

Organic mulches: physical barrier, organic material with allelopathic effect, source of nutrients for plants and soil fauna

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Introduction

Different organic residues can be used for soil mulching. In contrast to many countries, mulching is not widely used in Lithuania. Changing climate, decreasing soil fertility, sometimes unsuccessful and high-input requiring weed control, growing demand for organically grown vegetables are the main reasons for alternative measures in agricultural production. Organic mulches affect agricultural crops in a variety of ways. Firstly – as a physical barrier. Bare soil is not naturally found in ecosystems. In natural ecosystems it is usually covered. This barrier decreases weed emergence and re-growth in agricultural fields, not only of annual but also of perennial weeds. The temperature of covered soil is lower and more stable than that of bare soil. The higher temperature of soil is useful for some plants (in vineyards, for example), but the crops which we grow are the crops of temperate climate. The lack of soil moisture more and more often becomes the main reason of low yields. The physical barrier is important for protecting the soil structure from damage of heavy rains. Nowadays heavy rains or a lack of rainfall are important problems in agriculture. Many plants and their residues are known for their allelopathic effect. For example oilseed rape, buckwheat and other plants can decrease weed density and the spreading of pests. Data from many experiments prove the important role of soil organisms in crop productivity formation. Decomposable organic residues constantly supply nutrients to plants.

Methodology

The two-factor field experiment was carried out in 2019 on farmer's farm located in Gilaičiai village, Šiauliai district. Research object - *Allium cepa* L. (cultivar 'Red Baron') onion crop in plots with different organic mulches. Research aim - to determine the influence of different organic mulches and the varying thickness of their layers on soil temperature, soil agrochemical properties, the number and weight of earthworms in the soil, weed germination and the yield of onion. Soil temperature were measured 3 times with a mobile device. Weed accounting was done three times during vegetation period. Each kind of weed was counted and uprooted. The amount of weeds converted to units per m². In each plot were marked 4 sites for earthworm research. Earthworms were picked from the soil, counted, weighed and converted into units g m². To determine the agrochemical properties, the soil was taken from 5 different locations in each plot with a special drill. The onion harvest was recorded after removal from the plots, cleaning and weighing.

Results

During the field experiment it was found that the temperature in all fields covered with organic mulch was significantly 1.1 – 1.2 times lower compared to not mulched plots. Covering the soil with different organic mulches significantly increased the number and weight of earthworms in the soil compared to non-mulched fields. Throughout the vegetation period, the number of weeds in plots mulched with organic mulch was significantly lower compared to non-mulched plots. Different organic mulches did not have a significant effect on the agrochemical properties of the soil. Straw after 3-year storage, winter rape biomass and often cut lawn grass mulch increased yield. Straw mulch significantly reduced onion yield by 1.7 times. The thicknesses of the mulch layer significantly affected weed density and soil temperature.

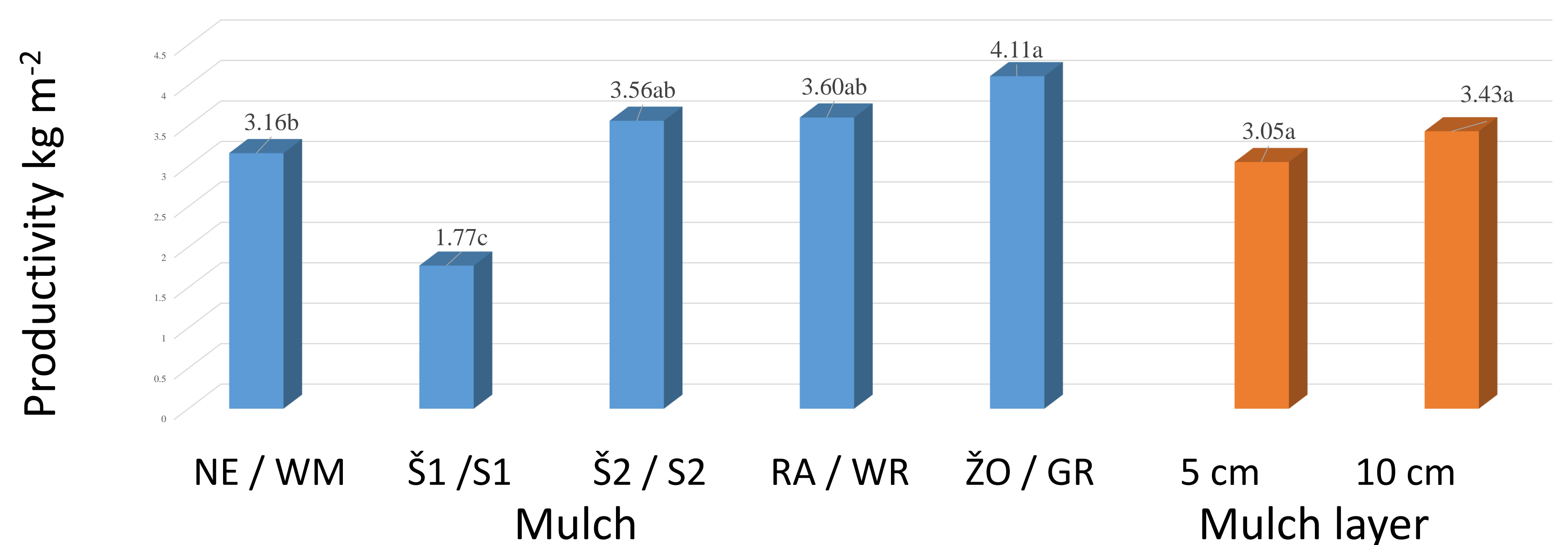


Fig. The residual effect of organic mulches and thickness on onion productivity.

Note: WM – without mulch, S1 – straw mulch, S2 – straw mulch after three years of storage, WR – winter rape biomass mulch, GR – often cut lawn grass mulch. The differences between the averages of variables, marked with a different letter (a,b,..) are significantly different at the 95 % probability

Main conclusion: The effect of mulch depends on many factors and can vary. Due to wide-ranging and multifaceted effects the yield of agricultural crops in mulched plots in many cases increases.