Grains in Poultry Diets:
An Overview of What Goes Into a Ration and Why

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‘Standard’ Grains (For Energy or Regulation of Energy):

Corn           Oats          Barley     Wheat    Alfalfa (meal)

Legume- But used for energy regulation
Corn:

- High in Energy → 1500 Mcal/lb
  - Energy value comes from the starchy endosperm and the germ (oil)

- Protein Value Ranges from 6-8.5% depending on yield and overall weather season

- Finer grind for birds up to 3 weeks; coarse grind better for birds older than 21 days of age

- Vomitoxins are the biggest concern with corn in our area
Oats & Barley:

- Primary purpose is to add fiber and to increase the bulk density of the feed
  - High fiber from small grains keeps the digestive track clean and can also be used to limit feed intake.
  - These grains also add protein and energy, although most of this added nutrition is burned off digesting the excess fiber

- Energy Value → 1250 Kcal/lb (Barley), 1100 Kcal/lb (Oats)
- Protein Values → 12% Barley, 10% Oats
Wheat:

- Has more protein and only slightly less energy than corn, but it shouldn't be fed at more than 30% of the diet unless enzymes are added
  - Contains 5-8% pentosans which can cause digesta viscosity problems

- Both red and white varieties are fine; slightly different protein amounts

- Protein is extremely variable → From 10-18%

- Wheat can be fed whole after 10-14 days of age
  - Whole wheat stimulates the gizzard and gastric motility
Alfalfa Meal:

- High in protein (16-20%), but amino acids like lysine are often below expected values for a legume

- Very high in fiber; most often added to diets as a source of xanthophylls for pigmentation
  - For pigmentation, diets should contain 5% alfalfa (higher levels don't necessarily do more)

- High in minerals that promote a better immune system – Helps to replace what is lost when pasture is unavailable
Not-So-Standard Grains:

Milo/Grain Sorghum  Triticale  Rye
Milo/Grain Sorghum:

- Very effective substitute for corn:
  - 7-10% protein and 1300-1500 Kcal/lb energy
  - Up to 50% of the corn in a diet can safely be replaced with milo

- Starch is closely associated with protein; reduced digestibility (4-5% less than corn)

- Lighter colored varieties contain less tannins; the red or rusty colors are worse for feeding
  - Protein availability is reduced by 6% for each 1% increase in tannins
Triticale:

- Cross between wheat and rye
- 11-14% protein
- Energy between 1300-1400 Kcal/lb
- Significant phytase content; better source of phosphorus than corn or milo
- High pentosans content; no enzyme to offset the effect of pentosans
  - (Highly undigestible fiber in cellulose)
  - Should be limited to 15-20% of the diet
Rye:

- Nutrient content similar to wheat and corn;
  - 12% protein, 1400 Kcal/lb energy
  - Poor feeding value due to the antinutrient content

- Improved growth rates if rye is soaked in water, pelleted, irradiated, or given supplemental antibiotics

- Causes the production of very sticky, wet excreta. Enzymes can help combat this
Inclusion Rates:

- **Oats & Barley** – 15% total (combined)
- **Wheat** – 20% (without digestive enzyme)
- **Alfalfa Meal** – 15%
- **Milo** – 50% of corn
- **Triticale** – 20%
- **Rye** – 15%
Roasted Soy

- Excellent source of both energy and protein

- Protein can be extremely variable! From 33-42%!

- Whole roasted soybeans should be 'medium ground' to maintain uniform particle size with corn and other ingredients. This also helps the fat release and aid in digestion

- Because of the high oil content, ground beans should not be stored for more than 30 days in the summer and 60 days in the winter before use otherwise you run the risk of the oil oxidizing and turning rancid. This smells like motor oil.

- Must be heated to 270-300 degrees for 20 minutes to insure breakdown of trypsin inhibitors and to improve overall digestibility
Soybean Meal (Expelled)

• The meal is a by-product of the vegetable and industrial oil industry, which removes the valuable oil, leaving a high-protein meal useful for livestock and poultry feed (42-44% protein)

• Amino acid profile is very well suited to poultry nutrition with combined with corn or sorghum

• 6% oil remains after extraction
Alternatives to Soy

- Fish Meal
- Peas
- Crab Meal
- Peanut Meal
- Linseed (Flax) Meal
- Camelina Meal
- Sunflower Meal
- Canola Meal
- Sesame Meal
Fish Meal

- Provides a varied form of concentrated protein; Typically around 60%
  - Catfish or fish by-product meal doesn’t have the high protein or the same amino acid profile!

- Excellent source of amino acids, particularly lysine and methionine

- Stimulates appetite; poultry have an instinctive craving for meat proteins

- Mixing with high levels of Canola or Flax seeds/oils/meals can cause an increase in fishy taste
Field Peas

- Medium-energy protein ingredient; Low levels of sulfur amino acids (methionine and cystine)

- 22-24% protein; 1100-1300Kcal/lb energy

- Protein availability is reduced by 6% for each 1% increase in tannins
  - Usually the darker the color the more tannins there are
Crab Meal

- Generally produced through the processing of either crabs or lobsters

- Meal ranges from 25-45% protein, with low energy of 800-1000 Kcal per pound

- Beneficial in delivering a meat-type protein molecule (a protein that is higher in methionine than a grain protein)

- Volume that can be incorporated into the ration is limited by the amount of naturally occurring salt it contains; also limited due to lower energy value
Peanut Meal

- Peanuts yield a solvent-extracted meal containing 0.5-1% fat with 47-48% protein
- Expeller meal is 42-44% protein with 6% fat
- Contains a trypsin inhibitor that is destroyed during the heating imposed in oil extraction
- Huge risk for aspergillus contamination and aflatoxins
**Linseed (Flax) Meal**

- Linseed meal is flax seeds that have had their oil removed

- Has approximately 30-37% protein and 1100-1300 Kcal/lb energy

- As long as it is kept fresh and not oxidized (rancid) it works well for poultry

- Levels above 20% have a potential to add a fishy flavor or paint-like smell to meat or eggs; also an increased risk of feed refusal
Camelina Meal

- By-product of the oil seed industry
- Only easily available in the Pacific Northwest currently
- Average protein content is 37% and 1510 Kcal/lb energy in seeds; once processed it has a similar protein and energy content to roasted soybeans
- FDA has limited product and currently you cannot use it for more than 10% of both layer and broiler diets
Sunflower Meal

- By-product of the oil seed industry
- Protein levels are 34-38% and energy is 1000-1100 Kcal/lb
- When fresh, it can be used for up to 10-15% of the diet
- Highly prone to oxidation and very high in non-digestible fiber
- Birds don't eat sunflower meal as readily unless it's fresh, so be careful when using in rations
Canola Meal:

- Derived from varieties of rapeseed

- Contains less lysine than soybean meal does, but slightly more amino acids per unit of protein
  - Lower metabolizable energy than soybean meal

- Levels up to 8% can be used in laying diets, however eggs may be up to 1 gram smaller

- Brown egg layers react to the sinapine in canola, which can make the eggs taste fishy

- More prone to fishy eggs if combined with fish meal
Sesame Meal:

- Good source of protein
  - 42% protein, 1025 Kcal/lb energy
  - 7% fat

- Very deficient in available lysine

- Contains high levels of phytic acid which can cause problems with calcium metabolism
  - If diets contain more than 10% sesame meal, then it should be formulated to contain an extra 0.2% calcium
Inclusion Limits:

- **Fish Meal** – 7.5% starter; 5% finisher and 2.5% layer
- **Peas** – 25% Layers; 10-15% for starters; 20% for growers
- **Crab Meal** – 7.5%
- **Peanut Meal** – 20%
- **Linseed/Flax Meal** – 20%
- **Whole Flax** – 10%
- **Camelina** – 10%
- **Sunflower Meal** – 15%
- **Canola** – 8%
Testing Your Grains:

• With such variable energy and protein contents, we HIGHLY recommend you get your grains tested!

• When we don’t know for sure what your grain values are, our best guess is 8% protein for corn and 38% protein for soybeans

• It will SAVE YOU MONEY to get your grains tested!
As an Example...

- Ration #1 → 9% Corn and 42% Roasted Soy
- Ration #2 → 6.5% Corn and 36% Roasted Soy
- With ration 2, you’ll need 30% more corn and 15% more roasted soybeans...
  - This equates to 3 lbs extra/bird to finish them
  - (12 lbs for good feed, 15 lbs for so-so feed to finish)
- You can feed 166 broilers on 1 ton of good feed; or 133 broilers on 1 ton of so-so feed
- 33 broilers x 4 lb carcass weight = 132 lbs saleable meat
- 133 lbs saleable meat at $3/lb = $400/ton lost with so-so feed!
- It only costs $85 to get your corn and soy tested!
Labs We Recommend:

- **New Jersey Feed Lab (Grain Samples):**
  - Calories Test → $44.00 per sample
  - Includes Dry Matter, Crude Protein, Crude Fat, Ash & Carbohydrates

- **Agri-Analysis (Forage Samples):**
  - AG4A Test → $42.50 per sample
  - Dry Matter, Crude Protein, Crude Fiber, Energy, Fat, P, & Ca
Questions?

Thank you!

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