

## Postural analysis of male worker operating maize thresher cum dehusker

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### Abstract:

In this paper, postural analysis of the key working postures of the worker during operation of maize threshing cum dehusking machine is presented. Maize is one of the most versatile emerging crops with wider adaptability under varied agro-climatic conditions. Though machines are being used for the threshing of maize, still many activities during threshing are required to be done manually. In this study, rapid upper limb assessment (RULA), lift/lower analysis and biomechanics analysis are carried out. The RULA analysis of all the five postures in the study gives a final RULA score as 7 for each posture which means that investigation and changes are needed immediately. Lift lower analysis shows that acceptable weight is 7 kg, which is less than the actual weight handled by the operator. Also, biomechanics analysis shows that the L4-L5 moment, L4-L5 compression, body load compression, axial twist compression, flex./ext. compression, and L4/L5 joint shear values are more than the acceptable. Thus, the analyses show that postures are not good and may cause musculoskeletal problems to the workers and need to be changed in order to make operations more user friendly, comfortable and efficient. In this work, Delmia V5 tools like Digital Human Manikin (DHM) and human activity analysis are used. Maize is one of the most versatile emerging crops with wider adaptability under varied agro-climatic conditions. Shelling and DE husking are important post-harvest operations in the production of maize. Now various manufacturers are manufacturing separate machines for these two operations or single machine handling both the operations. In India these machines are manufactured by small artisans and little attention is paid on their ergonomic design. This paper presents an ergonomic evaluation of one of the commonly used maize sheller cum dehusker machine in Maharashtra state. Various key postures of the workers are analyzed and evaluated the risk during the poster. Also study gave the suggestions for the improvement. Tools like digital human manikin (DHM) and Rapid Upper Limb Assessment (RULA) are used in this study. Hand operated maize dehusker-sheller was ergonomically evaluated with ten farm women to assess the physiological workload and its performance in standing and sitting postures. Two workers are required during its operation, i.e., one for hand cranking and another for feeding the cob. One by one cob (without removing its outer layer/sheath) was fed in hopper at an interval of about 4 s. Farm women operated the equipment at their rhythmic speed in both postures. The average heart rate of subject was 144 and 142 beats min<sup>-1</sup> in standing and sitting postures, respectively. The overall

discomfort rating (ODR) and Body Parts Discomfort Score (BPDS) clearly indicated that the standing posture could be better option for operation of this equipment. This was found to reduce the physiological cost by 38.95% and 21.62% in dehusking & shelling the maize cob with hand, and dehusking by hand & shelling by octagonal maize sheller respectively. In the present paper, an effort has been taken to perform a literature review on the development and performance evaluation of maize shelling machine. Maize shelling or simply maize threshing is the most important aspect of post-harvest operation of maize. It involves detaching of the maize grain from its cobs. Now days, few motorized, tractor/ power tiller operated machines have come into the market. Some hand operated maize shellers have been developed but they shell only one cob at a time and have limitations to use it continuously for a longer period of time. Therefore, it was the aim of this investigation to review the design of existing maize shelling machine and the performance evaluation parameters, and see the design parameters which are highly influencing operational performance of maize sheller.