

THE
Connecticut Agricultural Experiment Station.

BULLETIN No. 97.

APRIL, 1889.

FUNGOUS DISEASES OF PLANTS.

The Station desires to call the attention of farmers and others to the fact that it has extended its field of investigation by the addition of a new department for which a laboratory has been completed during the past winter and equipped with the necessary books and apparatus for the study of fungi which are injurious to vegetation through the production of *rusts*, *smuts*, *rots*, *mildews*, *blights*, and similar diseases. A small green-house is attached to the building for winter experiments; which has been used since its completion, for preliminary experiments to test the utility of certain methods of treating smut in onions, to which special attention will be given during the coming season. In order to obtain as much information as possible on this subject the following questions have been prepared and sent to numerous onion growers, and any one who can give any information on the subject will confer a favor by answering them as fully as possible, and sending his answers to the address given below.

No answers are desired that do not represent the results of *personal* observations.

QUESTIONS CONCERNING ONION SMUT.

1. How long has the onion smut been known in your vicinity?
2. Have you noticed that the prevalence of smut is influenced by
 - (a) the variety of onion grown.
 - (b) early or late planting.
 - (c) method of cultivation and nature of soil.
 - (d) condition of weather during germination and early growth of the onions.
3. How long have you known the smut to remain in the ground after the cultivation of onions has been discontinued?
4. Is this period affected by the crops grown on such land?
For example is smut as bad on land that has been used for hoed crops as on land which has been put down to grass.
5. Have you ever seen smut damaging sets or seed onions?
6. Do wild onions grow commonly in your vicinity and have you ever seen them smutted?
7. What means have you used to prevent or lessen the amount of smut?
8. About what per cent. of your crop is destroyed on an average by smut?
9. What is your own idea as to the nature, origin and spread of smut?
10. Can you give any general information on this subject not covered by the above questions?

In order to insure the usefulness of the department it is hoped that the occurrence of diseases of the nature above mentioned will be reported whenever their injury is sufficient to attract notice, and all inquiries on the subject will be cheerfully answered as far as it may be possible to do so. Specimens of any diseases concerning which information is desired should, if practicable, always accompany inquiries, since an accurate determination is otherwise impossible. Specimens such as leaves, stems or other diseased parts may be sent by mail pressed between two pieces of paste-board, or better in a small tin box with a little damp moss or paper.

Inquiries and specimens for this department should be sent to
Dr. ROLAND THAXTER, 27 Lincoln St., New Haven.

FERTILIZERS.

DUTIES OF DEALERS IN FERTILIZERS.

The Fertilizer Law which went into effect in 1882 and which is still in force without amendment holds the SELLER responsible for affixing a correct *label and statement of composition* to every package or lot of fertilizer sold or offered for sale. Purchasers, for their own security, should insist that such statements are supplied.

EVERY PERSON who sells commercial fertilizers in Connecticut is also required by law to report certain facts to the Director of this Station and a penalty is provided for neglect to do this.

The law also holds the SELLER responsible for the payment of an analysis-fee on every brand of fertilizer sold by him in case the fee is not paid by the manufacturer on or before the first of May annually.

No discretion is left with the Station regarding the enforcement of this law and in order that it may not become a dead letter its strict and impartial enforcement is evidently necessary.

GRATUITOUS ANALYSES OF FERTILIZERS.

The Station will endeavor by its authorized agents to draw samples in all parts of the State of all brands offered for sale and to send its agents on request to sample large lots of goods bought by Granges or Farmers' Clubs.

The coöperation of farmers' organizations is nevertheless desired in calling attention to new brands of fertilizers, and in securing samples.

To insure justice to manufacturers, dealers and consumers alike, the Station will make gratuitous analyses of Commercial Fertilizers *only* on samples taken by the Agents of the Station, or on such other samples as are *fully* described on the Station Forms for Description and taken in accordance with the Station Instructions for sampling, and furthermore are properly authenticated by the certificate of the person drawing the sample, *and in addition* the witness, either

1. Of a Selectman ;
2. Of an Officer of a farmers' club, grange or local agricultural society ; or
3. Of the Dealer from whose stock the sample is taken.

In case a Dealer takes samples of his own stock, the witness of one of the Officers aforesaid will be required.

It is particularly necessary that the *actual cost prices* be given. In case of special rates the Station, if desired, will hold confidential both the names of the seller and buyer, but to make the results of analysis of any general value, and so to justify making the analyses at all it is essential to know the cost of the material.

THE TRADE-VALUES FOR 1889 OF FERTILIZING INGREDIENTS
IN RAW MATERIALS AND CHEMICALS.

The average Trade-Values or *retail cost per pound* of the ordinarily occurring forms of nitrogen, phosphoric acid and potash are as follows :

	Cts. per lb.
Nitrogen in ammonia salts.....	19
nitrates	17
Organic nitrogen in dry and fine ground fish, meat and blood.....	19
in cotton seed meal and castor-pomace.....	15
in fine bone and tankage.....	16½
in fine medium bone and tankage.....	13
in medium bone and tankage.....	10½
in coarser bone and tankage.....	8½
in hair, horn shavings and coarse fish scrap.....	8
Phosphoric acid, soluble in water.....	8
in ammonium citrate*.....	7½
in dry ground fish, fine bone and tankage.....	7
in fine-medium bone and tankage.....	6
in medium bone and tankage.....	5
in coarser bone and tankage.....	4
in fine ground rock phosphate.....	2
Potash as high-grade Sulphate and in forms free from Muriate (or Chlorides)	6
as kainit.....	4½
as muriate.....	4½

These Trade-Values are the average prices at which in the six months preceding March the respective ingredients could be bought at retail for cash in our large markets, Boston, New York and Philadelphia, in the raw materials which are the regular source of supply. They also correspond to the average wholesale prices for the six months ending March 1st, plus about

* Dissolved from 2 grams of the unground phosphate previously extracted with pure water, by 100 c. c. neutral solution of Ammonium Citrate, sp. gr. 1.09, in 30 minutes, at 65° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" Phosphoric Acid.

20 per cent. in case of goods for which we have wholesale quotations. They have been agreed upon by the Experiment stations of Massachusetts, New Jersey, Pennsylvania and Connecticut for use in their respective States during 1889. The valuations obtained by use of the above figures will be found to agree fairly with the *average retail price* at the large markets of standard raw materials such as :

Sulphate of Ammonia,	Azotin,
Nitrate of Soda,	Ammonite,
Dried Blood,	Dry Ground Fish,
Muriate of Potash,	Bone or Tankage,
Sulphate of Potash,	Ground So. Carolina Rock,
	Plain Superphosphate.

VALUATION OF SUPERPHOSPHATES, SPECIAL MANURES AND MIXED FERTILIZERS OF HIGH GRADE.

The Valuation of a Fertilizer, as practised at the Station consists in calculating the *retail Trade-value* or *cash-cost* at trade centers (in raw materials of good quality) of an amount of nitrogen, phosphoric acid and potash equal to that contained in one ton of the fertilizer.

To obtain the Valuation of a Fertilizer we multiply the pounds per ton of Nitrogen, etc. by the trade-value per pound. We thus get the values per ton of the several ingredients, and adding them together we obtain the total valuation per ton.

Organic nitrogen in Mixed Fertilizers is reckoned at 19 cents, the price of nitrogen in raw materials of the best quality.

Insoluble Phosphoric Acid is reckoned at 3 cents, unless found to be from rock phosphate. In this latter form Insoluble Phosphoric Acid cost but 2 cents per pound. Potash is rated at 4½ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more Potash present than will combine with the chlorine, then this excess of potash is reckoned at 6 cents.

In most cases the valuation of the Ingredients in Superphosphates and Specials falls below the retail cash price charged for these goods at the factory. The difference between the two figures represents the manufacturer's charges for converting raw materials into manufactured articles and selling them. These charges are for grinding and mixing, bagging or barreling, storage, commission to agents and dealers, interest on investment,

and finally, profits. If instead of paying cash the purchaser buys on credit, giving a note for from 2 to 8 or 10 months, without security as is often the case, the price of the fertilizer must be increased of course to cover interest and bad debts. In these cases the purchaser virtually borrows the purchase-money of the seller of the goods and pays interest at the time of purchase just as he pays bank discount when borrowing money at the bank.

CORRECTIONS.

On page 50 of Part I, of the Report for 1888, it is stated that a sample of M. L. Shoemaker & Co.'s Swift-Sure Superphosphate was drawn from stock of W. A. Thomas, Hamden Plains.

This brand was not sold by Mr. Thomas, and the misstatement was caused by an oversight in proof-reading.

On page 72 of the same report the cost of the Davidge Potato Manure is stated to be \$41.00. We are informed by the manufacturer that the average retail price in this state is \$35.95. This would make the percentage difference between cost and valuation 28.6 instead of 46.7 as given in the Report.

The Potash guarantee on this brand is stated in the report to be 8.00 per cent. The manufacturers, however, claim but 8.00 per cent. of *sulphate of potash* equivalent to 4.3 per cent. of potash. In this connection attention is called to the fact that it is required, under the terms of the fertilizer law, that the quantity of *actual* potash shall be expressly stated. "Potash, Sulphate, 8 per cent." may be construed to mean eight per cent. of *actual potash* in the form of sulphate, instead of 4.3 per cent. of potash, and is therefore misleading.

FERTILIZER ANALYSES.

ASHES FROM SMALL BIRCH BOUGHS.

2407. This is ashes from a factory where oil of birch is distilled from birch brush, which is afterwards burned in the boiler furnace. Sent by Dennis Fenn, Milford.

ANALYSIS.

Sand.....	10.84
Phosphoric acid.....	5.89
Potash.....	4.86

TOBACCO STEMS.

2402. Kentucky Tobacco Stems. **2403.** Connecticut Seed Leaf Stems. Sampled and sent by Robert Aitken, Shaker Station. The Connecticut stems cost \$9.50 per ton in car lots (twelve tons), and the Kentucky stems \$10.00.

	ANALYSES.	
	Kentucky Stems.	Connecticut Stems.
	2402	2403
Water.....	26.70	13.47
*Organic and Volatile matters.....	60.18	70.85
†Ash.....	13.12	15.68
	100.00	100.00
*Containing nitrogen.....	1.84	1.93
†Containing Phosphoric Acid.....	.67	.53
Potash.....	8.03	6.41
Sand.....	.64	.70

The Kentucky stems contain about one and a half per cent. more of potash than the Connecticut stems, although they are not so dry.

COTTON SEED MEAL AND CASTOR POMACE.

2421. Damaged Cotton Seed Meal. Sold by J. E. Soper & Co., Boston. Sampled by Edmund Halladay, Suffield.

2449 and **2450.** Damaged Cotton Seed Meal. No. **2449** is coarse and contains hulls, No. **2450** is fine.

2439. Castor Pomace, made by Red Seal Castor Oil Co., St. Louis, Mo. Stock of F. Ellsworth, Hartford.

	ANALYSES.			
	2421	2449	2450	2439
Nitrogen.....	6.94	6.75	7.17	5.52
Phosphoric Acid.....	2.71	2.56	2.70	2.37
Potash.....	1.85	1.83	1.84	1.16
Cost per ton.....	\$23.00*	24.00*	24.00*	25.00
Nitrogen costs per pound.....	12.2 cts.*	13.5 cts.*	12.5 cts.*	18.3 cts.

* In car lots.

Nos. **2449** and **2450** were received from H. S. Frye, Poquonock, who states that they are fair samples from a car lot bought of J. E. Soper & Co., Boston, on sample shown, and analysis, giving 7.74 per cent. nitrogen; that the meal came in bags of all sizes from 75 to 160 pounds, and that it was of all grades and colors, light and dark, coarse and fine; that after correspondence

the seller charged one dollar less per ton than was at first asked. Mr. Frye estimates that 20 per cent. of the meal is coarse. The mechanical condition of the two grades is as follows.

	2449	2450
Fine, smaller than $\frac{1}{10}$ inch.....	3	52
Fine medium, smaller than $\frac{1}{8}$ inch.....	1	22
Medium, smaller than $\frac{1}{2}$ inch.....	4	22
Coarse, larger than $\frac{1}{2}$ inch.....	92	4
	100	100

NITRATE OF SODA.

2427. From stock of L. Sanderson, New Haven, guaranteed 95 per cent. pure nitrate.

2438. Stock of Rogers & Hubbard Co. Both were sampled by Station Agent. Guaranteed 98 per cent. pure nitrate.

ANALYSES.

	2427	2438
Moisture.....	1.31	1.59
Sulphate of soda.....	3.02	.27
Salt (chloride of sodium).....	.36	.60
Insoluble in water.....	.11	—
*Pure nitrate of soda.....	95.20	97.54
	100.00	100.00
*Containing nitrogen.....	15.70	16.07
Cost per ton.....	\$55.00	56.00
Nitrogen costs per pound.....	17.5 cents.	17.4 cents.

SULPHATE OF AMMONIA.

2405. From stock of L. Sanderson, New Haven. Guarantee 25 per cent. of ammonia.

2443. From stock bought by Dennis Fenn of C. Meyer, Jr., Maspeth, L. I.

ANALYSES.

	2405	2443
Nitrogen.....	20.46	20.88
Equivalent ammonia.....	24.85	25.35
Cost per ton.....	\$75.00	74.60
Nitrogen costs per pound.....	18.3 cents.	17.9 cents

POTASH SALTS.

2444. High grade Sulphate of Potash, sold by C. Meyer, Jr., Maspeth L. I., to G. F. Platt, Milford. Guarantee 52 per cent. potash.

2423. Double Sulphate of Potash and Magnesia. Guarantee 27 per cent. potash. Stock of L. Sanderson, New Haven.

2445. Double Sulphate of Potash and Magnesia, sold by C. Meyer, Jr., Maspeth, L. I., to Dennis Fenn, Milford. Guarantee 27 per cent. potash.

2425. Kainit. Stock of L. Sanderson, New Haven. Guarantee 12 per cent. potash.

2422. Muriate of Potash from stock of L. Sanderson, New Haven. Guarantee 50.5 per cent. potash.

2434. Muriate of Potash. Guarantee 80 per cent. Stock of Rogers & Hubbard Co.

2446. Muriate of Potash. Guarantee 82 per cent. nitrate. Stock sold by C. Meyer, Jr., Maspeth, L. I., to Dennis Fenn, Milford.

ANALYSES.

	2444	2423	2445	2425	2422	2434	2446
Potash found.....	52.23	27.82	25.98	12.58	52.11	52.39	51.75
Potash guaranteed..	52.0	27.0	27.0	12.0	50.5	50.4	51.6
Cost per ton.....	\$61.20	30.00	30.60	12.50	42.50	44.00	41.60
Potash costs per lb,	5.8 cts.	5.4 cts.	5.9 cts.	4.9 cts.	4.1 cts.	4.2 cts.	4.0 cts.

COTTON HULL ASHES.

2408, 2409 and 2410. From different car lots. Each sample taken from eight to eleven different bags. Stock of C. L. Spencer, Suffield. Sampled by Edmund Halladay, Suffield.

2418. Light color. **2419.** Dark Color. Both from stock of R. E. Pinney, Suffield. Sampled by C. H. Wells, Suffield.

2429. Stock of R. E. Pinney. Sampled by Edmund Halladay, Suffield.

2448. Bought by B. R. Townsend, Wallingford, of Wilder & Puffer, Springfield, Mass.

2453. Stock bought of R. E. Pinney by D. L. Brockett, purchasing agent of Suffield Grange. Sampled by D. L. Brockett.

2454. From car lot bought by Wayne Rice and others of East Windsor Hill, of The Southern Oil Co., Atlanta. Sampled and sent by R. E. Pinney, Suffield.

ANALYSES.

	2408	2409	2410	2418	2419
Phosphoric Acid, soluble.....	.45	.48	.48	1.28	2.78
“ “ “reverted,”.....	7.80	7.93	8.06	5.77	6.44
“ “ insoluble.....	.34	.36	.36	1.66	2.50
Potash.....	28.23	26.51	26.18	27.26	23.07
Cost per ton.....	\$35.00	35.00	35.00	30.00	30.00
Cost of potash per pound,*.....	3.9	4.1	4.2	3.41	3.23
	2429	2448	2453	2454	
Phosphoric Acid, soluble.....	1.12	.75	2.23	.03	
“ “ “reverted,”.....	5.46	6.43	5.98	2.20	
“ “ insoluble.....	1.30	1.81	2.02	1.49	
Potash.....	15.14	21.42	16.50	10.38	
Cost per ton.....	\$28.67	31.50	28.00†	25.60†	
Cost of potash per pound*.....	6.4	4.6	4.4	10.4	

* Reckoning soluble phosphoric acid at 8 cents per pound, “reverted” at $7\frac{1}{2}$, and insoluble at 2 cents.

† In Car lots.

The price originally charged for No. **2429** was \$30.00, but as the goods proved to be of lower grade than was anticipated, Mr. Pinney states that the price was reduced to \$28.67.

Cotton Hull Ashes have been for some years the cheapest source of potash in the Connecticut market. The potash is soluble in water, is entirely free from chlorides and is combined chiefly with phosphoric and carbonic acid. The ashes are now used chiefly on tobacco lands but are worth the attention of all who buy raw materials rather than mixed goods.

The only thing which stands in the way of their more general use is the uneven quality of the material due to the fact that the hulls are often burned together with coal, so that the hull ashes are mixed with considerable coal ashes.

This probably explains the low per cent. of potash in Nos. **2429**, **2453** and **2454**. No. **2454** has 42.95 per cent. of matters insoluble in acid.

BONE.

2440. Coarse Pure Ground Bone. **2441.** Fine Pure Ground Bone. From Stock bought of C. Meyer, Jr., Maspeth, L. I., by Messrs. Fenn, Merwin and Platt of Milford.

2431. Rogers & Hubbard Co's Pure Ground A. X. Bone.

2435. Rogers & Hubbard Co's Raw Knuckle Bone Flour.

2436. Rogers & Hubbard Co's Strictly Pure Fine Bone. The three last named were from stock of the manufacturer, The Rogers & Hubbard Co. Middletown.

2424. Sanderson's Fine Ground Bone. Stock of L. Sanderson, New Haven.

For table of analyses see page 12.

TANKAGE.

2442. Stock bought of C. Meyer, Jr., Maspeth, by Messrs. Fenn, Merwin and Platt of Milford.

2426. Blood Bone and Meat. **2430.** Fine Tankage. Both the above from stock of L. Sanderson, New Haven.

It will be seen that all the bone samples are slightly, and one of them very considerably below guarantee in nitrogen, while the phosphoric acid is considerably above guarantee. The guarantee of Sanderson's Blood, Bone and Meat does not represent even approximately its actual composition.

For table of analyses see page 12.

DISSOLVED BONE BLACK.

2447. Stock bought of C. Meyer, Jr., Maspeth, L. I., by Messrs. Fenn, Merwin and Platt, of Milford.

2428 and **2451.** Two different grades from stock of L. Sanderson, New Haven.

ANALYSES.

	2447	2428	2451
Soluble Phosphoric Acid,-----	13.33	16.95	15.59
Reverted " "-----	3.93	.06	.08
Insoluble " "-----	1.74	none.	.09
Cost per ton-----	\$26.00	26.00	26.00
Soluble Phosphoric Acid costs per pound,*	7.2 cts.	7.6 cts.	8.3 cts.

* Reckoning reverted at $7\frac{1}{4}$ cents, and insoluble at 2 cents per pound.

SPECIAL MANURES.

2432. Rogers & Hubbard Co's Complete Potato and Tobacco Manure. **2433.** Fairchild's Formula for Corn and General Crops.

2437. Fairchild's Formula Bone and Potash for Seeding Down.

These fertilizers are made by the Rogers & Hubbard Co., Middletown, and are mixtures of finely ground bone with fertilizer chemicals. Therefore the organic nitrogen and phosphoric acid in them are valued as in bone of the same fineness.

ANALYSES OF BONE AND TANKAGE.

No.	Name or Brand.	Mechanical Analysis.				Chemical Analysis.				Value- tion.	
		Finer than		Coarser than $\frac{1}{2}$ inch.	Nitrogen.		Phosphoric Acid.		Cost.		
		$\frac{1}{60}$ inch.	$\frac{2}{3}$ inch.		Found.	Guaran- teed.	Found.	Guaran- teed.			
	BONE.										
2440	Meyer's Coarse Pure Bone	45	28	.26	1	2.94	3.5	23.07	18.0	\$30.10	\$36.63
2441	Meyer's Fine Pure Bone	62	37	1	-----	3.37	3.5	22.36	18.0	30.10	39.77
2431	Rogers & Hubbard Co's Pure Ground A.X Bone	43	20	25	12	3.72	3.9	21.90	22.0	32.00	35.95
2435	" " Raw Knuckle Bone Flour	74	24	2	-----	3.60	3.8	25.70	24.5	37.00	45.73
2436	" " Strictly Pure Fine Bone	51	32	17	-----	3.80	3.9	22.80	22.0	34.00	39.82
2424	Sanderson's Fine Ground Bone	46	21	26	7	1.69	2.8	27.55	20.0	35.00	38.00
	TANKAGE.										
2442	Meyer's Tankage	14	26	26	34	8.41	8.0	2.29	3.5	28.60	21.50
2426	Sanderson's Blood, Bone and Meat	78	12	7	3	4.18	5.0	21.78	12.0	35.00	41.86
2430	Sanderson's Fine Tankage	92	8	-----	-----	4.55	-----	21.44	-----	35.00	44.43

*Mechanical Analyses.**

	2432	2433	2437
Fine, smaller than $\frac{1}{10}$ inch.....	74	66	73
Fine Medium, smaller than $\frac{1}{20}$ inch.....	26	34	18
Medium, smaller than $\frac{1}{2}$ inch.....	--	--	9
	<u>100</u>	<u>100</u>	<u>100</u>

Chemical Analyses.

Nitrogen as nitrates.....	3.16	3.13	----
Organic nitrogen.....	2.24	2.30	2.89
Phosphoric acid.....	15.74	14.63	18.54
Potash as muriate.....	----	11.61	13.12
Potash as sulphate.....	9.89	----	----
Cost per ton.....	\$47.50	46.00	40.00
Valuation per ton.....	\$50.82	47.60	45.30

* Made after washing the bone free from the chemicals.