Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

Musculoskeletal Symptoms Associated with Muscular Work in Peach Cultivation Tasks in Norte De Santander

Jorge Iván Anaya Baldovino[1], Claudia Milena Barrera Rangel[2], Blanca Judith Cristancho Pabón[3]

Abstract

Agriculture is crucial in production throughout the world and a key factor of human activity for the demand for food, which is growing every day. Peach crop workers are susceptible to musculoskeletal symptoms due to strained postures, held postures, antigravitational postures, repetitive movements, heavy lifting. This group of working conditions, added to a number of tasks that can generate difficulties in the health and productivity of the farmer. Objective: To determine the association between musculoskeletal symptoms and muscular work of peach growers in Pamplona, Norte de Santander. Materials and method: Cross-sectional and analytical study. Convenience sampling in which 220 peach growers (Pamplona, Pamplonita, Chitagá, Cacota) participated with the Standardized Nordic Questionnaire for identification of musculoskeletal symptoms, of these, 6 were applied the direct observation method OWAS (Ovako Working Posture Analyzing System), taking routine tasks as a reference. Results: it was identified that the muscular work of the peach cultivation tasks in Norte de Santander are associated with the musculoskeletal symptoms, showing that the task with the highest risk is the collection of pugs and the most affected area of the body in the cultivation tasks. peach is the back. Conclusion: musculoskeletal symptoms are associated with muscular work on tasks in peach cultivation, 13 of which are routine tasks performed for peach cultivation, the highest risk areas for these tasks are the back and legs.

Keywords: *Symptoms, Musculoskeletal, Posture, Biomechanical. (Source: DeCS, Bireme).*

Introduction

The activities involved in cultivating the land, ranging from food production to plant propagation, represent a significant contribution to the country's economy1. In times of high production, the workload, stress, physical demands, and the extension of the working day have direct consequences on the physical and mental dimension of people2 . The ergonomic risk factor is present in the tasks carried out in the agricultural sector, such as: application of force in different directions, lifting and carrying loads, tasks with repetitive physical movements, among others, which favor the development of musculoskeletal alterations[3].

The department of Norte de Santander has 209,753 hectares suitable for the cultivation of fruit trees. The production of fruits in the department is important where peaches are the fourth fruit product that the region produces the most, with a production of 5,532 tons per year, occupying the 2nd place with a national participation with 27.4% at the national level. The agricultural sector is the main source of the economy, accounting for 64.32%, in which potatoes, blackberries, corn, vegetables, arracacha, curaba, peas, beans and strawberries are grown, and the cultivation of red peaches and jarillo is being implemented4 .

Pamplona Norte de Santander has a planted area of 43.66 ha, which corresponds to 26.01 ha of the Gran Jarillo variety and 17.65 ha of the Jarillo variety. The village of El Naranjo has the largest planted area with 10.37 hectares, followed by Sabaneta with 5.85 hectares. The total number of plants planted was 8,385 distributed as follows: trees in formation 32.25% of Gran Jarillo, trees in production 45.98% of Jarillo, 21.75% of Gran Jarillo. The peach develops normally in clay and sandy soils with good depth. Regions with cool climates, average annual temperatures around 20ºC, the fruit ripens after 20 to 25 days of its traditional season, the tree takes between 10 to 12 years and between 3 and 4 years it begins to produce the fruit every 8 months5.

[1] Universidad de Pamplona, Email: jorge.anaya@unipamplona.edu.co, ORCID: 0000-0003-4464-656X
[2] Universidad de Pamplona, Email: claudia.barrera@unipamplona.edu.co, ORCID: 0009-0007-9837-392X.
[3] Universidad de Pamplona, Email: Judithcp@unipamplona.edu.co, ORCID: 0009-0006-1371-360X

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

The work environment presents physical risks, chemical risks, biological, psychosocial, mechanical risks, among others; leading the agricultural sector to be one of the most dangerous occupations, with the highest percentage of accidents and diseases; but it is musculoskeletal disorders (MSDs), with their main symptom, pain, that exceed any other type of work-related occupational disease in incidence6.

Agricultural work today has not experienced any change in terms of insurance, they continue to present difficulties such as the little adherence to the payment of risks, health, pensions, without a doubt this being a great problem for the management of accidents and diseases, this condition generates an increase in demand to the social security system, moreover, it does not allow for real statistics and an important under-reporting of the real conditions of this sector7.

In 2015, Colombia reported a 42% increase in the recognition of work-related diseases, with a main component derived from DME at 88%[8]. DME were the most diagnosed pathologies (80% and 82%) respectively, and agricultural work is the economic activity with the highest prevalence in the diagnosis of occupational disease (9%), followed by retail trade (7%), temporary services (7%) and the provision of health services (6%)[8]. A total of 9,524 cases were classified in Colombia in 2017, with a rate of 117.7 diseases per 100,000 workers. The 1,044 qualified in that year in this sector (11% of the total) also place it as the one with the highest accident rate, with a rate of 339.2 diseases per 100,000 [9]. On the other hand, in the figures for absenteeism due to illness in Colombia, the manufacturing industry is in first place in terms of the number of occupational diseases with 2,887 for 2014, followed by the real estate sector with 1,595, and in third place is agriculture with 1,273 that have been increasing10.

In Colombia, research studies related to musculoskeletal symptoms and muscle work in the agricultural sector are limited, for this reason a research process is necessary to identify the association of musculoskeletal symptoms with muscle work in peach farmers in Norte de Santander, undoubtedly a significant contribution to working conditions and the promotion of knowledge from ergonomics.

Materials and Methods

The research carried out is quantitative, it uses data collection to test hypotheses, based on numerical measurement and statistical analysis, to establish patterns of behavior and test theories, the study is non-experimental, prospective, cross-sectional and correlational11. To determine sociodemographic and occupational characteristics, a questionnaire with standardized questions was applied.

The population immersed in the research was 220 workers, selected at convenience; the inclusion criteria were: men and women, of legal age who have been growing peaches for at least 50% of their working day for more than a year. The target population was excluded with the following determinants: a) farmers with diagnosed work-related diseases or in the process of qualification, b) diseases or traumas that affect the musculoskeletal system of common origin, c) workers who share other tasks in other types of crops. The variable muscle work was analyzed from the estimation of the level of risk according to the OWAS method, this methodology has a reliability of Cronbach's alpha = 0.90 [12]. The analysis was carried out from a 2-minute video which was divided into 8-second takes using the KINOVEA©13 program. Each shot was analyzed by two experts who did not know each other, to obtain the average risk level for each segment.

The tasks for the cultivation of peaches in Norte de Santander were identified, which correspond to (13) thirteen tasks in which the cultivation activity is divided, observed by the researcher and contrasted with what was expressed within the research by the study subjects.

Table I. Classification of Tasks in Cultivation of Peach Norte de Santander.

Task	Routine/Non-Routine
Preparation of the Ground	Non-Routine
Subscriber	Non-Routine
Dome Planting	Non-Routine

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

Fumigation	Non-Routine
Pruning	Routine
Thinning	Routine
Lock	Non-Routine
Silvering	Non-Routine
Collecting Chicks	Routine
Collect	Routine
Cesar	Routine
Classification	Routine
Defoliation	Non-Routine

Thirteen (13) tasks were identified within the peach crop, of which 6 are routine (Decree 1072 of 2015, defines Routine Activity as that which is part of the normal operation) and within the research they were analyses for the variable of muscle work.

Regarding the variable of musculoskeletal symptoms, the self-report of the Nordic Standardized Korinka Questionnaire was applied. This is widely disseminated worldwide, being a validated instrument with a high level of reliability (Cronbach's alpha = 0.896)[14] , the evaluation of musculoskeletal symptoms in relation to pain. The correlation between the nominal variables of the study such as muscle work and musculoskeletal symptoms were analyzed from contingency tables, these tables allowed comparing the musculoskeletal symptom factor with each of the dependent variables of interest. For inferential analysis, it is performed by means of hypothesis testing with the Mann-Whitney U and Kruskal-Wallis H tests; where $P<0.05$, the result was that the null hypothesis is rejected, which means that musculoskeletal symptoms are associated with muscle work. Other contrasts were also made with Student's t-test and Pearson's chi-square, according to the types of variables. Data processing was performed in the SPSS 25.0 package for statistical analysis. The study guaranteed respect for all ethical aspects inherent to the proposed study, based on Resolution 8430 of 1993, the study was classified as "risk-free", at the same time the confidentiality of the data, the use of informed consent and the approval of the protocol by the Research Committee of the University of Pamplona are guaranteed.

Results

It was identified that the population (n=220) farmers are (mean $\dot{X}$=32.9 years), that is, relatively young, whose dominant arm is mainly the right one. On average, they have been working for 2.65 years and work an average of 49 hours a week. It is worrying that 59.3% of the respondents are not within the normal BMI range, indicating the presence of a cardiovascular risk factor that should be paid attention to.

66.9% of the peach trees reported pain or discomfort during the last year, with the back being the most affected segment (79.6%); only 18% have consulted for this reason. 66.7 percent reported pain in the last 7 days, showing that the back is the most affected segment as in the last year.

For the statistical association, the variables musculoskeletal symptoms and muscle work of the 6 assessed tasks were contrasted with the risk estimated by the OWAS direct observation method, finding that there is a significant statistical relationship between these, whose Chi-square contrast showed a value of P=0.001, indicating that the reported symptoms are associated with the muscular work of the tasks.

Table 2. Evaluation of Routine Tasks Using the OWAS Direct Observation Method.

Task	Back	Arm	Legs	Load	Punt
Pruning	**1,0**	**2,0**	**4,0**	**1,0**	**2,0**
Thinning	**1,0**	**2,0**	**2,0**	**1,0**	**1,0**
Collecting Pichos	**3,0**	**1,0**	**4,0**	**1,0**	**3,0**

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

Collect	**1,0**	**1,0**	**2,0**	**1,0**	**1,0**
Cestiar	**1,0**	**2,0**	**3,0**	**1,0**	**2,0**
Classificatio n	**1,0**	**1,0**	**3,0**	**1,0**	**1,0**

In the analysis of the tasks, it was shown that the collection of pichos is the most risky with a mean rating of $\dot{X}$=3.0, that is, according to the evaluation with the direct observation method OWAS, it is a posture with harmful effects on the musculoskeletal system, identifying the highest values of the evaluation, we find that it obtained a higher rating with a mean $\dot{X}$=4, This means an inclined and rotated or doubly inclined back, in addition the presence of pain is identified in the areas of highest score, the presence of back pain is identified in the last 7 days of 75% (n=60) of the workers and in the knee 25% (n=15), all this according to the muscular work that is carried out in the task. In the collection of pichos the risk is in the back area, it remains mainly with twisting, followed by the position of the legs with the knees bent. As for pruning and basketry. Both obtained a mean $\dot{X}$=2.0 in their evaluation, that is, according to the direct observation method OWAS, postures with the possibility of causing damage to the musculoskeletal system, the highest value of the evaluation was identified for leg pruning, with a mean $\dot{X}$=4, this means standing or squatting legs with both legs bent and balanced weight, associated with leg pain in the last 7 days of 81% (n=75), in terms of basketry, a mean $\dot{X}$=3.0 was found in the leg evaluation, i.e. kneeling on one or two legs, associated with leg pain in the last 7 days of 85% (n=58), in terms of thinning tasks, classification, collection presented in the rating a mean $\dot{X}$=1.0, in the three (3) cases, normal and natural posture was found without harmful effects to the musculoskeletal system, as for the musculoskeletal symptoms identified by the Nordic questionnaire, no symptoms were reported.

Regarding the musculoskeletal symptoms of the target population (n=220), it was found that back pain was more present with 46%, while leg pain was 25%, as for the other body segments it was found that only 1% mentioned pain in the elbow, while in the hand 5%, while 23% did not present any pain.

The Mann-Whitney U test and the Kruskal-Wallis H test show a value P = 0.001 indicating that the musculoskeletal symptoms are associated with the muscle work of the task performed, thus rejecting the null hypothesis and accepting the research hypothesis.

Discussion

In the research called Level of postural risk and musculoskeletal pain in farmers during the citrus harvest, Sánchez Huamash showed that 41.4% of the painful areas were the lumbar area, and in peach growers the back is the most affected segment with 46%[15]. Similarity was found in relation to the fact that the lumbar area predominates in these types of crops, this is due to the fact that the muscular work to perform the tasks has a great impact on the back, due to the different postures adopted, which they perform for the different tasks, in addition to the lack of controls and analysis from the point of view of national regulations.

As for sex, the study carried out by Sánchez Huamash in mandarin cultivation had a great predominance of females, on the other hand, Garzón Castañeda [16] . In the cultivation of oil palm, there was a predominance of males, having similarity with the study with peach growers. The predominance of men in agricultural activities may be due to muscular work and the type of tasks required.

With respect to age, in Sánchez Huamash's research with mandarin growers, they are between 20 - 39 years old (66%), in the same way Garzón Castañeda showed that oil palm growers are between 20 - 36 years old (52%), in peach crops the ages are between 25 - 34 years old with 40%; finding a similarity in the age ranges.

In relation to the working day, Sánchez Huamah's study showed that 33% of mandarin growers work between 30 and 39 hours per week, while 89% of peach growers work between 40-55 hours per week, that is, peach growers work more intense hours for the preparation of crops.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

Regarding BMI, Garzón Castañeda's study in oil palm growers was in the normal range, while 39% of peach crops were overweight and 10% obese, today it is known that these conditions can affect health, compromising the systems that generate a positive and adaptive development in tasks.

It should be noted that 10% of the population mentioned that they went to the doctor because of the symptoms, the peach growers mostly do not go to the doctor, they take other types of measures in the face of symptoms such as management at home, to this we add the lack of adherence to the health system, their beliefs and culture, no studies have been found that identify this variable within this sector.

It is important to highlight the contribution of identification of the tasks carried out by this research, to determine the tasks an observation was made in the Municipality of Norte de Santander (Pamplona, Pamplonita, Chitagá, Cacota) where its economic activity is the production of peaches, the 13 tasks that are identified are: 1) the preparation of the land, 2) fertilizing the land, 3) sowing, 4) fumigation, 5) pruning, 6) thinning, 7) locking, 8) plating, 9) fertilizing, 10) harvesting, 11) cestiating, 12) classifying, 13) defoliation, for the purposes of this research the routine tasks were analyzed, which by their presence denote an impact within the muscular work and the presence of musculoskeletal symptoms, the routine tasks were pruning, thinning, collecting, basketing, classifying, collecting pigs, it is important to note that they have a great muscular work in the different body segments, showing the highest risk the collection of pigs with a risk of 3 according to OWAS, followed by basketing and pruning with risk 2, perhaps because of the postures performed.

The presence of harmful postures was evidenced in areas such as back, arm, legs with the presence of movements, forced postures, prolonged postures, postures maintained, throughout the working day, arduous conditions such as tasks that require lifting loads with uneven ground, long days of work in a bipedal position, arms above the shoulder with a mixture of repetitive movements, These conditions generate risks such as the presence of musculoskeletal symptoms, which can generate the presence of diseases, generating a great impact on the agricultural sector of peach trees in the region, we find that within the evaluation of muscle work, the collection of pichos presented risk 3, in terms of cestiar and pruning, with risk 2, with a presence of lifting of load with weights between 10 to 20 kg in the task of cestiar, In these conditions, the back has a large component in the tasks of peach cultivation and has a close relationship with the symptoms in this area of the body.

According to Garzón Castañeda in oil palm plantations according to the REBA (Rapid Entire Body Assessment) direct observation method, the arms have a greater commitment, influenced by the height of the palm, which has an unfavorable impact on the presentation of DME at the level of the lumbar and dorsal area, while Sánchez Huamash according to the evaluation with the REBA ergonomic method a greater compromise occurs in the back, shoulder, wrist showing pain in painful areas such as lumbar area, shoulder/arm and wrist/hand, while the evaluation in routine tasks of peach cultivation the OWAS method (Ovako Working Posture Analysing System), the tasks analyzed, present risky muscle work in back and legs, these tasks (Pruning, thinning, Collecting Pigs, Collecting, Scaling, Classification), these tasks are mostly in a bipedal position, during long working days, The aforementioned studies find a similarity in relation to the segments that present harmful postures such as back, legs, arms, showing an association in the presence of musculoskeletal symptoms.

Conclusions

Peach growers in the region of Pamplona, Pamplonita, Chitagá and Cacota are relatively young, work more than 40 hours a week, have been working on average 4 years in the crop and 47% have a high body mass index.

The prevalence of musculoskeletal symptoms presented by the study population (n=220=) is 69%, a high figure, showing that the muscular work exerted in this type of activities can have a great impact on the health of peach cultivation workers.

Journal of Ecohumanism
2024
Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563

Muscle work in peach growers in Norte de Santander is associated with musculoskeletal symptoms, identifying two of the six routine tasks that presented risk, indicating in turn that if controls are not established they can be harmful to those who perform them.

The peach cultivation task with the highest muscular work is the collection of pichos, followed by pruning and basketing, which represents more risk than others.

The areas with the greatest impact were the back, legs, associated with musculoskeletal symptoms, which can have an impact on their health in the medium and long term.

Financing

There are no sources of funding other than the University of Pamplona.

Thanks

Thanks to the peach growers of Norte de Santander.

Conflict of Interest

No conflicts of interest are declared in relation to this research.

References

Agriculture and food [Internet]. Bancomundial.org. [cited 2021 Apr 19]. Available at: https://www.bancomundial.org/es/topic/agriculture/overview.

Tara Satyavathi C, Bharadwaj C, Brahmanand P. Role of Farm Women in Agriculture: Lessons Learned - C. Tara Satyavathi, Ch. Bharadwaj, P.S. Brahmanand, 2010 [Internet]. SAGE Journals. 2010 [cited 18 agosto 2021]. Available from: https://journals.sagepub.com/doi/abs/10.1177/097185241001400308?journalCode=gtda.

Gaviria D. International Trade and Environment in Colombia - DOCUMENTOP.COM [Internet]. documentop.com. 2013 [cited 18 August 2021]. Available at: https://documentop.com/comercio-internacional-y-medio-ambiente-en-colombia_59fcaa0d1723dd92374f335e.htm.

Beltrán J, Piñeros A, Avellaneda R. Colombian agricultural sector: Its economic reality and perspective. [Final degree project on the Internet]. [Bogotá]: EAN University; 2013 [cited 2021 Aug 20]. Retrieved from: http://www.unipamplona.edu.co/unipamplona/ portalIG/ home_ 174/recursos/pamplona/26042015/diagnostico_economico.jsp.

Peñaranda Cáceres G. Analysis of costs of peach (Prunus Pérsica) production in the province of Pamplona (Norte de Santander). Face [Internet]. 2012 [cited 2021 August 19]; 12:145-162. Available in http://revistas.unipamplona.edu.co/ojs_viceinves/index.php/FACE/article/view/371

Department of Labor Protection. International Labour Office. Agricultural Health and Safety. Geneva-Switzerland; 2000.

ILO. 95th International Labour Conference 2006. [cited on 22 August 2021] [Internet]. 2006. Available on the internet: http://www.ilo. org/ilc/ILC Sessions/95thSession/lang--es/index.htm.

Wilson J. Factors Associated with Work-Related Lumbar Disc Disease, Rated by the Regional Disability Rating Board of Meta (Colombia). Magazine. Colombia [Internet]. 2015 [cited 20 August 2021]; 5 (4); 1- 12. Available in revistasojs.unilibrecali.edu.co/index.php/rcso/article/view/275/487

Velásquez D, Velásquez J (dir), Ibáñez M (dir). Occupational morbidity in workers in the agricultural sector of Colombia. [Master's thesis]. [Bogotá]: Universidad del Rosario; 2014 [cited 2018 Nov 15]. Retrieved from http://repository.urosario.edu.co/handle/10336/11503?show=full

Aristizábal C. Report on Occupational Risks and Colombian Agriculture. Colombia. Fasecolda [Internet]. 2013 [cited 15 August 2021]: 19-24. Available in: http://www.fasecolda.com/files/1814/4909/24 79/Aristizabal._ 2012._ Riesgos_ laborales_y_el_agro_colombiano.pdf.

Hernández Sampieri R, Fernández Collado C, Baptista Lucio P. Research methodology. 5 ed. Mexico City: Mc Graw Hill; Updated 2015.

Osmo K, Pekka K, Likka K. Correcting working postures in industry: A practical method for analysis. revista científica Applied Ergonomics .2016; 1-34

Kinovea. A microscope for your videos [internet]. [cited 15 August 2021]:D available on :< https://www.kinovea.org/>.2016]

MARTIÍNEZ, Marta M. ALVARDO, Rubén. Validation of the standardized Nordic questionnaire of musculoskeletal symptoms for the Chilean working population, adding a pain scale. In: Journal of Public Health, (XXI) 2:41-51. August, 2017. 45 p.

Sánchez C, Otoya W. Level of postural risk and musculoskeletal pain in farmers during citrus harvest. 2015. Huaral – Lima. [Final degree project on the Internet]. [Lima]: Universidad Nacional Mayor de San Marcos; 2015 [Cited 2018

Volume: 3, No: 7, pp. 3138 – 3144
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i7.6563
Nov 17]. Available in: https://cybertesis.unmsm.edu.pe/bitstream/handle/20.500.12672/4591/S%C3%A1nchez_hc.pdf?sequence=1&isAllowed=y

Garzón L, Velázquez J (dir), Rodríguez N (dir). Musculoskeletal disorders and the relationship with postural load associated with the work of oil palm harvester in a plantation in Meta, Colombia [Master's thesis on the internet]. [Villavicencio]: University of the plains; 2015 [cited 2018 Nov 17]. Available at: http://repository.urosario.edu.co/handle/10336/10628?show=full.