

# INFLUENCE OF VARIOUS SOIL MAINTENANCE METHODS IN ORGANIC ORCHARD ON THE GROWTH AND YIELDING OF SWEET CHERRY TREES IN THE FIRST YEARS AFTER PLANTING

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## A B S T R A C T

The effect of various soil maintenance methods on the growth and yielding of sweet cherry cultivars, 'Burlat' and 'Karesova', was studied in the four-year-old organic orchard. Five experimental combinations were used: clean cultivation (control), seeding with Harlequin marigold to provide ground cover in tree rows, and three types of mulch: one organic – hard wood bark, and two inorganic mulches in the form of black polypropylene agro-fabric and linen-web.

Marigold plants significantly restrained the growth of sweet cherry trees and limited the number of shoots emerging in the crown, and the effect was more pronounced in 'Karesova' than in 'Burlat'. The effect of inorganic mulches on the increase in trunk thickness and shoot length in the crown was insignificant. Only bark mulch showed a tendency to hold back tree growth in comparison with the control combination. The direct effect of the mulches on the yielding of the trees could not be determined because in the spring of 2007 all the blossoms on sweet cherry trees got completely frostbitten.

**Key words:** cherry trees, soil cultivation, mulching materials, organic orchard

## INTRODUCTION

In many countries, the basic method of soil cultivation in orchards

is maintenance of grass fallows in the inter-rows and herbicide strips under the trees. Himmelsbach et al. (1995) emphasize chemical control of weeds

as an uncomplicated and inexpensive system of soil maintenance in an orchard. However, in response to the growing consumer awareness, alternative methods excluding or limiting the use of herbicides are promoted and put into practice. A typical example is the use of various organic and inorganic mulches (Engel et al., 2001; Szewczuk and Gudarowska, 2004; Szewczuk and Dereń, 2008).

Many authors have reported that mulching the soil in an apple orchard with pine bark or non-woven fabric improves the yielding of trees and increases fruit weight (Lakatos and Buban, 2000; Szewczuk and Gudarowska, 2004). The fruit from mulched plots have also been found to keep better than those from herbicide fallow. Czynczyk et al. (2004) found a somewhat stronger growth of apple trees and earlier fruiting of trees growing in a soil covered with polypropylene agro-fabric and flax felt than with a bark. It should be emphasized that most of the work has so far been devoted to apple trees (Ścibisz and Sadowski, 1995; Lipecki and Bilińska, 1998; Lakatos and Buban, 2000; Szewczuk and Sosna, 2001).

The aim of the work presented is to determine the effect of various types of mulches on the growth intensity of sweet cherry trees in the first years after planting, and indirectly also on their yielding.

## MATERIAL AND METHODS

The experiment was carried out in the years 2004-2007. One-year-old

maidens of the sweet cherry cultivars 'Karesova' and 'Burlat' grafted on sweet cherry F12/1 were chosen for the study. The young trees, with the crown already partly formed in the nursery, were planted in the organic orchard in the spring of 2004, at the spacing of 4.5 m between the rows and 3 m in the rows. Five soil maintenance methods were used in the tree rows: clean cultivation, seeding with Harlequin marigold 'Carmen' (*Tagetes patula nana*), and three types of mulch: an organic mulch of hard wood bark and two inorganic mulches of black polypropylene agro-fabric and linen-web. The experiment was set up in four replicates, with five trees per a plot. The fallow in the inter-rows was maintained mechanically over the entire duration of the experiment. In the combination with hard wood bark, any occasionally appearing weeds were removed by hand. The organic and inorganic mulches were spread in about 1-m-wide strips of the tree row. Thickness of the hard wood bark layer was 10cm. After the second year of the experiment it was necessary to add more bark. The mulch of polypropylene agro-fabric remained in a good condition throughout the entire experiment, whereas linen-web was systematically plucked by birds, which used it as a building material for their nests. Out-of-bloom marigold plants were cut a few centimeters above the ground. Mechanically cultivated plots served as the control combination.

Due to the young age of the trees and complete freezing of the flowers

in the spring of 2007, that is, in the fourth year after planting, only the results concerning the measurements of tree growth vigour have been presented here. Each year, trunk cross-sectional area was measured. Also, for the first three years, the total length of annual shoots and the number of shoots in the crown were determined. The results were evaluated statistically using the analysis of variance and the significance of differences between means were assessed with Duncan's t-test at  $p = 0.05$ .

## RESULTS AND DISCUSSION

In the first year after planting, the soil maintenance methods did not have an effect on the size of the trunk cross-sectional area in both the sweet cherry cultivars (Fig. 1). Only the ground cover with Harlequin marigold plants caused a significant restriction of their growth. This was particularly evident in the cultivar 'Karesova'. In the case of 'Burlat' trees, except for the first two years, marigolds were not found to have had a restrictive effect on the increase in trunk cross-sectional area of sweet cherry trees. This was probably a result of the trees becoming better rooted as time went by and of a greater care on the part of those running the experiment in not allowing the marigold plants to grow too tall by systematically cutting them when they were out of bloom.

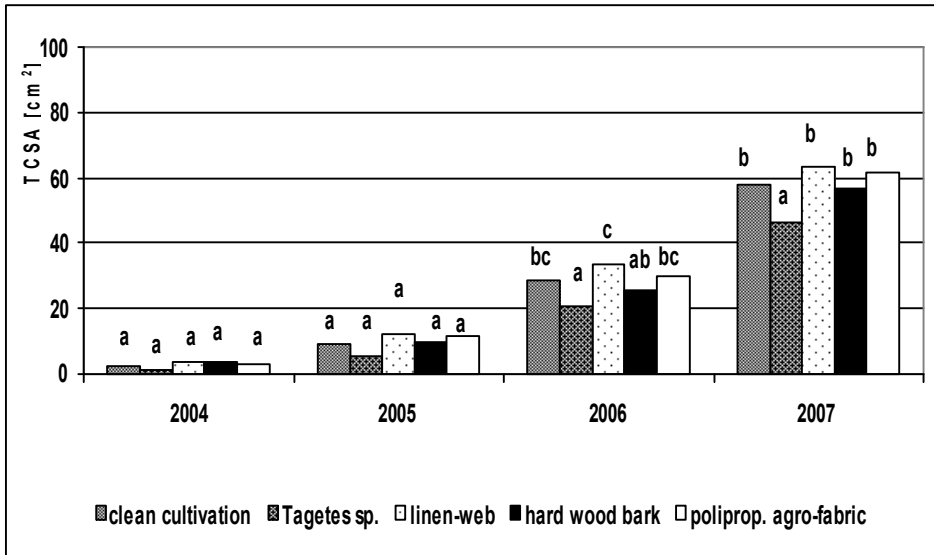
In comparison with the other mulches, the ground cover with marigolds significantly reduced the

number of shoots only (Fig. 2). On the other hand, mulches such as black polypropylene agro-fabric, line-web and hard wood bark created favourable conditions for shoot elongation, particularly in the cultivar 'Karesova', and also caused a significant increase in the number of shoots (Fig. 3).

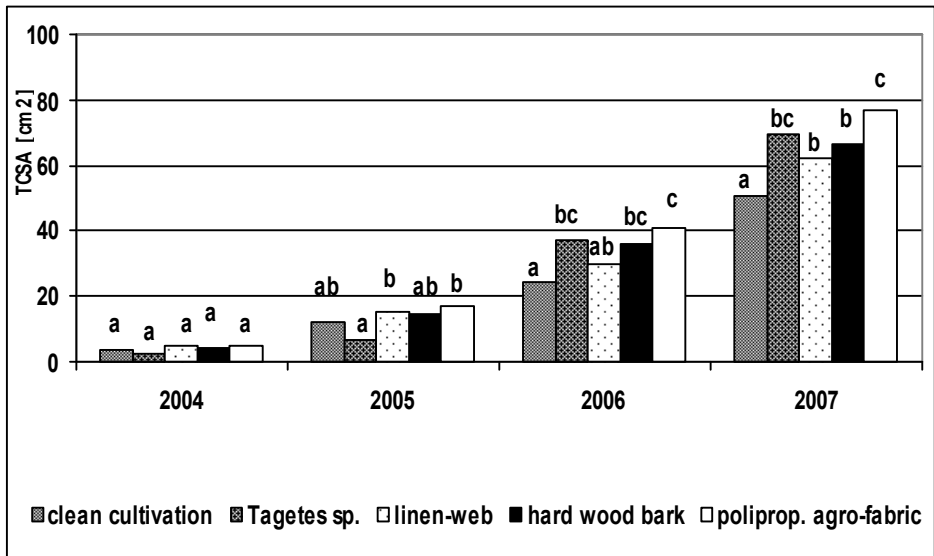
In the third year after planting there was a negative effect of linen-web mulch on shoot growth of both sweet cherry cultivars. After being used for two years, the linen-web was already very "tatty". It may be assumed that in the subsequent years the older trees will begin to show the health-enhancing action of marigold plants on the soil and thus better than in the other combinations shoot growth dynamics resulting from this fact. The authors are aware that this experiment has not run long enough to enable them to draw far-reaching conclusions on the basis of the results obtained thus far, but the results do nevertheless shed light on how sweet cherry trees respond to various methods of soil maintenance in an organic orchard, which in that respect have not been worked out sufficiently yet.

Despite the large number of flower buds in 2007, the effect of mulching on the yielding of trees, which was promising well, could not be determined because in the spring all the blossoms got frozen. The experiment is still young and will be continued and supplemented with the data on the effects of the various mulches on the yielding of sweet cherry trees.

A

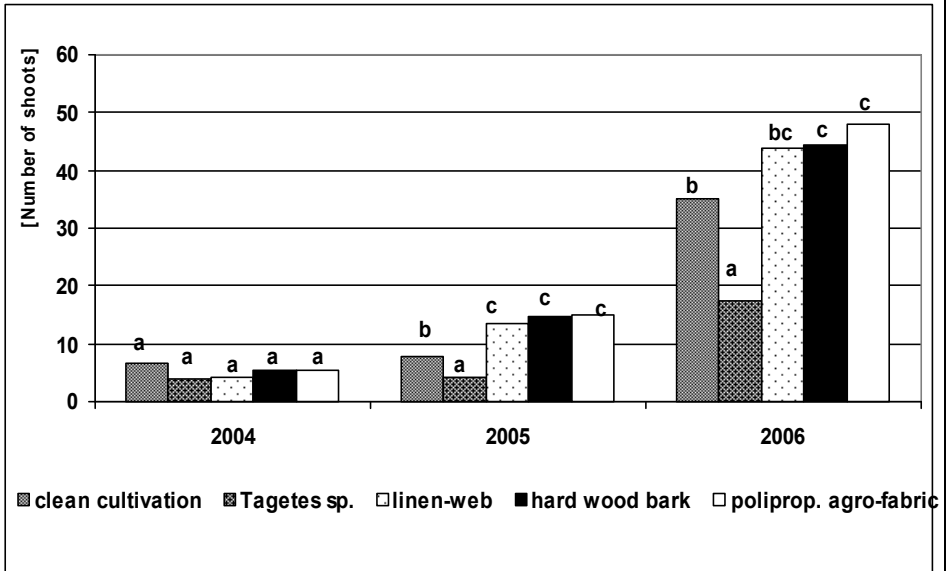


B



**Figure 1.** Effect of the method of soil maintenance in tree rows on trunk cross-sectional area of sweet cherry cultivars: A – ‘Karesova’, B – ‘Burlat’

A



B

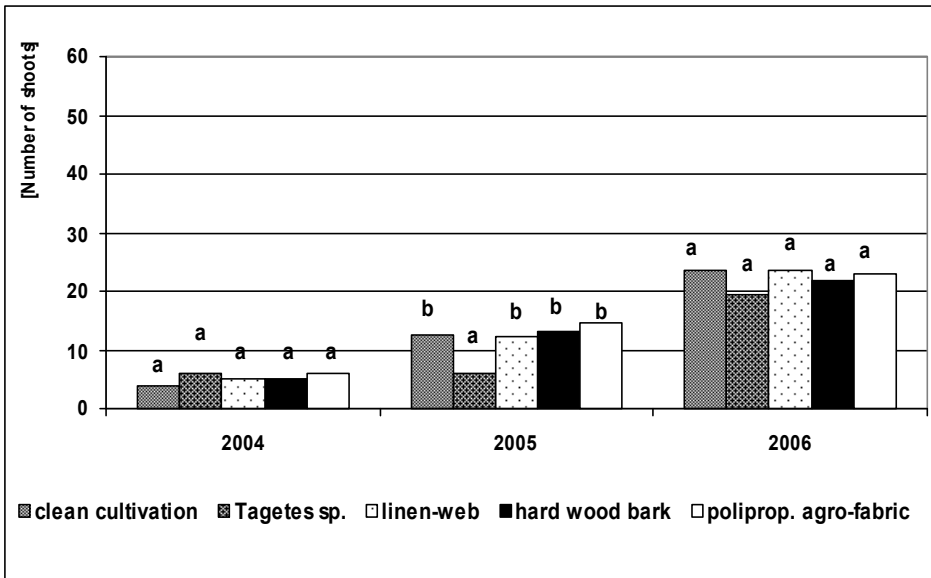
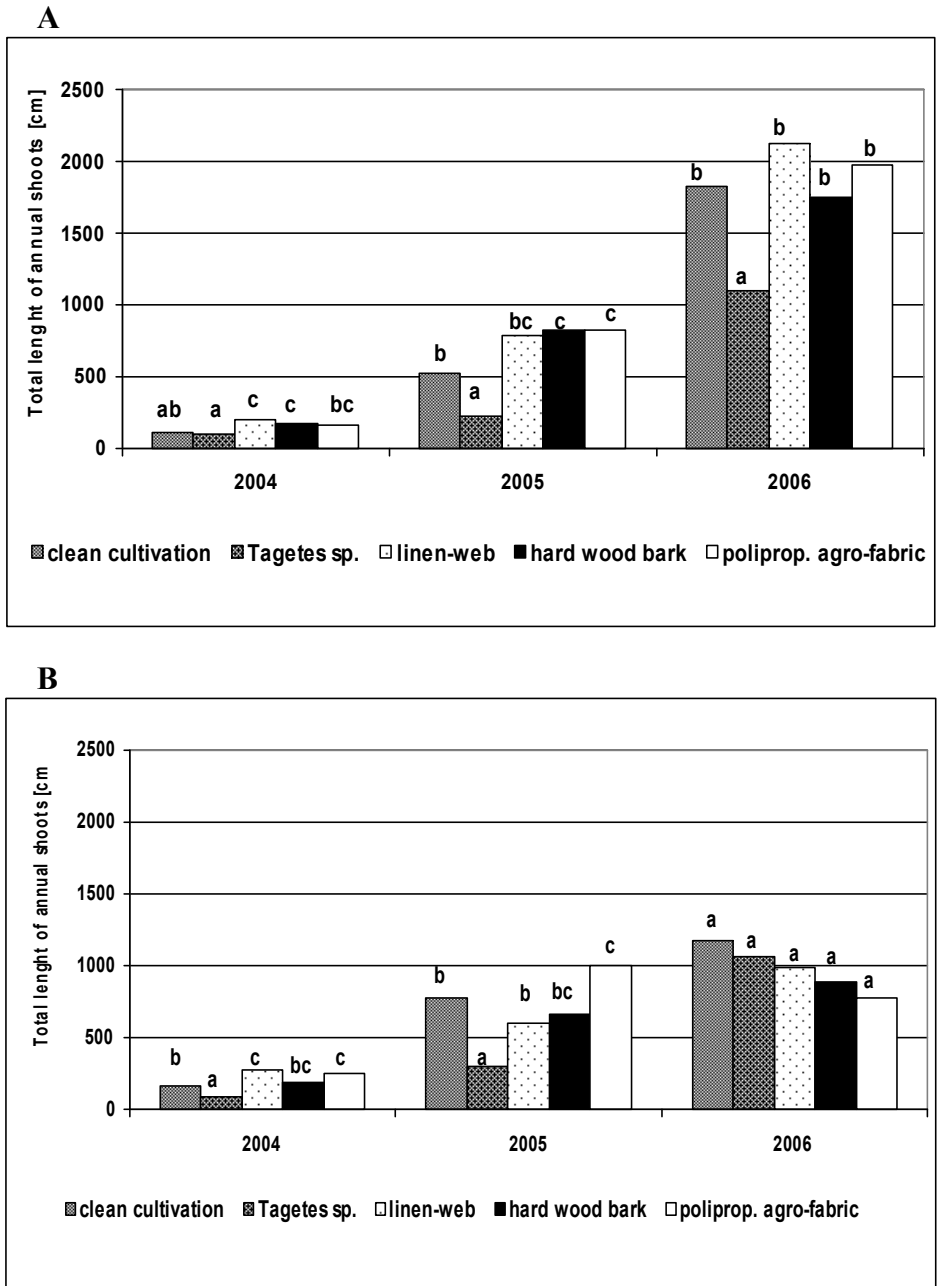


Figure 2. Effect of the method of soil maintenance in tree rows on the number of shoots of sweet cherry cultivars: A – ‘Karesova’, B – ‘Burlat’



**Figure 3.** Effect of the method of soil maintenance in tree rows on the total length of annual shoots of sweet cherry cultivars: A – ‘Karesova’, B – ‘Burlat’

## CONCLUSIONS

1. The ground cover provided by Harlequin marigold plants was effective in controlling weeds in the tree rows and reduced the growth intensity of annual shoots in young sweet cherry trees, and indirectly favoured the setting of flower buds.
2. The inorganic mulches in the young sweet cherry orchard did not have a significant effect on tree growth vigour, neither in terms of trunk thickness nor in terms of the number and length of annual shoots.
3. Hard wood bark restrains the growth of young cherry trees probably by restricting availability of nitrogenous compounds.

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## WPLYW RÓŻNYCH SPOSOBÓW UTRZYMANIA GLEBY W EKOLOGICZNYM SADZIE CZEREŚNI W PIERWSZYCH LATACH ŻYCIA DRZEW

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### S T R E S Z C Z E N I E

W okresie pierwszych pięciu lat badano wpływ różnych sposobów utrzymania gleby na wzrost i owocowanie drzew czereśni odmian 'Burlat' i 'Karesova' w sadzie ekologicznym. W rzędach drzew, do ochrony gleby przed chwastami, zastosowano następujące kombinacje doświadczenia: ugór mechaniczny i wysiew nasion aksamitki, a także trzy rodzaje mulczowania gleby: korę drzewną, czarną polipropylenową włókninę i wojłok lniany.

Aksamitka ścinana dwukrotnie w okresie wegetacji lekko hamowała wzrost drzew, w większym stopniu odmianę 'Karesova' niż 'Burlat' i zwiększała liczbę zawiązywanych pąków kwiatowych. Ściółki nieorganiczne nie miały wpływu na siłę wzrostu drzew badanych odmian czereśni. Natomiast kora drzewna istotnie osłabiała ich wzrost. Wpływu ściółki na owocowanie czereśni nie udało się zaobserwować, z powodu przymrozków wiosennych, które w 2007 roku zniszczyły wszystkie kwiaty. Doświadczenie jest kontynuowane i czynnik wpływu ściółek na plonowanie czereśni w dalszych badaniach będzie uwzględniony.

**Słowa kluczowe:** pielęgnacja gleby, czereśnia, sad, ekologia, ściółkowanie, wzrost drzew