

Abstract

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Project Title: Effects of the Newly-designed Rotary Blades on Vibration Characteristics of a Rotary Power Tiller

Investigator: อาจารย์ ดร. ศิริศักดิ์ เชิดเกียรติพล มหาวิทยาลัยเกษตรศาสตร์
รองศาสตราจารย์ ดร.ธัญญา นิยมามา มหาวิทยาลัยเกษตรศาสตร์
รองศาสตราจารย์ ดร.ประเทือง มหาวิทยาลัยเกษตรศาสตร์

Email: fengsrcp@ku.ac.th

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This research aims to study the vibration characteristics of the rotary power tiller installed the 10-prototype rotary blades (B3) in tillage conditions at 2,000, 2,200 and 2,400 engine speeds comparing with the vibration characteristics of the rotary power tiller installed the 14-Japanese C-shaped Blades (B1) and the 14-prototype blades (B2). Tests were conducted at 1,200, 1,600 and 2,000 rpm engine speeds in stationary and transportation conditions. The vibrations at 6 positions on the rotary power tiller, i.e. top engine, chassis, gear box, chain-sprocket case of rotary, mid handle and handle grip, were measured in three mutually perpendicular directions (traveling, lateral and vertical directions). Also, the effects of wheel types (cage wheel and rubber tyre) and the tilling numbers (1 and 2 passes) on vibrations of rotary power tillers were studied. The vibrations transmitted to the operator's hand were evaluated and compared to the ANSI standard S3.34-1986. The vibration characteristics of the rotary power tillers as tilling were found very complex. The intensity of the vibration at the top engine in all test conditions was the highest. The vibration during tillage with the 10-prototype blades was the highest at the chain-sprocket case and the handle grip of rotary. The shape of the 10-prototype blades (B3) affected that the vibration in the lateral mode at the chain-sprocket case was maximum as the 10-prototype blades (B3) were tilling soil. The shape of the prototype blades (B2) was not found to be significant comparing with the Japanese C-shaped blade. The vibration intensities measured at handle grip during tillage in all types of the rotary power tillers were compared with the standard and showed that the daily exposure time should not exceed 8 hour/day. After tilling soil by the 14-Japanese C-shaped blades (B1), the 14-prototype blades (B2) and the 10-prototype blades (B3), the average values of mean soil clod diameter were 35.96, 27.50 and 19.19 mm, respectively.

Keywords : Two-wheel tractor, Vibration, Rotary Blade, Power Tiller