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The Bulletins and Reports of this Station are mailed free to every citizen of Connecticut who applies for them seasonably.

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Notice as to Supply of Station Reports.

The Annual Report of this Station for the current year, to be printed at State expense, is limited to an edition of 7,000 copies. After reserving copies for exchanges with other Experiment Stations and Agricultural Journals, the remaining Reports will be sent to *Citizens of Connecticut* who shall apply for them by mail during the next two months. These copies will be supplied in the order in which the applications are received until the edition is exhausted, and if the demand in the State continues as heretofore, few or none will remain for distribution outside of Connecticut.

Extra copies can, however, be had if called for before the printing-forms are broken up. Such copies will be struck off and supplied early next year to *Citizens of other States who apply to this Station before January 1st, and who remit 25 cents per copy to defray costs.* This remittance will also secure to the sender a copy of each Bulletin issued by this Station during next year.

Coin may be forwarded by Post at sender's risk with very small chance of loss, if properly mailed, as follows: Cut an inch hole near one end of a card or scrap of thin paper-box that will just fit inside an envelope, fasten a twenty-five cent piece in the cavity by pasting paper over it on both sides of the card, write thereon name and Post office address, inclose within an envelope, and send as a letter prepaid in full. **P. O. stamps cannot be accepted.**

☞ A copy of this Bulletin is mailed to every address on our books, and special attention is called to the necessity of making new and early application for Reports and Bulletins, as on December 1, we begin to revise our *General Address List* for the next year and our old lists will be entirely discarded when the Annual Report and the next Bulletin are sent.

☞ Our Special List of Exchanges to Agricultural Colleges, Experiment Stations and Journals is not affected by this revision.

Corrections.

The per cent. of soluble phosphoric acid in Lister's Ammoniated Bone Superphosphate (No. 2823, page 10, Bulletin 104) is 7.05 and not 1.05 as printed.

The valuation of Crocker's Ammoniated Bone Superphosphate (No. 2799, page 13, Bulletin 104) is $26.37 and not $36.37 as printed.

THE POTATO SCAB.

By Roland Thaxter, *Mycologist.*

The "Potato Scab" has been under investigation in the Mycological Laboratory of this Station for some months with results of considerable interest. While heretofore the disease has been considered to be an effect of numerous agencies, especially chemical or physical, and more recently has been referred to the attack of a specific *Bacterium*, it is shown, by experiments at this Station, to be due to the direct action of a very peculiar filamentous fungus of extremely small dimensions which has been found invariably to accompany the disease wherever it has been examined by the writer in New England.

This fungus produces an evanescent grey film in connection with the disease, generally visible without a lens, especially in the earlier stages of the affection, and has been obtained absolutely pure for experiment, by the ordinary methods of isolation used in bacteriology. On nearly all neutral or slightly acid substrata used for its cultivation, it forms a compact lichenoid growth accompanied by a peculiar dark stain which diffuses from it through the nutrient substance. Its fructification is aerial and consists in the production of short rod-like bodies and spirals; the latter terminal, the former resulting from the general segmentation and breaking up of the aerial filaments into short pieces; the general mass, which is bluish grey in color, closely resembling various forms of bacteria in shape and size, the diameter of both the vegetative and reproductive portions of the plant reaching only from five to eight ten-thousandths of a milimeter, on the average. The fungus, which except for its apparently true-branching and aerial fructification resembles in some respects certain of the polymorphic Bacteria, cannot as yet be referred to any described form and answers to no generic description, as far as has been ascertained. It is readily propagated by means of its "spores," as well as by the smallest possible portions which can be detached from its vegetative filaments. When transferred from pure cultures to young growing potato-tubers, it reproduces the disease upon them with certainty at the point of application, under rigid experimental conditions.

This fact, together with the invariable association of the fungus with the disease in nature (as far as observed by the writer) after it has once been recognized and sought for, may be considered practically indubitable evidence of the connection between the two as cause and effect. Whether the disease under consideration is identical with that which, as previously mentioned, has been referred to a bacterial origin is quite another matter, and there is every reason to believe that the two are wholly distinct affections except in so far as their results are somewhat similar. Further than this nothing can be said, except that the disease here investigated usually takes the form of what has been called "deep" scab, which may possibly be found to be distinct in origin from the "surface" scab with which it is often associated even in New England.

In connection with this subject a study is being made of another organism morphologically identical with the scab-fungus; but apparently somewhat different physiologically. This organism, which may nevertheless ultimately prove to be entirely identical with the scab-fungus, is one of the commonest forms of growth upon rubbish, old hay or straw, barn-yard manure and similar substances, and its study is being prosecuted with a view to ascertain whether this identity, if it can be shown to exist, may not furnish a rational explanation of the observed fact that land containing much miscellaneous rubbish, or fertilized with barn-yard manure, is generally associated with scab in the potatoes raised upon it.

Having occupied so short a time, the work upon this disease has been of necessity preliminary and it has not been possible to consider experimentally, the practical side of the question to which attention will be given in the further investigations to be carried on during the coming season.

THE PROTEIDS OR ALBUMINOIDS OF THE OAT-KERNEL.

By Thomas B. Osborne, *Chemist.*

An extended study of the Proteids of the Oat-kernel has been carried on for several months in the Chemical Laboratory of the Station. The results of this work are very briefly as follows :

1. The proteid body removed from fresh-ground oats by direct extraction with weak alcohol, first observed by Norton and by him designated *glutin*, when dehydrated by absolute alcohol and dried over sulphuric acid is a light yellowish powder, insoluble in water as well as in absolute alcohol, soluble in mixtures of alcohol and water, soluble also in dilute acids and alkalies and from these solutions thrown down by neutralization. Separated from its solution in alcohol of 60 percent. by evaporating off the alcohol, it forms a yellowish slimy mass. Its composition—the average of five accordant analyses, representing various fractional precipitations of the alcohol-extract—is given in the table, p. 7, under I. This substance is remarkable for its considerable content of sulphur, which is exceeded by that of keratin alone among the proteids and is otherwise equaled only by that recorded in some analyses of serum-albumin.

2. When oats are treated first with water or 10-percent-solution of common salt, before extraction with dilute alcohol, the alcohol-soluble proteid undergoes alteration and a body of different composition and properties results. In the table, II is the mean of four closely-agreeing analyses of this substance. It is much more soluble in dilute alcohol than I, and when wet with absolute alcohol, the moisture attracted from the air shortly renders it gummy and tenaciously adhesive, unlike I.

Its composition as regards carbon, hydrogen and nitrogen, is very near to that found by Dumas and Cahours and also by v. Bibra, for *plant-gelatin* (extracted by hot alcohol from wheat-gluten and remaining dissolved in the alcohol when cold)—the substance which Taddei first prepared from wheat-gluten and termed *gliadin*. Kreusler obtained this material from the oat,

but what Ritthausen and he have named *oat-gliadin*, is a product of its further alteration by the chemical treatment to which it was subjected, with a view of obtaining from the oat a body with 18 percent. of nitrogen, which Ritthausen was led to regard as characteristic of wheat-gliadin.

3. In the presence of water, or 10-percent-salt-solution, the remaining proteids of the oat rapidly suffer change and become insoluble in salt-solution, as recognized by Weyl.

4. The proteid extracted by 10-percent-salt-solution, behaves towards reagents like the *myosin-globulin* from animal muscle as first stated by Weyl. Contrary to Weyl's observations, however, the coagulation-temperature (80°–100°) is much higher than that of animal myosin (55°–60°). This proteid appears to be the result of alteration similar to that by which myosin is formed from myosinogen. In composition it is quite close to muscle-myosin, as seen from analysis IV. The greatest proportion of this proteid extracted by salt-solution from the oat was 1.3 percent.

5. The proteid extracted, after complete exhaustion of the oats with alcohol of 0.9 sp. gr., by dilute potash, analysis V, as well as that dissolved out by 10-percent.-salt-solution, analysis V*a*, has very nearly the same composition as the proteid extracted by salt-solution directly.

6. A large share of the proteids of the oat, when exposed to the action of water, becomes insoluble in dilute potash-solution, the amount so rendered insoluble increasing with the duration of the contact with water. One hour's treatment with water rendered one-half, 24 hours' treatment made two-thirds insoluble in $\frac{2}{10}$-percent-solution of potash. The composition of the part soluble in potash, after action of water (and removal of the alcohol-soluble proteid), is the same as that of the part soluble in salt-solution. Analysis VI. This proteid, obtained by extraction with potash, *after* the action of water, is probably the substance called by Kreusler *Oat-Legumin*. To obtain the solution from which his oat-legumin was prepared, Kreusler mixed $1\frac{1}{2}$ lbs. of ground oats with 5 liters of water and added 3 gm. of potash to neutralize the acid of the oats

7. When ground oats are directly extracted by weak potash-solution without previous treatment with water, nearly the whole of the proteids is dissolved. The substance so extracted, after completely removing the body soluble in weak alcohol, has a different composition from that similarly obtained after first

treating with water. This body undoubtedly is the same as that designated *Avenine* by Johnston and Norton, who extracted oats with dilute ammonia-water. Analysis VII.

8. When ground oats are extracted with 10-percent-sodium chloride-solution heated to 65° C. a proteid separates on cooling, in the form of spheroids. This substance differs in composition and properties from that obtained by cold salt-extraction as well as from all proteids hitherto described. It is soluble in pure water, precipitated from such solutions by a little sodium chloride, is again dissolved by a certain additional quantity and is precipitated completely by saturation with this salt. In the presence of a little sodium chloride and acetic acid it is soluble in alcohol of 0.9 sp. gr. From solutions in distilled water, as well as from those in sodium chloride brine, it has been obtained crystallized in regular octahedrons. Analysis (of spheroids) VIII.

9. The aqueous extract of ground oats was found, in agreement with Norton and Kreusler, to contain very little proteid substance. The proteids thus dissolved appear to be, first, a *Globulin* similar in reactions to that extracted by 10-per cent-salt-solution, second, a *Proteose*, and possibly, third, a little *Acid-albumin*. No true albumin was found in the water-extract.

10. In the salt-extract a very small amount of a body was found, having the reactions of *Albumin*, but not analyzed.

The numbers over the analyses in the following table correspond with those of the paragraphs in the foregoing text.

COMPOSITION OF THE PROTEIDS FROM THE OAT-KERNEL.

Analyses by DR. THOMAS B. OSBORNE.

	I.	II.	IV.	V.	V. *a.*	VI.	VII.	VIII.
Carbon	53.06	53.70	52.33	52.45	52.48	52.61	53.49	52.22
Hydrogen	6.94	7.00	7.19	6.94	6.94	6.92	7.01	6.98
Nitrogen	16.38	15.71	16.95	16.63	16.85	16.99	16.33	17.85
Sulphur	2.26	1.76	.88	.81	.57	.89	.98	.77
Oxygen	21.38	21.83	22.65	23.19	22.12	22.59	22.19	22.18
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Full details of this investigation will appear in the forthcoming Annual Report of this Station for 1890.

Milk Testing.

The attention of dairymen is called to a method of determining fat in milk devised by Dr. Babcock of the Wisconsin Station. Its merits are that it is rapid, that both the milk and the fat are measured so that all weighing is dispensed with and that it is very accurate. It furnishes, we believe, the most rapid and accurate means of testing milk of individual cows or herds.

The apparatus is in daily use at this Station. Twenty-three cows are under experiment and separate fat determinations are made daily in the morning- and night-milk of each cow, the whole, including the cleaning of the apparatus, being accomplished in two hours by two persons. A considerable saving of time will be secured when power is used for driving the centrifuge. With this aid a young man or woman could probably do the whole easily in from three to four hours.

The Station will exhibit the working of the method at any time to dairymen who desire it and will give practical instruction in its use.