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Nitrogen in Rain and Snow

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NITROGEN IN RAIN AND SNOW.

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Shutt, Chemical News, December 10, 1909, determined the nitrogen in the rain and snow that fell near Ottawa, Canada, during a portion of the year 1906 and 1907. It occurred to us it might be interesting and profitable to study the precipitations of Mount Vernon, Iowa. The investigation was begun on January 12, 1910, and was continued for one year with the exception of the months of May, June, July and August. These were extremely dry months and we regret very much not to have been able to secure a sample of the heavy rainfall which broke the long drought, during the latter part of August.

There were in all seventeen samples collected, nine of snow and eight of rain. A foot of snow was upon the ground from which the first sample was taken. With this exception samples were collected during the precipitation.

Both rain and snow were collected in a large pan, twenty inches in diameter, either upon the top of a college building or upon the ground on the open campus. Concordant results were obtained from both localities. The college is located upon a hill southwest of the village of seventeen hundred inhabitants. The samples were thus considered quite free from contamination. We computed the weight of one inch of rainfall upon an acre to be 226,875 pounds. Then, if the rainfall should be one inch, and should contain .02 free ammonia per million, the weight multiplied by .02 and the product by 14-17 would express the nitrogen in pounds.

The nitrogen exists in free ammonia, albuminoid ammonia, nitrates and nitrites. The nitrogen in the two last was not determined separately, but together. It was reduced to ammonia with nascent hydrogen and the amount of ammonia obtained was also multiplied by the fraction 14-17. We found the least amount of nitrogen in the albuminoid ammonia, the most in the nitrates and nitrites, and in the free ammonia between the two. The nitrogen in the nitrites and nitrates is the most available form for plant food and the amount is doubtless dependent on the frequency and duration of thunderstorms.

The snowfall during the period mentioned was 41.75 inches, equivalent to 4.17 inches of rain, and the rainfall was 2.64 inches. The free ammonia averages 1.52 parts and the albuminoid ammonia 1.17 parts per million for the snow. The free ammonia is 3.08 parts and the albuminoid ammonia 1.25 parts per million in the rain. Thus it is seen that the free ammonia is greater in rain than in snow, while the albuminoid ammonia is approximately the same in both. In the nitrites and nitrates we found the average in the rain to be 3.45 parts per million and 6.04 parts per million in the snow. This suggests the value of heavy snows to the soil in supplying it with plant food. Another interesting fact is the large amount of free ammonia in the rain of April 5 which was 13.3 parts per million. This is no doubt owing to the fact that from February 26th to April 5th there was no precipitation. The rain continuing the following day, there were only two parts per million. It was found that the amount of nitrogen in the various compounds varied directly with the lapse of time between the precipitations. The question might arise in regard to the amount of nitrogen which may be deposited in the dew. The total number of pounds of nitrogen per acre as shown in Table II is 13.7132. The amount would probably vary greatly in different localities, and in the different seasons. The entire precipitation from January 1st to June 10th was equivalent to 6.81 inches of rain. This was very light for the period covered. A normal precipitation for this section is 10 to 15 inches.

TABLE No. 1

	PRECIPITATION IN INCHES		PARTS PER MILLION		
Date	Rain	Snow	In Free Ammonia	Alb. Amm.	Nitrates Nitrates
January 1-12		12	.20	.112	14.15
January 13.....		12	.28	.16	9.93
January 26.....		2	2.8	1.4	3.75
February 20.....		2	2.	1.	4.73
February 22.....		2½	2.	2.	1.85
February 26.....	.25		.04	.04	2.84
March		4			
April 5.....	.1		13.6	2.	7.74
April 6.....	.5		2.	1.	2.67
April 15.....	.25		1.	2.	2.67
April 16.....		4	.4	.28	4.58
April 22.....	.25		2.8	.2	2.67
April 23.....	.12		.4	.4	4.48
September 22.....	.5		.8	.4	1.58
October 20.....	.75		4.	4.	3.70
November 4.....		1¼	.16	.32	2.64
December 2.....		2	1.86	2.66	10.69
December 9.....		3½	4.	2.66	2.09

TABLE No. 2

Date	PRECIPITATION IN INCHES Rain	Snow	POUND OF NITROGEN PER ACRE In Albuminoid Ammonia	In Free Ammonia	Nitrates Nitrates	Total
January 1-12....		12	.0273	.0448	3.8522	3.9243
January 13.....		12	.0358	.0627	2.7124	2.8109
January 26.....		2	.0532	.1046	.1701	.3270
February 20.....		2	.0373	.0747	.2146	.3266
February 22.....		25	.0934	.0934	.1049	.2917
February 26.....	.25		.0018	.0018	.0161	.0197
April 5.....	.1		.0373	.2541	.4156	.7070
April 6.....	.5		.0934	.1868	.3026	.5828
April 15.....	.25		.0934	.0467	.1516	.2919
April 16.....		4	.0209	.0298	.4156	.4663
April 22.....	.25		.0934	.1307	.1514	.3755
April 23.....	.12		.0089	.0089	.1270	.6448
September 22....	.5		.0373	.0747	.1792	.2912
October 20.....	.75		.5604	.5604	.6294	.7502
November 4.....		12½	.0074	.0037	.0746	.0857
December 2.....		.2	.0994	.0695	.4850	.6539
December 9.....		3.5	.1989	.2989	.1659	.6637
Total			1.4986	2.0462	10.1684	13.7132

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