**Addressing the Ergonomic and Economic Challenges faced by Women Workers in Aonla Preserve Making Units: An Application of Response Surface Methodology**

Arpana Rai¹, Sudesh Gandhi² and D K Sharma³

¹PhD Scholar, Dept of Human Resource Management &Organization Behavior, NITIE, Mumbai, India
²Professor, Dept of Family Resource Management, COHS, CCSHAU, Hisar, Haryana, India
³Assistant Professor, Dept of AP&FE, COA&E, CCSHAU, Hisar, Haryana, India.

**Introduction:** Preserve making workers represent a typical example of the workforce that is continuously involved in precise work of pricking the fruit for long hours. Several observational studies of aonla preserve making units have revealed that workers in these units are still using age old hand tools and the work is carried out at ground without any workstation in improper environmental conditions especially poor lighting. This has resulted into increased physiological cost of work, exposure to physical and postural hazards (ergonomic challenges) along with decreased productivity and poor quality pricking (economic challenges). Therefore to address these issues, a workstation was developed and a series of experiments were carried out while pricking on workstation to address ergonomic and economic challenges faced by pricking workers.

**Objective:** To find out the most optimized conditions while pricking on the workstation that will minimize the ergonomic burden on workers and maximize the economic benefits.

**Methods:** After conducting a series of experiments with the aonla pricking workers using hand tool and workstation, it was found out that height of the workstation, light on the workstation and time spend in the pricking task were the major determinants of both the ergonomic and economic parameters concerned with the pricking task. Therefore, optimized working conditions were determined for pricking on workstation using response surface methodology (RSM). The process parameters selected were height (200, 600, 1000 mm) of the workstation, lighting on the workstation (100, 300, 500 lux) and time spend in pricking at the workstation (1, 2, 3 hrs). The responses selected were a combination of ergonomic (heart rate, HR and body part discomfort score, BPDS) and economic parameters (productivity of the workers and quality of the produce). A total of 17 experiments showing different combinations of 3 factors (height-light-time) using RSM were carried out to find the best combination.

**Results:** The most desired combination of height-light-time that result into minimum increase in HR and BPDS and maximum increase in productivity of workers and quality of produce was: working at 500 mm height (sitting posture) at 300 lux light for 1 hr and 45 min. Based on the findings, proper work rest allowances were determined for the workers. The workers were suggested to carry out pricking task in sitting posture with workstation accordingly adjusted, at light of 300 lux in workstation for a duration of around 2 hr and then get a break of 20 min from work and after break again start the work. The results obtained were suggested to preserve making units.

**Conclusion:** The result of this optimization study showed that the optimum value of physical dimensions gave a significant improvement for the ergonomic and economics measures while working on the workstation. Such type of studies should be replicated in future to cover other cottage industries.

**Keywords:** Aonla preserve; hand tool; workstation; response surface methodology; ergonomic; economic