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Biodegradable Film Decomposition Levels and Their Effects on Growth and Yield of Corn Crops

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[Abstract]

Recently, PE (polyethylene) film has been used increasingly in corn cultivation. However, PE films often cause soil and environment contamination. In order to reduce this problem, many researches have been carrying out studies on biodegradable films (BF) that are easily decomposed by soil microorganisms. Therefore, this study was conducted to determine which BF is optimal for growth and yield of corn crops while also having the highest rates of film decomposition. BFs Farmsbio (Farm Hannong), Heulgro Film (Sejin Bio), Vonto Film (Eco-Hansung) as well as a selected PE film were used in this study. For the control, we used crops grown without any kind of mulching. Experimental fields were fertilized according to conventional cultivation methods, tilled, and then covered by either BF or PE. After 1 week, corn (cv. MIBECK2ho) at the 3-leaf stage (16 days after seeding) was transplanted. Plant height was measured at 18 and 32 days after transplanting and heading stages. Yield components and yield were also measured at harvest. In addition, pH, EC, and decomposition and light transmittance levels of films were investigated during the experimental period. Daily average temperature, relative humidity and organic matter in soils were also measured during the experimental period. There was no significant difference in plant height, heading date, and silking between crops with BFs and PE, but the crops grown with BFs and PE films reached higher growth parameters in a shorter amount of time than the crops in the non-mulching control. Additionally, there were no significant differences in yield components such as length of ears, ear width, ear weight, and yield in crops that were grown using films or crops in the control plot. Light transmittance and decomposition levels of films generally increased with time after transplanting, and was highest in the Heulgro film than other BFs. Soil pH and organic matter in crops using BFs and PE films were significantly higher than in the control plot at 99 and 113 days after transplanting. In general, the EC contents in the control plot was lower than in crops using BFs and PE films. The average daily moisture in soil was higher when BFs and PE films were used than in the control plot. However, the daily average soil temperature was higher in crops using BFs and PE films than in the control plots at the beginning of the experimental period, but there was no consistent difference in soil temperature towards the later part of the experimental period. Therefore, the BFs used in this study were shown to be helpful without causing negative impacts on the growth and yield of corn.

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