Economic efficiency of different protection treatments in apple production

Ekonomska učinkovitost primjene različitih tretmana zaštite u proizvodnji jabuka

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ECONOMIC EFFICIENCY OF DIFFERENT PROTECTION TREATMENTS IN APPLE PRODUCTION

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Original scientific paper
Izvorni znanstveni članak

SUMMARY

Apple is the most represented fruit species in Croatia. Codling moth, Cydia pomonella L, is one of the most important apple pests whose population is growing from year to year. The aim of this study was to determine the economic effectiveness of four treatments against codling moth (1 - based on baculovirus; 2 - based on the group of synthetic pyrethroid; 3 - based on kaolin, 4 - control treatment), on the three apple varieties. The experiment was performed at the Agricultural Institute Osijek, Croatia, during three years (2012-2014). In order to analyze the results of apple production it was necessary to calculate production efficiency, labor productivity, and profitability of production. The results of the research of economic efficiency according to market prices treatment 1 and treatment 2 had economic coefficient above 1 with tendency of significant growth, while treatment 3 and 4 were uneconomical. The treatment 1showed advantage over the treatment 2 because of its positive effects on human health and biodiversity, as well as satisfactory economic efficiency.

Key-words: apple production, codling moth, production efficiency, profitability, labor productivity

INTRODUCTION

Apple is the most represented fruit species in Croatia with a share of total value fruit production of 51.7 percent by the data from the Ministry of Agriculture in 2013 (www.dzs.hr). The former way of apple production had a negative impact on the environment through pollution of ecosystems, on beneficial organisms and, due to the presence of residues of pesticides in fruits, on human health (Simon et al., 2007). Conventional production is abandoned due to environmental degradation, such as the destruction of biodiversity (Brmez et al., 2007).

Codling moth (*Cydia pomonella* L.), the most important apple pest, develop resistance to chemical insecticides group (Bouvier et al., 2001; Boivin et al., 2001; Brun-Barale et al., 2005; Franck et al., 2007) due to their frequent application during the growing season because of existence of several generations per year (Lacey et al., 2008). Except chemical protection program, the alternative approaches are used to protect fruit from codling moth such as the use of biological insecticides and methods of confusion (Lacey and Shapiro-Ilan, 2003). The risk of apple production is due to increase of production costs (Crnčan et al., 2011). In order to analyze the results we calculate economic efficiency, productivity, and profitability of production (Kanisek et al., 2008). The aim of this study was to determine the financial efficiency of four treatments against codling moth.

MATERIAL AND METHODS

The experiment was performed at the orchard of Agricultural Institute Osijek during 2012-2014 in four

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different treatments of apple protection against codling moth: the treatment 1 was based on biological product baculovirus; treatment 2 on the group of synthetic pyrethroids; treatment 3 on the kaolin clay and treatment 4 was untreated plot. Yield was calculated on the base of 0.1 ha. Economic efficacy of individual treatment is based on the existence of two prices, the farm gate price (redemption price - RP) and market price (MP). The market price is formed on the market based on trade laws effects (Zmaić and Petrač, 2002), and presents the production cost plus a certain profit. In economic analysis market prices for all production inputs were used; applications of herbicides, pesticides and mulching, cutting, harvesting experimental orchard as well as all kind labor costs and amortization (Ćejvanović, 2007). These items were presented by the cost of production summarized for each treatment and for each year separately and placed in relation with total income for each treatment separately during three years.

RESULTS AND DISCUSSION

During the three studied years the treatment 1 was economicly profitable, according to the market price (Figure 2). Financial result showed positive growth through two years of the investigation, and was conditioned by the increased yield. The financial result achieved on the basis of the redemption price (Figure 1) had a negative growth trend. In 2012, due to frost and temperatures below 0°C during apple flowering, the yield was lower by 40-50% of the average yield, which had an impact on the financial results. In 2013, the farm gate price of apples decreased by 37% and price HRK 2.2/kg compared to the previous year 2012 being HRK 3.5/kg, while the market price (TC) in 2012 was HRK 4.5. In 2013 farm gate price decreased by 22.3% and was HRK 3.5/kg of apples. In 2014 the redemption price of apple dropped to HRK 0.60 compared to 2013 when it was HRK 1.60/kg. In three years the redemption price decreased by 54.29% and the market price by 22.3%. As we can expect further market demands, only the producers with competitive product will survive (Gugić, 2009). The cost of application of plant protection preparations contains the cost of labor as well as amortization of working machines. The market price of biological preparation Granupom, increased in 2013 by 30% compared with 2012. The cost of other expenses remained unchanged compared with 2012.

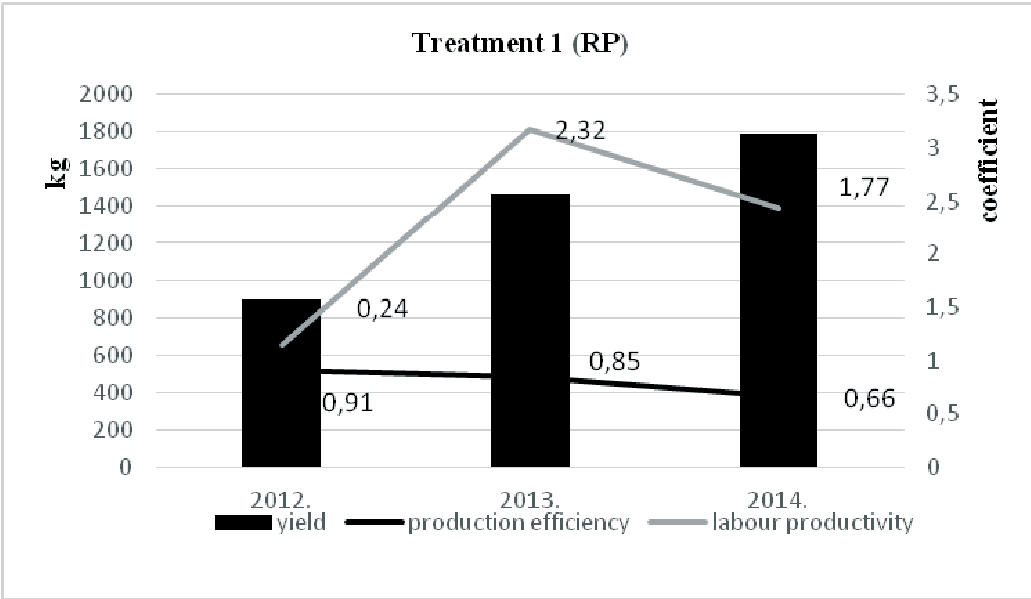

Figure 1. Economic efficiency and productivity of apple production in the treatment 1 according to redemption price (RP) considering the yield (2012-2014)

Grafikon 1. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 1 prema otkupnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

The realized income of the treatment T1 with redemption price during the whole study was not sufficient to cover the cost of apple production. However, economic efficiency was realized by the market price as well as profitability of production with 18% in 2012 and with 35% in 2013. The economic efficiency as well as profitability of production was achieved according to the market price with 44%.

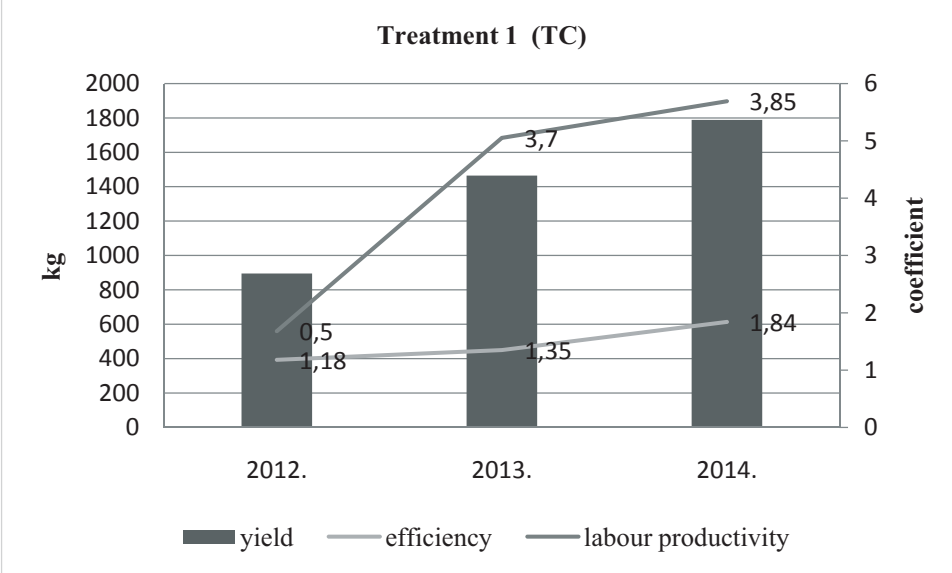

Figure 2. Economic efficiency and productivity of apples in the treatment 1 according to market price considering the amount of yield (2012-2014)

Grafikon 2. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 1 prema tržišnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

The apple production in the treatment T2 had a positive financial result, in farm gate price and market price (Figure 4). The realized income on the basis of redemption price had a negative growth trend which couldn't cover the production costs (Figure 3). In 2013 realized income of the treatment 2 was sufficient to cover the costs of apple production. The economic efficiency according to both prices, as well as production profitability according to market price was 104%. The realized income according to the redemption price in 2014 was not sufficient to cover the cost of apple production.

Results of economic analysis of treatment T3 varied in total amount during three years. In 2012 both financial results were negative, while in 2013, positive financial results were obtained. The economic efficiency of the treatment according to redemption and market price were shown in Figure 5 and 6.

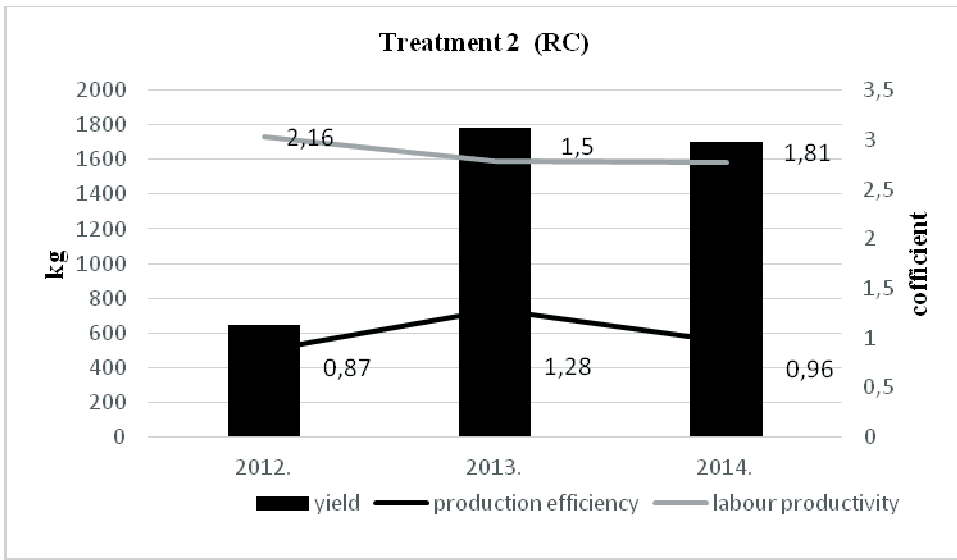

Figure 3. Economic efficiency and productivity of apples in the treatment 2 according to redemption price considering the amount of yield (2012-2014)

Grafikon 3. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 2 prema otkupnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

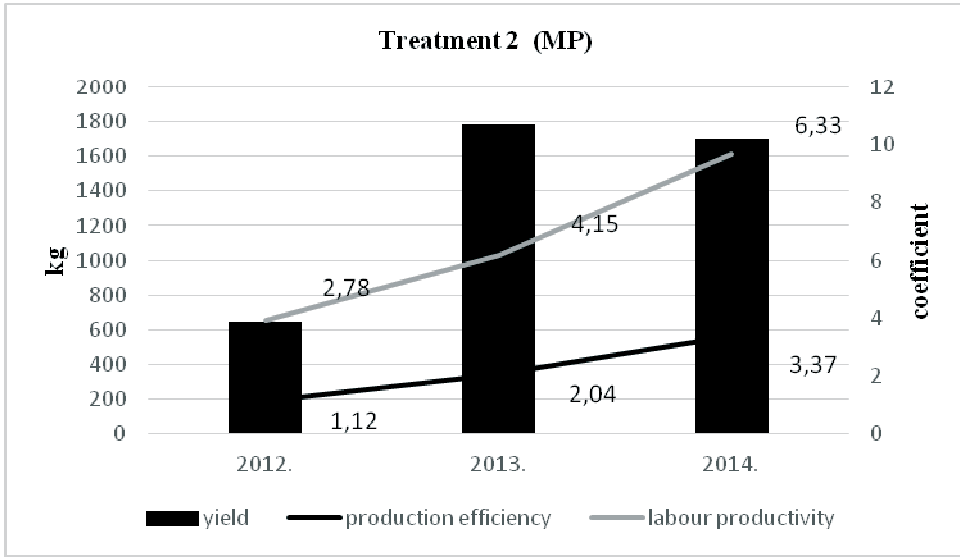

Figure 4. Economic efficiency and productivity of apples in the treatment 2 according to market price (MP) considering the amount of yield (2012-2014)

Grafikon 4. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 2 prema tržišnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

In 2014 a significant drop occurred in the redemption price for further HRK 0.6 and caused a negative financial result compared to 2013. The financial result based on the market price was positive but decreased by 5% compared to the financial results in 2013. The economic efficiency and production profitability was 77%.

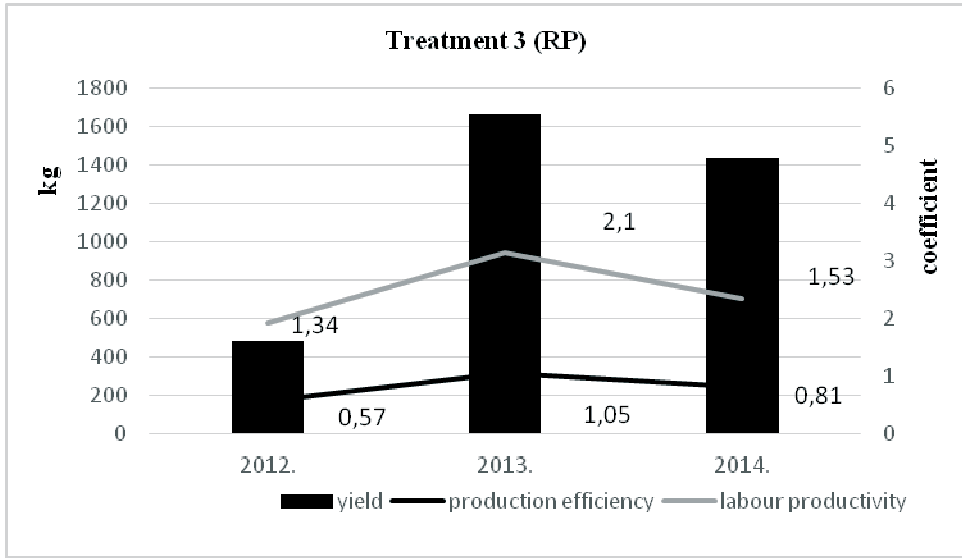

Figure 5. Economic efficiency and productivity of apples in the treatment 3 according to redemption price considering the amount of yield (2012-2014)

Grafikon 5. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 3 prema otkupnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

The results of economic analysis of treatment 4 or control treatment in all three years were negative (Figure 7 and 8). The financial result in 2012 was mainly influenced by the absence of protection against the codling moth which caused the decrease of already low yield. In 2013, significantly higher yield per average value of market prices managed to compensate reduced fruit quality and achieve the positive financial results.

In 2014 there was a lower yield per tree in the control compared with 2013. A big influence on the final negative financial result was a reduced redemption prices for the first class apple for HRK 0.6/kg and for industry for HRK 0.4/kg.

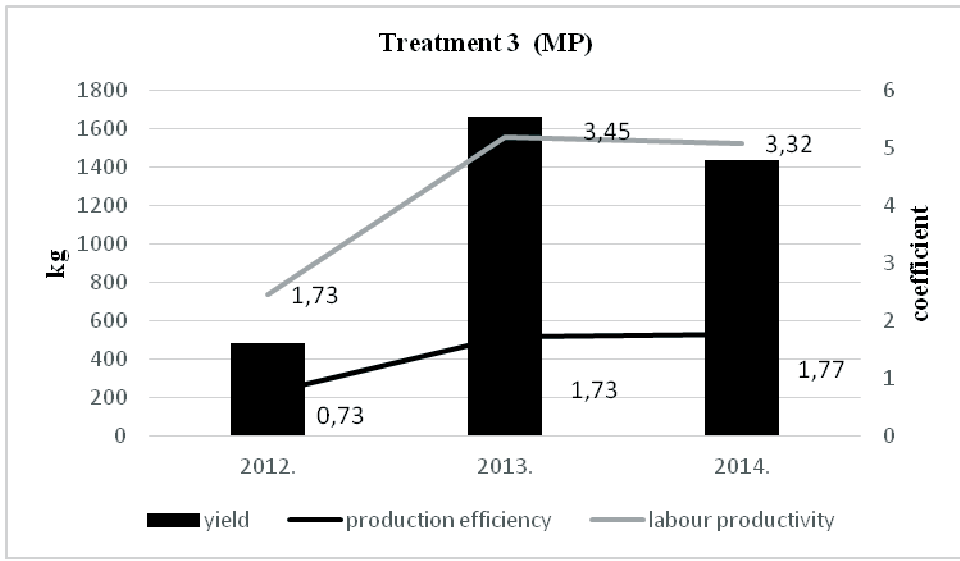

Figure 6. Economic and productivity of apples in the treatment 3 according to market price (MP) considering the amount of yield (2012-2014)

Grafikon 6. Ekonomska učinkovitost i proizvodnost jabuke u tretmanu 3 prema tržišnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

In 2014 there was a lower yield per tree in the control compared with 2013.

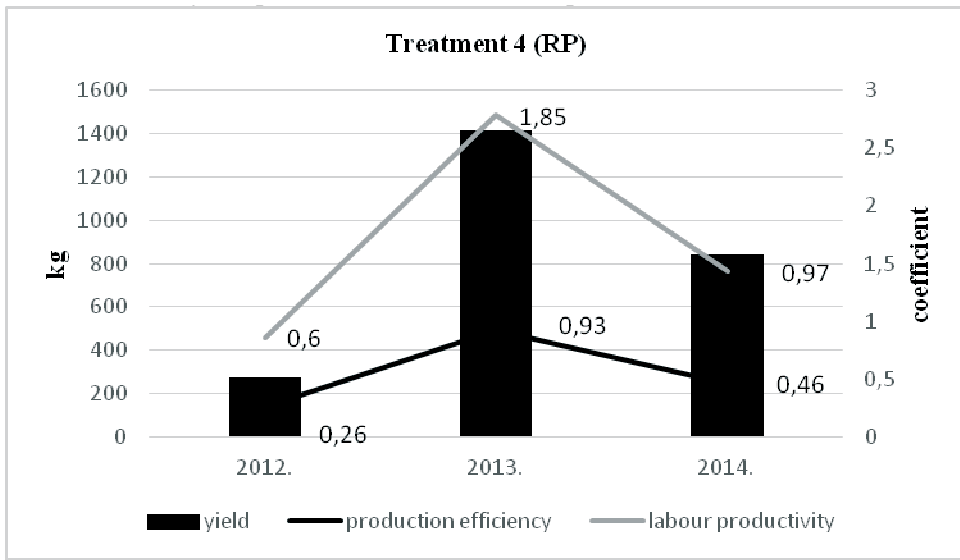

Figure 7. Economic efficiency and productivity of apples in the treatment 4 according to redemption price considering the amount of yield (2012-2014)

Grafikon 7. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 4 prema otkupnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

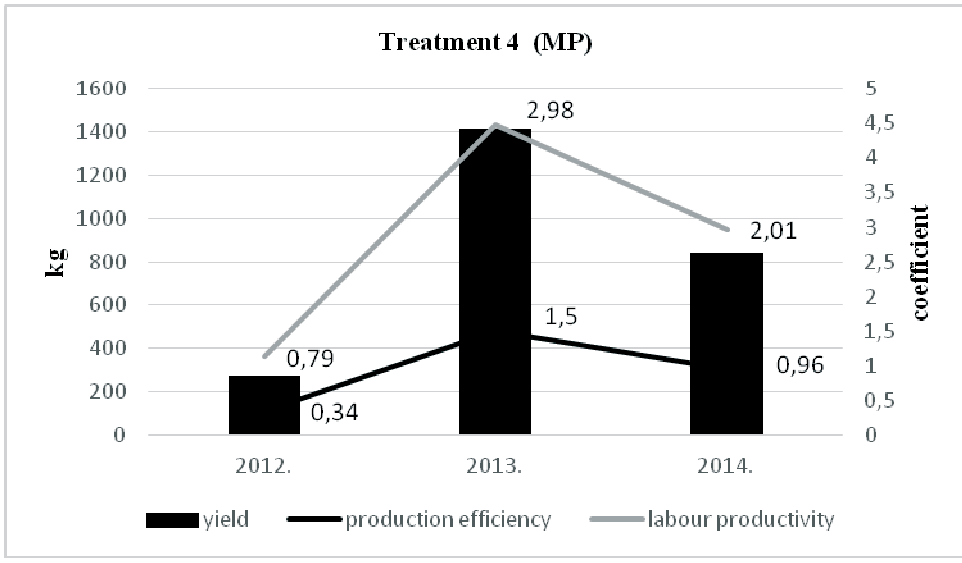

Figure 8. Economic efficiency and productivity of apples in the treatment 4 according to market price (MP) considering the amount of yield (2012-2014)

Grafikon 8. Ekonomska učinkovitost i proizvodnost u proizvodnji jabuke u tretmanu 4 prema tržišnoj cijeni, s obzirom na količinu uroda (2012.-2014.)

CONCLUSION

Economic efficiency is the measure of success of production based on comparison of produced effects and consumed elements of production. Using market prices, coefficient of economic efficiency in treatments T1 and T2 was above 1, with tendency of significant growth, while treatments T3 and T4 were uneconomical. The values of economic indicators - productivity, economic efficiency and profitability, show that apple production through treatment T2 was economically the most efficient during the three-year period where the economy coefficient ranged from 1.12 to 3.37. The ecological benefit compensates lower economic efficiency of treatment T1 while the treatment T2 was more economically efficient, but because of the bad influence on biodiversity, it is not allowed in integrated protection. Fruit growing, as labor, and capital-intensive branch of plant production, takes place under the influence of biological, ecological, technological and organizational-economic factors and is exposed to numerous risks. The economic efficiency must respect and follow the trends and new regulations on the environment and biodiversity. Development of apple production in the future will depend on the application of modern technology, business networking of producers in particular for more efficient market investments, establishment of adequate market infrastructure and marketing activities in order to increase competitiveness in the apple production.

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EKONOMSKA UČINKOVITOST PRIMJENE RAZLIČITIH TRETMANA ZAŠTITE U PROIZVODNJI JABUKA

SAŽETAK

Jabuka je u Hrvatskoj najzastupljenija voćna vrsta. Jabučni savijač, Cydia pomonella L., jedan je od najvažnijih tehnoloških štetnika jabuke, čija populacija raste iz godine u godinu. Na pokušalištu Poljoprivrednog instituta Osijek provedeno je trogodišnje istraživanje (2012.-2014.), čiji je cilj bio definirati postignuti stupanj ekonomskog uspjeha zaštite jabuke od jabučnoga savijača kroz četiri različita tretmana zaštite: 1. - baziran na primjeni biološkoga preparata na bazi baculovirusa, 2. - preparati iz grupe sintetskih piretroida, 3. - primjena kaolina, 4 - kontrolni tretman. Vrijednosti ekonomskih pokazatelja pokazali su kako je proizvodnja jabuke primjenom tretmana T2 bila ekonomski najučinkovitija tijekom trogodišnjega razdoblja, gdje se koeficijent ekonomičnosti kretao 1,12 (2012.)-3,37 (2014.). Prilikom kalkulacije tržišnih cijena i primjenom tretmana T1 i T2, koeficijent ekonomičnosti iznad je 1 te je imao tendenciju značajnijega rasta, dok su tretmani T3 i T4 bili neekonomični. Tretman 1 u istraživanju je izdvojen kao najbolji, zbog zadovoljavajuće ekonomske učinkovitosti te pozitivnog utjecaja na bioraznolikost i ljudsko zdravlje. Urod, odnosno ukupna proizvodnja imala je tendenciju rasta kroz analizirane godine (2012.-2014.), što je, također, utjecalo na pozitivne trendove i mjerila uspješnosti.

Key-words: proizvodnja jabuka, jabučni savijač, ekonomičnost, rentabilnost, proizvodnost

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