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A BIBLIOGRAPHY OF RESEARCHES BEARING ON THE COMPOSITION AND NUTRITIVE VALUE OF CORN AND CORN PRODUCTS

BY M. HELEN KEITH
PREFACE

It is recognized that the most valuable experimental work must be founded on a thorough knowledge of the work that has previously been done in the same or related lines. Only on such a basis can intelligent progress be made. The necessary search thru the literature, however, requires so much time that it is too often omitted or scantily done. This bibliography has been prepared as an aid to investigators and research students in making such a study of the literature of all phases of the nutritional side of the corn-feeding question. Reference to the citations made under subject headings will enable the reader to select the articles in which he is most interested. It is believed also that such reference to these subject lists may save instructors from the mistake of sending students to look for data on a subject upon which too little material is available to justify the search.

In order that the publications of the research laboratories of both the universities and the agricultural experiment stations might be included, Chemical Abstracts and the Experiment Station Record have been used as the primary sources of reference. The files of both these abstract journals have been examined in their entirety thru 1923. References not caught in this way have been added from other sources, notably from the valuable general index to Volumes 1 to 25 of the Journal of Biological Chemistry. Reference to these two abstract journals and to a few other journals of this character have been included for the convenience of those to whom the original articles may not be available.

The lists given here are fairly complete so far as the results of investigational work have been published in available form. The numerous reports of proximate analyses of corn or corn products (the percentages of moistures, crude fat, crude protein, crude fiber, nitrogen-free extract, and ash) have been omitted as not being true investigations. Unpublished academic theses and articles in farm papers are not generally included, altho they may be of value to those to whom they are available.

This bibliography is made up of three sections: Section I, the author bibliography, consists of a list, under the authors' names, of the complete titles and references for all articles found and references to abstracts of the same.

In Section II, the subject bibliography, the references have been classified rather minutely under the subjects investigated. They are briefly noted by author and date, by which the title and references may be found in Section I. In order to make this section as valuable as possible, a given reference may be included under several subject heads; however, such repetition is avoided by cross references when practical.
Section III consists of a list of books and articles of too general a nature to be specified in Section II; also compilations of data from several sources and discussions based on work from several sources.

Directions for using these three sections are given immediately following the Table of Contents.

It is to be expected that some users of this bibliography will be able to add further references. No one can realize more fully than the compiler that there are likely to be omissions in the selection of material, both thru oversight and thru uncertainties of individual judgment. It is believed, however, that there is brought together here a much larger amount of information on the subject than most of the users would be likely to collect for themselves, and it is hoped that the work will be a help and a stimulus to sound investigation.

This bibliography was first issued in mimeographed form by the National Research Council, Washington, D. C., in 1920. In bringing the material up to date, more than four hundred new references have been added.

Acknowledgment is hereby made to the many co-workers, particularly to Professor H. S. Grindley, who have given counsel and helpful suggestions and made possible the preparation of this bibliography. Thanks are also expressed to those who have called attention to errors or have suggested improvements in classification after use of the mimeographed issue.

M. Helen Keith

First Assistant in Animal Nutrition

May 1, 1924
## CONTENTS

<table>
<thead>
<tr>
<th>DIRECTIONS FOR USING THE BIBLIOGRAPHY</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

### SECTION I

<table>
<thead>
<tr>
<th>AUTHOR BIBLIOGRAPHY</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

### SECTION II

<table>
<thead>
<tr>
<th>SUBJECT BIBLIOGRAPHY</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>94</td>
</tr>
</tbody>
</table>

#### A. STUDIES OF CORN OR CORN PRODUCTS NOT INVOLVING EXPERIMENTS UPON ANIMALS

<table>
<thead>
<tr>
<th>I. ANALYTICAL DETERMINATIONS OTHER THAN PROXIMATE ANALYSES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidity</td>
<td>94</td>
</tr>
<tr>
<td>Acids</td>
<td>94</td>
</tr>
<tr>
<td>Alcohol in silage</td>
<td>94</td>
</tr>
<tr>
<td>Alcohol extract</td>
<td>95</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>95</td>
</tr>
<tr>
<td>Amino acids</td>
<td>95</td>
</tr>
<tr>
<td>Aqueous extract, Composition</td>
<td>95</td>
</tr>
<tr>
<td>Ash constituents</td>
<td>95</td>
</tr>
<tr>
<td>Benzin extract, Composition</td>
<td>96</td>
</tr>
<tr>
<td>Carbohydrate constituents</td>
<td>96</td>
</tr>
<tr>
<td>Carbon</td>
<td>96</td>
</tr>
<tr>
<td>Chloroform extract, Composition</td>
<td>96</td>
</tr>
<tr>
<td>Composition of parts of kernel</td>
<td>96</td>
</tr>
<tr>
<td>Enzymes</td>
<td>96</td>
</tr>
<tr>
<td>Ether extract, Composition</td>
<td>96</td>
</tr>
<tr>
<td>Fat or ether extract, oil</td>
<td>97</td>
</tr>
<tr>
<td>Iodin</td>
<td>97</td>
</tr>
<tr>
<td>Lecithin</td>
<td>97</td>
</tr>
<tr>
<td>Lipoids</td>
<td>97</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>97</td>
</tr>
<tr>
<td>Nitrogen distribution</td>
<td>98</td>
</tr>
<tr>
<td>Pentosans or their derivatives</td>
<td>98</td>
</tr>
<tr>
<td>Phosphorus and phosphorus distribution</td>
<td>98</td>
</tr>
<tr>
<td>Pigment</td>
<td>99</td>
</tr>
<tr>
<td>Proteins</td>
<td>99</td>
</tr>
<tr>
<td>Starch</td>
<td>99</td>
</tr>
<tr>
<td>Sugar</td>
<td>99</td>
</tr>
<tr>
<td>Sulfur and sulfur distribution</td>
<td>100</td>
</tr>
<tr>
<td>Toxic substances</td>
<td>100</td>
</tr>
<tr>
<td>Ultimate analysis</td>
<td>100</td>
</tr>
</tbody>
</table>

#### II. CONDITIONS AFFECTING THE COMPOSITION OF CORN

| Breeding                                                 | 100  |
| Detasseling                                              | 100  |
| Ensilage                                                 | 101  |
CONTENTS

PAGE

Fermentation............................................................101
Fertilizer.................................................................101
Form selected for silage...............................................101
Germination...............................................................101
Method of planting....................................................102
Milling processes.......................................................102
Moisture of soil........................................................102
Pigment.................................................................102
Removal of cob at milky stage......................................102
Removal of tops and leaves..........................................102
Section of the country, or the country, in which the corn is grown .............................................102
Stage of growth of plant.............................................102
Steaming before ensilage...........................................103
Storage.................................................................103
Variety...............................................................103
Weather and other conditions of growth........................104
Weathering..............................................................104
Other conditions.......................................................104

III. ENERGY VALUES..................................................104

IV. ENZYMIC DIGESTION.................................................104

V. SPECIAL STUDIES OF CORN OIL....................................104

VI. SPECIAL STUDIES OF CORN PROTEINS..........................105
  Amino acids in.....................................................105
  Partial decomposition...............................................105
  Properties..........................................................105
  Ultimate analysis...................................................105
  Other studies with corn proteins................................105
  (For animal studies with corn protein, see Section B VI)

VII. SPECIAL STUDIES OF CORN STARCH..........................106

VIII. SPECIAL STUDIES OF CORN SUGAR............................106

IX. BREAKFAST FOODS MADE FROM CORN..............................106

X. SPECIAL STUDIES OF POP CORN.....................................106

XI. SPECIAL STUDIES OF CORN COBS................................107
  Commercial products................................................107
  Composition........................................................107
  Calorific value.....................................................107

XII. SPECIAL STUDIES OF CORN POLLEN............................107

XIII. SILO, PROCESSES AND AGENTS WORKING IN...................107

XIV. STUDIES OF THE SPOILAGE OF CORN AND CORN PRODUCTS....108

XV. COMPARISONS OF THE COMPOSITION OF WHITE AND YELLOW CORN.108
  (For animal studies comparing white and yellow corn, see Section B V,
   Variety, and B VI, Pigment studies.)
CONTENTS

XVI. OTHER STUDIES NOT INVOLVING EXPERIMENTS UPON ANIMALS......108

B. STUDIES OF CORN OR CORN PRODUCTS INVOLVING EXPERIMENTS UPON MEN OR ANIMALS

I. FEEDING TESTS NOT INVOLVING CHEMICAL CONSIDERATIONS........109

(Note: Not including those in which coefficients of digestibility or the balance between intake and output were determined. For experiments of these kinds see pages 132 to 137 and 138 to 139.)

- Beef cattle ................................................. 109
- Dairy cattle .................................................. 114
- Fowls .................................................................. 119
- Hogs ................................................................... 120
- Horses and mules .............................................. 127
- Sheep and goats ................................................. 128
- Laboratory animals ............................................. 132

II. DIGESTION EXPERIMENTS ...................................... 132

(Note: Experiments in which the coefficients of digestibility of the nutrients were determined; i.e., the percentage of the nutrient taken in the ration which did not appear in the feces.)

- Cannery refuse .................................................. 132
- Cerealine feed ................................................... 132
- Chicago maize feed .......................................... 132
- Corn ................................................................... 132
- Corn-and-cob meal ........................................... 133
- Corn-and-millet silage ..................................... 133
- Corn bran .......................................................... 133
- Corn chop feed ................................................. 133
- Corn cobs ........................................................... 133
- Corn fodder ........................................................ 133
- Corn germ .......................................................... 134
- Corn gluten ........................................................ 134
- Corn meal ............................................................ 134
- Corn oil ............................................................... 135
- Corn proteins ..................................................... 135
- Corn shucks ......................................................... 135
- Corn silage .......................................................... 135
- Corn starch ........................................................ 136
- Corn stover ........................................................ 136
- Distillers' grains ................................................. 136
- Distillery refuse ............................................... 136
- Distillery slop ...................................................... 136
- Germ oil meal .................................................... 136
- Gluten feed ........................................................ 136
- Gluten meal ....................................................... 137
- Hominy chop ...................................................... 137
- Hominy feed ....................................................... 137
- Hominy meal ...................................................... 137
- Human foods ...................................................... 137
- "Maize-cake" ...................................................... 137
- Maizena .............................................................. 137
- "New corn product" ........................................... 137
III. BALANCE EXPERIMENTS .................................................. 138
   (Note: Experiments in which the balance between the intake and the output of specific constituents was determined; i.e., the difference between the amount in the food and that in the urine and feces combined.)
   Men ................................................................. 138
   Dairy cattle ...................................................... 138
   Hogs ................................................................. 138
   Horses ............................................................. 139
   Lambs ............................................................... 139
   Laboratory animals ............................................. 139
   Birds ............................................................... 139

IV. ENERGY METABOLISM OF ANIMALS ON RATIONS OF CORN OR CORN PRODUCTS ............................................ 139

V. SPECIAL STUDIES OF CONDITIONS AFFECTING THE NUTRITIVE VALUE of CORN .......................................................... 139
   Curing .............................................................. 139
   Decortication .................................................... 139
   Ensilage ........................................................... 139
   Freezing before ensilage ...................................... 140
   Grinding ........................................................... 140
   Heating ............................................................ 140
   Method of planting ............................................. 140
   Milling processes ............................................... 140
   Molding ........................................................... 140
   Smutted corn .................................................... 141
   Soaking ............................................................ 141
   Stage of growth at the time of cutting ..................... 141
   Storage ............................................................. 141
   Stover used for silage .......................................... 141
   Supplements affecting the digestibility of corn ........... 141
   Variety, including comparisons of white and yellow corn . 142
   Wind-scorching ................................................... 142

VI. OBSERVATIONS BEARING UPON SPECIFIC EFFECTS OF THE CHEMICAL COMPOSITION OF CORN ........................................... 142
   Acidity of ash .................................................... 142
   Calcium defect ................................................... 142
   Other mineral defect studies ................................ 142
   Protein studies .................................................. 143
      (a) With zein as sole protein ................................ 143
      (b) With corn products as sole source of proteins .... 143
      (c) Addition of amino-acid or protein supplement to corn proteins .................................................. 143
      (d) Corn proteins as supplements to other proteins .... 144
   Vitamin studies .................................................. 144
   Pigment studies, comparisons of white and yellow corn . 144
   Cellulose defect .................................................. 144

VII. OBSERVATIONS ON SPECIFIC PHYSIOLOGICAL AND ANATOMICAL EFFECTS OF CORN OR CORN PRODUCTS ........................................... 145
   Body lesions ...................................................... 145
CONTENTS

Digestive disturbances ........................................... 145
Effects on body resistance ...................................... 145
Effects on composition of parts of body ..................... 145
Effects on metabolic processes ............................... 145
Effects on nervous system ...................................... 146
Effects on offspring ............................................ 146
Effects on production or composition of milk ................ 146
Effect on reproductive powers .................................. 146
Growth and weight observations ................................ 147
Length-of-life observations ..................................... 147
Pellagra studies .................................................. 147
Toxic effects ...................................................... 147
Other physiological and anatomical effects ................. 148

VIII. Other Types of Studies with Animals ..................... 149

SECTION III
SELECTED BOOKS, PAMPHLETS, AND GENERAL ARTICLES ...... 150

DIRECTIONS FOR USING THE BIBLIOGRAPHY

This bibliography consists of three sections, as follows:

Section I, the author bibliography, giving a list of complete titles and references.

Section II, the subject bibliography, consisting of citations to the references of Section I, classified under main and subheadings.

Section III, listing books, pamphlets, and articles of a general or summarizing nature.

Section I will seldom be used by itself, unless one is interested in the work of an individual author, but is to be used in conjunction with Sections II and III. In Section II it will be noted that there are two distinct groups of investigations: those made without the use of animals and those involving the use of animals or of human subjects.

To look up the work on a given topic, first refer to the Table of Contents to determine what part of Section II deals with that subject, then turn to the subheading indicated and note the authors and dates of the references in which you are interested. In Section I you can then find listed under these authors and dates the complete titles and the locations of reports. Look thru Section III also for possible summaries on the topic.

In Section I the articles are listed under the authors' names arranged alphabetically, and are in chronological order under each name or group of names. The year of publication of the original article is shown in the margin; dates of abstracts are shown in parenthesis.
following their volume number. In Sections II and III these articles are referred to by the author's name followed by the date in parenthesis, a, b, c, etc., being added to differentiate articles bearing the same date. A question mark (?) following the date indicates that the date of the original article is not known and the date given is that of the abstract.

The abbreviations for publications used in Section I are those commonly employed, with the exception of those for Chemical Abstracts, Experiment Station Record, and Maly's Jahresbericht über die Fortschritte der Tierchemie. These occur so often that the contractions C.A., E.S.R., and Maly have been used. State agricultural experiment stations are indicated simply by the abbreviation Sta.; e.g., Pa. Sta. Rpt. 1909 means Pennsylvania Agricultural Experiment Station Report for 1909. While references have been given to abstracts in the three journals mentioned above and in some cases in the Journal of the Chemical Society and Biedermann's Centralblatt für Agricultur Chemie, the originals should always be consulted if possible.

The reader should bear in mind that the headings and subheadings used here may not exactly correspond with those in which he is interested, and he should therefore consider all headings which may include material for him. The whole Table of Contents should be studied, particularly all principal headings and the relation of subheadings to them. For example, processes of treatment of corn are considered first with relation to changes effected in the composition of the corn and later with relation to effects on the nutritive value as shown in animal experiments. It should be noted also that digestion experiments and balance experiments are not to be looked for under "Feeding Tests Not Involving Chemical Considerations," because in them the chemical composition of the feeds and the excreta must be considered. Many of the investigations of these groups, however, would be of distinct value to the man looking for animal feeding tests. They are omitted from that list simply to avoid unnecessary repetition.
A BIBLIOGRAPHY OF RESEARCHES BEARING ON THE COMPOSITION AND NUTRITIVE VALUE OF CORN AND CORN PRODUCTS

SECTION I—AUTHOR BIBLIOGRAPHY

1919 ABDERHALDEN, E. Influence of the kind of food upon the condition of the individual, his time of life, his rate of propagation, and the fate of the offspring. Arch. Ges. Physiol. 175, 187-326; C. A. 14 (1920), 1136.


1894 AGRICULTURAL STUDENT. Relative food value of corn and wheat for hogs. Agr. Student 1, 8, 9; E.S.R. 6 (1894), 466.


1916 ANONYMOUS. The Influence of chemical fertilizers upon the composition of the cereals. Agr. Mod. (Milan) 22, 284, 285; C. A. 12 (1918), 1582; E.S.R. 37 (1918), 827.


1921 —— Reliability of the nail test for predicting the chemical composition of green sweet corn. J. Agr. Res. 21, 817-820; E.S.R. 45 (1921), 834; C. A. 15 (1921), 3695.

1923 —— Forecasting the date and duration of the best canning stage for sweet corn. Md. Sta. Bul. 254, 47-56; E.S.R. 49 (1923), 832, 833; C. A. 18 (1924), 298.


1897 —— Digestion experiments. Me. Sta. Rpt. 1897, 141-153; E.S.R. 10 (1898-99), 879, 880.

1900 —— Digestion experiments with sheep. Me. Sta. Bul. 67, 133-170; E.S.R. 12 (1900-01), 873.

1904 —— Digestion experiments with sheep and steers. Me. Sta. Bul. 110, 185-208; E.S.R. 16 (1904-05), 1110.


1922 —— and Haas, A. R. C. The effect of lime, leaching, form of phosphate and nitrogen salt on plant and soil acidity, and the relation of these to the feeding power of the plant. Soil Sci. 13, 461-479; E.S.R. 47 (1922), 517, 518; C. A. 17 (1923), 1818, 1819.

1922 De Baufre, W. L. The heat value of corn. Power 56, 212; E.S.R. 47 (1922), 888; C. A. 16 (1922), 4324.


<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Title</th>
<th>Journal/Book</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1923b</td>
<td>———</td>
<td>Alfalfa and silage for fattening cattle. Alfalfa hay and corn silage fed alone, with oilmeal, and with corn.</td>
<td>Ohio Sta. Mo. Bul.</td>
<td>8, 139-144.</td>
</tr>
<tr>
<td>1910</td>
<td>———</td>
<td>The ratio of methyl pentosans to pentosans in certain seeds.</td>
<td>J. Landw.</td>
<td>58, 77-79; E.S.R. 23 (1910), 413, 414.</td>
</tr>
</tbody>
</table>


1914  ———  Maize—Its history, cultivation, handling, and uses.  Longmans, Green and Co.  831 pp., 1914.


1899 ——— Feeding ground corn versus ground peas to lambs before and after weaning. Wis. Sta. Rpt. 1899, 44-51; E.S.R. 12 (1900-01), 74.


1901a ——— The comparative value and the effect upon lamb crop of feeding various rations to ewes in winter. Wis. Sta. Rpt. 1901, 16-24; E.S.R. 13 (1901), 978, 979.

1901b ——— Experiments in pig feeding. The results of a feeding trial to determine the comparative effect of feeding pigs rations of corn meal and of ground peas. Wis. Sta. Rpt. 1901, 44-58; E.S.R. 13 (1901), 980.


1902 ——— and McCONNELL, T. F. Results of an experiment to determine the comparative effect upon the growth, development, and character of the carcass of pigs fed upon rations of ground peas and corn meal. Wis. Sta. Rpt. 1902, 17-33; E.S.R. 14 (1902), 999, 1000.


1912 CASA-BIANCHI, D., and VALLARDI, C. Feeding of maize and hypersensitiveness to maize extracts. Ztschr. Immunität 15, 370-408; C. A. 7 (1913), 645; E.S.R. 29 (1913), 175, 176.
1914a —— Nourishment with maize and hypersensitiveness to maize extracts. Pathologica 4, 375-379; C. A. 8 (1914), 519.
1913a CENTANNI, E., and GALASSI, C. Concerning factors of toxicity and an excessive corn diet. Sperimentale 67, No. 4, Sup. 142-150; E.S.R. 31 (1914), 859.
1913b —— The two-fold toxic and one-sided character of maize nourishment. VIII Riunione Soc. Ital. Pattol., Pisa, Mar. 1913; C. A. 8 (1914), 2897.
1894a —— Pentosans in plants. Amer. Chem. J. 16, 218-228.
1894b —— Pentosans in plants. Amer. Chem. J. 16, 589-611; E.S.R. 6 (1894-95), 603.
1917b —— Distribution in wheat, rice, and maize grains of the substance, the deficiency of which in a diet causes polyneuritis in birds and beri-beri in man. Proc. Roy. Soc. London (B) 90, 44-60; C. A. 12 (1918), 930; E.S.R. 38 (1918), 581.
1891b —— A study of the proteids of the corn or maize kernel. Amer. Chem. J. 13, 453-468; 529-552; 14 (1892), 20-44.


1889 —— A study of the corn plant. N. Y. (Geneva) Sta. Bul. 16 (n.s.), 117-121; E.S.R. 1 (1889-90), 265, 266.


1895 CONNER, C. M. Feeding wheat and corn to pigs. Amer. Agr. (middle ed.) 1895, 452; E.S.R. 7 (1895), 524.


1923 COWARD, K. H. The formation of vitamin A in plant tissues, II. Biochem. J. 17, 134-144; C. A. 17 (1923), 2303; E.S.R. 49 (1923), 767, 768.


1895a —— Corn meal, bran, and oats for lambs before and after weaning. Wis. Sta. Rpt. 1895, 40-45; E.S.R. 8 (1896), 714.


1897a —— Grain for lambs before weaning. Wis. Sta. Rpt. 1897, 37-41; E.S.R. 10 (1898-99), 774, 775.

1897b —— Grain mixture for lambs before and after weaning. Wis. Sta. Rpt. 1897, 42-44; E.S.R. 10 (1898-99), 775.


1900 ——— Corn v. peas for fattening lambs. Ontario Agr. Col. and Exp. Farm Bul. 110, 7, 8; E.S.R. 12 (1900), 380.
1908 DIETRICH, W. Food requirements of growing and fattening swine. Ill. Sta. Circ. 126, 18 pp.; E.S.R. 20 (1908-09), 1068.
1910 Doby, G. Sugar, cellulose, and alcohol manufacture from corn stalks. Chem. Ztg. 34, 1330, 1331; E.S.R. 24 (1911), 707.


1917b ——— The occurrence of mannite in silage and its possible utilization in the manufacture of explosives. Sci. 46, 192, 193; C. A. 11 (1917), 2834; E.S.R. 37 (1917-18), 801.


BIBLIOGRAPHY


1898 ——— Peanuts, cowpeas, and sweet potatoes as food for pigs. Ala. Sta. Bul. 93, 115-134; E.S.R. 10 (1898), 577-580.


1899 Dumont, R. The nutritive value of maize and maize forage. Prog. Agr. et Vit. (Ed. l'Est), 20, 637-640; E.S.R. 11 (1899-1900), 381.

1923 —— —— and CULBERTSON, C. C. Corn substitutes for fattening lambs. Part I. Comparing corn grain with other grains or concentrates, all fed straight. Part II. Comparing corn with oats and barley all fed straight; also with admixtures of same. Iowa Sta. Bul. 210, 203-229.


1920 — and DUNN, R. Barley v. corn for breeding gilts. Swine World 8, 26, 27; also in Durroc Bul. and Live Stock Farming 16 (1920), 50, 52; E.S.R. 43 (1920), 774.


1900 FRAPS, G. S. The digestibility of some non-nitrogenous constituents of certain feeding stuffs. N. C. Sta. Bul. 172, 49-80; E.S.R. 12 (1900-01), 667, 668.


1912 Digestion experiments with Texas hays and fodders. Tex. Sta. Bul. 147, 28 pp.; E.S.R. 27 (1912), 668, 669.

1914 Digestion experiments with Texas feeding stuffs. Tex. Sta. Bul. 166, 26 pp.; E.S.R. 31 (1914), 862, 863.


1921a —— and Anderson, J. A. The relation of lactic acid bacteria to corn silage. J. Biol. Chem. 46, 319-327; C. A. 15 (1921), 1768; E.S.R. 45 (1921), 502.

1921b —— The characteristics of certain pentose-destroying bacteria, especially as concerns their action on arabinose and xylose. J. Biol. Chem. 48, 385-412; C. A. 16 (1922), 945; E.S.R. 46 (1922), 503.


1905 —— Middlings and ground barley v. middlings and corn meal as a grain ration for young sows. Wis. Sta. Rpt. 1905, 37, 38; E.S.R. 18 (1906), 267.


1889a Record of feeding experiments with twelve cows. Mass. (State) Sta. Bul. 32, 2-9; E.S.R. 1 (1889), 77-79.


1906 GORTEIN, S. The influence of different amounts of ingested calcium and magnesium on the retention of these elements and the amount of them in the animal organism. Arch. Ges. Physiol. 115, 118-151; E.S.R. 18 (1906-07), 861.


1913 GOOD, E. S. The growing and fattening of hogs in the dry lot and on forage crops. Ky. Sta. Bul. 175, 309-356; E.S.R. 30 (1914), 770, 771.


1896 —— and Ferrati, E. The physiological action of maize which has been affected by hyphomyceetes. Riv. Ig. e Sanit. Pub. [Rome] 1896, 961; Maly 27 (1897), 793.

1904 Goss, A. Pig feeding experiments. Ind. Sta. Rpt. 1904, 6, 7; E.S.R. 16 (1904), 809.


1894 GRIFFITHS, A. B. On the microbes involved in the ensilage of green fodder; and on the variations of sugar and acidity with temperature and time. Chem. News 70, 273-275; E.S.R. 6 (1894-95), 633, 634.


1917 — CARMICHAEL, W. J., and NEWLIN, C. I. Digestion experiments with pigs with special reference to the influence of one feed upon another, and to the individuality of pigs. Ill. Sta. Bul. 200, 55-94; E.S.R. 37 (1917), 677, 678.


1906 HARCOURT, R. The nutritive value of bread as compared with breakfast foods. Amer. Food J. 1, 18, 19; C. A. 1 (1907), 75; E.S.R. 18 (1906-07), 460.


1913 —— Some effects of feeds upon the properties of lard. II. J. Indus. and Eng. Chem. 5, 410-414; C. A. 7 (1913), 2777.


1917 —— and Steenbock, H. The behavior of chickens restricted to the wheat or maize kernel. II. J. Biol. Chem. 31, 415-420; C. A. 11 (1917), 2924.

1922 —— With the cooperation of O. N. Johnson and A. Black. The nutritional requirements of baby chicks. II. Further study of leg weakness in chickens. J. Biol. Chem. 52, 379-386; C. A. 16 (1922), 2713; E.S.R. 47 (1922), 871, 872.


1916a —— Nutrition investigations at the Wisconsin Station. Wis. Sta. Bul. 268, 37, 38; E.S.R. 35 (1916), 562, 563.


1917b —— Efficiency of various protein concentrates for milk production. Wis. Sta. Bul. 275, 7, 8; C. A. 11 (1917), 3064, 3065; E.S.R. 36 (1917), 872.


Can "home grown rations" supply proteins of adequate quality and quantity for high milk production? II. J. Biol. Chem. 41, 189-201; C. A. 14 (1920), 3702; E.S.R. 45 (1921), 71, 72.


1914b —— Influence on growth of rations restricted to the corn or wheat grain. J. Biol. Chem. 19, 373-395; C. A. 9 (1915), 643; E.S.R. 33 (1915), 367.


1923-24 —— —— and LEPKOVSKY, S. The nutritional requirements of baby chicks. III. The relation of light to the growth of the chicken. J. Biol. Chem. 56, 33-41; C. A. 18 (1924), 549.

1920 —— —— and LETCHER, F. At what level do the proteins of milk become effective supplements to the proteins of a cereal grain? J. Biol. Chem. 42, 167-173; C. A. 14 (1920), 2363; E.S.R. 44 (1921), 174, 175.


1892b —— Corn meal, barley meal, and a mixture of nine tenths barley meal and one tenth oil meal compared. Minn. Sta. Bul. 22, 129, 130; E.S.R. 4 (1892), 423.


1894 —— Silage of flint, sweet, southern, and dent corn compared. Minn. Sta. Bul. 40, 238-245; E.S.R. 7 (1895-96), 149, 150.


1913 —— On the castration of plants. Rev. Sci. 51, I, 225-228; E.S.R. 31 (1914), 44.


1921 Heineman, P. G., and Hixson, C. E. Bacteria concerned in the ripening of corn silage. J. Bact. 6, 45-51; E.S.R. 45 (1921), 169; C. A. 15 (1921), 872.


1909 Henriques, V. Can the feeding of zein or gliadin as the sole nitrogen-containing substance give nitrogen equilibrium? Ztschr. Physiol. Chem. 60, 105-118; C. A. 4 (1910), 485.


1883b —— Sweet skim milk; its value as food for pigs and calves. Wis. Sta. Rpt. 1883, 31-38.

1884 —— Cornstalks compared with mixed hay and clover hay for producing milk and butter. Wis. Sta. Rpt. 1884, 11-16.


1890d — Cooked potatoes for fattening hogs. Wis. Sta. Rpt. 1890, 59-64; 1887, 64-83.
1898 — Whole corn compared with corn meal for fattening swine. Wis. Sta. Rpt. 1898, 8-16; E.S.R. 11 (1899-1900), 571, 572.
1900 — Whole corn compared with corn meal for fattening swine. Wis. Sta. Rpt. 1900, 7-11; E.S.R. 13 (1901-02), 79, 80.
1902 — Whole corn compared with corn meal for fattening pigs. Wis. Sta. Rpt. 1902, 10-16; E.S.R. 14 (1902-03), 999.
1903 — Whole corn compared with corn meal for fattening pigs. Wis. Sta. Rpt. 1903, 43-45; E.S.R. 16 (1904-05), 86.
1905 — Whole corn compared with corn meal for fattening pigs. Wis. Sta. Rpt. 1905, 16-20; E.S.R. 18 (1906-07), 266.


1890 —— Comparative effects of hay, silage, and corn fodder as fed to milch cows. Vt. Sta. Rpt. 1890, 86-88; E.S.R. 3 (1891), 473, 474.


1898b —— The oil of corn. J. Amer. Chem. Soc. 20, 948-961; E.S.R. 10 (1898-99), 817.


1900 —— Composition and digestibility of corn fodder and corn stover. Ill. Sta. Bul. 58, 361-370; E.S.R. 12 (1900-01), 370, 371.


1903b —— —— —— The chemical composition of different parts of the corn kernel. J. Amer. Chem. Soc. 25, 1166-1179; E.S.R. 15 (1903-04), 575.


1905 —— Soy beans v. wheat middlings as a supplement to corn meal for growing and fattening pigs. Wis. Sta. Rpt. 1905, 21-30; E.S.R. 18 (1906), 266.


1890 Hunt, T. F. The comparative value of corn fodder and silage in feeding yearling heifers. Ill. Sta. Bul. 9, 302-314; E.S.R. 2 (1890-01), 204-207.


1921 Hunter, C. A. Bacteriological and chemical studies of different kinds of silage. J. Agr. Res. 21, 767-789; C. A. 15 (1921), 3095; E.S.R. 45 (1921), 714, 715.


1897 Iacoangeli, T., and Bonanni, A. The nutritive value of Italian paste made wholly or in part from Indian corn. Bol. Not. Agr. 19, 434-448; E.S.R. 10 (1898-99), 180, 181.


1922a Indiana Station. [Hog feeding experiments at the Indiana Station.] Ind. Sta. Rpt. 1922, 18, 19; E.S.R. 49 (1923), 571.

1922b —— [Experiments by the Department of Poultry Husbandry at the Indiana Station.] Ind. Sta. Rpt. 1922, 39-42; E.S.R. 49 (1923), 573, 574.

1921a Iowa Station. [Swine feeding experiments at the Iowa Station.] Iowa Sta. Rpt. 1921, 22, 23, 24, 25; E.S.R. 47 (1922), 777.


1899f —— A reducing and invertible sugar obtained from corn-stalks. Bul. Roumaine 8, 325-351; E.S.R. 11 (1899-1900), 904.


1921a —— Sorghums or corn for fattening lambs. Breeder’s Gaz. 80, 13, 14; E.S.R. 45 (1921), 471.
1921b —— Grain sorghums v. corn for baby beeves. Breeder’s Gaz. 80, 81, 82; E.S.R. 45 (1921), 873.
1914 JONES, W. J., Jr., and HUSTON, H. A. Composition of maize at various stages of its growth. Ind. Sta. Bul. 175, 599-630; C. A. 8 (1914), 3068; E.S.R. 31 (1914), 431, 432.
1894-95 —— American digestion experiments. E.S.R. 6, 5-8.


1922 KAUFF, B. F., and IVEY, J. E. Digestible nutrients of poultry feeds as determined by laboratory feeding tests. Poultry Sci. 2, 1-9; also in Nat. Poultry J. 3 (1923), 454, 455, 456; E.S.R. 48 (1923), 573, 574.


1923 ——— ——— Buttermilk as a supplement to corn meal when fed to chickens. Poultry Sci, 2, 125-128; E.S.R. 49 (1923), 674.


1894 KENT, D. A. Corn meal and grass with stock steers. Iowa Sta. Bul. 25, 41-43; E.S.R. 6 (1894), 452.


1922a ——— [Hog feeding experiments at the Kentucky Station.] Ky. Sta. Rpt. 1922, pt. 1, 49, 50; E.S.R. 49 (1923), 571, 572.


1911 KLIMONT, J. In regard to the refraction constants of vegetable oils. Ztschr. Angew. Chem. 24, 254-256; E.S.R. 25 (1911), 801.


1894 KLOEPFER. Practical experience in Germany in feeding corn (maize) to horses. Deutsch. Landw. Presse 21, 582, 583; E.S.R. 6 (1894), 242.


1918 KÜHL, L. Medical studies in Roumania during the war, especially the treatment and etiology of pellagra. Arch. Schiffs u. Tropen Hyg. 22, 401-430; E.S.R. 41 (1919), 470.

1903 KUTSCHEK, F. Proteids: A contribution to the subject, II. Ztschr. Physiol. Chem. 38, 111-134; E.S.R. 15 (1903-04), 749, 750.


1922 —— and EVVARD, J. M. Vitamins on the farm—their practical relation to livestock feeding. Iowa Sta. Circ. 73, 8 pp.; C. A. 16 (1922), 2165; E.S.R. 47 (1922), 69.

1911 LANG, S. Action of pancreatic diastase upon various starches. Ztschr. Exp. Path. 8, 279; C. A. 5 (1911), 105.


1894b ——— Concerning the digestibility of pentosans. Agr. Sci. 8, 172-183; E.S.R. 6 (1894-95), 237, 238.


1921 LINDSTROM, E. W. The inheritance of green and yellow pigments in maize seedlings. Genetics 6, 91-110; C. A. 15 (1921), 3128.

1900 LINFIELD, F. B. Winter feeding experiments with cows. Utah Sta. Bul. 68, 239-265; E.S.R. 12 (1900-01), 783.


1899 —— Feeding tests to determine the value of corn, cotton seed, and cottonseed meal for beef production. Miss. Sta. Rpt. 1899, 13, 14; E.S.R. 12 (1900), 282.


1918b —— —— The nursing mother as a factor of safety in the nutrition of the young. Amer. J. Physiol. 46, 275-313; C. A. 12 (1918), 1658.


1921a ——— Supplementary dietary relations between animal tissues and cereal and legume seeds. J. Biol. Chem. 47, 139-173; C. A. 15 (1921), 2657, 2658; E.S.R. 46 (1922), 161, 162.

1921b ——— Supplementary protein values in foods. II. Supplementary dietary relations between animal tissues and cereal and legume seeds. J. Biol. Chem. 47, 265-234; C. A. 15 (1921), 2657, 2658; E.S.R. 46 (1922), 161, 162.

1921c ——— Supplementary protein values in foods. III. The supplementary dietary relations between the proteins of the cereal grains and the potato. J. Biol. Chem. 47, 175-206; C. A. 15 (1921), 2657, 2658; E.S.R. 46 (1922), 161, 162.

1921d ——— Supplementary protein values in foods. V. Supplementary relations of the proteins of milk for those of cereals and of milk for those of legume seeds. J. Biol. Chem. 47, 235-247; C. A. 15 (1921), 2657, 2658; E.S.R. 46 (1922), 161, 162.


1916c ——— The distribution in plants of the fat soluble A, the dietary essential of butter fat. Amer. J. Physiol. 41, 361-375; C. A. 10 (1916), 2902; E.S.R. 36 (1917), 61, 62.

1917a ——— Is lysine the limiting amino acid in the proteins of wheat, maize, or oats? J. Biol. Chem. 28, 483-499; C. A. 11 (1917), 980; E.S.R. 36 (1917), 506.

1917b ——— The supplementary dietary relationship between leaf and seed as contrasted with combinations of seed with seed. J. Biol. Chem. 30, 13-32; C. A. 11 (1917), 2484; E.S.R. 37 (1917), 264, 265.


1923 —— Effect of different concentrations of manganese sulphate on the growth of plants in acid and neutral soils and the necessity of manganese as a plant nutrient. J. Agr. Res. 24, 781-794; C. A. 17 (1923), 3741.


1922 MALLON, M. G., and CLARK, M. Vitamin A content of lard obtained from hogs on a control ration. J. Biol. Chem. 54, 763-766; C. A. 17 (1923), 800; E.S.R. 49 (1923), 59, 60.


1884 MAYER, A. A contribution to the better knowledge of the earlier and later parts of the ensiling process. J. Landw. 32, 357-405; Maly 14 (1884), 401, 402.


1894a Mills, A. A. The relative value of wheat, peas, corn, and barley, when mixed with bran, in the production of pork. Utah Sta. Bul. 34, 10 pp.; E.S.R. 6 (1894), 569, 570.


1923 —— and Villegas, V. The nutritive value of the proteins of coconut meal, soy beans, rice bran and corn. J. Dairy Sci. 6, 222-236.


1919 Morrison, F. B., and Boistedt, G. Barley for fattening pigs. Wis. Farmers' Inst. Bul. 32, 96-103; also in Hoard's Dairyman 57 (1919), 773, 776; E.S.R. 43 (1920), 774, 775.


1893 ——— Field experiments with corn, 1892. Ill. Sta. Bul. 25, 200, 201; E.S.R. 4 (1892-93), 905.


1907a ——— Ration experiments with lambs. Wyo. Sta. Bul. 73, 18 pp.; E.S.R. 19 (1907-08), 266.


1921b —— [Fattening lambs at the Nebraska Station.] Nebr. Sta. Rpt. 1921, 18, 19, 35, 36; E.S.R. 47 (1922), 775.
1914a NEDIG, R. E. The survival of amylase in dried fodders. J. Amer. Chem. Soc. 36, 1312-1314; E.S.R. 32 (1915), 503
1914b —— Chemical changes during silage formation. J. Amer. Chem. Soc. 36, 2401-2413; also Iowa Sta. Res. Bul. 16 (1914), 22 pp.; C. A. 8 (1914), 3827; E.S.R. 32 (1915), 710.


1913 Nicholls, L. The pathological changes in pellagra and the production of the disease in lower animals. J. Hyg. 13, 149-161; E.S.R. 29 (1913), 768.


BULLETIN

Feeding

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1919

NORTHROP, J. H., ASHE, L. H., and SENIOR, J. K. Biochemistry of

Bacillus acetethylicum

with reference to the formation of acetone.


1919


E.S.R. 45 (1921), 261.

1891


(1891), 179-182.

1896


1897


1899


1901


1885


1922a


E.S.R. 49 (1923), 372.

1922b


(1923), 370, 371.

1923


1911

OPPERMAN, C. L., and WAITE, R. H. Some experiments with poultry. Md.

Sta. Bul. 157, 79-95; E.S.R. 26 (1912), 770, 771; Reported also in

Country Gent. 79 (1914), 432, 433; E.S.R. 31 (1914), 473, 474.

1919-20a

OREGON STATION. Silage investigations [at the Oregon Experiment

Station.] Ore. Sta. Rpt. 1919-20, 22; E.S.R. 44 (1921), 866, 867.

1919-20b

[Feeding experiments with dairy cattle at the Oregon Experiment


1896

OSBORNE, T. B. The amount and properties of the protoids of the maize

kernel. Conn. Sta. Rpt. 1896, 391-397; E.S.R. 9 (1897-98), 519; also

J. Amer. Chem. Soc. 19 (1897), 525-532.

1900

Sulfur in protein bodies. Conn. Sta. Rpt. 1900, 443-471; E.S.R.

13 (1901-02), 521; also Ztschr. Analyt. Chem. 41 (1902), 25-35.

1910

The plant proteins. Ergeb. Physiol. 10, 47-215; 219 refs.

1913

The nutritive value of the proteins of maize. Science n.s., 37,

185-191; C. A. 7 (1913), 2596, 2597; E.S.R. 28 (1913), 759, 760.

1908

and CLAPP, S. H. Hydrolysis of the proteins of maize, zea mays.

Amer. J. Physiol. 20, 477-493; C. A. 2 (1908), 1299, 1300.

1903a


Soc. 25, 323-353; E.S.R. 15 (1903-04), 221, 222.

1903b

The carbohydrate group in the protein molecule. J.

Amer. Chem. Soc. 25, 474-478; E.S.R. 15 (1903-04), 222, 223.

1903c

The specific rotation of some vegetable proteins. J.

Amer. Chem. Soc. 25, 842-848; E.S.R. 15 (1903-04), 222.
1903d ——— The tryptophane reaction of various proteins. J. Amer. Chem. Soc. 25, 853-855; E.S.R. 15 (1903-04), 222.


1913 ——— and LEAVENWORTH, C. S. Do gliadin and zein yield lysine on hydrolysis? J. Biol. Chem. 14, 481-487; C. A. 7 (1913), 2530; E.S.R. 29 (1913), 408.


1913b ——— The relation of growth to the chemical constituents of the diet. J. Biol. Chem. 15, 311-326; C. A. 7 (1913), 3355; E.S.R. 30 (1914), 64.


1914b ——— Nutritive properties of proteins of the maize kernel. J. Biol. Chem. 18, 1-16; C. A. 8 (1914), 2561; E.S.R. 32 (1915), 164.

1914e ——— The contribution of bacteria to the feces after feeding diets free from indigestible components. J. Biol. Chem. 18, 177-182; C. A. 8 (1914), 3318.


1916a ——— The amino-acid minimum for maintenance and growth, as exemplified by further experiments with lysine and tryptophane. J. Biol. Chem. 25, 1-12; C. A. 10 (1916), 1881.


1916c ——— Some practical applications of feeding experiments with albino rats. Amer. J. Physiol. 40, 147; C. A. 10 (1916), 2918.

The relative value of certain proteins and protein concentrates as supplements to corn gluten. J. Biol. Chem. 29, 69-92; C. A. 11 (1917), 975; E.S.R. 36 (1917), 666.


Skimmed milk as a supplement to corn in feeding. J. Biol. Chem. 44, 1-4; C. A. 14 (1920), 3701.


Palmer, L. S. Xanthophyll, the principal natural yellow pigment of the egg yolk, body fat, and blood serum of the hen. The physiological relation of the pigment to the xanthophyll of plants. J. Biol. Chem. 23, 261-279.


and Eckles, C. H. Carotin—The principal natural yellow pigment of milk fat: its relations to plant carotin and the carotin of the body fat, corpus luteum and blood serum. I. The chemical and physiological relation of the pigments of milk fat to the carotin and xanthophylls of green plants. J. Biol. Chem. 17, 191-210; C. A. 8 (1914), 1787, 1788; E.S.R. 31 (1914), 273, 274.

Carotin—The principal natural yellow pigment of milk fat: its relations to plant carotin and the carotin of the body fat, corpus luteum and blood serum. II. The pigments of the body fat, corpus luteum and skin secretions of the cow. J. Biol. Chem. 17, 211-221; C. A. 8 (1914), 1788; E.S.R. 31 (1914), 274.

Carotin—The principal natural yellow pigment of milk fat: its relations to plant carotin and the carotin of the body fat, corpus luteum, and blood serum. III. The yellow lipochrome of blood serum. J. Biol. Chem. 17, 223-236; C. A. 8 (1914), 1788; E.S.R. 31 (1914), 274, 275.


1919c —— The influence of specific feeds and certain pigments on the color of the egg yolk and body fat of fowls. J. Biol. Chem. 39, 331-337; C. A. 13 (1919), 3217.


1889 PATRICK, G. E., and SMITH, L. P. Feeding experiments with steers. Iowa Sta. Bul. 6, 205-239; E.S.R. 1 (1889-90), 210, 211.


1917 **PAULETIG, M.** Digestibility of starches from various vegetable foods by diastases from malt, pancreas, and saliva. Ztschr. Physiol. Chem. 100, 74-92; C. A. 12 (1918), 159.


1917b —— Silage alone compared with silage and mixed hay as roughage for dairy cows. Pa. Sta. Bul. 147, 15; E.S.R. 38 (1918), 277, 278.


1923 **PERKINS, A. E.** Losses and exchange of material during the storage of corn as silage. Ohio Sta. Bul. 370, 280-306.


<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Title</th>
<th>Journal</th>
<th>Pages</th>
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<tbody>
<tr>
<td>1921a</td>
<td>——— ——— and Verhulst, J. H.</td>
<td>The destruction of pentosans in the formation of silage.</td>
<td>J. Biol. Chem.</td>
<td>46, 329-338; C. A. 15 (1921), 1768; E.S.R. 45 (1921), 502</td>
</tr>
<tr>
<td>1898</td>
<td>Phelps, C. S.</td>
<td>Digestion experiments with sheep.</td>
<td>Conn. (Storrs) Sta. Rpt.</td>
<td>1898, 204-220; E.S.R. 11 (1899-1900), 873, 874</td>
</tr>
<tr>
<td>1901</td>
<td>———</td>
<td>Field experiments with fertilizers.</td>
<td>Conn. (Storrs) Sta. Rpt.</td>
<td>1901, 122-147</td>
</tr>
<tr>
<td>1918</td>
<td>Pittz, W.</td>
<td>Studies of experimental scurvy. II. The influence of grains, other than oats, and specific carbohydrates on the development of scurvy.</td>
<td>J. Biol. Chem.</td>
<td>33, 471-482; C. A. 12 (1918), 2004</td>
</tr>
<tr>
<td>1892</td>
<td>Plumbe, C. S.</td>
<td>The silo and silage in Indiana.</td>
<td>Ind. Sta. Bul.</td>
<td>40, 65-81; E.S.R. 4 (1892), 154</td>
</tr>
<tr>
<td>1903</td>
<td>———</td>
<td>On the value of distillery dried grains as a food for horses.</td>
<td>Ind. Sta. Bul.</td>
<td>97, 37-42; E.S.R. 15 (1903-04), 997</td>
</tr>
<tr>
<td>1897</td>
<td>——— and Anderson, W. B.</td>
<td>Wheat and corn as food for pigs.</td>
<td>Ind. Sta. Bul.</td>
<td>67, 61-70; E.S.R. 10 (1898), 176, 177</td>
</tr>
</tbody>
</table>
1898 —— Corn meal and shorts as food for pigs. Ind. Sta. Bul. 71, 55-60; E.S.R. 10 (1898), 674.


1922b —— —— Comparison of the various corn products starches as shown by the Bingham-Greene plastometer. J. Indus. and Eng. Chem. 14, 49-52; C. A. 16 (1922), 657.


1912 Quevedo, J. M. Epizootic encephalomyelitis in the horse. Rev. Zootie. 4, 163, 164; E.S.R. 30 (1914), 485.


1913a Rammsstedt, O. The chemical composition of some cornmeal products and the digestibility of their nitrogenous substances in pepsin-hydrochloride as compared with the digestibility of the nitrogenous substances of other cereals and legumes. Arch. Hyg. 81, 286-306; C. A. 8 (1914), 969; E.S.R. 31 (1914), 161, 162, and 33 (1915), 564.

1913b ——— The importance of maize as food. Ztschr. öffentl. Chem. 19, 288-294, 305-316, 327-334; C. A. 8 (1914), 969; E.S.R. 30 (1914), 557.

1915 ——— The digestibility of the proteins of several cereal and leguminous flours and desiccated potatoes and their value for the nutrition of the (German) people and troops during the war. Pharm. Zentralhalle 56, 7 pp., 14-17, 22-25; C. A. 9 (1915), 2952.


1904 Richards, W. B., and Kleinhinez, F. Effect upon the lambs of feeding a mixed grain ration of corn, oats, and bran to pregnant ewes. Wis. Sta. Rpt. 1904, 60-66; E.S.R. 16 (1904-05), 808.

1884-85 Richardson, C. The chemical composition of wheat and corn as influenced by environment. Amer. Chem. J. 6, 302-317.

1885 —— Notes on the chemical alterations in green fodder during its conversion into ensilage. J. Chem. Soc. 47, T, 80-89.


1921a ——— Supplements to corn for fattening swine. Ohio Sta. Bul. 349, 131-183; E.S.R. 45 (1921), 674-676.


1911 RONDONI, P. Influence of corn diet and sunlight on mice in connection with the photodynamic theory of pellagra. Sperimentale 65, 307-316; C. A. 6 (1912), 2774; E.S.R. 26 (1912), 871.

1912 ——— Hypersensitiveness of pellagra patients to maize. Sperimentale 66, 447-472; C. A. 8 (1914), 3196, 3197.

1915 ——— Maize diet from the point of view of the etiology of pellagra. Sperimentale 69, 723-797; Trop. Diseases Bul. 7 (1916), 63; C. A. 10 (1916), 1372.


1915 ——— and MONTAGNAI, M. Histological lesions after exclusive maize diet, starvation, and experimental scurvy. Sperimentale 69, 659-696; Trop. Diseases Bul. 7 (1916), 63; C. A. 10 (1916), 1372.


1922 ——— Pigments of the mendelian color types in maize: Iso-quercetin from brown-husked maize. J. Biol. Chem. 54, 629-645; C. A. 17 (1923), 776, 777.


1914 ——— The etiology of beriberi. II. Arch. Schiffs u. Tropen Hyg. 18, Beiheft 6, 258 pp.; 309 refs.; E.S.R. 22 (1915), 858.


1900? Schuftp. G. Molasses feed meal with corn germs and malt sprouts. Ztschr. Öffentl. Chem. 6, 107-110; Maly 30 (1900), 689.

1884 Schulze, B. Changes in the nitrogenous parts of feeds when vegetables are soured. J. Landw. 32, 349-355; Maly 14 (1884), 401.


1918b —— Food conservation from the standpoint of the chemistry of nutrition. Proc. Amer. Phil. Soc. 57, 491-500; C. A. 12 (1918), 2601.

1919 —— and Walker, F. Influence of aspartic acid and asparagin upon the enzymic hydrolysis of starch. J. Amer. Chem. Soc. 41, 1866-1873; C. A. 14 (1920), 188.


1918 —— Corn-stover silage. J. Agr. Res. 12, 589-600; C. A. 12 (1918), 1220, 1221; E.S.R. 38 (1918), 802.


1922b —— Corn oil, its preparation and uses. Amer. Food J. 17, 27, 28; E.S.R. 48 (1923), 310.


1911 —— Feeding experiments with sheep. Ind. Sta. Rpt. 1911, 19, 20; E.S.R. 26 (1912), 874.


1908 —— Supplements to corn for fattening hogs in dry lot. Ind. Sta. Bul. 126, 143-159; E.S.R. 20 (1908-09), 369, 370.


1913b —— Fattening western lambs. Ind. Sta. Bul. 168, 47-68; E.S.R. 30 (1914), 769.


1910 —— —— and Smith, W. W. Corn silage for winter feeding of ewes and young lambs. Ind. Sta. Bul. 147, 611-627; C. A. 5 (1911), 938; E.S.R. 24 (1911), 72, 73.


1893 Smetham, A. Notes on (a) Rice oil; (b) Maize-oil. Analyst 18, 191-193.


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<th>Year</th>
<th>Title</th>
<th>Author/s</th>
<th>Source(s)</th>
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1920b — Gas production during the acetone and butyl alcohol fermentation of starch. J. Biol. Chem. 43, 401-411; C. A. 14 (1920), 3692; E.S.R. 44 (1921), 308, 309.


1921 ——— SELL, M. T., and BUELL, M. V. Fat-soluble vitamine. VII. The fat-soluble vitamine and yellow pigmentation in animal fats with some observations on its stability to saponification. J. Biol. Chem. 47, 89-109; C. A. 15 (1921), 2657; E.S.R. 46 (1922), 61.


1890b ——— Chemical experiments in 1889 in Weihenstephan and Friedberg concerning fodders used for preparing silage, also the kinds of silage resulting. Ztschr. Landw. Veriens Bayern 80, 827; Biedermann's Centbl. Agr. Chem. 20 (1891), 523, 524.


1921 ——— Amino-acids in nutrition. III. Is proline a growth-limiting factor in the proteins of peas (Vicia sativa)? What nucleus in zein is responsible for supplementing these proteins? J. Biol. Chem. 46, 443-452; C. A. 15 (1921), 2661; E.S.R. 45 (1921), 864, 865.


1897a ——— The quantitative determination of carbohydrates in food stuffs. J. Amer. Chem. Soc. 19, 183-197.


1921 ——— Amino-acids in nutrition. III. Is proline a growth-limiting factor in the proteins of peas (Vicia sativa)? What nucleus in zein is responsible for supplementing these proteins? J. Biol. Chem. 46, 443-452; C. A. 15 (1921), 2661; E.S.R. 45 (1921), 864, 865.


1903  TAYLOR, F. D. Corn silk as a feed stuff. Breeder's Gaz. 44, 569; E.S.R. 15 (1903-04), 391, 392.


1917  TEMPLETON, G. S. Velvet bean pasture compared with corn and dried blood; velvet bean meal compared with corn for fattening hogs. Ala. Sta. Bul. 198, 118-122; E.S.R. 38 (1918), 771.


1921a  THOM, C., and LEFÉVRE, E. Flora of corn meal. Abs. of Bact. 5, 10, 11; C. A. 17 (1923), 2898.


1890 —— —— Corn silage versus sugar beets as food for milk production. Ohio Sta. Bul. 20, 153-174; E.S.R. 11 (1890), 247-249.


1982 TYN, D. A. DEJONG. Steamed vs. cracked corn for fattening pigs. Milch Ztg. 21, 21; E.S.R. 3 (1891-92), 747.
1903 UNDERHILL, F. P. New experiments on the physiological action of the proteoses. Amer. J. Physiol. 9, 345-373; E.S.R. 15 (1903-04), 704.
1905 UNIVERSITY OF LEEDS. Bullock feeding experiments. Mark Lane Express Agr. J. 92, 24, 56, 57; E.S.R. 16 (1904-05), 1113.


1913 Volz, W., and Deutschland, A. The feeding value of corn slop. Ztschr. Spiritusindus. 36, 47, 48; Maly 43 (1913), 730, 731.

1913 —— Dietrich, W., and Deutschland, A. Comparative value of distillery-waste mixed feeds for sheep. Landw. Jahrb. 45, 1-27; E.S.R. 30 (1914), 671, 672.


1901 ——— The nature and properties of corn oil. II. Determination of the constitution. J. Amer. Chem. Soc. 23, 1-8; E.S.R. 12 (1900-01), 1006.


1889a WASHBURN, J. H., and TOLLENS, B. Concerning the cane sugar of corn grain and concerning American sweet corn in different stages of ripeness. J. Landw. 37, 503-524.


1921 WEISER, F. The power of the diastase of cow's milk to hydrolyze different kinds of starch. Biochem. Ztschr. 125, 179-186; C. A. 16 (1922), 937; E.S.R. 47 (1922), 503.


1913 WHEELER, R. Feeding experiments with mice. J. Exp. Zool. 15, 209-223; C. A. 7 (1913), 3608; E.S.R. 29 (1913), 767.


1898 WIDTSE, J. A. Digestion experiments with shredded corn fodder, lucern, timothy and wheat bran. Utah Sta. Bul. 54, 141-151; E.S.R. 10 (1898-99), 179, 180.

1903 ——— The influence of soil moisture upon the chemical composition of certain plant parts. J. Amer. Chem. Soc. 25, 1234-1243; E.S.R. 15 (1903-04), 657.


1912 ——— and STEWART, R. The chemical composition of crops as affected by different quantities of irrigation water. Utah Sta. Bul. 120, 205-240; E.S.R. 28 (1913), 332-334.

1913b --- Occurrence of maltase in cereals. Biochem. Ztschr. 57, 125-131; E.S.R. 31 (1914), 204.


1898 --- and BIGelow, W. D. Calories of combustion in oxygen of cereals and cereal products, calculated from analytical data. J. Amer. Chem. Soc. 20, 304-316.


1906-07 WILLCOCK, E. G., and HOPKINS, F. G. The importance of individual amino-acids in metabolism. Observations on the effect of adding tryptophane to a dietary in which zein is the sole nitrogenous constituent. J. Physiol. 35, 88-102; C. A. 1 (1907), 753; E.S.R. 18 (1906-07), 760.


1903 —— Feeding trials with pigs. Wis. Sta. Rpt. 1903, 82-91; E.S.R. 16 (1904-05), 85, 86.
1920b —— Some new factors in the production of silage. Wis. Sta. Bul. 319 (Rpt. 1918-19), 41, 42; E.S.R. 44 (1921), 266.
1923a —— Feeding eggs to baby chicks gets results. Wis. Sta. Bul. 352 (Rpt. 1921-22), 7-9; E.S.R. 49 (1923), 672.
1923b —— Quality of hatching eggs depends upon the ration. Wis. Sta. Bul. 352 (Rpt. 1921-22), 9, 10; E.S.R. 49 (1923), 672, 673.

1908  --- and BRADLEY, C. E. Digestibility of kale; vetch hay, steamed and unsteamed silage. Ore. Sta. Bul. 102, 29 pp.; E.S.R. 20 (1908-09), 969.


1890a --- Corn silage vs. dry fodder corn for milk and butter production. Wis. Sta. Rpt. 1890, 80-97; E.S.R. 2 (1890-91), 440, 441.


1890 Zavitc, C. A. Live stock experiments. Ontario Agr. Col. and Exp. Farm Rpts. 1890, 186-201; E.S.R. 3 (1891-92), 129.

SECTION II—SUBJECT BIBLIOGRAPHY

The references are to be found in Section I, under author's name and date of publication.

A—STUDIES OF CORN OR CORN PRODUCTS NOT INVOLVING EXPERIMENTS UPON ANIMALS

I

Analytical Determinations Other Than Proximate Analyses

Acidity

Bailey and Thom (1920); Balland (1895) corn; Bauer (1921) plant and parts; Bauer and Haas (1922) leaves, stalks, roots; Bechdel (1916) corn silage; Besley and Baston (1914) corn; Besley, Baston, and Duvel (1913) corn; Black and Alsberg (1910) corn; California Station (1922) silage; Collier (1881-82) corn juice; Dox and Neidig (1912), (1913a) silage; Dox and Yoder (1920) silage; Esten and Mason (1912) silage; Griffiths (1894) silage; Haigh (1918) silage; Hunter, C. A. (1921) silage; Hunter, O. W. (1917) silage; Hunter, O. W., and Bushnell (1916) silage; Hurd (1923) stalks and leaves of young plants; Jordan (1910) gluten feed; Lamb (1917) silage; McHargue (1920) whole corn, degenerated corn, corn germs, same after spoiling; Neidig (1914b) silage; Russell (1908a) silage; Shaw, R. H., and Norton (1920) fodder, silage; Spitzer, Carr, and Epple (1919) soft corn; Swanson, Calvin, and Hungerford (1913) silage; Wilt (1915) corn germs; Withycombe (1901) silage; Wussow and Grindley (1911) corn, corn meal; Wyant (1920).

Acids

Alway and Trumbull (1909) corn stalks (HCN); Bechdel (1916) corn silage; Brünnich (1903) young plant (HCN); Burrill (1889) silage; Dox and Neidig (1912), (1913a), (1913b) silage; Dyer and Gibbard (1895) corn products; Esten and Mason (1912) silage; Fred, Peterson, and Anderson (1921a) silage; Hart, E. B., and Willaman (1912) silage; Hunter, C. A. (1921) silage; Lamb (1917) silage; Neidig (1914b) silage; Peterson and Fred (1920) silage; Russell (1908a) silage; Shaw, R. H., and Norton (1920) fodder silage; Sherman, J. M., and Bechdel (1918) silage; Winterstein and Wünsche (1915) corn germs; Woll (1890a) silage.

Alcohol in silage

Burrill (1889) (mannitol); Davis (1923); Dox and Plaisance (1917a) (1917b) (mannitol); Dox and Yoder (1920); Fred, Peterson, and Anderson (1921); Hart, E. B., and Lamb (1914); Hart, E. B., and Willaman (1912); Irish (1890); Lamb (1917); Neidig (1914b); Peterson and Fred (1920).

1 Proximate analyses, i.e., simple determinations of moisture, crude fat, crude protein, crude fiber, nitrogen-free extract, and ash, are not listed. Several summaries of such analyses are given in the general articles referred to in Section III, and many are reported in connection with investigations which are listed in this section.
(I. Analytical determinations other than proximate analyses)

Alcohol extract

Headden (1907) fodder; Winterstein and Wünsche (1915) corn germ.

Alkaloids

de Schweinitz (1896) corn stalks; Werenskiold (1896) distillery slop.

Amino acids

Brewster and Alsberg (1919) grain, germ; Fürth and Lieben (1921) tryptophane in corn meal; Grindley (1917) corn; Hamilton, Nevens, and Grindley (1921) ground corn; Ide (1921) tryptophane in corn and corn minus germes; Lamb (1917) silage; Matsuyama and Mori (1923) tryptophane in zein; May, C. E., and Rose (1922) tryptophane of corn gluten and zein; Neidig and Snyder (1921) hydrolyzed corn silage; Nollau (1915) distillers' dried grains, corn kernel; Osborne and Clapp (1908) proteins of corn grain; Osborne and Harris (1903) zein; Osborne and Jones (1910) zein; Osborne and Leaveworth (1913) zein; Osborne and Liddle (1910) zein; Osborne and Mendel (1913a) proteins of corn; Pettibone and Kennedy (1916) seeds, seedlings, and sap; Van Slyke and Birchard (1913-14) zein; Winterstein and Wünsche (1915) corn germ.

Aqueous extract, Composition

Brünnich (1903-4) corn; Danesi and Scurti (1910) corn cobs; Headden (1907) fodder; Istrati and Oettinger (1899) corn stalks; Poppe (1913) corn grain; Rammstedt (1913a) corn meal; Wesener and Teller (1916) commercial glucose; Winterstein and Wünsche (1915) corn germ.

Ash constituents

Anderson and Kulp (1922a), (1922b) pollen; Bauer (1921) plant and its parts (Ca, P); Bertrand and Mokragnatz (1922) plant (Co, Ni); Birckner (1919) corn kernel, degerminated kernel (Zn); Britsch (1918) no Se in corn; Brünnich (1903-04) corn; Duley and Miller (1921) different parts of plant at different stages (Ca,Mg,P); Fluent and Levi (1920) grain (Cu); Forbes (1909a) corn grain, pearl hominy, corn bran, corn stover; (1909b) corn meal, hominy, germ oil meal; Forbes and Beegle (1916a) corn grain, silage; Forbes, Beegle, Fritz, and Mensching (1914) corn; Forbes, Beegle, Fritz, Morgan, and Rhue (1917) corn grain, silage; Forbes, Beegle, and Mensching (1913) corn, bolted corn meal, corn bran, gluten feeds, corn stover, pearl hominy, distillers' grains; Forbes, Halverson, and Morgan (1918) corn grain; Fraps (1918) corn bran, fodder; Graham, T., Stenhouse, and Campbell (1857) corn seed; Guddeman (1913) commercial glucose; Guerithault and Maquenne (1920) grain (Cu); Hagemann (1897) corn (P,K), corn cobs; Halverson and Wells (1920) grain (Cl); Harris and Pitman (1917) kernel (P,Ca, Mg); Hart, E. B., Steenbock, and Fuller (1914) corn grain, gluten meal, fodder, stover (Ca,K,P); Headden (1907) fodder; Hills (1893a) corn, silage, spoiled silage (P,K); Hills, (1893b) several varieties (P,K); Hoffer and Carr (1923) stalks (Al,Fe); Ladd (1888) corn grain, fodder, stover, cobs; McIlargue (1923) effect of Mn in soil; Muttelet (1916) commercial glucose (As); Peter, A. M., and Beatty (1901) germ feed, dried distillers' grains (P,K), corn cobs; Rhue (1918) corn meal, silage (Na,K); Schaumann (1914) corn; Terry (1917) corn cobs (K,P); Vipond (1912-13) corn; Voorhees (1894) several products (P,K); Wesener and Teller (1916) commercial glucose; von Wrangell (1922) plants and kernels (Ca,P).

See also Iodin, p. 97, Phosphorus, p. 98, Sulfur, p. 100, Ultimate Analysis, p. 100.
(I. Analytical determinations other than proximate analyses)

**Benzine extract, Composition**

*Stellwaag (1890a)* corn seed.

**Carbohydrate constituents**

*Atwater (1869); Balland (1895) corn; Eichel (1916) corn silage; Burrill (1899) silage (mannitol); Carr and Ripley (1920) pop corn; Collier (1889) fodder; Doby (1910) corn stalks; Dos and Plaisance (1917a), (1917b) silage (mannitol); Dos and Yoder (1920) silage; Fraps (1900) corn bran, silage; (1916) corn shucks; (1922a) corn, corn bran, corn silage; Frear and Sweetser (1892) fodder; Hall and Hay (1920) three varieties; Hals and Heyggenhougen (1917) corn meal, maizena; Haywood and Warner (1908) corn products; Headen (1907) fodder; Jordan (1893b) corn plant, (1895) fodder; Jordan, Bartlett, and Merrill (1893) whole plant at different stages; Kaining (1917) corn germs; Ladd (1888) corn meal, fodder, stover; (1899) several; (1900) fodder; Neidig (1914b) silage; Remy (1922) several varieties; Richardson (1885) fodder, silage; Sourtit and Morbelli (1919) corn cobs; Semmler and Fringsheim (1919) corn stalks, corn kernels; Severson (1917) silage; Shaw, E. H., and Wright (1920-21) entire plant at different stages; Shaw, R. H., Wright, and Deysher (1921) corn and silage; Slussen (1897) corn breakfast foods; Spitzer, Carr, and Epple (1919) normal corn, soft corn; Stone (1896), (1897a), (1897b) corn, corn bread; Straungh (1907) sweet corn; Washburn and Tollens (1889a) corn, sweet corn; Weatherwax (1922) erythrodextrin in endosperm of some corn; Weiser, S. (1912b) corn; Winterstein and Wünsche (1915) corn germ.

*See also* Alcohol, p. 94, Pentosans, p. 98, Starch, p. 99, Sugar, p. 99.

**Carbon**

*Armsby and Fries (1917)* hominy, hominy feed.

**Chloroform extract, Composition**

*Fraps and Rather (1913)* corn shucks.

**Composition of parts of kernel**

*Atwater (1869) ether extract; Hopkins, Smith, and East (1903a), (1903b); Osborne and Mendel (1914b); Voorhees (1894); Weiser, S. (1913) parts of the plant; Winterstein and Wünsche (1915) corn germ.

**Enzymes**

*Abderhalden and Damhahn (1908)* peptolytic enzymes of corn grain; Chrzaszcz and Terlikowsk (1912) amylase in corn; Fernandez and Pizarroso (1917a) lipase of kernels, (1917b) urease of kernels; Giesen (1900) protease in corn grain; Huerre (1909a), (1909b) maltase in seed; Neidig (1914a) amylase in dried stover; Nőmek (1919), (1920) glycerophosphatase in corn seed; Nőmek and Duchon (1921) saccharophosphatase in corn seed; Price, T. M. (1904) glucoside-splitting enzyme in corn stalks; Vorbrodt (1910) phytase in corn grain; Wierchowski (1913a), (1913b) maltase of corn; Winterstein and Wünsche (1915) no protease in corn germ.

**Ether extract, Composition**

*Fraps and Rather (1912)* corn shucks; König (1871) kernels; Snyder, H. (1906) fodder, grain, silage; Stellwaag (1890a) corn grain; Winterstein and Wünsche (1915) corn germ.
Fat or ether extract, oil

*Atwater* (1869) endosperm, embryo; *Borghesani* (1909†); *Bowers* (1880-90) seeds at different stages; *Carr and Ripley* (1920) pop corn; *Dunnington* (1912) corn meal; *Haberlandt and Lenz* (1866) several varieties of corn, parts of kernel; *Haigh* (1918) silage; *Hall and Hay* (1920) three varieties; *Honcamp and Blanck* (1920) corn hulls; *Honcamp, Nolle, and Blanck* (1919) corn cobs; *Hopkins* (1898a), (1899) corn grain; *Hopkins, Smith, and East* (1903a), (1903b) corn grain; *Hoppe-Seyler* (1866) corn grain; *Hume, Champlin, and Loomis* (1914) grain; *Illinois Station* (1922a) grain; *König* (1871) true fat; *Schulze, B.*, *Bialon, Werner, Gorkow, and Kloze* (1911) maize feed meal, maize distillers' wash; *Sievers* (1920) germs, corn oil cake, hominy feed; *Smith, L. H.* (1908) corn grain; *Weiser, E.* (1916) corn and various products; *Weiser, S.* (1920) embryos; *Winterstein and Wünsche* (1915) corn germ.

*See also* most Digestibility and Balance tests, p. 132 and p. 138.

Iodin

*Bohn* (1917) corn meal, stover, distillers' grains, corn gluten; *Forbes and Beegle* (1916b) several varieties of corn, immature corn, sweet corn, corn germ, corn plant, silage, stover, distillers' grains, gluten feed, gluten flour, pearl hominy.

Lecithin

*Alpers* (1918) corn embryo, corn oil; *von Bitto* (1894) yellow corn; *Borghesani* (1909†) corn; *Brünnich* (1903-04) corn; *Forbes* (1909b) corn meal, germ oil meal; *Hopkins* (1898a) kernel; *Schulze, E.* (1898) seed; *Schulze, E., and Frankfurt* (1893) white and yellow corn; *Winterstein and Wünsche* (1915) corn germ.

Lipoids

*Anderson* (1923) pollen; *Anderson and Kulp* (1922a), (1922b); *Anderson and Moore* (1923) corn oil; *New York (Geneva) Station* (1922a) pollen; *New York (Geneva) Station* (1922-23a) pollen, oil.

Nitrogen

*Anonymous* (1916) corn; *Arbuckle and Thies* (1923) corn; *Armsby and Fries* (1917) hominy, hominy feed; *Duley and Miller* (1921) different parts of plant at different stages; *East and Jones* (1920); *Fraps* (1922a) corn, corn bran, corn silage, corn shucks; *Haberlandt and Lenz* (1866) several varieties of corn, parts of kernel; *Hagemann* (1897) corn; *Harris and Pitman* (1917) corn kernel; *Hart, E. B., and Bentley* (1915) young plant, stover; *Hart E. B., and Humphrey* (1914) corn meal, gluten feed, stover; *Honcamp, Nolle, and Blanck* (1919) corn cobs; *Hopkins* (1898a), (1899) corn grain; *Hopkins, Smith, and East* (1903a), (1903b) corn kernel; *Hume, Champlin, and Loomis* (1914) corn grain; *Hunter, C. A.* (1921) silage; *Illinois Station* (1922a) grain; *Ladd* (1904) stalks; *Osborne and Mendel* (1914b) parts of corn kernel; *Parrozzani* (1907-8), (1909b) corn grain; *Penny* (1907) corn grain; *Peter, A. M., and Beatty* (1901) germ feed, dried distillers' grains; *Pilz* (1911) corn plant; *Pommer* (1921) "maize-cake"; *Rammstedt* (1913a) corn meal; *Schaumann* (1914) corn; *Short* (1889) parts of corn plant; *Smith, L. H.* (1908) corn; *Soule and Vanatter* (1907) ears; *Tottingham* (1924) leaves, grain; *Vipond*
(I. Analytical determinations other than proximate analyses)

(1912-13) corn; Voorhees (1894) several products; Whitson and Stoddard (1904)
corn plant; Wianoko (1905) corn; Wiley (1901) corn plant; Willard, Clothier,
and Weber (1902) corn; Winterstein and Wünsche (1915) corn germ.

See also Digestibility and Balance tests, p. 132 and p. 138.

Nitrogen distribution

Albert (1891) fodder, silage; Annett and Russell (1908) fodder, silage;
Bechdel (1916) corn silage; Brewster and Alsbeg (1915), (1919) corn, corn
germs; Chittenden and Osborne (1891a), (1891b) corn kernel; Donard and
Labbé (1903) corn grain; Fraps (1922a) corn, corn bran, corn silage, corn
shucks; Grindley (1917) corn; Grindley and Eckstein (1916) corn; Hamilton,
Nevens, and Grindley (1921) ground corn; Hart, E. B., and Bentley (1915)
young corn plant, stover; Headden (1907) fodder; Honcamp and Blanck (1920)
corn hulls; Hunter, C. A. (1921) silage; Ladd (1885), (1888), (1889) several;
(1890) fodder; Lamb (1917) silage; Neidig and Snyder (1921) hydrolyzed
corn silage; Nollau (1915) distillers' dried grains, corn kernel; Osborne (1913)
corn kernels; Parazzani (1907-08), (1908), (1909a), (1909b) corn grain; Passerini
(1916) corn grain; Pollard and Carr (1923-24) corn grain, pop corn; Bemy
(1922) several varieties; Richardson (1885) fodder, silage; Schulze, B. (1884)
silage; Schulze, E. (1888) silage; Severson (1917) silage; Shaw, R. H., and
Norton (1920) fodder, silage; Shaw, R. H., and Wright (1920-21) entire plant
at different stages; Showalter and Carr (1922b) high-protein and low-protein
corn, high-protein pop corn; Soave (1907) corn grain; Spitzer, Carr, and Epple
(1919) normal corn, soft corn; Tottenham (1924) leaves, grain; Winterstein
and Wünsche (1915) corn germ; Woll (1889a) fodder, silage; Woods (1889)
grain, stover.

See also Amino acids, p. 95, Proteins, p. 99.

Pentosans or their derivatives

Borghesani (1900), (1910) corn; de Chalmt (1893a) corn leaves; (1893b)
seeds and seedlings; (1894a) corn plant, leaves, cobs; (1894b) seeds and seed-
lings; Fraps (1900) corn bran, silage; (1916) corn shucks; (1922a) corn,
corn bran, corn silage; Hals and Heggenhougen (1917) corn meal, maizena;
Haywood and Warner (1908) corn products; Headden (1907) fodder; Hudson
and Harding (1918) xylose from corn cobs; Ishida and Tolloens (1911) corn;
LaForge and Hudson (1918) xylose from corn cobs; Lindsey (1902) corn cobs,
gluten feed; Ling and Nanji (1923) corn cobs; Oshima and Kondo (1918)
methylpentosans in parts of corn grain; Peterson, Fred, and Verhulst (1921a)
corn fodder and silage; Porst (1912) corn, corn products; Schmidt, Peterson
and Fred (1923) stover; Semmler and Pringsheim (1919) corn stalks, corn
kernels; Severson (1917) silage; Stone (1890) corn cobs, fodder, silage, bran;
(1891) corn stover, silage, bran, corn-and-cob meal, corn meal, corn cobs;
(1896) corn meal, corn bread; (1897a) corn, corn bread; Stone and Jones
(1893) fodder, gluten meal; Stone and Lotz (1891a), (1891b), (1891c) xylose
from corn cobs; Straughn (1907) sweet corn; Tangl and Weiser (1913) corn-
and-cob meal; VerHulst, Peterson, and Fred (1923) whole plant and its parts,
at different stages; Weiser, S. (1912b) hard and soft corn.

Phosphorus and phosphorus distribution

Anderson (1914) corn grain; Anderson and Kulp (1922a), (1922b) pollen;
Anonymous (1916) corn; Ballard (1906), (1908) phosphorus in corn; Bauer
(I. Analytical determinations other than proximate analyses)

(1921) plant and parts; Duley and Miller (1921) different parts of plant at different stages; Emmett and Grindley (1914) phosphorus in corn; Forbes (1909b) corn meal, germ oil meal, hominy; Forbes, Lehmann, Collison, and Whittier (1910) corn meal, distillers' grains; Green (1918b) whole corn and milling products; Hart, E. B., and Andrews (1903) corn, distillers' grain, germinated corn; Hart, E. B., and Tottenham (1909) corn grain; Hills (1893a) corn, silage, spoiled silage; Hills (1893b) several varieties; Jurits (1913) grain; McRae (1914) phosphorus in corn flour; Mumford, H. W., Grindley, Hall, and Emmett (1914) phosphorus in corn; Parrozzani (1907-08), (1908), (1909a), (1909b) corn grain; Rather (1917b), (1917c), (1917d) phytin in corn grain; Remy (1922) several varieties; Rogozinski (1915) corn fodder, kernel, seedlings; Ross, Keith, and Grindley (1915) shelled corn; Schaumann (1910), (1914) corn grain; Slosson (1897) breakfast foods; Voeglin, Lake, and Myers (1918) milling products; Vorbrodt (1910) corn seed; von Wrangell (1922) plant and kernels.

See also Ash constituents, p. 95, Lecithin, p. 97.

Pigment

Drummond and Coward (1920) oil; Gill (1918) carotin; Palmer (1915); Palmer and Eckles (1914a), (1914e); Palmer and Kempster (1919a), (1919e); Sando and Bartlett (1921), (1922) brown husks; Van den Bergh and Muller (1920); Woodman (1923) silage.

Proteins

Chittenden and Osborne (1891a), (1891b) corn grain; Donard and Labbé (1902), (1903) corn grain; Fleurent (1896) gliadin, glutenin; Gorham (1821); Lindet and Ammann (1907) corn flour; Osborne (1896), (1913) corn grain; Osborne and Mendel (1913a), (1914b) corn grain; Parrozzani (1907-08) corn grain; Showalter and Carr (1922a), (1922b) high-protein and low-protein corn, pop corn; Soave (1907) corn grain; Spitzer, Carr, and Epple (1919) normal corn, soft corn; Weiser, E. (1916) various mill products; Weiser, S. (1912b) hard and soft corn; Winterstein and Wünsche (1915) corn germ.

Starch

Appleman (1921), (1923) green sweet corn at various stages; Appleman and Eaton (1920-21) sweet corn at different stages; Hall and Hay (1920) three varieties; Hals and Heggenhougen (1917) corn meal, maizena; Harper (1920); Pommer (1921) "maize-cake"; Remy (1922) several varieties; Shaw, R. H., and Wright (1920-21) entire plant at different stages.

Sugar

Annett and Russell (1908) fodder, silage; Appleman (1921), (1923) green sweet corn at various stages; Appleman and Eaton (1920-21) sweet corn at different stages; Atwater (1869); Ballard (1895) corn; Blackshaw (1912) corn stalks; Clark (1913) corn stalks; Collier (1880) sap of corn stalks; (1881-82) plant at different stages; (1889) fodder; (1893) corn stalks; Danesi and Scurti (1910) corn cobs; Deacock (1914) corn stalks; Doby (1910) corn stalks; Fraps (1916) corn shucks; (1922a) corn, bran, corn silage; Frear and Sweetser (1892) corn fodder; Goessmann (1880) corn stalks; Griffiths (1894) silage; Hall and Hay (1920) three varieties; Harper (1920); Haywood and
(I. Analytical determinations other than proximate analyses)

Warner (1908) corn products; Headden (1907) fodder; Heckel (1912), (1913), (1914), (1915a), (1915b) corn stalks; Hudson and Harding (1918) xylose in corn cobs; Istrati and Oettinger (1899a), (1899b), (1899†) corn stalks; Jordan (1893b) corn plant; Jordan, Bartlett, and Merrill (1893) whole plant at different stages; Ladd (1889) several; (1890) fodder; LaForge and Hudson (1918) corn cobs; Lamb (1917) silage; Ling and Nanji (1923) corn cobs; Morse (1902) fodder; Neidig (1914b) silage; Severson (1917) silage; Shaw, E. H., and Norton (1920) fodder, silage; Short (1889) corn stalks; Shaw, E. H., and Norton (1918) corn cobs; Stone (1890) corn cobs, fodder, silage, bran; (1891) stover, silage, bran, corn-and-cob meal, cobs, meal (pentose); (1896) corn meal, corn bread; (1897a) corn, corn bread; Stone and Lots (1891a), (1891b), (1891c) xylose in corn cobs; Straughn (1907) sweet corn kernels, in different parts of kernel; Straughn and Church (1909) sweet-corn kernels; Vieillard (1920); de Vilmorin and Levallois (1913a), (1913b) corn stalks; Washburn and Tollens (1889a) maize, sweet corn; (1889b) same; Winterstein and Wünsche (1915) corn germ.

Sulfur and sulfur distribution

Balland (1908†) sulfur in corn; Fraps (1903) sulfates in corn grain and silage.

See also Ash constituents, p. 95.

Toxic substances

Alsberg and Black (1913) spoiled corn; Luxardo (1883†) sound corn.

See also Alkaloids, p. 95.

Ultimate analysis

Headden (1907) fodder; Hopkins (1898a) corn grain.

Vitamins

See Section B VI, p. 142.

II

Conditions Affecting the Composition of Corn

Breeding

East and Jones (1920) protein in grain; Harper (1920) starch, sugar; Hayes and Garber (1919) kernel; Heckel (1915a), (1915b) stalks; Hopkins (1899), (1902) kernel; Hopkins, Smith, and East (1903a) kernel; Hume, Champlin, and Loomis (1914) kernel; Illinois Station (1922a) protein and oil in grain; Ladd (1904) stalk; Showalter and Carr (1922a), (1922b) N distribution and proteins; Smith, L. II. (1908), (1912) kernel; Straughn (1907) sugar in sweet-corn kernels; Wiancko (1905) kernel; Willard, Clothier, and Weber (1902) kernel.

Detasseling

Decook (1914) sugar; Heckel (1912), (1913), (1914), (1915a), (1915b) sugar; de Vilmorin and Levallois (1913a) sugar.
(II. Conditions affecting the composition of corn)

Ensilage

Albert (1891); Annett and Russell (1908); Armsby and Caldwell (1890); Bechdel (1922); Cook and Hills (1891); Dox and Yoder (1920); Eckels, Oshel, and Magruder (1916); Evvard, Lamb, and Maynard (1923) soft corn; Flechsig (1884); Gaines (1922); Goessmann (1892a); Good, Horlacher, and Grimes (1921); Haigh (1918); Hayden and Perkins (1923); Henry and Woll (1888); Hills (1893a), (1894); Jordan, Bartlett, and Merrill (1889a), (1893); Ladd (1890); Lamb (1917); Meissl (1889); Morse (1902); Neidig (1914b); Perkins (1923) proximate analysis and acidity; Peterson, Fred, and Verhulst (1921a) pentosans; Ragsdale and Turner (1921); Richardson (1885); Russell (1908a), (1908b); Sanborn (1889a), (1889b); Schulze, B. (1884), (1887); Schulze, E. (1888); Shaw, R. H., and Norton (1920); Shaw, R. H., Wright, and Daysher (1921); Short (1889); Stellwaag (1890b); Tangl and Weiser (1911); Weiske and Schulte (1884); Withycombe (1901); Woll (1888b), (1890a), (1890b), (1890c), (1891b).

Fermentation

Davis (1923) corn; Fred and Peterson (1921) hydrolyzed corn cobs; Fred, Peterson, and Davenport (1919) silage bacteria acting on sugars; Northrop, Ashe, and Senior (1919) corn and cornstarch; Speakman (1920a), (1920b) corn meal and starch; Ver Hulst, Peterson, and Fred (1923) pentosans of stover; Völitz and Deutschland (1903) corn; Wesener and Teller (1916) commercial glucose and cornstarch.

See also Silo, Processes and Agents Working in, p. 107.

Fertilizer

Anonymous (1916); Armsby (1887a) grain, stover; (1887b) whole plant; Bauer (1921); Bauer and Haas (1922); Blair, A. W., and McLean (1916) grain, stover; Brünnich (1900) fodder; Duley and Miller (1921) different parts of plant; Freer (1887); Harris and Pittman (1917); Jenkins (1894), (1895), (1896) grain, stover; McGinnis (1918); McIlargue (1923) ash constituents; Parnasoani (1907-8), (1908), (1909a); Phelps (1901); Pilz (1911); Redfern (1922) CaCl, taken up by roots varies with concentration; Snyder, H. (1907); Tottingham (1924) grain; Whiston and Stoddart (1904); Whiston, Wells, and Vivian (1902); Wisconsin Station (1922b) Ca of stover; Woods (1889) grain, stover; von Wrangell (1922).

Form selected for silage

Evvard, Lamb, and Maynard (1923) soft corn; Griffiths (1894) immature corn and corn in bloom; Hayden and Perkins (1923); Hills (1894) whole plant, stover; (1901-02) mature and immature; Ladd (1890) mature and immature; Morse (1902); Neidig (1914b) mature and immature; Patten (1921) normal and stover silage; Pennsylvania Station (1917a) stover; Richardson (1885) put in at different ages; Sherman, J. M., and Bechdel (1918) stover; Wilson, J. W., and Thompson (1918) put in at different ages, also frosted corn silage; Withycombe (1901) immature corn; Woll (1890b) mature fodder, green fodder, several varieties.

Germination

Hart, E. B., and Andrews (1903).
(II. Conditions affecting the composition of corn)

Method of planting

Armsby (1891) thickness of planting; Armsby, Frear, Caldwell, and Holter (1889) thickness of planting; Bartlett (1896a) thickness of planting; Lipman (1912) with soybeans or peas; Morse (1902) thickness of planting; Pilz (1911) planting with legume; Roberts (1888b); Roberts and Clinton (1897); Snyder, H. (1907) planting after clover; Thaxter (1890) kernels, stover.

Milling processes

Bailey and Thom (1920); Dunnington (1912); Funk (1913); LeClerc and Wesling (1918) flour and bread from raw, parched, and steamed corn; McCrae (1914); Voeglin, Lake, and Myers (1918); Voeglin and Myers (1918a), (1918b); Weiser, E. (1916); Winton, Burnet, and Bernmann (1915).

Moisture of soil

Harris and Pittmann (1917); Redfern (1922) CaCl$_2$ taken up by roots varies with concentration; Widtsoe (1903); Widtsoe et al (1901); Widtsoe and Stewart (1912).

Pigment

See Variety, p. 103.

Removal of cob at milky stage

Blackshaw (1912) sugar; Clark (1913) sugar; Doby (1910) sugar; Istrati and Oettinger (1899b) sugar; Vieillard (1920); de Vilmorin and Levallois (1913b) sugar.

Removal of tops and leaves

Curtis, G. W. (1891) analyses of shelled corn and of fodder removed.

Section of the country, or the country, in which the corn is grown

Balland (1895); Dunnington (1912); Harrington and Adriance (1891); Ince (1916); Mitchell and Grindley (1913); Passerini (1919); Richardson (1884-85); Straughn and Church (1909) sugar in sweet corn; Tottingham (1924) grain; Weiser, S. (1912b); Wiley (1901).

Stage of growth of plant

Annett and Russell (1908) fodder; Appleman (1921), (1923) sweet corn; Appleman and Eaton (1920-21) sweet corn; Armsby, Frear, Caldwell, and Holter (1889); Blackshaw (1912) sugar; Bowers (1889-90) oil; Brünnich (1903) fodder; Collier (1881-82) sugar; (1889) carbohydrates; Duley and Miller (1921) different parts of plant; Failyer and Willard (1889); Farrington (1894); Frear (1887); Goessmann (1880); Hart, E. B., and Bentley (1915); Heckel (1912), (1915b) sugar; Hernberger and Raumer (1882) general analysis; Hume, Champlin, and Loomis (1914); Ince (1916); Istrati and Oettinger (1899a), (1899b) sugar; Jones, W. J., Jr., and Huston (1914); Jordan (1893b), (1895); Jordan, Bartlett, and Merrill (1893); Kennedy et al (1904); Ladd (1888), (1889), (1890); Leplay (1882a), (1882b); Morrow (1893); Morse (1903); Roberts and Clinton (1897); Pettibone and Kennedy (1916); Schweitzer (1889); Shaw, R. H., and Wright (1920-21) entire plant; Sievers (1920) amount
(II. Conditions affecting the composition of corn)

and quality of fat in by-products; Smith, P. H., and Lindsey (1911); Snyder, H. (1907); Spitzer, Carr, and Epple (1919) soft corn; Straughn (1907) sugar in sweet-corn kernels; VerHulst, Peterson, and Fred (1923) pentosans and methyl pentosans of plant and its parts; de Vilmarin and Levallois (1913) sugar; Washburn and Tollens (1899a) sweet corn; Waters and Wold (1894); Weiser, S., and Zaitschek (1920); Whitcher (1888); Withycombe (1901); Woll and Adams (1891).

Steaming before ensilage

Withycombe (1904); Wyant (1920).

Storage

Appleman and Arthur (1919) green sweet corn; Bailey and Thom (1920); Black and Alsberg (1910); Blackshaw (1914); Cotton (1920-21); Euvard, Lamb, and Maynard (1923) soft corn; Gaines (1922); Gosia (1909) corn; Jordan (1893) corn plant; Jordan, Bartlett, and Merrill (1893) rate of drying; Ladd (1885) corn meal heated in the bin; (1890) field- or barn-cured corn fodder; Leavitt and LeClerc (1909); McElroy and Bigelow (1893) canned corn; McElravye (1920); Rabak (1920) effect of mold on corn oil; Remington (1917) canned corn; Sanborn (1889a); Schmidt, Peterson, and Fred (1923); Sievers (1920) amount and quality of fat in by-products; Snyder, H. (1907); Stevens and Higgins (1919) green sweet corn; Straughn (1907) sugar in sweet-corn kernels, canned corn; Weiser, S. (1920) free fatty acid of embryos; Woll (1890b) spoiled silage; Wussow and Grindley (1911) toxic substances in moldy corn.

See also Studies of Spoilage, p. 108.

Variety

Anderson and Kulp (1922a), (1922b) pollen; Armsby (1891); Armsby, Frear, Caldwell, and Holter (1889); Atwater (1869); Black and Alsberg (1910); Blackshaw (1912) sugar; Borghesani (1909f), (1910); Collier (1881-82), (1893); Damianovich (1922) spectra of oil and of pigment; Danesi and Scurti (1910) corn cobs; Doby (1910) sugar; Flechsig (1886); Grimme (1920) several analyses; Goessmann (1892a); Guthrie (1912); Hall and Hay (1920); Harrington and Adriance (1891); Hayden and Perkins (1923); Heckel (1914), (1915a), (1915b) sugar; Henry and Woll (1888); Hills (1893b); Hopkins (1898a); Huerre (1909a), (1909b) maltase; Hurd (1923) acidity and sp. gr. of juice of young plants; Istrati and Oettinger (1899f) sugar; Jordan (1893b); Jordan, Bartlett, and Merrill (1889a), (1893); Juritz (1913); Morse (1902); Passerini (1919); Porter, E. D. (1889); Remington (1917) canned corn; Remy (1922) analyses of white, yellow, red, and violet corn; Schulze, E., and Frankfurt (1893) lecithin in white and yellow corn; Short (1889); Showalter and Carr (1922a), (1922b) N distribution and proteins of corn grain and of pop corn bred for proteins; Sievers (1920) amount and quality of fat in by-products; Smith, P. H., and Lindsey (1911); Soave (1907); Soule and Vanatter (1907); Stone and Jones (1893) pentosans in fodder; Straughn and Church (1909) sugar in sweet corn; Vipond (1912-13); Weatherwax (1922) Chinese waxy corn contains rare carbohydrate; Weiser, S. (1912b); Woll (1888b), (1890b) shocked fodder; (1899) corn germ; Woll and Adams (1891).
(II. Conditions affecting the composition of corn)

Weather and other conditions of growth

Annett and Russell (1908) fodder; Harrington and Adriance (1891); Holter (1889) wind-scored corn; Hurd (1923) acidity and sp. gr. of juice of young plants; Ince (1916); McGinnis (1918); Mitchell and Grindley (1913); Stevens and Higgins (1919) sugar in sweet corn; Straughn and Church (1909) sugar in sweet corn.

Weathering

Hartwell and Kellogg (1904) frosted leaves; Henry and Woll (1888); Ladd (1890); Ragsdale and Turner (1921); Short (1889); Snyder, H. (1907); Woll (1890b).

Other conditions

Carr and Ripley (1920) the change in popping.

III

Energy Values

Armsby (1905) corn meal; Armsby and Putney (1916) several compiled; deBaufre (1922) grain, cobs; Headden (1907) fodder and several fractions of the same; Richards, C. E. (1897) whole plant, stalks, kernels, and cobs of white and yellow corn; Smith, P. H., and Lindsey (1911) corn meal, corn cob; Snyder, H. (1906) ether extract of fodder and silage; Wiley and Bigelow (1898) corn oil; Withycombe and Bradley (1908) silage.

IV

Enzymic Digestion

Baglioni (1908), (1910f), (1911f), (1912) zein; Ladd (1885) digestion of several corn products by the contents of hog's stomach or by pepsin; Lang (1911f) digestion of cornstarch by pancreatic diastase; McGuigan (1919) digestion of starch by ptyalin; Palmer and Eckles (1914d), (1914g) pigments; Paulletig (1917) action of diastases on corn starch; Ramstedt (1913a), (1915) pepsin-HCl digestion of corn; Rinaldini (1911a) digestion of cornstarch by salivary, intestinal, and pancreatic juices; Sherman, H. C., and Walker (1920) action of diastases on cornstarch and influence of amino acids on same; Sherman, H. C., Walker, and Caldwell (1919) digestion of cornstarch with a number of enzymes; Stone (1896) action of malt diastase, saliva, pancreatic enzymes, and takadiastase on cornstarch; Volhard (1903) pepsin-HCl digestion of dried and undried maize, and distillery refuse; Welsmüller (1921) hydrolysis of starch by diastase of cow's milk; Wesener and Teller (1916) action of malt extract, takadiastase, and pancreatin on commercial glucose, cooked corn meal, corn flakes, cooked cornstarch; Woll (1895) digestion of proteins of gluten feeds and meal (1888a).

V

Special Studies of Corn Oil

Alpers (1918); Anderson and Moore (1923) phytosterols; Archbutt (1899); Backer (1915); Baughman and Jamieson (1921) composition; Bowers (1889-90);
(V. Special studies of corn oil)

Damianovich (1922) spectrum of oil from yellow and white corn and of pigment from yellow oil; Drummond and Coward (1920) pigments and vitamin A; Gill and Tufts (1903); Hart, F. (1893); Hopkins (1898a), (1898b); Hehner (1897); Klimont (1911), (1918); König (1871); Ladd (1888); Lloyd, J. V. (1888); McPherson and Ruth (1906); Morse (1892); de Negri and Fabris (1894); New York (Geneva) Station (1922-23a) phytosterols; Robak (1920); Reicbert and Treles (1921a), (1921b) hydrogenation; Rokitanski (1894); Shuttleworth (1885-86); Sievers (1920) chiefly composition and methods of extraction; (1922a) processes of extraction and purification, physical and chemical constants; (1922b) physical and chemical properties of corn oil, and processes of manufacture; Sievers and Shrader (1922) preparation of edible oil; Smetham (1893); Smith, J. C. (1892); Spuller (18901); Stellwaag (1890a); Vintilesco and Holmman (1922) alteration by exposure to light; Vulte and Gibson (1900), (1901); Wiley and Bigelow (1898) calorie value; Williams, R. (1910).

See also Composition of ether extract, p. 96.

VI

Special Studies of Corn Proteins

Amino acids in

Dakin (1923); Folin and Looney (1922) zein from yellow corn; Kossel and Kutscher (1900) zein; Kutscher (1903) zein; Langstein (1903) zein; Matsuyama and Mori (1923) zein; May, C. E., and Rose (1922) tryptophane in corn gluten and zein; Osborne and Clapp (1908) zein, alkali-soluble protein; Osborne and Harris (1903d) zein; Osborne and Jones (1910a), (1910b) zein; Osborne and Leavenworth (1913) zein; Osborne and Liddle (1910) zein; Osborne and Mendel (1913a); Van Slyke and Birchard (1913-14) zein; Winterstein and Wünsche (1915) corn germ.

Partial decomposition

Chittenden and Osborne (1891b); Dennstedt (1901); Dennstedt and Hessler (1906).

Properties

Bagioni (1908); Chittenden and Osborne (1891a), (1891b) the several proteins; Donard and Lábbe (1902), (1903); von Fényvessy (1911); Gorham (1821); Kjeldahl (1892); Lüder and Ammann (1907); Osborne (1896); Osborne and Mendel (1914b) each of the proteins; Szumowski (1902) zein.

Ultimate analysis

Chittenden and Osborne (1891a), (1891b) the several proteins; Donard and Lábbe (1902), (1903) "mazaine"; Osborne (1896) the several proteins; (1900) S in zein.

Other studies of corn proteins

Osborne (1910) general review; Osborne and Harris (1903a) nitrogenous groups in zein; (1903b) carbohydrate tests with zein; (1903c) specific rotation of zein; (1903d) Hopkins-Cole reaction of zein; Showalter and Carr (1922a), (1922b) specific proteins in high-protein and low-protein corn.

For animal studies with corn proteins, see Section B VI, p. 142.
VII
Special Studies of Corn Starch

Blake (1918) changes in starch when heated with acid; Chrzaszcz (1923) sugar formation by corn amylase; Dox and Baork (1917) gelatinizing temperature of starch; Fall (1923) photomicrographs; Francis and Smith (1916) microscopical and chemical examination of starch; Grimmie (1921) comparison with cassava starch; Hals and Heggenhougen (1917) polarimetric studies; Hanousek (1911?) microscopical examination of starch; Herschel and Bergquist (1921) consistency of pastes of corn starch and corn dextrins; Hersfeld and Klinger (1920); Lang (1911?) digestion of starch by pancreatic diastase; McGuigan (1919) digestion by ptyalin; Northrop, Ashe, and Senior (1919) fermentation; Parow (1922); Pauletig (1917) action of diastases on starch; Porst and Moskowitz (1922a), (1922b) plastometer examination of corn starches; Reilly, Hickinbottom, Henley, and Thayson (1920) fermentation; Rinaldini (1911a) digestion of starch by salivary, intestinal, and pancreatic juices; Sherman, H. C., and Walker (1920) hydrolysis by several enzymes; Sherman, H. C., Walker, and Caldwell (1919) digestion of starch by a number of enzymes; Speakman (1920a) fermentation; Stone (1896) digestion of starch by malt diastase, saliva, pancreatic enzymes, and takadiastase; Tanret (1914a), (1914b), (1915) composition and properties of starch; Taylor, T. C., and Nelson (1920) fat in hydrolyzed starch; Welzmüller (1921) hydrolysis by enzymes of cow’s milk; Wesener and Teller (1916) fermentation and acid hydrolysis of starch, action of malt extract, takadiastase, and pancreatin on starch.

VIII
Special Studies of Corn Sugars

Bryan (1911) analyses of commercial glucose and starch sugars; Bryan (1912) analysis of commercial glucose; Fred, Peterson, and Davenport (1919) bacterial fermentation of xylose; Gudeman (1913) ash constituents of commercial glucose; Muttelet (1916) arsenic determinations in commercial glucose; Porst and Mumford (1922) pure dextrose from corn sugar; Wesener and Teller (1916) fermentation and acid hydrolysis of commercial glucose, ash constituents of commercial glucose.

IX
Breakfast Foods Made from Corn

Armsby and Fries (1917) analysis of hominy; Forbes (1909a), (1909b) ash constituents of hominy; Forbes and Beegle (1916b) iodin in hominy; Forbes, Beegle, and Mensching (1913) ash constituents in hominy; McCrae (1914) corn meal and milk products (P in); Stoloss (1897) analysis of cerealine; Stone (1896) corn meal, corn bread; (1897a) same; (1897b) same; Voegtiln, Lake, and Myers (1918) corn mill products; Voegtiln and Myers (1918b) same; Wesener and Teller (1916) corn meal, corn flakes, corn starch; Youngburg (1916) analysis of several breakfast foods.

See also Corn meal, p. 134, Corn starch, p. 136, Milling processes, p. 102.

X
Special Studies of Pop Corn

Carr and Ripley (1920) study of popping quality; New York (Geneva) Station (1922b), (1922-23b) study of popping quality; Pollard and Carr (1923-24) N distribution; Showalter and Carr (1922a), (1922b) proteins and amino acids.
XI

Special Studies of Corn Cobs

Commercial products

Fred and Peterson (1921) acetic acid, lactic acid; Hudson and Harding (1918) xylose, glucose; LaForge (1920) adhesives and others; (1921), (1923) furfural; (1924) adhesives, furfural; LaForge and Hudson (1918) several; LaForge and Mains (1923a), (1923b) furfural; Ling and Nanji (1923) xylose; Monroe (1919) xylose; (1921) furfural; Peterson, Fred, and Verhulst (1921b) acetone, alcohol, volatile acids; Stone (1890) xylan and xylose; Stone and Lotz (1891a), (1891b), (1891c); Wisconsin Station (1920a), (1922a) lactic and acetic acids; (1923f) several.

Composition

Danesi and Scurti (1910); de Chalmot (1894a) pentosans; Evvard, Lamb, and Maynard (1923) soft corn; Honcamp, Nolte, and Blanch (1919); Ladd (1888); Lindsey (1902) pentosans; Peter, A. M., and Beatty (1901) ash constituents; Scurti and Morbelli (1919) (also $H_2SO_4$ hydrolysis); Smith, P. H., and Lindsey (1911); Stone (1891) pentosans; Terry (1917) K, P, Ver Hulst, Peterson, and Fred (1923) pentosans.

Calorific value

de Baufre (1922); Richards, C. R. (1897); Smith, P. H., and Lindsey (1911).

XII

Special Studies of Corn Pollen

Anderson (1923); Anderson and Kulp (1922a) (1922b); New York (Geneva) Station (1922a), (1922-23a) corn pollen.

XIII

Silo, Processes and Agents Working in

Babcock and Russell (1900), (1901); Bechdel (1916); Burrell (1889); Davis (1923) products of butyric fermentation of corn; Dox and Yoder (1920); Eckles, Oshel, and Magruder (1916); Esten and Mason (1912); Fred, Peterson, and Anderson (1921a) action of lactic acid bacteria; Fred, Peterson, and Anderson (1921b) action of the bacteria on sugar; Fred, Peterson, and Davenport (1919); Gorini (1914); Griffiths (1894); Heineman and Hixson (1921) bacteria concerned; Hunter, C. A. (1921) corn silage and corn plus soybean; Hunter, O. W. (1917); Hunter, O. W., and Bushnell (1916); Lamb (1917); Mayer (1884); Neidig (1914b); Northrop, Ashe, and Senior (1919) fermentation by Bacillus acetioethyllicum; Oregon Station (1919-20); Pennsylvania Station (1917a); Perkins (1923); Perroncito (1915); Peterson and Fred (1920); Peterson, Fred, and Verhulst (1921a); Reed and Barber (1917) moldy silage; Reilly, Hickinbottom, Henley, and Thayson (1920); Russell (1908a); Sherman, J. M., (1916a), (1916b); Sherman, J. M., and Bechdel (1917), (1918); Speckman (1920a), (1920b); Wisconsin Station (1920a), (1920b), (1923j); Woodman (1923) silage formation; Wyant (1920).
XIV

Studies of the Spoilage of Corn and Corn Products

Alsberg and Black (1913); Cotton (1920-21) insect pests; Fitzgerald, Bo- 
hart, and Kohman (1922) canned corn; Hills (1893a) spoiled silage; Kentucky 
Station (1919) moisture effect; McIlhargue (1920) corn, corn meal; Northrup 
(1919) canned corn; Rabak (1920) mold in corn oil; Reed and Barber (1917) 
moldy silage; Schmidt, Peterson, and Fred (1923) destruction of pentosans of 
stover; Thom and LeFevre (1921a), (1921b) moisture effect, flora; Weiser, S. 
(1920) fat of embryos; Woll (1890b) spoiled silage; Wussow and Grindley 
(1911) moldy corn meal.

See also Conditions Affecting Composition—Storage, p. 103.

XV

Comparisons of the Composition of White and Yellow Corn


XVI

Other Studies Not Involving Experiments Upon Animals

Appleman (1918) changes in respiration and catalase activity of sweet corn 
during storage. 
Balland (1918) corn meal lowers the gluten of wheat flour with which it is mixed. 
Burtt-Davy (1922) general compilation on food value and other uses, also condi-
tions affecting changes.

Chrsaszcz (1923) study of the action of amylase of corn. 
Damianovich (1922) study of the nature of corn vitamins.
Davis (1923) commercial products from corn.
Ellis (1924) growth of corn seedlings treated with insulin.
Gay and McIver (1922) alcoholic extracts of yellow corn pigments possess fluo-
rescent properties and aqueous extracts produce photodynamic hemolysis in 
vitro.

Hanausek (1911) structure of sweet-corn grain. 
Hopkins, Smith, and East (1903a) structure of corn kernel.
Lindstrom (1921) inheritance of pigments in corn seedlings.
McCandlish (1920) composition of refuse from corn cannery.
Michiels and Hennes (1921) chloroform and salt extraction of corn flour.
Mitchell and Grindley (1913) statistical studies of the variability in the composi-
tion of corn, its nutritive ratio, and energy value.
Némec and Duchor (1921) germinative power tested by enzymes.
Schuftan (1900?) corn germs effect changes in molasses with which they are 
mixed.
Taylor, F. D. (1903) analyses of corn silk.
Vintilesco and Haimann (1922) exposure of corn meal to direct or diffused light 
makes chemical changes in the fat.
Weiser, I. (1910) analyses of tassel, leaves, husks, combined corn and cob, three 
divisions of stalks.
B—EXPERIMENTS ON MEN AND ANIMALS

I

Feeding Tests Not Involving Chemical Considerations

Beef cattle

Allison (1913) corn silage vs. clover hay, with shelled corn and linseed oil meal; corn silage vs. shocked corn; corn silage supplements.

——— (1917a) broken vs. shelled corn vs. crushed corn and cob vs. corn-and-cob meal vs. ground corn.

——— (1917b) corn silage with or without shelled corn, with alfalfa hay and cottonseed meal or linseed meal.

Archibald et al (1914) corn silage vs. dry corn fodder, with meal and straw; silage added to oat straw, mixed hay and oat-and-barley meal.

——— ——— (1915) corn silage vs. corn fodder, with grain and straw; corn fodder added to alfalfa, with barley.

——— (1916a) silage vs. turnips, with wheat bran, cottonseed meal, ground oats, corn meal, and hay.

Armsby (1890) corn silage vs. corn fodder.

Barnett and Goodell (1923a) corn vs. cottonseed meal, or with cottonseed meal, with corn silage.

——— ——— (1923b) corn vs. molasses, with cottonseed meal and corn silage.

——— and Greene (1922) corn silage vs. sorghum or sunflower silage, with cottonseed meal and hay.

Blair, W. S. (1917), (1918) corn silage vs. turnips, with hay and grains.

Bittis and Lee (1915) corn silage vs. prairie hay, with ground corn and cottonseed cake; heavy vs. light feed of corn silage with ground corn and alfalfa hay.

Bohstedt (1922a) corn silage vs. corn stover, with shelled corn, oil meal, and hay; limited corn with corn silage, oil meal, and hay.

——— (1922b) stover silage vs. dry stover vs. corn silage, with oats straw and cottonseed meal, ground corn being added with stover or stover silage.

——— (1923a) heavy vs. light corn with corn silage, oil meal, and hay.

——— (1923b) corn silage plus alfalfa hay alone or with oil meal or with corn.

Brown (1920) normal silage vs. stover silage.

——— (1921b) stover silage vs. normal corn silage vs. stover silage + whole corn.

Bruce (1915) dried distillers' grains vs. various others.

Burnett (1902) corn meal vs. others.

——— and Smith (1902a) corn vs. wheat.

——— (1904) comparison of various supplements for corn; corn vs. corn + oil meal.

Burtis (1900) corn meal vs. kafr corn.

Call (1918b) shelled corn vs. ground corn, with limseed meal, alfalfa hay, and corn-and-kafr silage; shelled corn, linseed meal, and alfalfa hay vs. same + immature corn-and-kafr silage; shelled corn and alfalfa hay vs. same + linseed meal.

Christensen (1922) corn silage vs. other silages, with oat straw, cottonseed meal, and corn meal.

Cochel (1912b) corn silage vs. car corn.

1 Not including those in which coefficients of digestibility or the balance between intake and output were determined. For experiments of these kinds see pages 132 to 137 and 138 to 139.
(I. Tests not involving chemical considerations, Beef cattle)

——— (1917) corn silage vs. kafr corn silage or sweet sorghum silage; ground corn vs. ground kafr corn and hominy feed for calves.
——— and Doty (1910) heavy vs. light rations of corn silage.
——— and Severson (1911) corn silage vs. ear corn and corn stover.
Cooke (1896) corn fodder vs. corn silage vs. others.
Craig and Marshall (1904) corn-and-cob meal + alfalfa vs. cottonseed meal and hulls; corn alone vs. shelled corn, ear corn, and cottonseed meal as supplements to pasture.

Cunningham and Kenney (1917) corn vs. kafr corn, with sorghum silage and alfalfa hay.

Curtis, R. S. (1912) corn silage vs. corn silage + corn stover vs. cottonseed hulls.
——— Shook, and Meacham (1914) corn silage vs. cottonseed hulls.
Day (1901) corn silage vs. roots; corn vs. peas.
——— (1902) corn silage vs. roots.

Dugger and Ward (1908) shredded corn stover vs. cottonseed hulls or sorghum hay; corn vs. cottonseed or cottonseed meal.

Emery (1893) corn silage vs. soybean silage.
Fain and Jarnigan (1907) corn meal vs. shelled corn.

Foster and Merrill (1898) corn fodder vs. alfalfa or timothy, or corn fodder + alfalfa or roots.

Frear (1886) corn fodder + corn meal, corn fodder + corn meal + cottonseed meal.

Gayle and Lloyd (1917) corn silage or corn stover silage vs. other silages, with cottonseed meal or cottonseed meal + corn-and-cob meal.

Georgesen, Burtis, and Otis (1894) dry vs. soaked corn.
——— (1896) corn meal + cut corn stover or ear corn + corn stover vs. mixed balanced ration.
——— (1897) corn meal vs. red or white kafr corn meal.

Goessmann (1891b) gluten meal vs. corn-and-cob meal.

Good (1914) corn silage added to broken ear corn, cottonseed meal and hulls, and clover hay.
——— (1916) corn silage added to cottonseed meal, clover hay, and oat straw.
——— (1917b) winter feeding of corn silage.
——— and Horlacher (1921) broken ear corn vs. shelled corn, with cottonseed meal and silage.
——— and Grimes (1921) corn silage vs. sorghum silage, with corn, cottonseed meal, and straw or corn stover.

Gramlich (1919) ground vs. shelled vs. snapped corn vs. corn silage, with cottonseed meal and alfalfa hay.

Gray (1916) corn silage vs. corn silage + cottonseed meal in varying amounts, with corn stover; ear corn vs. corn stover, with mixture of corn stover, hay, and straw.
——— and Ward (1911a) corn-and-cob meal added to cottonseed meal, with alfalfa hay and cottonseed hulls.
——— (1911b) corn silage vs. Johnson grass hay, with cottonseed meal and cottonseed hulls.

Gulley and Carson (1890) silage vs. dry fodder; supplements for silage.
Hacketdorn (1922) corn silage vs. sunflower silage, with cottonseed meal and alfalfa hay.

Haney and Elling (1904) corn vs. barley and wheat.
(I. Tests not involving chemical considerations, Beef cattle)

and Holder (1906) corn-and-cob meal vs. kafr corn, wheat, or mixed grains.

Hart, E. B., McCollum, Steenbock, and Humphrey (1917) grain and roughage both from corn plant, or both from wheat plant, or corn grain and wheat straw, or wheat grain and corn stover, or corn grain and a roughage from alfalfa hay and wheat straw for heifers.

Hendrick (1905) gluten feed vs. gluten feed + feeding cake + oats and vs. cake and oats; gluten feed vs. crushed oats, cottonseed cake, or oil cake.

Henry (1887c) whole corn vs. corn meal, with bran.

(1888b) value of silage.

(1888c) whole corn vs. corn meal, with bran.

(1893b) hay and silage for calves; silage alone for steers.

Hickman, C. W., and Einhart (1922a) corn silage vs. barley or corn silage + barley, with alfalfa hay.

Hunt, R. E. (1917) corn meal and corn stover vs. corn silage in different amounts + cottonseed meal vs. corn silage alone; corn meal + corn silage vs. cottonseed meal + corn silage in different amounts vs. corn silage alone; corn silage in different amounts vs. corn silage + mixed hay, wheat straw, or corn stover.

Idaho Station (1923a) corn silage or same + barley, with alfalfa hay.

Iowa Station (1923a) corn fodder or corn silage vs. other roughages.

Jones, J. M. (1921b) corn vs. grain sorghums, baby beeves.

(1921c) ground corn ears and shucks vs. ground heads of grain sorghums, with cottonseed meal, alfalfa hay, and sorghum hay.

Brewer, and Dickson (1922) corn vs. grain sorghums.

Jordan, Bartlett, and Merrill (1889b) corn silage vs. hay.

Kellner and Köhler (1900) starch meal vs. gluten meal vs. earth-nut meal vs. extracted straw vs. molasses vs. hay vs. oat straw vs. wheat straw for fattening in excess of maintenance requirement.

Kennedy (1907-8) gluten feed vs. alfamo.

et al (1904) soft corn vs. mature corn.

and Marshall (1902c) corn (snapped corn, shelled corn, corn-and-cob meal, or corn meal) + various supplements.

Kent (1894) corn meal vs. no grain.

Kentucky Station (1914-15) corn silage added to broken ear corn, cottonseed meal, cottonseed hulls, and clover hay.

(1919a) corn silage vs. sorghum silage, with corn, cottonseed meal, and straw.

(1921) shelled corn vs. broken ear corn.

Ladd (1889) corn meal vs. "nitrogenous foods."

Lloyd, E. R. (1889) corn vs. cottonseed.

(1905) corn silage vs. cottonseed hulls.

(1914) corn silage vs. cottonseed hulls.

McCampbell and Winchester (1921a) shelled corn vs. molasses, with linseed meal, alfalfa hay, and cane silage.

(1921) corn silage vs. alfalfa hay; silage made from corn at different stages; corn silage vs. shelled corn.

Mairs (1906) corn-and-cob meal vs. broken ear corn.

Martin and Leiper (1907) corn stover vs. corn silage.

(1918) corn vs. barley, with alfalfa + barley; corn silage vs. sugar-beet pulp, with cottonseed cake and alfalfa.

May (1903) ear corn vs. corn-and-cob meal vs. corn-and-cob meal + supplements.
(I. Tests not involving chemical considerations, *Beef* cattle)

**Minnesota Station** (1917) dry shock corn vs. corn silage as supplement to millet and timothy hay and ground oats and barley.

**Monnot** (1889) maize residues from the manufacture of glucose beer, or starch. Mumford, F. B. (1911) corn alone vs. corn + supplements with blue-grass pasture. Mumford, H. W. (1902) silage vs. shocked corn for calves.

- (1903) comparison of supplements for corn.
- (1905) corn on the ear vs. in the shock vs. shelled vs. corn meal vs. corn-and-cob meal; nitrogenous supplements for corn.
- (1906) silage vs. shock corn vs. corn stover for beef-breeding cows.
- Grindley, Emmett, and Bull (1917) ground corn + clover hay in different proportions or + clover hay and linseed oil meal.

**Nebraska Station** (1916) corn + alfalfa hay vs. same with silage or other supplements.

- (1922a) corn silage vs. linseed meal or + linseed meal or + molasses meal.

**North Dakota Station** (1922a) corn silage or corn and sunflower silage mixed, with hay and grain.

Notse (1891) silage vs. hay; whole corn vs. corn meal. Nourse (1899) whole corn vs. corn-and-cob meal.

- (1901) stover vs. hay, or hay + silage; whole corn vs. corn meal.

Otis (1904) shelled corn vs. corn chop for calves.

Patrick and Smith (1889) fodder vs. silage vs. timothy hay vs. sorghum silage; corn-and-cob meal vs. whole corn or bran.

**Pennsylvania Station** (1917a) silage vs. silage + stover; broken ear corn vs. corn-and-cob meal, or shelled corn vs. corn meal.

- (1922a) corn silage; corn silage vs. oat straw; supplements to corn silage for beef cows; corn grain with corn silage for steers.
- (1923a) corn stover vs. oat straw or mixed hay, with corn silage and cottonseed meal, for breeding cows; corn stover + corn silage vs. mixed hay, with shelled corn and cottonseed meal, with or without molasses substituted for part of the corn, for steers.

Peters, W., H., and Carnes (1922) shelled corn vs. ground barley, with clover hay and with or without linseed meal and corn silage; shelled corn vs. ground barley, with linseed meal, ground oats, and alfalfa hay; addition of corn silage to hay and mixed grain ration.

Pew, Evvard, and Dunn (1918) shelled corn in different amounts; shelled corn vs. silage.

Plumb (1892) silage vs. clover hay.

Quereau (1908) corn vs. soybeans or cowpeas.

Quesenberry (1922) corn silage vs. other silages, with cottonseed meal and molasses.

Robertson (1891a) silage vs. hay and turnips.

Rogers (1922) corn added to cottonseed meal, corn silage, and clover hay.

Sanborn (1891) silage vs. fodder.

- (1892a) silage vs. fodder.

- (1893) silage vs. fodder.

Scurti and Vezeani (1922) press cake made from treated corn cobs.

Severson (1917) corn silage as sole roughage for breeding cows, bulls, and heifers.

Shaw, R. S., and Norton (1907) corn meal vs. dried beet pulp.

Shaw, T., et al (1892) silage vs. silage and hay or roots and hay.

- and Zavitz (1891) silage vs. roots.

Sheets (1916) supplements to silage.

Simpson (1910) corn meal vs. corn stover with alfalfa vs. alfalfa alone.
(I. Tests not involving chemical considerations, Beef cattle)

*Skinner and Cochel* (1906) corn vs. oil meal, with shredded stover and oat straw vs. ear corn + clover hay.

--- (1909a) clover hay, cottonseed meal, or corn silage as supplement for shelled corn.

--- *and King* (1912c) silage vs. clover hay, with shelled corn and cottonseed meal.

--- (1913a) silage vs. clover hay, with shelled corn and cottonseed meal.

--- (1914a) silage + leguminous hay vs. leguminous hay; silage + oat straw vs. silage + leguminous hay.

--- (1915) silage added to corn, cottonseed meal, and clover or alfalfa hay.

--- (1916a) silage + leguminous hay vs. leguminous hay; limited feed of corn vs. full feed of corn.

--- (1917b) silage added to shelled corn, cottonseed meal, and clover or alfalfa hay.

--- (1920a) corn silage.

--- (1920b) different amounts of corn; corn silage vs. corn-and-soybean silage; cottonseed meal added to above.

--- (1921) limited vs. full feed of corn, with corn silage, clover hay, and cottonseed meal; corn silage vs. corn-and-soybean silage.

--- (1922) limited vs. full feed of corn, with cottonseed meal, corn silage, and clover hay.

--- *and Rusk* (1911) corn silage vs. clover hay.

--- *and Starr* (1912b) corn in different amounts with cottonseed meal, corn silage, and clover hay; corn silage vs. corn-and-soybean silage, with shelled corn and clover hay.

--- *and Vestal* (1919b) corn silage vs. corn-and-soybean silage; cottonseed meal fed with silage.

*Smith, A.* (1912) stover vs. silage vs. cottonseed hulls.

*Smith, H. E.*, (1905) various corn supplements.

--- (1906) corn supplements.

--- (1907) supplements with corn stover, shelled corn, and snappled corn.

--- (1912) silage vs. stover for steers and calves.

*Snyder, W. P.* (1914) silage vs. prairie hay, with alfalfa and corn; corn silage added to prairie hay, corn, and cottonseed cake, for calves.

*Soule and Fain* (1905b) silage or corn stover vs. timothy hay; linseed meal vs. cottonseed meal as supplement to corn-and-cob meal for steers.

--- (1907) comparison of ear corn, split corn, coarse and fine corn-and-cob meal, fed with cottonseed meal, 1:1; shelled corn or corn meal with cottonseed meal, 2:3; silage vs. stover or with stover with low grain ration.

--- *and Jarnagin* (1907b) comparison of ear corn, corn-and-cob meal, shelled corn, and corn meal as supplement to cottonseed meal, corn silage, hay, and stover.

*Starkey and Salmon* (1922) shelled corn vs. rice meal or velvet beans.

*Stockbridge* (1901) corn meal vs. shelled corn.

*Thorne and Hickman* (1895) corn meal vs. wheat meal; gluten meal vs. linseed meal; silage as part of ration; silage vs. stover.

*Tomhaye* (1917) value of silage.

--- *and Gerlaugh* (1916) place of corn silage in fattening ration; corn vs. molasses, with cottonseed meal, corn silage, and mixed hay.

--- *and Hickman* (1914) silage vs. silage + mixed hay; silage vs. silage + alfalfa hay; ear corn vs. corn-and-cob meal; corn ration with corn stover vs. corn silage ration.
(I. Tests not involving chemical considerations, Beef cattle)

and Severson (1913a) silage vs. silage + mixed hay as roughage.

(1913b) silage as sole roughage, with cottonseed meal. Calves.

(1913c) silage with cottonseed meal and ear corn or shelled corn vs. same + mixed hay.

and Gerlaugh (1917) silage vs. silage + mixed hay; value of silage.

Tormey (1916) addition of silage to rations of concentrates and clover hay or alfalfa.

Union of South Africa Department of Agriculture (1916) corn meal added to grass for fattening 6-year-old cattle.

University of Leeds (1905) gluten feed vs. undecorticated cotton cake and barley meal.

Ward, Gray, and Lloyd (1919) silage vs. silage + cottonseed hulls, with cottonseed meal; stover + sorghum silage vs. sorghum silage vs. oat straw + sorghum silage, with cottonseed meal.

Jordan, and Lloyd (1919) corn-and-cob meal + cottonseed meal vs. cottonseed meal vs. cold-pressed cottonseed cake; broken ear corn vs. shelled corn, with cottonseed meal vs. cottonseed meal alone.

Waters (1901a) corn fodder and clover hay vs. other fodders.

(1901b) fodder, whole corn, shredded corn, ensiled corn.

(1907) whole corn stover, shredded corn stover, siloed corn stover vs. timothy hay; shelled corn vs. coarse fodders without grain.

Patterson, and Hess (1895) corn-and-cob meal vs. wheat.

Wilson, J., and Curtiss (1903) corn meal vs. linseed meal.

Wilson, J. F., and Kuhlman (1920) silage from several varieties of corn; silage from mature and immature corn vs. millet silage, with oil meal.

(1922) corn silage vs. sunflower silage or with sunflower silage; silage made from smutted corn.

Wilson, J. W. (1912b) silage vs. roots.

(1914a) corn vs. oats vs. corn silage, with corn silage and cottonseed meal or corn silage.

(1915) corn silage vs. sorghum silage; others with silage.

and Skinner (1906) corn vs. spelt, oats, millet for calves.

and Thompson (1918) comparison of silages made from corn cut at different stages of maturity.

Winter (1902-03) corn meal vs. wheat meal.

Wisconsin Station (1920f) effect of adding shelled corn to ration of cottonseed meal, corn silage, and mixed hay.

(1920j) corn vs. barley, with corn silage, hay, and cottonseed meal.

(1923i) corn silage vs. sunflower silage, with broken ear corn, cottonseed meal, and mixed hay.

Wolverton (1906) fodder vs. oat sheaves.

Zavitz (1890) silage vs. turnips.

Dairy cattle

Anthony and Henderson (1920) corn silage vs. sunflower silage.

Archibald (1916) gluten feed vs. corn vs. linseed oil meal, cottonseed meal, peanut oil meal, or fish meal.

et al (1915) silage vs. molasses, with mixed meal and hay; corn silage vs. pea-and-oats silage, peas and oats green feed, timothy hay + turnips and straw or prairie hay, each with mixed grains; corn silage vs. clover silage, with hay, mangels, and mixed grain.
(I. Tests not involving chemical considerations, Dairy cattle)

(1916b) corn silage vs. soiling crop of peas and oats as supplements to grain mixtures.

Armsby (1884) corn meal vs. same + cottonseed meal or malt sprouts, with clover hay.

(1885) corn meal vs. oil meal.

(1887c) corn meal vs. wheat bran, with hay and corn meal.

(1890) silage vs. fodder; silage vs. roots.

Frear, and Caldwell (1890) fodder, silage.

and Risser (1905) distillers’ dried grains vs. cottonseed meal.

Bartlett (1895) corn meal vs. wheat meal, with timothy hay and cottonseed meal.

(1896b) gluten meal vs. cottonseed meal, with corn meal, bran, timothy hay, and silage.

Beach (1906) corn meal vs. hay for maintenance.

Bechdel (1922) corn silage vs. sunflower silage, with grains and hay; corn silage vs. sunflower-and-corn silage.

(1923) corn silage vs. corn-and-soybean silage or oat-and-pea silage, with hay and grain.

Bedford (1895) fodder corn and straw vs. native hay.

Billings (1904) hominy meal vs. dried molasses beet pulp.

(1905) silage vs. dried beet pulp; hominy meal vs. dried molasses beet pulp.

(1907a) distillers’ grains vs. gluten feed; summer silage vs. soiling.

(1907b) effect of large amounts of corn distillers’ grains; silage as substitute for forage crops or pasture.

Bondurant and Cory (1893) silage vs. green rye fodder, with grains and coarse fodder.

Brooks (1892) silage vs. beets.

California Station (1922) corn silage vs. sunflower silage, with mixed grains.

Cooke (1893) comparison of cream gluten meal, corn-germ meal, corn bran and gluten feed, and equal parts bran and corn meal.

(1892b) cream gluten meal, corn-germ feed, or Buffalo gluten meal.

(1892c) silage vs. fodder.

and Hills (1891) silage vs. fodder.

(1892) corn ensiled or field cured with or without the ears.

Day (1897) sweet corn vs. dent corn.

Dean (1897) different amounts of silage.

Dorman (1916) silage vs. hays.

Eckles (1918) silage + alfalfa or corn + alfalfa vs. alfalfa alone; corn + other roughages for heifers.

and Palmer (1916) corn stover + timothy hay vs. timothy hay; silage + alfalfa hay vs. alfalfa hay, with grain or grain and cottonseed oil.

Emery (1890) silage vs. mangels.

Evilla (1910) corn vs. barley for heifers.

Flint (1909a) corn meal vs. green sorghum with cottonseed meal, distillers’ grains, and oat straw.

Foster and Meeks (1920) corn silage vs. alfalfa hay, with grain; corn silage vs. beet pulp.

Frandsen, Hendrickson, White, North, and Woodward (1921) corn silage + alfalfa hay vs. various crops fed as cut, with grains.

Friis et al (1899) corn vs. barley or oats, or the three together.

Georgia Station (1922a) corn silage vs. sunflower silage.

Gerloch (1898-99) maize-germ molasses vs. molasses + wheat husks or rye bran and palm-kernel cake.
(I. Tests not involving chemical considerations, Dairy cattle)

Goessmann (1889a) fodder, stover, or silage vs. root crops.
——— (1889b) corn vs. corn stover vs. silage vs. carrots or sugar beets, with hay.
——— (1891a) gluten meal vs. old process linseed meal or same + cottonseed meal.
——— (1891d) cottonseed meal vs. old process linseed meal, or gluten meal, fed with 1:1 mixture of corn meal and wheat bran, and with rowen hay, corn stover, or a silage of mixed green corn fodder and green soybeans.
——— (1892a) dent corn vs. sweet corn, as silage or stover; corn meal vs. maize feed.

Goldschmidt (1902) gluten meal or gluten feed vs. ordinary concentrated feeds.

Gray (1916b) silage vs. cottonseed hulls and stover.

Haecker (1903) silage vs. sugar beets.

Hayden (1916) silage vs. beets and mangels.
——— (1923) two varieties compared in silage, fed with legume hay and mixed grain.
——— and Perkins (1923) two varieties compared in silage, fed with legume hay and mixed grain.

Hays, W. M. (1894) silage from different varieties of corn.

Hayward and Weld (1897) cerealine vs. buckwheat middlings or dried brewers' grains, with corn meal, linseed meal, and mixed hay.

Hendrick (1905) gluten feed.

Hengefeld (1880) maize cake vs. linseed cake, with ordinary fodder.

Henry (1884) corn stalks vs. mixed hay or clover.
——— (1885a) cut vs. uncut corn stalks, with bran, corn meal, and shorts, or bran only.
——— (1886a) cut vs. uncut corn stalks.
——— (1887a) silage vs. dry fodder, with bran and corn meal.
——— (1887b) cut vs. uncut fodder.
——— (1888a) silage vs. fodder.
——— (1893b) silage fed alone for heifers.
——— (1893c) corn stalks vs. mixed hay and clover hay; cut vs. uncut corn stalks; silage vs. dry fodder; corn meal vs. oil meal; corn meal vs. bran; silage from corn with ears vs. silage from corn without ears and the ears fed dry.

Hickman, J. F. (1889) silage replacing part of hay for heifers.

Hills (1889) comparison of hay, corn fodder, corn silage (frosted and unfrosted), corn stover, the butts and tops of corn stover, apple-pomace silage, Hungarian-grass silage, pea-and-oat hay, and pasture.
——— (1890) silage vs. fodder vs. hay.
——— (1891) corn silage vs. clover silage.
——— (1893a) corn silage vs. silage made from rye, corn and soybeans, oats and vetch, or oats and peas.
——— (1894) whole corn silage vs. stover silage and meal, vs. corn fodder, vs. corn stover and meal.
——— (1895a) King gluten corn meal or Chicago maize feed vs. bran and corn meal, with hay and silage.
——— (1895b) silage vs. beets or carrots; corn oil cake vs. corn meal and bran; Atlas gluten meal vs. corn meal and bran; cottonseed feed vs. corn meal and bran.
——— (1896-97b) Atlas gluten meal vs. corn meal and bran; vs. cottonseed and linseed meals.
——— (1896-97c) corn silage vs. silage from cowpea vines and soybeans; corn silage vs. potatoes.
(1. Tests not involving chemical considerations, Dairy cattle)

- (1896-97d) corn and bran vs. Atlas gluten meal vs. cottonseed and linseed meals.
- (1901-02) comparison of two gluten meals, one high and other lower in protein; corn silage vs. apple-pomace silage.
- (1905) hominy feed vs. wheat bran, cottonseed meal, or linseed meal.

Hulce, Morrison, and Humphrey (1921) yellow corn vs. white corn with whey, wheat middlings, linseed meal, and legume hay for dairy calves.

Hunt, E. E. (1921) stover silage + molasses vs. corn silage, with different concentrates.

Hunt, T. F. (1890) silage vs. field-cured fodder for heifers.

- (1891) corn meal vs. wheat bran.
- and Caldwell (1892) fodder cut at different stages.

Hunsicker and Caldwell (1917) gluten feed vs. cottonseed meal or linseed meal as protein concentrate with ground corn, corn silage, and leguminous hay.

Idaho Station (1923b) corn silage vs. sunflower silage, with hay and grain, for cows; corn silage added to alfalfa for dairy calves.

Iowa Station (1921) ear corn vs. shelled corn vs. cracked corn vs. corn-and-cob meal vs. corn meal, with mixed basal ration.

Johnson (1889) silage vs. stalks and ground corn and cob.

Jones, R. C. (1922) corn silage vs. sunflower silage or oat-and-vetch silage.

Jordan (1893c) silage from two varieties of corn, with barley, hay, and grains.

- Bartlett, and Merrill (1889b) silage vs. hay.

Ladd (1888) corn meal added to hay or hay and linseed meal or wheat bran, for cows; fodder vs. silage, with hay and linseed meal, for heifers.

- (1889) corn meal vs. gluten meal vs. linseed meal and wheat bran; corn meal vs. other mixed foods.

Lindsey (1904) distillers' grains vs. gluten feed; gluten feed vs. malt sprouts.

- (1907) effects of corn gluten, corn oil, corn meal.
- et al (1895a) Chicago gluten meal vs. King gluten meal.
- (1895b) Chicago gluten meal vs. Atlas meal.
- (1904) gluten meal vs. gluten meal + corn oil; same vs. corn meal.

- and Beals (1918) corn bran vs. wheat bran, with mixed hay, corn gluten feed, ground oats, and cottonseed meal.

Linfield (1900) fodder in place of part of alfalfa, with grain in different amounts.

Lloyd, E. R. (1890) corn meal vs. cottonseed or cottonseed meal with hay.

- (1891) corn meal vs. cottonseed.

Lyon and Hoecker (1899) corn vs. others as forage.

McCandlish (1921) corn silage vs. soiling crops, with pasture and grains.

- and Weaver (1921) corn meal vs. ear corn vs. corn-and-cob meal, with corn silage, clover hay, and mixed grains.

- (1922) gluten feed vs. coconut meal or linseed meal, with corn silage, alfalfa hay, and grains.

- (1923) corn fodder vs. corn silage; corn silage + alfalfa hay vs. corn fodder + timothy hay, with grains.

Mairs (1909) field corn as soiling crop.

- and Putney (1907) field corn as soiling crop.

Michels (1908) stover vs. cottonseed hulls with grain; corn meal vs. mixture of corn meal and dried brewers' grains, 1:1, with cottonseed meal.

Michigan Station (1920) corn silage vs. sunflower silage.

Morrison, Humphrey, and Hulce (1920) corn-stover silage vs. corn silage, with grains and alfalfa hay.

- (1921) corn-stover silage vs. corn silage.
(I. Tests not involving chemical considerations, Dairy cattle)

Morse (1892) corn meal vs. gluten meal vs. cottonseed meal, or with these or wheat gluten; corn oil vs. other oils.

New York (Geneva) Station (1894) silage vs. alfalfa fodder or oat-and-pea fodder.

North Dakota Station (1922c) corn silage or corn and sunflower silage vs. sunflower silage.

Ontario Department of Agriculture (1923) corn silage vs. sweet-clover silage, with mangels, hay, and grain.

Oregon Station (1919-20) corn silage vs. oat-and-vetch silage or sunflower silage.

Patterson, H. J. (1896a) relative waste in feeding dry shredded corn fodder and grain separately and wet shredded corn fodder and grain mixed.

— (1902) corn vs. corn, wheat bran, and gluten meal; value of "new corn product."

Pennsylvania Station (1917b) silage vs. silage + hay.

— (1922b) gluten feed vs. buckwheat middlings; corn silage vs. pea-and-oat silage, with grain; corn silage or silage from soybean forage + green corn forage vs. soybean silage; corn silage or silage from sunflower forage + corn forage vs. sunflower silage.

— (1922d), (1923) silage from corn at different stages.

Porter, E. (1908f) gluten meal vs. bone meal or undecorticated cotton cake.

Porter, E. D. (1889) silage from southern corn vs. silage from flint corn.

Price, J. N. (1908) corn stover vs. soybean straw, with corn silage; corn-and-cob meal.

Quayle (1922) corn silage vs. sunflower silage, with alfalfa hay and mixed grains.

Quick (1892) corn meal vs. linseed meal or wheat bran.

Ramm (1897) corn meal vs. others as grain.

— (1899) gluten meal vs. peanut cake.

— and Mintrop (1898) corn bran vs. malt sprouts, linseed cake, or others (with hay, cut straw, and sugar beets); corn bran added to linseed cake or blood-molasses (with same basal ration).

Ritland (1902) gluten feed vs. rye bran or cottonseed meal.

Robertson (1891b) silage vs. hay and roots.

Sanborn (1889b) field-corn or sweet-corn silage vs. same as fodder, with hay, bran, cottonseed meal, and straw.

Schneider (1893) green corn vs. clover, with meadow grass.

Schulze B. (1898) effect of the use of maize cake in different proportions.

— (1899) maize germ + molasses + mangels or wheat bran.

Scott (1917a) corn silage vs. sweet-potato silage, with cottonseed meal and bran.

Short (1889) silage vs. fodder.

Slate, Brown, White, and Chapman (1923) early-, medium-, and late-maturing silage corn.

Smith, C. D. (1897f) gluten meal.

Smith, H. R. (1905) corn + different supplements.

Soule and Fain (1905a) gluten vs. cottonseed meal, with silage, corn-and-cob meal and hay or stover.

— (1905b) silage or stover vs. timothy hay; linseed meal vs. cottonseed meal as supplements to corn-and-cob meal for heifers.

Sturtevant (1884) silage vs. fodder vs. soybean fodder, a mixed hay, or hay + potatoes, each with corn meal and wheat bran.

— (1885) waste from starch or glucose factories (i.e., "wet feed," "dry feed," "starch meal," "glucose meal," or "sugar meal") fed with hay or hay and acetic acid; also hay alone or hay + corn meal.

Taylor, F. W. (1907-08b) stover vs. hay.
(I. Tests not involving chemical considerations, Dairy cattle)

Thiel (1908) corn or maizena vs. other grains.
Thomann (1920) corn-germ meal vs. hay, with hay and rowen.
Thorne and Hickman (1889) silage vs. beets.
———— (1890) silage vs. sugar beets.
———— and Falkenbach (1893) silage vs. wheat; meal vs. wheat bran.
Voorhees and Lane (1897) silage vs. dry fodder.
Walton and Bidwell (1923) corn silage vs. dried apple pomace or apple pectin pulp, with grain and hay.
Waters and Hess (1899) silage vs. sugar beets or mangels.
———— and Weld (1894) silage vs. roots, with stover, corn meal, bran, and linseed meal.
Weiser, I. (1912) maize distillery residues.
Whitcher (1890a) silage vs. dry fodder.
———— (1891) gluten meal vs. corn meal, cottonseed meal or skim milk; silage vs. hay.
White and Kuelling (1919) corn silage for young dairy calves.
Williams, R. H., and Cunningham (1918b) corn silage vs. cottonseed cake or corn + cottonseed cake, with alfalfa hay.
Wilson, J. (1894) sweet-corn fodder.
———— Curtiss, Kent, and Patrick (1891) fodder vs. corn silage vs. sorghum silage or roots.
———— Kent, Curtiss, and Patrick (1891) gluten meal vs. corn-and-cob meal.
————Patrick, Curtiss, Eaton, and Kent (1891) fodder vs. corn silage vs. sorghum silage or mangels.
Wisconsin Station (1884) corn meal vs. cottonseed meal vs. malt sprouts.
———— (1893) corn stalks vs. mixed hay or clover hay; cut vs. uncut corn stalks; value of corn fodder; dry fodder vs. silage; corn meal vs. oil meal; effects of corn smut; digestibility of fodder corn and silage.
———— (1920e) corn vs. barley, with protein concentrates, alfalfa hay, and corn silage.
———— (1920g) corn-stover silage vs. corn silage, with alfalfa and grain mixture.
———— (1922b) corn vs. barley or oats, with hay and corn silage.
Woll (1888a) silage vs. fodder.
———— (1890a) silage vs. dry fodder.
———— (1891a) silage vs. fodder.
———— (1892) comparison of corn ensiled, ears and all, with ensiled corn stover + the ear corn from the same.
———— (1894) corn meal vs. linseed meal or wheat bran.
———— Humphrey, and Oosterhuis (1914) soiling crops vs. silage.
———— and Voorhies (1917) silage + alfalfa vs. alfalfa alone, with or without mixed grains; corn silage vs. silage from Sudan grass or sweet sorghum, with grain mixtures.
Wood, A. H., and Parsons (1891) gluten meal vs. corn meal, cottonseed meal or skim milk; silage vs. hay.
Woods, H., and Bartlett (1903) distillers’ grains.

Fowls
Brooks, Fulton, and Gaskill (1906) wheat and corn oil vs. corn, with animal meal, for egg production.
———— and Thomson (1902) corn vs. wheat or buckwheat, with beef scraps or milk albumin, for egg production.
Buss (1916) shelled corn vs. shelled corn, wheat, and oats, each with ground corn, wheat bran, and meat scrap, vs. shelled corn + ground corn and meat scrap, for laying hens.
(I. Tests not involving chemical considerations, Fowls)

— (1918) shelled corn + ground corn vs. whole wheat + ground wheat vs. mixed corn and wheat, each with bran, meat scrap, and oil meal for laying hens.

Collier (1891) corn meal vs. nitrogenous ration for egg production.

Gowell (1907) whole vs. cracked corn, with wheat, for egg production.

Indiana Station (1922b) corn germ better than pearl hominy for chicks.

Kansas Station (1920-21) corn vs. other grains.

Kennard, Holder, and White (1922a) corn and soybeans + different mineral supplements for chicks.

— (1922b) corn meal + soybean meal vs. same + salts vs. corn meal + buttermilk, for chicks.

— (1923) corn meal + buttermilk vs. same + salt mixture, for chicks.

Musschel, Calvin, Halbersieben, and Sandstedt (1921) corn or corn + supplements for chicks.

Nebraska Station (1921a) corn or corn + supplements for chicks.

New Mexico (1919) corn vs. barley or milo, with mash of bran, alfalfa meal, and meat scrap, for egg production.

New York (Geneva) Station (1893) corn meal vs. wheat bran.

Palmer (1915) yellow vs. white corn.

— and Kempster (1919a), (1919b), (1919c) yellow vs. white corn.

Pennington, Madleer, and Greenlee (1918) corn meal + water or corn meal + buttermilk or corn meal, dried distillers' grains, and buttermilk, for chickens.

Philip, Carr, and Kennard (1919-20) corn vs. corn + meat scraps or soybean meal or both, with ash and sprouted oats, for chickens.

Scarti and Vezzani (1922) press cake made from treated corn cobs.

Shutt (1902) gluten meal vs. clover meal for fattening chickens.

Smith, C. D. (1896) corn vs. wheat for egg production.

— and Brooks (1898) cracked corn vs. ground corn for fattening chickens.

Wisconsin Station (1923a) yellow vs. white corn, with middlings and skim milk or milk and egg, for early spring chickens.

— (1923c) white corn + tankage vs. same + cod-liver oil for young chicks.

Hogs

Archibald (1916) gluten feed vs. corn vs. linseed oil meal, cottonseed meal, peanut oil meal, or fish meal.

— et al (1915) corn vs. corn and shorts, or tankage, or shorts and tankage, or oil meal, each with skim milk.

Agricultural Student (1894) corn vs. wheat.

Ashbrook (1917) corn vs. dried pressed potatoes, with tankage.

Aune (1917) corn vs. barley or shorts, as supplement to alfalfa pasture.

Barnett (1922) corn + tankage or cottonseed meal, for hardening pork; corn vs. rice polish, with tankage for young pigs.

— and Goodell (1923c) corn with soybeans, grazed, or corn hand-fed.

— (1923d) corn + soybeans or velvet beans, grazed or hand-fed; protein supplements for corn; corn vs. polished rice, with tankage; corn with cottonseed meal.

Bliss and Lee (1914) dry shelled corn vs. wheat variously prepared.

Brown (1920) corn vs. ground rye or barley or mixtures of these and middlings, with tankage.

— (1921a) corn vs. other grains and grain mixtures, with tankage.

Burk and Ewing (1919) corn, or corn + cottonseed meal vs. peanuts; corn + cottonseed meal following peanuts.
(I. Tests not involving chemical considerations, Hogs)

Burkett (1899) corn meal and bran or meal vs. others; ear corn vs. ground corn and cob.

Burnett (1899) corn meal vs. wheat shorts, or barley, or combinations of the three.

— (1908) corn meal alone vs. corn + various supplements, including ground bone.

— and Smith (1902b) corn vs. wheat.

Burns (1910) corn vs. molasses; corn chop vs. rice bran.

— (1917) corn chops or corn chops fermented vs. fermented mixture of cottonseed meal and corn.

Burtis and Malone (1901) corn vs. corn and middlings or corn and cottonseed meal.

Call (1918a) corn + tap water or distilled water, or shorts and tankage, or gluten meal and blood meal, for sows. Corn + shorts and tankage in different proportions, or + shorts, tankage, and alfalfa pasture, or + alfalfa, or + bone ash and alfalfa, for pigs.

— (1918c) shelled corn vs. whole kafir corn, with alfalfa; corn silage added to corn and alfalfa.

Carlyle (1901b) corn meal vs. ground peas.

— and Hopkins (1900) corn meal vs. pea meal and shorts, with skim milk

— and McConnell (1902) corn meal vs. ground peas.

— and Morton (1910) alfalfa hay vs. beets vs. tankage as supplements to corn.

Carmichael (1909) corn meal vs. corn meal with grains; corn and pasture; light and heavy grain rations.

— and Eastwood (1912) corn vs. corn + supplements; corn vs. corn and tankage, with rape pasture.

Carnes (1921) corn vs. barley, with tankage.

Chilcott (1894) ground corn vs. spring wheat or ground peas.

Cochel (1917) ground corn vs. ground kafir, ground feterita, ground milo, ground kaoliang, whole kafir, or kafir heads.

Collier (1890) silage vs. corn on cob vs. silage + corn on cob, with wheat middlings and wheat bran.

Connell (1889) shelled corn vs. corn meal vs. cob meal vs. wheat bran or ship stuff.

Conner (1895) corn vs. wheat.

Connor (1900) corn meal vs. rice meal, with skim milk.

— (1891) corn vs. sweet skim milk or sour skim milk.

— (1892a) corn and milk vs. milk.

— (1897) corn vs. barley, with or without skim milk.

Cooke (1890) corn meal vs. rice meal, with bran and buttermilk.

Cunningham and Kenney (1917) corn vs. kafir corn, milo maize, feterita, or kaoliang, with shorts and tankage.

Curtis, R. S. (1909) fermented corn vs. same + fermented cottonseed meal or linseed meal.

Day (1898) corn meal vs. peas, barley, and shorts 1:1:1.

Duggar (1897) corn vs. cowpeas or wheat bran.

— (1898) shelled corn vs. cowpeas and corn; corn meal vs. sweet potatoes.

— (1903) corn hearts vs. cowpea meal or corn bran, fed with rice bran; corn with or without skim milk or mixed grains vs. rice polish or skim milk.

Dunstan (1899f) corn vs. corn and milk or whey; corn meal vs. barley.

Dvorachek and Sandhouse (1918?) corn vs. kafir corn or feterita, with tankage.

— — (1918) corn + supplements.

Eastwood (1914) corn vs. oats with tankage; corn vs. hominy feed with tankage; corn vs. ground wheat or middlings with tankage; corn in light vs. heavy grain rations with rape pasture.
(I. Tests not involving chemical considerations, Hogs)

Emmett and Grindley (1914) ground corn + different proportions blood meal and calcium phosphate.

Evvard (1913) corn vs. corn + various supplements for sows.

— (1914) comparison of forages to be used with corn and meat meal or tankage for pigs; corn alone vs. corn + various supplements for gilts and sows.

— and Culbertson (1923) shelled corn + rape or blue-grass pasture; shelled corn + several commercial products, with pasture; Clinton Corn Oil Cake Meal, Sucrene Hog Meal, Corn Products Special Hog Meal, Chapin’s Korn Saver, Chapin’s Korn Balance as partial supplements with shelled corn and pasture.

— and Dunn (1920) shelled corn vs. barley, with tankage and alfalfa for pregnant gilts.

— Strausbaugh, Adams, and Winchester (1921) corn oil cake meal + corn and tankage vs. corn and tankage alone.

— Kennedy, and Kildee (1913) standing field corn vs. same + supplements.

Farrell (1919b) corn vs. barley, oats, shorts, or milo maize as supplement to alfalfa pasture; corn vs. corn + supplements for hogging off.

Ferrin and Jessup (1922) ear corn vs. standing corn vs. standing corn + rape.

— and Winchester (1921) shelled corn vs. barley, wheat, rye, feterita, milo or kafir, with tankage.

Flint (1909) corn + supplements (shorts, skim milk, soybeans, Spanish peanuts).

Forbes (1905) corn + various supplements.

Friis (1899) corn vs. molasses feed or barley; corn vs. palmnut meal.

Fuller (1904) corn meal + water vs. wheat middlings + skim milk for young pigs.

— (1905) corn meal vs. ground barley, with middlings for young sows.

Gennys (1906) corn-and-cob meal of immature corn.

Georgesen, Burtis, and Otis (1895) corn meal vs. ground wheat or ground kafir corn or ground wheat + corn meal.

Georgia Station (1922b) corn + tankage or cottonseed meal for hardening pork.

Gerlach (1898-99) maize-germ molasses vs. crushed rye.

Good (1913) corn meal vs. wheat, or corn meal + supplements, in dry lot; corn meal vs. corn meal + supplements, with rye pasture.

— (1914) distillers’ dried grains vs. corn meal vs. distillers’ dried grains + corn meal, with pasture of rape and oats.

— (1917b) corn added to soybean pasture; velvet bean meal or digester tankage as supplements for corn.

— and Mann (1918) corn meal supplements (velvet bean-and-hull meal, soybean meal or tankage).

— and Smith (1915) distillers’ dried grains as supplement for corn meal, pasture, or corn meal + pasture.

Goss (1904) corn vs. corn supplements.

Gray, Duggar, and Eidgeway (1908) corn supplements.

Grimes (1921) corn + different supplements for fattening hogs or mature sows; shelled corn + alfalfa vs. alfalfa for sows.

Hackedorn (1920) hogging off corn.

Hansen and Gongweir (1921) corn vs. barley, with skim milk and alfalfa hay, or with alfalfa pasture, for fattening pigs; corn vs. barley, with tankage or alfalfa pasture, for sows with pigs; hogging off corn, or corn and rape, or corn with tankage.

— Seamans, and Hutton (1921) corn pasture; corn supplements; corn vs. corn + tankage, with alfalfa pasture.

Hansson (1911) soaked maize.
(I. Tests not involving chemical considerations, Hogs)

Hart, E. B., Steenbock, and Letcher (1920) corn meal + milk in various proportions.

Hayes, F. A. (1919) corn vs. corn + different supplements; hominy feed + different supplements.

Hayes, W. M. (1892a) corn meal vs. barley meal.
--- (1892b) corn meal vs. barley meal or barley meal + linseed meal.

Hayward (1919) corn vs. corn + different supplements.

Hendrick (1905) gluten feed for pigs.

Henry (1883a) corn meal vs. cane-seed meal.
--- (1883b) corn meal vs. skim milk or with skim milk.
--- (1885b) corn meal vs. shorts or with shorts for pigs; cooked shelled corn and shorts vs. the same mixture uncooked for hogs.
--- (1886b) corn meal vs. shorts or with shorts; cooked vs. uncooked corn and shorts.
--- (1886c) corn meal vs. dried blood + shorts and skim milk.
--- (1887d) cooked vs. uncooked corn.
--- (1888d) whole corn vs. corn meal; corn meal + skim milk.
--- (1890b) corn vs. shorts and bran or shorts, bran, and corn; corn vs. corn + bone meal or ashes; corn vs. barley, with skim milk.
--- (1890c) corn meal vs. barley meal; corn meal + skim milk vs. barley + skim milk.
--- (1890d) corn meal alone vs. corn meal + potatoes vs. shorts + potatoes.
--- (1893a) whole corn vs. corn meal; corn meal vs. or with shorts; corn alone; corn meal + skim milk.
--- (1894) corn meal vs. wheat meal, or + wheat meal.
--- (1895a) corn meal vs. corn or corn meal + different proportions of skim milk.
--- (1895b) corn meal vs. wheat + wheat meal.
--- (1896) whole corn vs. corn meal.
--- (1897) whole corn vs. corn meal.
--- (1898) whole corn vs. corn meal, with wheat middlings.
--- (1899) whole corn vs. corn meal.
--- (1900) whole corn vs. corn meal, with wheat middlings.
--- (1901) whole corn vs. corn meal.
--- (1902) whole corn vs. corn meal.
--- (1903) whole corn vs. corn meal.
--- (1904) whole corn vs. corn meal.
--- (1905) whole corn vs. corn meal.
--- and Otis (1906) whole corn vs. corn meal, 10 yrs. summary.

Hickman, J. F. (1889) silage in place of part of hay.

Hills (1896-97a) shelled corn vs. corn meal, with skim milk; corn + milk vs. wheat bran + whey.

Holden (1917) corn vs. ground barley as supplement for alfalfa pasture.

Hostetter (1922) corn with fish meal or tankage.

Humphrey (1904) soybeans vs. middlings as corn supplement.
--- (1905) soybeans vs. wheat middlings as supplement to corn meal.
--- and Fuller (1906) corn meal + soybean meal vs. corn meal + wheat bran, with rape pasture.

Hunter, J. M. (1917) corn meal vs. molasses vs. corn meal + molasses vs. hominy feed + molasses, for brood sows; corn + supplements, for pigs.

Idaho Station (1923a) corn vs. barley, with tankage or cracked peas.

Illinois Station (1922b) yellow vs. white corn, with tankage for sows and pigs.
(I. Tests not involving chemical considerations, Hogs)

**Indiana Station** (1922a) corn + tankage, with clover pasture; soybeans vs. tankage as supplement to corn hogged off; corn hogged off vs. corn harvested and fed.

**Iowa Station** (1921) corn + different supplements.

**Jordan, Bartlett, and Merrill** (1889b) corn meal + various supplements.

**Kansas Station** (1920-21) corn vs. barley, with alfalfa pasture; corn + various supplements; corn vs. kafir, milo, and feterita; corn vs. kafir, with tankage or ground alfalfa and tankage.

**Kellner et al** (1909†) potato flakes and potato chips vs. ground corn.

**Kellner, Lehmann, and König** (1909) value of maize; dried distillery slops.

**Kennedy and Marshall** (1902b) corn alone vs. corn + various supplements.

— and **Robbins** (1907) corn meal vs. corn meal + supplements.

—— ——— (1909) dry corn vs. soaked; dry corn meal vs. dry or soaked corn-and-cob meal, for hogs of different ages.

**Kentucky Station** (1914-15) distillery slop for hogs.

—— (1919c) hogging down corn alone; same + tankage; corn and soybeans grown together; soybeans + corn grain.

—— (1922a) supplements for corn hogged off; corn + soybeans did not produce soft pork.

**King** (1914) ear corn vs. shelled corn vs. ground corn, with tankage, for hogs of different sizes.

—— (1916) ear corn vs. shelled corn vs. ground corn, with tankage or shorts and tankage, for hogs of different weights.

**Klein** (1895) corn vs. barley.

**Lamb and Evvard** (1922) defects of white corn ration.

**Lindsey et al** (1898a) corn meal vs. hominy meal vs. cerealine feed, with skim milk.

—— **Holland, and Billings** (1896) corn meal vs. oat feed or rice meal.

**Linklater** (1911) corn meal vs. corn meal + green alfalfa, green rape, or tankage, in different amounts; ear corn vs. ear corn + tankage, alfalfa meal, or alfalfa hay.

—— (1912) corn chop in different proportions added to alfalfa forage.

**McDonald and Malone** (1908b) corn meal vs. corn meal + supplements.

**Mairs and Doty** (1909) corn meal + tankage vs. middlings.

**Malone** (1918) corn vs. kafir corn or darso, with tankage.

**May, D. W.** (1902) shelled corn vs. same + corn-and-soybean silage, or shelled soybeans, or dried distillery grains; corn vs. same + cottonseed meal, with skim milk or tankage.

**Mills** (1894a) corn vs. wheat, peas, or barley, with bran.

**Minkler** (1916) molasses vs. ear corn + tankage, with alfalfa hay and mangels, for brood sows; molasses vs. ear corn and tankage, with alfalfa hay, for breeding gilts; corn vs. hominy meal, with middlings and tankage, vs. corn and middlings and peanut meal, for pigs.

**Morrison and Bohstedt** (1919) corn vs. barley fed in various ways, with tankage.

—— ——— (1921) linseed meal and wheat middings vs. tankage as supplement to corn.

**Morrow** (1891) corn vs. corn + grass; dry corn alone; soaked vs. dry corn.

**Morton** (1907b) corn vs. corn + supplements.

—— (1913b) corn + supplements.

**Mumford, H. W.** (1902) silage vs. shock corn.

**Nebraska Station** (1921c) corn or corn + supplements, with tankage.

—— (1922e) corn vs. corn + supplements.

**New Mexico Station** (1920) ground corn vs. same + tornilla beans.
(I. Tests not involving chemical considerations, Hogs)

North Dakota Station (1922b) hoggimg down corn, with tankage and shorts.
Nourse (1891) silage vs. hay; whole corn vs. corn meal.
—— (1896) silage for maintenance.
Ohio Station (1885) corn vs. green feed.
—— (1922a) corn hoggged off + tankage.
—— (1922b) ear corn vs. shelled and ground corn; immature corn.
Pennsylvania Station (1917a) shelled corn vs. corn meal vs. ear corn, with tankage, vs. corn meal with linseed meal or chopped alfalfa, for pigs; shelled corn + alfalfa hay vs. alfalfa hay vs. shelled corn + tankage vs. corn meal + ground oats and wheat middlings, for brood sows.
—— (1922c) supplements for shelled corn, with rape pasture or in dry lot.
—— (1923a) supplements to corn.
Plumb and Anderson (1897) corn vs. wheat; corn + wheat.
—— ——— (1898) corn meal vs. shorts.
Popowitsch (1908) corn vs. barley, peas or sesame oil meal, with potatoes and skim milk.
Proskau Institute (1896) corn in different amounts and differently prepared.
Quesenberry (1922) corn vs. rice, brewers' grains, or rice polish, with oat pasture and tankage.
Quick and Spencer (1908) corn in hard flinty condition vs. new corn; various corn supplements.
Rice (1924) corn vs. corn + different proportions of tankage or middlings and tankage, with pasture.
Robison (1917) corn vs. corn + supplements in varying amounts and proportions.
—— (1918a) corn vs. corn + tankage, skim milk, linseed oil meal, or wheat middlings; corn + different amounts of tankage or of skim milk.
—— (1918b) hoggimg down corn, with or without nitrogenous concentrates.
—— (1919) corn vs. corn + supplements, with legume hay, for sows.
—— (1920a) corn vs. corn + tankage fed in various ways with hay or pasture.
—— (1920b) corn vs. corn + supplements.
—— (1920c) hominy feed vs. ground corn, with skim milk or tankage; corn vs. corn + corn-germ meal vs. corn-germ meal, with tankage; corn as partial substitute for tankage, with corn in dry lot or on forage.
—— (1921a) corn + various supplements; corn-germ meal as supplement to corn, with tankage.
—— (1921b) standing corn or corn supplemented by standing soybeans or ground soybeans or linseed meal, with or without tankage.
Sanborn (1892a) silage + grains vs. grains alone.
Scott (1911) shelled corn vs. shelled corn + culled velvet beans, culled velvet beans and shorts or culled velvet beans and green sorghum hay.
—— (1916) shelled corn + supplements (green cowpeas and green sorghum, peanuts and rape, rape and velvet beans, velvet beans and iron sulfate, velvet beans and dasheens).
—— (1917b) shelled corn vs. shelled corn + sweet-potato silage.
—— (1917c) corn + supplements.
Scurti and Vezzani (1922) press cake made from treated corn eobs.
Shaw, E. L. (1904) corn meal vs. corn + middlings.
Shaw, T. (1891) silage vs. turnips.
—— (1898) ground corn vs. barley, with oats and fresh green feed.
Shepton and Cottrell (1889) corn meal vs. shorts and bran.
Shepperd and Richards (1909) corn or corn meal vs. barley or low-grade wheat.
Shutt (1901) corn meal alone or corn meal added to oats, peas, and barley.
(I. Tests not involving chemical considerations, Hogs)

Skinner (1905) corn meal vs. corn meal + supplements.

and Coehoel (1908) various corn supplements.

— and King (1912a) hominy feed vs. corn meal.

— and Starr (1918a) corn feed meals vs. ground corn; hominy feeds vs.
ground corn; corn-germ meals, with or without tankage or tankage + corn.

Smith, C. D. (1895) corn meal vs. barley meal.

— (1895) corn vs. wheat, with skim milk.

Smith, H. R. (1902) corn vs. wheat or other grains.

Snyder, W. P. (1907) corn vs. corn + rye, shorts, emmer, or barley.

— (1911) corn in different proportions with alfalfa pasture; corn vs. corn + barley vs. corn + wheat vs. corn + rye and wheat, each with alfalfa pasture.

— (1912a) corn vs. corn + alfalfa vs. corn + wheat, barley, emmer, or milo, with alfalfa; corn vs. sorghum seed, with alfalfa; corn supplements (tankage, bone meal, shorts, or alfalfa), all for pigs. Corn vs. corn + alfalfa, for sows.

— (1912b) corn with alfalfa in different forms and different proportions; corn vs. corn + wheat, barley, tankage, bone meal, shorts, milo or sorghum seed, each with alfalfa.

— (1915) corn vs. corn + shorts; dry vs. soaked shelled corn; corn vs. corn + various supplements; corn vs. wheat or rye; whole grain vs. ground.

— and Burnett (1917) corn added to alfalfa hay in rack or alfalfa hay in rack + stewed alfalfa, for brood sows.

— (1918) corn in light or full ration vs. corn + tankage, with alfalfa pasture; soaked vs. dry corn, with alfalfa pasture; corn vs. corn + shorts, with alfalfa pasture, for pigs.

Soule and Pain (1903) corn vs. corn + skim milk, with or without wheat meal or soybean meal.

— and Jarnagin (1907a) corn meal vs. corn meal + supplements; shelled corn vs. corn meal; soaked vs. unsoaked grain.

South Carolina Station (1922) corn or corn + tankage vs. peanuts or sweet potatoes.

Stabler (1911) "new corn product" (ground corn stalks with ear and pith removed) vs. corn-and-cowpea silage, with hominy chop, gluten meal, and linseed meal; shelled corn vs. corn meal, with skim milk; hominy chop vs. chop and wheat bran.

Stewart and Atwood (1899) whole corn vs. corn meal; soaked whole corn vs. corn-meal mush.

Stockbridge (1899) corn vs. cassava and others.

Swanson (1921) corn or corn + ash and protein supplements.

Taylor, F. W. (1907-08a) soaked shelled corn vs. shelled corn + supplements for showats.

Templeton (1917) corn + dried blood vs. same + velvet bean pasture; corn vs. velvet-bean meal.

Thompson, C. P. (1919) corn vs. corn + barley vs. barley or oats, with tankage.

Thompson, O. A. (1922) hogging down corn.

Tomhave and Havner (1913-14a) corn meal vs. shelled corn with tankage; corn + supplements.

— (1913-14b) corn meal + tankage in various proportions.

— (1915) corn meal vs. shelled corn, with tankage; corn meal + different supplements (tankage, buttermilk, wheat middlings).

Tyn (1892) steamed vs. cracked corn.

Vernon and Scott (1907) corn + alfalfa in different proportions.
(I. Tests not involving chemical considerations, Hogs)

Watson (1895b) corn meal or gluten feed vs. wheat; corn meal vs. corn meal + meat scrap.

Weaver (1915) corn vs. wheat or with wheat, with or without tankage.

— (1920) hominy feed vs. corn, with shorts, tankage, and blue grass; corn vs. barley, with shorts and tankage or buttermilk.

— (1921a) shelled corn or corn + tankage vs. sunflower seed or with sunflower seed, with minerals.

— (1921b) corn vs. corn + soybeans, with or without tankage, hogged down.

Wells, C. A., and Ewing (1916) gluten flour vs. cottonseed meal or tankage, with starch and skim milk or whole milk on different planes.

Wheel, G. C., and Wright (1913) corn, corn + supplements.

Whitcher (1890b) skim milk vs. middlings as supplement for corn meal.

—and Morse (1890) corn meal + skim milk vs. corn meal + middlings.

Wilson, J. W. (1912a) shelled corn vs. shelled corn + buttermilk, sweet skim milk or sour skim milk.

— (1914b) several varieties of corn.

— (1920) corn vs. barley, with tankage.

—and Kuhlman (1921) supplements for field corn.

—and Skinner (1908) corn meal or corn meal + barley vs. same + stock feeds, for pigs.

Wisconsin Station (1903) corn meal vs. ground peas.

— (1920d) shelled corn vs. ground barley, with tankage.

— (1920h) corn + whey vs. barley + whey or same + tankage; comparison of several supplements for corn.

— (1920i) yellow vs. white corn, with tankage, linseed meal, and rock phosphate or with vitamin A.

— (1922b) yellow corn vs. white corn, with tankage, skim milk, or linseed meal + skimmed whey.

— (1923d) yellow corn vs. same + cod-liver oil, with oil meal, floats, salt, and paper; yellow vs. white corn, with skim milk vs. same + cod-liver oil.

— (1923g) yellow vs. white corn, with skim milk.

— (1923h) corn + tankage vs. same + linseed meal and alfalfa hay.

Wolff, A. (1891) dried corn slop vs. buttermilk, with rye and potatoes.

Zavitz (1890) silage vs. turnips.

Horses and mules

Burkett (1901) stover vs. timothy hay; corn + oats vs. corn + bran.

Carmichael (1908) corn vs. oats.

Cochel (1912a) silage vs. mixed hay, with corn and cottonseed meal, for horses.

Gennys (1906) corn-and-cob meal from immature corn.

Gray and Hostetler (1922) corn vs. corn + oats, with legumes, for horses.

Grisdale (1910) corn vs. barley or oats, with bran and hay.

Havner and Goodling (1915) silage added to shelled corn, cottonseed meal, and timothy hay; shelled corn vs. shelled corn + oats, with hay, for horses.

Hickman, J. F. (1889) silage vs. hay.

Hooper and Anderson (1913) cracked corn vs. mixture of cracked corn, wheat bran, and oil meal, 3:1:1, for mules.

Irby (1889) chicken corn vs. corn for mules.

Kennedy, Robbins, and Kildee (1910a) corn and oats vs. corn, oats, and oil meal; gluten meal vs. oil meal.

Kloepfer (1894) cracked corn.

McCandless (1912) corn vs. oats.
(I. Tests not involving chemical considerations, Horses and mules)

**Mills** (1894b) corn vs. oats.

**Nourse** (1897) silage.

**Plumb** (1903) value of distillers' dried grains.

**Sanborn** (1892b) corn and timothy hay vs. oats, wheat, and clover; ground vs. unground grain.

**Trowbridge** (1913) corn vs. oats with mixed clover and timothy hay, for mules.

— **and Chittenden** (1921) corn silage as part ration for horses.

**Williams, R. H.**, and **Cunningham** (1918a) silage for horses.

**Wisconsin Station** (1923k) corn silage for horses.

Sheep and goats

**Archibald** (1916) gluten feed vs. corn vs. linseed oil meal, cottonseed meal, peanut oil meal, or fish meal, for lambs.

— **et al** (1914) stover added to mixed hay vs. timothy hay and roots vs. mixed hay, roots, and extra grain, for lambs.

— **(1916e)** corn meal vs. gluten meal vs. cottonseed meal, linseed meal, or peanut meal, with silage and hay, for lambs.

**Buffum and Griffith** (1902) corn vs. spelt, emmer, barley, wheat and barley or wheat and emmer, with alfalfa; corn vs. mixture of oats, wheat, and barley, with alfalfa and warm or cold water, for lambs.

**Burnett** (1900) shelled corn vs. corn + supplements, with alfalfa hay or prairie hay, for lambs.

— **(1901)** corn vs. corn + oats, bran or linseed meal, with alfalfa hay or sorghum hay, for lambs.

**Carlyle** (1898) corn meal vs. cracked peas or whole oats for lambs.

— **(1899)** ground corn vs. ground peas for lambs before and after weaning.

— **(1900)** fodder, silage, roots, and hay compared.

— **(1901a)** silage vs. fodder, with stover; stover vs. blue-grass hay, with corn silage; silage vs. sugar beets, with blue-grass hay, for ewes.

— **and Spencer** (1916) silage vs. alfalfa for wether lambs.

**Carmichael** (1906) corn vs. corn + supplements, with hay, for lambs.

— **(1907)** linseed meal vs. condimental stock feed as corn supplement; heavy vs. medium corn ration for lambs.

— **and Hammond** (1912) corn vs. corn + linseed oil meal; clover hay vs. alfalfa as supplement to shelled corn; corn stover vs. soybean straw, with shelled corn and linseed oil meal; corn stover vs. others with corn or corn + linseed oil meal.

**Clothier** (1900) ear corn vs. corn + condimental stock feed for sheep.

**Coffey** (1914) proportions of shelled corn and alfalfa for lambs.

**Cooke** (1897) corn vs. barley, wheat, beets, or corn + barley for sheep.

**Craig** (1891) shelled corn, cut corn fodder, and corn silage vs. oats, oil meal, clover hay, and clover silage for sheep.

— **(1895a)** corn meal vs. oats or bran for lambs.

— **(1895b)** corn with or without oats and peas for lambs.

— **(1896)** corn vs. corn + oats, or peas, or peas and oats, for lambs.

— **(1897a)** ground corn vs. bran, oats, or cracked peas for lambs before weaning.

— **(1897b)** ground corn vs. same + oats, or cracked peas, for lambs before and after weaning.

**Cunningham and Kenney** (1917) shelled corn vs. kafr corn, with cottonseed meal, alfalfa hay, and sweet sorghum silage, for lambs.
(1. Tests not involving chemical considerations, Sheep and goats)

Darlow (1922) corn silage vs. darso grain, darso silage, or sunflower silage, with alfalfa hay and karir corn, for ewes.

Day (1899) corn vs. peas for lambs.

Dunn and Evward (1919) protein supplements for shelled corn, corn silage, and alfalfa hay (linseed meal, velvet bean feed meal or peanut meal); corn gluten feed vs. corn, with corn silage and alfalfa hay, for lambs.

—— and Culbertson (1923) shelled corn, or hominy feed, or corn gluten vs. whole oats or whole barley, with oil meal, corn silage, and clover hay; shelled corn + whole oats or whole barley vs. whole oats or whole barley, with oil meal, corn silage, and clover hay, for lambs.

Emery (1902) alfalfa hay as roughage with corn.

Evward (1913) corn alone or with various supplements, for ewes.

—— (1917) preparation of corn for fattening lambs.

Faville (1909) corn vs. emmer or Scotch barley for lambs.

—— (1910) corn vs. barley or emmer, with alfalfa hay; corn + alfalfa vs. corn + native hay for lambs.

—— (1911) whole corn vs. bald barley or Scotch barley or corn supplement, with hay, for lambs.

—— (1914) corn vs. barley, with alfalfa, for lambs.

—— (1915) corn vs. barley, with alfalfa and oat-and-pea silage, for fattening lambs.

Fraps (1919) corn cobs, with cottonseed meal.

Goessmann (1890) silage vs. rowen for lambs.

—— (1891c) corn meal + wheat bran + gluten meal vs. wheat bran + gluten meal for lambs.

—— (1892b) maize feed vs. gluten feed; silage vs. mangels for lambs.

Gramlich (1915) ground corn vs. shelled corn, with alfalfa or alfalfa + corn silage; silage added to ground or shelled corn + alfalfa; good alfalfa vs. poor alfalfa, with ground corn, for lambs.

—— (1918) corn vs. corn + silage, with blue-grass pasture and alfalfa hay; cornfield feeding vs. dry-lot feeding; supplements with cornfield feed and alfalfa hay, for lambs.

Grisdale (1910) silage vs. turnips, with mixed meal and hay, for lambs.

—— (1911) silage vs. turnips or mixture of silage and turnips, with mixed meal and clover hay, for lambs.

Hackford (1914) silage vs. stover or hays or grain for breeding ewes.

—— (1920) corn silage vs. sunflower silage, with barley, beans, and pea straw for lambs; corn silage vs. sunflower silage for ewes after lambing.

—— Bean, and Sotola (1922) corn in different amounts vs. corn + corn silage in different amounts or corn silage and cottonseed meal vs. corn + beet molasses, with legume hay, for lambs.

Hammond (1919) corn added to pasture for lambs.

Harwood and Mumford (1892) silage vs. roots for lambs.

Hays, W. M. (1893) cracked corn vs. other grains.

Head den (1907) corn fodder vs. hay or sorghum fodder for sheep.

Hickman, C. W., and Rinehart (1922b) corn vs. barley or wheat and oats, with alfalfa hay; corn silage in different amounts, with alfalfa hay and barley, for lambs.

Higbee (1903) cooked corn vs. dry corn for sheep.

Holden (1923) shelled corn or corn + beet tops, beet pulp or cottonseed cake vs. beet pulp or tops or other feeds with alfalfa hay, for lambs.
(I. Tests not involving chemical considerations, Sheep and goats)

Humphrey and Kleinheinz (1906) shelled corn and whole oats vs. dried beet and whole oats for lambs.

Idaho Station (1923a) different amounts of corn silage with barley and alfalfa hay, for lambs.

Jones, J. M. (1914) silage vs. roots for lambs.

— (1921a) corn vs. sorghums for lambs.

— (1921c) ground corn vs. heads of grain sorghums, with cottonseed meal, and alfalfa hay, for lambs.

— and Brewer (1922) corn vs. grain sorghum for lambs.

— and Dickson (1920) corn vs. grain sorghums for lambs.

Kansas Station (1920-21) silage vs. no silage; corn gluten feed vs. linseed meal; shelled corn vs. ground corn; shelled corn vs. whole barley.

Kennedy and Marshall (1902a) corn vs. oats, barley, or corn and oats; corn vs. corn and gluten feed vs. emmer or soybeans, for sheep.

— Robbins, and Kildee (1910b) silage vs. cabbage or roots for lambs.

Ladd (1888) whole corn vs. cottonseed meal + wheat bran, with hay, for sheep.

Logan (1895) dried distillers' grains vs. linseed cake for sheep.

McDonald and Malone (1908a) comparison of alfalfa hay and cowpea hay as roughage with corn meal; stover + alfalfa hay vs. other roughage with corn + cottonseed meal.

Maynard (1922) corn vs. corn + beet pulp, with or without alfalfa, for lambs.

Middleton (1903) gluten feed vs. gray peas or grain for sheep.

Morton (1905) corn vs. barley for lambs.

— (1907a) corn vs. oats or barley, with native hay; corn vs. oats or barley, with oil meal and native hay; corn + alfalfa vs. corn + peas.

— (1908) corn with other feeds; corn vs. barley for lambs.

— (1913a) corn vs. Scotch barley, with alfalfa hay, for lambs.

Mumford, F. B. (1894) corn vs. oats or bran or with oats or bran, with roots and hay; silage vs. rutabagas, with oats, bran, and hay.

— (1895) corn vs. wheat, or sugar beets, or mixed grain, with clover hay, for lambs.

Mumford, H. W. (1896) corn stalks vs. clover hay, alfalfa, millet hay, oat straw or bean straw, with or without clover hay, for lambs.

Nebraska Station (1916) corn + alfalfa in different proportions; corn + alfalfa with different supplements (corn silage, oil meal, cottonseed meal or cold pressed cottonseed cake), for lambs.

— (1921b) value of silage added to corn + alfalfa or same + molasses or linseed meal; corn vs. beet pulp, with alfalfa, cottonseed cake, beet tops or corn silage, for lambs.

— (1922b) corn silage vs. linseed meal or + linseed meal or + molasses meal, with corn and alfalfa, for lambs.

— (1922c) corn vs. dried beet pulp; corn silage vs. beet tops, for lambs.

New Mexico Station (1920) corn vs. Pinto beans, with alfalfa hay for lambs.

Paterson and Winchester (1921) shelled vs. ground corn; corn + oil meal; corn vs. corn + corn silage or silage and oil meal; corn gluten feed vs. linseed meal, for lambs.

— (1922) white shelled corn vs. yellow shelled corn, with cottonseed meal, alfalfa hay, and cane silage for yearling wethers.

Richards, W. B., and Kleinheinz (1904) shelled corn or shelled corn + whole oats + bran vs. oats or bran or dried brewers' grains, with corn silage and hay, for breeding ewes.

Roberts (1888a) corn meal vs. oil meal and wheat bran, with meadow hay and mangolds, for lambs.
(I. Tests not involving chemical considerations, Sheep and goats)

- and Watson (1892) silage vs. hay for lambs.
- and Wing (1889) corn vs. wheat bran + cottonseed meal (or with these), with hay and roots, for lambs.

Sanborn (1891) silage vs. fodder, for sheep.
- (1892a) silage vs. dried fodder for sheep.

Scourt and Vezzani (1922) press cake made from treated corn cobs.

Severson (1913-14) silage as sole roughage for ewes.
- (1915-16) silage added to alfalfa hay, with or without grain, for breeding sheep.

Shaw, T. (1902) corn and bran vs. corn and oats for lambs.

Simpson (1911) varying amounts of corn with alfalfa for lambs.

Skinner (1911) supplements with shelled corn — silage + clover hay or silage + clover hay + cottonseed meal vs. clover or timothy hay alone or with cottonseed meal, for sheep.
- (1922) limited vs. full feeding of corn, with corn silage, cottonseed meal, and clover hay, for lambs.
- and King (1912b) timothy hay vs. clover hay, with corn or corn + cottonseed meal; corn silage as roughage, with shelled corn and clover hay or with shelled corn, clover hay, and cottonseed meal; for lambs.
- (1913b) silage vs. clover hay, with corn or corn + cottonseed meal; corn vs. corn + oats, with clover hay + silage, for lambs.
- (1914b) silage + clover hay; silage vs. silage + cured roughage, for lambs.
- (1916b) corn silage and other supplements to shelled corn, for lambs.
- (1917a) silage vs. silage + dry roughage; silage added to alfalfa hay; ground soybeans vs. cottonseed meal as supplement to shelled corn, clover hay, and corn silage, for lambs.
- and Smith (1910) corn silage for ewes and young lambs.
- and Starr (1918c) hominy feed vs. shelled corn, with cottonseed meal, corn silage, and clover hay, for lambs.
- and Vestal (1919a) limited vs. full feed of corn; corn silage vs. corn silage + dry roughages; hominy feed vs. shelled corn, for lambs.

Smith, C. D., and Mumford (1894) corn vs. corn + roots vs. corn + oil meal and roots vs. corn + oil meal vs. corn + wheat bran vs. corn + wheat vs. wheat + oil meal, each with clover hay, for lambs.

Tangl and Weiser (1913) value of ground mixture of corn + corn cobs, 3:1, for sheep; coarse vs. fine ground corn for sheep.

Taylor, F. W. (1907-08a) corn meal vs. molasses as supplement to ration for ewes.

Texas Station (1920) corn vs. milo, feterita or kafir, for lambs.

Watson (1895a) silage vs. mangels, for lambs and ewes.

Wilson, J. W. (1916) corn silage with grain or with grain and hay, for lambs.
- and Skinner (1903) corn vs. other grains, for lambs.
- (1904) corn vs. other grains.

Wing (1911) silage replacing part of the hay in a ration of mixed hay, pea-and-oat hay, and grain, for lambs.

Wisconsin Station (1920k) gluten feed vs. linseed meal; linseed meal vs. cottonseed meal vs. supplement to shelled corn, with legume hay and corn silage, for lambs.
(I. Tests not involving chemical considerations)

Laboratory animals

Galmoszi (1920) corn alone; corn + injected lecithin; corn + bird liver; corn + butter; corn + arsenic compound.

Illinois Station (1922b) protein value of endosperm of high-protein strains of white corn (rats).

Johns, Finks, and Paul (1920) gluten meal, same + supplements (rats).

Jones, D. B., Finks, and Johns (1923) corn meal + different supplements (rats).

Maynard and Prunda (1921) corn meal vs. coconut oil meal; corn meal + coconut oil meal; corn meal + skim milk, as protein for rats.

Scurti and Vessani (1922) press cake made from treated corn cobs (rabbits).

Wisconsin Station (1923) white corn + whole, skimmed, or filled milk (rats).

II

Digestion Experiments

Cannery refuse

McCandlish (1920): cows.

Cerealine feed

Lindsey et al (1898b), (1902): sheep.

Chicago maize feed

Lindsey, Smith, and Holland (1894): sheep.

Corn

Bartlett (1910) whole corn and cracked corn: fowl.

Brown (1904), corn (determinations include pentosans): hens.

Dietrich (1908) corn, corn + supplements: pigs.

—— and Grindley (1914) ground corn: hogs.

Fields and Ford (1900), corn: fowl.

Forbes (1917a) corn + supplements: cows.

—— and Beegle (1916a) corn + supplements: cows.

—— ——— Fritz, and Menching (1914) corn, corn + supplements: hogs.

—— Mangels, and Morgan (1917) corn, corn + supplements: pigs.

Fraps (1922a) (nutrients, carbohydrates, proteins): sheep.


Grindley, Carmichael, and Newlin (1917) corn, corn + supplements: pigs.

Guernsey and Ewurd (1914) corn on cob, dry shelled corn, dry ground corn, soaked shelled corn, soaked ground corn: hogs.

Hagemann (1897) corn: dairy cattle.

Kuyp and Ivey (1922) bolted and unbolted: poultry.

Lindsey et al (1902) corn: sheep.

Michael and Kennedy (1910) corn, corn + condimental stock feeds: hogs.

1 Experiments in which the coefficients of digestibility of the nutrients were determined; i.e., the percentage of the nutrient taken in the ration which did not appear in the feces.
II. Digestion experiments

Patterson, H. J. (1897) shelled corn: horses.
Schulze, B. (1896) dried brewer's corn.
Snyder, H. (1893) corn, corn + shorts, corn + bran: pigs.
Schläguy and Kriwuschka (1918) (N, energy): ducks, hens, geese.
Wolff, E., Funks, and Dittmann (1876): swine.
Zaitschek (1908) corn, corn + blood meal: pigs.

Corn-and-cob meal

—— and Kilgore (1894) corn-and-cob meal + crimson-clover hay: goat.
Honcamp and Gschwendner (1911): sheep.
Tangl and Weiser (1913) coarse and fine ground: sheep.

Corn-and-millet silage

Brünnich and Rawson (1921): sheep.

Corn bran

Emery (1899) corn bran, corn bran + crab-grass hay: sheep.
Honcamp and Blanck (1918) with meadow hay: sheep.
——— Beals, and Smith (1917): sheep.

Corn chop feed

Rather (1917a): hogs.

Corn cobs

Emery and Kilgore (1894): goat.
Fraps (1919) with cottonseed meal: sheep.
Honcamp,Notte, and Blanck (1919) with meadow hay and poppy-seed cake: sheep.
Lindsey (1893a): sheep. (1902): sheep
——— and Holland (1894a), (1894b) (pentosans): sheep.

Corn fodder

Armsby (1891): sheep. (1892a), (1892b): steers, sheep.
——— and Caldwell (1889a), (1889b): steers.
——— Frerar and Caldwell (1890): sheep, steers.
——— ——— and Holter (1889): sheep.
Bartlett (1904): sheep, steers.
Emery and Kilgore (1892): sheep, goat.
Fields and Ford (1900): sheep.
Fraps (1918): sheep.
(II. Digestion experiments)

Frear (1886) fodder + corn meal, fodder + corn meal or hay + cottonseed meal: steers. (1890): sheep, steers.
— — and Sweetser (1892) sweet-corn fodder and dent-corn fodder: sheep, steers.
Grandeau, Leclerc, and Ballacey (1892): horses.
Harrington and Adriance (1891): steers.
Jordan (1891) southern-corn fodder, ordinary field-corn fodder, and sweet-corn fodder: sheep. (1893a): sheep.
— — Bartlett, and Merrill (1889a): sheep.
Ladd (1890) field-cured fodder: heifers.
Lindsey et al (1904) green fodder and dry fodder: sheep.
— — Holland, and Smith (1906): sheep.
— — and Smith (1911) fodder of several varieties: wethers.
Maine Station (1891) southern-corn fodder, ordinary field-corn fodder, and sweet-corn fodder: sheep.
Patterson, H. J. (1893) parts of corn fodder: steers. (1896a) fodder + wheat bran: steers. (1896b) fodder wet or dry, whole or shredded, ground fodder blades and shucks, shredded fodder + wheat bran, mixed grain + corn blades: steers.
Phelps (1898) sweet-corn fodder: sheep.
— — and Woods (1895) sweet-corn fodder: sheep.
Smith, P. H., and Lindsey (1911) whole plant of several varieties: sheep.
Weiser, S., and Zaitschev (1913): sheep.
Widtsoe (1898): steers.
Wisconsin Station (1893): cows.
Woll (1888a), (1889b): cows.

Corn germ

Bartlett (1900): sheep.
Boruttau (1912): men, laboratory animals.
Kalning (1917): sheep, swine.

Corn gluten

Fries (1922).

Corn meal

Armsby (1898): steers.
— — and Fries (1905), (1917): cattle.
— — — — and Braman (1916): steers.
Beach (1906): cows.
Brünnich and Rawson (1921): sheep.
Emery (1899) corn meal, corn meal + clover hay: goat.
— — and Kilgore (1904) corn meal, corn meal + crimson-clover hay: goat.
Fields and Ford (1900): fowl.
Frear (1886) corn meal + fodder, corn meal + fodder + cottonseed meal: steers.
(II. Digestion experiments)

Fries (1922).
Kaupp and Ivey (1922) bolted and unbolted: poultry.
Ladd (1888): cows.
Lindsey and Smith (1914): cattle.
McCullum and Brannon (1909) corn meal + corn stover + gluten meal (pentosans): cows.
McDowell (1906) (determinations included pentosans): steers.
Morse (1890) corn meal + skim milk, corn meal + middlings: pigs.
Patterson, H. J. (1897): horses.
Snyder, II. (1903) corn meal + alfalfa hay: steers.
Stone (1892) corn meal + wheat bran, wheat bran alone (pentosans): rabbits.

Corn oil
Holmes (1918): man.
Holmes and Deuel (1920-21) 'hardened' and commercial: man.
Holt, Courtney, and Fales (1919) in mixed diet: children.
Rockwood and Swickes (1918): dogs.

Corn proteins
Mendel and Fine (1911): dog.
Rockwood (1904) (zein): dog.

Corn shucks

Corn silage
Armsby (1892a): steers, sheep.
—— Frear, and Caldwell (1890): steers, sheep.
Emery (1899): cows.
—— and Kilgore (1892) cottonseed meal + corn silage: dairy cattle.
Ewing and Smith (1918) corn silage, corn silage + supplements: steers.
—— ——— and Smith (1917) corn silage + cottonseed meal: steers.
Fraps (1914): sheep. (1922a) (nutrients, carbohydrates, protein): sheep.
Frear (1890): sheep, steers.
Hopkins (1896): steers.
Irish (1890): cattle.
Jordan (1893a): sheep. (1894): sheep.
—— Bartlett, and Merrill (1889a): sheep.
Ladd (1890) silage from mature and immature corn: heifers.
Lindsey et al (1898b), (1902): sheep.
—— Holland, and Smith (1906): sheep.
(II. Digestion experiments)

Patterson, H. J. (1891): steers.
Tangl and Weiser (1911) silage from stover: sheep.
Weiser, S., and Zaitschek (1913): sheep.
Wisconsin Station (1893): cows.
Withycombe and Bradley (1908): cows.
Withycombe and Kinsely (1905): cows.
Woll (1888a), (1889b): cows.

Corn starch
Armsby (1898): steers.
Fries (1922).
Langworthy and Deuel (1920a), (1920b): man.

Corn stover
Hopkins (1900): steers.
Jordan and Jenter (1897): sheep.
Lindsey, Holland, and Smith (1906) two varieties of corn stover: sheep.
McCullum and Brannon (1909) corn stover + corn meal + gluten meal (pentosans): cows.
Patterson, H. J. (1891): steers.
Tangl and Weiser (1911): sheep.

Distillers' grains
——— Beals, and Smith (1917): sheep.
Risser (1904): sheep.

Distillery refuse
Lindsey, Smith, and Holland (1894): sheep.
Völtz, Dietrich, and Deutschland (1913): sheep.

Distillery slop
Honcamp and Gschwendner (1911): sheep.

Germ oil meal

Gluten feed
——— Beals, and Smith (1917): sheep.
——— and Holland (1894a), (1894b) (pentosans): sheep.
——— ——— and Smith (1906): sheep.
——— and Smith (1914): cattle.
——— ——— and Holland (1894): sheep.
Gluten meal

Jordan (1891): sheep.


—— Beals, and Smith (1917): sheep.

—— Smith, and Holland (1894): sheep.

McCollum and Brannon (1909) gluten meal + corn meal + stover (pentosans): cows.


Hominy chop

Lindsey et al (1904): sheep.

Hominy feed

Armsby and Fries (1917): cattle.

Lindsey et al (1904): sheep.

—— Holland, and Smith (1906): sheep.

Hominy meal

Lindsey (1903): sheep.

—— et al (1898b).

Human foods

Corn bread: Langworthy and Holmes (1916).

Corn-meal mush: Harcourt (1906), (1907); Iacoangeli and Bonanni (1897); Malfatti (1884); Merrill (1906); Panegrossi (1896); Rubner (1899).

Cornstarch pudding: Zentmire and Fowler (1917).

Force: Harcourt (1906), (1907).

Green corn: Bryant and Milner (1903).

Hulled corn: Merrill (1908).

“Maize cake”

Pommer (1921): sheep.

Maizena

Kellner and Honcamp (1907): sheep.

“New corn product”

Patterson, H. J. (1896b) new corn product wet or steamed, mixed grain + new corn product: steers. (1897) new corn product, mixed ration containing new corn product: horses.
III
Balance Experiments

Men
Baglioni (1913a) corn meal: N.
Panegrossi (1896) corn-meal foods: N.
Sherman, H. C. (1918a), (1918b) corn meal in mixed diet: N.
—— Gillett, and Osterberg (1920) corn meal, milk, and apple: N.
—— Wheeler, and Yates (1918) corn meal in mixed diet: N, Ca, P.
—— and Winters (1918) corn meal in mixed diet: N, Ca, P.
Spriggs and Weir (1917) corn bread in mixed diet: N.

Dairy cattle
Armsby (1898) corn meal + hay, cornstarch + hay: N.
—— and Fries (1905), (1907) corn meal + hay: N, C, H₂O, energy.
Forbes (1917a), (1917b) corn + supplements: mineral elements.
—— and Beegle (1916a) corn: mineral elements, N.
—— ——— Fritz, Morgan, and Ehue (1917) corn: mineral elements, N.
Gaessler and McCandlish (1923) Ca balance not affected by acid of corn silage.
Hagemann (1897) corn with roughage: ash, N.
Hart, E. B., and Humphrey (1914), (1915), (1916a), (1916b), (1917a), (1917b) ration of corn products only: N.
—— ——— (1918), (1919) mixed ration testing corn products: N.
—— ——— (1920) corn + corn silage and alfalfa hay: N (high-producing cows).
—— ——— (1921) corn + corn silage and alfalfa: N (high-producing cows).
—— ——— and Morrison (1914) ration of corn products only; also alfalfa + cornstarch: N.
Iowa Station (1922c) acids of corn silage do not influence Ca balance.
Ladd (1888) corn meal: N.
Larsen, Wright, Jones, Hoover, and Johnson (1920): N and others.
Meigs, Blatherwick, and Cary (1919) corn silage + alfalfa hay or grain, or both, with or without phosphate added: N, Ca, P.

Hogs
Forbes (1914) corn, corn + supplements: mineral elements.
—— Beegle, Fritz and Mensching (1914) corn or corn + supplements: mineral elements.
Hart, E. B., and Steenbock (1919a) corn + supplements: N.
—— ——— and Fuller (1914) corn + gluten feed + Ca compound: Ca, P.
—— ——— and Letcher (1920) corn meal + milk: N.
McCullum (1913), (1914) corn with different protein planes: N.
Snyder, H. (1903) corn or corn and shorts: N.
Steenbock, Nelson, and Hart (1914) corn meal, gluten feed, and tap water: Ca, P.
Weiser, S. (1912a) corn: mineral elements, N.
Wells, C. A., and Ewing (1916) gluten flour + starch and milk: N, S.
Zaitschek (1915?) exclusive corn ration: mineral elements.

¹Experiments in which the balance between the intake and the output of specific constituents was determined; i.e., the difference between the amount in the food and that in the urine and feces combined.
(III. Balance experiments)

Horses
Zuntz, Hagemann, et al (1898) corn: N, C.

Lambs
Ross, Keith, and Grindley (1915) corn, linseed meal, and alfalfa hay: different forms of phosphorus.

Laboratory animals
Baglioni (1913b) zein: N (rats).
——— (1915a) corn flour: N (rats).
Henriques (1909) zein: N (rats).
Mitchell and Villegas (1923) corn rations: N (rats).
Nevens (1921) corn rations: N (rats).
Nitzescu (1918) old and new corn: N (rats).
Schaumann (1914) corn: N, P, S, Ca, Mg (rabbits).

Birds
Hari and Kriwuscha (1918) corn: C, N, energy (ducks).
Kennard, Holder, and White (1922b) corn meal + soybean meal, and same + salts: N (chickens).
Nitzescu (1918) old and new corn: N (fowl).
Paraschtschu (1902) corn: nutrients (chickens).
Szalasy and Kriwuscha (1914b) corn or corn + amino acids: N, amino-acid N (ducks, hens).
——— (1918) corn: N (ducks, hens, geese).

IV
Energy Metabolism of Animals on Corn or Corn Products
Armsby (1905); Armsby and Fries (1905), (1915), (1916), (1917); Armsby, Fries, and Braman (1916); Armsby and Putney (1916); Hari and Kriwuscha (1918) (birds); Kellner, Köhler, Barnstein, Zielstorff, Lührig, and Mach (1900); Smith, P. H., and Lindsey (1911) (sheep).

V
Special Studies of Conditions Affecting the Nutritive Value of Corn
Curing
Gamble, W. P. (1905), (1906) fodder; Lindsey et al (1904) fodder.

Decortication
Weill and Mouriquand (1917).

Ensilage
Allison (1913); Archibald et al (1914), (1915); Armsby (1890); Armsby and Caldwell (1889a), (1889b); Cartyle (1900), (1901a); Cochel (1912); Cochel and Severson (1911); Cooke (1892c), (1896); Cooke and Hills (1891), (1892); Ellis, Steenbock, and Hart (1921) antiscorbutic value; Goessmann (1889), (1892a); Gulley and Carson (1890); Hart, E. B., Steenbock, and Ellis (1920)
(V. Conditions affecting the nutritive value of corn)

antiscorbutic vitamin: Henry (1887a), (1888a), (1893e); Hills (1889), (1890), (1894); Hunt, T. F. (1890); Johnson (1889); Jordan, Bartlett, and Merrill (1889a); Ladd (1890); Mairs (1907); Minnesota Station (1917); Mumford, H. W. (1902), (1906); Patrick and Smith (1889); Sanborn (1889b), (1891), (1892a), (1893); Short (1889); Smith, A. (1912); Smith, H. E. (1912); Soule and Fain (1905b), (1907); Tangl and Weiser (1911); Thorne and Hickman (1895); Tomhave and Hickman (1914); Voorhees and Lane (1897); Waters (1901b), (1907); Whitcher (1890a); Wilson, J., Curtiss, Kent, and Patrick (1891); Wilson, J., Patrick, Curtiss, Eaton, and Kent (1891); Wisconsin Station (1884); Wisconsin Station (1920m) effect on milk vitamin as compared with summer pasture; Woll (1888a), (1890), (1891).

Freezing before ensilage

Hills (1889), (1906); Wilson, J. W., and Thompson (1918).

Grinding

Connell (1889); Fain and Jarnagin (1907); Georgeson, Burtis, and Otis (1896); Georgeson, Burtis, and Shelton (1892); Guernsey and Evvard (1914); Henry (1887e), (1888b), (1888d), (1893a), (1896), (1897), (1898), (1899), (1900), (1901), (1902), (1903), (1904), (1905); Henry and Otis (1906), (1907); Hills (1896-97a); Kennedy and Marshall (1902e); King (1914); Mumford, H. W. (1905); Nourse (1891); (1901); Patterson, H. J. (1896b) fodder; Pennsylvania Station (1917a); Soule and Fain (1907); Soule, Fain, and Jarnagin (1907a), (1907b); Stabler (1911); Stewart and Atwood (1899); Stockbridge (1901); Tangl and Weiser (1913) corn-and-cob meal; Tomhave and Havner (1913-14a), (1915).

Heating

Carlson and Drennan (1912-13) sugar in urine of pigs after feeding on cooked corn meal, not after cracked corn; Henry (1885b) cooked with shorts; (1887d) cooked vs. uncooked; Higbee (1903) cooked vs. dry corn; Hogan (1917b) heated 6 hours at 30 lbs. pressure; (1890) cooked before ensilage; Montanari (1907); Petragnani (1921); Rammstedt (1913a) long boiling of corn; Tyn (1892) steamed corn; Weill and Mouriquand (1917) sterilized 1.5 hours at 120°.

Method of planting

Armsby (1891); Armsby, Frear, Caldwell, and Holter (1889); Kentucky Station (1919c) with soybeans.

Milling processes

Nightingale (1914); Voegtlin, Lake, and Myers (1918); Voegtlin and Myers (1918a), (1918b); Voegtlin, Sullivan, and Myers (1916); Wood, E. J. (1916).

Molding

Alsberg and Black (1913) toxic substances from spoiled corn; Bezzola (1907b); Bitting (1899); Dalrymple (1892); Gosia (1909); Gosia and Ferratti (1896); Haslam (1910); Mayo (1891), (1896); Peters, A. T. (1903); Peters, A. T., and Avery (1902); Quevedo (1912); Reed and Borber (1917); Rieveld
(V. Conditions affecting the nutritive value of corn)

(1916) spoiled corn; Rondini (1912) spoiled corn; Sheldon (1903); Singer, MacNeal, and Books (1911); Tiffany (1907); Tirelli (1895) spoiled corn; Volpino, G. (1914), (1918) spoiled corn; Volpino, G., et al (1912); Volpino, B., and Alpago-Novello (1914) spoiled corn meal; Wussow and Grindley (1911).

Smutted corn

Wilson, J. W., and Kuhlman (1922) for silage.

Soaking

Georgeson, Burtis, and Otis (1894); Guernsey and Euvard (1914); Hansson (1911); Kennedy and Robbins (1909); Morrow (1891); Müller (1885); Patterson, H. J. (1896b); Snyder, W. P. (1915); Snyder, W. P., and Burnett (1918); Soule, Fain, and Jarnagin (1907a); Stewart and Atwood (1899); Taylor, F. W. (1907-08a).

Stage of growth at the time of cutting

Armsby, Frear, Caldwell, and Holter (1889) fodder cut at different stages; Gennys (1906) corn-and-cob meal of immature corn; Harrow and Krasnow (1922) no vitamins formed by germination; Headden (1904) immature and mature fodder; Hills (1906) silage from immature and mature corn; Hunt, T. F., and Caldwell (1892) fodder cut at different stages; Jordan (1894) large immature southern corn and mature flint corn; Kennedy et al (1904) soft vs. matured corn; Ladd (1890) silage from mature and immature corn; McCampbell and Winchester (1921b) silage; Ohio Station (1922b) hogging down; Pennsylvania Station (1922d), (1923a) silage; Smith, P. H., and Lindsey (1911) several varieties grouped by stages of growth; Tiffany (1907) immature corn; White, Chapman, Slate, and Brown (1922) silage for cows; Wilson, J. W., and Kuhlman (1920) silage; Wilson, J. W., and Thompson (1918) silage from corn cut at different stages.

Storage

Kentucky Station (1922b); Nitzescu (1915a), (1918) new corn and corn one to three years old; Quick and Spencer (1908) new corn and hard, flinty corn.

Stover used for silage

Bohastdt (1922a), (1922b); Brown (1920), (1921b); Ewing and Wright (1918); Gayle and Lloyd (1917); Henry (1893c); Hills (1894); Hunt, E. E. (1921); Morrison, Humphrey, and Hulse (1920), (1921); Pennsylvania Station (1917a); Tangl and Weiser (1911); Waters (1907); Wisconsin Station (1920g) (cows); Woll (1892).

Supplements affecting the digestibility of corn

Ewing and Smith (1918); Ewing and Wells (1915); Ewing, Wells, and Smith (1917); Ewing and Wright (1918); Forbes (1917a); Forbes and Beogle (1916a); Forbes, Beogle, Fritz, and Mensching (1914); Forbes, Mangels, and Morgan (1917); Grindley, Carmichael, and Newlin (1917); Hart, E. B., and Steenbock (1919a); Jordan (1894); McCollum, Simmonds, and Parsons (1919a); Michael and Kennedy (1910); Mumford, H. W., Grindley, Hall, and Emmett (1914); Zaitschek (1908).
(V. Conditions affecting the nutritive value of corn)

Variety of corn

Armsby (1891) fodder; Armsby, Frear, Caldwell, and Holter (1889) fodder; Day (1897) fodder; Frear and Sweetser (1892) fodder; Hayden (1923) silage; Hayden and Perkins (1923) silage; Hays, W. M. (1894) ensiled; Hulce, Morrison, and Humphrey (1921) (calves); Illinois Station (1922b); Iowa Station (1922b) (swine); Jordan (1891) fodder, (1893a) fodder, (1893c) ensiled; Jordan, Bartlett, and Merrill (1889a) fodder; Lindsey, Holland, and Smith (1906) stover; Lindsey and Smith (1911) fodder; Maine Station (1891) fodder; Mitchell, Kendall, and Card (1923) vitamins of white and yellow corn; Morse (1902); Nebraska Station (1921c), (1922d); Paterson and Winchester (1922) white vs. yellow; Porter, E. D. (1889) ensiled; Sanborn (1889b) fodder, silage; Smith, P. H., and Lindsey (1911) fodder; Steenbock (1919); Steenbock and Boutwell (1920a) white, yellow, and red corn; Steenbock, Boutwell, and Kent (1920); White, Chapman, Slate, and Brown (1922) silage for cows; Wilson, J. W. (1914b) pasture; Wilson, J. W., and Kuhlman (1920) silage; Wisconsin Station (1922b) yellow vs. white corn for pigs, calves, chickens; (1923b) hatchability of hen eggs; (1923c), (1923d), (1923g) white vs. yellow corn.

Wind-scorching

Holter (1896).

See also Observations Bearing upon Specific Effects of the Chemical Composition of Corn, p. 142.

VI

Observations Bearing Upon Specific Effects of the Chemical Composition of Corn

Acidity of ash

Baglioni (1915b), (1915d); Blatherwick (1920); Forbes and Beegle (1916a); Forbes, Beegle, Fritz, Morgan, and Rhue (1917); Hart, E. B., McCollum, Steenbock, and Humphrey (1911); McDanell and Underhill (1917a), (1917b), (1917c), (1917d); Steenbock, Nelson, and Hart (1914); Underhill and Bogart (1916).

Calcium defect

Aron and Sebauer (1908); Euvard, Dox, and Guernsey (1914); Forbes, Beegle, Fritz, Morgan, and Rhue (1917); Goitein (1906); Hart, E. B., Halpin, and McCollum (1917); Hart, E. B., Halpin, and Steenbock (1917); Hart, E. B., and McCollum (1914a); Hart, E. B., Steenbock, and Fuller (1914); Hart, E. B., Steenbock, Hoppert, and Humphrey (1923-24) need of vitamin to favor the Ca assimilation for cows; Hogan (1917a); McCollum and Simmonds (1917a); McCollum, Simmonds, Becker, and Shipley (1922); Patterson, S. W. (1908); Schaumann (1914); Steenbock, Nelson, and Hart (1914); Weiser, S. (1912a), (1914); Wisconsin Station (1920l); Zaitschek (1915f).

Other mineral defect studies

Baglioni (1915); Dietrich (1908); Forbes (1914), (1917a); Forbes and Beegle (1916a); Forbes, Beegle, Fritz, Morgan, and Rhue (1917); Hart, E. B.,
(VI. Effects of chemical composition of corn)

Halpin, and Steenbock (1917); Hart, E. B., and McCollum (1914a), (1914b); Hart, E. B., McCollum, and Steenbock (1914); Hart, E. B., McCollum, Steenbock, and Humphrey (1917); Hart, E. B., and Steenbock (1919a), (1919b); Henry (1889), (1890a), (1890b), (1895a); Hogan (1916), (1917a); Hughes (1918); Kansas Station (1914); Kennard, Holder, and White (1922a), (1922b), (1923); McCollum and Simmonds (1917a), (1918a), (1918b); McCollum, Simmonds, and Parsons (1919e); McCollum, Simmonds, and Pitz (1916b), (1917b); McCollum, Simmonds, Shipley, and Park (1921); Musschl, Calvin, Halbersleben, and Sandstedt (1921) for young chicks; Osborne and Mendel (1920); Schaumann (1910), (1914); Voegtlin and Myers (1919).

Protein studies

(a) With zein as sole protein

Hart, E. B., Nelson, and Pitz (1918); Henriques (1909); McCollum (1909), (1911); Osborne (1913); Osborne and Mendel (1911), (1912a), (1912b), (1912c), (1913a), (1914a), (1914b), (1914c), (1915), (1916d), (1918b); Rockwood (1904); Szumowski (1902); Wheeler, E. (1913); Willcock and Hopkins (1906-07).

(b) With corn products as sole source of proteins

Albertoni and Tullio (1914); Bezzola (1907a); Chick and Hume (1920) pellagra-like symptoms; Fidanza (1914); Hart, E. B., Halpin, and Steenbock (1917); Hart, E. B., and Humphrey (1914), (1915), (1916a), (1916b), (1917a), (1917b), (1918), (1919); Hart, E. B., Humphrey, and Morrison (1914); Hart, E. B., McCollum, Steenbock, and Humphrey (1917); Hogan (1916), (1917a); Hughes (1918); Johns, Finks, and Paul (1920) gluten meal, gluten meal + whole yellow corn; Kansas Station (1914); McCollum (1913); McCollum and Simmonds (1917b), (1918b); McCollum, Simmonds, and Parsons (1919a), (1921b); McCollum, Simmonds, and Pitz (1916b), (1917a), (1917b); Maynard and Fronda (1921); Maynard, Fronda, and Chen (1923); Mitchell (1922) "net protein value"; Mitchell and Villegas (1923) "biological value of protein," "net protein content of corn"; Nevens (1921) utilization of proteins of corn for growth; Osborne and Mendel (1912a), (1912c), (1913b), (1914b), (1916b), (1918a); Schaumann (1910), (1914); Sherman, H. C. (1918a), (1918b); Sherman, H. C., and Winters (1918); Szumowski (1902); Thomas (1909).

(c) Addition of amino-acid or protein supplement to corn proteins

Albertoni and Tullio (1914); Ewvar, Daz, and Guernsey (1914); Hart, E. B., Halpin, and Steenbock (1917); Hart, E. B., Nelson, and Pitz (1918); Hart, E. B., and Steenbock (1919a); Hogan (1916), (1917a); Hughes (1918); Johns, Finks, and Paul (1920); Jones, D. B., Finks, and Johns (1923); Kansas Station (1914); McCollum (1916); McCollum and Simmonds (1917a), (1918a); McCollum, Simmonds, and Parsons (1919a), (1919c), (1921a), (1921b), (1921c), (1921d); McCollum, Simmonds, and Pitz (1916b), (1917a), (1917b); Maynard and Fronda (1921); Maynard, Fronda, and Chen (1923); Mitchell and Villegas (1923); Musschl, Calvin, Halbersleben, and Sandstedt (1921); Nevens (1921); Osborne (1913); Osborne and Mendel (1911), (1912a), (1912b), (1912c), (1913a), (1914a), (1914b), (1915), (1916a), (1916b), (1916c), (1916d), (1917), (1920); Schaumann (1910); Sherman, H. C., Gillett, and Osterberg (1920); Voegtlin and Myers (1919); Willcock and Hopkins (1906-07).
(VI. Effects of chemical composition of corn)

(d) Corn proteins as supplements to other proteins

McCollum, Simmonds, and Parsons (1919b); Sure (1920), (1921), (1922).

Vitamin studies

Chick and Hume (1917a), (1917b); Clementi (1916), (1917); Coward (1923) etiolated and green seedlings; Coward and Drummond (1921) etiolated and green seedlings; Drummond and Coward (1920) corn oil; Dutcher (1918) corn pollen; Ellis, Steenbock, and Hart (1921) silage; Emmett and McKim (1917); Funk and Dubin (1920); Green (1918a), (1918b), (1918c); Harrow and Krasnow (1922); Hart, E. B., Halpin, and Steenbock (1917): Hart, E. B., Halpin, Steenbock, Johnson, and Black (1922); Hart, E. B., and Steenbock (1919a); Hart, E. B., Steenbock, and Ellis (1920) silage; Hart, E. B., Steenbock, and Lepkowsky (1923-24); Hogan (1916), (1917b); Hughes (1918); Hulshoff (1910); Illinois Station (1922b); Indiana Station (1922b); Johns, Finks, and Paul (1920); Keith and Mitchell (1923); Kramer and Howland (1922) corn oil; Lamb and Eyward (1922); McCollum and Davis (1915); McCollum and Simmonds (1917a), (1918a); McCollum, Simmonds, Becker, and Shipley (1922); McCollum, Simmonds, and Parsons (1919e), (1921b); McCollum, Simmonds, and Pitz (1916a), (1916b), (1916c), (1917b); McCollum, Simmonds, Shipley, and Park (1921); Mallon and Clark (1922); Mitchell, Kendall, and Card (1923); Mussehl, Calvin, Halbersleben, and Sandstedt (1921); Osborne and Mendel (1920); Palmer, Kennedy, and Kempster (1921); Petrognani (1921) dry heating corn at 140° for four hours did not destroy the antineuritic vitamin. Heating with H₂O at 133.9° for two hours destroyed it; Schaumann (1910); Steenbock (1919); Steenbock and Boutwell (1920a), (1920b), (1920c) fat-soluble; Steenbock, Boutwell, and Kent (1920); Steenbock, Hart, Jones, and Black (1923-24); Steenbock, Sell, and Buell (1921); Steenbock, Sell, and Jones (1923); Steenbock, Sell, and Nelson (1923); Steenbock, Sell, Nelson, and Buell (1921) endosperm; Suárez (1916); Voegtlin, Lake, and Myers (1918); Voegtlin and Myers (1918a), (1918b), (1919), (1920); Voegtlin, Sullivan, and Myers (1916); Weill and Mouriquand (1917); Wellman and Bass (1913); Wisconsin Station (1920c), (1920d), (1922b), (1923b), (1923c), (1923d), (1923e), (1923g).

Pigment studies: comparisons of white and yellow corn

Coward (1923); Coward and Drummond (1921); Drummond and Coward (1920) corn oil; Hart, E. B., Halpin, Steenbock, Johnson, and Black (1922); Hart, E. B., Steenbock, and Lepkowsky (1923-24); Hayden and Perkins (1923) silage; Hulce, Morrison, and Humphrey (1921); Illinois Station (1922b); Iowa Station (1922b); Mitchell, Kendall, and Card (1923); Nebraska Station (1921a), (1921c), (1922d); Opperman and Waite (1911); Palmer (1915); Palmer and Coolege (1914); Palmer and Eckles (1914a), (1914b), (1914c), (1914e), (1914f), (1914g); Palmer and Kempster (1919a), (1919b), (1919e); Palmer, Kennedy, and Kempster (1921); Paterson and Winchester (1922); Steenbock and Boutwell (1920a), (1920b); Steenbock, Boutwell, and Kent (1920); Steenbock, Hart, Jones, and Black (1923-24); Steenbock, Sell, and Buell (1921); Steenbock, Sell, Nelson, and Buell (1921); Wisconsin Station (1920c), (1920d), (1922b), (1923a), (1923c), (1923d), (1923g).

Cellulose defect

Baglioni (1915b), (1915d).
VII
Observations on Specific Physiological and Anatomical Effects of Corn or Corn Products

Body lesions
Abderhalden (1919); Baglioni (1915b); Casa-Bianchi and Vallardi (1912); Pitz (1918); Rondoni (1919); Rondoni and Montagnani (1915); Tiffany (1907) unsound or moldy corn; Wisconsin Station (1923c), (1923d), (1923g).

Digestive disturbances
Baglioni (1915b), (1915d); Bezzola (1907b); Clementi (1916), (1917).

Effects on body resistance
Hunt, R. (1910); Tizzoni and Panichi (1907).

Effects on composition of parts of body
Aron and Sebauer (1908) bones; Blatherwick (1920) blood and urine (silage); Burkh and Ewing (1919) fat; Burnett (1906), (1908), (1910) bones; Carlyle and McConnell (1902) several parts; Eckles and Palmer (1916) fat (silage); Eckles, Palmer, and Swett (1917) fat (silage); Emmett and Grindley (1914) blood; Forbes (1909b) several parts (corn, corn + supplements); Forbes, Beegle, Fritz, Morgan, and Rhue (1915) several parts (corn, corn + supplements); Frear (1889) N of muscle; Hare (1910), (1913) fat; Hart, E. B., Halpin, Steenbock, Johnson, and Black (1922) P in blood serum; Hart, E. B., McCollum, Steenbock, and Humphrey (1911) several parts; Hart, E. B., Steenbock, and Fuller (1914) bones; Henriques and Hansen (1901) fat; Henry (1886c); (1888d) bones; (1889) several parts; (1890a) bones; (1890b), (1893a) several parts; Holst and Fröhlich (1912) bones; Joseph (1914) N in several parts (corn + supplements); Kennard, Holder, and White (1922b); Kentucky Station (1922a) fat; Kramer and Howland (1922) blood; Ladd (1888) fat and lean meat; Lemmermann and Linkh (1903) fat; Mallon and Clark (1922) vitamin A in lard; Mumford, H. W. (1903) several parts; Palmer and Eckles (1914b), (1914e), (1914f) pigment; (1914g) blood pigment; Popowitz (1908) lean, fat of hog; Rievel (1916) fat (spoiled corn); Sanborn (1893) several parts; Schaumann (1910), (1914) bones; Shelton and Cottrell (1889) several parts; Shutt (1901) fat; Steenbock, Hart, Jones, and Black (1923-24) Ca and P of blood and bones; Swanson (1921) (pigs); Templeton (1918) fat; Weill and Mouriquand (1918) bones; Weiser, S. (1914) bones; Williams, E. H., and Emmett (1914a) ash in several parts (corn + supplements); (1914b) P in several parts (corn + supplements); Wisconsin Station (1903) several parts; Zaitschek (1915f) bones.

Effects on metabolic processes
Baglioni (1915b), (1915d); Blatherwick (1920); Bushnell and Frey (1917); Forbes (1917a); Forbes and Beegle (1916a); Hart, E. B., Humphrey, and Morrison (1914); Hart, E. B., McCollum, Steenbock, and Humphrey (1911); Janney (1915); Kellner, Köhler, Barnstein, Zielstorff, Lührig, and Mach (1900); McCollum (1911); McDonell and Underhill (1917a), (1917b), (1917c), (1917d); Monaco (1916); Nitzesco (1915a); Rievel (1916); Steenbock, Nelson, and
(VII. Physiological and anatomical effects of corn)
Hart (1914); Tirelli (1895); Underhill and Bogart (1916); Zuntz, Hagemann, et al (1898).

Effects on nervous system
Clementi (1916), (1917); Koch and Vogtlin (1916); McCollum, Simmonds, and Parsons (1919a); Weill and Mouriquand (1917), (1918).

Effects on offspring
Abderhalden (1919); Ewvard (1913), (1914); Ewvard, Dox, and Guernsey (1914); Hacketdorn (1914); Hart, E. B., McCollum, and Steenbock (1914); Hart, E. B., McCollum, Steenbock, and Humphrey (1911), (1917), (1919); Hart, E. B., and Steenbock (1919b); McCollum and Simmonds (1918b); McCollum, Simmonds, and Parsons (1919a), (1919e); Skinner and Smith (1910).

Effects on the production or composition of milk
Forbes (1917a); Forbes and Beegle (1916a); Gamble, J. A., and Kelly (1922) effect of silage on flavor and odor of milk; Georgia Station (1922a); Hart, E. B., and Humphrey (1914), (1915), (1916a), (1916b), (1917a), (1917b), (1918), (1921); Hart, E. B., McCollum, Steenbock, and Humphrey (1911); Hart, E. B., Nelson, and Pitz (1918); Hart, E. B., Steenbock, and Ellis (1920) corn silage does not produce antiscorbutic vitamin in milk; McCollum and Simmonds (1918b) (human subjects); Palmer and Cooleedge (1914) pigment; Palmer and Crocket (1917); Palmer and Eekles (1914a), (1914e) pigment; (1914g) pigment and albumin; Schmeoeger and Neubert (1883); Wisconsin Station (1920m) silage does not supply antiscorbutic vitamin to milk; Zaitseck (1911) effect of corn oil.

See also Feeding Experiments on Dairy Cattle, p. 114.

Effect on reproductive powers
Abderhalden (1919); Bezzola (1907b); Buckner, Peter, Wilkins, and Hooper (1920) (chickens); Darlow (1922); Hart, E. B., Halpin, and McCollum (1917); Hart, E. B., Halpin, and Steenbock (1917); Hart, E. B., McCollum, Steenbock, and Humphrey (1911), (1917); Hart, E. B., and Steenbock (1919b); Hart, E. B., Steenbock, and Humphrey (1918); Hughes (1918); Illinois Station (1922b) (sows); McCollum, Simmonds, and Parsons (1919a), (1919e), (1921b), (1921c), (1921d); Pollard and Carr (1923-24) (hatchability of hen eggs); Robison (1919) (sows); Steenbock and Boutwell (1920a); Steenbock, Boutwell, and Kent (1920); Steenbock, Nelson, and Hart (1914); Wisconsin Station (1923b).

Growth and weight observations
Abderhalden (1919); Baglioni (1913a), (1913b), (1915a), (1915b); Bezzola (1909); Boruttan (1912); Buckner, Peter, Wilkins, and Hooper (1920) (chickens); Bushnell and Frey (1917); Carlyle and McConnell (1902); Carlson, Hektotn, and LeCount (1916) (commercial glucose); Forbes (1909b), (1917a); Forbes and Beegle (1916a); Forbes, Beegle, Fritz, and Mensching (1914); Forbes, Beegle, Fritz, Morgan, and Rhue (1915); Galmozzi (1920); Hart, E. B., Halpin, and McCollum (1917); Hart, E. B., Halpin, and Steenbock (1917); Hart, E. B., Humphrey, and Morrison (1914); Hart, E. B., and McCollum (1914a), (1914b); Hart, E. B., McCollum, Steenbock, and Humphrey (1917);
(VII. Physiological and anatomical effects of corn)

Hart, E. B., Steenbock, and Humphrey (1918); Hart, E. B., Steenbock, and Lepkovsky (1923-24); Henry (1889), (1890a), (1890b); Hogan (1916), (1917a), (1917b); Hughes (1918); Illinois Station (1922b) (pigs); Kansas Station (1914); Kellner and Köhler, (1900); Kellner, Köhler, Barnstein, Zielstorff, Lührig, and Mach (1900); Kellner, Köhler, Zielstorff, Herring, Ewert, and Lehmann (1900); Luckesch (1908); McCollum (1914), (1916); McCollum and Davis (1915); McCollum and Simmonds (1917b); McCollum, Simmonds, and Parsons (1919a), (1919b), (1919c), (1921a), (1921b), (1921c), (1921d); McCollum, Simmonds, and Pitz (1916a), (1916b), (1917); Maynard and Fronda (1921); Maynard, Fronda, and Chen (1923); Mitchell, Kellner, and Card (1923) (chickens); Musschel, Calvin, Halbersleben, and Sandstedt (1921) (chickens); Osborne (1913); Osborne and Mendel (1911), (1912a), (1912b), (1912c), (1913a), (1913b), (1914a), (1914b), (1915), (1916a), (1916b), (1916c), (1917); Pitz (1918); Schaumann (1910), (1914); Steenbock and Boutwell (1920a); Steenbock, Boutwell, and Kent (1920); Steenbock, Nelson, and Hart (1914); Voegtlín and Myers (1919); Willcock and Hopkins (1906-07); Wisconsin Station (1923c).

See also Feeding Experiments, p. 109.

Length-of-life observations

Abderhalden (1919); Baglioni (1915b); Burns (1917); Hughes (1918); Luckesch (1908); Pitz (1918); Weill and Mouriquand (1917); Wheeler, R. (1913); Willcock and Hopkins (1906-07).

Pellagra studies

Albertoni and Tullio (1914); Alessandrini, Giannelli, and Fileni (1913); Bass (1911); Carbone and Cazzamalli (1914); Centaneri and Galassi (1913a), (1913b); Chick and Hume (1920); Gay and McEvor (1922) photodynamic action; Goldberger, Wheeler, and Sydenstricker; (1920) statistics of pellagrous districts; Hirschfelder (1911); Koch and Voegtlín (1916); Küle (1918); Lavinder (1911); Nicholls (1913); Nightingale (1914); Nitzesco (1914), (1915a), (1915b); Popovici-Lupa (1905); Raubitschek (1911); Rondoni (1911), (1912), (1915); Rondoni and Montagnani (1915); Ruhl (1915); Siler and Garrison (1913); Siler, Garrison, and McNeal (1914); Sudres (1916); Singer, MacNeal, and Kooks (1911); Sundwall (1917); Voegtlín, Sullivan, and Myers (1916); Tirelli (1895); Tizzoni and Panichi (1907); Volpino, B., and AlipagNovello (1914); Volpino, G. (1914), (1918); Volpino, G., et al (1912); Wood, E. J. (1916); Wussow and Grindley (1911).

Toxic effects

Alsberg and Black (1913) substances isolated from spoiled corn; Aviragnet (1910); Baglioni (1908), (1915c); Bass (1911); Beaumont (1909); Bezzola (1907b), (1909); Carbone and Cazzamalli (1914); Casa-Bianchi and Vollardi (1912); Gosio and Ferrari (1896); Graham, E. (1918) silage; Graham, R., Breececker, and Pontius (1917) silage; Kentucky Station (1922) corn, corn stover, spoiled canned goods; Luckesch (1908); Luxardo (1883) toxic base isolated from sound corn grain; Mayo (1891), (1896); Moore, V. A. (1896); Nicholls (1913); Nitzesco (1915b); Peters (1898); Peters and Avery (1902); Price, T. M. (1904); Rusk and Grindley (1918); de Schweinitz (1896); Tiffany (1907) unsound or moldy corn; Underhill (1903) proteoses of zein; Wisconsin Station (1923k) corn silage poisons horses; Wussow and Grindley (1911) sound and moldy corn.
(VII. Physiological and anatomical effects of corn)

Other physiological and anatomical effects

Ashbrook (1917) slaughter condition.
Belonowsky (1907) intestinal flora of white mice.
Bushnell and Frey (1917) intestinal flora of pigs.
Carlson and Drennan (1912-13) sugar tolerance of pigs after cooked corn meal and after cracked corn.

—— Hektoen, and Le Count (1916) effects of commercial glucose in white rats.
Carmichael and Hammond (1912) relative weights of parts of body.
Casa-Bianchi (1912), (1914) sensitiveness to corn extracts.
Ellis, Steenbock, and Hart (1921) corn silage does not protect against scurvy.
Emmett and Allen (1919) tadpole development on corn-gluten ration.

—— and Grindley (1914) weights, measurements, and appearance of all parts of body (corn + supplements).
Forbes, Beege, Fritz, and Mensching (1914) relative weights of parts of body (corn, corn + supplements).

—— ——— Morgan, and Rhue (1915) relative weights of parts of body, blood count, catalase, and quality of fat and of meat (corn, corn + supplements).

Good (1917a) residual effect of winter silage.
Haney, Elling, and Heldor (1906) relative weights of parts of body (corn + supplements).
Hart, E. B., Halpin, Steenbock, Johnson, and Black (1922) leg weakness in chicks on white-corn ration.

—— Steenbock, and Lepkovsky (1923-24) leg weakness in chicks on white-corn ration.

Henry (1888d) weights of parts of body and strength of bones (corn + supplements).

Herter (1910) intestinal flora of monkeys.
Hills (1901-02) effects of germ oil meal and of gluten meal on butter constants.
Holst and Fröligh (1912) microscopical appearance of tissues in scurvy caused by one-sided corn diet.

Illinois Station (1922b) white corn + tankage inadequate for exercising rats.
Indiana Station (1922b) leg weakness of chicks.
Keith and Mitchell (1923) white corn + tankage inadequate for exercising rats.
Kellner, Köhler, Barnstein, Zielstorff, Lührig, and Mach (1900) various computations on metabolism, gas, and energy.
Kennedy and Marshall (1902e) relative weights of parts of body (corn + supplements).

Lindsey (1907) effect of corn gluten, corn oil, and corn meal on composition and consistency of butter.

—— et al (1904) effects of gluten meal, gluten meal + corn oil, and corn meal on the composition of milk and butter fat and the consistency of the butter.

Lucksch (1908) falling out of hair, catarrh of the intestines, enlargement of the adrenals, and paralysis of the hind legs.

McCollum, Simmonds, Becker, and Shipley (1922) xerophthalmia and rickets.
—— ——— Shipley, and Park (1921) rickets in rats.
Mitchell, Kendall, and Card (1923) leg weakness in chickens.

Morse (1892) effects of corn meal, gluten meal, and corn oil on butter constants.

Mumford, H. W. (1903) weight of parts of body (corn + supplements).
Opperman and Waite (1911) yellow corn gives color to the egg yolk of hens; white corn does not.
(VII. Physiological and anatomical effects of corn)

Osborne and Mendel (1914c) bacteria in feces (rats).
Palmer (1915) xanthophyll of yellow corn is found in blood serum, egg yolk, and body fat of hens.
—— and Kempster (1919a), (1919b), (1919c) color of skin, fat, and egg yolk of hens is affected by color of corn; fecundity and growth are not.
Rettger and Horton (1914) intestinal flora of white rats after zein ration.
Rievel (1916) appearance and character of the fat (spoiled corn).
Robison (1917) relative weight of parts of body (corn, corn + supplements).
Kondori (1919) various histological changes in the organs of guinea pigs.
Sammis (1917) effect of silage on quality of Swiss cheese.
Shelton and Cottrell (1889) weight of parts of body, character of meat, and strength of bones (corn + supplements).
Steenbock, Boutwell, and Kent (1920) xerophthalmia.
—— Hart, Jones, and Black (1923-24) rickets on white-corn ration.
Szalágyi and Kriwuscha (1914a) composition and properties of urine of ducks and hens on corn alone.
White and Kuclling (1919) silage causes scouring in very young calves.

VIII

Other Types of Studies with Animals

Buell (1919a) blood regeneration when on corn-meal diet (pigs).
—— (1919b) forms of N excretion when on corn-meal or cornstarch diet and effect of hemorrhage on same (pigs).
Eckles, Palmer, and Swett (1917) cause of the effect of corn silage when fed with cottonseed meal for milk production.
Ewing and Wright (1918) physical changes of silage in the digestive tract of steers and time of passage thru the digestive tract.
Forbes, Mangels, and Morgan (1917) metabolic nitrogen from corn and from corn + supplements (pigs).
Janney (1915) glucose forms from zein in the phlorhizinized dog.
Ritter (1908) corn oil in treatment of tuberculosis.
Rondoni (1915) adrenaline, thyroid tablets, and other substances were tested for their power to counteract the effects of corn.
Sanssum and Woodyatt (1916) utilization of commercial glucose by phlorhizinized dogs.
Scheuert and Grimmer (1908) progress of digestion and absorption of corn in horses.
Shaw, R. S., and Norton (1906) whole grain recovered whole in the feces of cattle.
Szumowski (1902) examination of organs of birds and of dogs for zein after zein ingestion; also injection of zein solutions and examination for storage or excretion.
Underhill and Hendrix (1915) injection of zeoses.
Wells and Osborne (1911) anaphylactic effect of zein injection.
SECTION III—SELECTED BOOKS, PAMPHLETS, AND GENERAL ARTICLES

Armsby and Putney (1916). Tables compiled on the basis of Henry and Morrison's values: net energy values, digestible proteins and nonproteins. Net energy value for ruminants, including corn fodder in different stages, corn stover, silage from corn in various conditions, corn grain, corn-and-cob meal, corn meal, hominy feed, gluten feed, gluten meal.

Bowman (1915). Brief discussions on many topics, with some data and references.

Burtt-Davy (1912). Discussion of preparation and value of all kinds of stock feeds made from corn or corn products.  
——— (1914). Comprehensive discussion, with data and bibliography.  
——— (1922). An extensive compilation of information on the various uses which can be made of the parts of the corn plant.

Chamberlain (1909). Collected and summarized analyses of corn grain from Bureau of Chemistry; also "digestible nutrients," "production value," and "nutritive ratio" computed by use of Kellner's factors.

Henry and Morrison (1923). Includes discussions of many phases of the composition and nutritive value of corn and corn products and compilations of data.

Holland and Smith (1901). Compilations of analyses and digestion coefficients, including corn fodder, silage, fresh stover, very dry stover, gluten meals, gluten feeds, germ oil meal, dried distillers' grains, corn meal, corn-and-cob meal, corn cobs, cerealine.

Hunt, T. F. (1904). Discussion mainly from agronomist point of view. Large section on maize, with some references.

Jenkins and Winton (1892). Compilation of proximate analyses.

Jordan (1894-95). Summary of digestion coefficients as determined in American experiment stations, including sixty-three trials with corn.  
——— and Hall (1900). Summary of digestion coefficients as determined in American experiment stations up to the close of 1898, classified (a) by stations, (b) by animals and feeding stuffs used, (c) by consideration of factors affecting digestibility.

——— and Wheeler (1907). Summary of work done at the New York (Geneva) Station during twenty-five years, including conclusions reached with regard to corn as a feeding stuff.

Kiesselbach (1915). Résumé of experiment station work on the value and use of silage. A bibliography of literature on silos and silage is included.


Lindsey (1893b), (1894), (1895). Compilations of digestion experiments made in the United States with ruminants and with swine, showing in each case the maximum, minimum, and average coefficients obtained.

——— and Hunting (1901). Compilation of digestion experiments with ruminants, swine, horses, and poultry.

——— and Smith (1905), (1910). Compilations of digestion experiments made in the United States with ruminants, swine, horses, and poultry.

For titles and references to these publications, refer by author and date to Section I.
McBryde (1896). Compilation of analyses and of digestion experiments with ruminants and swine.

Osborne (1910). Extensive and detailed review of the subject of plant proteins, including those of corn, on the basis of literature in all languages.

Rammstedt (1913). Chemical Abstracts says: "A complete review of the literature on maize and corn meal as a food, including analyses." (German)

Sievers (1920). Discussion of production of corn oil as by-product in various industries in U. S.

—— (1922a). Includes review of the literature of the processes of extraction and purification of corn oils and the physical and chemical constants of the oils.

United States Department of Agriculture (1923). Deals with the value of corn as a human food and gives practical suggestions and recipes for using corn preparations in a variety of ways.

Wiley (1898). Chiefly a compilation of work done by the U. S. Dept. Agr., Division of Chemistry, on the composition of corn and its parts, the manufacture of corn products and by-products, and feeding tests.

—— et al (1898). Summaries of various compilations of analyses of corn and corn products, as well as of other cereals.


