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DECEMBER, 1907.

New York Agricultural Experiment Station.

GENEVA, N. Y.

DIRECTORS' REPORT FOR 1907.

W. H. JORDAN.

PUBLISHED BY THE STATION.
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Address all correspondence, not to individual members of the staff, but to
the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.
The Bulletins published by the Station will be sent free to any farmer
applying for them.

* Riverhead, N. Y.
† Absent on leave.
BULLETIN No. 295.

DIRECTOR'S REPORT FOR 1907.

To the Honorable Board of Control of the New York Agricultural Experiment Station:

GENTLEMEN: I have the honor to submit for your consideration the report of this institution for the year 1907. In this report I have endeavored to set forth the important facts relating to the existing status of the Station, its policy, its needs for maintenance and progress, and a review of the principal facts and conclusions published in the bulletins of the year.

ADMINISTRATION.

STAFF.

Several appointments have been made to the staff during 1907.

John G. Grossenbacher, Ph. B., A. B., a graduate of the University of Missouri and during the year 1906-7 a fellow in Harvard University, was appointed as Assistant Botanist with especial reference to plant pathology, to fill the position vacated in 1906 by Mr. H. J. Eustace.

Maxwell J. Dorsey, B. S., a graduate of the Michigan Agricultural College and for the year 1906-7 an instructor in Horticulture at the University of Maine, was appointed Assistant Horticulturist.

The following gentlemen were elected to the position of Assistant Chemist:

Morgan P. Sweeney, A. M., and James T. Cusick, B. S., graduates of Colgate University, the former having pursued a year's post-graduate work at the same institution in 1906-7; Otto McCreary, a graduate of the University of Michigan, and Percy W. Flint, a graduate of South Carolina College and at the time of his appointment an assistant chemist in the Pennsylvania State College Experiment Station. Mr. Flint has since resigned in order to take up further studies at the University of Illinois.
MAINTENANCE FUNDS.

The maintenance funds appropriated by the Legislature of 1907 for the use of the Station during the fiscal year 1907-8 were the same amounts that were available during the year 1906-7, as follows:

Salaries .......................................................... $28,000
Labor .............................................................. 13,000
Expenses of various departments of research ............... 20,000
General expense, heat, light, water, apparatus, repairs,
&c. .................................................................. 4,000
Horticultural investigations ..................................... 8,000
Fertilizer inspection ............................................... 10,000
Feeding stuffs inspection ....................................... 3,500

In accordance with a recent action of your Board, the following are the sums that the coming Legislature is to be asked to appropriate for the maintenance of the Station during the fiscal year 1908-9:

Salaries .......................................................... $33,000
Labor .............................................................. 14,000
Maintenance expenses of departments of research ...... 20,000
Horticultural investigations ..................................... 8,000
General expense, heat, light, water, apparatus, repairs,
&c. .................................................................. 4,000
Fertilizer inspection ............................................... 10,000
Feeding stuff inspection ....................................... 3,500

THE MAILING LIST.

Early in the year the number of names listed to receive our bulletins and other publications aggregated approximately 44,900. A recent revision of the list for the purpose of removing from it the names of persons who had died or changed their place of residence, reduced the above number to about 43,200, a decrease of 1,700. It should be said that no additions are made to our mailing list except the names of those persons who express a desire to receive our publications. These are free to all the citizens of the State who ask for them. It is assumed that
a bulletin will be of little benefit to a person who makes no effort to secure it.

The belief seems to be somewhat prevalent that the Station bulletins are issued monthly or at certain regular intervals during the year. Such is not the case. Bulletins are published only as fast as results are reached that are deemed of sufficient importance to print. The number ranges from twelve to twenty per year. Often the statement comes to us by letter "Why is my name removed from your mailing list? I have received no bulletins for three months." No name is ever discontinued except by request or because of some other necessary cause, such as death or change of residence.

The following is a summary of the list as it now stands:

**Popular Bulletins.**

<table>
<thead>
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<th>Category</th>
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<tr>
<td>Residents of New York</td>
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<tr>
<td>Residents of other states</td>
<td>2,540</td>
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<tr>
<td>Newspapers</td>
<td>776</td>
</tr>
<tr>
<td>Experiment stations and their staffs</td>
<td>1,305</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>115</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39,536</strong></td>
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</tbody>
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**Complete Bulletins.**

<table>
<thead>
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<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment stations and their staffs</td>
<td>1,305</td>
</tr>
<tr>
<td>Libraries, scientists, etc.</td>
<td>184</td>
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<tr>
<td>Foreign list</td>
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<td>Individuals</td>
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<tr>
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</table>

**The Twenty-Fifth Anniversary of the Station's Establishment.**

On August 29th, 1907, exercises were very successfully held on the Station grounds celebrating the twenty-fifth anniversary of the Station's establishment. The institution was honored by the presence of the Chief Executive of the State, Governor Charles Evans Hughes, and other distinguished guests.

Addresses were made by Hon. A. P. Rose, Mayor of Geneva, Governor Hughes, Congressman Sereno E. Payne, Senator John Raines, President William Oxley Thompson of the Ohio State
University, Hon. George L. Flanders of the State Department of Agriculture, Dr. L. H. Bailey, Director of the New York State College of Agriculture, Hon. F. N. Godfrey, Master of the New York State Grange, and Hon. J. A. Woodward, a member of the first Board of Control of the Station. Approximately 3,500 persons gathered to listen to the addresses. The day was fine and the spirit of the occasion was all that could be desired. The pleasures of the day were enhanced by the presence of some of the early members of the Station staff who have attained distinction, notably Dr. S. M. Babcock of the University of Wisconsin, Dr. J. A. Arthur of Purdue University, and Prof. H. H. Wing of Cornell University. The officers and friends of the Station are under great obligations to the Mayor and citizens of Geneva and especially to Capt. Stacey and the military company under his command, for their kind co-operation in making the celebration a success. Especial thanks should be tendered to the Governor of the State and to the other speakers, who gave inspiring and helpful addresses.

ADDITIONS TO THE BUILDING EQUIPMENT.

_Dwelling houses._—The Legislatures of 1906 and 1907 made appropriations for new dwelling houses, an electrical lighting plant and other minor construction at the Station. The appropriation for 1906 was for two houses. When it became probable that additional houses would be provided for in 1907, it was decided to wait and carry on the construction under one contract. After the 1907 appropriation was secured, the State Architect kindly hastened the plans and bids were invited for the construction of the five houses, so that, if the bids had been satisfactory, their erection could have been begun late in September. Unfortunately the bids greatly exceeded the funds available and as the plans agreed upon by your Board called for houses as inexpensive as in your judgment should be built, it was decided to suspend operations and present the situation to the Legislature of 1908. In order to erect the five structures as planned, $10,000 additional should be provided. It is not asked that elaborate or ornate dwellings shall be erected but it is deemed essential that they shall be substantially built and
shall be of modern construction and equipment. Anything less than this would not be creditable to a State institution.

*Lighting and motor plant.*—Construction has not yet begun on the electrical equipment authorized by the Legislature of 1907, but it is hoped that specifications will be received from the State Architect so that the plant can be installed in the early spring.

*An auditorium.*—My report to you for 1906 contained the following statements: "So far in its history the Station has suffered the disadvantage quite unusual to institutions of this class, of not having on its grounds an auditorium where audiences of any considerable size can meet. Such assemblages as have met with us have held their sessions either in the open air, or as was the case on one occasion, under a large tent. This fact has placed limitations upon our relations to the public and in view of the enlarging responsibilities of the institution constitutes a disadvantage that is increasingly evident. There are several agricultural organizations in the State that would meet with us occasionally and probably some would be glad to make our grounds a permanent meeting place. The means are few by which we could more effectively bring the public into an intelligent touch with our work. This is true not only of agriculture but of the educational efforts of the schools to which, I believe this Station will in time come to sustain much closer relations."

The Legislature of last winter was asked to appropriate sufficient money to build an auditorium but the request was not granted. The reasons why such a structure should find a place on the Station grounds still exist and it is gratifying to know that your Board is not to cease its endeavors to secure this addition to our building equipment.

*The function of the Station.*—The question of the work the Station should undertake to do is an ever recurring one. Theoretically its primary office is to establish facts and principles that shall serve as a safe guide for conducting and developing agricultural practice. The effort cannot stop with this, however. It is equally the duty of such an institution to suggest new applications of knowledge, verify conclusions in their
relations to agricultural practice, and disseminate the results of its investigations. All this the Station does in some measure. It must be confessed, however, that its efforts are not as closely confined to its real function as is essential to maximum efficiency. This is a time of the strenuous exploitation of agricultural knowledge and the agricultural public is demanding,—an attitude that has been assiduously cultivated by the leaders of agriculture,—that those connected with agricultural institutions shall be almost constantly acting as popular teachers, a service that is undoubtedly productive of great good. The experiences of the past year make it clear, however, that because of the continuous demands made on the members of the Station staff for speaking and exhibition work of an educational character, the management of the Station will find it necessary to determine just how far the institution shall be allowed to depart from the real purpose for which it was organized. It is very certain that the members of the staff cannot successfully carry on important investigations and experiments unless they can give to such work their uninterrupted attention through a large portion of the year, a fact that is not fully appreciated by those without experience in studying scientific problems. It cannot be truly said that popular teaching is more important than the discovery of facts and principles, for indeed there could be no teaching without knowledge and no well established knowledge without careful and severe inquiry.

It needs but a glance at the progress of agriculture in the United States during the past twenty-five years to show that nothing has so powerfully promoted it as a few important discoveries. The experiment station workers who have established truths of general agricultural importance stand in the forefront of the benefactors of agriculture. So long, then, as so many important problems are not solved and the experiment station is the recognized research agency for each state, why should it assume the functions of the college or the school and become largely an agency for popular education? In this connection I take the liberty of referring to the remarks I made at the time of our twenty-fifth year celebration which are to be printed elsewhere. Twenty-sixth Annual Report of this Station, 1907.
Requests for service of special kinds.—There come to the Station each year numerous requests for services of special kinds, such as the analysis of soil, drinking water, samples of feeds, fertilizers, seeds, milk, vinegar, mineral substances, stomachs of animals supposed to be poisoned, etc. Many persons evidently suppose that it is the rightful business of the Station to analyze anything that may be sent to it. These persons do not understand that to comply with these requests in an indiscriminate way would largely waste the funds of the Station and the time of its staff. The Station must necessarily hold itself pretty closely to activities that serve the interests of its constituents in a more or less general way.

The following explanations are offered with the hope that they will clear up misunderstandings in several directions.

Many requests come to us from manufacturers of fertilizers and feeds and dealers in the same, for analysis of the products they manufacture or sell. In many cases there is expressed a willingness to pay for the service. The answer to these requests is that the Station does no commercial work and under no conditions whatever can it assume the burden of the chemical or other expert work of the trades.

Frequently farmers mail us samples of feeds or fertilizers, asking for an analysis. In most cases these are samples of brands that are inspected by the State and it is unwise to duplicate work, especially when samples sent by consumers are liable, because of inexperience in sampling, not to represent fairly the goods from which they are taken. Users of feeds and fertilizers should utilize the official reports as a guide to the character of these materials. It would be impossible to make special analyses for each farmer in the State, but what is granted in one case cannot rightfully be refused in another.

It is often possible by the mere physical inspection of a sample of feed for us to determine what are the materials out of which it is made. This sort of an examination consumes little time and it can often be made the basis of useful advice to a prospective buyer. Such examinations we are glad to make.

It should be stated, however, that when an association of
farmers makes a contract for the purchase of a large lot of feed or fertilizer on the basis of a guaranteed composition, the Station is always willing to make free analyses to determine whether the goods are according to the guarantee. This we have done in many cases.

Many samples of water are sent to us that we may determine their sanitary quality. Examinations of this kind are not undertaken by the Station as they properly belong to the State Board of Health, which is located at Albany.

Inquiries are frequently received by us as to the purity of samples of seeds. Such inquiries can be answered with comparatively little effort and our replies often serve to warn the farmers of a community against injurious adulterations, such as dodder and trefoil in alfalfa seed.

Requests are not infrequently received at the Station to have some member of the staff visit a particular farm or orchard or other agricultural operation in order to give expert advice as to the business management that should be followed. Such requests are made in good faith and with the best of motives and are a gratifying evidence of confidence in the Station, but they show something of a misconception of the kind of aid the institution can render to farmers. The Station staff is not made up of expert farm managers but of scientific specialists who are studying specific problems that are important to agriculture. To illustrate, the botanists study plant diseases and their remedies; the bacteriologists investigate soil and dairy conditions that involve the action of germ life; the entomologists inquire into the life history of injurious insects and the methods for preventing their ravages; the horticulturists deal with such questions as plant breeding, orchard culture, and varieties of fruit, and the chemists and other members of the staff take up questions relating to plant and animal nutrition, dairy methods, barn sanitation and poultry production. All this effort is largely in the direction of seeking new knowledge, which, when obtained, we endeavor to adjust to agricultural practice. We do not endeavor to adjust all knowledge, experience and business conditions to the management of a given farm, for this is the owner's problem and for us to take
it out of his hands, even if it were possible, would do him more harm than good. We can and do give advice freely on specific points connected with farm management when the questions involved are definitely brought before us.

*The Station publications as a source of information.*—Modern agricultural literature may be divided in a general way into two classes, first that which is placed on the market by publishing houses and is largely the literature of compilation with a view to a comprehensive discussion of the subject under consideration, and second the literature issued in their official capacity by members of government departments and experiment stations. Without desiring to criticize policies that may prevail elsewhere, I wish to express the conviction that an experiment station endowed for the maintenance of research, cannot wisely act as a bureau of compilation to prepare and publish books on all sorts of agricultural subjects. It is often necessary, to be sure, to do more or less compiling in order to adjust existing information with results obtained at the Station. Such organization of knowledge on a given subject is legitimate to an investigating agency and even necessary. There is a broad difference, however, between an exhaustive treatise on the growing of corn or potatoes or any other crop and a bulletin setting forth the results of an investigation on the stage of growth of corn that yields the most nutritive value, or on the influence of seed selection on the amount and character of the product. It is the belief of the writer that when a station has set forth the results of its work in a clear manner and their relation to pre-existing knowledge accompanied by sufficient demonstration of the relation to practice, it has fulfilled its duty to the agricultural public. These explanations are made because my office is in almost constant receipt of requests for agricultural literature of the most general kind covering all phases of farm methods and management. Such requests cannot be met. Our bulletins are free to all who ask for them and we take pleasure in answering specific inquiries up to the limit of our time and knowledge.

*The Grapes of New York.*—In accordance with a previous announcement, copy for a volume to be known as the Grapes
of New York will be submitted as a part of our annual report for 1907. It is hoped that the Legislature will provide for printing of this part of our report more than the usual number of copies.

The Graduate School of Agriculture.—In my report for 1906 it was stated that the Graduate School of Agriculture had been invited to hold its 1908 session in New York under the joint auspices of the New York State College of Agriculture and this institution. That invitation was accepted by the Association of Agricultural Colleges and Experiment Stations and plans are now being perfected for holding the school during the month of July, 1908. A good share of the work done at this school relates to experiment station aims and methods, which justifies the support our stations give to such an effort.

INVESTIGATION.

The following paragraphs are not intended to summarize the activities of any of the Station departments during 1907. They present only the outlines and conclusions of experiments reported in the bulletins of the year.

DEPARTMENT OF BACTERIOLOGY.

Chloroform as an aid in the study of milk enzymes.—Among the factors which combine to produce the ripening of cheese there is none more difficult of study than the enzymes which are secreted with the milk. Any results in this field are open to question unless it can be shown that the activity of bacteria has been suppressed during the period of study.

The adaptability of chloroform for this purpose has been studied. It was found that fat and proteid each associate with chloroform in such a way as to take it out of the general solution. When there was present an excess above the requirements of these two components of the milk the germicidal action of the chloroform was prompt and satisfactory.

DEPARTMENT OF BOTANY.

Potato spraying experiments.—During the season of 1906 the potato spraying experiments begun in 1902 were continued along practically the same lines as in previous years. In the
ten-year experiment at Geneva five sprayings increased the yield 63 bu. per acre, while three sprayings increased it 31.75 bu. In the duplicate of this experiment at Riverhead, Long Island, the gain due to five sprayings was 53.25 bu. per acre and to three sprayings 21.5 bu. In fifteen farmers' business experiments, including 225.6 acres, the average gain due to spraying was 42.6 bu. per acre; the average total cost of spraying $5.18 per acre; and the average net profit, $13.89 per acre. Sixty-two volunteer experimenters, spraying 598 acres, reported gains averaging 44.5 bu. per acre.

One-half the time during which this series of experiments is expected to run has now passed. Thus far the results are highly favorable to the practice of spraying. In the ten-year experiments at Geneva, the average gain for five years from spraying every two weeks has been 132 bu. to the acre, and from spraying three times during the season 103.3 bu.; at Riverhead the corresponding gains have been less, but still decided, being 66.3 bu. and 35.3 bu. respectively.

In 48 business experiments made in four years the average gain due to spraying has been 52 bu. to the acre, the average total expense of spraying, $4.85 per acre, and the average net profit from spraying $20.51 per acre. In 153 volunteer experiments reported in three years the average gain from spraying was 58 bu. to the acre.

DEPARTMENT OF CHEMISTRY.

*Effect of treating milk with carbon dioxide under pressure.*—In connection with some work done in making kumiss from cows' milk, it was learned that carbon dioxide gas under pressure has the power of delaying the souring of milk. The suggestion thus obtained was utilized in studying the effect of treating milk with carbon dioxide under pressure, the milk being carbonated in precisely the same way that soda water is made. Fresh skim milk and whole milk, pasteurized and unpasteurized, were treated with carbon dioxide gas under pressures of 70, 150 and 175 pounds per square inch and then kept at temperatures varying from 35 to 70° F. Pasteurized milk, carbonated, kept for five months with little increase of acidity.
Fresh, whole milk, carbonated, kept, under high pressure, about the same length of time. Milk carbonated under a pressure of 70 pounds comes from the bottle as a foamy mass; it has a slightly acid, pleasant flavor, due to the carbon dioxide, and tastes somewhat more saline than ordinary milk. It might easily become a popular beverage. Among the several possible useful applications which may be made of carbonated milk, the following can be mentioned: On steamships, in hospitals and elsewhere as a food for invalids, in feeding children in case of certain ailments and as a common beverage.

*Analyses of miscellaneous materials.*—During the past years of the Station’s activity, there have accumulated the results of a large number of analyses which have been made gratuitously for individual farmers. These analyses include many interesting materials and it has seemed desirable to publish such representative cases as would be of interest. The materials included are ashes, dried blood, nitrate of soda, meat meal and tankage, potash salts, muck soils, fertilizer constituents of miscellaneous materials, constituents of feeding stuffs, molasses refuse, commercial gruels, poultry foods, maple sugar, home-made cider vinegar and dried apples.

*Some of the first chemical changes in cheddar cheese and the activity of the water-extract of cheddar cheese.*—Before we can control intelligently and completely the changes taking place in cheddar cheese, especially those changes which affect the most important commercial qualities of cheese, flavor and texture, we must learn in detail what chemical changes the material undergoes from the time rennet is added to milk until the cheese is ready for consumption. Some of these changes are known, but only in a very incomplete manner. Of special importance appear those changes occurring in the cheese-vat and cheese-press, because the character of change at this time may affect the later changes. One change which has heretofore been completely overlooked occurs within a dozen hours after the cheese is put in press. The insoluble proteid of fresh cheese curd (calcium paracasein) changes rapidly into a form soluble in a 5 per cent. solution of common salt and then changes into another form insoluble in such a solution, this latter
change taking place rapidly at first and then slowly. Proteids in water-soluble form do not appear to any extent until after the second change above noted has taken place. The exact manner in which these changes are brought about and their direct bearing upon the practical problem of cheese-making have not yet been fully worked out. The changes appear to be connected with the formation of lactic acid during the cheese-making process and with its action upon the calcium phosphate compounds of the milk. Thus, the calcium and phosphoric acid compounds of cheese, insoluble in water at the start, become soluble until about 80 per ct. of the calcium and all of the phosphates become soluble in water. About 20 per ct. of all the calcium in the cheese is found in the salt-soluble portion.

The acidity of the water-extract of normal cheddar cheese is largely due, not to the presence of free lactic acid but to acid calcium phosphate. The lactic acid formed during cheese-making acts upon the phosphates, forming acid calcium phosphate and calcium lactate.

Chemical studies of camembert cheese.—This work was begun by A. W. Bosworth, assistant chemist, before he came to this Station. He has continued the work here. It is shown that bacteria are responsible for the most important chemical changes which take place in this kind of cheese during its early history, such as the formation of lactic acid from milk-sugar, the combination of this acid with some of the insoluble calcium present in certain compounds, forming calcium lactate and soluble phosphates, the conversion of calcium paracasein into a compound completely soluble in a 5 per ct. solution of common salt, the conversion of this soluble into an insoluble compound. The acidity of camembert cheese is due mainly to proteids and to acid calcium phosphate. One of the characteristic differences in the making of cheddar cheese and camembert cheese seems to be the proper control of the production of the salt soluble compound and of the subsequent change in this compound. Molds are responsible for that part of the ripening in which the compact insoluble curd is changed in texture and becomes a soft, creamy mass almost entirely soluble in water. This is due to enzymes produced by the molds.
The willow borer as a nursery pest.—The willow borer (Cryptorrhynchus lapathi L.) is an insect of growing importance to the nursery interests of this State. Native willows along streams, swamps and canals are also frequently badly attacked, and injuries are being sustained by certain species of willows planted for ornamental purposes. The species of plants observed to be conspicuously injured are Populus monilifera, Salix lucida, S. caprea, S. cordata, S. sericea, S. alba and S. amygdaloides.

Investigations were commenced in 1905 to determine the habits of the insect and practical means of protecting nursery stock. The life history has now been completely studied. It was found that this species has one brood a year. Oviposition occurs in the corky portions of the wood, near a bud or branch, or in overgrowths caused by pruning, and takes place during August or September. The injury to the plants is caused by the larvae which girdle the trees, and so weaken them that they often fall with the wind.

It was noticed in observing the habits of the beetles that they are external feeders, which suggested the possibility of employing arsenical poisons as a means of combating this pest in the nursery. To ascertain the effects of these insecticides upon the beetles, a number of experiments were made which showed conclusively that thorough spraying with an arsenical poison of popular and willow plantations about July 15th will materially reduce the number of beetles and thereby lessen the number of eggs deposited in the trees. Experiments are now being conducted to determine the actual value of this treatment for field use.

Bordeaux injury.—Under some conditions bordeaux mixture injures the fruit and foliage of fruit trees sprayed with it. A study of bordeaux injury of this fruit in the State at large showed: That in 1905, 70 per ct. of the orchards sprayed had been injured; that an excess of lime did not prevent the
injury; that in some orchards spraying did more harm than good; that there had been similar losses in past years; that the use of power machinery increased the injury; that wet weather gave favoring conditions for injury; and that some varieties are more susceptible to injury than others. Experiments on the Station grounds proved that bordeaux mixture causes the trouble known as "spray injury." In these experiments injury seems to follow the first shower of rain. The toxic substance passes, for most part, through stomata and the basal cells of plant hairs into the cellular tissue of fruit and leaves. Small black specks characterize the first stage of the injury. As the fruit grows, the epidermis is lacerated because the dead cells are unable to bear their share of the surface tension. It is these dead cells that give the russetted appearance.

An experiment to show whether wet or dry weather gave favoring conditions for the injury proved that wet weather gives the favoring condition for the trouble. Bordeaux mixture containing an excess of lime, in these experiments, did not prevent nor lessen bordeaux injury. An experiment to show the effects of bordeaux mixtures made with varying quantities of copper sulphate and lime showed that, the more copper sulphate the greater the injury; and that, in general, the stronger the solution, as to copper sulphate, the better the control of the scab fungus. From the experiments it was believed that what is known as the 3:3:50 solution can be used to check the fungus and yet cause a minimum amount of injury.

Practical suggestions for spraying without injury are: Use less copper sulphate; spray in moderation; use the bordeaux mixture in dry weather, as far as possible; use equal amounts of lime and copper sulphate. Some varieties of apples may be sprayed without much fear of injury. Others must be sprayed with great care. Many varieties are nearly immune to attacks of apple scab. These need light applications of bordeaux mixture.

_Ringing herbaceous plants._—The objects of ringing plants are: To cause unproductive plants to set fruit; to increase the size of the fruit; and to hasten the maturity of the fruit.
Experiments were made in the Station forcing houses in ringing the tomato and the chrysanthemum. In ringing these plants a wound was made through cortex and the bast and a band of bark of greater or less width removed. The plants were ringed during the period when the bark peels most readily from the wood.

The theory upon which ringing is founded is: That unassimilated food passes from the roots of the plant to the leaves through the outer layer of the woody cylinder. The assimilated food is distributed through the cortex of the inner bark. When plants are ringed the flow upward continues, but that downward is checked and the top of the plant is thus supplied with food at the expense of the parts below the ring.

With the tomatoes ringed there were no differences to be noted in regard to either the color, the maturity or the flavor of the fruits from the ringed plants. The average loss in weight per plant due to the ringing was about 14 per ct. The roots of ringed plants were less well developed, fewer in number and smaller in size. The foliage was more or less abnormal.

With the chrysanthemum, ringing decreased the height of the plant, produced abnormal foliage and stems; the first ringing hindered the opening of the buds, but the second ringing, two weeks later, slightly hastened the maturity of the buds. The size of the blossoms of all varieties was greatly reduced; the earlier the ringing the greater the injury.

These two plants were chosen because they seemed to be typical of a great number of herbaceous plants. From the experiments conducted with them, it seems to be very doubtful if ringing can be made beneficial to herbaceous plants. The loss to the plant is great, and there seems to be little or no compensating gain.

The effect of wood ashes and acid phosphate on the yield and color of apples.—An experiment was begun in 1893 to ascertain the effects of potash, phosphoric acid and lime as found in wood ashes and acid phosphate on the yield and color of apples. This test continued for twelve years, being completed in 1904. The seat of the experiment is a 55-year old orchard on the Station grounds, located on a medium heavy clay soil.
Throughout the experiment the orchard was given clean cultivation until August 1st and was then seeded to a cover crop of oats, barley or clover. There were 94 trees in the test representing five varieties. The orchard was divided into eight plats, four treated and four untreated.

Wood ashes were applied to the treated plats at the rate of 100 pounds per tree; acid phosphate at the rate of 81½ and lime at 32 pounds per tree. Analyses showed that 169 pounds per acre of actual potash were applied each year; 129 pounds of phosphoric acid; and 1536 pounds of lime. These amounts are excessive for all three of the fertilizers.

From a financial standpoint the results were negative. The estimated increase in value of crop on the treated plants for a hypothetical five acres is $99.00 and the estimated value of the fertilizers for the above area is $74.50. This gives a difference of $24.50 which does not pay for handling the fertilizers.

Results as to color of fruit lack uniformity and were not decided enough in a sufficient number of the twelve seasons to enable the experimenters to state that the fertilizers applied improved the color of the apples. The only practical application of the results obtained by this experiment is, that fruit growers should not apply manure in quantity until good evidence has been obtained that some of the food elements are needed and if any, as to which ones.

**INSPECTION.**

**FEEDING STUFFS.**

The following is a summary of the results of the inspection of feeding stuffs as based upon the analyses of samples sent to the Station by the Commissioner of Agriculture. The composition of the samples may be seen in Bulletin No. 291.

**NUMBERS AND KINDS OF BRANDS INSPECTED.**

It is interesting and suggestive to note the number of brands of each class of feeding stuffs that were found on the market. These are shown below, together with the number of samples analyzed of each class.
<table>
<thead>
<tr>
<th>Product</th>
<th>Brands inspected. No.</th>
<th>Samples analyzed. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed meals</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>Linseed meals</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Gluten feeds</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Corn brans</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Dried distillers' grains</td>
<td>17</td>
<td>24</td>
</tr>
<tr>
<td>Malt sprouts</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Dried brewers' grains</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Hominy feeds</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>Compounded feeds</td>
<td>114</td>
<td>139</td>
</tr>
<tr>
<td>Animal products</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>Poultry foods (compounded)</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Beet sugar wastes</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Barley by-products</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Oat by-products</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous feeds</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

The above figures are suggestive as showing the present status of the feeding stuff market. About 31 per ct. of the brands inspected are feeds carrying a relatively high proportion of protein and which, in most cases, bear names that are indicative of their character. The hominy feeds and animal products are also materials having a fairly definite composition and concerning the nutritive value of which an approximate estimate may be made. On the other hand about 44 per ct. of the feeds examined is made up of brands compounded from a variety of materials that bear names in many cases savoring of quackery. These brands, in a majority of cases, are simply a means of selling at grain prices inferior by-products that could not be floated on the market unless disguised in some way. The extensive sale of such mixtures is not creditable either to the intelligence or the business judgment of the purchasing public. It is no exaggeration to state that at the present time the conditions of the feeding stuff market are
bad and are inimical to the financial interests of the farmers and other consumers.

**COMPARISON OF THE ACTUAL WITH THE GUARANTEED COMPOSITION.**

While the inspection of feeding stuffs under the sanction of law indirectly serves certain ends such as acquainting farmers with the character of the goods in the market, its chief purpose is to secure conformity between the manufacturer’s claims and the goods he offers for sale. To this end the State Department of Agriculture selects samples in the open market and forwards them to the Experimental Station for analysis.

In the table which follows the results of these analyses are summarized; but the comparison between the actual and guaranteed composition of the separate brands must be sought in the bulletin.

**NUMBER OF BRANDS AND SAMPLES FOUND TO BE MATERIALLY BELOW THE GUARANTEE.**

<table>
<thead>
<tr>
<th></th>
<th>No. of brands.</th>
<th>No. of samples.</th>
<th>Percent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonseed meals</td>
<td>6</td>
<td>8</td>
<td>46</td>
</tr>
<tr>
<td>Linseed meals</td>
<td>3</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Gluten feeds</td>
<td>6</td>
<td>7</td>
<td>46</td>
</tr>
<tr>
<td>Corn brans</td>
<td>2</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>Dried distillers' grains</td>
<td>12</td>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>Malt sprouts</td>
<td>4</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Dried brewers' grains</td>
<td>3</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Compounded feeds</td>
<td>19</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Animal products</td>
<td>5</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Poultry foods (compounded)</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous feeds</td>
<td>1</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Total .......................... 62 69

It seems that sixty-two brands or about 19 per cent. of the whole number of brands examined fell below the guaranteed composition to a serious extent.
THE QUALITY OF THE COMPOUNDED FEEDS.

It is unfortunate for the feeding stuff trade and especially for the consumer that inferior materials have come into such extensive use in compounding commercial feeds. The substances chiefly in evidence in this connection are oat hulls and ground corn cobs, although other materials like ground alfalfa are associated with grain products in order to sell at grain prices what is really a coarse fodder.

The presence of low grade materials in a mixture may be discovered in many cases either by microscopical examination or by chemical analysis. For instance, several brands of feeds have been offered for sale that consist of mixed wheat offals adulterated with ground corn cobs. With these mixtures the microscope reveals the corn cob tissues and chemical analysis shows a protein content too low and a fibre content too high for pure mixed wheat offals. In the case of many other feeds their low percentage of protein and high percentage of fibre characterizes them as made up in part of inferior ingredients. Any supposed grain mixture with only $8\frac{1}{2}$ per ct. of protein or less and 12 per ct. of fibre or more may safely be considered as made up in part of some low grade by-product. No mixture of straight farm grains would have so little protein or so much fibre. Indeed a grain feed with protein as low as 9 per ct. should be regarded with suspicion.

A careful survey of the results of the inspection herewith reported shows that approximately eighty, or 70 per ct., of the 114 brands of compounded feeds contain low-grade products. In many instances these mixtures bear names that to the ordinary mind are deceptive and to all intents and purposes are dishonest.

It will be well for prospective buyers of feeds to study carefully the published analyses of compounded feeds and avoid the purchase at grain prices of any feed carrying $8\frac{1}{2}$ per ct. of protein or less or over 12 per ct. of fibre. A feed is especially to be avoided if the protein is low and the fibre high.

In view of the character of a majority of the compounded feeds now offered in our markets and the ease with which, by
ingenious methods of mixing, purchasers of feeds may be deceived as to the quality of what they are buying, wise consumers will avoid compounded feeds and mix their own rations from such standard feeds as the oil meals, distillers' and brewers' by-products, gluten meal and gluten feed, wheat-offals, hominy feed, farm grains and other feeds having characteristic composition and quality. It is the height of folly for buyers to allow manufacturers to palm off upon them at grain prices inferior materials like oat-hulls and corn cobs that are no more valuable than the roughest, poorest farm products such as straw, corn stalks and the like.

FERTILIZERS.

The Station continues to analyze samples of fertilizers collected in the State under the direction of the Commissioner of Agriculture. These number several hundred annually. This work involves the preparation of evidence to be submitted in those cases prosecuted by the State Department for the violation of the fertilizer law. The amount of work required by these analyses and the various duties related thereto, is very large.

PUBLICATIONS ISSUED DURING 1907.

BULLETINS.


TECHNICAL BULLETINS.

No. 4. April. I. Some of the first chemical changes in cheddar cheese. II. The acidity of the water extract of cheddar cheese. L. L. Van Slyke and Alfred W. Bosworth. Pages 22.

CIRCULAR.