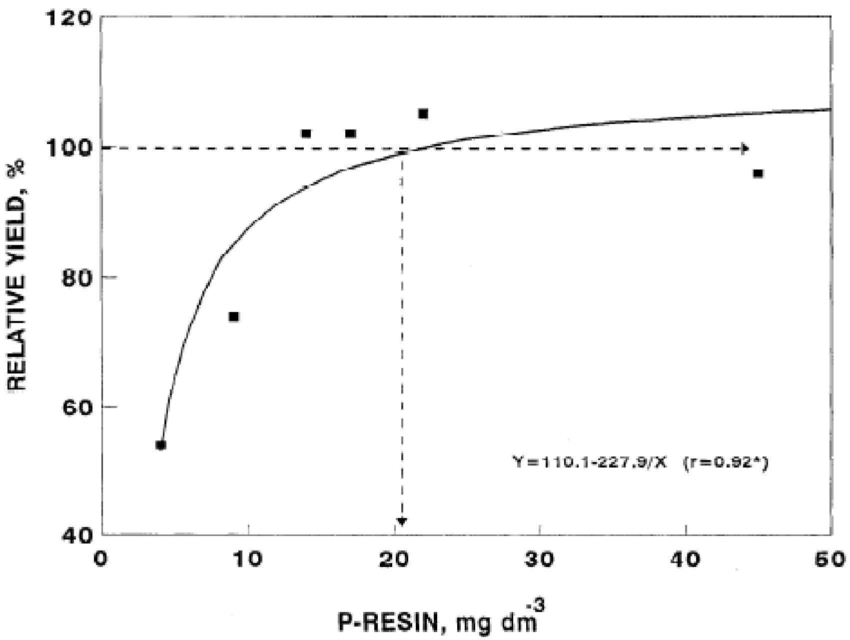
Introduction

Efficient use of phosphorus (P) by plants in agriculture relies on accurate estimation of the phytoavailable soil P.

However, poor relationships are frequently observed between P availability indices, such as Olsen P, and P uptake by plants

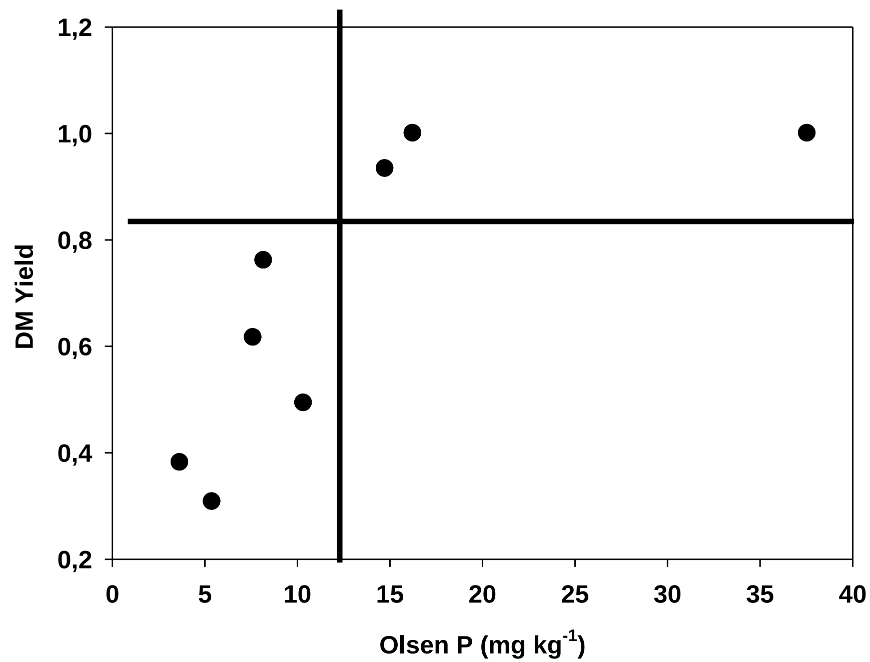
Introduction

Phosphorus availability to plants is mainly ruled by the concentration of P in the soil solution ('intensity' factor, I), the amount of P in the solid phase that can be easily made available to plants ('quantity' factor, Q), and the capacity of soil to keep P concentration in soil solution (P buffer capacity, PBC)
(Sánchez-Alcalá et al., 2014).



Phosphorus and potassium soil test and nitrogen leaf analysis as a base for citrus fertilization

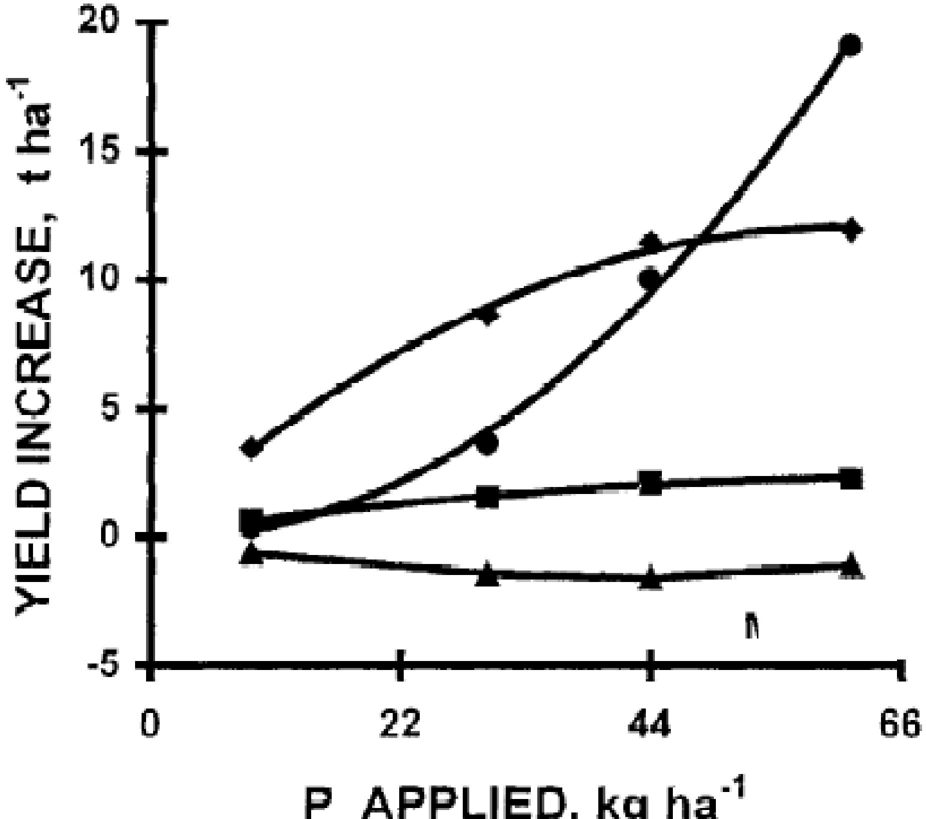
J. A. Quaggio, H. Cantarella and B. van Raij
Section of Soil Fertility and Plant Nutrition, Instituto Agronômico, Caixa Postal 28, 13001-970 Campinas, SP, Brazil

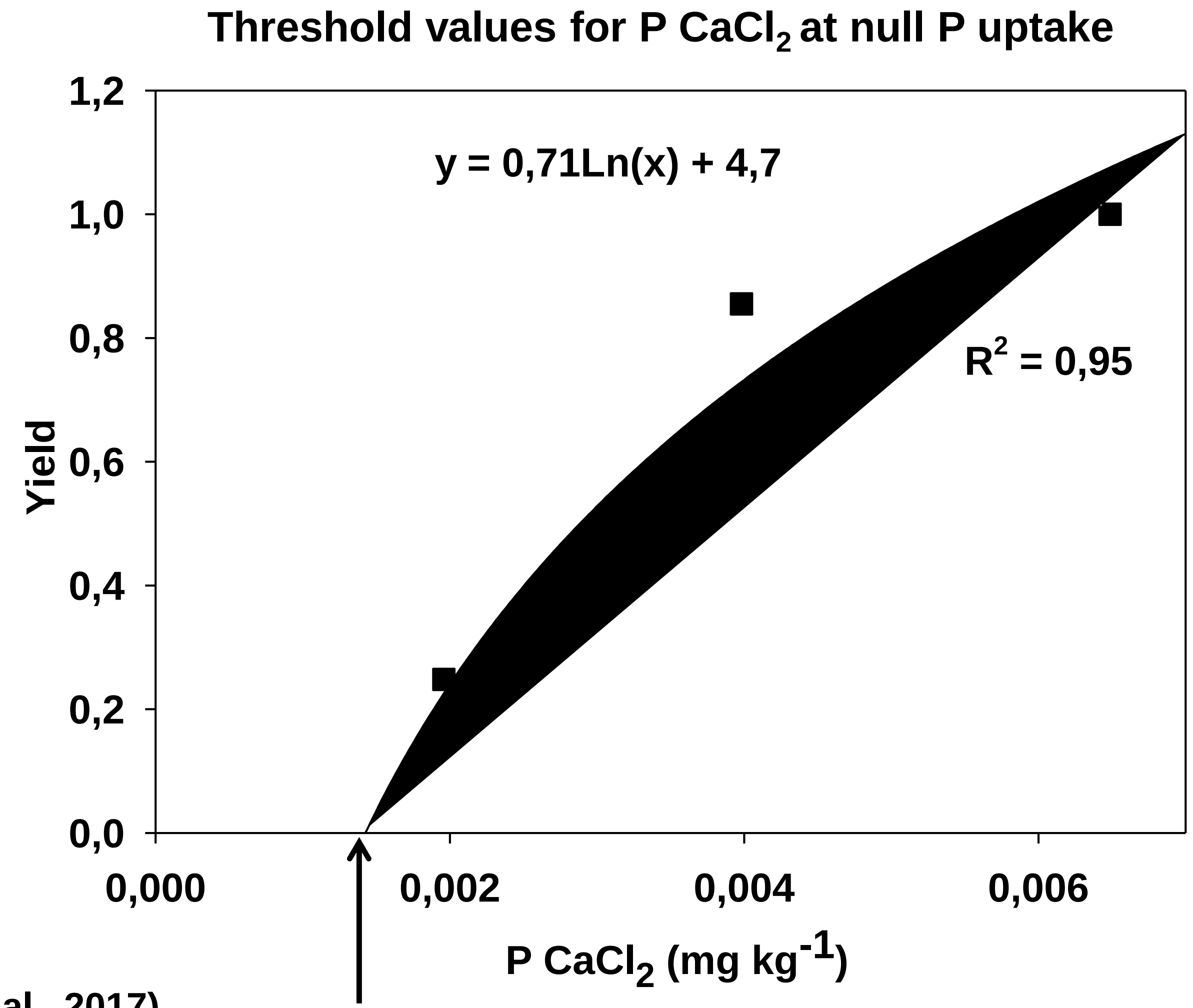


(Recena et al., 2017)

Phosphorus and potassium soil test and nitrogen leaf analysis as a base for citrus fertilization

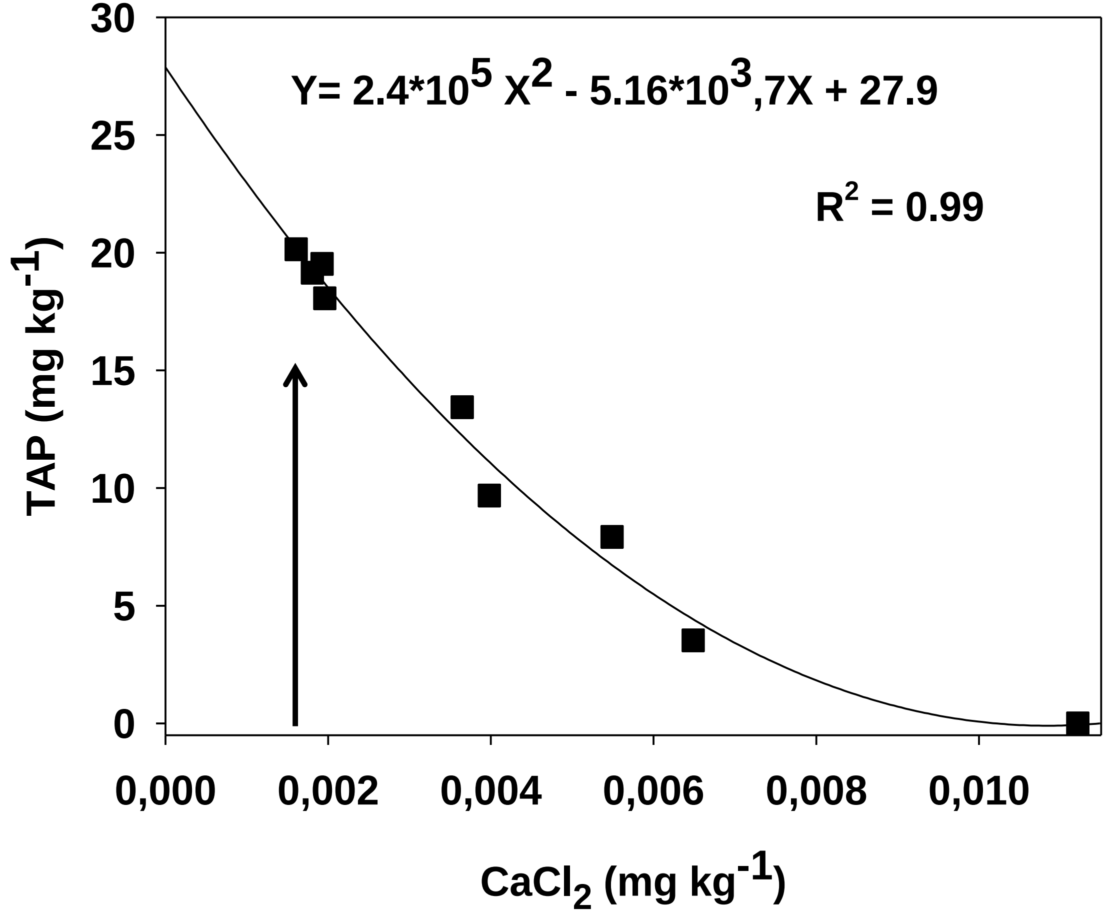
J. A. Quaggio, H. Cantarella and B. van Raij
Section of Soil Fertility and Plant Nutrition, Instituto Agronômico, Caixa Postal 28, 13001-970 Campinas, SP, Brazil





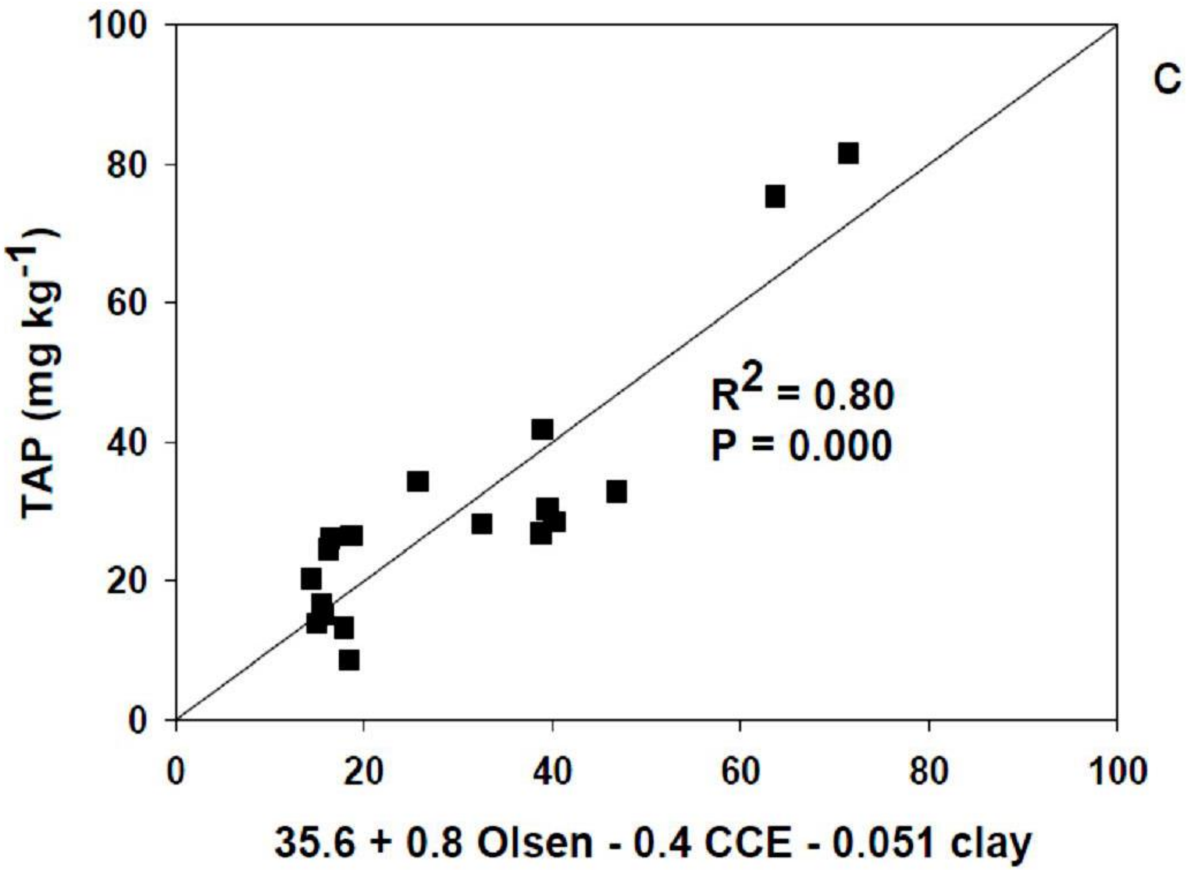
(Recena et al., 2017)

Total available phosphorus (TAP)

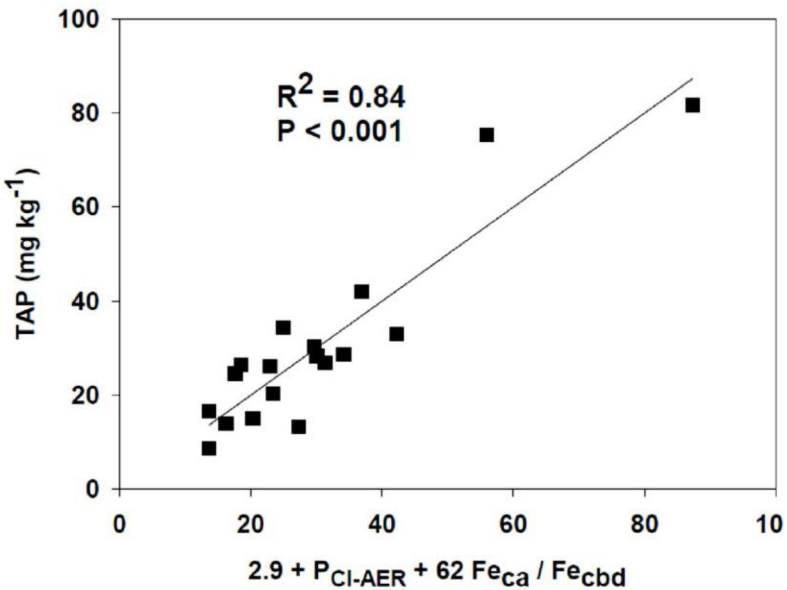


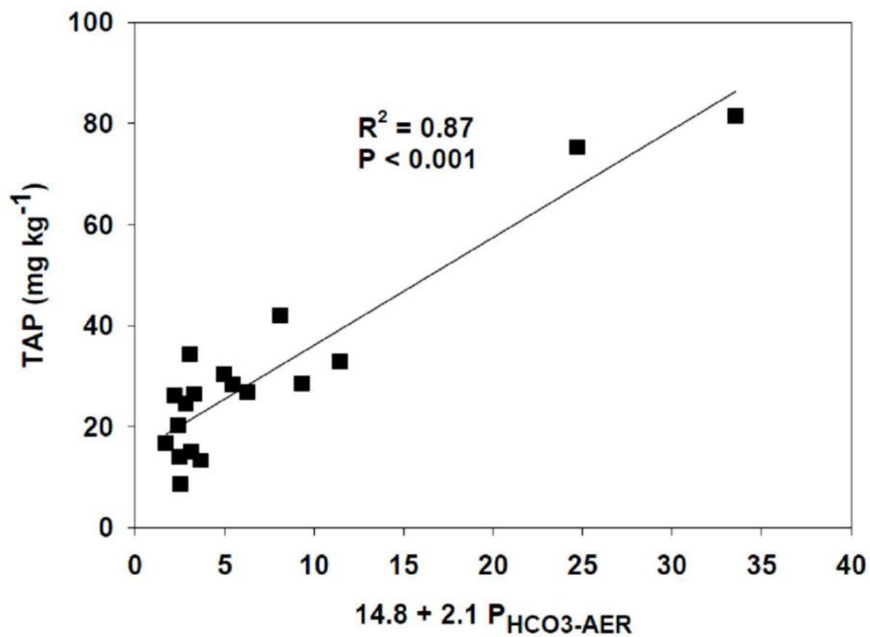
(Recena et al., 2017)

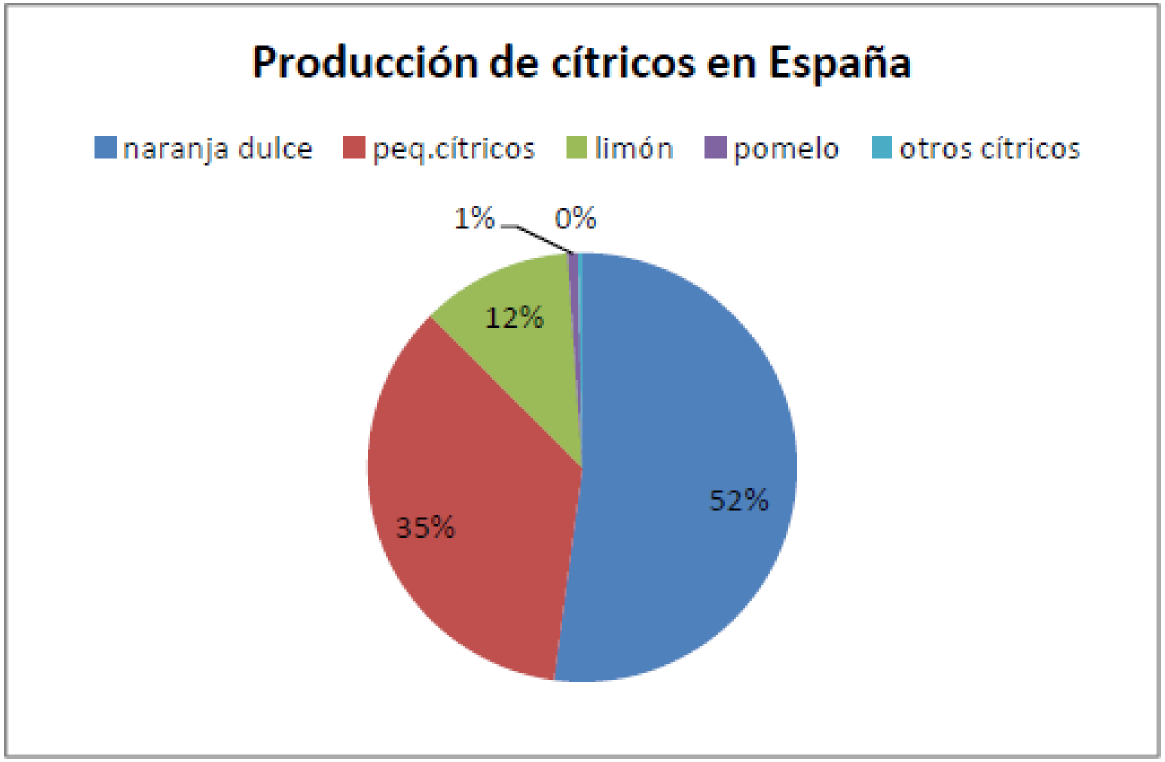
Total available phosphorus (TAP)



(Recena et al., 2017)







Fte: Anuario estadística MAGRAMA

Ud. X 1.000 ha. X 1.000 t

	MEDIAS	
	superficie	producción
Hortalizas (no patata)	348	13.079
F. cítricos	314	5.781
F. hueso	140	1.348
F. pepita	59	1.092
F tropical	22	192
Total frutas (no plátano, no cáscara)	**536**	**8.578**
Total frutas y hortalizas	**921**	**24.628**
F cáscara	637	450
Plátano	9	369
Patata	80	2.317

M. Agustí (✉) · C. Mesejo · C. Reig · A. Martínez-Fuentes
Instituto Agroforestal Mediterráneo, Universitat Politècnica de València,
Camino de Vera s/n 46022, València, Spain
e-mail: magusti@prv.upv.es

C. Mesejo
e-mail: carmeco@prv.upv.es

C. Reig
e-mail: mareiva@prv.upv.es

A. Martínez-Fuentes
e-mail: demarfue@upvnet.upv.es

G. R. Dixon, D. E. Aldous (eds.), *Horticulture: Plants for People and Places, Volume 1*,
DOI 10.1007/978-94-017-8578-5_6,

Tree age (years)	Phosphorus (P_2O_5)	
	g/tree	Kg/ha
1–2	0–20	0–8
3–4	30–40	12–16
5–6	50–60	20–24
7–8	80–100	32–40
9–10	120–150	48–60
>10	150–200	60–80

M. Agustí (✉) · C. Mesejo · C. Reig · A. Martínez-Fuentes
Instituto Agroforestal Mediterráneo, Universitat Politècnica de València,
Camino de Vera s/n 46022, València, Spain
e-mail: magusti@prv.upv.es

C. Mesejo
e-mail: carmeco@prv.upv.es

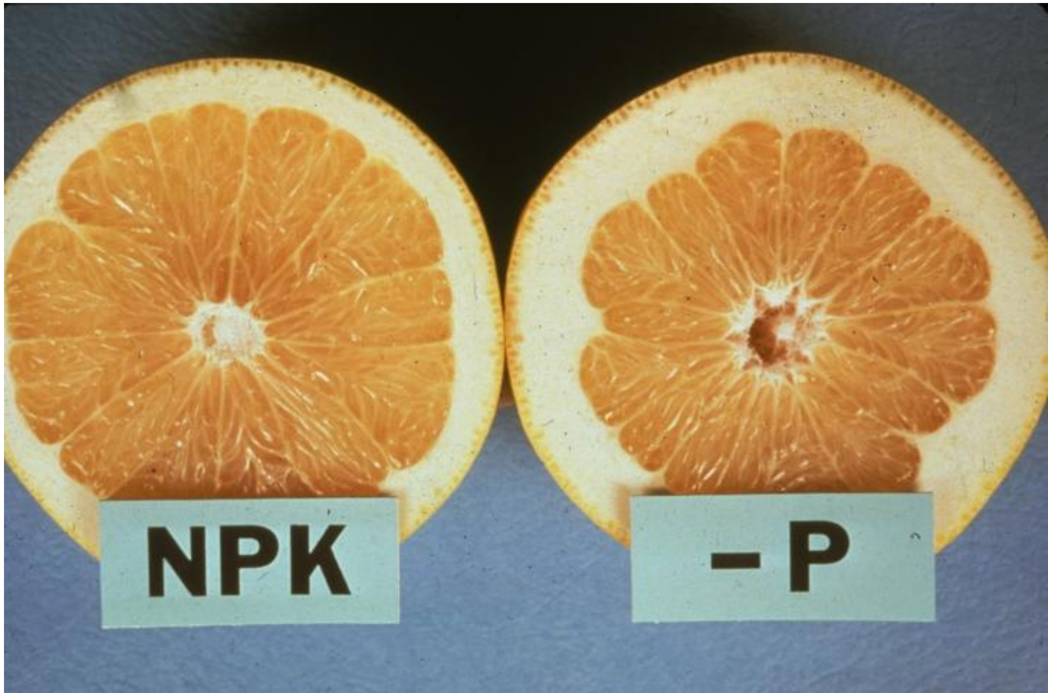
C. Reig
e-mail: mareiva@prv.upv.es

A. Martínez-Fuentes
e-mail: demarfue@upvnet.upv.es

G. R. Dixon, D. E. Aldous (eds.), *Horticulture: Plants for People and Places, Volume 1*,
DOI 10.1007/978-94-017-8578-5_6,

Leaves analysis guide for diagnosing macronutrient status of citrus adult trees. (Legaz et al. 1995)

Ranges (dry matter basis; %)		Deficient	Low	Optimum	High	Excess
Sweet orange	N	<230	2.30–2.50	2.51–2.80	2.81–3.00	>3.00
	P	<0.10	0.10–0.12	0.13–0.16	0.17–0.20	>0.20
	K	<0.50	0.50–0.70	0.71–1.00	1.01–1.30	>1.30
Clementine Mandarin	N	<2.20	2.21–2.40	2.41–2.70	2.71–2.90	>2.90
	P	<0.09	0.09–0.11	0.12–0.15	0.16–0.19	>0.19
	K	<0.50	0.50–0.70	0.71–1.00	1.01–1.30	>1.30
Satsuma Mandarin	N	<2.40	2.40–2.60	2.61–2.90	2.91–3.10	>3.10
	P	<0.10	0.10–0.12	0.13–0.16	0.17–0.20	>0.20
	K	<0.40	0.40–0.60	0.61–0.90	0.91–1.15	>1.15


NPK
– P

1 - Single models for improving estimations of total available phosphorus (TAP) with Olsen P index and P $CaCl_2$ extraction

2 - Properties contribuiting to explain the equilibrium between P soild and liquid soild phase are very relevant explaining the accuracy of SPT

3 - TAP estimation with Olsen-P, is improved by PBC and Fe_{ca}/Fe_{cbd}

4 - P sinks provide better estimation of TAP than chemical extractions

5 - AER in Cl- form gave worse explications of the TAP variance than HCO_3^- ; Cl^- inhibit the exchange reaction (Mayers et al., 2005) and HCO_3^- seems to have similar effect than roots (Sibbensen, 1978).

6 - Overall, P sinks are better correlated with soil factors affecting P availability to plants

-**P**; macronutriente de concentración variable en la solución del suelo

-con gran afinidad por las superficies de los óxidos de Fe (Torrent, 1987)

-facilidad para formar complejos insolubles, reduciendo la solubilidad del Fe y dificultando su absorción por parte de las plantas (Zheng et al., 2009)

Gracias por su atención.

Ramiro Recena

rrecena@us.es