

THE RISK OF MUSCULOSKELETAL DISORDERS DUE TO REPETITIVE MOVEMENTS OF UPPER LIMBS FOR WORKERS EMPLOYED IN VEGETABLE GRAFT IN GREENHOUSES

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1. INTRODUCTION

Grafting is a horticultural technique whereby tissues from one plant are inserted into those of another so that the two sets of vascular tissues may join together. The herbaceous grafting in orthocultivation is a practice widely spread and it permits to unite the quality and productivity characteristics with those of resistance to pathology transmitted from the soil much more quickly as regards the time necessary for genetic improvement. There are different methods of grafting (crown, split, ligule grafting, leaf under leaf grafting) especially used by skilled workers with the help of manual tools such as the grafting – knife.



Fig.1 The grafting-knife

Work-related musculoskeletal disorders (WMSDs) are associated with several factors: work postures and movements, repetitiveness of actions, force, exposure to shock and vibration etc. Certain workplace conditions, for example, the layout of the workstation, the work speed (especially in conveyor-driven jobs), and the weight of the objects being handled influence these factors. The aim of this research is to assess the risk of musculoskeletal disorders due to repetitive work, for workers employed in manual grafting in greenhouses.

2. MATERIALS AND METHODS

The OCRA index is the model used in this experiment to evaluate the risks for the upper limbs due to repeated strain. We chose this method because it is the official European Community (EC) method (EN 1005-5:2007) for assessing and controlling health and safety risks due to machine-related repetitive handling at high frequencies. To assess the risk during this kind of work, we have used a method (according to ISO 11228-3:2009 Ergonomics - Manual handling - Part 3: Handling of low loads at high frequency) which keeps into consideration the different risk factors. Our model uses an “exposure index” (OCRA index), which is defined by the ratio:

$$\text{OCRA index} = \text{ATA}/\text{RTA}$$

where ATA is the overall number of actual technical actions needed in the workers’ shift, and RTA is the overall number of reference technical actions (i.e., the total number of actions recommended so as not to expose the workers to risks) in the shift.

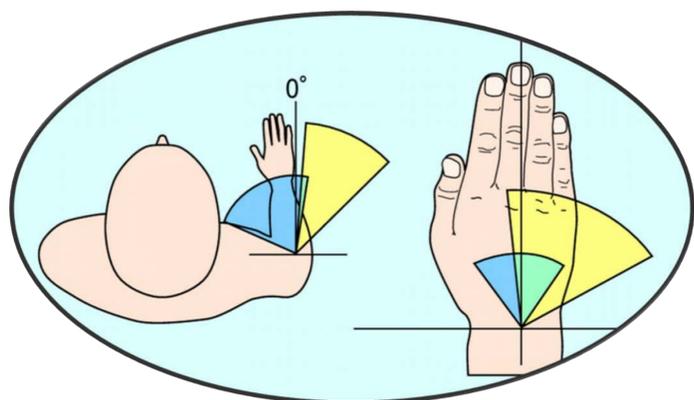


Fig.2 Shoulder postures and movements (CEN, 2007)

3. RESULTS



In order to apply this model to the grafting phases for an horticultural farm, we began by calculating the number of actions carried out during the cycle.



Fig.3 Different actions during the grafting of a small plant

VALUES OF POSTURES AND MOVEMENTS CALCULATED	DX	SX
<i>Shoulder</i>	6	6
<i>Elbow</i>	2	2
<i>Wrist</i>	2	2
<i>Hand</i>	8	4
<i>Stereotypy</i>	1,5	1,5
POSTURE SCORE	9,5	7,5
	DX	SX
<i>Recovery Period Factor</i>	3	3
<i>Frequency</i>	5,5	0
<i>Force</i>	4	4
<i>Posture</i>	9,5	7,5
<i>Additional Factors</i>	2	0
<i>Task duration</i>	0,900	0,900
OCRA INDEX VALUES	22	13,1

5. CONCLUSIONS

The results of this research show a medium - high risk for the right limb which effects the cutting up on the small plant to be grafted and a medium risk for the left limb. The factors which have contributed to reach such results are to be attributed to the continuous pinch of the knife, to the great number of movements and to the lack of recovering time.