STUDY ON THE CULTIVATION OF VEGETABLES WITH THE USE OF COVERING MATERIALS THAT AFFECT MOISTURE. PH SOIL FERTILITY

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Abstract

The purpose of this study was to study the effect of growing soil water and to compare the effectiveness of growing saffron with the use of dry leaves as biological mulch with bare soil in maintaining moisture, soil temperature, and minerals. The experiment divided the area into 4 types: (1) bare soil, (2) soil in which vegetables are grown, and (3) soil for planting vegetables + shredded dry wood, (4) soil for planting vegetables (full leaf dry wood), and measurement of soil moisture, temperature, and minerals for a period of 4 weeks.

Studies have shown that plots where vegetables are grown have a better soil moisture value than bare soil. When planting vegetables together with mulch, the leaves do not tear, and the torn leaves are ground cover. It was found that soil moisture is no different from growing vegetables alone, but using untorn leaves as mulch can be preserved. The N, P, K values of the soil are better than in other conditions.

Bio mulch is an effective approach to soil and water conservation, can reducesoil erosion problems in sloped areas, increase water efficiency, and help create a suitable environment for the growth of economic crops. The results can be applied to the agronomy system. Restoration of degraded areas and sustainable management of natural resources.

Keywords: ground cover, soc, soil moisture, biological mulch

Introduction

Thailand's tropical climate causes continuous soil moisture loss in most agricultural areas, particularly in farmlands and sloped regions. High temperatures and uneven rainfall accelerate water loss through evaporation and soil permeability, leading to plant dehydration and negatively affecting crop growth and agricultural productivity. As a result, farmers must increase irrigation, which raises production costs and contributes to the loss of soil minerals and organic matter, key factors for maintaining soil fertility.

The use of ground cover plants and organic mulch has been widely recognized as an effective method for improving the soil's water-holding capacity. These practices reduce water evaporation from the soil surface, help maintain soil moisture, lower soil surface temperature, enhance water infiltration, and improve soil structure to better support water retention.

This project focuses on the use of Peperomia pellucida, a small, short-lived, fast-growing biennial plant that thrives both indoors and outdoors. The plant has succulent stems and dense, bright green leaves that enable rapid soil surface coverage. Although its root system is relatively shallow, it spreads widely and contributes to increased soil water-holding capacity. Peperomia pellucida is easy to maintain, requires minimal water and fertilizer, and is commonly used as a medicinal plant and local vegetable.

This study aims to compare the water retention capacity of soils using Peperomia pellucida as a ground cover plant and dry leaves as biological mulch to maintain soil moisture and reduce water loss from the soil surface. The findings are expected to support sustainable water management and improve agricultural efficiency in tropical environments.

Research Methods

This research began with a review of relevant theories and previous studies related to the use of ground cover plants, methods for measuring soil moisture, soil temperature at a depth of 5-10 cm, and the measurement of soil water infiltration rates. The experimental area was then designed using four identical clay pots, each approximately 6 inches in size, with a width of 16 cm and a depth of 10 cm. All pots were filled with the same type of soil, compacted to a similar level.

The experiment consisted of four different treatments: (1) bare soil, (2) soil covered with vegetable plants, (3) soil covered with vegetable plants combined with bio-mulch made from torn dry leaves, and (4) soil covered with vegetable plants combined with thick dry leaf bio-mulch. Seedlings were grown and transplanted into the pots at equal spacing and maintained until the plants were well established and provided similar soil coverage, which took approximately 3-4 weeks.

A simulated rainfall system using a shower was applied to ensure uniform irrigation across all experimental pots. Soil moisture was measured using a soil moisture meter at a depth of 5-10 cm at three positions in each pot: the plant base, the center of the pot, and the edge of the pot. Measurements were recorded before the experiment, 30 minutes after simulated rainfall, and two weeks after the experiment. Soil surface temperature was measured using an infrared thermometer before, during, and after the experiment to evaluate the effect of soil cover on reducing water loss through evaporation. The infiltration rate was assessed by recording the time required for water to seep into the soil after simulated rainfall.

Soil samples were randomly collected from each pot at a depth of 5-10 cm before and after the experiment to analyze soil pH and macronutrient contents, including nitrogen (N), phosphorus (P), and potassium (K). The experiment was repeated at least three times to improve reliability, and data were collected at different plant growth stages (2, 4, and 6 weeks) to compare the effectiveness of plant age on soil water retention, soil temperature reduction, and soil quality improvement.

GLOBE Badges

I am a participant.
The project was carried out through teamwork. Team members were assigned specific responsibilities such as data collection, conducting experiments, data analysis, and studying information from GLOBE, which helped improve data efficiency. Working as a team resulted in accurate data and information sharing, making the research more reliable.

I am a scientist.
This project involved teamwork following the GLOBE approach, using the scientific process to formulate questions and measure and collect soil quality data such as moisture, pH, temperature, and soil nutrients from systematically selected sampling points. The data were then compared and conclusions were drawn based on evidence from actual experimental data.

I am a problem solver.
In this project, problems related to soil moisture loss in each pot and soil quality were studied. Solutions were designed by using ground cover plants and biodegradable mulching materials. Experiments were conducted, results were measured, and approaches were improved based on real data in order to find an appropriate method for retaining soil moisture efficiently and sustainably.

Research Question

1. Growing vegetables affects soil moisture. Acidity-alkalinity (pH) Surface Temperature The amount of nutrient minerals in the soil (nitrogen, phosphorus and potassium) and the ability to retain water in the soil. Compared to bare soil? How?
2. Planting vegetables with bio-mulch, including dry leaves and torn dry leaves, affects soil moisture, acidity-alkalinity (pH), and soil surface temperature. Is there a difference between the amount of nutrient minerals in the soil (N, P, K) and the water retention capacity in the soil?

Summary and discussion of research findings

According to a study of the joint cultivation of vegetables, the use of covering materials that affect moisture. Soil fertility pH found

1. Growing vegetables causes the soil moisture value to increase from bare soil. This means that the basiline can retain moisture in the soil well.
2. The use of mulch, namely leaves and torn leaves to cover the soil in the cultivation of vegetables, that the soil moisture is similar to that of growing vegetables alone. Moreover the use of torn leaves for mulching the soil will have more N P and K values than in growing vegetables in bare soil. This indicates that mulching using non-torn leaves reduces the amount of mineral losses in the soil.
3. According to experiments, planting vegetables with mulching with torn leaves will retain water and reduce mineral loss.

Materials & Equipment

Materials and equipment and methods of conducting research

1. Universal Indicator Paper
2. Loam Soil
3. Seedlings for planting as ground cover plants
4. Biological mulch (Thick dry leaves/thick dry leaves with tear)
5. Shower watering
6. Beaker
7. Digital Scales
8. Soil moisture meter
9. pH NPK Test Kit
10. Infrared Thermometer
11. Measuring Cylinder

GLOBE Measurement Principle
1) Pedosphere (Soil) Measurement Principle
2) Principles of biosphere measurement, principles of measurement methods for soil cover

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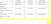
Methodological measurement of soil temperature, retrieved on December 3, 2025, from Globe Thailand https://drive.google.com/file/d/[illegible]/view?usp=drivesdk
Measurement by the Moisture Method Retrieved on December 3, 2025 from Globe Thailand https://drive.google.com/file/d/[illegible]/view?usp=drivesdk
Methodological measurement of soil pH, retrieved on December 3, 2025 from Globe Thailand https://drive.google.com/file/d/[illegible]/view?usp=drivesdk

Results



Geographical coordinates

Study location	Latitude(N)	Longitude(E)
4 Moo 3 Khok Yang Subdistrict, Kantang District, Trang Province 92110	[illegible]	[illegible]