THE EFFECT OF CLAYING CARRIED OUT IN 1923 UPON THE THERMAL CONDITIONS IN CULTIVATED SPHAGNUM PEAT SOIL IN THE SUMMER OF 1959

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The addition of mineral soil to cultivated peat soil as a soil improving agent produces changes in the thermal conditions prevailing in the soil (4, 3, 5, 6, 12, 6, 2, 13, 7). However, the experiments in the study of this question have mostly been carried out with only a few years at the most having passed since the soil improving agent was added. Now the addition of mineral soil as a soil improving agent on cultivated peat soil has a prolonged effect, as has been made evident by the crop yield results obtained in a number of soil improving tests (1, p. 12, 11, 8, p. 16). At the experimental Station Leteensuo a claying test was established in 1923, and the claying has not been repeated since in the test area. This test consequently provides an opportunity to study the significance of claying from the point of view of the thermal conditions in the soil after a long period. The investigation was carried out in the summer of 1959, 36 years after clay had been applied to the test area.

Test area and plan of experiment

The peat of the test area mainly consists of Sph. fuscum moss. The peat layer has a thickness of about 3 metres. In connection with its clearing for agriculture, the test area was drained by open ditches so that strips 20 m in width were formed. The clearing was done with a hand-hoe in 1921.

The investigation was carried out in connection with a Sphagnum bog liming and claying test established in 1923. The detailed plan of the experiment has ben described before (8). Similarly, an account has been given of the effect of claying upon the settling of the soil surface (9) and of the effect of liming upon the soil temperature in the unclayed area (10). One half, in the longitudinal direction, of the 20 m wide test strip was clayed, adding clay in a quantity of 300 m^3 per hectare.

The liming was combined with this test by applying varying quantities of lime to areas stretching across the layed and unclayed strips (for details, see 8, p. 3.). The annual fertilization was equivalent to 100—300 kg superphosphate, 200 kg 40 % potassium salt and 100—300 kg calcium nitrate per hectare. Stable manure was given in a total quantity of 51 tons per hectare. The test plant in 1959 was barley, which was sown 12. V. and harvested 6. IX.

Results

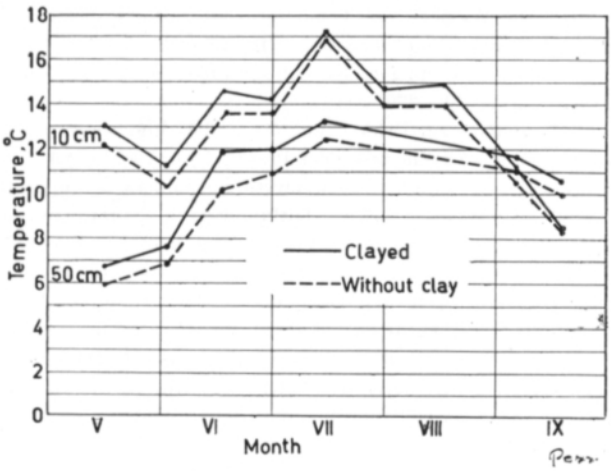
The studies were carried out with the aid of a thermometer specially designed for the measuring of soil temperatures, which has been descriped in detail in a previous publication (10). Measurements were made during the summer months at intervals of about two weeks. The measuring depths were 10, 20 and 50 cm. As measurements were taken only once on each day of measurement, at about 14.00 hours, it was not considered necessary to measure the temperature close to

Temperature on days of observation in clayed peat soil (t_1), temperature differences between clayed and unclayed soil (t_1-t_0) and P-values of temperature differences.

Date	10 cm			20 cm			50 cm		
	t_1	t_1-t_0	P-value	t_1	t_1-t_0	P-value	t_1	t_1-t_0	P-value
15. V	13.0	0.8	0.009	10.7	1.2	<0.001	6.7	0.8	<0.001
2. VI	11.2	0.9	<0.001	9.8	1.0	<0.001	7.6	0.8	<0.001
17. VI	14.5	1.0	<0.001	13.8	1.3	<0.001	11.8	1.6	<0.001
1. VII	14.2	0.7	0.017	14.0	0.9	<0.001	11.9	1.0	<0.001
14. VII	17.2	0.4	—	16.4	0.9	—	13.2	0.8	—
1. VIII	14.6	0.7	0.013	14.2	0.7	0.019	—	—	—
16. VIII	14.8	0.9	0.017	14.6	0.9	0.006	—	—	—
4. IX	11.1	0.6	0.022	11.6	0.6	0.011	11.6	0.7	0.001
18. IX	8.4	0.2	0.296	9.0	0.1	0.463	10.5	0.6	—

the soil suface, since its daily variations may be quite considerable. Even at a depth 10 cm the daily temperature variations are clearly noticeable in periods when the soil surface is not shaded by plants. This has to be taken into account when examining the temperature values for a depth of 10 cm and for the early part of the summer. At a depth of 20 cm, on the other hand, the said variations in peat soil are already very small (7, p. 65), particularly when the soil surface is shaded the vegetation.

Measurements were taken on five points on the clayed and on five points on the unclayed strip, choosing the points so that they lay on different liming test plots.



Soil temperatures of cultivated Sphagnum bog in depths of 10 cm and 50 cm in summer 1959.

The results can be seen from the Table and the accompanying figures. The statistical significance of the temperature differences has been checked by means of the Student's t test; the corresponding P values are also given in the Table. It can be seen that the claying has caused differences in soil temperature amounting to about 1°C as compared to the unclayed soil. The temperature differences have to be considered highly significant. In the autumn there are no temperature differences (cf. 7, p. 58).

Summary

In the present investigation the significance of claying of cultivated Sphagnum bog was studied from the point of view of the thermal conditions in the soil after a long period. The investigation was carried out when 36 years had passed since clay had been applied to the test area.

The results have shown that the claying has caused differences of about 1°C in soil temperature in summer as compared to unclayed soil.

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SELOSTUS:

VUONNA 1923 SUORITETUN SAVEUKSEN VAIKUTUKSESTA RAHKASUOVILJELYKSEN MAAN LÄMPÖOLOIHIN KESÄLLÄ 1959

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Kivennäismaalla suon maanparannusaineena on pitkä vaikutusaika. Tämä on ilmennyt useiden maanparannusainekokeiden tuloksista (1, 11, 8,). Leteensuon koeasemalla on perustettu vuonna 1923 eräs savetuskoe, jossa savetusta ei ole uusittu. Koe tarjoaa mahdollisuuden tutkia, mikä merkitys saveuksella on maan lämpöolojen kannalta pitkän ajanjakson kuluttua. Tutkimus suoritettiin kesällä 1959 jolloin suon saveuksesta oli kulunut 36 vuotta.

Koealueen turve on muodostunut pääasiassa Sph. fuscum-sammaleesta. Mittaustulokset ilmenevät taulukosta ja piirroksesta. Lämpötilaerojen luotettavuutta on tarkasteltu t-testiä käyttäen. P-arvot on esitetty myös taulukossa. Tuloksista ilmenee, että savetus on aiheuttanut noin 1 asteen lämpötilaeroja maassa saveamattomaan verrattuna. Lämpötilaeroja on pidettävä erittäin luotettavina lukuunottamatta viimeistä havaintopäivää, jonka tulokset osoittavat lämpötilaerojen tasaantuvan syksyllä (vrt. 7, s. 58).