



Fôrer vi fisken syk på planteingredienser?

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Nofima



Innhold

- **Kort introduksjon av APC**
- **Utfordringer ved bruk av planteråvarer**
- **Resultater ved bruk av planteråvarer**
- **Hvordan løse utfordringene**
- **Konklusjon**

APC
Aquaculture Protein Centre
Centre of Excellence

Aquaculture Protein Centre's visjon

Sikre bærekraftig vekst i akvakulturnæringen ved å bidra med integrert grunnleggende ernæringsmessig, fysiologisk, patologisk og teknologisk viten som er nødvendig for optimal bruk av protein i fôr til oppdrettsfisk



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Tre forskningsområder

39 Ansatte
5 Assosierte

Administrasjonen
UMB, Ås
Margareth Øverland

Feed Ingredients & Processing
UMB, Ås
Margareth Øverland

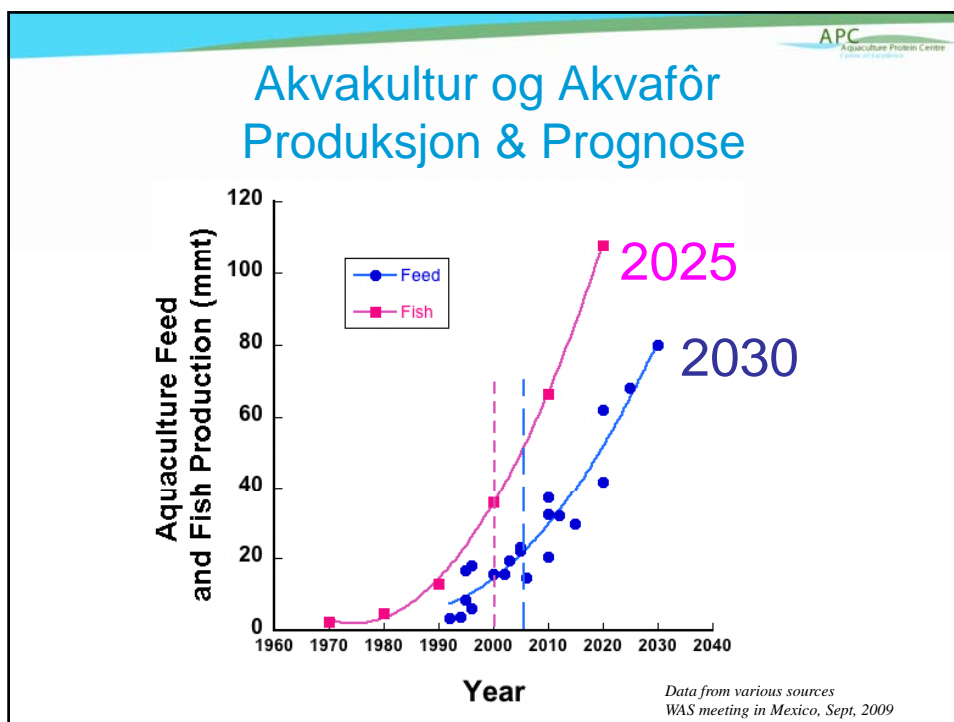
FIP

Gut & Health
NVH, Oslo
Åshild Krogdahl

GH

Protein & Amino acid Metabolism
Nofima Marine
Sundalsøra
StåleHelland

PAM



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Hensikt

Evaluere nye proteinfôrmidler og utvikle nye prosesseringsmetoder for å kunne optimalisere fôr til oppdrettsfisk.

Planter Eks. soya	Mikrober Eks. <i>Methylococcus capsulatus</i>	Animalia Eks. Krill (<i>E. Superba</i>)
		

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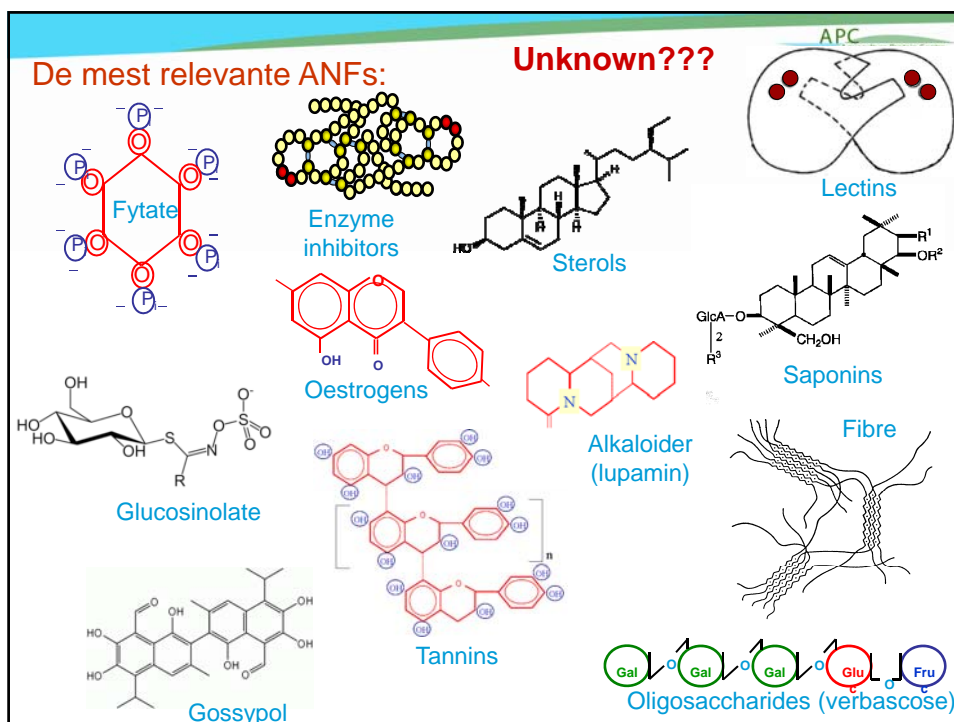
Forskning med planteproteiner i APC



Plantefôrmidler

- **Utfordringer:**
 - Aminosyresammensetning
 - Protein- og energikonsentrasjon
 - Smakelighet
 - Antinæringsstoffer (ANF)
 - Genmodifisering






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Soyabønner

- Omfattende studert i forsøk med laksefisk
- God tilgang
- Lav pris
- Høgt innhold av protein, med god aminosyreprofil
- Blir brukt som modell for å studere andre planteråvarer



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Soyaenteritt, histologi i baktarm

Fiskemel
Normal bak-tarm

Soyamel
Enteritt

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Tarmflora i baktarm

fastsittende og i tarminnholdet

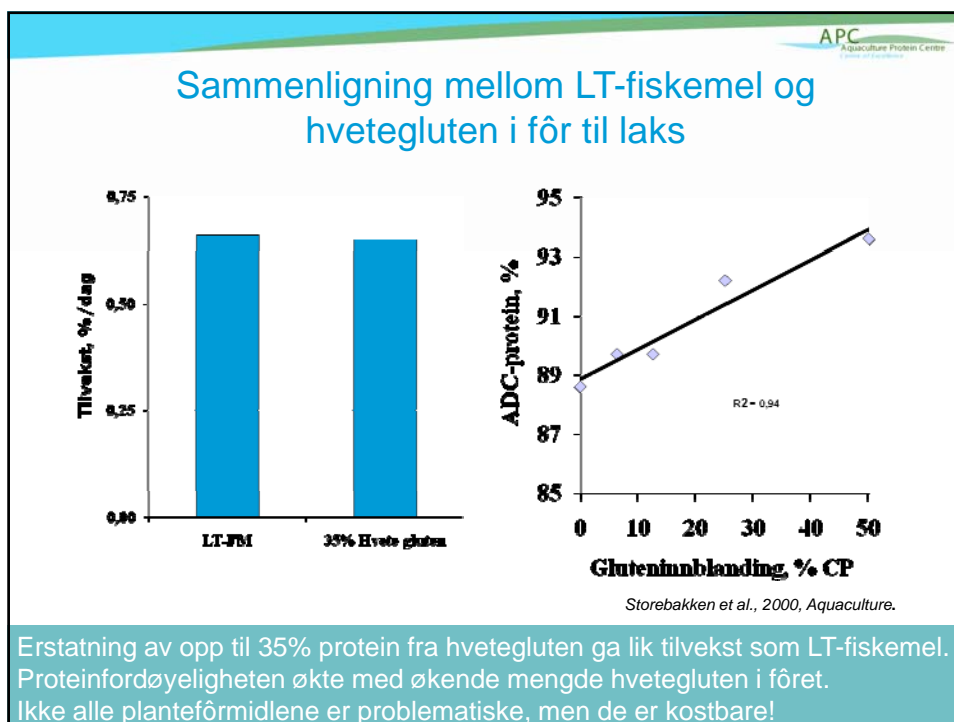
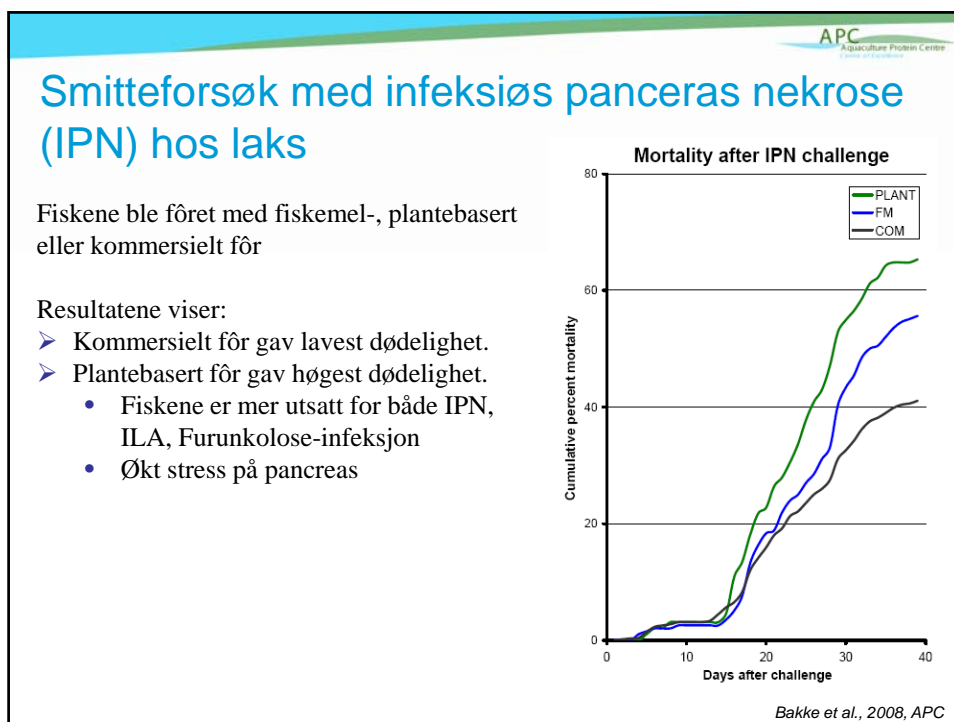
Fiskemel

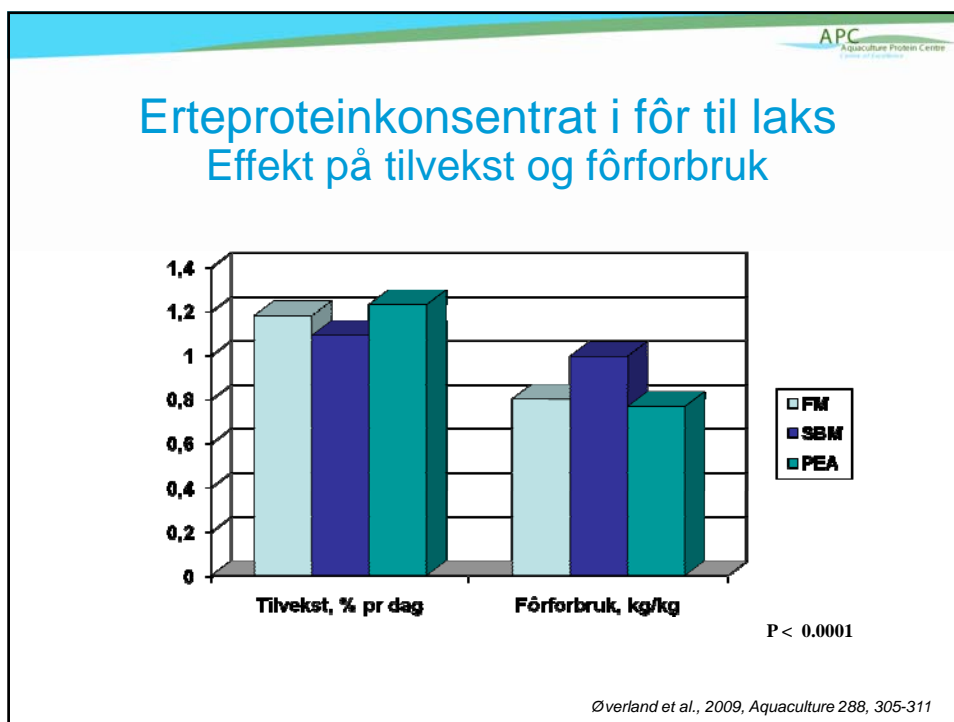
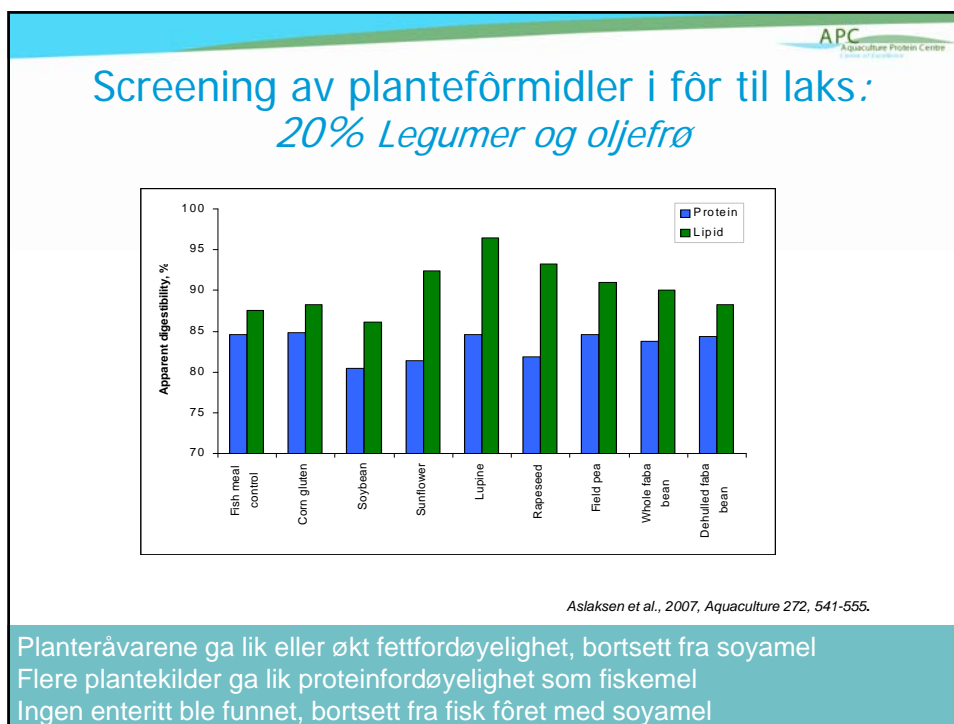
Adherent bacteria isolated from large intestine of Atlantic salmon (*Salmo salar* L.) fed fish meal

Soymel

Adherent bacteria isolated from large intestine of Atlantic salmon (*Salmo salar* L.) fed soybean meal

Stor forskjell i type bakterier og i antall påvist ved dyrking og DNA-karakterisering





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Hvordan løse utførdningene med planteproteiner

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Kondisjonør: ~90°C

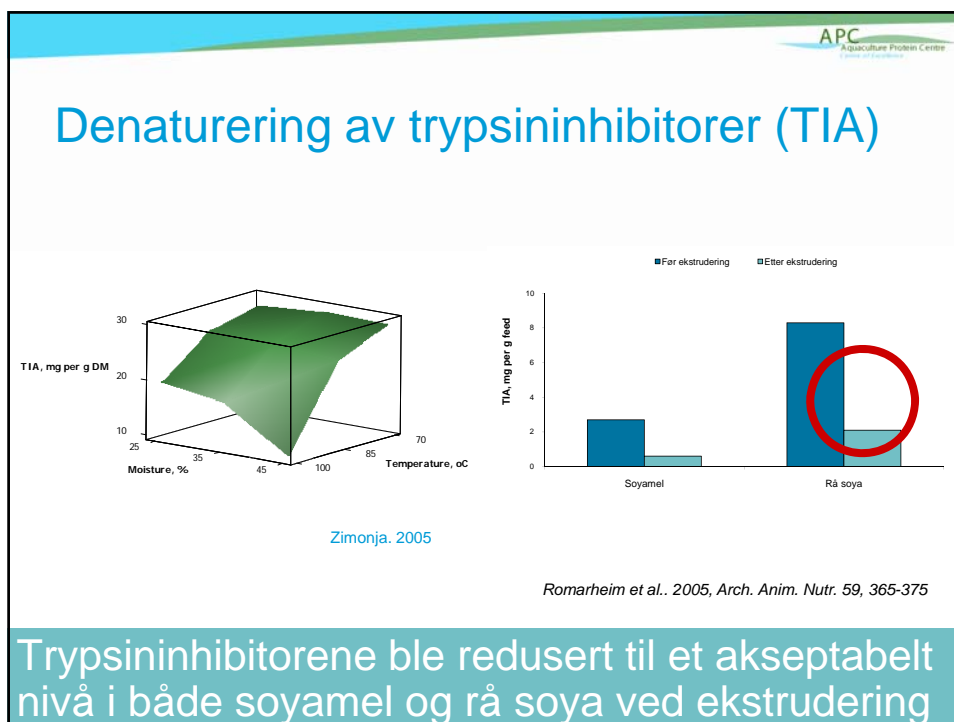


Ekstruder: ~110-140°C



Tørking: ~90-110°C

Reduksjon av varmelabile ANF ved ekstrudering



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Fytinsyre (IP₆)

Lupin

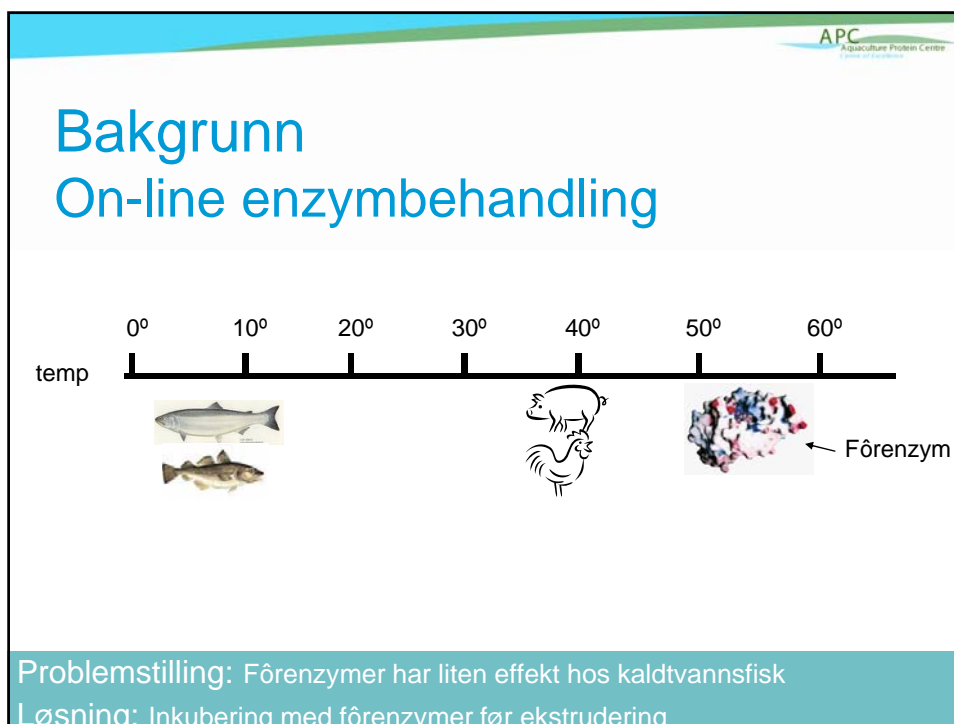
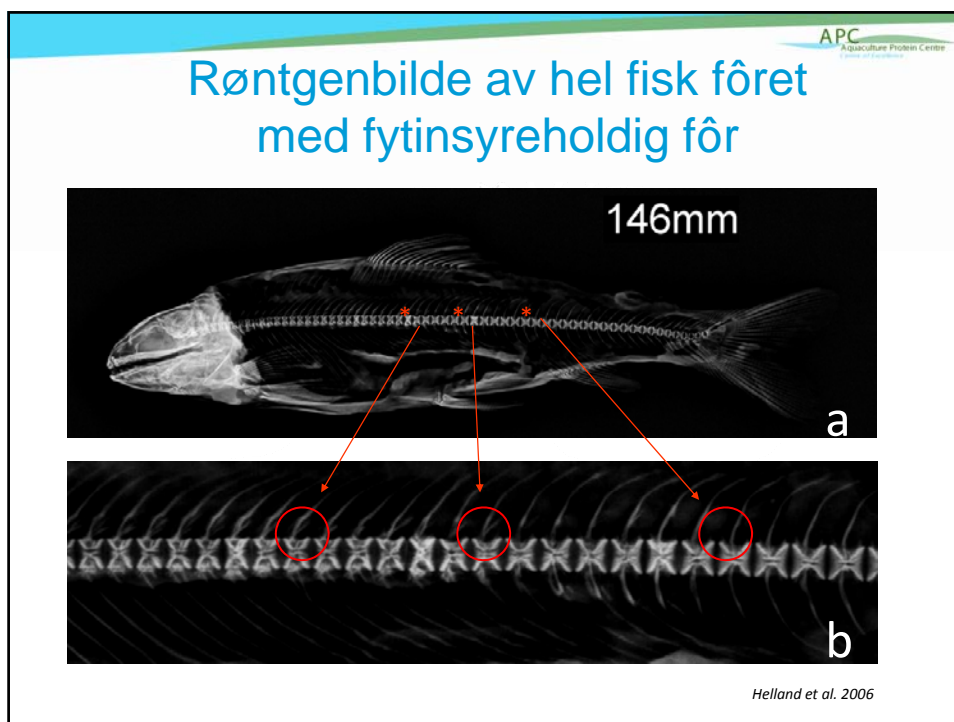
Soy

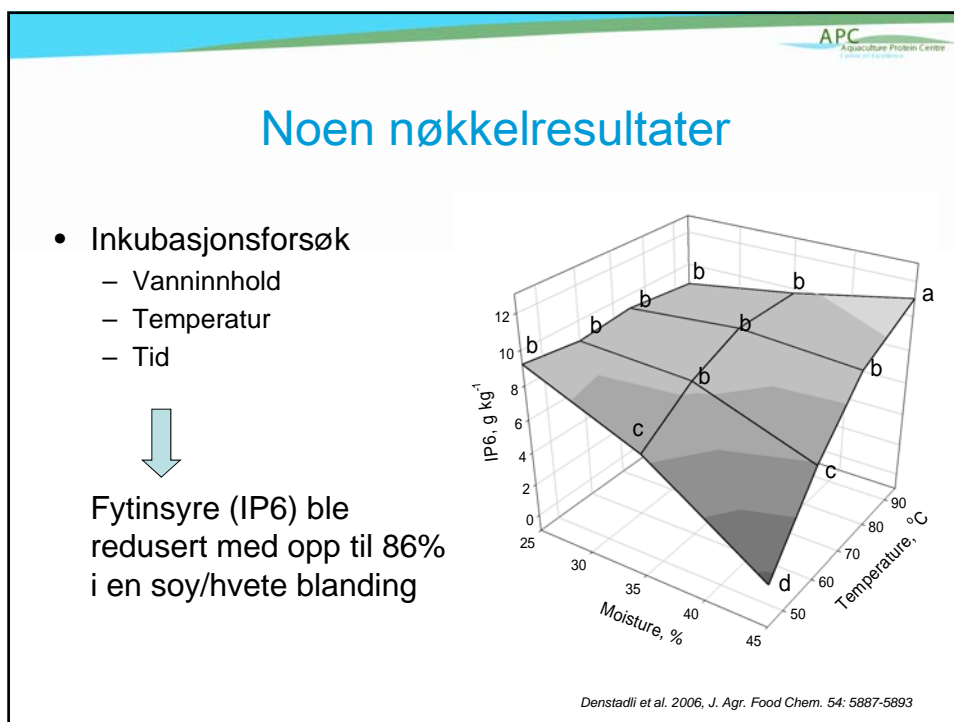
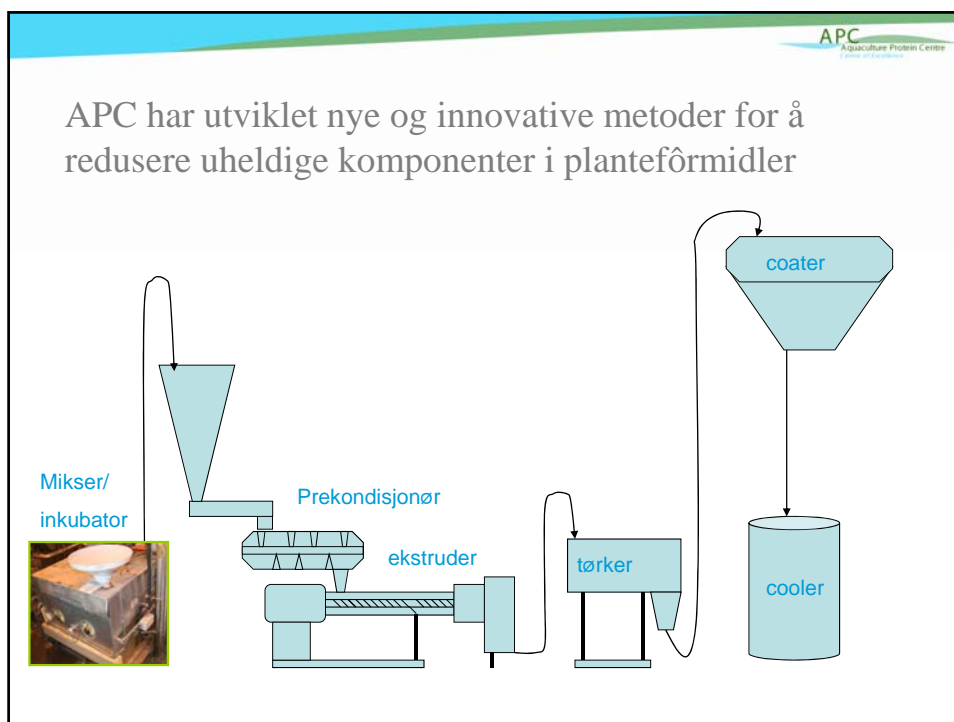
Wheat

Sunflower

Rapeseed

Maize





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Inorganisk P

- 90-95% benyttet som mineralgjødning
- 5-7% benyttet som tilskudd i dyrefôr (MCP, DCP)
- Prisen på P: Økte med 600% fra 2007-2008

Phosphate Rock Commodity Price

Date (Year)	Price (USD/tonne)
2007-01-01	50
2007-02-01	50
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Oppsummering

Den sterke veksten i oppdrettsnæringa fører til økt behov for nye proteinkilder i fiskefôr:

Fremtidig fiskefôr krever kombinasjon av ulike proteinkilder, både marine, fra planter og mikrober, og co-produkter fra varmblodige husdyr

Mange plantebaserte proteinkilder må forbehandles ved fremstilling av fôr slik at næringsverdien blir høy, og at fisken ikke påføres feilernæring eller andre lidelser

En må foreta riktig utvalg av råvarer og kombinasjoner av disse for å oppnå gode produksjonsresultater og helse

Prosesseringsnivå må tilpasses slik at produksjonskostnadene holdes lave