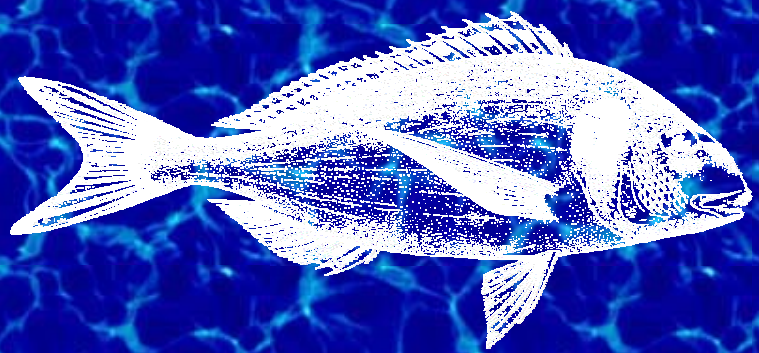
The role of phosphorus in nutrition of gilthead seabream (*Sparus aurata*) and its consequences on environmental enrichment



Loss of dietary phosphorus may be divided into

- inevitable loss
- undigestible phosphorus
- regulatory or homeostatic excretion

Objectives:

1. To determine the phosphorus demand of gilthead seabream

Diet composition: DCP growth experiment

[g/kg]	diet 1	diet 2	diet 3	diet 4	diet 5	diet 6	diet 7
wheat gluten			500.0				
wheat			144.3				
fishoil			200.0				
premix			75.7				
$CaCO_3$	22.0	12.0	7.0	-	-	-	-
silicate	58.0	55.5	48.0	12.5	30.0	17.5	5.0
binder							
DCP	**-**	**12.5**	**25.0**	**37.5**	**50.0**	**62.5**	**75.0**
sum	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0

Diet composition: MCP growth experiment

[g/kg]	diet 1	diet 2	diet 3	diet 4	diet 5	diet 6	diet 7
wheat gluten			500.0				
wheat			174.0				
fishoil			200.0				
premix			5.0				
$CaCO_3$	8.9	4.8	0.8	-	-	-	-
silicate	42.2	39.4	36.6	30.5	23.6	16.8	9.9
binder							
MCP	**-**	**6.9**	**13.7**	**20.6**	**27.5**	**34.3**	**41.2**
sum	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0

Procedure

triplicate groups

feeding twice a day

final weight = 3 x initial weight

DCP:

27 fish per tank

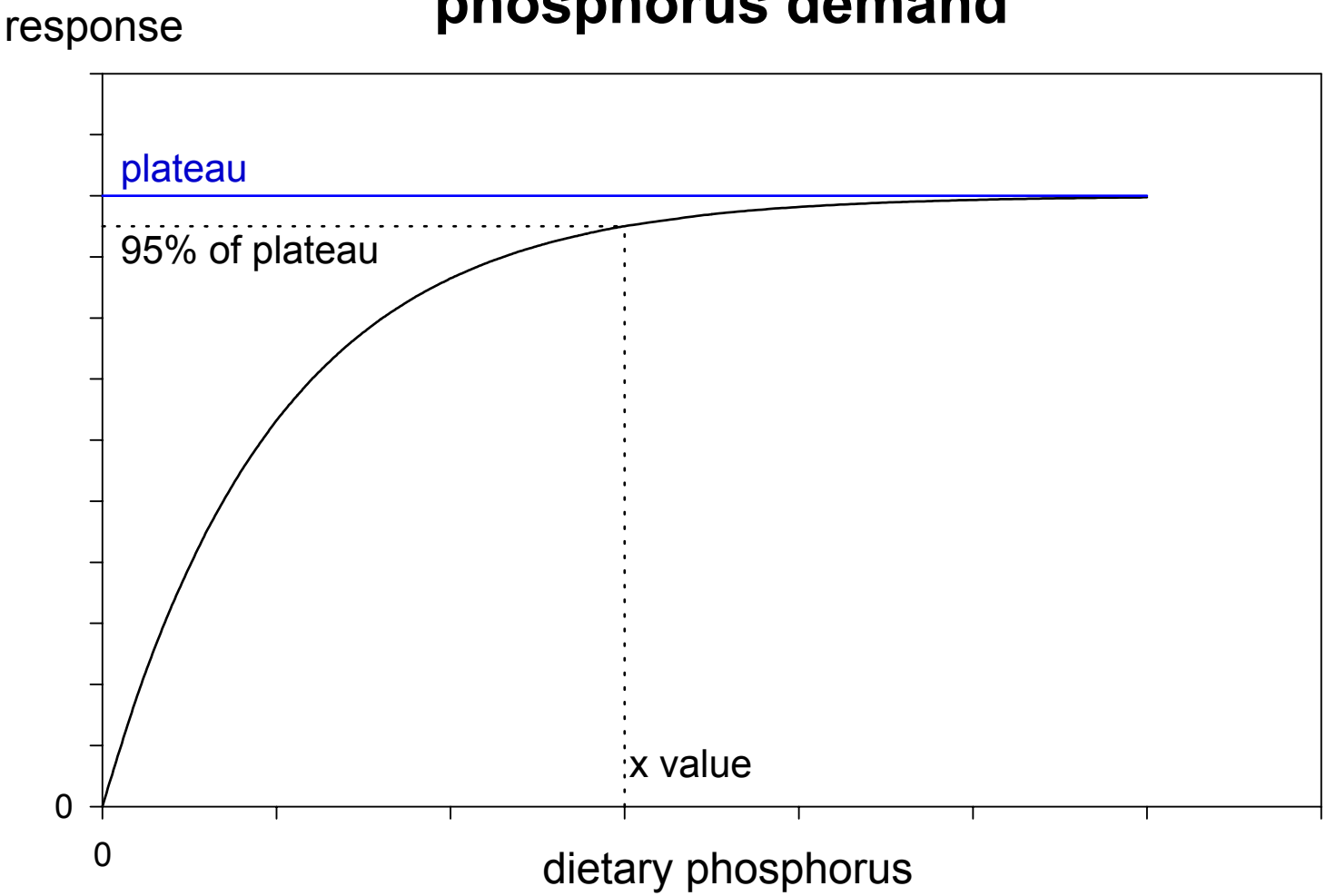
to satiation

MCP:

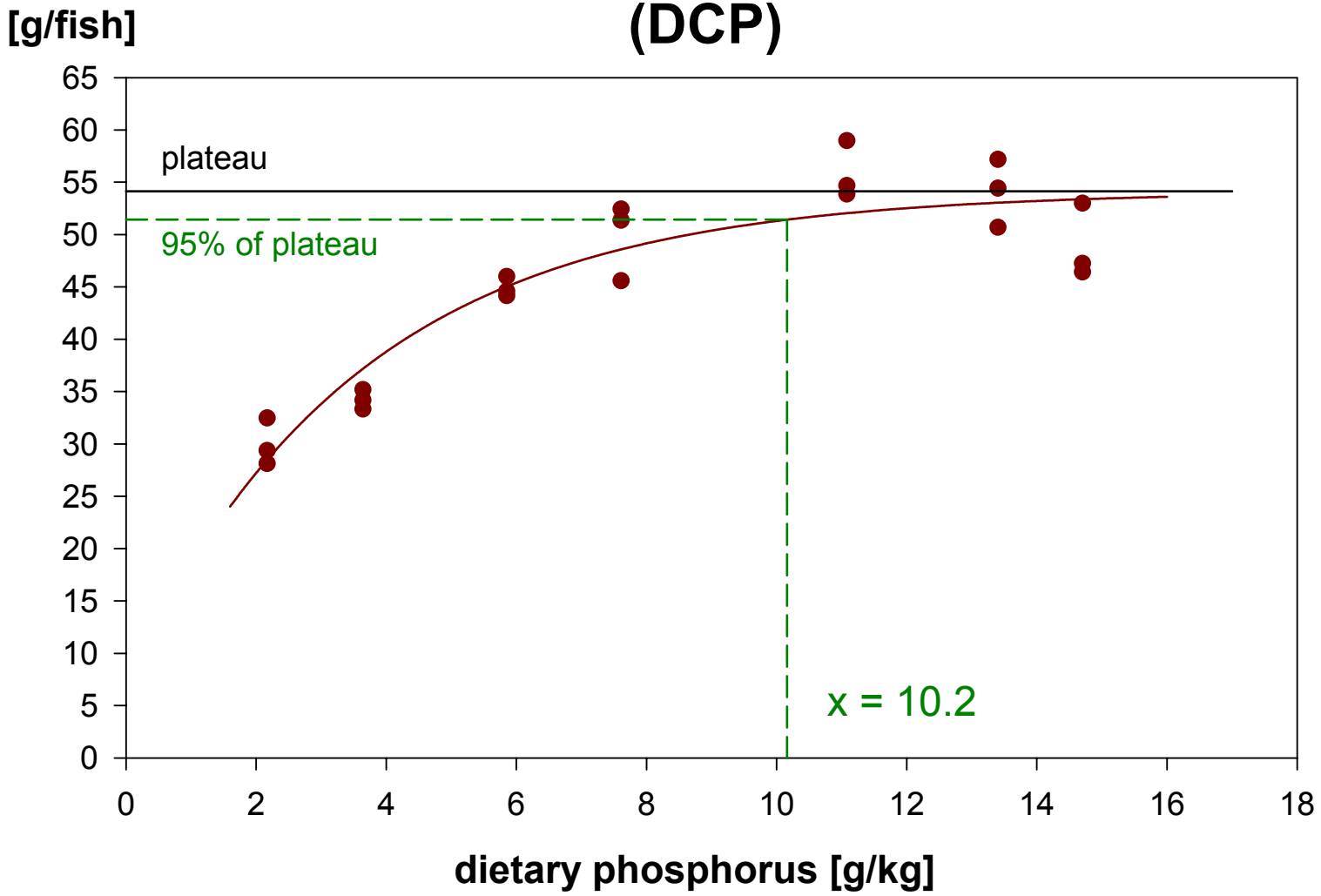
26 fish per tank

pair fed

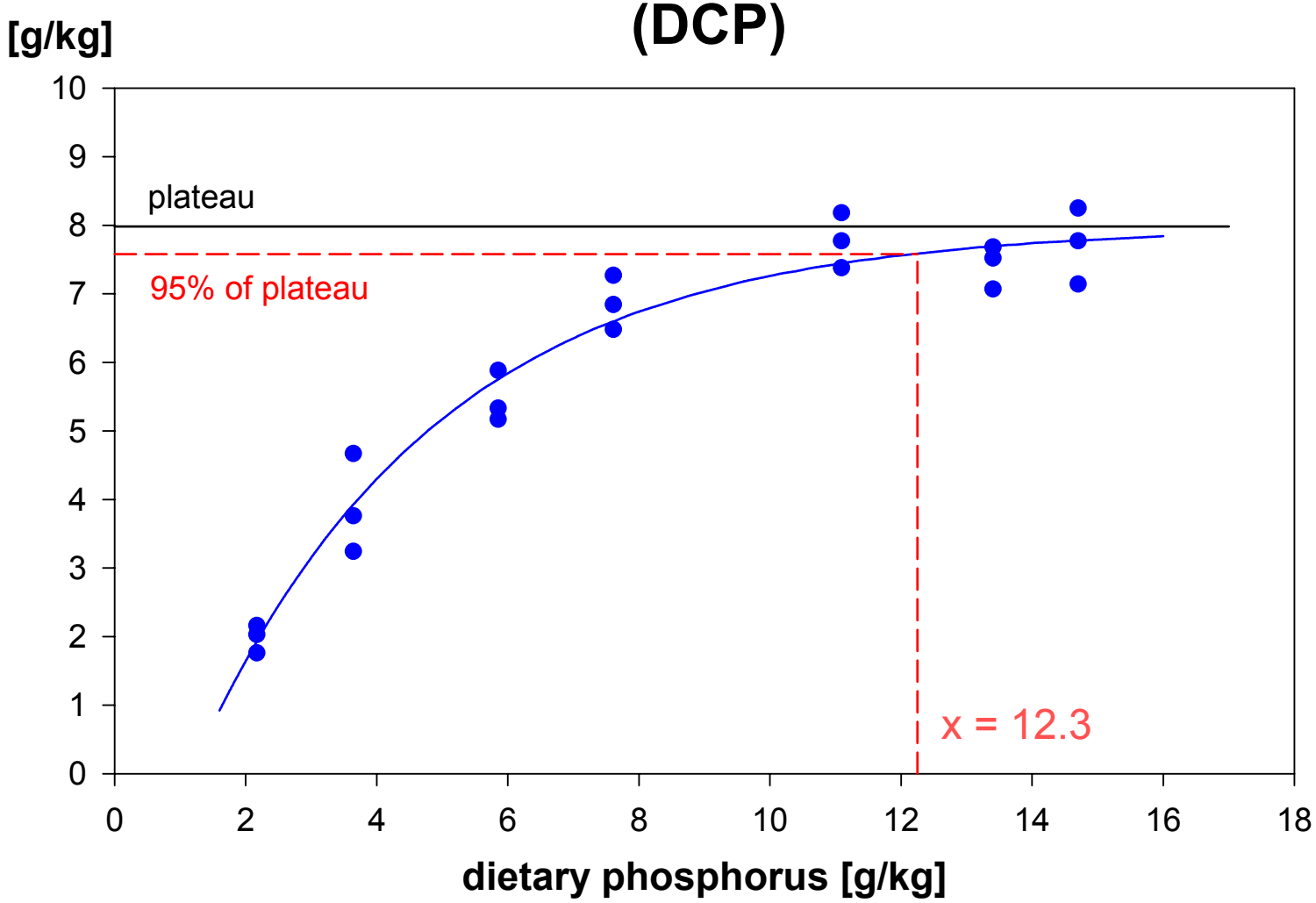
Mathematical approach to calculate phosphorus demand



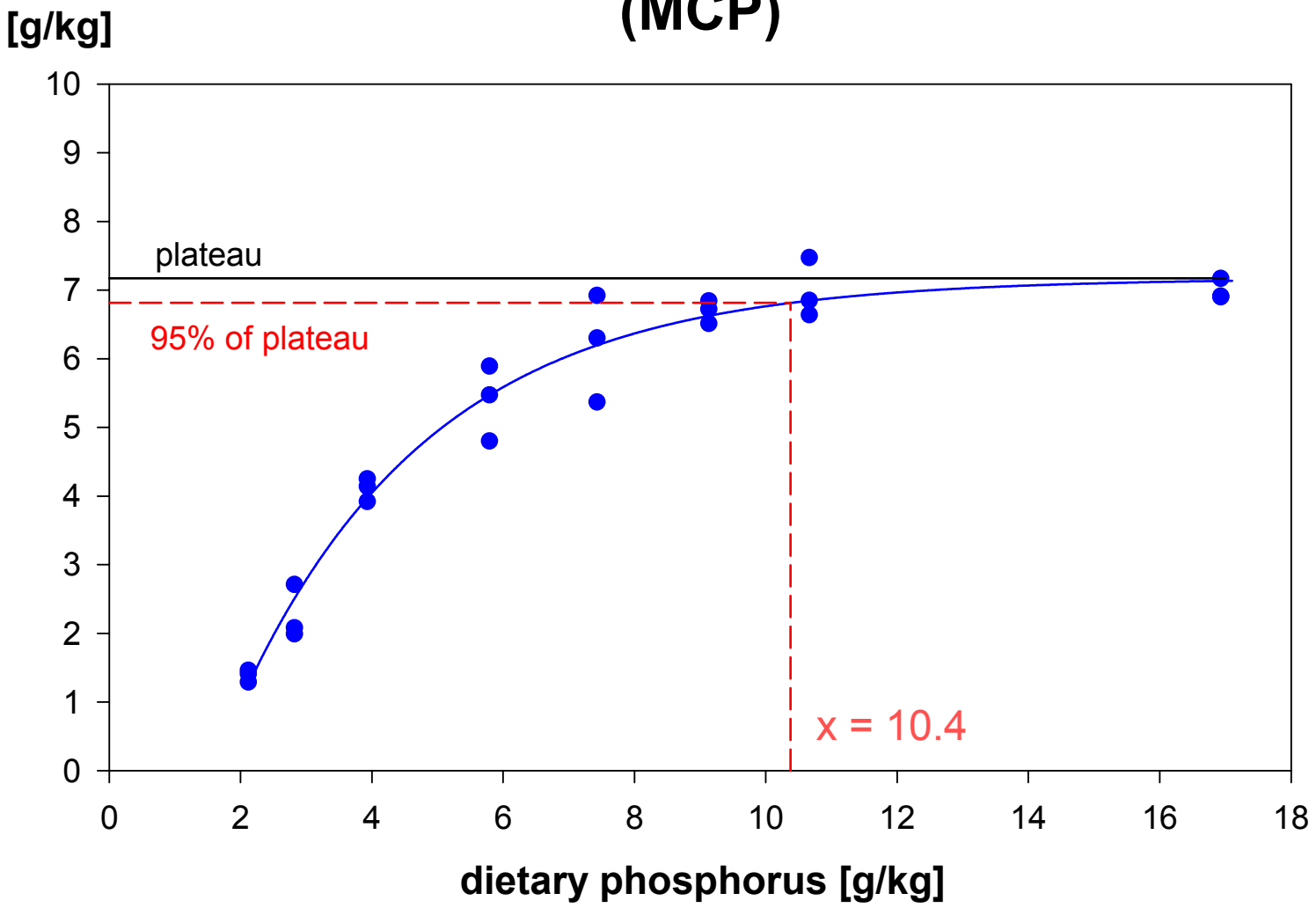
Weight gain (DCP)



Phosphorus concentration in gain (DCP)



Phosphorus concentration in gain (MCP)

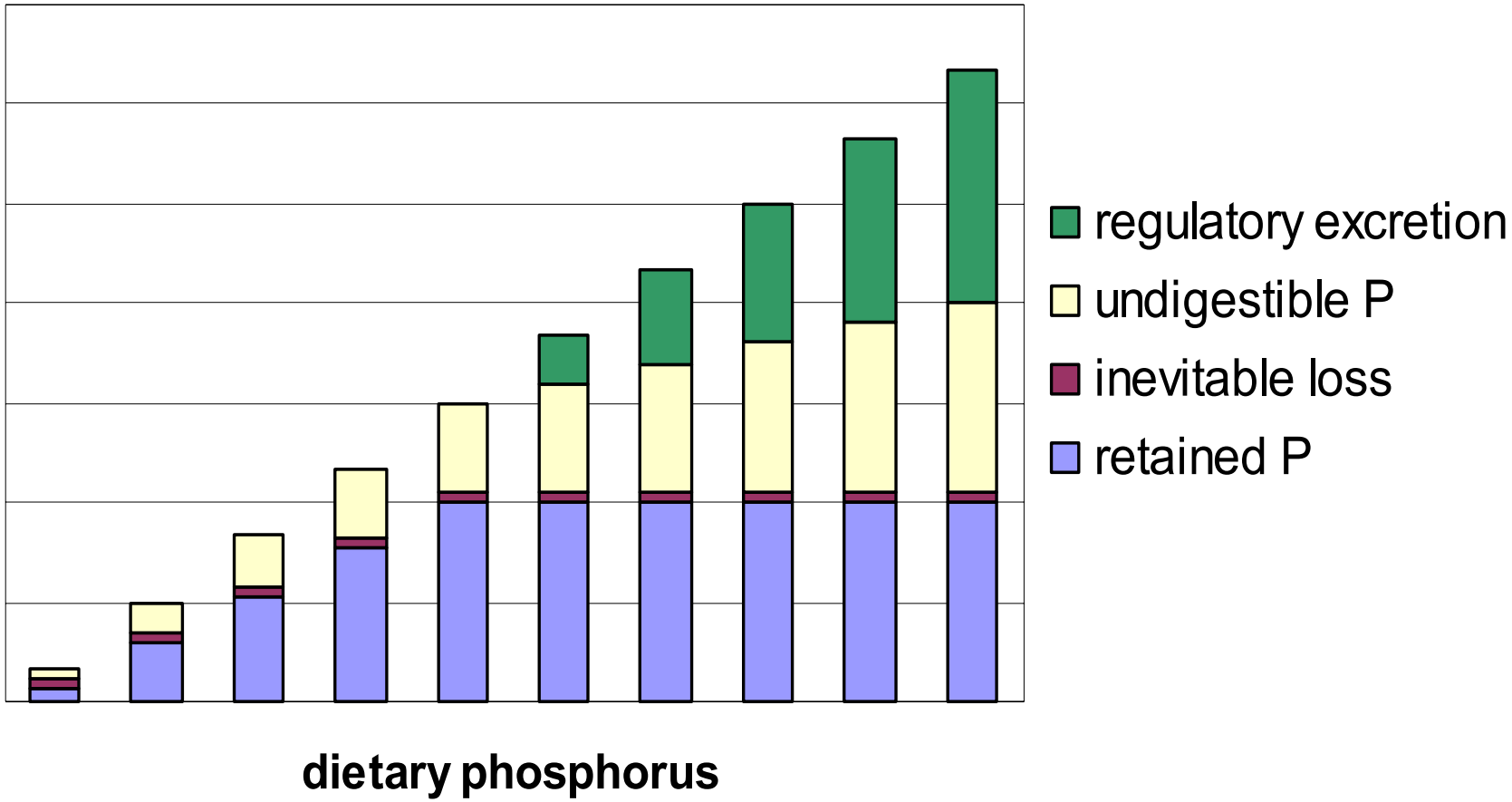


Objectives:

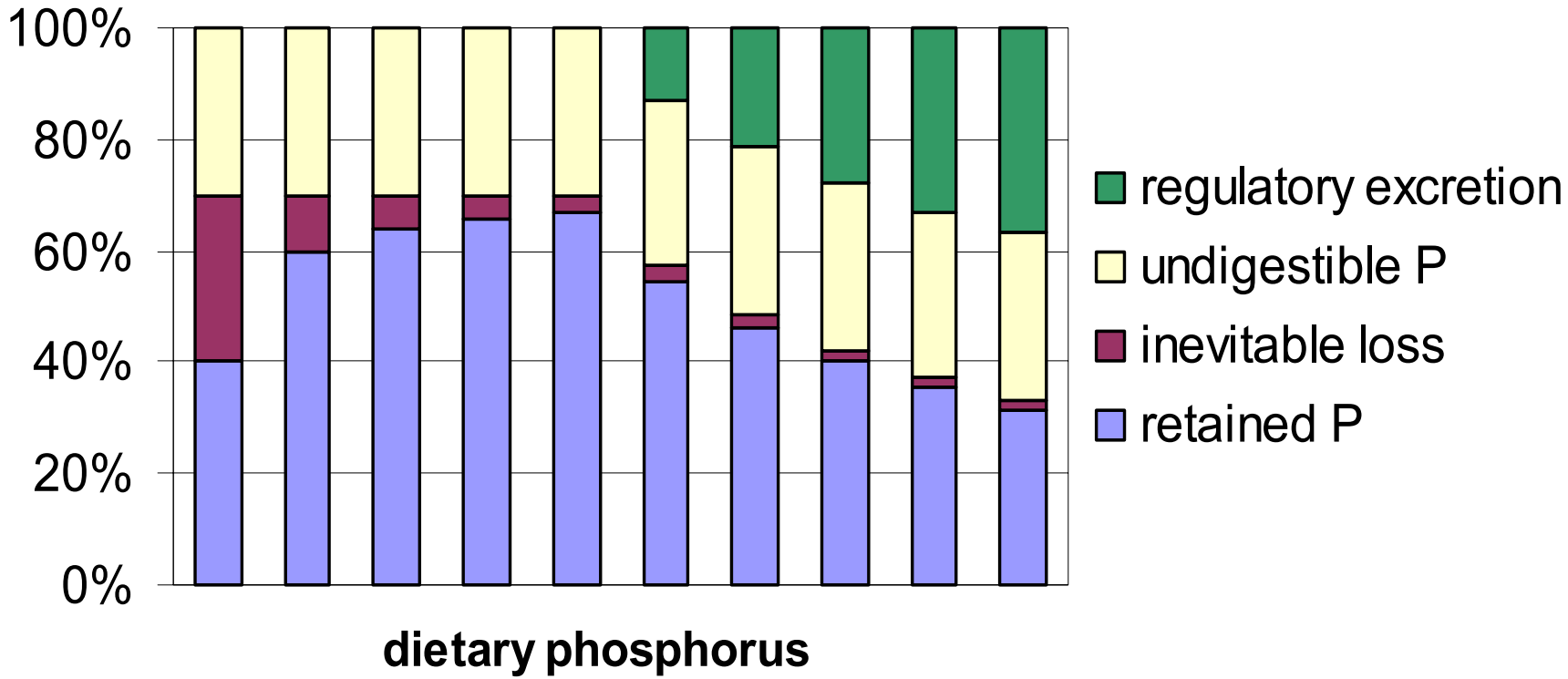
1. To determine the phosphorus demand of gilthead seabream

2. To determine the efficiency of phosphorus retention

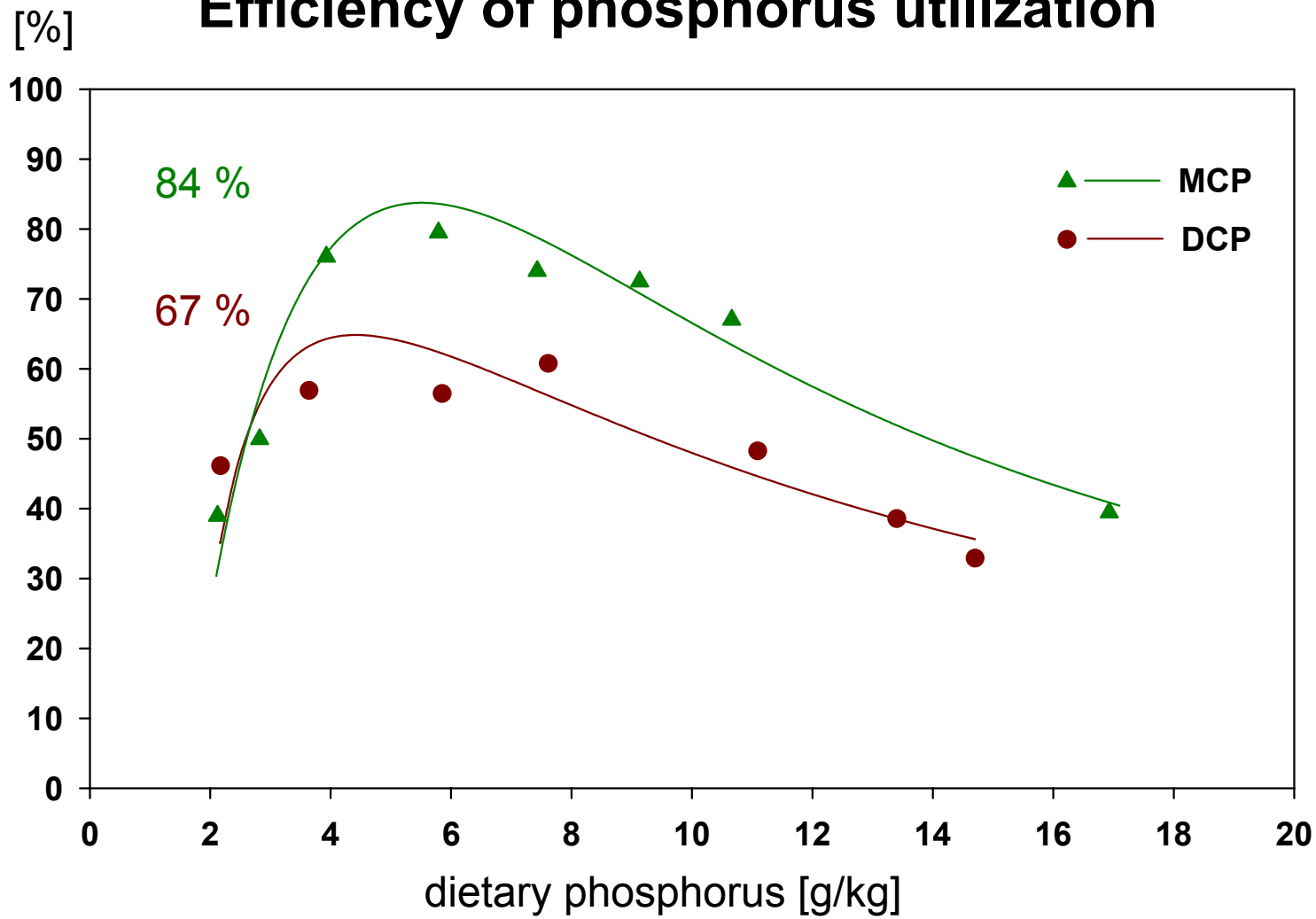
Absolute distribution of dietary phosphorus



Relative distribution of dietary phosphorus



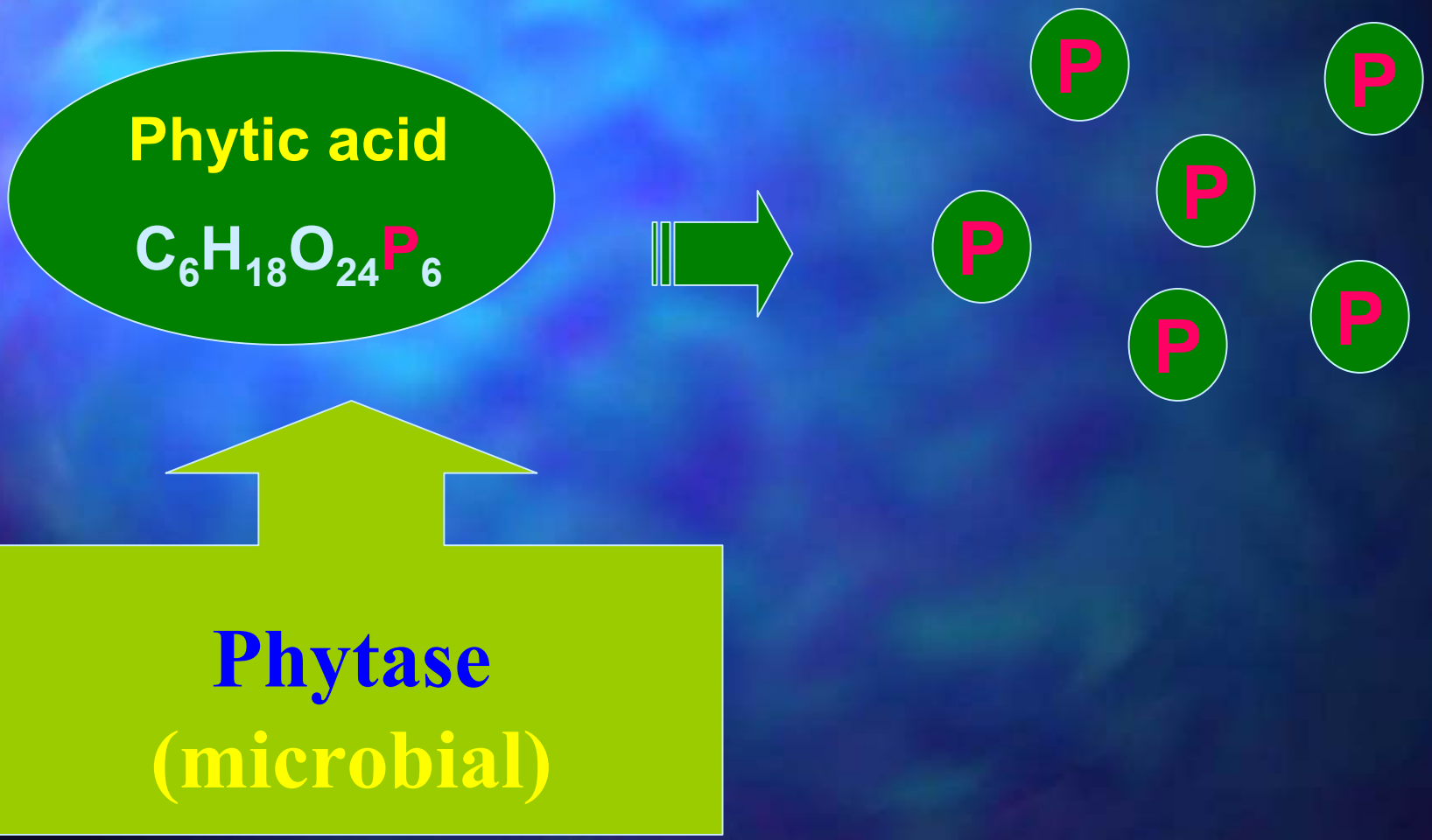
Efficiency of phosphorus utilization



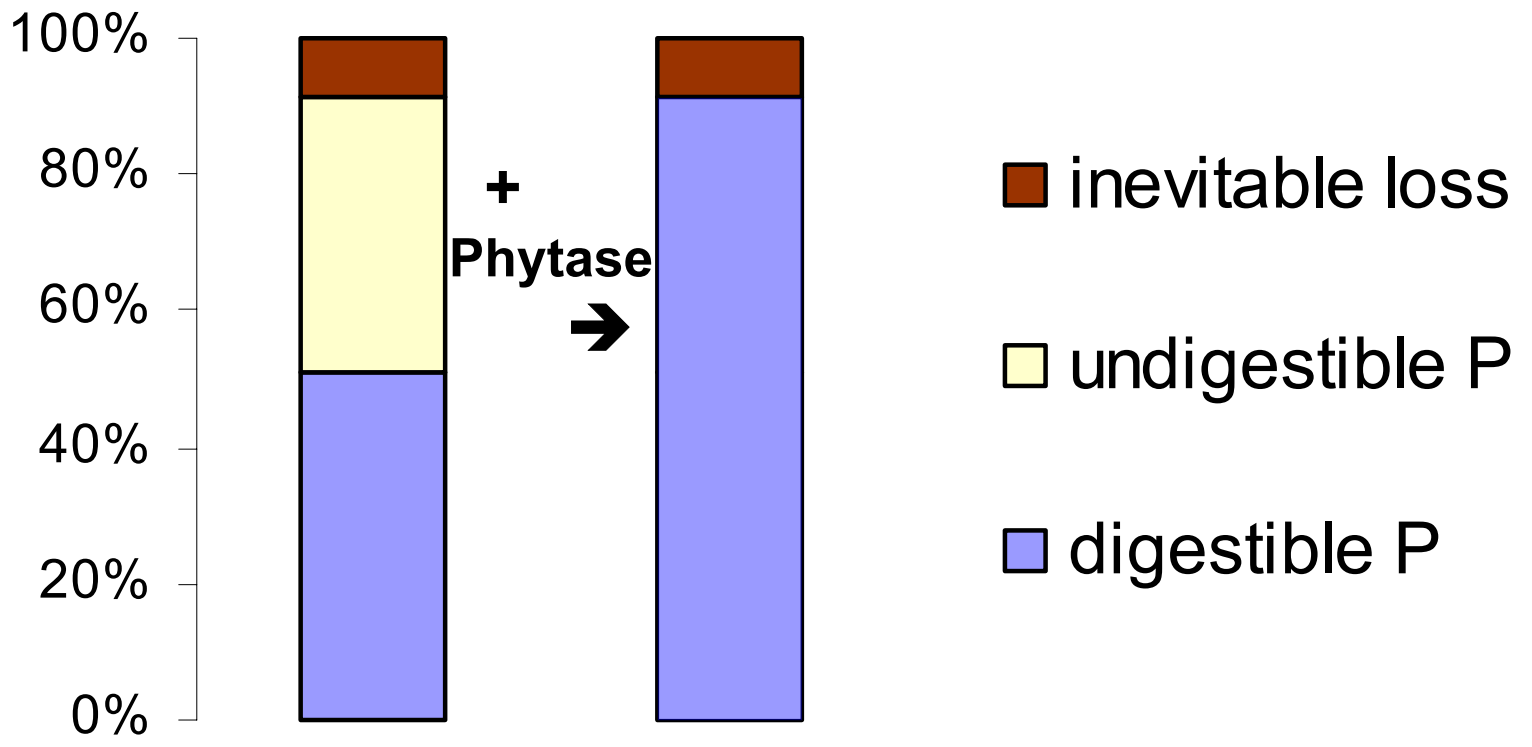
Objectives:

1. To determine the phosphorus demand of gilthead seabream
2. To determine the efficiency of phosphorus retention
3. Ways to improve phosphorus digestibility in gilthead seabream

Phosphorus In Plants



Effect of microbial phytase on dietary phosphorus

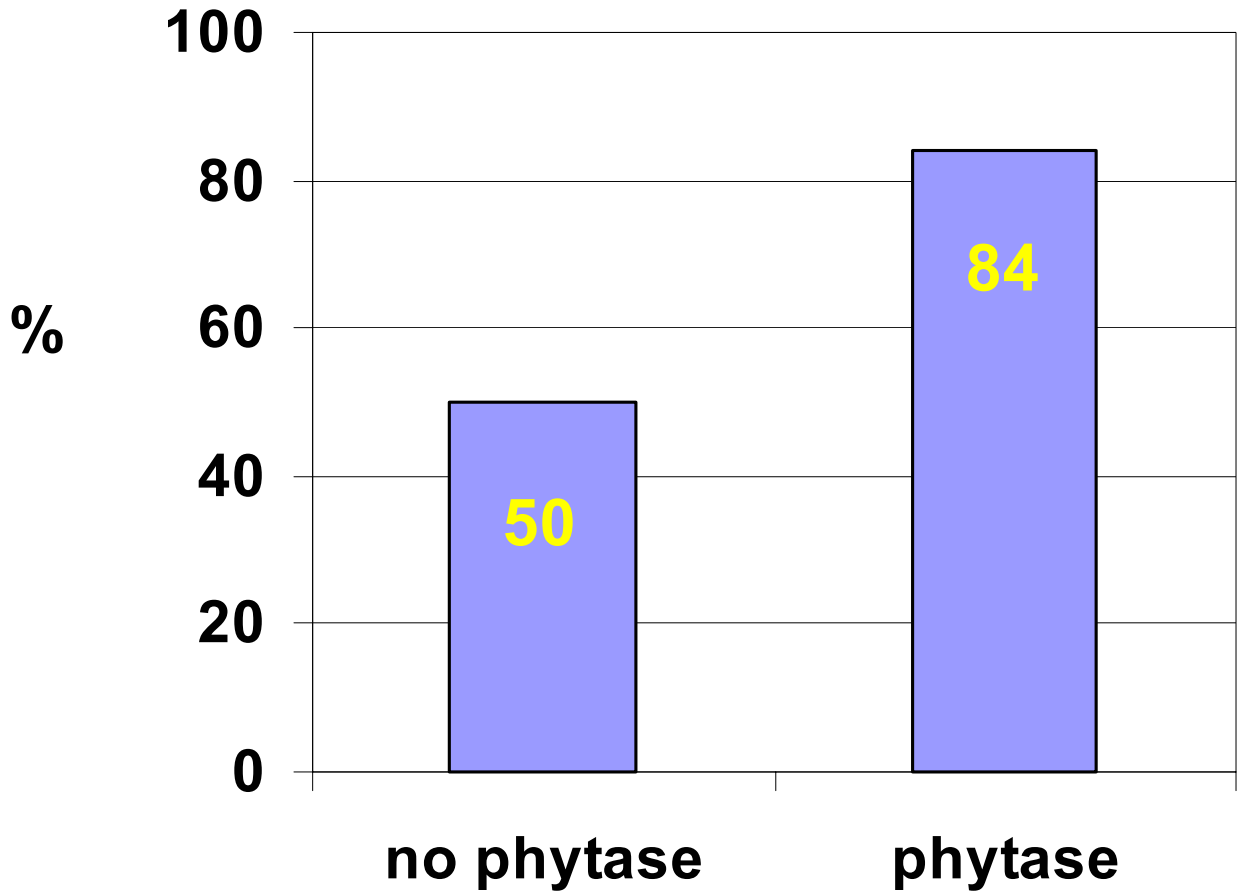


Diet composition

[g/kg]	no phytase	phytase
rapeseed oilmeal	782	
fishoil	200	
premix	10	
Cr_2O_3	8	
phytase*	-	+
sum	1000	1000

* 2000 FTU/kg, BASF AG

Effect of microbial phytase on phosphorus digestibility



Summary:

1. Determine the phosphorus demand of gilthead seabream

DCP

Maximal phosphorus retention: 12.3 g/kg dietary P

MCP

Maximal phosphorus retention: 10.4 g/kg dietary P

2. Determine the efficiency of phosphorus retention

The efficiency is depending on the phosphorus source.

DCP: 67 %

MCP: 84 %

Maximal efficiency can only be achieved below the phosphorus demand.

3. Ways to improve phosphorus digestibility in gilthead seabream

Rapeseed oilmeal + microbial phytase:

Digestibility of phosphorus

50 % ➞ 84 %.

Conclusion

Plant feedstuffs are an alternative to fishmeal regarding phosphorus.