Ergonomics evaluation of okra ring cutter in Shahdol district, Madhya Pradesh

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 Received:16.02.2021/Accepted: 10.03.2021

ABSTRACT

Farm women are mainly involved in tedious, monotonous, time consuming task in agriculture the result of which is that they are subjected to drudgery. The farm women are compelled to long static postures resulting in physical drudgery to their body. In spite of current scenario of agricultural advancements, the drudgery of farm women remains the same with non-friendly technologies and implements. Thus for the benefit of farm women and to aid in ease of farm women involved in okra plucking the okra ring cutter was evaluated. The results revealed that the use of ring cutter reduced the drudgery of farm women with higher productivity per unit of time. The ring cutter increased the efficiency by nearly two times as compared to traditional hand harvesting method.

Keywords: Ergonomics; evaluation; drudgery; efficiency; productivity

INTRODUCTION

In the current scenario the role of farm women in agriculture is widely recognized as they are involved in all stages of agricultural production. The male farmers role remains basically confined to tillage and field preparations whereas farm women are left with all other operations viz sowing, transplanting, weeding, intercultural operations, harvesting, storage operations etc. Farm women are basically subjected to such agricultural work which involves long, monotonous, repetitive unskilled drudgery-prone activity due to continuous static posture.

Engberg (1993) reported that farm women have anatomical and physiological differences that may place them at risk of injuries. Anon (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.

Thus there is a need to design women-friendly small tools which can help them in saving time and energy. The use of these small tools reduces musculoskeletal disorders and increases the efficiency and productivity of the farm women. KVK, Shahdol, Madhya Pradesh intervened in the use of okra ring cutter and train the farm women to use it. The ergonomics in the okra plucking activity by farm women was calculated in terms of energy expenditure, cardiac cost and output.

MATERIAL and METHODS

The experiment was conducted through on-farm trial (Fig 1) with 60 farm women in three adopted villages of Shahdol district, Madhya Pradesh in three consecutive years viz 2018, 2019 and 2020. The observations were recorded and compared with traditional practice of hand plucking of okra. Ergonomics measurement was done to evaluate okra ring cutter and compare its efficiency with respect to hand picking.

Farm women involved in okra plucking activity were selected randomly. The women with any sort of

physical disability were excluded from the study. The participants were subjected to equivalent working atmosphere for both the traditional hand plucking and okra ring cutter practice. The respondents were given a resting period for stabilizing their heart rate.

During the experiment parameters such as time required and energy expenditure were studied. Output was measured as quantity of okra harvested per hour during both the trials viz manual (by hand) and using okra ring cutter. Anthropometric rod and weighing balance were used to measure the height and weight of the respondents. The time was recorded using stop watch.

The heart beat rate is an ergonomic measure to evaluate the physiological or functional demand of work of the individual workers (Hasalker et al 2004). 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.

Energy expenditure per minute was calculated from the heart rate with the help of formulae given by Varghese et al (1994). The results obtained were statistically analyzed using mean values and standard deviation.

Energy expenditure (kj/min)= 0.159 x Average heart rate (beats/min) – 8.72

ΔHR (beats/min)= Average working heart rate – Average heart rate during rest

Output (kg/h)= Weight of okra harvested x Duration/ Average time

Cardiac cost of worker per unit of output (beats/kg of okra harvested)= ΔHR x Duration/Output

RESULTS and DISCUSSION

The ergonomic evaluation of okra harvesting activity was done. For this purpose 60 respondents in the age group 19 to 55 years were selected randomly. The mean age count, average height and weight of farm women were 38.7 years, 152.21 cm and 51.30 kg respectively (Table 1).

Table 1. Anthropometic measurements

Physical characteristic	Mean ± SD
Age (years)	38.7 ± 8.20
Height (cm)	152.21 ± 4.29
Weight (kg)	51.30 ± 3.85

The data given in Table 2 reveal that 6.5 and 8.5 kg of okra per hour was harvested by traditional

a b

Fig 1. On-farm trial on the use of okra ring cutter a) KVK scientists demonstrating the use of ring cutter, b) Farm woman using the ring cutter

Table 2. Comparative ergonomic evaluation of okra harvesting

Parameter	Mean value	
	Manual plucking	Plucking with okra ring cutter
Output (kg/h)	6.5 ± 1.52	8.5 ± 1.4
Increase in efficiency (%)	-	23.53
Average working heart rate (beats/min)	106 ± 3.04	98 ± 2.88
Average heart rate during rest (beats/min)	91 ± 2.54	88 ± 2.94
ΔHR (beats/min)	15 ± 3.76	10 ± 2.54
Cardiac cost (beats/kg)	138.46 ± 11.40	70.59 ± 4.62
Saving in cardiac cost/kg (%)	-	49.02
Drudgery reduction (%)	-	49.02

Table 3. Perceived exertion and injury caused during okra harvesting

Parameter	Traditional plucking	Plucking using okra ring cutter	Remarks of the participants
Perceived exertion (5-point scale)	3 (95.00%)	1 (4.00%)	Okra ring cutter easy to operate
Finger injury	78.83%	2.38%	Reduction in wounds by okra ring cutter
Skin irritation	98.00%	4.18%	Itching of fingers, roughening of fingers during traditional hand plucking

hand plucking and with okra ring cutter respectively which shows that okra ring cutter increased the efficiency by 23 per cent against the manual plucking. During hand plucking the average ΔHR was 15 beats/min while using okra ring cutter it was 10 beats/min. Similar observations were made by Sharma et al (2019) and Lakshmi and Deepika (2019) while working on various farm tools.

Table 3 reveals the perceived exertion of farm women on five-point scale. It was found that majority of the farm women had itching and wound problem during picking of okra as also reported by Vishwakarma et al (2020). The problems pertaining to illness, injuries and disorders related to musculoskeletal systems in the neck, shoulders, arms and hands are well recognized. There was a reduction in finger injury from 78.83 to 2.38 per cent and reduction in skin irritation from 98.00 to 4.18 per cent with the use of ring cutter.

CONCLUSION

Okra harvesting is reported to be a very repetitive, monotonous, time consuming and drudgery prone activity by the farm women. Okra with thorny stems causes rashes, injuries and scratches on the fingers of farm women during the picking activity. The okra ring cutter proved to be useful for harvesting as it saved time, labour, energy and also increased the per hour output in terms of produce harvested. The cutter can be held in index finger like a shear and plucking of okra fruit can be done easily. This small tool shows its vast utility for farm women involved in okra harvesting by reducing the perceived exertion and injuries caused.

REFERENCES

Anonymous 2009. Occupational noise-induced hearing loss (NIHL). Report of the Putting Data to Work: Occupational Public Health Programme (OPHP), Oregon Department of Human Services, Public Health Division, Office of Environmental Public Health Toxicology, Assessment and Tracking Services (TATS), Portland.

Engberg L 1993. Women and agricultural work. Occupational Medicine **8:** 869-883.

Hasalker S, Budihal R, Shivalli R and Biradar N 2004. Assessment of workload of weeding activity in crop production through heart rate. Journal of Human Ecology **15(3):** 165-167.

Lakshmi VV and Deepika J 2019. Performance evaluation of ring cutter in harvesting activity. International Journal of Current Microbiology and Applied Sciences **8(4):** 1838-1843.

Oberoi K, Oberoi H and Gupta R 2006. Assessment of muscular stress of rural women while performing different activities with traditional and improved tools. Journal of Human Ecology **19(3):** 191-194.

Sharma A, Vishwakarma N, Singh M, Tripathi PN, Chouhan D and Pandre BP 2019. Ergonomic evaluation during wheat cleaning through hanging type grain cleaner (HTGC). International Journal of Farm Sciences **9(4):** 124-126.

Varghese MA, Saha PN and Atreya N 1994. A rapid appraisal of occupational workload from modified scale of perceived exertion. Ergonomics **37(3):** 485-491.

Vishwakarma N, Sharma DP, Sharma A and Sharma P 2020. Ergonomics evaluation of farm women during using okra cutter. International Journal of Current Microbiology and Applied Sciences **9(5):** 1380-1384.