

Development of cost effective protective clothing for the *Ber* fruit harvesters

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■ **ABSTRACT** : The major problem encountered by the *Ber* fruit farm workers is during plucking the fruit, in which they get cuts and wounds on hands/arms and legs due to thorns and splinters. This leads to large lesions and infection. Looking into their problem cost effective protective clothing were developed for the farm workers working in *Ber* fruit orchards to meet occupational health hazards. The developed *Kurta pyjama* as protective clothing was stitched from non woven fabric of 70 GSM and underlining of 100 % cotton fabric with 126 GSM. To further prevent the thorns from entering the body, Nehru Collar was stitched at neck, with front opening and elastic band at the full length sleeves and ankle of *Pyjama*.

■ **KEY WORDS**: *Ber*, Protective clothing, Harvesters, Fruit

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With the advancement of technology, harvesting of selected fruits has become mechanized. However, hand harvesting is still prevalent in many parts of the world. In Punjab, the most common method of harvesting *Ber* fruit is by manual shaking or beating the tree branches to induce the mature fruit to fall on cloth laid on the ground. Neither of these methods of harvesting is satisfactory, as they cause considerable damage to fruit and the harvest includes mature as well as immature fruit to fall. Other methods of harvesting include plucking the fruit using ladder or clipper and hand picking the individual fruit, as less fruits are damaged (Anonymous, 2016). But both these methods are more time consuming and more difficult, because while plucking the fruit, the body is exposed to objects like splinters, thorns, sticks or hand tools. As a result, the farm workers

get abrasions, injuries on different body parts.

The injuries range from minor cuts to large lesions on body parts. Fungal and bacterial infections may enter through the injury point and cause infection and sickness. Many times it causes sepsis among the farm workers (Anonymous, 2000 and 2016). Even farm workers face difficulty in harvesting of cereal crops leading to cuts in hands/arms, as the stalks of these crops dry completely and become hard (Jyoti *et al.*, 2014).

According to the International Labour Organization (ILO), the agricultural sector is one of the most hazardous to health worldwide. Agricultural work possesses several characteristics that are risky for health. These include exposure to the weather, close contact with animals and plants, extensive use of chemical and biological products, difficult working postures and lengthy hours, and use of

hazardous agricultural tools and machinery (Anonymous, 1978). Moreover, agricultural workers constitute the most deprived class in the rural economy of our country. Their income is low and employment is irregular. The injury caused during farming is also not taken care off. They need of protective clothing which is economical to buy. The problems faced by farm workers during the harvesting of *Ber* fruit have been accessed in detail and recommend remedial measures have also been elucidated in the research study conducted by the authors (Bains *et al.*, 2016).

Rural farm workers often lack education and information regarding the health hazards they may face (Otero and Preibisch, 2010). Moreover, the existing dress pattern doesn't protect the farm workers from the injuries caused during plucking. If occupational health hazards are to be addressed, cost effective protective clothing needs to be developed. The problems of farm workers are not solved by mere development of protective clothing. The farmers need to be made aware and educated of such special clothing through organizations, farm clubs, *Kisan melas* etc. The researchers Tondle and Schulze (2000) in their study have also mentioned that educational efforts need to be planned for farm workers, so that they intend to use protective clothing during pesticide application (Rani *et al.*, 2013). Svtowa and Soropa (2015) emphasized that safety on the farms still have to be improved in order to create a safe and accident free working environment (Tondle and Schulze, 2000). For this short courses need to be delivered to the farmers. The use of protective clothing will not only improve health condition, but also increase the work efficiency. Thus this study suggests the appropriate protective clothing for workers plucking *Ber* fruit.

■ RESEARCH METHODS

Locale and sample selection :

The study was conducted in two villages (*Gurre* and *Jagraon*) during the month of mid December to mid January 2016. A sample of thirty respondents, fifteen from each village was selected to get the required information. The selection of the sample was done purposively. The harvesters were personally contacted and requested to wear the designed *Kurta pyjama* protective clothing during plucking the fruit for a period of one month *i.e.* in March. They were asked to provide unbiased and independent opinions regarding the desired

information needed for this study. After a period of one month the respondents were contacted personally to get the required information about the acceptability of the designed protective clothing.

Tools used :

The basis of scoring and ranking has been described as under: Suitability of every functional feature incorporated in *Kurta pyjama* (KP) was assessed on 3 point continuum scale *i.e.* Highly Suitable, Suitable and Somewhat Suitable and was given weightage 3, 2, 1, respectively. The frequency was multiplied with weightage. The scores were added and then were divided with number of respondents (N). WMS of all the characteristics of garments were added and then were divided by the number of characteristics. Any functional feature having WMS between 1-1.66 was rated as Somewhat Suitable, 1.67-2.33 was rated as Suitable and scoring 2.34-3.00 was rated as Highly Suitable. The attribute scoring maximum WMS was given first rank, where as the attribute scoring least WMS was given last rank.

Development of protective clothing :

Health status of agricultural workers can be enhanced by using protective functional clothing as it is a means to prevent and control occupational health hazards among various agro base activities (Gogoi *et al.*, 2016). According to the problems faced by the *Ber* fruit harvesters, *Kurta pyjamas* were designed from five types of non woven fabrics with varied GSM *i.e.* 60, 70, 80, 90 and 100 to protect them from the health hazards. These were stitched using Non woven fabric with underlining of fine cotton fabric. The underlining fabric was 100% cotton, with GSM 126, the count of the fabric being Warp 51, Weft 38. Designed *Kurta* had a Nehru collar, with front opening and elastic band at the full length sleeves and ankle of *Pyjama*. The acceptability of the designed protective garment was evaluated on the basis of different attributes inquired from harvesters. The *Kurta pyjamas* with different GSM were given separate codes: KP - I = *Kurta pyjama* of 60 GSM, KP - II = *Kurta pyjama* of 70 GSM, KP - III = *Kurta pyjama* of 80 GSM, KP - IV = *Kurta pyjama* of 90 GSM, KP - V = *Kurta pyjama* of 100 GSM.

■ RESEARCH FINDINGS AND DISCUSSION

The socio-personal profile of farm workers working in *Ber* fruit orchards have been furnished in Table 1. It is evident from the table that 46 per cent of the respondents were from the age group of 30-40 years, followed by 34 per cent of the respondents within the age group of 20-30 yrs. The rest 20 per cent were from the age group of 40-50 years. Mostly the male respondents (70 %) work in the orchards and less number (30 %) of the farm workers were female.

| Age group (Years) | No. of respondents | %age |
|---------------------------|--------------------|------|
| 20-30 | 10 | 34 |
| 30-40 | 14 | 46 |
| 40-50 | 6 | 20 |
| Sex | | |
| Male | 21 | 70 |
| Female | 9 | 30 |
| Level of education | | |
| Illiterate | 26 | 90 |
| Upto primary | 4 | 10 |
| Family type | | |
| Nuclear | 26 | 85 |
| Joint | 4 | 15 |

The literacy level of the farm workers have been divided only into two categories, which include illiterate and education up to primary level. The educated Punjabis do not engage themselves in labour work. Illiterate migrant labour constituted of 90 per cent, as the work doesn't involve any technical efficiency and the rest 10 per cent had acquired their education only up to primary level. The families were nuclear (85 %) and only 15 per cent of the labourers resided in joint families. It was observed that manual plucking was done. The harvesters used ladder while plucking the fruit from the top of the tree. During plucking of fruit, skin diseases such as contact dermatitis, skin cancers, and other skin injuries and infections crop up. Physical agents such as extreme temperatures and ultraviolet or solar radiation are also damaging to the skin due to prolonged exposure (Anonymous, 2013).

Satisfaction level and acceptability of functional features of all five types of developed protective *Kurta pyjama* (KP) were assessed for ease in wearing, removing, working, protection against thorns, satisfaction level regarding durability and social acceptability. The authors have also developed protective gloves for okra pluckers of Punjab in which similar attributes were studied (Anonymous, 2016). The data given in Table 2 indicates the satisfaction level in relation to ease of wearing the

| <i>Kurta pyjama</i> | Frequency distribution | | | Weighted score | Weighted mean score | Rank |
|------------------------|------------------------|----------|-------------------|----------------|---------------------|------|
| | Highly suitable | Suitable | Somewhat suitable | | | |
| Ease in wearing | | | | | | |
| KP-I | 26.6 | 13.3 | 60.0 | 25 | 1.6 | III |
| KP-II | 80.0 | 20.0 | - | 42 | 2.8 | I |
| KP-III | 40.0 | 46.6 | 13.3 | 34 | 2.2 | II |
| KP-IV | - | - | 100 | 16 | 1.0 | IV |
| KP-V | - | 06.6 | 93.3 | 16 | 1.0 | IV |
| Ease in removal | | | | | | |
| KP-I | 26.6 | 13.3 | 60.0 | 25 | 1.6 | IV |
| KP-II | 93.3 | 06.6 | - | 44 | 2.9 | I |
| KP-III | 40.0 | 46.6 | 13.3 | 34 | 2.2 | III |
| KP-IV | 86.6 | 13.3 | - | 43 | 2.8 | II |
| KP-V | - | - | 100 | 16 | 1.0 | V |
| Ease in working | | | | | | |
| KP-I | 26.6 | 13.3 | 60.0 | 25 | 1.6 | IV |
| KP-II | 86.6 | 13.3 | - | 43 | 2.8 | I |
| KP-III | 40.0 | 46.6 | 13.3 | 34 | 2.2 | III |
| KP-IV | 80.0 | 20.0 | - | 42 | 2.8 | I |
| KP-V | - | 6.66 | 93.3 | 16 | 1.0 | V |

Kurta pyjama. It was observed that majority (86.6 %) of the workers preferred KP-II. This *Kurta pyjama* was developed from non-woven fabric with 70 GSM. It was given the first rank with weighted mean score of 2.8. It had soft hand so that the respondent could wear it easily. 93.3 per cent of the respondents had problem while wearing KP-V was ranked 1st and given the weighted mean score of 1.0.

It is evident from the Table 2 that 93.3 per cent of the respondents showed satisfaction level in ease of removing the *Kurta pyjama* (KP-II) and ranked it first with the weighted mean score of 2.9. While *Kurta pyjama* (KP-V) was ranked last due to problem in removing and was given the weighed mean score of 1.0. It was seen from Table 3, that 86.6 per cent of the respondents reported that while wearing *Kurta pyjama* (KP-II) the speed of working increased and they had given the rank first with the weighted mean score of 2.8. Whereas, 93.3 per cent of the respondents reported that while wearing *Kurta pyjama* (KP-V) there was hindrance in working and their speed slowed down and was ranked last with weighted mean score of 1.0.

The results in Table 3, elicited that all the

respondents preferred *Kurta pyjama* (KP-V) as it protects from thorns while working and restrict the entry of thorny bushes into fabric, while 93.3 per cent of the *ber* fruit harvesters responded that while wearing *Kurta pyjama* (KP-II) there is protection from thorny bushes with the weighted mean score of 2.9 and ranked second, whereas *Kurta pyjama* (KP-I) was somewhat suitable as reported by 53.3% of respondents and was ranked last with WMS 1.7. This non woven fabric had 60 GSM tore easily with thorns and splinters. The study by Rani *et al.* (2013) elicited that sleeves with elasticized cuffs having elastic in two rows of Apron was assessed to be highly suitable as it gave more protection against dust and wheat husk to upper body while wheat threshing (Rani *et al.*, 2013).

The data in Table 4 elicited that fabric of *Kurta pyjama* KP-II, III, IV and V had maximum durability and was ranked first with the weighted mean score of 2.9. Only *Kurta pyjama* developed from fabric with 60 GSM had less durability. As all *Kurta pyjama* were compared the Social acceptability KP-II fabric has very good acceptability.

Looking into the aggregate WMS values for

| <i>Kurta Pyjama</i> | Frequency distribution | | | Weighted score | Weighted mean score | Rank |
|---------------------|------------------------|----------|-------------------|----------------|---------------------|------|
| | Highly suitable | Suitable | Somewhat suitable | | | |
| KP-I | 26.6 | 20.0 | 53.3 | 26 | 1.7 | V |
| KP-II | 93.3 | 6.66 | - | 44 | 2.9 | II |
| KP-III | 80.0 | 20.0 | - | 42 | 2.8 | III |
| KP-IV | 80.0 | 20.0 | - | 42 | 2.8 | III |
| KP-V | 100 | - | - | 45 | 3.0 | I |

| <i>Kurta pyjama</i> | Frequency distribution | | | Weighted score | Weighted mean score | Rank |
|---|------------------------|----------|-------------------|----------------|---------------------|------|
| | Highly suitable | Suitable | Somewhat suitable | | | |
| Durability of protective <i>Kurta pyjama</i> | | | | | | |
| KP-I | 26.6 | 20.0 | 53.3 | 26 | 1.7 | II |
| KP-II | 93.3 | 6.66 | - | 44 | 2.9 | I |
| KP-III | 93.3 | 6.66 | - | 44 | 2.9 | I |
| KP-IV | 93.3 | 6.66 | - | 44 | 2.9 | I |
| KP-V | 93.3 | 6.66 | - | 44 | 2.9 | I |
| Social acceptability of protective <i>Kurta pyjama</i> | | | | | | |
| KP-I | 26.6 | 13.3 | 60.0 | 25 | 1.6 | IV |
| KP-II | 93.3 | 6.66 | - | 44 | 2.9 | I |
| KP-III | 86.6 | 13.3 | - | 43 | 2.8 | II |
| KP-IV | 40.0 | 46.6 | 13.3 | 34 | 2.2 | III |
| KP-V | - | - | 100 | 16 | 1.0 | V |

Table 5 : Suitability assessment of protective *Kurta pyjama* for *ber* fruit harvesting

| Attributes | KP-I | KP-II | KP-III | KP-IV | KP-V |
|----------------|------|-------|--------|-------|------|
| Easy to wear | 1.6 | 2.8 | 2.2 | 1.0 | 1.0 |
| Easy to remove | 1.6 | 2.9 | 2.2 | 2.8 | 1.0 |
| Easy to work | 1.6 | 2.8 | 2.2 | 2.8 | 1.0 |
| Durability | 1.7 | 2.9 | 2.9 | 2.9 | 2.9 |
| Aggregate WMS | 1.9 | 2.3 | 2.2 | 2.1 | 1.6 |

Suitability level: Highly suitable: 2.34-3.00***, Suitable: 1.67-2.33*, somewhat suitable 1.00-1.66*

Table 6 : Costing of *Kurta pyjama*

| Material used | Quantity | Cost in Rs. |
|----------------------------------|----------------|-------------|
| Non woven fabric (70 GSM) | 3 Meters | 65 |
| Underlining fabric (Pure cotton) | 4.5 Meters | 270 |
| Elastic | 0.5 Meter | 5 |
| Buttons and thread | 4 pcs + 1 Reel | 10 |
| Stitching cost | 1 set | 200 |
| Total cost | | 550/- |

Table 7 : Preference regarding costing of *Kurta pyjama*

| Developed protective clothing | Cost price | High | Adequate | Low |
|-------------------------------|------------|---------|----------|--------|
| <i>Kurta Pyjama</i> | 550/- | 6 (20%) | 22 (73%) | 2 (7%) |

different attributes, it was concluded that that *Kurta pyjama* with 70GSM was best and could be promoted as protective clothing for the *Ber* fruit harvesters.

Cost price:

Cost price included, cost of raw material and labour involved.

The data pertaining to cost effectiveness of developed *Kurta pyjama* was done by the 30 respondent involved in plucking *Ber* fruit. Majority (73%) were of the view that the cost was adequate and would help in protection from the thorns and increased the yield.

Summary :

Kurta pyjama (KP-II) developed from Non woven fabric of 70GSM is the best as regards suitability assessment when used for plucking *Ber* fruit. This fabric had maximum protection as compared to other fabrics. The cost of Protective clothing was less than the conventional *Kurta pyjama* available in the market. The workers can shell out some money to protect themselves against occupational hazards.

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