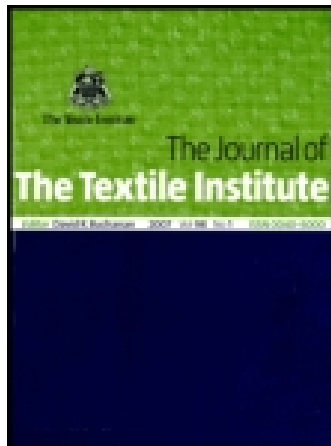


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Fabrication of innovative charkha for pashmina spinning and its impact assessment

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Pashmina, a finest natural animal fiber is utilized for preparation of world famous Kashmiri pashmina shawls by traditional practices. Hand spinning is one of the important processing step, wherein fibers are converted into a fine yarn on a traditional spinning wheel (*yander*). The task is usually carried out by women folk. It is a laborious process resulting in a lot of physical stress affecting the efficiency of artisans. An innovative charkha has been fabricated to reduce the physical stress and its effect on the spinning efficiency and remuneration of artisans over traditional one was evaluated. The study revealed that innovative charkha was efficient in terms of time consumed for spinning by 73.50% over traditional one besides decreasing physical drudgery. In terms of income, there was an increase of 146% over traditional one for same period of time without deteriorating the quality of yarn.

Keywords: charkha; pashmina; shawls and traditional

Introduction

The handicraft industry is well established in the northwest Himalayan regions of Jammu and Kashmir. Among the handicrafts of Kashmir valley, pashmina shawls have gained global recognition and are liked by all, irrespective of sex, age, or nation (Yaqoob, Sofi, Wani Sarfaraz, Sheikh, & Bumla Nazir, 2012). They are internationally known for their quality in terms of total hand value and long life with no pile formation (Bumla, 2010). Traditional method of processing has given them hand-spun hand-woven status (Bumla, 2010). Processing of pashmina involves number of steps viz. dehairing, spinning, weaving, finishing, etc. (Bumla et al., 2012). Spinning converts continuous untwisted strand of fibers into yarn of requisite count and twist suitable for further processing. This is done by women folk on a traditional spinning wheel locally known as *Yander* (Yaqoob et al., 2012). In this method, a small tuft (*tumb*) of pashmina is held between the second and third finger of the left hand supported by the thumb. As the spinner turns the wheel with her right hand, she raises and lowers the left hand holding and releasing the fiber in a perfect harmony to the rhythm of turning wheel (Yaqoob et al., 2012). This is a difficult task causing a lot of physical stress like backache, numbness in legs, etc. reducing output and at the same time is less remunerative to the artisans (Yaqoob et al., 2012). Keeping in

view the importance of handmade pashmina shawls, an innovative charka (Table Top Paddle operated) was fabricated aimed at alleviating the physical stress of the artisans. Its effect on the spinning efficiency and overall improvement in the livelihood security without compromising the quality of yarn was also studied.

Materials and methods

Traditional charkha (Yander)

The traditional charka (Figure 1) is being used for spinning of pashmina by the artisans of Kashmir valley resulting in a fine yarn which is used for development of pashmina shawls. The artisans, usually the women folk carry out spinning in sitting position resulting in a fine yarn, but at the same time it is full of physical drudgery.

Fabrication of innovative charkha

Efforts were made to fabricate a spinning wheel which will reduce drudgery and increase remuneration without deteriorating the quality of yarn. Initially four types of charkhas (small size model, ball-bearing model, paddle-operated model, and table top model) were fabricated. Out of these, table top model (Figure 2) proved efficient. The charka comprises of table top, small spinning wheel, spindle, and foot paddle. The spinner

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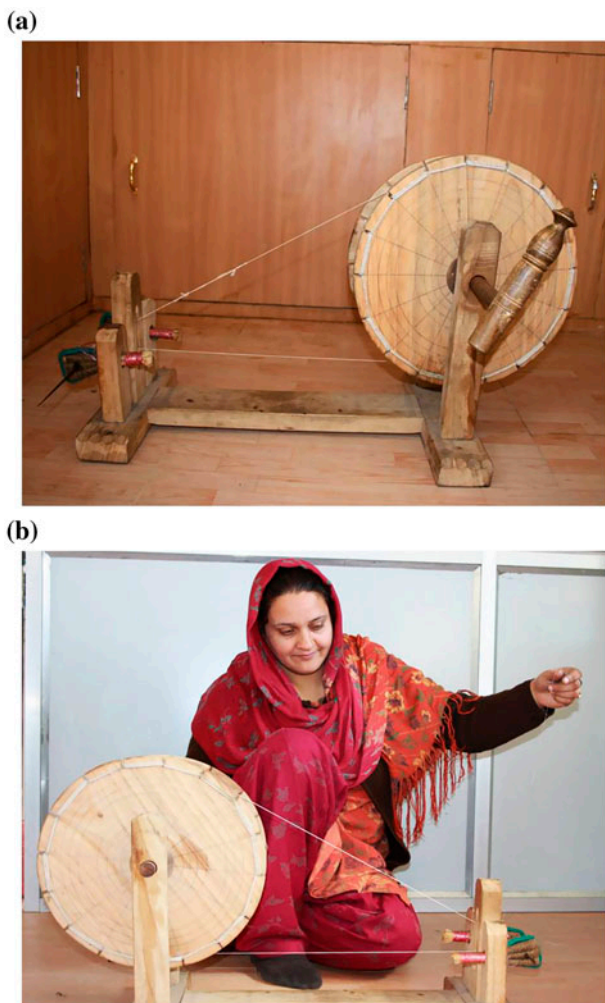


Figure 1. (a) Traditional charkha. (b) Traditional charkha in operation.

sits on a stool and operates the charkha with her foot. The patent application for this innovative charkha has been filled vide no.: 3616/DEL/2011.

Distribution

Ninety innovative charkas were distributed to ninety spinners in Kashmir valley.

Spinning

Pashmina yarn was spun on both traditional and innovative charkha by experienced spinners who are in this art for number of years.

Collection of information

Information was collected from the spinners on random basis about few set parameters. The parameters include:

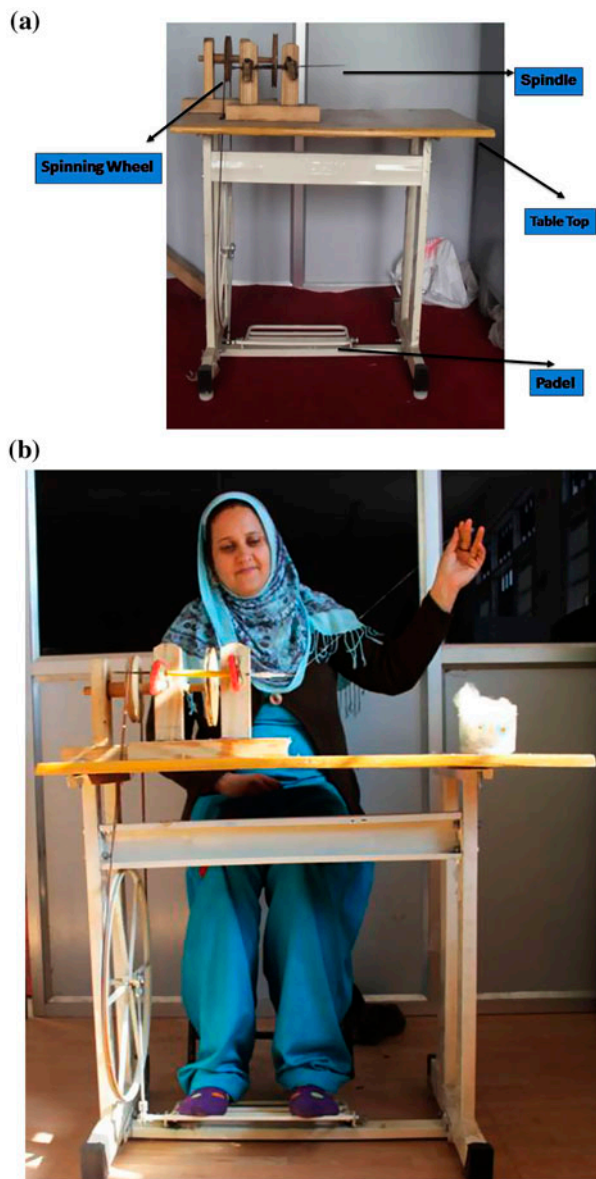


Figure 2. (a) Innovative charkha. (b) Innovative charkha in operation.

- (1) Effect of innovative charkha on reduction in physical stress as compared to traditional one.
- (2) Number of knots spun per 10 g of pashmina on traditional and innovative charkha.
- (3) Time consumed in spinning 10 g of pashmina on innovative and traditional charkha.

Yarn quality evaluation

Both types of yarn was subjected to analysis in terms of count, tex, breaking strength, elongation percentage, tensile strength, tenacity, number of

Table 1. Spinning efficiency and economic returns of traditional and innovative charkha.

S. No.	Parameter	Traditional charkha	Innovative charkha
1	Average quantity of pashmina spun per month (g)	117.39 ± 1.30 (say 117)	202.74 ± 1.38 (say 203)
2	Spinning efficiency over traditional one (%)	–	73.50
3	Average working hours per day	7	7
4	Average working hours per month	210	210
5	Average number of Knots* spun per 10 g	199.9 ± 0.99 (say 200)	259.4 ± 0.98 (say 259)
6	Average number of knots spun per month	2340	5258
7	Spinning charges per knot as per market rate (Rs)	1.00	Rs 1.00
8	Spinning charges earned per month (Rs)	2340 × 1.00 = 2340	5258 × 1.00 = 5258
9	Cost of raw material (@ Rs 6 per g)	117 × 6 = 702	203 × 6 = 1218
10	Net income per month (Rs)	2340 – 702 = 1638.00	5258 – 1218 = 4040.00
11	Net increase in income over traditional one (Rs)	–	Rs 2402.00
12	Percent increase in income (%)	–	146.64

Notes: *One knot = 9 numbers of 2 ply threads of 9 in. length each = unit for spinning charges.

fibers/cross-section, and twist per inch. Yarn count and tex was done in accordance with methods specified by Bureau of Indian Standards, New Delhi i.e. IS-681: 1964 (Anonymous, 2000a). Number of fibers/cross-section was done by untwisting 0.5 cm parts of yarns and counting number of fibers. Twist/inch of yarn was estimated following the method specified as per Bureau of Indian Standards i.e. IS-832-1985 (Anonymous, 2000b) on twist measuring machine. Tensile properties viz.: breaking strength, tenacity, and elongation percentage were done on Universal tensile tester (Lyod Instrumentation). Tenacity was calculated by dividing overall breaking strength with the mean tex.

Comparative analysis

The results obtained from both types of yarn were compared statistically. Besides that, spinning loss percentage was also recorded and compared.

Results and discussion

From the study, it was observed that the table top paddle-operated innovative charkha proved efficient as far as the reduction in physical drudgery in terms of backache, numbness, etc. is concerned. It was also observed that there is a decrease in the spinning loss of pashmina fibers from 12.66 ± 1.82 to 3.00 ± 1.08% resulting in more remuneration. On the basis of the quantity (g) of pashmina spun/month, it was observed that 117.39 ± 1.30 and 202.74 ± 1.38 of pashmina is being spun on traditional and innovative charkha, respectively, revealing that innovative charkha is 73.50 (%) more efficient than traditional one in terms of time consumed for spinning of pashmina (Table 1).

It was also observed that average number of knots spun per 10 g of pashmina on innovative charkha is 259.4 ± 0.98 which is far better than traditional one (199.9 ± 0.99). On the basis of number of knots (unit for spinning charges), the study revealed that there is an income of Rs 4040.00 per month of spinners which is Rs 2401.00 more than spinning charges on traditional one (Rs 1638.00) showing that innovative charkha is 146.64 (%) more efficient in terms of economic benefits to spinners.

The comparative qualities of yarn spun on traditional and innovative charkha are presented in Tables 2 and 3. From Table 2, it is clear that the count of yarn spun on traditional and innovative charkha shows nonsignificant difference with the mean values as 61.18 ± 1.53 (Nm) and 68.80 ± 0.76 (Nm), respectively. Tex (g/km) of the yarn spun on an innovative charkha was also found nonsignificantly lower than traditional charkha with mean values of 14.57 ± 0.35 and 17.35 ± 0.95, respectively. The number of fibers/cross-section was found significantly higher in case of yarn spun on traditional (68.13 ± 0.89) than innovative one (58.48 ± 0.69). The lower mean values in case of innovative charkha could be because of the fact that it helps in spinning of finer yarn which is clear from the values of tex proving the efficiency of the innovative charkha further. The number of twists/inch was found significantly lower in case of innovative charkha (8.76 ± 0.21) than traditional one (10.42 ± 0.24). Although there were fewer twists in the yarn spun on innovative charkha but the number is within acceptable range. Our reported values are far better than the reported values of Ahmad and Gupta (1989) in case of pashmina yarn where he reported 6.98 ± 0.81 twists/inch.

The mechanical quality viz., breaking strength, elongation percentage, tenacity, and tensile strength of

Table 2. Comparative quality of pashmina yarn spun on traditional charkha and innovative charkha.

Treatment parameter	Yarn spun traditional charkha	Yarn spun on innovative charkha
Actual count (Nm)	61.18 ± 1.53 (23.03)	68.80 ± 0.76 (5.00)
Actual tex (g/km)	17.35 ± 0.95 (30.96)	14.57 ± 0.35 (5.08)
Conditioned count (Nm)	63.58 ± 1.55 (22.61)	70.28 ± 0.81 (5.59)
Tex (g/km)	16.65 ± 0.91 (30.10)	14.27 ± 0.37 (5.76)
No. of fibers/cross-section	68.13 ± 0.89 ^b (27.9)	58.42 ± 0.69 ^a (19.47)
No. of twists/inch	10.42 ± 0.24 ^b (22.60)	8.76 ± 0.21 ^a (22.45)

Note: Figures in parentheses means CV%; means bearing different superscript in a row differ significantly ($P < 0.05$).

Table 3. Comparative mechanical quality of pashmina yarn spun on traditional charkha and innovative charkha.

Treatment parameter	Yarn spun traditional charkha	Yarn spun on innovative charkha
Breaking load (g wt)	42.107 ± 0.36 (49.13)	42.25 ± 0.37 (48.26)
Percent elongation (%)	4.123 ± 0.14 (72.81)	4.174 ± 0.13 (62.83)
Tensile strength (N/mm ²)	3824 ± 4.51 ^b (49.13)	2350 ± 2.77 ^a (48.25)
Tenacity (g wt/Tex)	2.53	2.35

Note: Figures in parentheses means CV%; means bearing different superscript in a row differ significantly ($P < 0.05$).

pashmina yarn spun on traditional and innovative charkha are presented in Table 3. The breaking load (g wt) of pashmina yarn spun on traditional charkha (42.11 ± 0.36) showed nonsignificant difference with that of innovative one (42.25 ± 0.35) showing that there is hardly any difference between the two types of yarn as far as the strength is concerned. The elongation percentage of yarn was found as 4.12 ± 0.14 (%) and 4.17 ± 0.13 (%), respectively, for yarn spun on traditional and innovative charkha which showed

nonsignificant difference among each other. Although tensile strength (N/mm²) showed significant difference with values of 2771.75 ± 4.51 and 2350 ± 2.77, respectively, between yarns spun on traditional and innovative one but the values are again within acceptable range. The mean ± SE values of tenacity (g wt/tex) showed nonsignificant difference between traditional yarn (2.53) and innovative one (2.35).

Conclusion

Study revealed that the innovative charkha resulted in reduction of physical drudgery to the artisans and increased remuneration by 146.64 (%), when compared with traditional one without deteriorating the yarn quality.

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