

## **ANALISIS BIOMEKANIKA DAN FISILOGI KERJA PADA PEKERJA PENGANGKUTAN GABAH DENGAN CARA DIPANGGUL**

Zidane Yulio Riyadi<sup>1</sup>, Guntarti Tatik Mulyati<sup>2</sup>, Novita Erma Kristanti<sup>2</sup>

### **INTISARI**

Kegiatan pengangkutan beban pada industri benih gabah dilakukan oleh pekerja secara manual, yaitu pada kemasan 70 kg dengan cara dipanggul. Aktivitas *manual material handling* (MMH) berisiko terhadap terjadinya keluhan *musculoskeletal disorders* (MSDs). Dalam pendekatan biomekanika, gaya dan momen pada sambungan tubuh tertentu dapat menimbulkan gejala MSDs dan juga peningkatan denyut nadi secara fisiologis akibat beratnya pekerjaan dapat memperburuk gejala. Penelitian ini bertujuan untuk mengetahui risiko bahaya dan beban kerja pengangkutan gabah dengan cara dipanggul berdasarkan pendekatan biomekanika dan fisiologi kerja.

Penelitian dilakukan di industri benih gabah CV Adjie Jaya di wilayah Metro, Lampung yang melibatkan 3 pekerja. Dalam penelitian ini, dilakukan observasi, wawancara, dan dokumentasi terhadap pekerja, yaitu pengukuran denyut nadi, wawancara menggunakan kuesioner, dan pengambilan gambar pekerjaan. Penilaian postur menggunakan *Ovako Working Posture Analysis System* (OWAS) dan tingkat keluhan rasa sakit menggunakan kuesioner *Nordic Body Map* (NBM). Pendekatan biomekanika digunakan untuk menentukan risiko pengangkutan beban berdasarkan gaya kompresi ( $F_c$ ) dan gaya geser ( $F_s$ ) pada L5/S1. *Revised NIOSH Lifting Equation* digunakan untuk menentukan nilai *Recommended Weight Limit* (RWL) dan *Lifting Index* (LI). Parameter fisiologi kerja yang diukur berupa denyut nadi untuk menentukan nilai denyut nadi kerja (DNK), *Cardiovascular Load* (CVL), konsumsi energi (KE), dan denyut nadi pemulihan sehingga dapat dilakukan klasifikasi beban kerja.

Hasil pengukuran biomekanika pada pekerja pengangkutan gabah dalam kemasan 70 kg dengan cara dipanggul berdasarkan parameter  $F_c$  dan  $F_s$  masing-masing sebesar 3431,7 N dan 435,2 N. Pengangkutan gabah dengan cara ini memiliki risiko bahaya ditinjau dari parameter  $F_c$  dengan rekomendasi batas berat yang aman diangkat sebesar 15,26 kg. Sementara itu, hasil pengukuran fisiologi kerja berdasarkan parameter DNK, CVL, dan KE pada aktivitas ini masing-masing sebesar 112,5 bpm, 37,9%, dan 2,8 kkal/menit. Berdasarkan pendekatan fisiologi kerja, beban kerja aktivitas ini tergolong berat.

Kata kunci: biomekanika, fisiologi kerja, manual material handling, postur kerja

---

<sup>1</sup>Mahasiswa Departemen Teknologi Industri Pertanian, FTP UGM

<sup>2</sup>Dosen Departemen Teknologi Industri Pertanian, FTP UGM

## **BIOMECHANICAL AND WORK PHYSIOLOGY ANALYSIS ON LOAD CARRYING WORKER ON SHOULDER**

Zidane Yulio Riyadi<sup>1</sup>, Guntarti Tatik Mulyati<sup>2</sup>, Novita Erma Kristanti<sup>2</sup>

### **ABSTRACT**

Load carrying activities in the grain seed industry are carried out by workers manually, namely in 70 kg packages on shoulder. Manual material handling (MMH) activities are at risk for the occurrence of musculoskeletal disorders (MSDs). In a biomechanical approach, forces and moments at certain body joints can cause MSDs symptoms and also a physiological increase in pulse rate due to heavy work can worsen symptoms. This study aims to determine the risk of hazards and the workload of transporting grain by means of a shoulder based on biomechanics and work physiology approaches.

The research was conducted at the CV Adjie Jaya grain seed industry in the Metro City, Lampung, involving 3 workers. In this study, observations, interviews, and documentation of workers were carried out, namely pulse measurement, interviews using questionnaires, and taking activities pictures. Assessment of posture using the Ovako Working Posture Analysis System (OWAS) and the level of pain complaints using the Nordic Body Map (NBM) questionnaire. A biomechanical approach is used to determine the risk of load carrying based on the compression force ( $F_c$ ) and shear force ( $F_s$ ) at L5/S1. Revised NIOSH Lifting Equation is used to determine the Recommended Weight Limit (RWL) and Lifting Index (LI) values. Work physiology parameters measured in the form of pulse to determine the value of work pulse (DNK), Cardiovascular Load (CVL), energy consumption (KE), and recovery pulse so that workload classification can be carried out.

The results of biomechanical measurements on workers carrying grain in 70 kg packaging on shoulder based on FC and FS parameters are 3431.7 N and 435.2 N, respectively. Grain carrying in this way has a hazard risk in terms of FC parameters with recommended weight limit safely lifted by 15.26 kg. Meanwhile, the results of the measurement of work physiology based on the parameters of DNK, CVL, and KE in this activity were 112.5 bpm, 37.9%, and 2.8 kcal/min, respectively. Based on the work physiology approach, the workload of this activity is classified as heavy

**Keywords:** biomechanical, load carrying, work physiology, work posture

---

<sup>1</sup>Student of the Department of Agricultural Industrial Technology, FTP UGM

<sup>2</sup>Lecturer of the Department of Agricultural Industrial Technology, FTP UGM