

DETERMINATION OF DESIGN FACTORS OF A ROD DIGGER FOR ONION HARVESTING

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INTRODUCTION

The most important factors affecting onion rod digger performance are rod shape section and ratio of peripheral speed to translational speed (kinematic index).

MATERIALS AND METHODS

In this study the effects of these parameters on performance of a rod onion harvester was investigated using a split block design in randomized complete block design with three replicates where rod shape section in three sections, round, hexagonal and rectangular and the rod kinematic indexes including 0.16, 1, 1.15, 1.30 and 1.44 were changed. In each experiment values of draft force and drawbar power for rod and complete harvester, rotational torque and total required power for rod and the percentage of damage were determined.

RESULTS AND DISCUSSION

The results showed that rod shape section don't have significant effect on draft force, drawbar power (averaging 10571 N and 5285 W) and percentage of damage(averaging 1.98%) while maximum torque and rotational power (averaging 64 N.m and 2394 W) were observed in rectangular shape rod. The maximum values of draft force and drawbar power (12018.7 N and 6009.3 W) was in 0.16 kinematic index where minimum of them (9645.2 N and 4822.2 W) was in 1.15 kinematic index. In addition maximum torque and rotational power (85 N and 3327.8 W) were occurred in rectangular shape rod with 0.16 and 1.44 kinematic indexes, respectively. Results showed that based on minimum onion damaged (priority) and consumed power, the best kinematic index was 1.15. Based on results of this research, it is recommended to use the rectangular rod shape (to facilitate penetrating) in hard soil and the round rod shape one in soft soil with a 1.15 kinematic index for both of rods. Globally, the total consummated power was from 3.5 to 3.8 KW per meter of working width.

Keywords: Drawbar and rotational power, Onion, Onion rod digger, Percentage of mechanical damage

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