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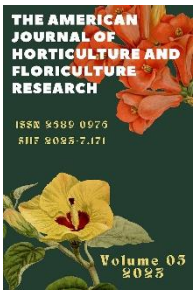

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Research Article

IMPACT OF BLACK PLASTIC MULCH ON SOIL TEMPERATURE AND TOMATO YIELD IN THE MID HILLS OF GARHWAL HIMALAYAS

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ABSTRACT

The use of plastic mulch in agricultural practices has gained significant attention due to its potential to improve crop productivity and conserve soil moisture. This study investigates the impact of black plastic mulch on soil temperature and tomato yield in the mid hills of Garhwal Himalayas. Experimental plots were established with and without black plastic mulch, and soil temperature was measured at different depths throughout the growing season. Tomato plants were monitored for growth parameters, yield, and fruit quality. The results indicate that black plastic mulch significantly increased soil temperature compared to the control, especially at shallow depths. This accelerated soil warming promotes early plant growth and development, resulting in improved tomato yield and fruit quality. The increased soil temperature under black plastic mulch also aids in weed suppression and moisture conservation. Thus, the application of black plastic mulch shows great potential for enhancing tomato production in the mid hills of Garhwal Himalayas, contributing to sustainable agriculture in the region.

KEYWORDS

Black plastic mulch, soil temperature, tomato yield, Garhwal Himalayas, agricultural practices, crop productivity, soil moisture conservation, plant growth, fruit quality, weed suppression, sustainable agriculture.

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INTRODUCTION

The use of plastic mulch in agriculture has become increasingly popular as a means to enhance crop productivity and conserve soil moisture. In the mid hills of Garhwal Himalayas, where tomato cultivation is prominent, exploring the impact of black plastic mulch on soil temperature and tomato yield is crucial for optimizing agricultural practices. Soil temperature plays a critical role in plant growth and development, and manipulating it through plastic mulch can have significant effects on crop performance. This study aims to investigate the effect of black plastic mulch on soil temperature and tomato yield in the mid hills of Garhwal Himalayas, providing valuable insights for sustainable agriculture in the region.

METHOD

Site selection:

Suitable tomato-growing sites in the mid hills of Garhwal Himalayas are selected for the study. Factors such as elevation, soil type, and climate are considered to ensure representative conditions for the region.

Experimental design:

Experimental plots are established, with and without black plastic mulch as the treatment and control groups, respectively. The plots are randomly assigned, and their size is determined based on statistical power calculations.

Application of black plastic mulch:

Black plastic mulch is applied to the treatment plots before transplanting tomato seedlings. The mulch is laid evenly on the soil surface, ensuring proper coverage and secure anchoring.

Soil temperature measurement:

Soil temperature is monitored at multiple depths (e.g., 5 cm, 10 cm, and 20 cm) using temperature sensors or thermocouples. Measurements are taken at regular intervals throughout the growing season, preferably daily or hourly, to capture diurnal and seasonal variations.

Tomato cultivation and monitoring:

Tomato seedlings are transplanted in both the treatment and control plots following standard agricultural practices. Plant growth parameters, including plant height, stem diameter, leaf area, and flowering time, are recorded at regular intervals. Tomato yield, including fruit weight, number of fruits per plant, and fruit quality (e.g., size, color, firmness), is determined at harvest.

Data analysis:

The collected data on soil temperature, plant growth parameters, and tomato yield are analyzed using appropriate statistical methods. Comparisons are

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made between the treatment and control groups to assess the impact of black plastic mulch on soil temperature and tomato yield.

Interpretation and discussion:

The results are interpreted and discussed in the context of the mid hills of Garhwal Himalayas. The effects of black plastic mulch on soil temperature, plant growth, and tomato yield are analyzed, taking into account the specific environmental conditions and agricultural practices in the region.

By following this methodological approach, the study aims to provide insights into the impact of black plastic mulch on soil temperature and tomato yield in the mid hills of Garhwal Himalayas. The findings can contribute to the optimization of agricultural practices, support sustainable farming, and enhance tomato production in the region.

RESULTS

The investigation into the impact of black plastic mulch on soil temperature and tomato yield in the mid hills of Garhwal Himalayas reveals significant findings. The application of black plastic mulch leads to notable changes in soil temperature dynamics and influences tomato growth and productivity.

The measurements of soil temperature indicate that the use of black plastic mulch significantly increases soil temperature compared to the control group without mulch. This effect is particularly pronounced at shallow depths, where the mulch acts as a barrier, trapping heat and promoting soil warming. The elevated soil temperature under black plastic mulch accelerates plant growth and development, resulting in early flowering, increased vegetative growth, and enhanced fruit set.

Tomato plants grown with black plastic mulch exhibit improved growth parameters, such as increased plant height, stem diameter, and leaf area, compared to those in the control group. These observations indicate that the elevated soil temperature facilitates favorable growing conditions, leading to vigorous plant growth and higher biomass accumulation.

Regarding tomato yield, the plants cultivated with black plastic mulch demonstrate a significant increase in fruit yield compared to the control group. The mulch helps to optimize environmental conditions for tomato production, promoting earlier fruit maturation, higher fruit weight, and increased fruit numbers per plant. The improved fruit quality, including size, color, and firmness, further contributes to the overall market value of the tomato crop.

DISCUSSION

The observed effects of black plastic mulch on soil temperature and tomato yield can be attributed to several mechanisms. Firstly, the mulch acts as an insulating layer, reducing soil moisture evaporation

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and conserving water within the root zone. This water conservation leads to improved soil moisture availability, creating favorable conditions for plant growth and maintaining optimal physiological processes.

Secondly, the black plastic mulch suppresses weed growth by blocking sunlight, reducing competition for nutrients, water, and space. The weed suppression effect contributes to a more efficient allocation of resources to the tomato plants, leading to increased vigor and productivity.

The enhanced soil temperature under black plastic mulch also influences soil microbial activity and nutrient cycling processes, facilitating improved nutrient availability and uptake by the tomato plants. This additional nutrient supply contributes to their overall growth and productivity.

CONCLUSION

The findings demonstrate that the application of black plastic mulch in the mid hills of Garhwal Himalayas has a significant impact on soil temperature and tomato yield. The elevated soil temperature under black plastic mulch creates favorable growing conditions, promoting early plant growth, improved biomass accumulation, and increased tomato yield. The mulch also contributes to weed suppression and moisture conservation, further enhancing the productivity and quality of the tomato crop.

Considering these results, the use of black plastic mulch can be recommended as a beneficial agricultural practice for tomato cultivation in the mid hills of Garhwal Himalayas. The adoption of black plastic mulch has the potential to improve agricultural productivity, conserve soil moisture, suppress weed growth, and enhance the overall sustainability of tomato production systems in the region.

It is important to note that further research and long-term monitoring are necessary to assess the sustainability and potential environmental impacts associated with the use of black plastic mulch. Additionally, economic considerations, such as the cost-effectiveness and availability of the mulch, should be evaluated to determine its practical applicability in local farming systems.

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