



Nutrient sources

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Nutrient sources for horses



Learning Outcomes

By the end of this section you should be able to:

- Recognise and critically appraise nutrient sources for horses and ponies



Nutrient sources for horses



Content

- Forages
- Cereal grains
- Cereal by-products
- Fibrous by-products
- Oil and oil by-products



Nutrient sources for horses



Forage

- Constitutes the ↑ portion of diet of all classes of equids
- Entire diet for equids in wild and many domesticated horses
- Grazed directly (fresh) or conserved



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Fresh forage

- Natural environment for horse = grazing on fresh pasture
- Many domesticated horses still spend ↑ time at pasture
- Some competition horses spend much ↓
- Natural diet = low quality herbage
- Domesticated horse = improved pastures (↑ nutritive value)

Nutrient sources for horses



Grasslands

Chemical composition:

- Extremely variable
- CP = 3 to 30 %
- CF = 20 to 40 %
- WSC = 3 to 40 %
- Lipid= 1.5 to 3.5 % (unsaturated)
- Ash = 4 to 8 %
- DE (energy) = 7.5 to 12 MJ/kg DM (depending on time of year)
- DE of legumes \uparrow = 10 to 12 MJ/kg DM
- Minerals = \uparrow in pastures containing legumes



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The amount of nutrition grass can provide depends on:

- Time of year
- Environment
- General management of the pasture
- Number of animals grazing the area



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Time of year:

- Rapid in spring and early summer
- Often more produced than animals can eat
- Grazing pasture often cropped for conservation in spring
- Used for grazing in summer
- Less growth in autumn
- Very little growth in winter
- Ground damage in winter
- Thus animals housed and fed conserved forages
 - Hay
 - Silage
 - Haylage
 - High-temperature dried

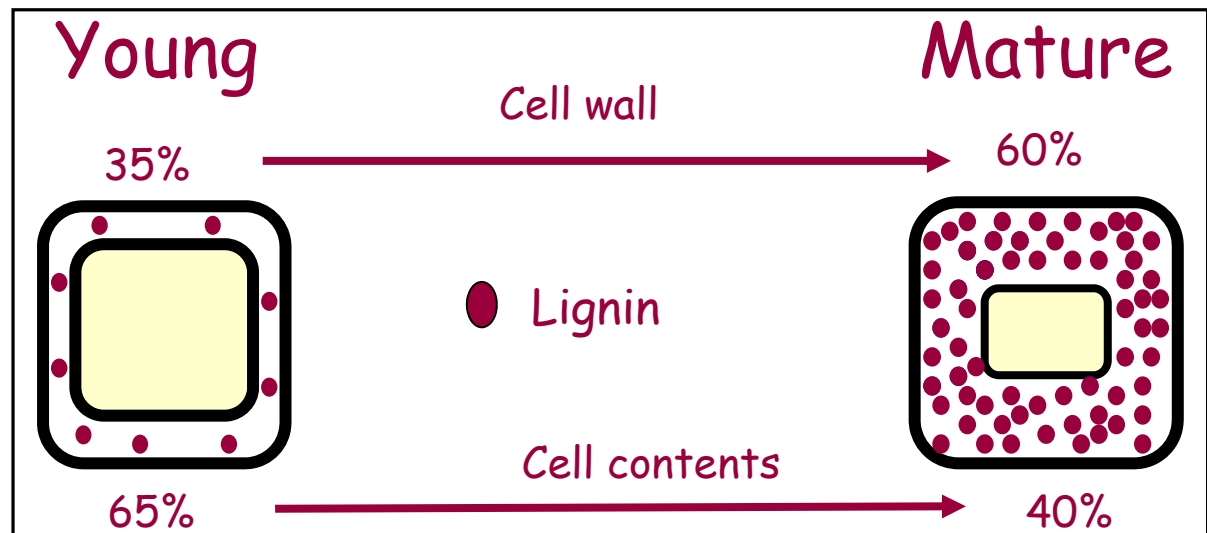
Nutrient sources for horses



Nutritive value

Dependent on:

- Stage of growth:
 - Most important factor in nutritive value of grass
- Plant species
- Soil type
 - Grass responds well to soil with ↑ fertility
 - Soil type can limit plant growth and nutrient content
- Environmental conditions
 - Temperature
 - Light
 - Rainfall



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Nutritional intakes

- Nutritional quality and growth ↑ in spring and summer
- Difficult to estimate amount of grass eaten
- Most horses/ponies will eat ~ 2 % of BW per day
- In spring/summer can = too much grass can be consumed
 - 1 acres will feed 3 to 4 horses
- Excess grass = conserved for winter feeding
- Intakes lower in winter
 - 1 acres will feed 1 horse or 2 ponies

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Requirement for conserved forage

- Seasonal growth = need to conserve for winter feeding
- Thus – provides forage when demand exceeds supply
- Some horses stabled year round
- Grassland management tool
 - Grazing exceeds grazing needs



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Objectives of forage conservation

- Preserve a product with ↑ digestible nutrients
 - Quality of preservation key to:
 - Palatability
 - Longevity
 - Nutritional quality
 - Hygienic quality



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Methods of forage conservation

- By removing the moisture for aerobic storage
 - Dried in field, or barn, or part both
 - Haymaking and artificial dehydration
- By acidification in an anaerobic environment
 - Fermentation and storage of moist crop
 - Silage/haylage making

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Conserved forage - Hay

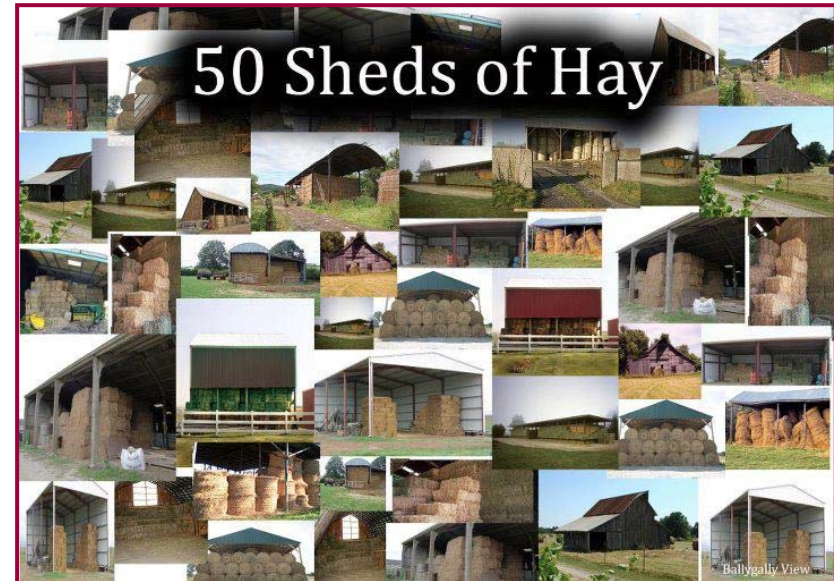
- Plant materials dried to ~ 15 % moisture content
- Usually field dried = ↑ weather dependent
- Cut at late stage of maturity
- Stable at ambient conditions
- Changes during storage
- UK = grass hay

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Conserved forage - Hay

- Variable quality
 - Nutritionally
 - Hygienically
- Low energy (DE = 4 to 8 MJ/kg)
- Dust (RAO)
- Soak (10 mins) or steam



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Conserved forage - Hay

- North America = lucerne (alfalfa)
- UK too wet
- Higher protein
- Higher energy (DE = ~ 10 MJ/kg)
- UK = conserved by HT drying



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Conserved forage – HT forages

- Dried at very high temperatures
 - Efficient, but very expensive
- Young forage = ↑ digestibility
 - Drying has little effect on nutritional quality
- Used as a short chop added to bucket feed



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Conserved forage – HT forages

- Lucerne (alfalfa)
 - DE = 10 MJ/Kg DM
- Grass (readigrass)
 - No data in horses
- Alfalfa/straw mix
 - Lower energy

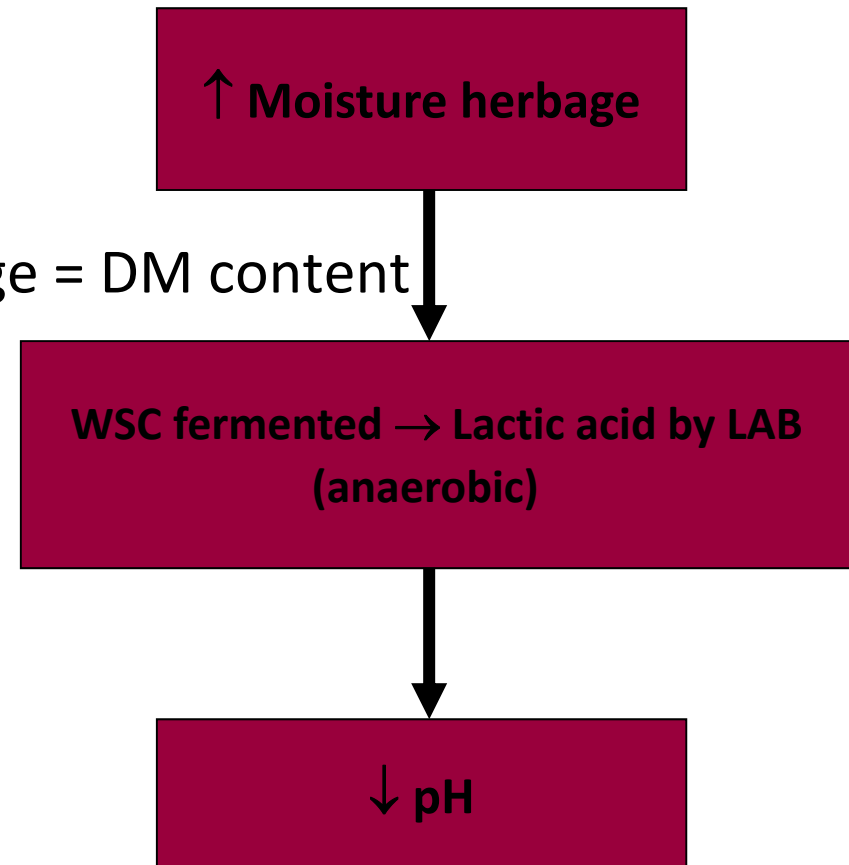


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Conserved forage – haylage and silage

- Fermentation of low DM crop
- Difference b/w haylage and silage = DM content
- Generally made from grass
 - Legumes (e.g. lucerne)
- Cut, wilted, ensiled



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Conserved forage – haylage

- Haylage
 - Typically grass haylage
 - Popular feed for horses
 - ↑ DE than hay
 - Low dust
 - Palatable
 - ↓ need for cereals
 - ↓ aerobic stability



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Conserved forage – silage

- Silage
- Clamp or big bale (clamp not usually fed to horses)
- Perceived as high risk
 - Acidity (no diff in faecal pH of horses fed silage compared to hay)
 - Laxative effect (only small diff in faecal DM)
 - Hygienic quality (can contain *Listeria spp.* or *Clostridium botulinum*)
 - Hygienic quality important - horse can't metabolise certain toxins
 - Haylage contains less moisture for microbial growth

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Cereal grains

- Nutritional value:
 - CP: 80 – 120 g/kg DM
 - Low in protein quality (↓ essential aa)
 - Lipids: 10 – 60 g/kg DM (unsaturated)
 - ↓ calcium (<1 g/kg DM)
 - ↑ phosphorus (3-5 g/kg DM)
 - Poor Ca:P ratio
 - ↑ energy (starch) – DE 12 – 16 MJ/kg
 - Less variable than forage



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Cereal grains

- Commonly utilised grains:
 - Oats (40 % starch, fibre content [hull] – naked oats those with no hull)
 - Barley (55 % starch, ↑ energy value)
 - Maize (70 % starch, need to be processed)
- Other grains
 - Wheat
 - Rye
 - Sorghum
 - Triticale

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Oats

- ~ 40 % starch
- Fibre content – hull
- Naked oats – no hull



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Barley

- ~ 55 % starch
- ↑ energy than oats



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Maize

- ~ 70 % starch
- ↑ energy than oats and barley
- Needs to be processed

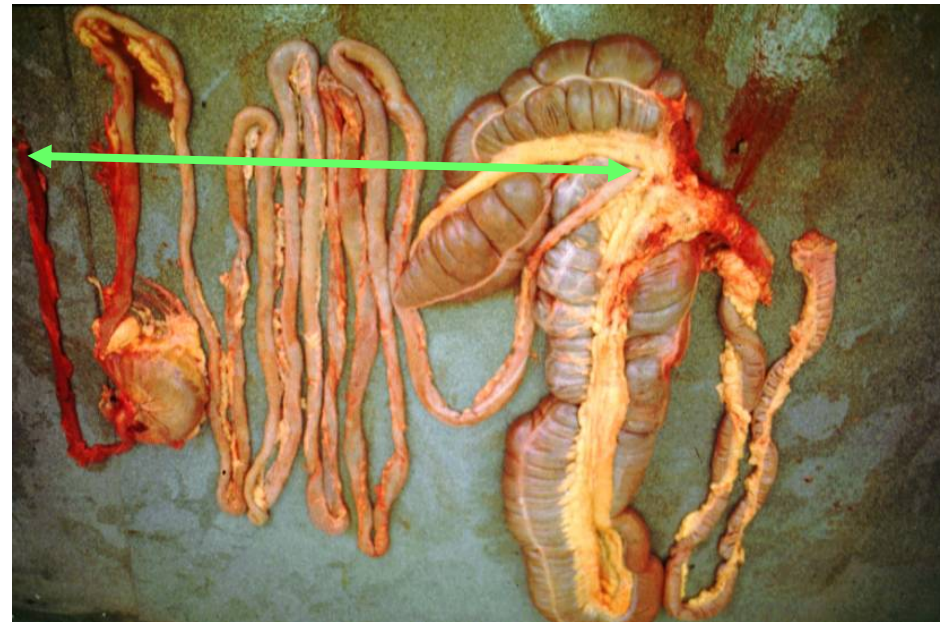


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Botanical source of starch

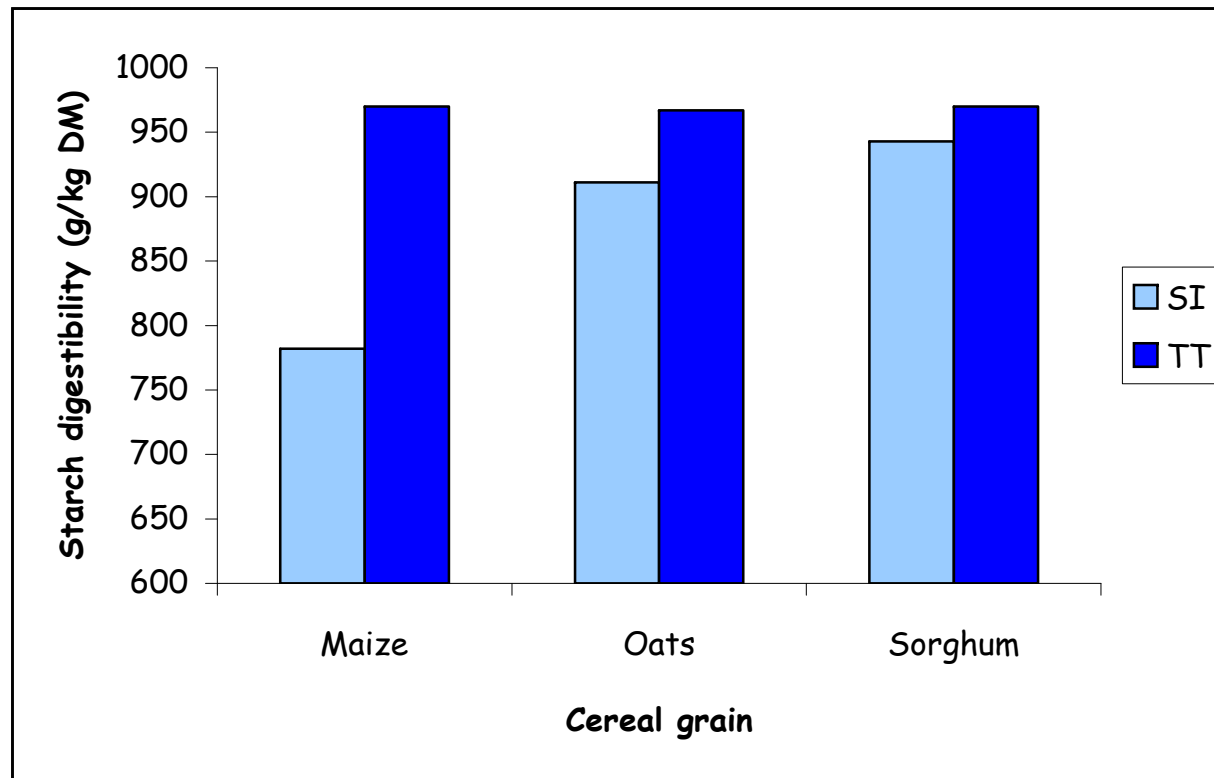
- No effect on TT digestibility = ~ completely digested
- SI digestibility is affected



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Botanical source of starch



Arnold *et al.* (1981)

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Cereal processing

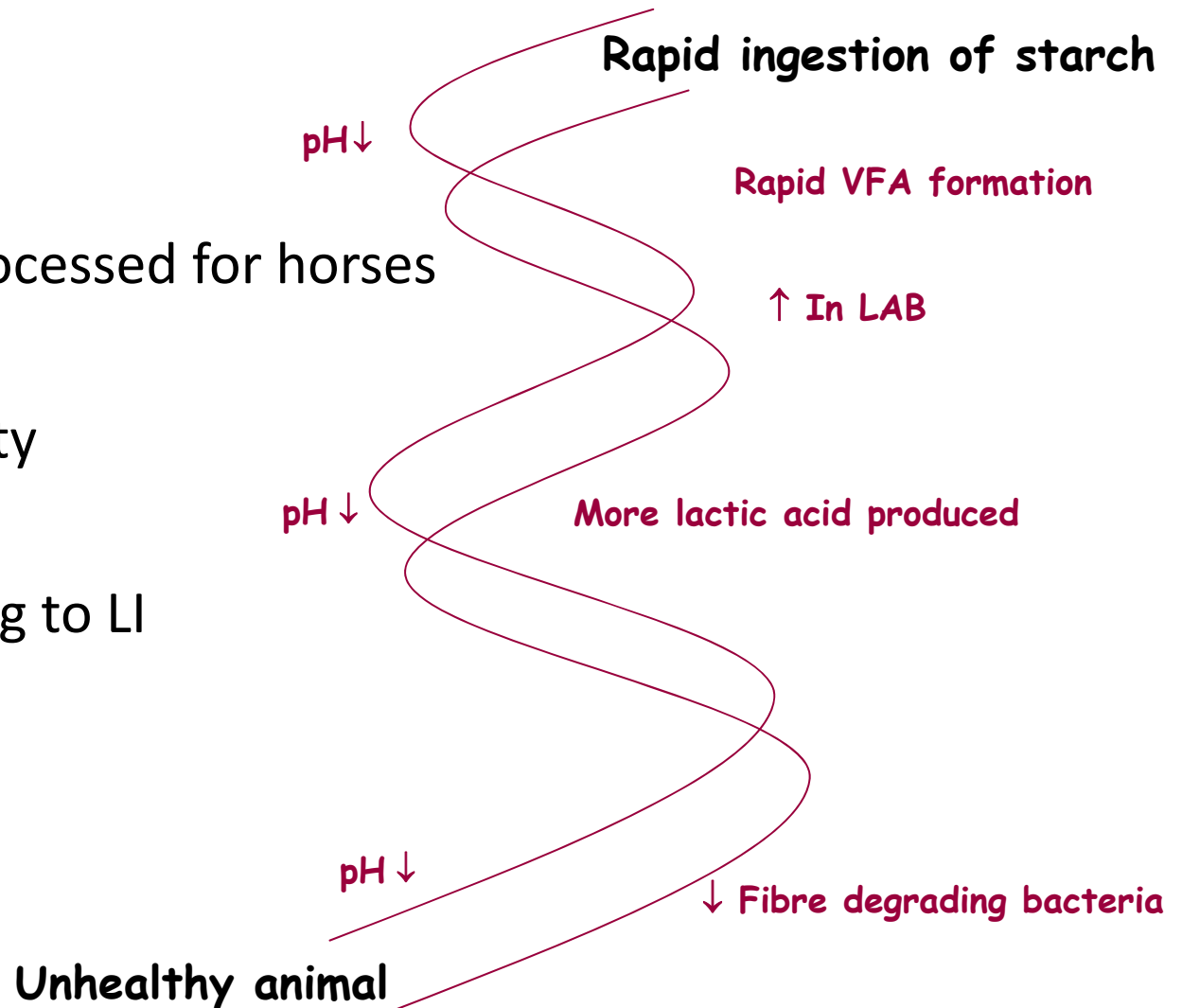
- Improves availability of nutrients
- Simple mechanical processing:
 - Rolling
 - Grinding
- More sophisticated techniques:
 - Micronisation (heat and mechanical pressure – infrared technology)
 - Extrusion (high temperature steam – then rolled into a flake)

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Cereal processing

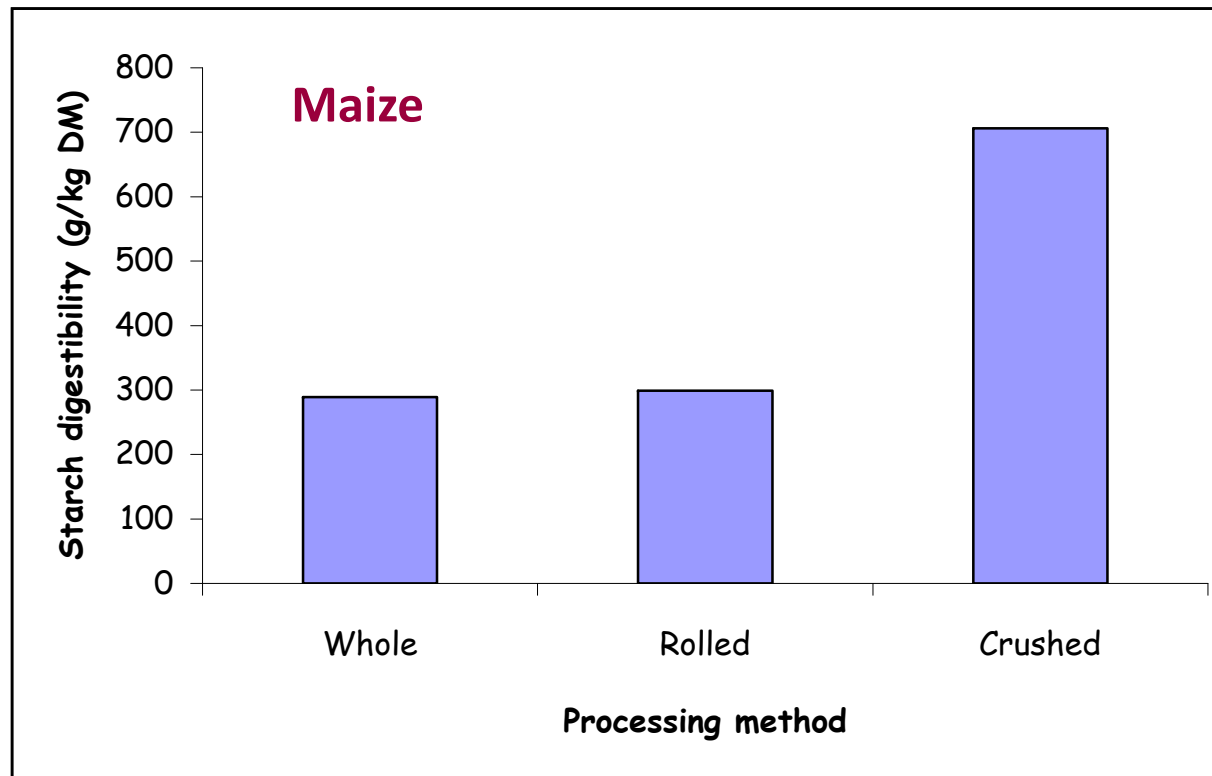
- Cereals need to be processed for horses
- Improves SI digestibility
- Prevents grains passing to LI
 - = disturbance



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Processing of cereals



Kienzle *et al.* (1992)

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Starch intakes

McLean et al. (2000):
➤ 2 g/kg LW per meal

500 kg horse - 0.5 kg starch/meal
No more than 1.2 kg oats per meal
(1.2 kg x 40 % starch = 0.48 kg)

Vervuet et al. (2009):
➤ 1 g/kg LW per meal

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Cereal grains - overview

- Energy-dense feedstuffs
- Consistent nutritive value
- Starch = okay for horses in fast work
- Needs to be processed
- Fed in moderation & small, frequent meals
- Utilise ↑ energy fibrous feeds



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Cereal by-products

- Wheatbran – major milling product fed in UK
 - Arising from milling of cereal grains
- Nutritional value = poor
 - ↑ levels of lignin
 - ↓ Ca and ↑ P (poor ratio)
- ↑ H₂O holding capacity
- Good vehicle for administering medicine
- Palatable = good appetite stimulant



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Fibrous by-products

- Sugar beet pulp – commonly fed to horses
 - Soaked to prevent choke and stomach distension
- Residue after extraction of sucrose
 - Dried
 - Shredded or pelleted
 - +/- molasses
- Nutritional value
 - ↑ fibre content ; ↑ fibre digestibility
 - Moderate CP content
 - ↑ Ca content



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Fibrous by-products

- Sugar beet pulp – very good cereal replacer
 - Uniform composition
 - More favourable Ca content
 - ↓ risk of LI disturbances
 - ↑ DM digestibility (~ 85 %)
 - DE of almost 13 MJ/kg DM
- Uses
 - Found in compound mixes
 - Added to bucket feed
 - Generally valued and under used



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Molasses

- Residue following sugar extraction from the sugar beet root
- Thick residue after sugar separated from water extract
 - ↑ soluble sugars
 - Often added to sugar beet pulp
 - And proprietary mixes, mineral “licks”
- Nutritional value
 - DE = ~ 11 MJ/kg
 - CP = 50 g/kg
 - ↑ CHO content

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Oil and oil by-products

- Vegetable oils – most commonly fed to horses
 - Corn oil (most palatable)
 - Soy oil
 - Sunflower oil
 - Rapeseed oil
 - Linseed oil
- Fish oils (particularly cod liver oil)
- Most oils have energy content = 9 Mcal/kg
- 2.25 x more than CHO



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Oil and oil by-products

- Use of oil in horse rations
 - Mainly to ↑ energy content of the ration
- Other benefits seen
 - Improved energetic efficiency
 - Improved athletic performance
 - Enhanced body condition
 - Less excitable behaviour
 - Improved health



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Oil and oil by-products

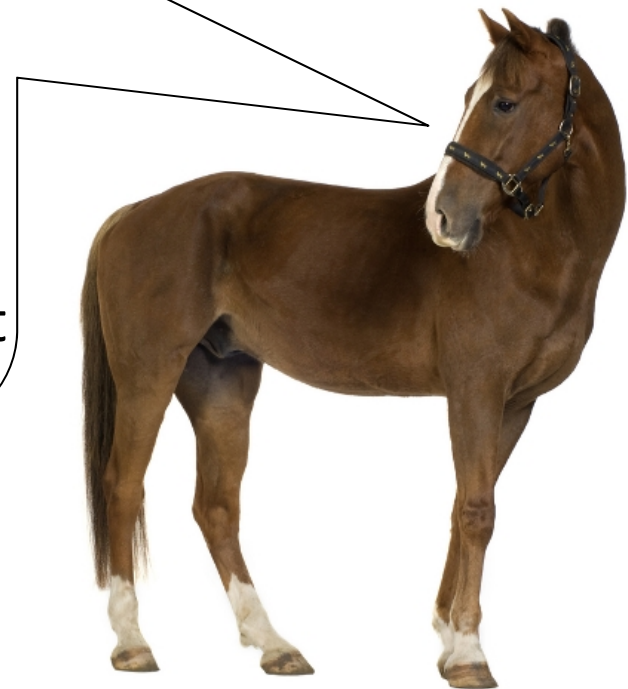
- Oil by-products
 - Seeds grown for ↑ oil content – oil extracted
 - Residue remaining = oil seed meal
- Oil seed meal
 - ↑ protein
 - Generally used as protein supplement
 - Some oil content (1-1.5 % solvent or 4 – 5 % mechanical)
- Types (↑ quality protein - ↑ lysine)
 - Soybean meal
 - Linseed meal
 - Hempseed meal

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Nutrient sources - conclusion

- Feed high quality forage
- Use high degradable fibrous feeds
- Feed cereals in moderation
and
- **ONLY** as supplement to a fibre-based diet



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**Thank you for participating
in the course 😊**

