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227
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THESIS

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T H E S I S

ON

DETERMINATION OF THE AMOUNT OF CaSO_4
WASHED OUT OF SOILS BY DRAINAGE WATERS

BY

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Michigan Agricultural College,

August 11, 1880.

THESIS

DETERMINATION OF THE AMOUNT OF CaSO_4
WASHED OUT OF SOILS BY DRAINAGE WATERS.

At the suggestion of Dr. Kuhnle, and thinking that some-
thing along this line might be of general interest, I have
directed my attention to the determination of the amount of
 CaSO_4 which is washed out of soils by drainage waters.

Plaster of Paris, CaSO_4 , or Gypsum, is used with
great success on every kind of crop. Especially are its ef-
fects striking when applied to corn, beans, peas and clover.
Its value is not so much from the fact that it contains lime
and sulphuric acid, but because it acts upon the unavailable
Potash present in the soil, making it available. Its presence
also promotes the process of nitrification. Calcium sulphate
plays a leading part in the supply of sulphur to plant growth.

In my manipulations, I have confined myself to water ob-
tained from drains on the College Farm, and from the Red Cedar
and Grand Rivers. In all I analyzed nine samples; both for
Calcium content, and Sulphuric Acid. Six of these samples,
(Nos. 1, 2, 3, 4, 5 and 6) were taken from the outlet of
drains emptying directly into the Red Cedar River. No. 7 was
taken just above the drain in the same river, and Nos. 8 and 9
were taken respectively from above and below the North Lansing
dam across the Grand River.

The direct results of my analyses, showing the number of grams of CO_2 and CaCO_3 per litre of water analysed are shown in Table No. 1.

Table No. 1.

Weight in grams per litre of water.

	CO_2	CaCO_3
" 1	.077707	.016127
" 2	.004955	.00132
" 3	.003155	.018112
" 4	.002087	.077327
" 5	.073312	.07250
" 6	.076174	.07506
" 7	.07133	.03193
" 8	.005135	.00432
" 9	.075127	.01346

From the atomic weight of CaSO_4 , the Calcium in CaSO_4 is in the ratio of 40 : 96 to the SO_4 . From the above table it will be seen that an excess of Calcium is present. This is the Calcium which exists as a Carbonate, with which, directly, it is not combined.

From Table No. 1, Table No. 2 is found, showing grams of SO_4 , Ca as a Sulphate and Ca as a Carbonate.

Table No. 2.

Weight in grams per litre of water.

	SO_4	Ca as Sulphate	Ca as a Carbonate.
" 1	.007728	.000314	.003723
" 2	.004955	.00032	.004031
" 3	.003155	.000415	.043913
" 4	.002087	.00017	.043667
" 5	.073312	.002775	.009605
" 6	.076174	.002613	.00137
" 7	.07133	.00063	.03192
" 8	.005135	.000427	.000407
" 9	.075127	.001232	.024005

1. 1. 1.

2. 2. 2.

3. 3. 3.

4. 4. 4.

5. 5. 5.

6. 6. 6.

7. 7. 7.

8. 8. 8.

9. 9. 9.

10. 10. 10.

11. 11. 11.

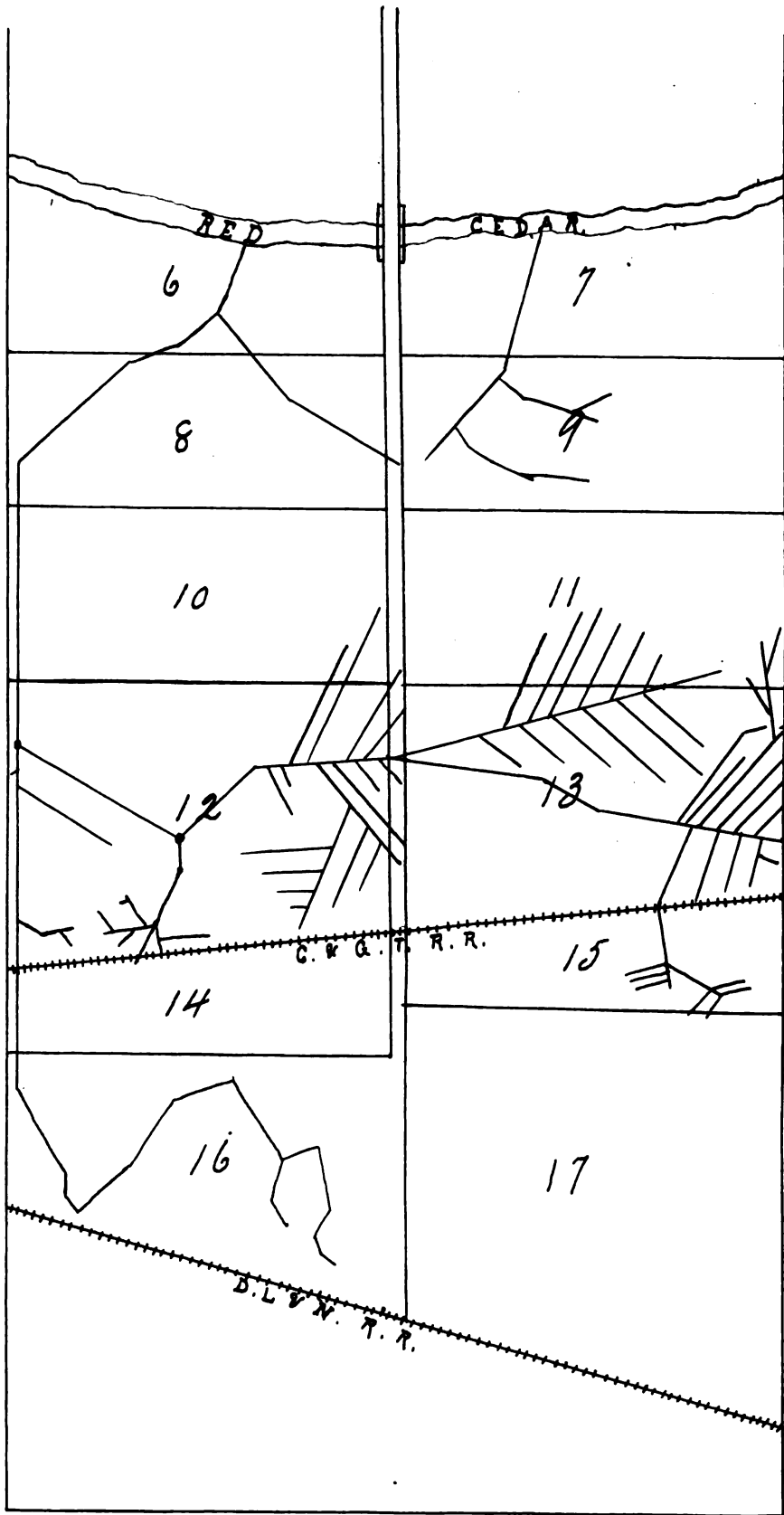
12. 12. 12.

13. 13. 13.

Table No. 7.

	Grams of CaSO_4 per litre.	Parts of CaSO_4 per Million.
No. 1	.102000	102.000
" 2	.090944	90.944
" 3	.086013	86.613
" 4	.112008	112.008
" 5	.104107	104.107
" 6	.119017	119.017
" 7	.10184	101.84
" 8	.120003	120.003
" 9	.100071	100.071

The map on the following page shows the drain from which sample No. 6 was taken. It flows all the year, and drains Fields No. 3, 8, 10, 11, 12, 13, 14, 15 and 16. Over 40 % of CaSO_4 is carried by this drain off the above fields in a day.



Notes and estimations on each sample.

No. 1	Taken	Apr. 21,	Drain	flowing	at	rate	of	3	gal.	per	min.
" 2	"	"	"	"	"	"	"	"	3	"	"
" 3	"	"	"	"	"	"	"	"	4	"	"
" 4	"	"	SS	"	"	"	"	"	5	"	"
" 5	"	May	3	"	"	"	"	"	30	"	"
" 6	"	June	3	"	"	"	"	"	4	"	"

With the assistance of W. L. Cummings '93, I took a cross section of both the Red Cedar and Grand Rivers; at the same time measuring the rate of flow of each. The current at the cross section of the Red Cedar was 100 ft. in 11 minutes, or 9.09 ft. per minute, or one mile in 9 hrs. 2 min. In Grand River the rate of flow was 100 ft. in 1-3/4 minutes, or 57.1 ft. per minute, or one mile in 1 hr. 32 min.

In the Red Cedar 10,563 gallons of water pass the cross section per minute. In the Grand 195,024 gallons per minute.

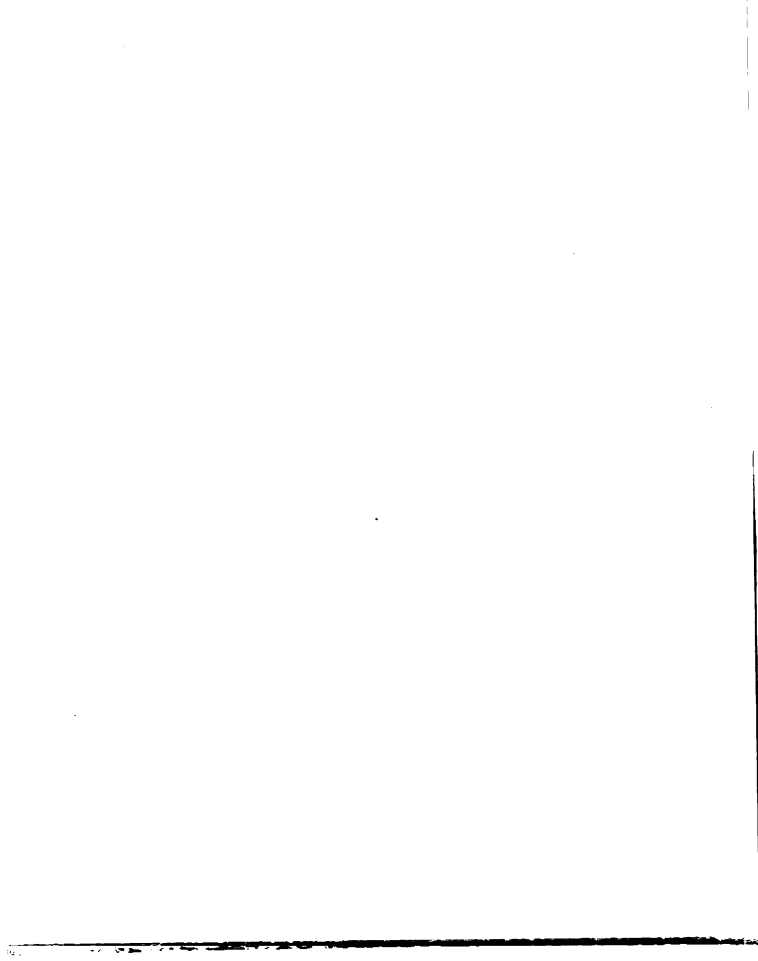
Figuring from the content and flow of the waters table No. 4 is found as a conclusion.

Table No. 4.

Shows number of Kilograms of CaSO_4 flowing from the mouth of drains and by the cross section of Rivers each day.

	Kilograms.
No. 1	3,003,331.23
" 2	4,714,520.23
" 3	2,732,454.4
" 4	4,591,052.34
" 5	12,743,244.3
" 6	2,091,533.32
" 7	6,950,234,333
" 8	152,419,023,753.13
" 9	127,154,123,222.13

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