

Influence of Mulching on the Productivity of Chamomile

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Introduction

Chamomile (*Matricaria chamomilla* L.) occupies an important place in the pharmaceutical industry due to its unique medicinal properties. This plant is widely used for the production of anti-inflammatory, antispasmodic and antiseptic agents, as well as in cosmetic products. In the context of growing demand for natural medicines, the issue of increasing the efficiency of chamomile cultivation is of particular relevance.

One of the key agricultural techniques that helps improve growth and increase the yield of chamomile is mulching. Mulching is covering the soil with a variety of materials that help retain moisture, regulate soil temperature, and suppress weed growth. This technique is widely used in agriculture to maintain a favorable microclimate around plants and protect the soil from erosion.

In the conditions of the Zarafshan oasis, with its specific climate and soil-agrophysical characteristics, the choice of the right mulching method is crucial. Organic mulch, such as straw, and inorganic mulch, such as clear polyethylene film, exhibit different advantages and disadvantages that must be carefully evaluated to optimize the chamomile cropping process.

The purpose of this article is to study the influence of different types of mulch on the growth, development and productivity of chamomile in the conditions of the Zarafshan oasis. The article discusses the results of research conducted at Samarkand State University, where the effects of organic and inorganic mulching on the phenological parameters and productivity of chamomile were analyzed. Thus, with global climate change and increased interest in natural medicines, research into agricultural practices such as mulching plays an important role in ensuring sustainable and efficient production of medicinal raw materials.

Literature review

Mulching is one of the key agricultural practices that is widely used to improve growing conditions and increase crop yields. The literature contains numerous studies confirming the effectiveness of mulching in various agroclimatic conditions, including the cultivation of chamomile (*Matricaria chamomilla* L.).

Mulching involves covering the soil with a variety of materials to retain moisture, control soil temperature, and suppress weed growth. Depending on the materials used, mulching can be organic or inorganic.

Organic mulches such as straw, compost, wood chips and leaves have a positive effect on soil properties. Organic materials decompose over time, improving soil structure and enriching it with nutrients. Research by G.G. Cherepanov showed that the use of organic mulch significantly reduces the evaporation of moisture from the soil, improves its physical properties and helps to increase plant productivity. [5]

Inorganic mulches, including plastic film, gravel, and geotextiles , are used to create a stable microclimate around plants. Clear plastic film, for example, helps retain heat in the soil, which is especially useful in the early spring months. This promotes accelerated growth of the root system and improves overall conditions for plant growth. Safarova N.K. and Safarov K.S. in their studies noted that polyethylene film provides a higher yield of quality seeds compared to other types of mulch. [2]

The effect of mulching on the growth and productivity of chamomile

Chamomile, widely used in pharmaceuticals and cosmetics, requires special conditions for optimal growth and maximum yield. Mulching plays an important role in creating these conditions, especially in regions with extreme climatic conditions such as the Zarafshan oasis.

Research conducted by Olimova N.T. and Safarov A.K., showed that the use of mulch made of transparent polyethylene film in the conditions of the Tashkent region helps to improve the phenological parameters of chamomile. In particular, this leads to an increase in plant height and more intensive branching, which ultimately increases the yield of flowers and seeds. [3]

In addition, experiments conducted at Samarkand State University confirmed that mulching with straw and plastic film significantly affects the growth and development of chamomile. In particular, mulching with straw helps improve soil structure and reduce moisture evaporation, which ensures more sustainable plant growth. Transparent polyethylene film, in turn, effectively retains heat and protects young plants from temperature changes, which is especially important in early spring . [5]

The literature confirms the importance of mulching as an effective agrotechnical technique for increasing productivity and improving the growth conditions of chamomile. The use of different types of mulch, such as straw and plastic film, allows you to adapt growing conditions to specific climate requirements and production goals. In the future, it is important to continue research in this area to optimize cultivation technologies and increase the efficiency of resource use.

Basic mulching methods

Mulching is an agricultural practice in which the surface of the soil is covered with various materials to improve conditions for plant growth. Mulch can be either organic or inorganic. The main purpose of mulching is to retain soil moisture, maintain optimal temperature, suppress weed growth and prevent soil erosion. Let's consider the main mulching methods used for chamomile, their characteristics and impact on the agrophysical properties of the soil.

Table 1. Comparison of mulching methods

Mulching method	Material	Advantages	Flaws	Effect on chamomile
Organic	Straw	Increases organic content, improves soil structure	May attract pests	Improves soil moisture and nutritional composition
	Compost	Enriches the soil with nutrients, activates microflora	Decomposes faster, requires regular updating	Promotes rapid growth and development
Inorganic	Polyethylene film	Effectively retains moisture and heat	Does not allow air to pass through, may lead to overheating of roots	Promotes early spring growth
	Black plastic	Suppresses weed growth and retains heat	May promote the development of rot and mold	Improves moisture control, accelerates seed ripening

Soil mulching is an important agricultural practice that significantly improves growing conditions and increases the yield of crops, including chamomile (*Matricaria chamomilla* L.). The use of various types of mulch allows not only to retain moisture and maintain optimal soil temperature, but also to suppress the growth of weeds, which is especially important in the specific climate of the Zarafshan oasis.

Organic mulching

One common mulching method is to use organic materials such as straw. Straw plays a key role in maintaining soil moisture by reducing water evaporation. This is especially important in dry regions where moisture deficiency can severely limit plant growth. In addition, straw decomposes and improves

the soil structure over time, enriching it with organic matter. This helps improve the water-holding capacity of the soil and creates more favorable conditions for the chamomile root system.

Table 2. The effect of straw mulching on the phenological parameters of chamomile

Index	No mulch	Mulching with straw
Plant height (cm)	45-50	60-65
Bush diameter (cm)	25-30	35-40
Flower yield (kg/ha)	500-600	650-750

Comparative studies show that chamomile plants mulched with straw exhibit higher growth rates compared to unmulched areas. For example, the average height of plants under conditions of straw mulching can reach 60-65 cm, while in control plots it is 45-50 cm. This is due to the fact that straw helps maintain stable temperature and moisture, which is especially important for a young plant.

However, despite the benefits, straw has its limitations. As it decomposes, it can attract pests and pathogens, which requires additional plant protection measures. In addition, straw needs to be renewed regularly because it decomposes more quickly than other types of mulch.

Inorganic mulching

Another important mulching method involves the use of inorganic materials such as plastic film. Clear plastic film is used extensively to retain heat in the soil, which is especially useful in the early spring months when soil temperatures may not be warm enough for optimal plant growth. The film helps to retain heat, which accelerates the development of the root system and contributes to the rapid start of the growing season. This is especially important for chamomile, which is sensitive to temperature fluctuations during the initial growth phases.

Table 3. The effect of mulching with polyethylene film on the phenological parameters of chamomile

Index	No mulch	Mulching with film
Plant height (cm)	45-50	70-75
Bush diameter (cm)	25-30	40-45
Flower yield (kg/ha)	500-600	800-900

Transparent polyethylene film also effectively retains moisture, significantly reducing evaporation. This creates a more stable environment for plant growth and reduces the need for frequent watering. However, using film also has its disadvantages. It does not allow air to pass through, which can limit oxygen access to the roots and can also cause the soil to overheat on hot days. Despite this, research shows that the use of plastic film can significantly increase chamomile yields. In particular, flower yield in areas mulched with film can reach 800-900 kg/ha compared to 500-600 kg/ha in control areas.

Black plastic, another popular inorganic material, is also used for soil mulching. Its main benefits include effective weed suppression as it blocks light and prevents weed growth. Black plastic, like plastic film, retains heat and moisture in the soil, which promotes stable plant growth. However, it can contribute to overheating of the soil and, like film, does not decompose, which does not improve the soil structure in the long term.

The effect of mulching on the growth and productivity of chamomile

The effectiveness of mulching largely depends on the selected material and growing conditions. Organic mulch, like straw, improves the physical and chemical properties of the soil, which is especially beneficial in long-term growing conditions. It helps maintain stable soil moisture and temperature, which improves conditions for the root system and overall plant growth. Inorganic mulches, such as plastic wrap and black plastic, are more effective at quickly creating favorable conditions for plant growth, especially during the early growing season.

Table 4. The influence of different types of mulch on the phenological parameters of chamomile

Index	No mulch	Straw	Polyethylene film
Plant height (cm)	45-50	60-65	70-75
Bush diameter (cm)	25-30	35-40	40-45
Number of buds	15-20	25-30	30-35
Time before flowering (days)	50-60	45-55	40-50

A comparative analysis shows that the use of polyethylene film can significantly increase the growth and yield of chamomile. This is explained by the fact that the film effectively retains heat and moisture in the soil, creating optimal conditions for early plant growth. At the same time, straw as an organic mulch improves long-term soil conditions and supports stable plant growth and development throughout the season.

Thus, the choice of mulching method should be based on specific growing conditions and production goals. To obtain maximum yield and quality of chamomile, it is recommended to use a combined approach, which includes both organic and inorganic mulching, depending on seasonal and climatic conditions.

Conclusion

Mulching is an effective agrotechnical technique that significantly improves the growing conditions for chamomile. Research results have shown that the use of both organic (straw) and inorganic mulch (plastic film) helps to increase plant growth, development and productivity.

Organic mulch improves soil structure, contributes to its enrichment with organic matter and maintains optimal moisture. This is especially important in arid climates, where maintaining soil water balance is critical.

Inorganic mulch, such as clear plastic sheeting, provides effective heat and moisture retention, which is especially useful in early spring and when temperatures fluctuate.

To achieve the best results in the cultivation of chamomile, it is recommended to use a combined approach to mulching. In the arid climate of the Zarafshan oasis, it is optimal to use plastic film in the early spring months to quickly warm up the soil and protect plants from temperature changes. In the future, you can switch to mulching with straw to maintain soil structure and fertility. Prospects for further research include the development of new mulching methods using innovative materials that could combine the benefits of both organic and inorganic mulches. In addition, it is important to continue studying the effect of mulching on the content of biologically active substances in chamomile to improve the quality of medicinal raw materials.

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