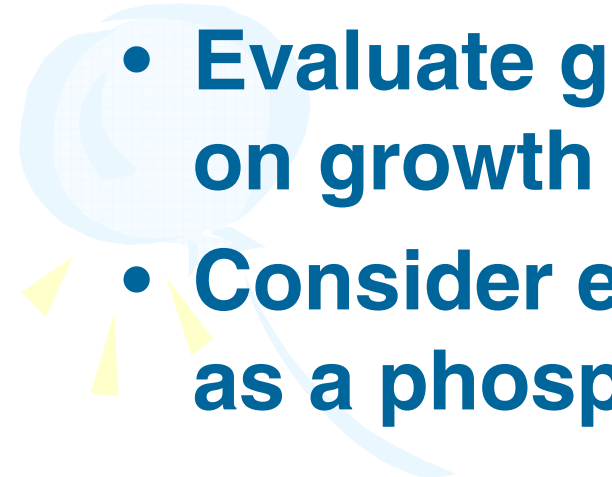
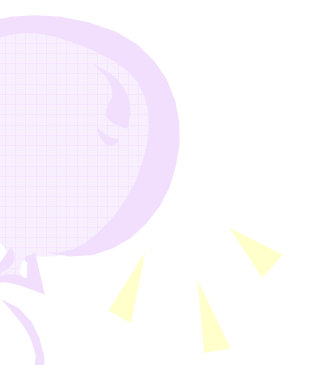
The background features several large, overlapping, colorful swirls in shades of purple, green, and blue. Scattered throughout are numerous small, yellow, triangular shapes, some pointing upwards and others downwards, creating a dynamic and celebratory feel.

# **Direct Substitution of Dicalcium Phosphate with Poultry Litter Ash in Broiler Diets**

**J. P. Blake and J. B. Hess  
Department of Poultry Science  
Auburn University**



# Objectives

- **Evaluate potential for poultry litter ash as a phosphorus supplement for poultry.**
  - **Evaluate graded levels of poultry litter ash on growth performance of broiler chickens.**
  - **Consider economic value of poultry litter ash as a phosphorus supplement.**
- 
- 



# Composition of Poultry Litter Ash

As percent

Calcium 16.68

Phosphorus 10.08

Copper 0.17

Iron 0.59

Magnesium 2.65

Potassium 7.64

Sodium 4.34

Chloride 0.99

Zinc 0.14

As ppm

Selenium 2.40

Fluoride 436.0

Aluminum 7,260

Antimony <5.0

Arsenic 52.0

Cadmium 0.80

Chromium 34.0

Lead 4.40

Mercury <0.1

Vanadium 26.0

# Dioxin Analysis of Poultry Litter Ash

Toxic Equivalency Quotient (TQE)

0.632 ng/kg\*

Non-quantified PCBs

115 ng/kg\*

World Health Organization

Maximum Limit

1.0 ng WHO-PCDD/F-TEQ/kg

\*Eurofins, Memphis, TN

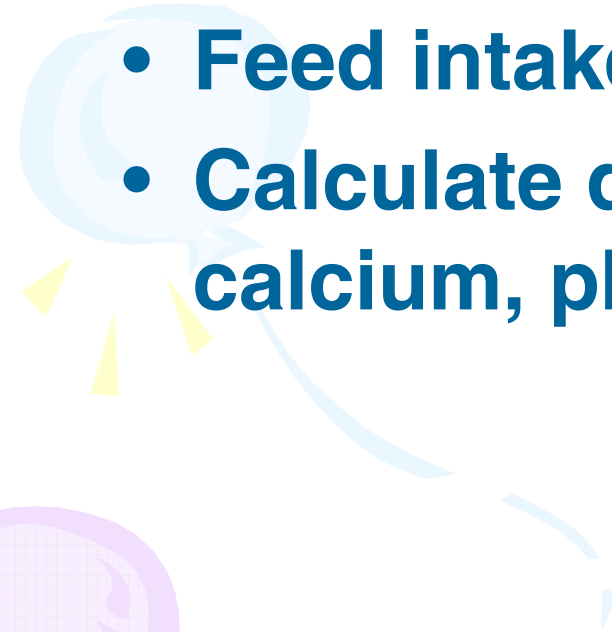
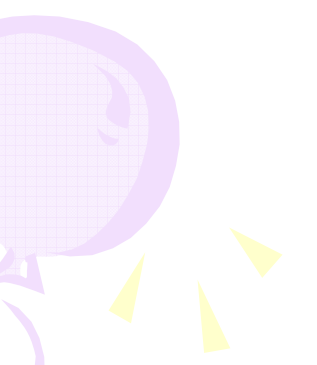


# Materials and Methods

- **Substitute dicalcium phosphate with poultry litter ash on a weight:weight basis at 0, 25, 50, 75, or 100% level.**
- **Starter (0-21 d) and grower (21-41 d) to meet or exceed NRC requirements.**
- **Nine replicates with 8 birds in wire batteries. 45 total pens.**
- **Bird and feed weights at 21 and 41 d.**



# Materials and Methods

- **Initiated 24-hr total excreta collection on day 22 for each pen.**
  - **Feed intake and excreta (dry matter) output.**
  - **Calculate dry matter digestibility of nitrogen, calcium, phosphorus and potassium.**
- 
- 

# Composition of Starter Diets

| Ingredient (%)      | Level of Poultry Litter Ash (%) |      |      |      |      |
|---------------------|---------------------------------|------|------|------|------|
|                     | 0                               | 25   | 50   | 75   | 100  |
| Ground corn         | 58.52                           |      |      |      |      |
| Soybean meal (48%)  | 30.80                           |      |      |      |      |
| Poultry meal        | 4.00                            |      |      |      |      |
| Poultry oil         | 2.80                            |      |      |      |      |
| Dicalcium Phosphate | 1.40                            | 1.05 | 0.70 | 0.35 | 0.00 |
| Limestone           | 1.12                            |      |      |      |      |
| Poultry Litter Ash  | 0.00                            | 0.35 | 0.70 | 1.05 | 1.40 |
| Other               | 1.36                            |      |      |      |      |

**Dical=18.5% P/24.1% Ca PLA=10.0% P/16.7% Ca**

# Calculated Analysis of Starter Diets

| Nutrient (%)         | Level of Poultry Litter Ash (%) |      |      |      |      |
|----------------------|---------------------------------|------|------|------|------|
|                      | 0                               | 25   | 50   | 75   | 100  |
| Crude Protein        | 22.00                           |      |      |      |      |
| ME (kcal/lb)         | 1400.                           |      |      |      |      |
| Methionine           | 0.62                            |      |      |      |      |
| Met + Cys            | 0.95                            |      |      |      |      |
| Lysine               | 1.27                            |      |      |      |      |
| Calcium              | 0.93                            | 0.90 | 0.88 | 0.85 | 0.83 |
| Available Phosphorus | 0.45                            | 0.44 | 0.39 | 0.36 | 0.33 |
| Sodium               | 0.20                            | 0.22 | 0.23 | 0.25 | 0.26 |



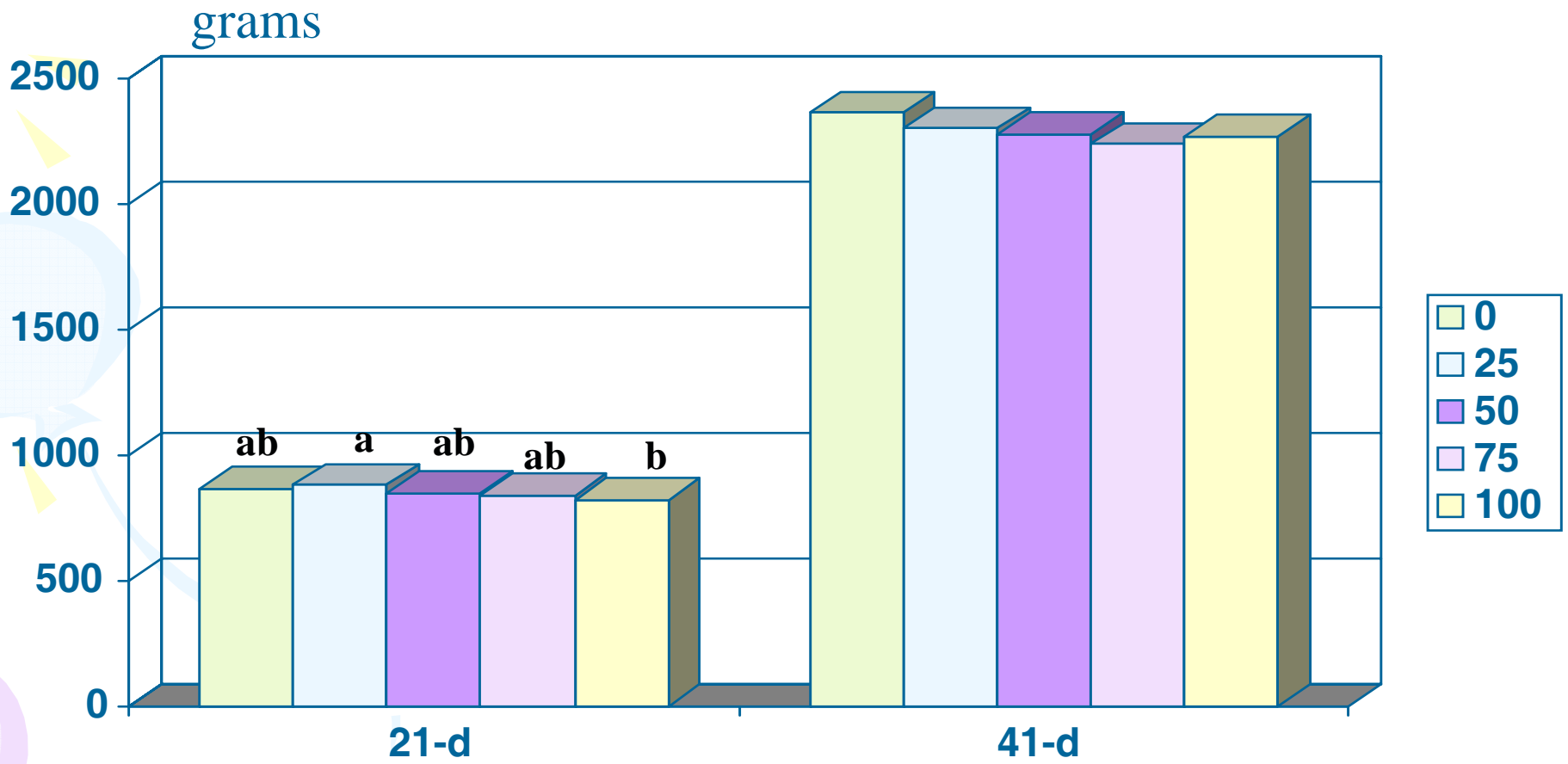
# Composition of Grower Diets

| Ingredient (%)      | Level of Poultry Litter Ash (%) |      |      |      |      |
|---------------------|---------------------------------|------|------|------|------|
|                     | 0                               | 25   | 50   | 75   | 100  |
| Ground corn         | 64.00                           |      |      |      |      |
| Soybean meal (48%)  | 25.67                           |      |      |      |      |
| Poultry meal        | 4.00                            |      |      |      |      |
| Poultry oil         | 2.77                            |      |      |      |      |
| Dicalcium Phosphate | 1.28                            | 0.96 | 0.64 | 0.32 | 0.00 |
| Limestone           | 0.98                            |      |      |      |      |
| Poultry Litter Ash  | 0.00                            | 0.32 | 0.64 | 0.96 | 1.28 |
| Other               | 1.36                            |      |      |      |      |

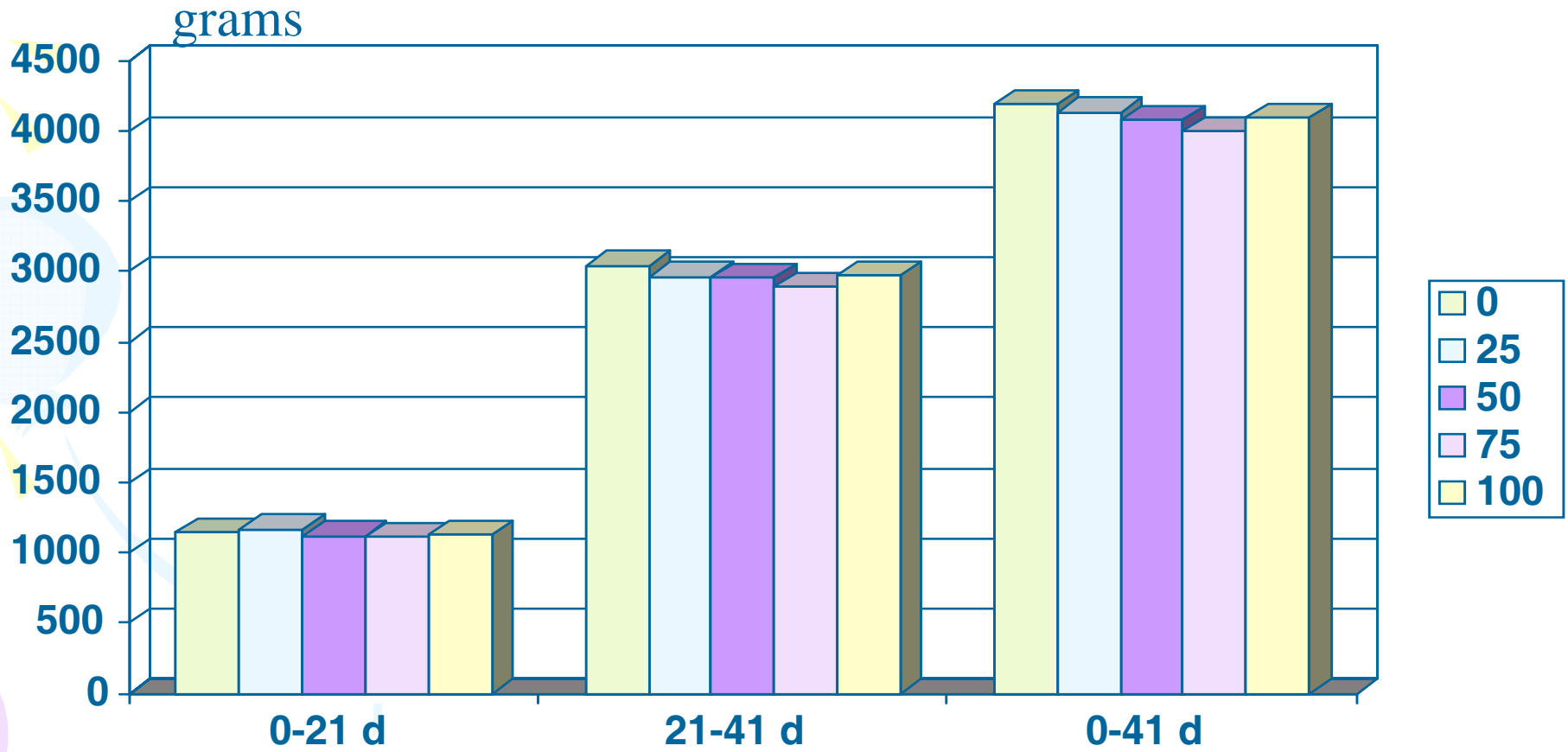
# Calculated Analysis of Grower Diets

| Nutrient (%)         | Level of Poultry Litter Ash (%) |      |      |      |      |
|----------------------|---------------------------------|------|------|------|------|
|                      | 0                               | 25   | 50   | 75   | 100  |
| Crude Protein        | 20.00                           |      |      |      |      |
| ME (kcal/lb)         | 1430.                           |      |      |      |      |
| Methionine           | 0.56                            |      |      |      |      |
| Met + Cys            | 0.86                            |      |      |      |      |
| Lysine               | 1.10                            |      |      |      |      |
| Calcium              | 0.84                            | 0.82 | 0.79 | 0.77 | 0.75 |
| Available Phosphorus | 0.42                            | 0.39 | 0.37 | 0.34 | 0.31 |
| Sodium               | 0.20                            | 0.22 | 0.23 | 0.25 | 0.26 |

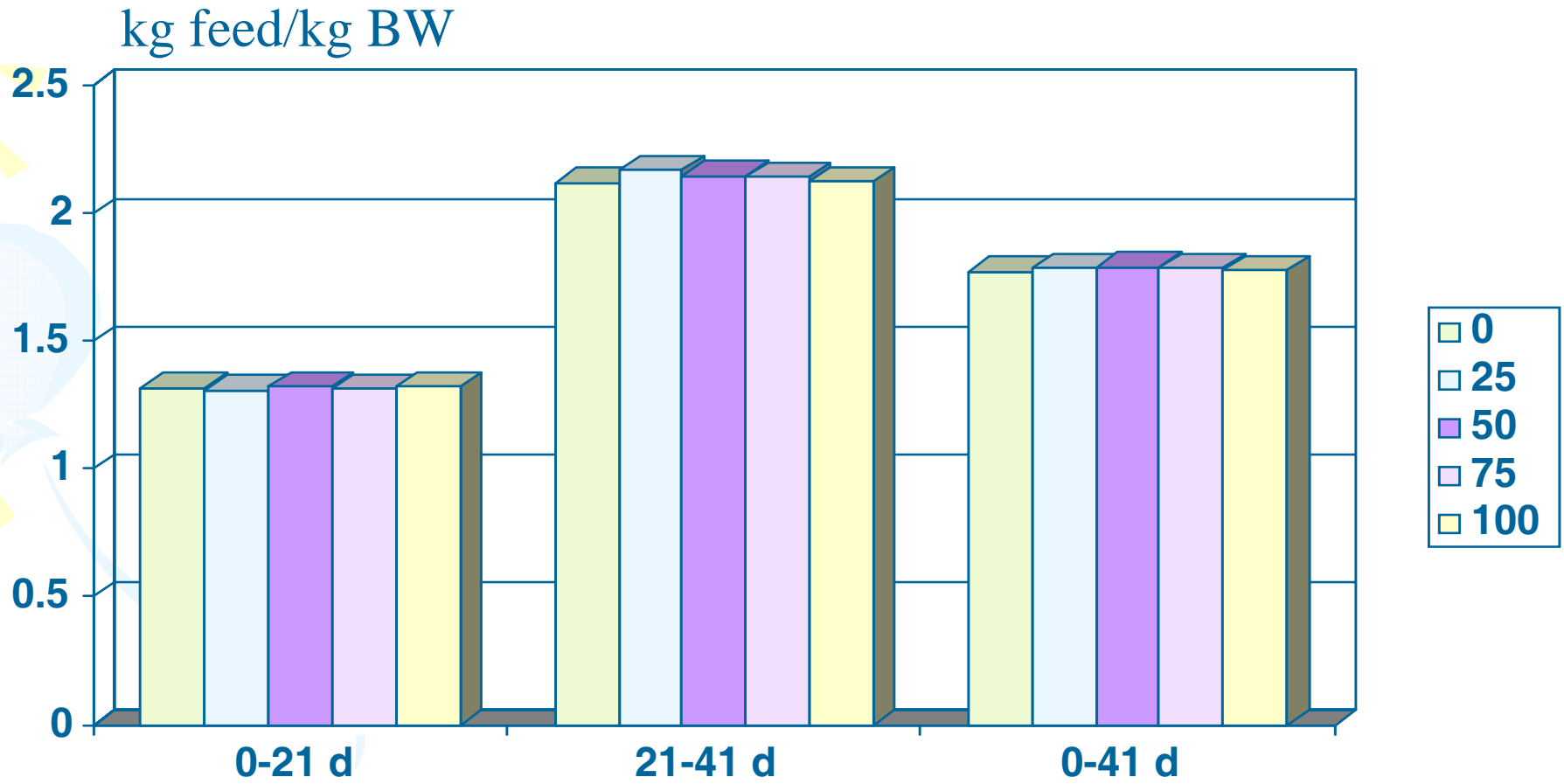
# Bodyweight



# Feed Consumption


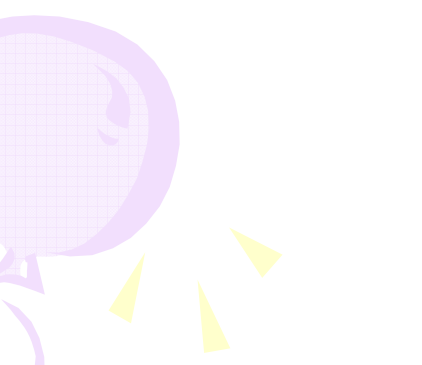


# Feed Efficiency

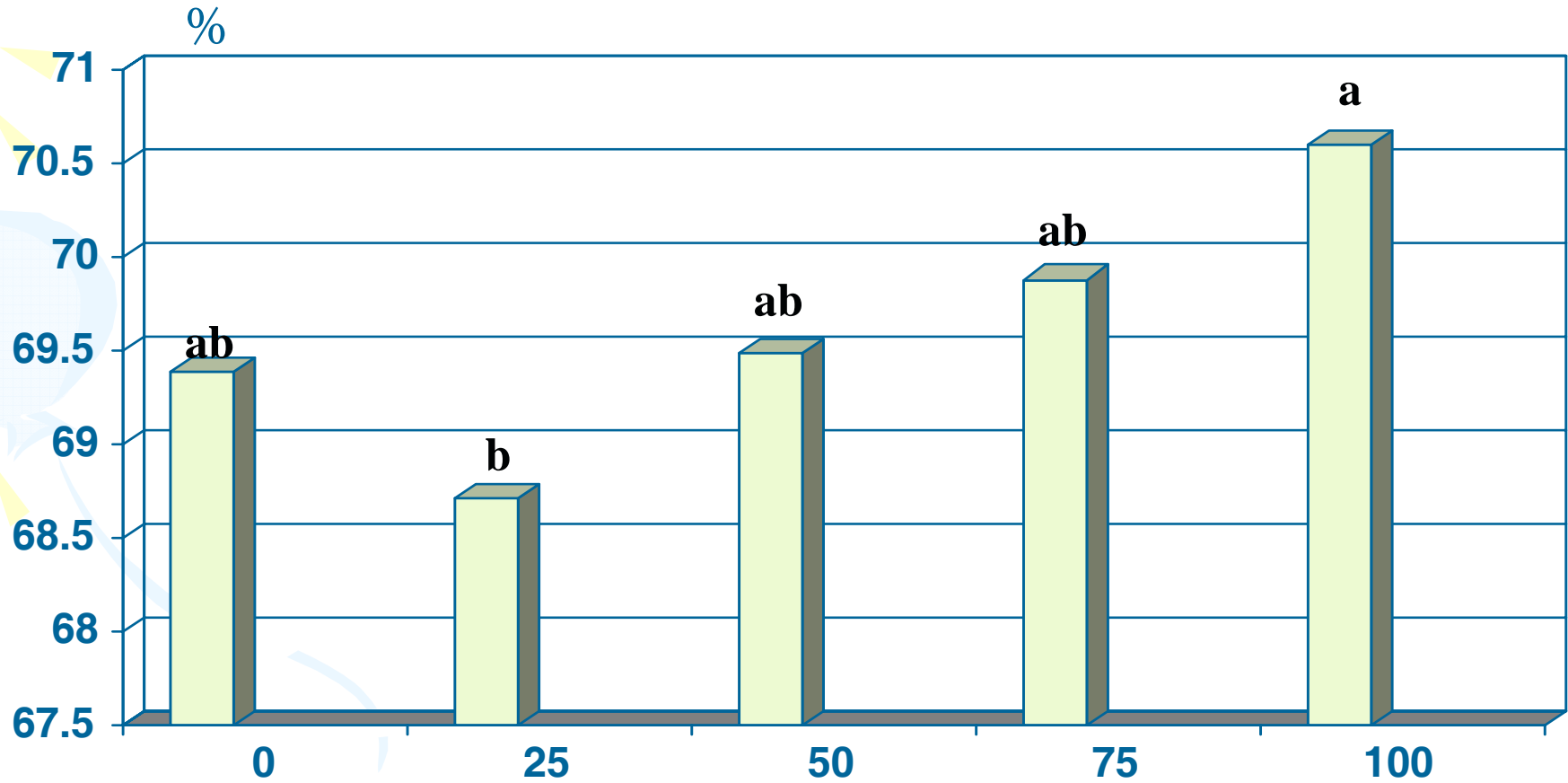




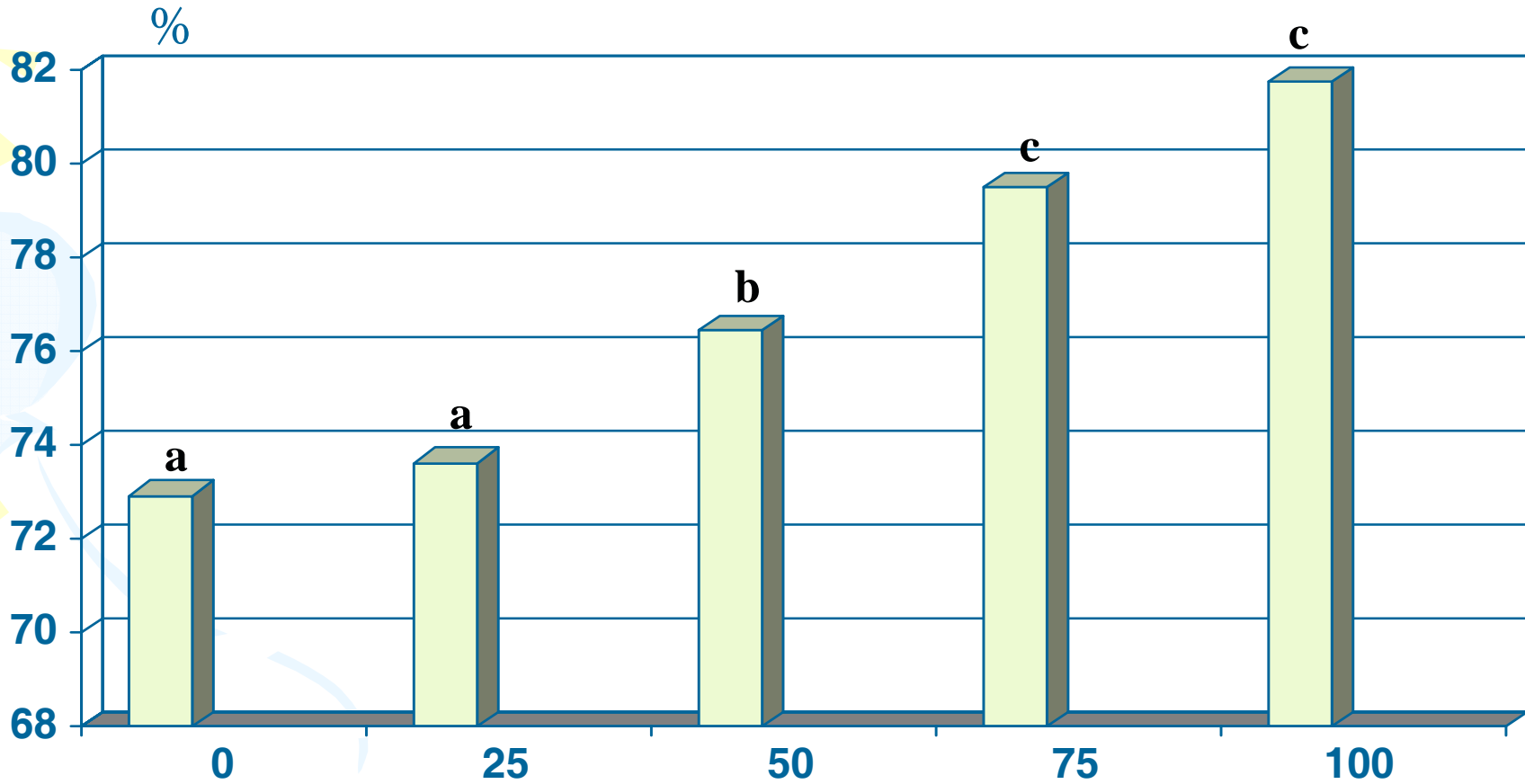
# Conclusions

- **Growth performance from 0-21 d was decreased when using 100% poultry litter ash.**
  - **Performance decrease may be attributed to decreased dietary phosphorus level (0.45 vs. 0.33).**
  - **No effect on feed consumption or feed efficiency**
  - **Substitution scheme used in this experiment failed to compromise performance of market-age broilers.**
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# Bone Ash Analysis

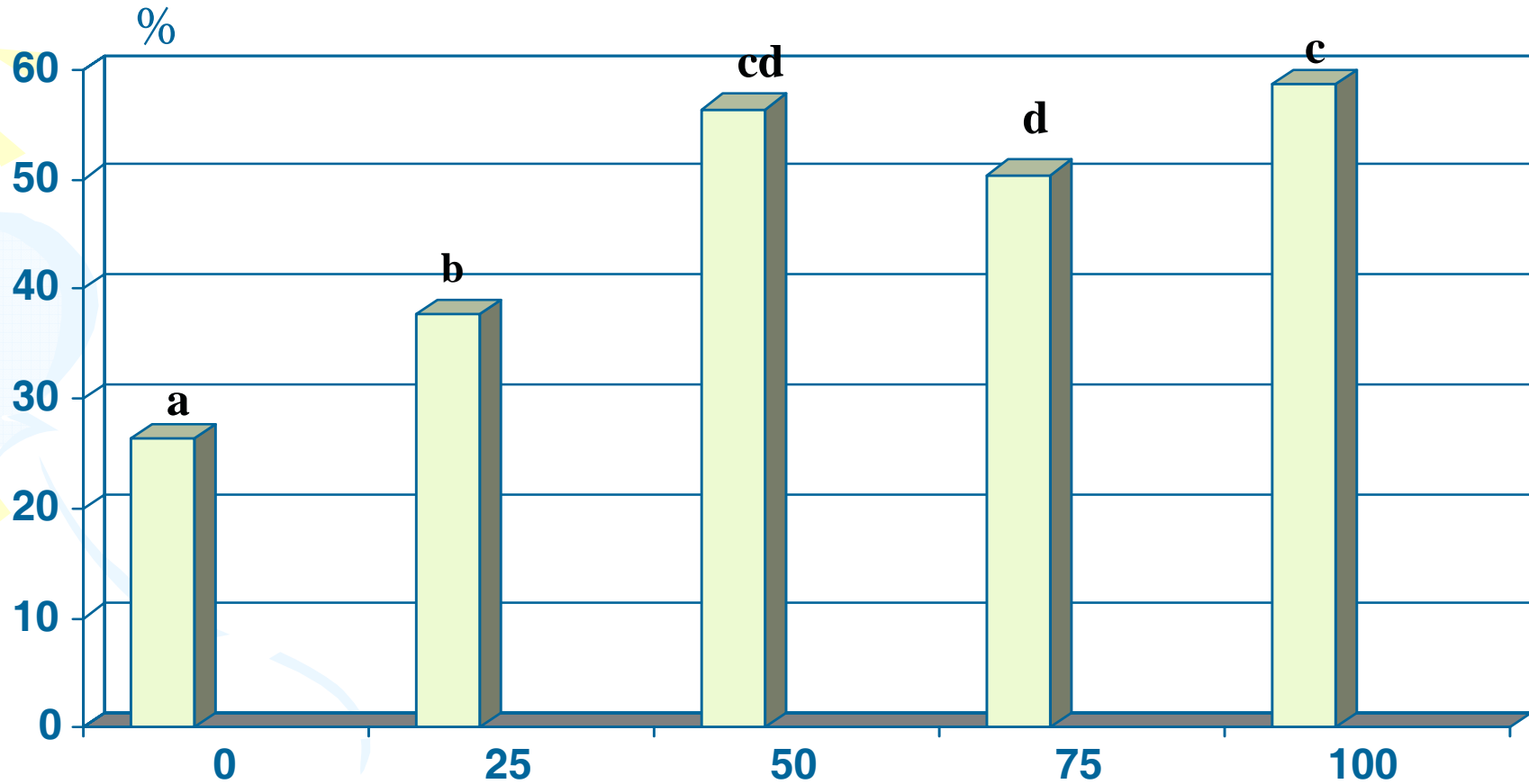


# Excreta Moisture

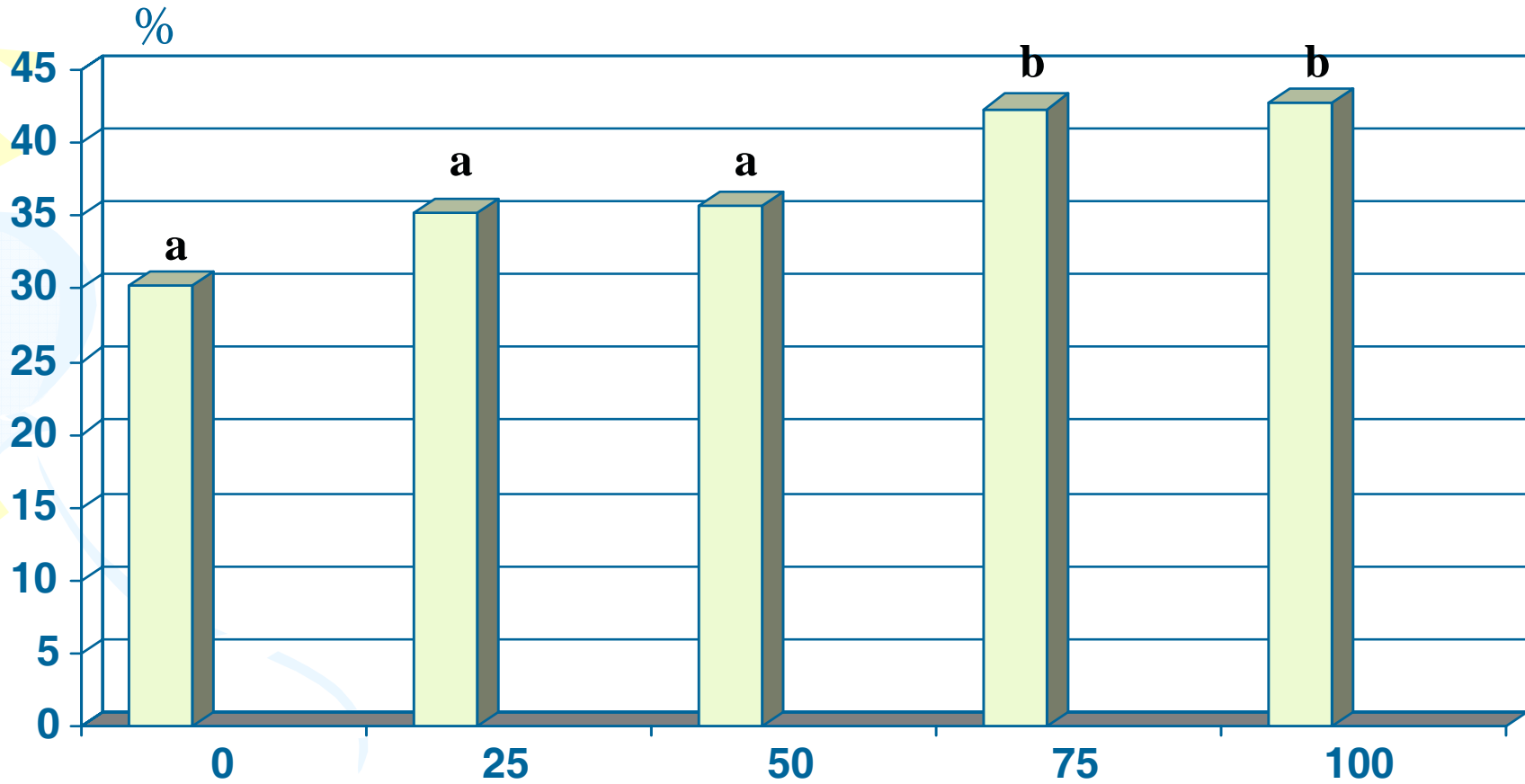




# Calcium Dry Matter Digestibility



# Phosphorus Dry Matter Digestibility





# Conclusions

- **Excreta moisture increased with level of poultry litter ash.**
- **Salt level must be adjusted to account for high sodium content of PLA. There is a need to formulate diets for sodium content. (4.34% Na in PLA).**
- **Dry matter digestibility of Ca and P increased with increasing level of poultry litter ash.**
- **Ca and P component of diet was more effectively utilized with increasing level of poultry litter ash.**

The background features several large, overlapping, colorful swirls in shades of purple, green, and blue. Scattered throughout are numerous small, yellow, triangular shapes, some pointing upwards and others downwards, creating a festive or celebratory feel.

# **Nutritional Value of Poultry Litter Ash Fed to Broiler Chickens Under Commercial Conditions**



# Objective

- **To evaluate poultry litter ash under commercial conditions.**
    - **Growth performance**
    - **Processing yield**
- 
- 



# Materials and Methods

- **1600 mixed-sex broilers**
- **64 pens with 25 birds/pen**
- **Starter, grower, and finisher to meet or exceed NRC requirements.**
- **Fed by weight**
  - **Starter (1.8 lbs/bird)**
  - **Grower (3.5 lbs/bird)**
  - **Finisher (~6.7 lbs/bird)**
- **Substitute dicalcium phosphate with poultry litter ash on a nutrient basis at 0, 25, 50, 75, or 100% level.**

# Experimental Treatments

## Level of Poultry Litter Ash (%)

| Treatment | Starter | Grower | Finisher |
|-----------|---------|--------|----------|
| 1         | 0       | 0      | 0        |
| 2         | 25      | 25     | 25       |
| 3         | 50      | 50     | 50       |
| 4         | 75      | 75     | 75       |
| 5         | 100     | 100    | 100      |
| 6         | 25      | 100    | 100      |
| 7         | 50      | 100    | 100      |
| 8         | 75      | 100    | 100      |



# Materials and Methods

- **Eight replicates/treatment with 25 birds/pen. 64 total pens.**
- **Bird and feed weights at 14, 28 and 41 d.**
- **Carcass yield evaluation at 42 d.**
  - **10 birds/pen (640 birds total)**
  - **Front and rear half yield**



# Composition of Starter Diets

| Ingredient (%)      | Level of Poultry Litter Ash (%) |       |       |       |       |
|---------------------|---------------------------------|-------|-------|-------|-------|
|                     | 0                               | 25    | 50    | 75    | 100   |
| Ground corn         | 55.75                           | 55.44 | 55.14 | 54.79 | 54.47 |
| Soybean meal (48%)  | 35.09                           | 35.12 | 35.14 | 35.17 | 35.19 |
| Poultry oil         | 4.53                            | 4.65  | 4.77  | 4.90  | 5.02  |
| Dicalcium Phosphate | 1.73                            | 1.30  | 0.86  | 0.43  | 0.00  |
| Limestone           | 1.23                            | 1.12  | 1.01  | 0.90  | 0.79  |
| Poultry Litter Ash  | 0.00                            | 0.80  | 1.60  | 2.41  | 3.22  |
| Salt                | 0.45                            | 0.37  | 0.28  | 0.20  | 0.11  |
| Other               | 1.22                            |       |       |       |       |

# Calculated Analysis of Starter Diets

| Nutrient (%)         | Level of Poultry Litter Ash (%) |    |       |    |     |
|----------------------|---------------------------------|----|-------|----|-----|
|                      | 0                               | 25 | 50    | 75 | 100 |
| Crude Protein        |                                 |    | 21.5  |    |     |
| ME (kcal/lb)         |                                 |    | 1425. |    |     |
| Methionine           |                                 |    | 0.62  |    |     |
| Met + Cys            |                                 |    | 0.95  |    |     |
| Lysine               |                                 |    | 1.27  |    |     |
| Calcium              |                                 |    | 0.93  |    |     |
| Available Phosphorus |                                 |    | 0.45  |    |     |

# Composition of Grower Diets

| Ingredient (%)      | Level of Poultry Litter Ash (%) |       |       |       |       |
|---------------------|---------------------------------|-------|-------|-------|-------|
|                     | 0                               | 25    | 50    | 75    | 100   |
| Ground corn         | 63.00                           | 62.70 | 62.31 | 62.01 | 61.62 |
| Soybean meal (48%)  | 29.70                           | 29.71 | 29.81 | 29.82 | 29.93 |
| Poultry oil         | 3.28                            | 3.41  | 3.53  | 3.65  | 3.77  |
| Dicalcium Phosphate | 1.60                            | 1.20  | 0.80  | 0.40  | 0.00  |
| Limestone           | 1.09                            | 0.99  | 0.89  | 0.80  | 0.70  |
| Poultry Litter Ash  | 0.00                            | 0.74  | 1.48  | 2.22  | 2.96  |
| Salt                | 0.45                            | 0.37  | 0.30  | 0.22  | 0.14  |
| Other               | 0.88                            |       |       |       |       |

# Calculated Analysis of Grower Diets

| Nutrient (%)         | Level of Poultry Litter Ash (%) |    |    |    |     |
|----------------------|---------------------------------|----|----|----|-----|
|                      | 0                               | 25 | 50 | 75 | 100 |
| Crude Protein        | 19.50                           |    |    |    |     |
| ME (kcal/lb)         | 1430.                           |    |    |    |     |
| Methionine           | 0.56                            |    |    |    |     |
| Met + Cys            | 0.86                            |    |    |    |     |
| Lysine               | 1.10                            |    |    |    |     |
| Calcium              | 0.84                            |    |    |    |     |
| Available Phosphorus | 0.42                            |    |    |    |     |

# Composition of Finisher Diets

| Ingredient (%)      | Level of Poultry Litter Ash (%) |       |       |     |       |
|---------------------|---------------------------------|-------|-------|-----|-------|
|                     | 0                               | 25    | 50    | 75* | 100   |
| Ground corn         | 72.54                           | 72.25 | 71.95 |     | 71.33 |
| Soybean meal (48%)  | 21.76                           | 21.82 | 21.87 |     | 21.97 |
| Poultry oil         | 1.98                            | 2.08  | 2.18  |     | 2.41  |
| Dicalcium Phosphate | 1.38                            | 1.03  | 0.69  |     | 0.00  |
| Limestone           | 1.02                            | 0.94  | 0.85  |     | 0.68  |
| Poultry Litter Ash  | 0.00                            | 0.64  | 1.28  |     | 2.56  |
| Salt                | 0.45                            | 0.39  | 0.32  |     | 0.20  |
| Other               |                                 | 0.86  |       |     | 0.86  |

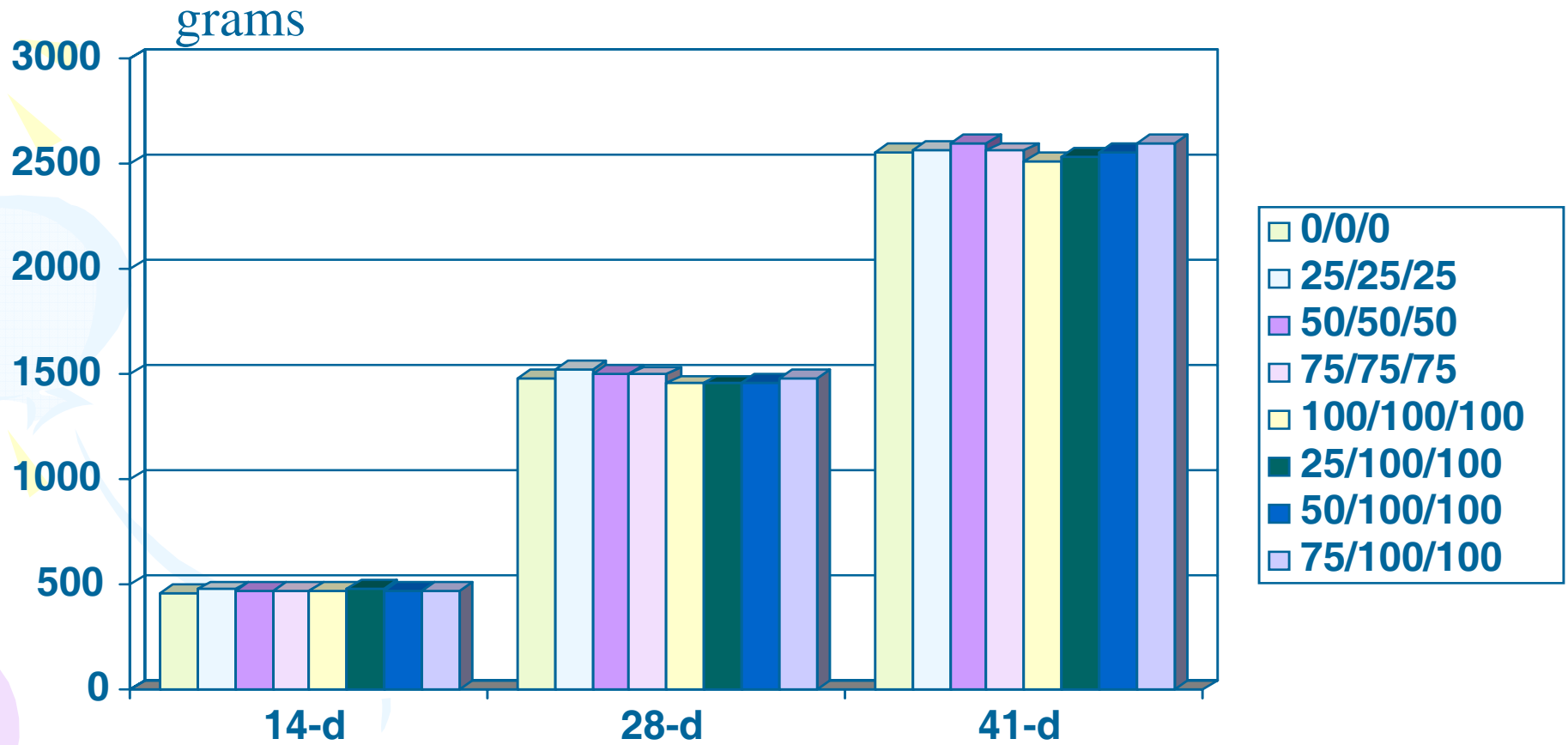
\*Substituted with 0% diet

# Calculated Analysis of Finisher Diets

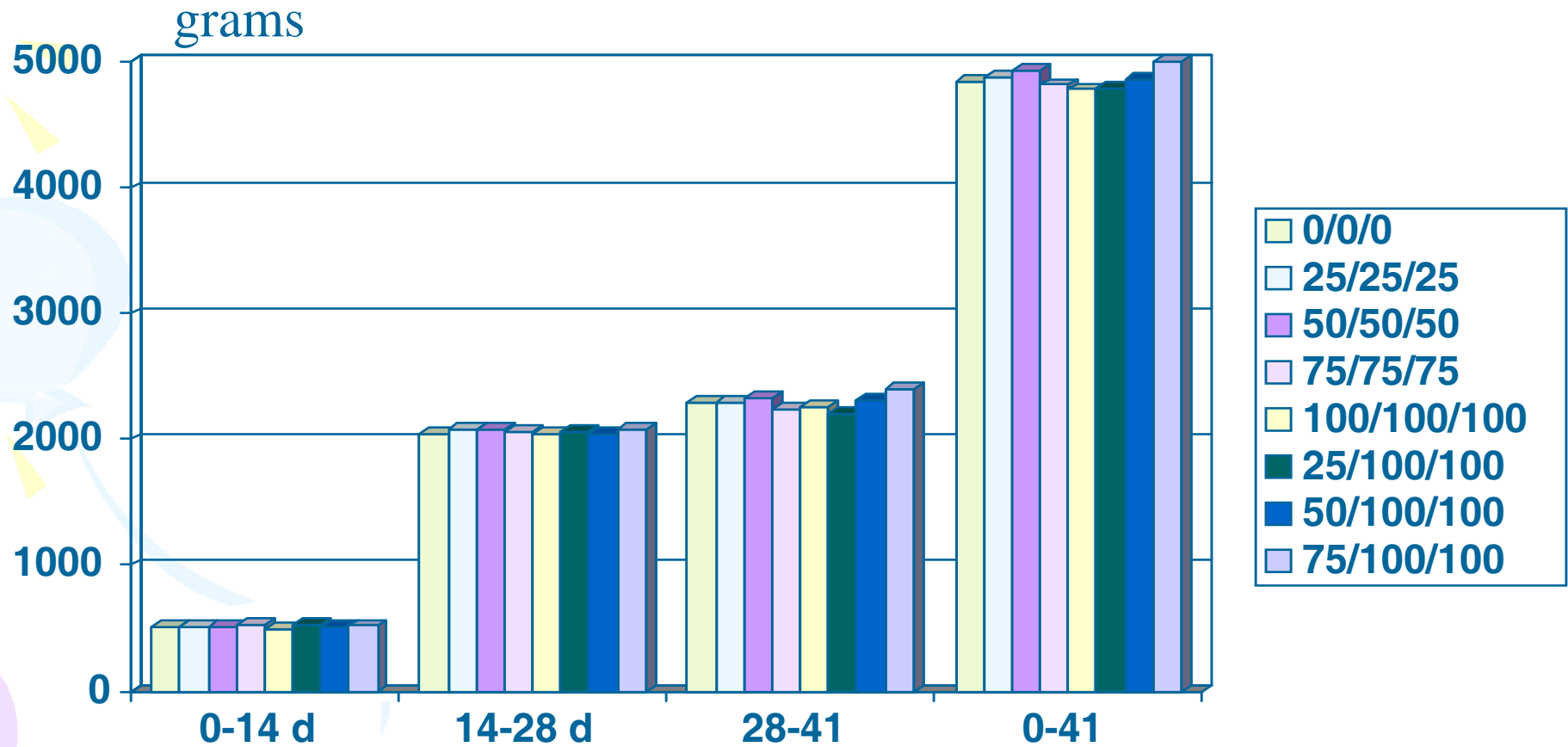
| Nutrient (%)         | Level of Poultry Litter Ash (%) |    |       |     |     |
|----------------------|---------------------------------|----|-------|-----|-----|
|                      | 0                               | 25 | 50    | 75* | 100 |
| Crude Protein        |                                 |    | 16.50 |     |     |
| ME (kcal/lb)         |                                 |    | 1440. |     |     |
| Methionine           |                                 |    | 0.54  |     |     |
| Met + Cys            |                                 |    | 0.79  |     |     |
| Lysine               |                                 |    | 0.92  |     |     |
| Calcium              |                                 |    | 0.75  |     |     |
| Available Phosphorus |                                 |    | 0.37  |     |     |

\*Not available

# Bodyweight

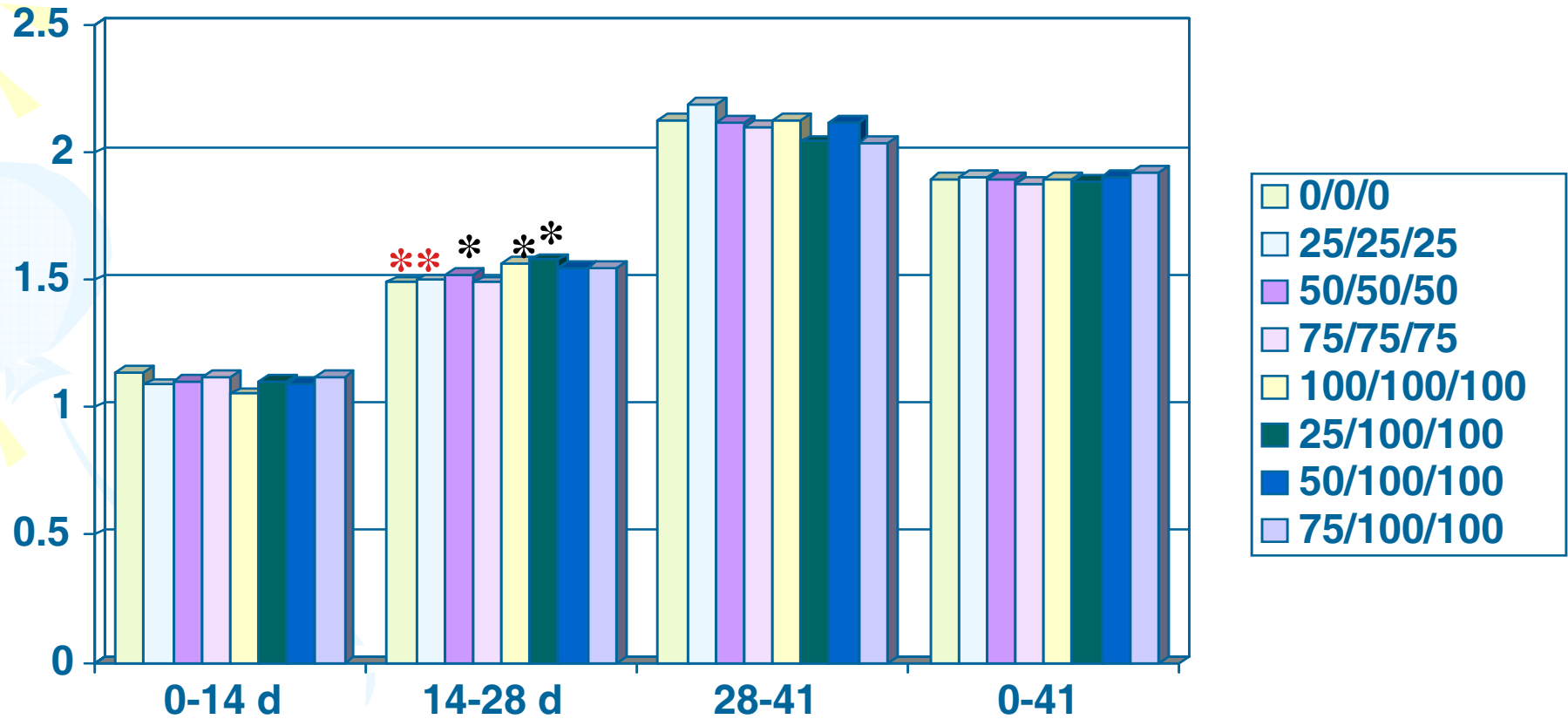


# Feed Consumption





# Feed Efficiency





# Conclusions

- **No effect on bodyweight or feed consumption.**
- **Feed efficiency differences were noted during the 14-28 d period, but do not follow any specific pattern.**
- **No effect on processing yield.**
- **Substitution scheme used in this experiment failed to compromise performance and processing yield of market-age broilers.**



# Value of Poultry Litter Ash

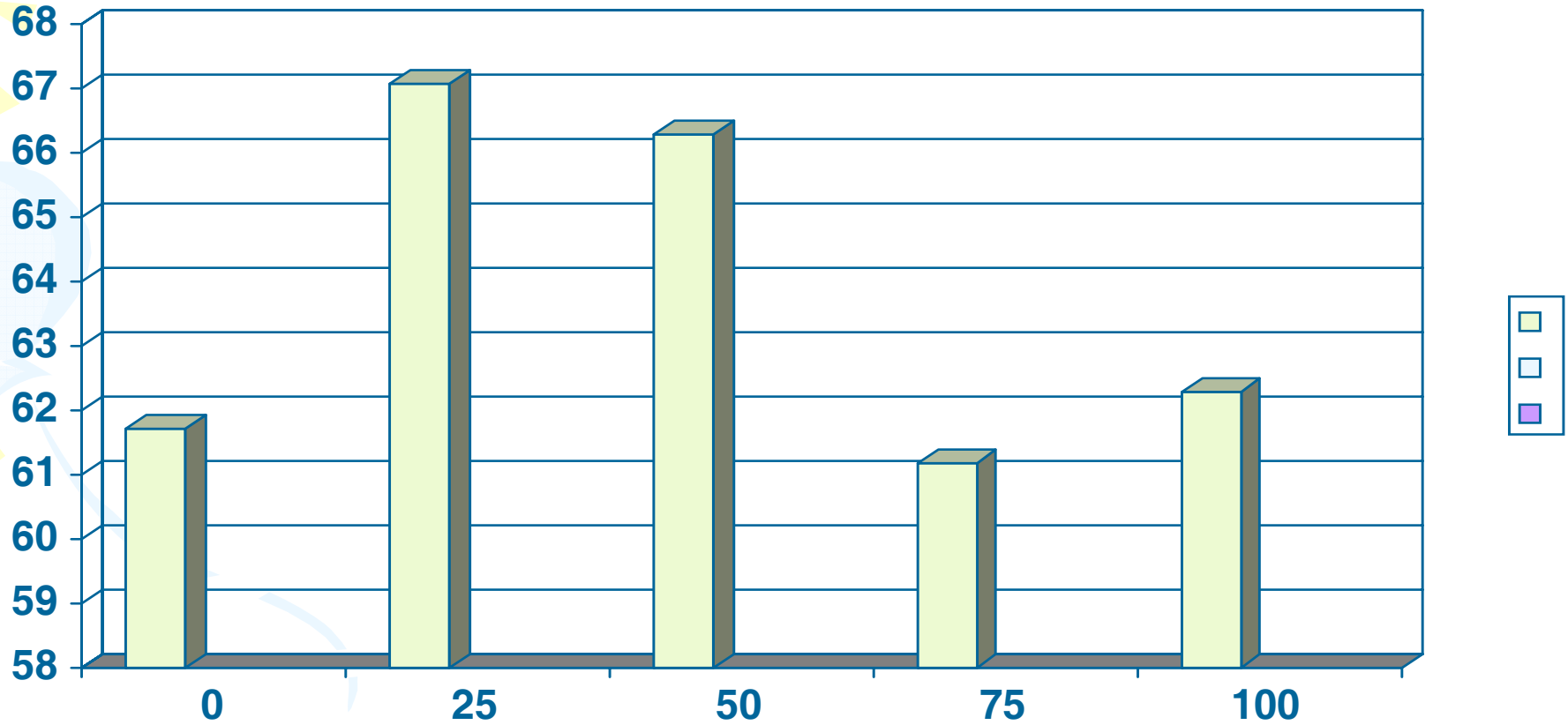
- **Substitution Rate PLA vs. Dical (lbs/100 lbs)**
  - Starter---3.22 vs. 1.73
  - Grower---2.96 vs. 1.60
  - Finisher---2.56 vs. 1.38
- **Require 46% more PLA to replace Dical.**
- **Breakeven is 54% the value of Dical.**

The background features several large, overlapping, curved shapes in shades of green, purple, and light blue. Scattered throughout are numerous small, yellow, triangular shapes, some pointing upwards and others downwards, creating a dynamic and celebratory feel.

# **Nutritional Value of Poultry Litter Ash Fed to Broiler Chickens**

**J. P. Blake and J. B. Hess**  
**Department of Poultry Science**  
**Auburn university**

# Nitrogen Dry Matter Digestibility



# Potassium Dry Matter Digestibility

