

Original Research Article

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Ergonomic Evaluation of Farm Women during Using Okra Cutter

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ABSTRACT

Agriculture is an important unorganized sector where majority of the women labour force is engaged. Women as agricultural labourers, participate in several activities such as seeding, transplanting, weeding, fertilizer application, plant protection, thinning, harvesting, processing, selling, harvesting, winnowing, storing, looking after animals, kitchen gardening etc. The farm women adopt long static postures for some of the farm activities, which increase the static muscular effort resulting in high physiological cost and low productivity. The plucking efficiency, energy expenditure, carrying capacity, ease, comfort, safety, loading and unloading etc. were documented for comparison. Present Study was carried out in three districts named Jabalpur, Mandla and Katni. Under these districts eleven okra grower villages were selected. Front Line Demonstration was conducted under Krishi Vigyan Kendra, Jabalpur, Mandla and Katni during Year 2016, 2017 and 2018-19. A total of 60 farm women were selected for the study. The study mainly dealt with ergonomic evaluation of harvesting of okra by okra cutter. It is very useful to saves time and energy. Physiological responses and physiological cost of work is reduced significantly. The result of the study reveals increased efficiency and reduce HR work, ÅHR whereas output is concerned it was 6.8 kg/h by hand harvesting which increased to 9.84 kg/h by okra cutter increasing the output by 44%.

Keywords

Traditional tool,
Physiological cost,
Heart rate, Average
heart rate,
Discomfort

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Introduction

Women in rural India play a major role in shaping the economy of the country. Agriculture is an important sector where majority of the women labour force is engaged. The rural women play significant role in agriculture and agro processing activities. The daily work schedule of rural women is very demanding and arduous.

Women as agricultural labourers, participate in several activities such as seeding, transplanting, weeding, fertilizer application, plant protection, thinning, harvesting, processing, selling, harvesting, winnowing, storing, looking after animals, kitchen gardening etc.

Majority of the farm women doing hand harvesting without gloves and mostly affected

from pesticides exposure. Though, this method efficiency of agriculture from labour increases and drudgery to reduced. Farm women have anatomical and physiological differences that may place them at risk of farm injuries (Engber, 1993). The farm women adopt long static postures, which increase the static muscular effort resulting in high physiological cost and less productivity. There is a need to design women friendly tools and equipment as women can comfortably operate these tools and equipment. Use of Improved tools will reduce musculoskeletal disorders and increase the efficiency and there by productivity of the worker. Karam *et al.* (2009) suggested that the best way to prevent an injury is to eliminate the hazards. Oberoi *et al.* (2006) conducted a study to assess the muscular stress of rural women while performing different household, allied and farm activities with the use of traditional as well as improved tools. This ergonomic study on okra harvesting by traditional and improved method is conducted to find discomfort level, energy expenditure, efficiency, comfort, safety, loading and unloading and several factors involved during okra plucking operation.

Table 1 Depicts Area, Production, Number of growers and number of laborers in various villages of Majholi block of Jabalpur District. Table depicts that in this block, total area of Okra production was 182.8 ha and 742 Qt/year was the production.

Okra production in Mandla block of Mandla district with its area, number of growers and number of laborers was presented in Table 2. It shows that total area of production is 43.5 ha with 147 Qt/year production.

Table 3 shows the okra production, its area, number of growers and number of laborers in in Mandla Block of Mandla district. Total area in this block was 27 ha with annual

production of 75 Qt.

Materials and Methods

To demonstrate the safe method for protected hazards and injury during the okra harvesting, the work was conducted among 60 farmwomen at three district named Jabalpur, Mandla and Katni of Madhya Pradesh in their adopted villages. Heart rate is measuring an ergonomic measure to evaluate the physiological or functional demands of work on the individual workers (Hasalkar et al 2004). Thus the heart rate response method was used that measures the change in heart rate and uses it to calculate the energy expenditure during okra plucking activity. The present study was undertaken to assess the drudgery and efficiency enhancement during okra harvesting by the use of cutter.

The time was recorded using stop watch. Heart rate monitor was used to measure the heart rate. All other parameters were calculated from the heart rate measurement. Average heart rate was calculated during rest and work. The energy expenditure per minute was calculated from the heart rate with the help of formula given by Varghese *et al.*, (1994).

Energy expenditure (kj/min) = $0.159 \times$
Average heart rate (beats/min) – 8.72
 Δ HR (beats/min)= Average working heart
rate – Average heart rate during rest
Output (kg/h)= Weight of picked Okra x
duration/average time

Results and Discussion

The ergonomic evaluation of harvesting of okra activity was done. For this purpose 24 respondents of the age group of 25 to 55 years were randomly selected. The mean age count, average height and weight of respondents were 39.8 years, 154.26 cm and 52.23 kg respectively.

The results revealed that majority of the women (43.3%) harvesting of okra in the farm were in between 31-40 years followed by below 30 years (8.3%), above 51 years (11.6%) and between 41-50 years (36.3%). Nearly forty three percent of the farm women had above six years of work experience whereas only 8.3 percent of farm women had below 30 years of age which implies that since the sample comprised of only 11.6 percent of women aged above 51 years, had long years of work experience but there efficiency was low due to less physical fitness

Table 5 revealed that the majority of the respondents had musculoskeletal problems of farm women during the harvesting of Okra. The problems pertaining to illness, injuries and disorders related to musculoskeletal systems in the neck, shoulder, arms and hands are well recognized (Anderson, 1984; Kroemer, 1989; Bhattacharya and Meglothlin, 1996). Data given in Table 6 reveal that 7.9 kg harvesting of okra by age between 31-40 years of manually (hand harvesting) while output 11.2 kg by okra cutter.

Table.1 Farmers Involve to okra production in Majholi Block of Jabalpur district, MP

Village	Area (ha)	Production(Qt) /year	No. of Growers	No. of labours
Nanghat	60	280	134	450
Talad	50	195	130	580
Mohla Bargi	14	62	72	290
Darshni	50	180	102	233
Khamariya (Behar)	8.8	25	24	69
Total	182.8	742	462	1622

Table.2 Farmers involve to okra production in Mandla Block of Mandla district, MP

Village	Area (ha)	Production(Qt) /year	No. of Growers	No. of labours
Nadiya	15	52	32	38
Piparpani	10	27	18	16
Sakwah	18.5	68	22	20
Total	43.5	147	72	74

Table.3 Farmers Involve to okra production in Mandla Block of Katni district, MP

Village	Area (ha)	Production (Qt) /year	No. of Growers	No. of labours
Teori	12	30	26	20
Lingri	5	18	20	8
Lakhapateri	10	27	28	14
Total	27	75	74	42

Table.4 Anthropometric measurements

Physical characteristic	Mean ± SD
Age (years)	39.8 ± 8.00
Height (cm)	154.26 ± 5.128
Weight (kg)	52.23 ± 3.95

Table.5 Distribution of sample by age

Age in years farmwomen	Frequency (N=60)	Percentages (%)	Mean ± S.D
Below 30 years	5	8.3	27.80 ±2.28
Between 31-40 years	26	43.3	34.35±2.17
Between 41-50 years	22	36.6	44.18±2.32
Above 51 years	7	11.6	54.86±1.95

Table.6 Performance and problems of harvesting of okra

Subject Age Group	Traditional		Okra cutter	
	Av. Quantity harvested No/hr, kg/hr	Remarks from subject	Av. Quantity harvested No/hr, kg/hr	Remarks from subject
Below 30 years	570, 7.55	Health hazards and accidents while performing okra harvesting hand harvesting	820, 10.72	Easy to operate, feeling presser to thumb and center.
Between 31-40 years	604, 7.9	Very difficult activity for farmwomen due to pricking of thorns and prickles and skin contact of natural secretion of plant	847, 11.2	Women experienced moderate relief in itching experience in hands and pain in hands
Between 41-50 years	489, 6.85	Wounds, skin irritation and rashes faced to contact of pesticides	702, 9.84	Reduction in Itching of fingers, roughening of fingers
Above 51 years	350, 4.9	Farm women were having occupational health problems during harvesting	542, 7.6	Reduced the unhealthy impact but more time required to practicing

Table.7 Ergonomic evaluation during okra harvesting activity

Parameter	Mean values ± SD	
	Traditional (by hand harvesting)	Improved (by okra cutter)
Average working heart rate (beats/min)	84.76 ± 2.40	93.46 ± 2.41
Average heart rate during rest (beats/min)	73.05 ± 2.54	74.16 ± 2.38
ΔHR (beats/min)	10.79 ±2.86	19.3 ± 3.11
Output (kg/h)	6.8 ± 0.59	9.84 ± 1.16

Data given in Table 7 depicts that harvesting of okra 6.8 kg manually (hand harvesting) while 9.84 kg by okra cutter. Thus it is very clear that okra cutter saved more than 44 percent of time against the manual/hand harvesting and increased the working efficiency. It was found that the difference between working and resting heart rate (Δ HR) differ more in okra cutter. Shows change in Heart Rate (Δ HR) of the farm women during harvesting of okra was 10.79 beats/min by local sieve and 19.3 by Improved Method by okra cutter.

In conclusion, the okra harvesting activity is a very monotonous, repetitive, lengthy and time consuming. Moreover harvesting of okra with thorny stems leads to cuts, injuries, rashes and scratches on the fingers of farm women and tedious activity. This okra cutter proved to be use full for okra harvesting it saves time, labour, energy and economically advantage of the technology. Though the drudgery experience is high in these two okra cutter but work output and safe use is higher than traditional method. Okra cutter is a cutter type of tool of steel/metal with a cutting blade on two sides. This can be hold in index finger like a shear and plucking of okra fruit be easily done. It has tremendous utility for farmwomen working in okra field and also reduces health hazard.

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