Honey Bee Nutrition

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Editor, Bee Culture Magazine

HONEY BEE NUTRITION ENOUGH GOOD FOOD ALL OF THE TIME FOR EVERY BEE IN THE BUNCH

1 Cell Of Pollen
1 Cell Of Honey
1 Cell Of Water
To Make A Bee

A Honey Bee’s
Meat and Potatoes
The Meat...

POLLEN
Fats
Vitamins
Minerals
And Especially
PROTEINS

Essential Amino Acids

Crude Protein
Minimum 20% - 25%
Healthy – 30+% 
Chickens Need Only 16%

<table>
<thead>
<tr>
<th>Essential Amino Acids</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Arginine</td>
<td>3.00%</td>
</tr>
<tr>
<td>Histidine</td>
<td>1.50%</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>4.00%</td>
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<tr>
<td>Leucine</td>
<td>4.50%</td>
</tr>
<tr>
<td>Lysine</td>
<td>3.00%</td>
</tr>
<tr>
<td>Methionine</td>
<td>1.50%</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>2.50%</td>
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<tr>
<td>Threonine</td>
<td>3.00%</td>
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<tr>
<td>Valine</td>
<td>4.00%</td>
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Protein Notes

- 40 – 70 Pounds Pollen per Year
- For Every 10g of Protein Needed, Colony Must Collect 48 g of 30% CP, or 72g of 20% CP
- High Crude Protein MAY Have Imbalance of AA
- Brood Reduction If:
  - Not Enough Pollen Collected, No Matter CP%
  - CP% Is Below 20%, No Matter How Much They Collect
Fats

- Cholesterol Needed For Brood Rearing
- Fats Are Highly Attractive To Foragers
- Have Some Microbial Activity
- High In Lipids
  - Fatty Acids, Sterols, and Phospholipids
  - Required For Membrane Growth
  - Linoleic Acid Inhibits AFB and EFB

Minerals

- Potassium, Phosphorous, and Magnesium Required By All Insects
- Sodium, Calcium and Sodium Chloride Detrimental
- 0.5% – 1.0% Ash Increases Brood Production
- But 2+% Reduces Brood Production
- And Over 8% Ash Stops Brood Production

Vitamins

- B Complex, A and K Essential For Hypopharyngeal Gland and Brood Development
- Vitamins Mostly Unstable In Storage, But Irradiated Pollen Will Last Longer

Pollen Deficiency

- Reduced Brood Production Overall
- Reduced Longevity Of Workers
- Longer For Drones To Reach Maturity
- Reduced Fertility Of Drones
- Drones Neglected, Discarded, or Eaten
- Fewer Drones = Poor Mating and Queen Supercedure
- Starvation
Some Common Pollen Sources

Canola - ~23% CP, Minimum+ AA
Buckwheat - ~11% CP, Minimum+ AA
Sunflower - ~15% CP, Minimum+ AA
Lavender - ~19% CP, Short on Isoleucine, rest OK
Alfalfa - ~21% CP, Short on Isoleucine and Methionine
Pine - ~7% CP
Almond - ~26%CP, Short on Methionine
Pear - ~26%CP, Minimum+ AA
Crude Protein, Minimum 20-25%, 30+% Best

Some Common Pollen Sources

Raspberry, Blackberry - ~20%CP, Min AA
Clover Sp - ~25% CP, Low Isoleucine
Blueberry - ~14% CP, Min AA
Beans Sp - ~22% CP, Min AA
Corn - ~15% CP, Min AA
Peas Sp - ~30% CP, Min+ AA
Willow Sp - ~18% CP, Barely Min AA
Locust - ~25% CP, Min+ AA
Crude Protein, Minimum 20-25%, 30+% Best

…And Potatoes

NECTAR
- Carbohydrate Source
- Primarily Sucrose Sugar and Water
- Breaks Down To:
  – Fructose (Levulose)
  – Glucose (Dextrose), Promotes Crystalization
  – Water Must Be Reduced To Less Than 17%
    or Mixture Will Ferment
- Minerals – Ca, Cu, K, Mg, Mn, Na, P, Zn
Nectar Notes

- 7 Other Sugars Found In Nectar
- Proteins, Amino Acids, Enzymes, lipids, Organic Acids, Vitamins and Antioxidants
- Sugar Concentration Ranges From 5% - 75%, Average 25% - 40%

Nectar Notes

- 1 Worker Needs 11 mg Sugar/day
- 1 - 50M Colony Eats 1 Pound Of Sugar, or ½ Gallon of 25% Nectar/Day – Just For Adults
- 50M Colony – 350#s Sugar/Year
- People Average 22 TEASPOONS of Sugar/Day...77 Pounds/Year

Nectar Notes

- When Food Is Plentiful, Bees Get Fussy, When Short, They’ll Take Anything
- Related Plant Families Have Similar Nectars

Nectar Notes

- Nectar Flows Stimulate Hygienic Behavior By Cleaning Brood Nest For Room
- Nectar Availability Stimulates Brood Production and Population Expansion
- Additional Brood Stimulates Pollen Collection
**Nectar Deficiency**

- Defensive Behavior Increases
- Fewer Pollen Foragers
- Reduced Hygienic Behavior = Higher Brood Disease Problems
- Reduced Brood, and Brood Nest Size
- Starvation

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**Virtual Water...**

Liters of Water/kg or liter of food

About 140 gallons of Water to Produce 1 pound of Honey

- Daniels: Red Meat
- Dairy: Milk, Cheese
- Grains: Wheat, Rice
- Fruits: Apples, Oranges
- Vegetables: Carrots, Lettuce

**Water...**

¼ - 1 Gallon/Colony Each Day In The Hot Summer Months

**Earth has about 130 MILLION TRILLION GALLONS of water less than 12 MILLION TRILLION GALLONS (.001%) are usable between 1.4 MILLION TRILLION and 3.7 MILLION TRILLION GALLONS (.001%) usable by humans because it’s of adequate quality and accessible at acceptable cost.**

- 64.4% of ALL water resources are found in just 13 countries
- A growing number of countries are short of water with per capita availability of less than 264,000 gallons per year...about 700 gallons/day Min
- Minimum Daily Requirement to survive – 5 – 12 gallons/day ... 1800 – 4400 gallons/annum UN

**Used how...**

- Agriculture – 70% of fresh water use (95% in developing countries)
- Industry – 22% (59% in developed countries)
- Domestic use – 8%
What Else Are Bees Eating?

Monocultures Are Efficient For Food...

Development – Pavement Is The Last Crop

And people are getting farther away...

Take land from pollen and nectar production and turn it into fuel production, and you have a problem...
Nutrition Management
Why Are You Feeding?

- Spring Build Up
  - Sugar and Protein
- Package, Nuc or Split
  - Sugar and Protein
- Queen Production
  - Sugar and Protein
- To Encourage Pollen Collection
  - Sugar
- Nectar Dearth (Bad Weather, Poor Location)
  - Sugar, maybe Protein
- Boost Winter Stores
  - Sugar and Protein
- Emergency
  - Sugar

To Stimulate A Build Up

- Thin Mix – 1:1, or even 0.75:1.
- Feed Several Small Amounts Several Times, Rather Than 1 large Amount All At Once. Makes More Work, but Better Results
- Open Feeding...

Stimulation For Package, Nuc Or Split Feeding

Of Course, The Real Thing Is Always The Best Choice, If Available

Making Queens Light Syrup Stimulation Gives Lots of Royal Jelly
To Encourage Pollen Collection

To Store Sugar...

- Very Thick Syrup: 2 parts sugar: 1 water, or even ½ water
- Dry sugar crystals on inner cover, or in hive feeder
- Fondant patties
- Avoid Stimulating A Build-Up

Pre-Summer Dearth
Thick Syrup, Avoid Robbing!!

Why Did These Bees Die?

All Of These Problems Are Preventable.
Simply Put... Honey Bees Should Not Die Overwinter. If They Do, It Is A
Mismanagement Problem by The Beekeeper

Marathon
- Not Enough Food

Starvation
- Food In The Wrong Place

Becoming Wet From Condensation

Some Pests and Diseases
- Not Enough Bees

Simply Too Cold, For Too Long... No Matter How
Many Bees, Or How Much Food
Overwinter Protein

Winter bee with fat bodies; Primarily protein, but some carbohydrates

Overwinter Carbs

Both of these colonies starved in March, but for very different reasons.

Fat Body

Summer bee with no fat body
Enough Good Food All Of The Time Is The Cheapest Insurance And The Best Medicine You Can Give Your Colony. Period.

HONEY BEE NUTRITION - ENOUGH GOOD FOOD ALL OF THE TIME FOR EVERY BEE IN THE BUNCH.