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Assessment of Drudgery Load of Farm Workers Involved in Flower Harvesting Activity and Technology Intervention

Jayshree. P. Zend [1] and ManjushaS. Revanwar [2]
[1&2] VasantraoNaik Marathwada KrishiVidyapeeth, Parbhani-431402 (India)
Corresponding Author: jpzend@rediffmail.com

ABSTRACT
Field survey was conducted to know the existing flower plucking practices followed by farm workers & constrains faced by them during plucking and collecting of loose roses, cut roses, gaillardia & marigold flowers. Total sample of 120 farm workers (Male & Female) intensively involved in flower plucking of cut & loose roses, gaillardia & marigold were purposively selected as respondents. Parameters used to assess the drudgery experiences were rated perceived exertion, work related drudgery experience Physical load,Postural load; time load, repetitive strain load, physiological load and MSD load. Drudgery load and index were calculated for harvesting activity performed in each selected flower farm. The design of the bags and material to be used was finalized after conducting field trial and collecting feedback of the selected workers. Percentage change in pace of work (kg/h/worker) in improved method was highest (33.3 %) in case of harvesting cut roses, followed by 16.66 percent in case of loose roses & 14.28 percent in case of harvesting gaillardia . Time load in flower harvesting was decreased due to use of developed customized harvesting bags for all the selected flowers such as cut roses (25 %), loose roses (9 to 14 %), gaillardia (12 to 16 %) & marigold (22 to 24 %). Rated perceived exertion (RPE) was highly significantly decreased by 25 to 33 percent in improved method while performing flower harvesting in case of all the three selected flowers.
Key words: Flower harvesting, time load, repetitive strainload.

INTRODUCTION

Survey report of farm workers shows that flower plucking activity is very tedious. Flower harvesting of loose roses is carried out by the use of finger tips directly so wounds/cuts and swelling to fingershave reported by all the farm workers. Body pain was reported by majority (93 %) of the farm workers while harvesting aster & marigold, because plucking of flowers was performed continuously in bending posture. Marigold harvesting always needs to be finished within two to three days due to highest seasonal work load. This was the stressful & time demanding load experienced by workers involved in marigold harvesting. Marigold harvesting was performed since morning to evening, hence, heat stress, headache, eye irritation was experienced by the workers. Incidences of allergy and skin infection were reported by majority of farm workers involved in harvesting asters and roses [2]. This was due to large area of grown weeds in the field and application of pesticides on the plants.

MATERIAL AND METHODS

Field survey was conducted to know the existing   flower plucking practices followed by farm workers & constrains faced by them during plucking and collecting of loose roses, cut roses, gaillardia & marigold flowers. An interview schedule was developed & interview cum observation techniques were used to collect the data. Parbhani, Nanded & Jintoor blocks were selected purposively to collect the data as these blocks have maximum flower cultivation fields. Total sample of 120 farm workers (Male & Female) intensively involved in flower plucking of cut & loose roses, aster & marigold were purposively selected as respondents. Based on the information gathered, customized harvesting bags were designed to reduce the drudgery of farm workers. The design of the bags was finalized after conducting field trial and collecting feedback of the selected workers.
Parameters used to assess the Drudgery Experiences

RPE (Rated perceived exertion). Very light (1),Light (2), Moderately light (3), Heavy (4) ,Very heavy (5) (5)

Work related drudgery experience. Very demanding (5), demanding (4), Moderately demanding (3), Less demanding (2), Very less demanding (1)

Physical load. Very heavy (5),Heavy (4),Moderately heavy (3),Light (2),Very light (1)

Postural load rating. Very comfortable (5), Comfortable (4), Moderate (3), Discomfort (2), Very uncomfortable (1)

Postural load rating. Very slow (5), Slow (4), Moderate (3), Fast (2), Very fast (1)

Musculoskeletal symptoms were evaluated by using body map and following parameters

1. Presence of nonspecific symptoms such as itching, burning, numbness, stiffness and swelling
2. Presence of specific pain symptom
3. Tolerance to the symptoms:- Ignorable-1, bearable-2 and unbearable-3
4. Level of pain: Very low-5, Low-4, Moderate-3, severe -2 and very severe-1

Estimation of load factor by comparative selection from combinations given

	Physical load x Posture		Physical load x repetitive strain		Physical load x Time		Physical load x MSD		Physical load x physiological load
	Posture x repetitive strain		Posture x Time		Posture x MSD		Posture x physiological load		Repetitive strain x Time
	Repetitive strain x MSD		Repetitive strain x physiological load		Time x MSD		Time x physiological load		MSD x physiological load

1. There were 15 combinations enlisted in 15 boxes.
2. The opinion of the respondent was elicited for every box of combination for each activity
3. Only one variable from each of the combinations listed was tick marked in every box.
4. Summation of the frequency as per the tick mark given in every box against each variable for the each activity was done.
5. The sum obtained against each variable was mentioned as load factor of each activity at the columns mentioned with variable name.

Drudgery load and drudgery index were calculated for each selected activity in selected crop system by using following formulae

$$\text{Drudgery Load} = [dr (PL) + dr(P) + dr(RS) + dr(T) + dr(MSDs) + dr(PysL)]$$
$$\text{Drudgery Index} \%(DI) = [100 \times dr (total)] / 150$$

Where,

dr (total)= Total drudgery, PL – physical load (25 points) , P – postural load (25 points) , RS – repetitive strain load (25 points) , T – time load (25 points), MSDs – musculoskeletal disorders (25 points), PhsL – physiological load (25 points)

[1] , [2] and[4]

Drudgery Level Categorization:< 15 = V. Low ,15- 30 = Low, 30 – 45 = Moderate to Heavy,

45 – 60 = Heavy ,60- 80 = V. heavy, >80 = Unacceptable

Drudgery Load of conventional methods of harvesting flowers from the fields such as loose & cut roses, gaillardia & marigold was calculated. The results revealed that all the selected flower harvesting activities were drudgery prone and no improved technology and methods were used for plucking & collecting of selected flowers from the fields. There was intensive involvement of rural women in this activity and further they performed this activity putting large demands on their time & energy. The aspects considered for selecting material and designing bags for harvesting each flowers such as cut roses, loose roses, gaillardia & marigold were different such as water resistant material, durable to bear cuts due to thorns, size of the bag which will hold 5 kg of flowers, light in weight, both hands should be free for work, anthropometry of the worker and prevention from damage to the flower petals:

Name of the flower	Different conventional and customized bags tested in the experiment	Customized flower harvesting bags selected for conducting field trials
Gaillardia	• Tarpaulin waist bag with zip • Tarpaulin waist bag with flap • Cloth waist bag with flap • Piece of saree (waist tied)	• Tarpaulin waist bag with zip, • Tarpaulin waist bag with flap (Tikai) (Plate. 1)
Loose roses	• Tarpaulin waist bag with zip & flap • Tarpaulin waist hollow leg bag • Bamboo strip back sac • Plastic bin back sac • Cotton tarpaulin hollow leg shoulder bag • Wire waist bag with flap	• Plastic bin back sac (Phuleri) (Plate. 2)
Cut roses	• Plastic tarpaulin waist bag with zip & flap • Plastic tarpaulin hollow waist leg bag • Bamboo strip back sac • Cotton tarpaulin hollow leg shoulder sac • Plastic laundry bin • Wire waist bag with flap	• Plastic bin back sac (Phuleri) • Cotton tarpaulin hollow leg shoulder sac (Gauri) (Plate. 3)
Marigold	• Tarpaulin waist bag with flap • Tarpaulin waist long bag with zip • Tarpaulin waist long bag with bottom cord • Cloth waist bag with bottom cord	• Tarpaulin waist long bag with bottom cord (Sonai) (Plate. 4)

RESULT AND DISCUSSION
Drudgery load in flower harvesting
Loose rose, gaillardia & marigold harvesting was found to be heavy drudgery prone activity. Loose rose plucking was heavy activity due to maximum repetitive strain &musculoskeletal pain of wounds & cuts due to thorns. Whereas gaillardia harvesting was heavy activity due to postural & repetitive strain load as reported by workers. Drudgery level of marigold harvesting was highest (51 drudgery index) due to physiological load as they worked 6 hrs continuously in the field and carried 5-6 kg weight at a time for every 30 min. Cut roses harvesting was moderately heavy activity because this was performed with the help of secateurs. Large spacing in plants made easy to move between the rows and drudgery load of cut rose harvesting was found reduced.

Work output of flower harvesting activity with conventional and improved method
Work output with conventional & improved method of flower harvesting activity   is given in table 3. Percentage change in pace of work due to technology (kg/hr/worker) was highest in case of cut roses (33%) followed by gaillardia (14.28 %). There was 5 percent change i.e. increase in pace of work due to technology in case of harvesting marigold.
With regard to time required for flower harvesting (hr/ha), it was found that 25.8 percent reduction in time due to technology in cut rose harvesting, followed by 24.38 percent reduction in time required in case of marigold harvesting. Similarly in terms of man days required for flower harvesting, total nine man days were reduced in case of harvesting of marigold per hector.

Change in rated perceived exertion (RPE) due to technology while performing flower   harvesting activity
Table 2 indicates that on an average there was 25 to 33 % reduction in perceived exertion due to developed technology used for flower harvesting in different types of fields. Statistically results were highly significant for all the selected flowers. There was highly significant reduction in perceived exertion in improved method.

CONCLUSION
Prevalence of health problems reported by farm workers were maximum while performing harvesting of aster due to lower height of the plants i.e. below the waist line of the worker, followed by allergy/ skin infection & seasonal workload. Classification of drudgery load indicated that drudgery level of farm worker involved in marigold, aster & loose rose harvesting was heavy. Whereas harvesting of cut rose belonged to classification of moderately heavy task. Percentage change in pace of work (kg/h/worker) in improved method was highest in case of harvesting cut roses, followed by loose roses &aster. Time load

in flower harvesting was decreased due to use of developed customized harvesting bags for all the selected flowers.Rated perceived exertion (RPE) was highly significantly decreased in improved method while performing flower harvesting in case of all the three selected flowers. Hence, it can be concluded that developed customized harvesting bags for aster, marigold, cut &loose rosés are suitable technologies for mitigating drudgery & man days required for flower harvesting.

Table : 1. Incidences of health problems while performing flower harvesting.

	Frequency & Percentage			
Symptoms	Cut roses n = 30	Loose roses n = 30	Gaillardia n = 30	Marigold n = 30
Body Pain	16 (53)	16 (53)	28 (93)	28 (93)
Headache	-	-	-	25 (83)
Eye irritation	03 (10)	03 (10)	04 (13)	05 (17)
Swelling of fingers	04 (13)	-	-	-
Heat stress	-	-	-	20 (67)
Wounds / cuts	30 (100)	30 (100)	-	-
Scratches on arm & back skin	30 (100)	30 (100)		
Allergy / skin infection	01 (3)	06 (20)	12 (40)	-
Exertion due to seasonal workload	--	--	29 (97)	30 (100)
Decreased efficiency in performing household activities	20 (67)	20 (67)	08 (27)	23 (77)

Figures in parenthesis indicates percentages

Table 2. Drudgery Load of farm women in flower harvesting.N=30 for each flower

Name of Flower	Physical Load (25)	Postural Load (25)	Repetitive Strain Load (25)	Physiological Load (25)	Time Load (25)	MSD Load (25)	Total Drudgery (150)	Drudgery Index (%)	Drudgery Level
Cut Rose	8	8	19	15	5	7	62	41	MH
Loose Rose	10	8	19	16	10	10	73	49	H
Gaillardia	8	16	21	11	5	11	72	48	H
Marigold	10	8	21	18	13	7	77	51	H

Drudgery level: Unacceptable > 80, Very heavy: 60 – 80
Heavy: 45-60, moderately heavy 30 –45,
Low : 15 – 30, Very Low < 15
MH – Moderately heavy
H - Heavy

Table 3. Work output of flower harvesting activity with conventional and improved Method.
n = 30 for each flower

Name of the flower and parameters	Conventional Method	Improved Method	Percentage Change due to Technology (%)
Pace of work	*Kg / hr / worker*		
Cut Rose	10.5	14	33.30
Loose Rose	6	7	16.66
Gaillardia	10.5	12	14.28
Marigold	20	21	05.00
Time	*hr / ha / worker*		
Rose	31	23	25.80
Loose Rose	54	49	5 (9.25
Gaillardia	62	52	16. 12)
Marigold	324	245	24.38
Man days	*No. of Man days / ha*		
Cut Rose	4	3	25.00
Loose Rose	7	6	14.28
Gaillardia	8	7	12.50
Marigold	40	31	22.50

Table 4. Rated perceived exertion (RPE) while performing flower harvesting.

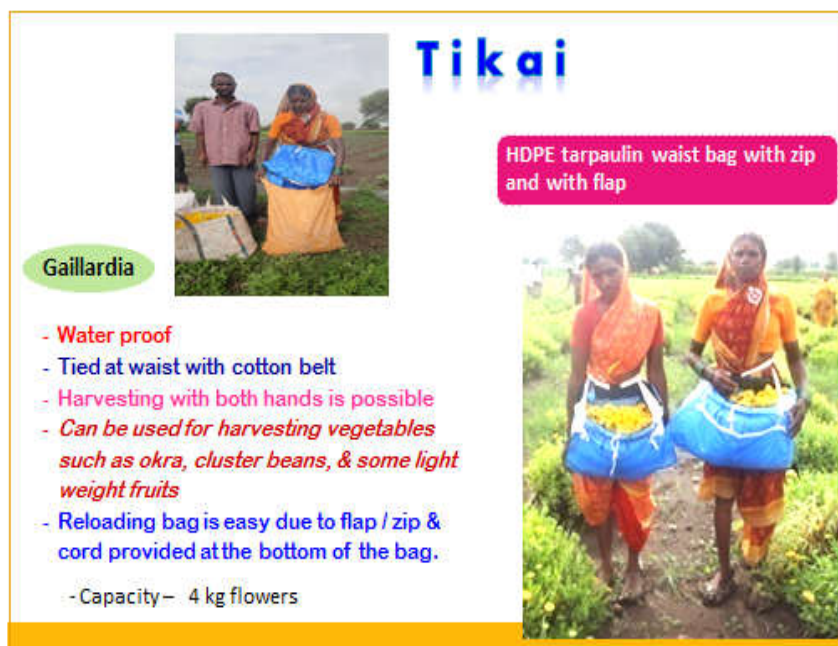| Name of the flower	RPE Score		Reduction in Improved over conventional (%)	't' Values
	Conventional Method	Improved Method		
Cut roses	3.73 ± 0.59	2.32 ± 0.45	33.33	10.44**
Loose roses	4.20 ± 0.86	3.40 ± 0.81	25.00	3.80**
Gaillardia	4.40± 0.63	3 .00 + 0.89	25.00	6.03**
Marigold	4.30 ± 0.57	3.34 ± 0.65	25.00	6.11**

** Significant at 1 % Level

Plate. 1. Customized bag for Gaillardia harvesting.

Plate. 2. Customized bag for Loose Roses harvesting

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