



## Research Article

## Optimizing Motor Power and Peripheral Speed for Enhanced Energy Efficiency in Barley Hammer Milling

Ali Jabary Shannon<sup>1\*</sup>, Assad Yousif Khudher<sup>2</sup>, Ali Abass Almaid<sup>3</sup> and Ali Khairallah Daher<sup>4</sup>

<sup>1</sup>University of Misan, College of Agriculture, Misan, Iraq; <sup>2</sup>Department of Agricultural Machinery and Equipment, College of Agriculture, University of Basrah, Basra, Iraq; <sup>3</sup>Department in University of Misan - College of Agriculture, Misan, Iraq; <sup>4</sup>Misan Agriculture Directorate, Misan Province, Iraq.

**Abstract** | Electricity is a scarce resource in many production regions, leading to energy waste in concentrated feed mills due to the underutilization of motor power. This research aims to reduce electrical energy consumption and improve productivity in barley milling a critical component for both livestock and poultry feed by determining the optimal peripheral speed and selecting the appropriate motor power. An experimental study was conducted using a commercial mill (200 kg/hr capacity) with two motor sizes (1.5 kW and 4.5 kW) and three hammer peripheral speeds (45, 56.4, and 78.9 m/s). The results showed significant electricity waste when using the 4.5 kW motor, as it operated at a partial load of only 24.5% far below the ideal 75% threshold. In contrast, the 1.5 kW motor achieved a more efficient load of 66.5%. Increasing the peripheral speed to 78.9 m/s significantly enhanced specific productivity, reaching 129.5 kg/kWh, and improved the hammer mill's mechanical efficiency. Economically, the combination of a 1.5 kW motor and high peripheral speed reduced grinding costs to 0.0076 \$/hr. These findings provide a practical framework for optimizing feed production for the poultry and livestock sectors, ensuring maximum energy efficiency and reduced operational costs in resource-limited environments.

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\*Correspondence | Ali Jabary Shannon, University of Misan, College of Agriculture, Misan, Iraq; Email: aljabaryalhi@uomisan.edu.iq

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