

عنوان مقاله:

Application of Response Surface Methodology for Optimization of Picker-Husker Harvesting Losses in Corn Seed

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نویسندگان:

S.H pishgar komleh - *Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran*

a keyhani - *Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran*

m.r mostofi sarkari - *Iranian Agricultural Engineering Research Institute, Karaj, Iran*

a jafari - *Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran*

خلاصه مقاله:

Seed corn is one of the most important crops due to its high economical value. For this reason harvesting operation should be done precisely. Losses in harvesting seed corn are inevitable but can be decreased to the acceptable level. There are several machinery factors such as cylinder and travel speed which can affect total harvesting losses in two stage harvesting method (with picker-husker and sheller). For this purpose this study evaluated the amount of losses in different speed levels (3, 4 and 5 km h⁻¹) and cylinder speed (400, 500 and 600 rpm) and investigated the relationship between the specified factors (independent variables) and machinery losses (dependent variable). All types of machinery losses were measured and summed as total losses from a representative seed corn field. In order to find the relationship between the variables several models (linear, 2FI, quadratic and cubic) were tested. All analyses were done by applying the response surface methodology based on two variables, three levels and central composite design (CCD). Based on the results of this study, the relationship between cylinder and travel speed was analyzed and the corresponding model was designed. The results recommended that the 2FI model as the highest order model with significant term can describe the harvesting losses in relationship between cylinder and travel speed. The coefficient of determination (R^2), the adjusted determination coefficient (adjusted R^2) and coefficient of variation (CV) were calculated as 0.90, 0.89 and 3.69%, respectively and the response surface results showed that an increase of travel and cylinder speed would lead to an increase of harvesting losses. It was denoted that the travel speed have more impact on harvesting losses in comparison with cylinder speed. The optimization study showed the least harvesting losses of 209.88 kg ha⁻¹ in cylinder and travel speed of 600 rpm and 3 km h⁻¹, respectively. It was concluded that the increase of travel and cylinder speed resulted in the increase of harvesting losses where the highest losses score was occurred in 5 km h⁻¹ and 600 rpm, respectively.

کلمات کلیدی:

Response Surface Methodology; Seed Corn; Picker-husker; Machinery Losses

