

Organic mulching in hot climates

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Introduction

The effects of organic mulching on vegetables, using three different crops, which are Broccoli (*Brassica oleracea italica*), Turnips (*Brassica rapa*) and Cauliflowers (*Brassica oleracea capitata*) seeds, which were grown in a soil covered with organic mulching.

The results from this study indicate that where the organic mulching method where used on the soil, various benefits where observed. The aim of this study was to explore the effects of organic mulching on vegetables.

Materials and methods

Seeds were grown in a soil covered with organic mulching. These crops were compared with other crops of the same species which were grown at the same time, in the same type of soil. The only difference is that the soil where these crops were grown was not mulched. The mulch used, was a four layer mulching. The first layer is paper, the second layer is horse manure, the third layer is straw, while the fourth layer using 2 types of dried mulch gathered from wild plants namely *Glebionis Coronaria* which also protects neighbouring plants from caterpillars and it's secretions from the roots control soil nematodes. The other wild plant is *Diploaxis tenuifolia*.

The experiment was conducted on the land managed by the Genista Research Foundation at the Rinella valley.

The area where the experiment was done was rotavated to the depth of 25cm. This was done by a rotary cultivator. After the tillage it was time to do the mulch layers. First the area was covered with newspaper sheets. Approximately around 1/3 of an inch of sheets were put on the area. Then on the sheets approximately 2/3 of an inch shredded papers were put. Following this the area was covered with the horse manure. This was done about 1 inch high all around. The last stage of the mulching was the straw. Around 1 inch of straw was spread on the manure together with the dried wild plants gathered from another part of the valley. In all 3 inches of mulch was put all over the area. Then it was time to water the mulch.

Everything was left untouched for three weeks. This was done so that the three layers would compact to each other.

After three weeks it was time to plant the crops. Three different types of plant crops, which were all grown organically, were obtained. These crops are Broccoli (*Brassica oleracea italica*), Turnips (*Brassica rapa*), and Cauliflowers (*Brassica oleracea capitata*). A plant seed was also included in the experiment so that the effect of the mulch on growing seeds would be observed. So it was decided that Broad Bean (*Vicia faba*) seeds would also be sown in the mulch.

Results and discussion

In first 2 weeks low temperatures and strong wind have affected negatively the plant growth.

Table 1. Situation at the experiment area after the third week from planting

Mulched area	Unmulched area
Broccoli: 20% still alive, stunted growth yellowing of leaves	All dead
Broad beans: 90% started to germinate	No signs of germination
Cauliflowers: 60% still alive, stunted growth, yellowing of leaves	All dead
Turnips: 75% still alive, stunted growth, yellowing of leaves	All dead
Weeds: some grass growing from the seeds present in the manure	Some small weeds

The only symptoms shown by the plants during the second week were the burning of the leaves and stunted growth. These symptoms were due to the cold temperatures and strong cold winds. The low temperatures continued next weeks, too.

Table 2. Situation of the experiment area after the fifth week from planting

Mulched area	Unmulched area
Broccoli: 10% still alive, yellowing of leaves, stunted growth, wilting of leaves	All dead
Broad beans: 100% germination, plants 2 inches tall with 2 dark green, open leaves	90% germination, 1 inch long with no leaves
Cauliflowers: 20% still alive, stunted growth, yellowing of leaves, wilting of leaves	All dead
Turnips: 15% still alive, stunted growth, yellowing of leaves	All dead
Weeds: some grass growing from the seeds present in the manure	A lot of growing weeds all over the area

It was seen that there was some grass growing in small patches in the mulched area while in the unmulched area there was quite an amount of weeds growing all over the section.

As many of the plants died due to the cold weather, it was decided to replace the plants so that more results could be obtained when the weather became warmer. In fact, during the first week of March, some Turnip, Cauliflower and Broccoli plantlets were planted again in both sections of the experiment area. During the first week of March the weather remained cold. But from the second week onwards the temperature started to rise slowly. In the first week of March it was observed that the Broad Bean plants in the mulched area had developed some flower buds while those in the unmulched area had no flower buds.

The plantlets planted during the first week of March all started to grow gradually and no difference was seen in growth. The other Turnip, Broccoli and Cauliflower plants which were still alive from January showed little signs of growth.

It was noticed that the soil under the mulch was still very wet. Despite this, the plants in the mulched section did not show lack of air in the root zone. It was also noticed that in the soil under the mulch there were various earthworms. When a hole was done in the soil of the unmulched area no earthworms were seen. When this was done it was during the last week of March. It was also observed that the soil under the mulch was warmer than that in the unmulched area even though the former contained more water.

During the month of April there were only a few changes in the results. The crops in the unmulched area were all covered with weeds. This stunted the growth of the crops. In the mulched area all the crops continued growing normally. During the 2nd week of April the

Broad Bean plants in the mulched section formed the pod while the Broad Bean plants in the unmulched section were still with flowers.

Table 3. Situation at the experiment area during the last week of March

Mulched area	Unmulched area
Broccoli: 1 st planting; growing very slowly 2 nd planting; all growing normally	1 st planting; all dead 2 nd planting; growing slower, covered with weeds
Broad beans: bigger plants, larger and greener leaves, had several flowers	Smaller plants with smaller leaves had several flowers
Cauliflowers: 1 st planting; growing very slowly 2 nd planting; all growing normally	1 st planting; all dead 2 nd planting; all growing normally
Turnips: 1 st planting; almost stunted in growth 2 nd planting; a little smaller	1 st planting; all dead 2 nd planting; a little bigger
Weeds; scattered patches of grass growing all over the section, about 30 cm long	Covered almost all the section, nettles almost 30 cm long, some plants couldn't be seen

The results show that the mulch offers various benefits to the crops. No negative effect was seen on the plants caused by the mulch. The period of time when the experiment was done must also be taken into consideration. In fact, when the Broccoli, Turnips and Cauliflowers were planted for the second time during the first week of March, the temperature was warmer than that of the first planting. The plantlets that were planted during the second planting all survived and grew normally. The strong cold winds that took place also affected badly the plantlets as it led to the burning of the leaves of many plants. The experiment shows that the mulch helped some crops to grow faster, healthier and even more. The following is a list of effects that were observed during the experiment. The Broad Bean seeds in the mulched area germinated almost one week and a half before those planted in the soil without mulch. This shows that the mulch helps seeds to germinate. So the fact that the seeds in the mulched area had a warmer environment than those in the unmulched area helped the seeds to germinate quicker. The fact that the Broad Bean plants grown in the mulched area grew larger in size and had bigger and greener leaves than those grown in the unmulched area can also be expressed as a mulching effect. This can be due to the fact that the plants in the mulched area had more nutrients than those in the unmulched area. Roots need warm temperatures to grow. During the experiment it was noticed that the soil under the mulch was warmer than the soil which was not covered. Therefore this might have helped the plants in the mulched area to grow up the new roots. The fact that in the soil under the mulch various earthworms were observed in contrast to the soil with no mulch where no earthworms were observed can also be defined as a mulching effect.

Conclusions

1. Organic mulches applied decompose by time and enrich and improve the soil. This results in increased aeration of silt in soils and added water-holding capacity which is of ultimate importance due to our hot weather and long days.
2. Decomposition of organic mulch increases the amount of organic matter in the soil followed by increase of the Cation Exchange Capacity of soils Also the continued breakdown of organic matter by micro-organisms leads to a gradual release of nutrients over a long period of time.
3. Mulching is increasing soil moisture and the number of earthworms

4. Mulching is a good practice against weeds. During April the crops in the unmulched area were all covered with weeds. This stunted the growth of the crops. In the mulched area all the crops continued growing normally. During the 2nd week of April the Broad Bean plants in the mulched section formed the pod while the Broad Bean plants in the unmulched section were still with flowers.
5. In the mulched area only weeds growing from the seeds present in the manure grew. Perhaps if the mulching layers were changed and the manure was placed first, then the papers and the straw on top neither weeds from the soil nor from the manure would have grown. By this the weeds' problem could be more controlled and there would also be a less labour needed to remove the weeds. Moreover there would be no need to use herbicides to control the weeds while growing crops. This is because the sheets of paper would restrain the grass from the seeds in the manure to grow.
6. Based on the results of the experiment it can be concluded that a mulch layer of paper, horse manure, straw and wild plants on the soil help vegetables to grow faster, healthier and with less labour. All the crops showed that the mulch helped them to grow better. No negative effects were seen on the crops that could have been caused by the mulch. Moreover when the crops are harvested the mulch layers can be mixed in the soil. This would enhance the soil structure and enrich the soil fertility in various ways.