



Environmental and Ergonomic Risk Factors of Professional Gardeners

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ABSTRACT

The present study was undertaken to investigate the various activities performed by the gardeners and assessing the risk factors faced by gardeners on environmental and ergonomic aspects. The study was conducted on 150 sample size of male gardeners in Ludhiana city by using purposive sampling technique to ensure that the respondents, have worked for the last 5 years in gardening as their main occupation. Primary data were collected with the help of structured interview schedule. Findings of the study unveils that weeding activity absorb most of the time (on average 6.26 hr/day) performing activity in squatting/sitting/bending posture with frequent twisting and turning. Gardeners work most of the time in unshaded outdoor areas which eventually make them susceptible to environmental risk and the extreme environmental risk perceived by workers during gardening was heat stress (mean score=3.79). Indeed, heat stress has a straight effect on workers output because of poor performance and work-related illness/injuries. Other than that, the ergonomic risk also contributes in physical fatigue and discomfort during task performance, awkward working posture (mean score=4.56) was perceived to be high ergonomic risk among gardeners which may led to musculoskeletal disorders in the body.

Key Words: Disorders, Ergonomic, Fatigue, Gardeners, Movements, Musculoskeletal, Risk.

INTRODUCTION

The probability of an accident occurring as a result of exposure to job risks is referred to as occupational risk. The term occupational risk in the present study talks about two major risks *i.e.*, environmental and ergonomic risk which is likely to be occurred because of their workplace and job routine, as gardeners work outside and are extremely exposed to hot and cold weather. Exposure to ultraviolet (UV) radiation is obviously high in outdoor occupation as gardeners work in unshaded area for long duration. Jackson and Rosenberg (2010) stated that excessive heat may cause heat rash, heat cramps, heat exhaustion, and heatstroke. Heat rash is an irritating skin inflammation from clogged sweat glands. In addition to working under severe hot condition this eventually causes dehydration state to most of the workers because of poor hydration problem. Gardeners and agricultural

workers face almost the same occupational risk due to their workplace and work pattern similarity.

According to Dash and Kjellstrom (2011) physical work and unsound working conditions have a significant impact on India's labour force. Apart from that the repetitive motion, forceful work, adopting awkward postures comply to increase in number of injuries during gardening. In particular, gardeners who work in crooked and crouched positions in hoeing, and cleaning duties, or standing and walking jobs while carrying heavy equipment of grass cutting, fertilizing, watering, trimming and pest spraying, perhaps develop musculoskeletal issues over time (Savitri *et al*, 2012). Hence, the present study investigated about activities performed by gardeners and time spent per day; the environmental and ergonomic risk faced by workers engaged in gardening as profession.

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MATERIALS AND METHODS

The study was carried out in two educational institutes, one community garden and eight nurseries in Ludhiana city because of the easy accessibility and availability of sample.

Selection of sample

The information regarding the list of gardeners was procured from Department of Floriculture and Landscaping, Punjab Agricultural University and Landscaping wing of Guru Angad Dev Veterinary and Animal Sciences University. The snowball technique was also used to get the information regarding the gardeners working in nurseries and community garden. A total of 150 male gardeners were selected purposively as respondents, who were fully engaged in gardening job for the last five years. The selected respondents were personally interviewed with the help of self constructed interview schedule to collect the primary data about activities performed by gardeners and time spent per day based on their subjective response. Environmental and ergonomic risk faced by the gardeners' during gardening was assessed by using risk assessment method.

Risk assessment method

It is a method through which hazardous tasks are prioritized which help us to determine which risk is the most serious. The risk score is based on two parameters the product of probability of occurrence marked as (O) and severity score (S). Further, the parameters are assessed on perceived risk score i.e., Risk score= $O \times S$. Based on the risk score the risk is ranked.

Scoring of occurrence description.

Score	Inference
1	Rarely -may occur, but not likely
2	Sometimes-likely to occur sometime
3	Always- likely to occur several times

Scoring of severity description.

Score	Inference
1	Negligible- no action required, but generally be reviewed periodically.
2	Moderate- risk should be monitored.
3	Serious- take immediate action.

Further, the data collected were tabulated and analyzed using descriptive statistical tool (frequency, percentage and mean score method).

RESULTS AND DISCUSSION

Time spent for performing different activities

The data (Table 1) revealed that majority of the respondents (95.30%) participated in bed preparation activity on seasonal basis with the average time spent per day was 4 hr mostly in squatting, standing and bending posture. For planting/sowing activity 98.0 per cent of the respondents participated actively in it. Likewise, bed preparation activity was also executed based on season. The average time spent was 4.35 hr for planting or sowing a field area. Sitting, squatting and bending posture was adopted by the respondents.

All the respondents were involved in watering activity. The frequency of watering the plants or field area depends upon season such as in summer the respondents' water the plants every day or on alternative day. In rainy season, once in a week and in winter twice or thrice times in a week. The average time spent by the respondents in watering was 3.5 hr/day and the posture adopted was standing. Around 96.0 per cent of the respondents were involved in pruning activity. The frequency of doing this activity was recorded to be twice per season for about 4.5 hrs/day by adopting standing, bending and twisting posture.

The mowing activity was performed by 89.30 per cent of the respondents for 1-2 times per season and the duration to perform the task was observed

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Table 1. Activities performed by the respondents and the time spent per day. n=150

Activity	Frequency (%)	Frequency of performance	Average time spent (per person/day) (hr.)	Posture used
Bed preparation	143 (95.30)	Seasonal	4	Squatting+ standing +bending
Planting/sowing	147 (98.00)	Seasonal	4.35	Sitting +squatting+ bending
Watering	150 (100.00)	Summer (Every day or alternative day) Rainy Season (Once in a week) Winter (twice or thrice in a week)	3.5	Standing
Pruning	144 (96.00)	Twice per season	4.5	Standing +bending+ twisting
Mowing	134 (89.30)	1-2 times per season	4.04	Standing
Weeding	146 (97.30)	1-2 times per season	6.26	Sitting +squatting+ bending + twisting
Cleaning	133 (88.70)	Multiple times	3	Standing +bending
Spraying (Pesticides)	105 (70.00)	Twice in a year	2	Standing

Note: Figures in parentheses indicate percentage. Multiple response*

to be 4.04 hr/day in standing posture. The active respondents involved in weeding activity were 97.30 per cent. Frequency of performing weeding was observed 1-2 times per season. The average time taken to perform the task was recorded 6.26 hr/day with the posture adopted was sitting, squatting, bending and twisting.

Cleaning is the everyday task that is required after every gardening work. So, the frequency of performance was recorded to be multiple times. The time taken to perform the task was recorded to be 3 hr/day in standing and bending posture. About 70.0 per cent of the respondents were involved in spraying activity twice in a year to protect the gardening area from insects and pest. For spraying, knapsack spray bag is commonly used by the respondents. The average time consumed to perform the task was 2 hr/day depending upon the area. Spraying was done in the standing posture.

Environmental risk

The data (Table 2) give an information about the environmental risk faced by the respondents during gardening activity. Gardeners working outside are prone to inevitable risk such as heat stress, dehydration, respiratory problem, noise, insect bite etc. It can be clearly seen that the respondents assigned highest mean score to heat stress (mean score= 3.79). Jacklitsch *et al* (2016) also reported that heat stress can affect workers who are exposed to excessive heat or work in a hot outdoor environment. The other risk mentioned by the respondents were dehydration (mean score= 2.61) due to direct exposure of outside element i.e., sunlight. According to Balanay *et al* (2015) noise is a significant hazard in groundskeeping occupation. In this study also the respondents reported headache problem due to noise (mean score=2.52) who were working with garden machinery as well as

Table 2. Environmental risk factors faced by the respondents at workplace. n=150

Environmental factor	Occurrence Mean Score (A)	Severity Mean Score (B)	Risk Mean Score (A*B)	Rank
Heat stress	2.43	1.56	3.79	I
Dehydration	2.27	1.15	2.61	II
Head ache due to noise	2.25	1.12	2.52	III
Respiratory problems due to dust	2.06	1.05	2.16	IV
Insect bite	2.20	1.00	2.20	V
Skin allergy	1.33	1.07	1.42	VI

Occurrence score-3-Always, 2-Sometimes, 1-Rarely

Severity Score-3-Serious, 2-Moderate, 1-Negligible

the continuous passing of vehicle in nearby area. Further, the respondents also faced the problems related to insect bite (mean score= 2.20) and skin allergy (mean score= 1.42) while performing gardening activities.

Ergonomic risk

Ergonomic risk factors are workplace conditions which if inappropriate may cause injury to the body of the worker. These include awkward working posture, repetitive, forceful work and exposure to vibration. Anonymous (2021) reported that the landscapers perform a wide variety of tasks from mowing lawns and pruning bushes to weeding, planting, tree trimming, and irrigation work. Many of these tasks require awkward postures, forceful exertions, repeated movements, whole body vibration and hand-arm vibration—all these risk factors leads to development of musculoskeletal disorders (MSDs). The data (Table 3) indicate that the high ergonomic risk was observed during working in awkward posture (mean score= 4.56). A similar result was found in a study conducted by Lim *et al* (2021) who found that awkward posture was the main ergonomic risk factor identified, and none of the working postures during assessment was appropriate while performing landscape task. This was followed by repetitive mode of work in various gardening activities (mean score= 4.45) as experienced by respondents. Most of the gardeners

were using conventional hand tool while gardening in forceful way (mean score= 3.69). Whereas, the respondents felt the vibration while operating power tool (mean score= 2.40). The reason behind it was that some of the gardeners who were operating power tool were not wearing any anti vibrational gloves. Instead of wearing protective gloves they were just wrapping plastic polyethene on the handle of power operating machine.

CONCLUSION

So far from the above study, it can be concluded that from various gardening activities, the most time taking activity was found to be weeding activity among gardeners. In particular, the traditional practice of weeding activity using hand tools (such as trowel, spade) and poor posture (squatting/ bending) was considered as back breaking. Moreover, gardeners perform most of the activities in unshaded or partially shaded areas in outdoor environment. Therefore, the high environmental risk was perceived to be heat stress among gardeners. Also, their job observed as physically laborious, most of the gardeners perceived high ergonomic risk due to awkward posture followed by repetitive and forceful work. All in all, health is everything for every individual, one should have a healthy work practice at their level such as wearing protective clothing, taking frequent break,

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Table 3. Ergonomic risk factors faced by the respondents at workplace.

n=150

Ergonomic factor	Occurrence Mean Score (A)	Severity Mean Score (B)	Risk Mean Score (A*B)	Rank
Awkward working posture	2.82	1.62	4.56	I
Repetitive work	2.91	1.53	4.45	II
Forceful work	2.66	1.39	3.69	III
Vibration due to contact with power tool	1.89	1.27	2.40	IV

Occurrence score-3-Always, 2-Sometimes, 1-Rarely

Severity Score-3-Serious, 2-Moderate, 1-Negligible

hydration, minimizing excessive poor posture practice to overcome with work related postural discomfort.

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