

ERGONOMIC ASSESSMENT OF ROSE AND MARIGOLD FLOWER HARVESTERS ACCORDING TO THEIR RATE OF PERCEIVED EXERTION SCALE OF AVERAGE HEART RATE

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Abstract: The topic has been describing the physiological workload assessed by average heart rate recording which compared to the rate of perceived exertion of rose and marigold flower harvesters because this is also a drudgery prone activity. Their work capacity on field is fluctuate at the time of flower harvesting. It was evaluated by Rate of Perceived Exertion and Recording of Heart Rate assessment. The data of the study has been collected through ergonomic assessment tool named Digital Heart Rate Monitor which was divided in five categories in which two categories of very light, light, heavy, very heavy and moderate heavy of RPE scale with average heart rate. All these categories of heart rate were use in this assessment for the study of rose and marigold flower harvesters. Male and female both were respondent of this study. The study has been taken from Allahabad city in block Chaka, where rose and Marigold both flowers are propagated on large scale.

Index Terms— Drudgery, Ergonomic, Heart Rate, Rate of Perceived Exertion

I. INTRODUCTION

India has a long tradition of floriculture. Appreciation of the potential of commercial floriculture has resulted in the blossoming of this field into a viable agri-business option. Availability of natural resources like diverse agro-climatic conditions permit production of a wide range of temperate and tropical flowers, almost all through the year in some part of the country or other. Improved communication facilities have increased their availability in every part of the country. The commercial activity of production and marketing of floriculture products is also a source of gainful and quality employment to scores of people.

Farmer involved into floriculture get very high entrepreneurial opportunities but, so far has found that rose and marigold are the main cash crops of Allahabad that involves farmers at great number. The harvesting processes of these crops are very drudgery prone. India being an agricultural country, where majority live in the rural areas, both men and women work very hard in the fields. The present study will be taken in Allahabad's rural areas where the farmers are engaged in harvesting of Roses and Marigolds. These two flowers- Rose and Marigold are very much in demand in Allahabad. Harvesting of these is a very drudgery prone activity for the rural women because Rose thorns make them bleed from their hands and over all body and their dress get torn. At the time of harvesting of Marigold, harvesters feel pain in their backbone, thighs, and legs, neck etc. because bending during harvesting causes pain. These are major drudgeries of harvesting the Rose and Marigold for these harvesters. These two flowers are planted frequently because Allahabad is a Holy and Religious city. Here every day in all the temples people use the flowers for worship God as well as the Dhoopbatti and Agarbatti sticks also used in temple which has fragrance and these two flowers are being used especially for fragrance. Rose and Marigold are cash crops in Allahabad city.

Rose is planted commercially by women in Allahabad city and nearby areas. The women are facing lot of difficulties in the cultivation of rose flowers. Rose thorns keep hurting them to their hands and other parts of body (that are in the contact with thorns) start bleeding and their clothes get thorn as well. Rose is grown in the city of Allahabad throughout the year. The Farm women have to harvest rose flower in standing posture by hand and collect them in a cloth wrapped around the waist, which result in decreasing the commercial value of flowers.

The harvesting of rose comes under the severe drudgery prone activity (Ergonomic practices, 2003).

Marigold is an annual flower plant. The harvesting of the Marigold flower is considered as the severe most drudgery prone activity (Ergonomic practices, 2003) where women have to keep their posture in bending position from the back facing the ground for the harvesting of flowers. It leads them to severe pain in their backbone, leg, and thigh and feet etc. To reduce such problems, the 'hybrid variety of tall plant' of Marigold as well as rose can help reduce or completely abandon the bending position of women while the harvesting process goes on.

Ergonomic Assessment of rose and marigold flower harvesters was nessessry for the study, collection of heart rate with the help of digital heart rate moniter was begining of ergonomic assessment which explor in this study.

II. OBJECTIVE

The major objective of the study is to know Ergonomic Assessment of Rose and Marigold flower harvesters according to their Rate of Perceived Exertion Scale of Average Heart Rate.

III. METHODOLOGY

The research procedure and technique used in arriving at

(i) Location of the study: -

District -Allahabad,

Block- Chaka,

Villages of Block Chaka

(ii) Sampling Procedure:

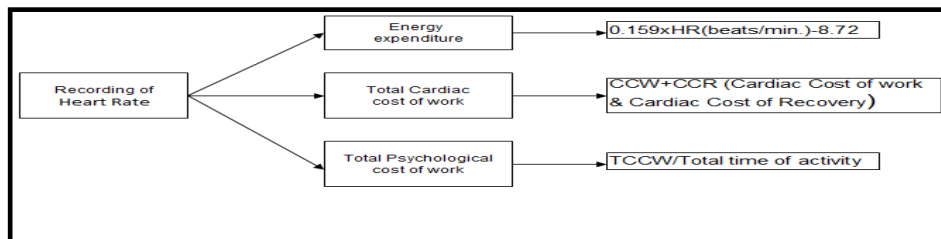
Sample selection and size –A sample of 106 farmer, 53 from each harvesting of Rose and Marigold respectively will be selected for the study.

A village inventory and interview schedule will be developed and administered with the BDO, Sabhapati and farm women respectively.

iii) Tools for the data collection: - The following tools will be selected for the data collection:

RECORDING OF HEART RATE: Recording of heart rate was done by using Digital Heart Rate Monitor. The heart rate was required to calculate the energy expenditure, total cardiac cost of work and the total physiological cost of work.

The following is the flow chart used for recording the heart rate.

**FLOW CHART OF RECORDING HEART RATE**

ENERGY EXPENDITURE – It is defined as the total amount of energy spent while performing an activity (Jatinder and Aruna 2007). The following formula was used to calculate the energy expenditure.

Energy Expenditure = $0.159 \times \text{HR (beats/min.)} - 8.72$.

TOTAL CARDIAC COST OF WORK (TCCW) – It is defined as the total heart rate involved in performing work. It is the sum of cardiac cost at work and cardiac cost at recovery or rest.

TOTAL CARDIAC COST OF WORK = CCW + CCR (Cardiac Cost of work + Cardiac Cost Recovery)

CARDIAC COST AT WORK (CCW) – It is known as the heart rate reading at the time of work (Kishtwaria 2001).

CARDIAC COST AT REST (CCR) – CCR is defined as the reading of heart rate at the resting position.

PHYSIOLOGICAL COST OF WORK- Physiological cost at work can be defined as the total cardiac cost of work involved in an activity (Gandhi and Bimla 2007). It is derived by dividing TCCW by Total time of activity. Total time of activity is the amount of time involved in completing an activity.

$$\text{TCCW} = \frac{\text{Physiological Cost of Work}}{\text{Total time of activity}}$$

IV. RESULT AND DISCUSSION

TABLE.1: DISTRIBUTION OF THE FLOWER HARVESTERS OF THE SELECTED THREE VILLAGES ACCORDING TO THEIR RATE OF PERCEIVED EXERTION SCALE OF AVERAGE HEART RATE

RPE Scale	A.H.R (Beats / min.)	Rose, n=65				Marigold, n=41				Total n=106			
		Male		Female		Male		Female		Male		Female	
		F	%	F	%	F	%	F	%	F	%	F	%
Very Light	70 – 80	6	18.8	0	0	4	19.1	0	0	10	18.9	0	0
Light	90 – 100	0	0	0	0	0	0	0	0	0	0	0	0
Moderate	100 – 110	0	0	2	6.06	0	0	2	11.8	0	0	4	7.55
Heavy	110 – 120	1	3.13	4	12.1	3	14.3	5	29.4	4	7.55	9	17
Very Heavy	120 >	25	78.1	27	81.8	14	66.7	13	58.8	39	73.6	40	75.5
Total		32	100	33	100	21	100	20	100	53	100	53	100

GRAPH: 1

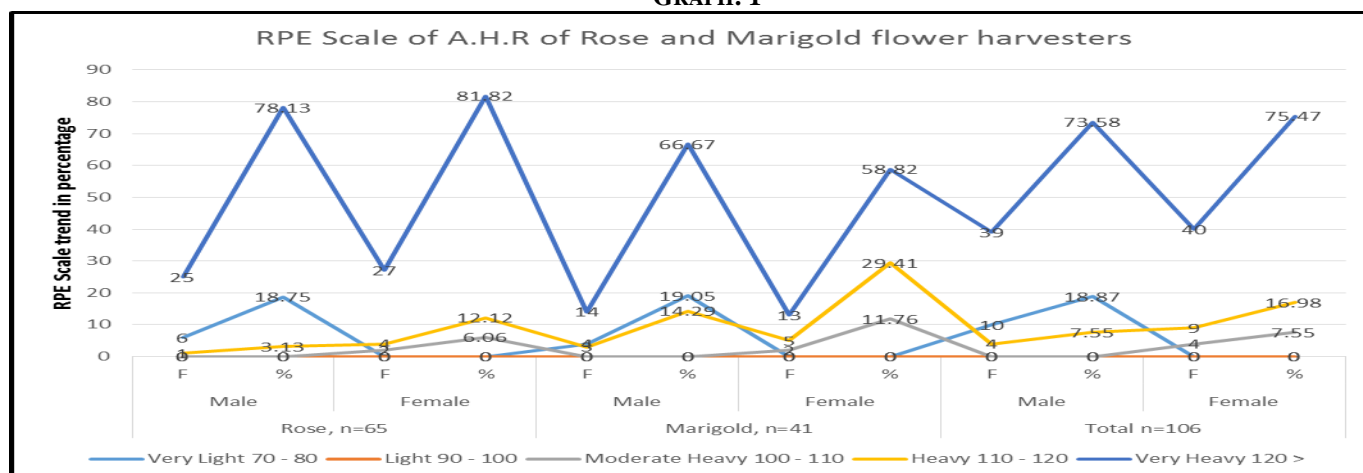
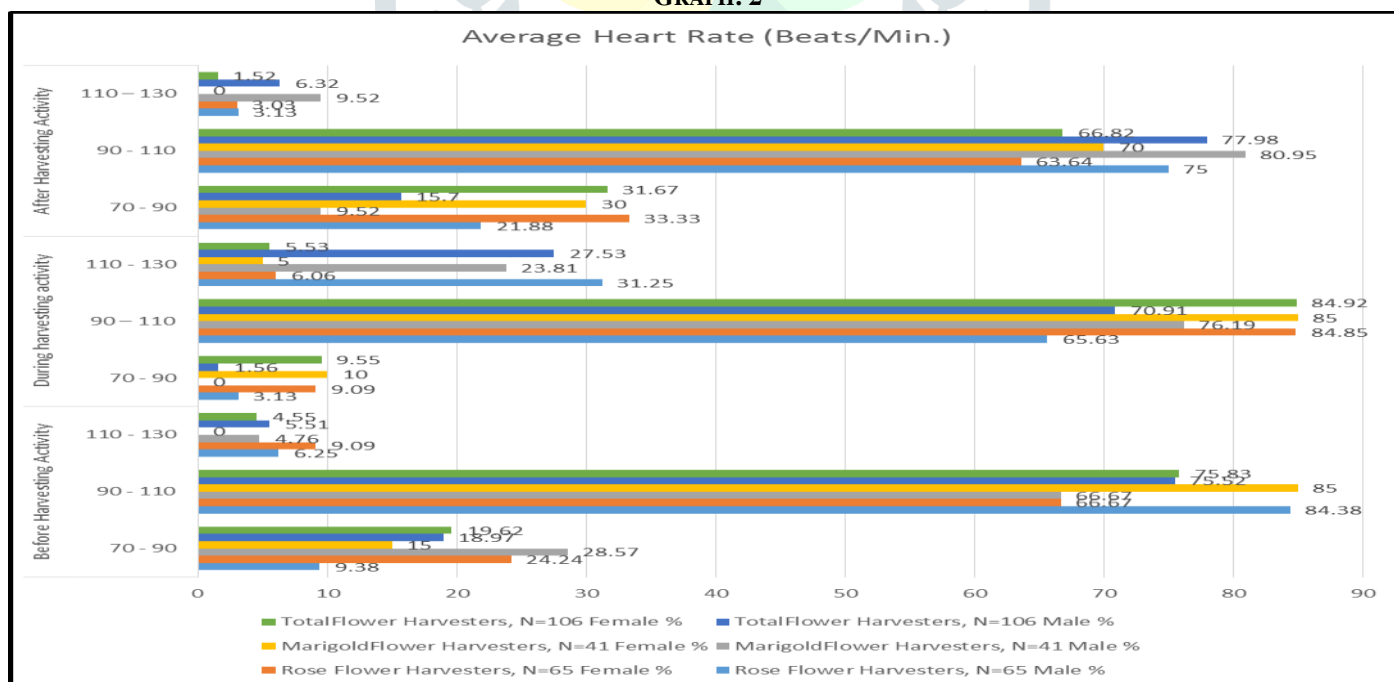


TABLE.2: AVERAGE HEART RATE (BEATS/MIN.) OF ROSE AND MARIGOLD FLOWER HARVESTERS OF THE THREE SELECTED VILLAGES DURING FLOWER HARVESTING

Harvesting activity of flower harvester			Before Harvesting Activity			During harvesting activity			After Harvesting Activity			Total Flower Harvesters, n=106
A.H.R. (Beats/Min.)			70 - 90	90 - 110	110 - 130	70 - 90	90 - 110	110 - 130	70 - 90	90 - 110	110 - 130	
Rose Flower Harvesters, n=65	Male	F	3	27	2	1	21	10	7	24	1	32
		%	9.38	84.38	6.25	3.13	65.63	31.25	21.88	75.00	3.13	100
	Female	F	8	22	3	3	28	2	11	21	1	33
		%	24.24	66.67	9.09	9.09	84.85	6.06	33.33	63.64	3.03	100
Marigold Flower Harvesters, n=41	Male	F	6	14	1	0	16	5	2	17	2	21
		%	28.57	66.67	4.76	0.00	76.19	23.81	9.52	80.95	9.52	100
	Female	F	3	17	0	2	17	1	6	14	0	20
		%	15.00	85.00	0.00	10.00	85.00	5.00	30	70.00	0.00	100
Total Flower Harvesters, n=106	Male	F	9	41	3	1	37	15	9	41	3	53
		%	18.97	75.52	5.51	1.56	70.91	27.53	15.70	77.98	6.32	100
	Female	F	11	39	3	5	45	3	17	35	1	53
		%	19.62	75.83	4.55	9.55	84.92	5.53	31.67	66.82	1.52	100

GRAPH: 2

The physiological workload assessed by average heart rate recording compared to the rate of perceived exertion which was divided in five categories in which two categories of very light and light of RPE scale with average heart rate of 80-90 beats/min. and next 90-100 beats/min were those categories in which any flower harvesters does not exist because these were the lowest category of heart rate and flower harvesters who comes in this categories were not physically fit. On the other side both rose and marigold maximum male 75.00 percent and 68.42 percent flower harvesters were in range of beats/-min. recorded 110-120 and their RPE scale was very heavy respectively whereas both female rose and marigold maximum flower harvesters 70.37 percent and 58.82 percent were in range of more than 120 beats/-min. and their RPE scale were recorded very heavy respectively and in total maximum male flower harvesters 72.34 percent were in range of more than 120 beats/-

min. and their RPE scale were recorded very heavy as well as from the total female flower harvesters maximum 65.91 percent were in range of more than 120 beats/-min. and their RPE scale were recorded very heavy also. Than minimum male of both flower rose and marigold flower harvesters 3.57 percent and 5.26 percent were in range of beats/-min. recorded 100-110 and their RPE scale was heavy respectively whereas both female rose and marigold minimum flower harvesters 7.41 percent and 5.26 percent were in range of more than 100-110 beats/-min. and their RPE scale were recorded moderate heavy respectively as well as from the total female flower harvesters minimum 9.09 percent were in range of more than 120 beats/-min. and their RPE scale were recorded moderate heavy.

In total flower harvesters maximum both male and female flower harvesters lies under the same range of 90-110 beats/min in all three categories as 75.52 percent before harvesting, 70.91 percent during harvesting and 77.98 percent after harvesting for male flower harvesters whereas 75.83 percent before harvesting, 84.92 percent during harvesting and 66.82 percent after harvesting for female harvesters respectively. The minimum 5.51 percent male and 4.55 percent female flower harvesters were under 110-130 beats/min before harvesting whereas 1.56 percent male flower harvesters were under 70-90 beats/min and 5.53 percent female flower harvesters were under 110-130 beats/min during harvesting and 6.32 percent male and 1.52 percent female flower harvesters were under 110-130 beats/min after harvesting respectively.

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