

Utilisation of Himalayan Nettle plant waste for development of innovative union fabrics

■ Neha Garg, Kanwaljit Kaur Brar and Harinder Kaur Saggi

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■ **ABSTRACT** : Nettle or *Bicchu buti* grows abundantly as wild plant in Chamoli and Uttarkashi in Uttarakhand. Very soft and warm nettle fibres are obtained from its bark. Only limited product line of pure nettle fabric was available in the market at a high cost. Thus, the need was felt to diversify the nettle usage and develop innovative textile textures. Thus, present study was conducted to develop eighteen nettle union fabric textures using three selected yarns viz., cotton (2/20, 2/24), acrylic (2/24, 2/32) and polypropylene (2/120, single ply) as warp along with nettle (6 Nm) yarn in weft direction in plain, basket, and twill weaves. Developed union fabrics were shown to a sample of 180 women in the age group of 25-35 years to assess their preferences for product development from union fabrics. Developed union fabrics were most preferred for jackets, stoles and various home textile products. Cotton (2/20)/nettle (6 Nm) with EPI=48, PPI=26 was preferred 41.67 per cent respondents for jacket, while 51.67 per cent respondents preferred acrylic (2/32)/nettle (6 Nm) with EPI=65, PPI=34 for stole. Developed union fabrics were comparatively cheaper as cost of cotton, acrylic and polypropylene was nearly 20 per cent of the nettle cost.

See end of the paper for authors' affiliations →

Neha Garg

Department of Apparel and
Textile Science, College of Home
Science, Punjab Agricultural
University, Ludhiana (Punjab)
India

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The handloom industry is facing acute competition from imported machinery and other machine made textiles which are cost effective, better in quality and commercial viability (Sood, 1983). Cottage industry being household based not only preserves the cultural heritage of the country but also has immense potential to provide employment to a large number of rural people with low investment input. People are becoming more conscious about their cultural heritage and take pride in possessing such textile items (Kaur, 2003). In India, nettle is an unexplored fibre plant growing abundantly without

being utilized. Its potential in natural fibre sector of economic development of the rural communities can be stated as one of the reasons for spending money its manufacturing plants, since its availability in Himalayas is not much of an issue. Apart from being natural, the biggest benefit which nettle fibre holds, is that it can be hundred per cent sustainable starting from its production to its disposal (Anonymous, 2010). Thus the study on manufacturing of union fabric using Himalayan nettle was carried out with the following objective.

– To develop union fabrics using nettle

(*Giraridnia diversifolia*) yarns with other selected yarns.

– To explore the preference of the target consumers for handloom products developed from nettle union fabrics.

■ RESEARCH METHODS

Materials :

Cotton yarns (2/20, 2/24 count) and acrylic yarns (2/24, 2/32 count) were obtained from Ludhiana city. Polypropylene (2/120, single ply) was purchased from Bhiwadi, and nettle (6 Nm) yarn was procured from Chamoli district of Uttarakhand.

Methods:

A total of eighteen samples comprising of six samples each of cotton/nettle, acrylic/nettle and polypropylene/nettle were hand-woven on frame loom. Two suitable yarn counts for each of CO, PC and PP and three weaves, *i.e.* plain, twill and basket, were used for each of these union fabrics to create varied textural effects. Thus, six samples of each union fabrics were developed using two yarn counts and three weaves.

To study the preference of the target consumers for handloom products from developed nettle union fabrics, three localities of Ludhiana city, namely BRS Nagar, Kitchlu Nagar and Model Town were selected purposively to include respondents having good standard of living. Out of these localities, 180 women in the age of 25-35 years, who were managing household affairs and had interest in furnishing their homes, were selected purposively. Sixty respondents were selected from each locality. The prepared union fabrics were shown to the respondents to record their preference regarding. The suitability of the developed union fabrics for various end uses the data were analysed statistically.

■ RESEARCH FINDINGS AND DISCUSSION

Handloom weaving is one of the largest economic activity after agriculture providing direct and indirect employment to more than 43 lakh weavers and other workers (Zhang and Ayele, 2011).

Preparation union fabric using nettle (*Giraridnia diversifolia*) yarns with other selected yarns :

Survey of nettle units in Chamoli and Uttarkashi by

the investigator revealed that 100 per cent pure nettle fabric was being woven for product development.

Selection of yarns for preparing union fabrics :

Nettle fabric being very warm could only be used at high altitude where temperature is very low. Thus, different yarns namely nettle, cotton, acrylic and polypropylene were selected for preparing samples of union fabrics. For all the union fabrics, nettle weft was used, while other three types of yarns (cotton, acrylic and polypropylene) were used as warp. All selected warp yarns differed in physical and chemical properties. Nettle is a natural filament bast fibre which has high tensile strength, excellent spinnability, flame retardance and poor heat conductivity (UBFDB, 2011). The fibres have 89.6% cellulosic content, 7.3% moisture and 1.5% ash. Nettle yarn is 30-50% lighter than cotton yarn. The density of yarn is nearly same as that of cotton, but much higher than jute (Chamoli and Uttarkashi). Also, nettle costs 3.5 to 3.9 times more than cotton, acrylic and polypropylene. Therefore, need was felt to diversify the nettle textile textures and products to make it suitable for the varied climatic conditions and affordability of consumers. To partially compensate the roughness of nettle fibres, soft cotton warp was used. Cotton being good conductor of heat not only made the fabric suitable for varied temperatures but also reduced the cost. Acrylic is warm, but not as warm as nettle. Use of acrylic yarns in the union fabric is useful where warm fabric is required at lower cost. It is soft, lightweight, resilient and high bulk fibre. Polypropylene is a thermoplastic polymer having lower density. It is normally more tough and flexible than nettle, especially when copolymerized with ethylene.

The count of nettle was kept constant in all the samples of union fabrics. But warp yarns were selected with varied yarn counts *viz.*, cotton in 2/20, 2/24 counts acrylic in 2/24, 2/32 and polypropylene 2/120, single ply in warp wise direction with nettle yarn of 6 Nm in weft wise direction. Union fabrics were woven using different types of yarns in various counts. Different codes were assigned to yarns of two different counts. CN₁, CN₂, CN₃ codes were assigned to cotton yarn of 2/20 count and CN₄, CN₅ and CN₆ codes were assigned to 2/24 count of cotton yarn. AN₁, AN₂, AN₃ codes were assigned to acrylic yarn of 2/24 count and AN₄, AN₅, and AN₆ codes were assigned to 2/32 count of acrylic yarn. Similarly

Table 1 : Codes assigned to different union fabrics on the basis of type and size of yarns used

Type of the yarns	Yarn count		Assigned code
	Warp	Weft (Nm)	
Cotton/Nettle	2/20	6	CN ₁
			CN ₂
			CN ₃
Cotton/Nettle	2/24	6	CN ₄
			CN ₅
			CN ₆
Acrylic/Nettle	2/24	6	AN ₁
			AN ₂
			AN ₃
Acrylic/Nettle	2/32	6	AN ₄
			AN ₅
			AN ₆
Polypropylene/Nettle	Single ply	6	PN ₁
			PN ₂
			PN ₃
Polypropylene/Nettle	2/120	6	PN ₄
			PN ₅
			PN ₆

*= Cotton/Nettle, *= Acrylic/Nettle, *= Polypropylene/Nettle

polypropylene yarn in 2/120 and single ply counts were used for making union fabric. Thus, PN₁, PN₂ and PN₃ codes were assigned to count 2/120 while single ply polypropylene was give PN₄, PN₅ and PN₆ codes (Table 1).

Details of weaves used for creating textures :

Sample of union fabrics in plain, twill and basket weaves were woven on frame looms. The threading and lifting plan for plain, twill and basket weaves have been shown graphically as under.

Samples in plain weave:

Pure nettle fabric was already being woven in plain weave at Chamoli and Uttarkhashi. Thus, variation was done using warp other than nettle. Six samples were prepared in plain weave using cotton, acrylic and polypropylene each in two different counts. Two harness loom was used for making samples in plain weave (Fig. 1 and 2).

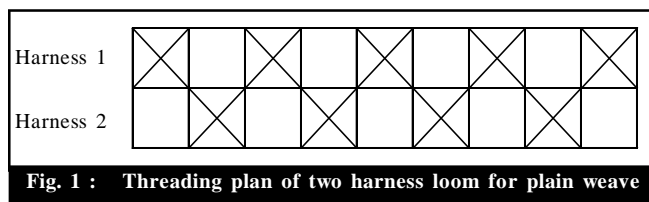
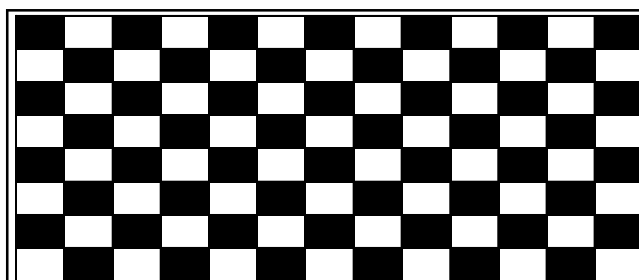


Fig. 1 : Threading plan of two harness loom for plain weave



1, 2, 1, 2, 1, 2 repeat from

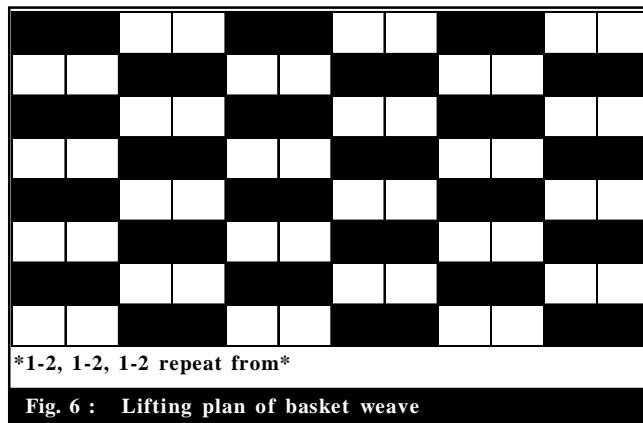
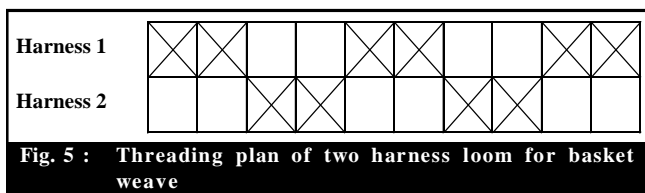
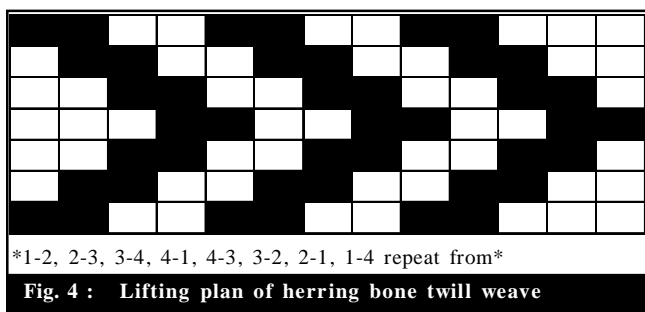
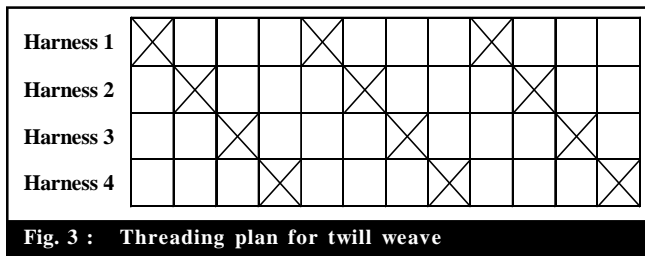
Fig. 2 : Lifting plan of plain weave

Samples in twill weave:

Nettle fabric was also available in twill weave at Chamoli and Uttarkashi. Thus, variation of twill weave, *i.e.* herring bone twill weave, was used for hand weaving of union fabrics. Six samples of union fabric were woven in this weave as was done for the plain weave. Four harness loom was used for preparing the samples in herring bone twill weave (Fig. 3 and 4).

Samples in basket weave:

Nettle fabric was not being produced in basket weave by any of the selected nettle unit in Chamoli and Uttarkashi. Six samples of same yarn combination were woven in basket weave as well. Two harness loom was used for making samples in basket weave (Fig. 5 and 6).



Details of developed union fabrics :

Total eighteen samples of union fabrics were developed using above given yarns and weaves. Cotton (2/20)/nettle (6Nm) was woven in plain (EPI=35, PPI=22), twill (EPI=48, PPI= 26) and basket (EPI=51, PPI=24) weaves. Samples in plain (EPI=39, PPI=26), twill (EPI=35, PPI=20) and basket (EPI=40, PPI=28) weaves were also woven using cotton (2/24)/nettle (6 Nm). Besides, union samples in the selected plain (EPI=40, PPI=27), twill (EPI=42, PPI=26), basket

Table 2 : Developed nettle union fabrics (cotton/nettle, acrylic/nettle, polypropylene/nettle) in different weaves			
Code assigned	Composition	Types of weaves	Images
CN ₁	Cotton (2/20)/Nettle (6Nm) EPI=35, PPI= 22	Plain	
CN ₂	Cotton (2/20)/Nettle (6Nm) EPI=48, PPI=26	Twill	
CN ₃	Cotton (2/20)/Nettle (6Nm) EPI=51, PPI=24	Basket	
CN ₄	Cotton (2/24)/Nettle (6Nm) EPI=39, PPI= 26	Plain	
CN ₅	Cotton(2/24)/Nettle (6Nm) EPI=35, PPI= 20	Twill	
CN ₆	Cotton (2/24)/Nettle (6Nm) EPI=40, PPI= 28	Basket	

Table 2 contd... ..

Table 2 contd....


AN ₁	Acrylic (2/24)/ Nettle (6Nm) EPI=40, PPI= 27	Plain	
AN ₂	Acrylic (2/24)/ Nettle (6Nm) EPI=42, PPI=26	Twill	
AN ₃	Acrylic (2/24)/ Nettle (6Nm) EPI=31, PPI=25	Basket	
AN ₄	Acrylic (2/32)/Nettle (6Nm) EPI=36, PPI=27	Plain	
AN ₅	Acrylic (2/32)/Nettle (6Nm) EPI=65, PPI=34	Twill	
AN ₆	Acrylic (2/32)/Nettle (6Nm) EPI=36, PPI=29	Basket	
PN ₁	Polypropylene (2/120)/Nettle (6Nm) EPI=21, PPI=13	Plain	
PN ₂	Polypropylene (2/120)/Nettle (6Nm) EPI=28, PPI=20	Twill	
PN ₃	Polypropylene(2/120)/Nettle(6Nm) EPI=30, PPI= 16	Basket	
PN ₄	Polypropylene (single ply)/Nettle (6Nm) EPI=39, PPI=28	Plain	
PN ₅	Polypropylene (single ply)/Nettle (6Nm) EPI=38, PPI=36	Twill	
PN ₆	Polypropylene (single ply)/Nettle (6Nm) EPI=31, PPI=37	Basket	

Table 3 : Fabrics and weaves preferred by respondents for preparing different handloom textile products (n=180)*

Products	Jacket	Stole	Carry bag	Coaster	Cushion cover	Rug	File cover	Seat cover	Table runner	Wall hanging
Union fabric code	(f)%	(f)%	(f)%	(f)%	(f)%	(f)%	(f)%	(f)%	(f)%	(f)%
CN ₁	(25)13.89	(18)10.00	(29)16.11	(22)12.22	(48) 26.67	(44)11.11	(50)27.78	(82) 45.56	(68) 12.78	(38) 21.11
CN ₂	(75)41.67	(31)17.22	(27)15.00	(26)14.44	(44) 24.44	(38)21.11	(35)19.44	(34) 18.89	(49) 27.22	(48) 26.67
CN ₃	(34)18.89	(21)11.67	(43)23.89	(22)12.22	(41) 22.78	(70)38.89	(43)23.89	(38) 21.11	(39) 21.67	(52) 28.89
CN ₄	(33)18.33	(23)12.78	(28)15.56	(20)11.11	(77) 42.78	(22)12.22	(53)29.44	(37) 20.56	(68) 37.78	(40) 22.22
CN ₅	(44)24.44	(30)16.67	(27)15.00	(26)14.44	(56) 31.11	(42)23.33	(33)18.33	(38) 21.11	(44) 24.44	(40) 22.22
CN ₆	(33)18.33	(18)10.00	(33)18.33	(25)13.89	(29) 16.11	(44)24.44	(26)14.44	(22) 12.22	(37) 20.56	(49) 27.22
AN ₁	(28)15.56	(48)26.67	(16)8.89	(20)11.11	(23) 12.78	(27)15.00	(36)20.00	(33) 18.33	(24) 13.33	(30) 16.67
AN ₂	(25)13.89	(52)28.89	(29)16.11	(21)11.67	(28) 15.56	(35)19.44	(33)18.33	(37) 20.56	(27) 15.00	(31) 17.22
AN ₃	(43)23.89	(41)22.78	(32)17.78	(28)15.56	(27) 15.00	(44)24.44	(24)13.33	(33) 18.33	(16) 8.89	(37) 20.56
AN ₄	(40)22.22	(65)36.11	(19)10.56	(22)12.22	(33) 18.33	(23)12.78	(32)17.78	(42) 23.33	(27) 15.00	(40) 22.22
AN ₅	(55)30.56	(93)51.67	(25)13.89	(35)19.44	(43) 23.89	(30)16.67	(24)13.33	(38) 21.11	(32) 17.78	(42) 23.33
AN ₆	(25)13.89	(35)19.44	(25)13.89	(20)11.11	(22) 12.22	(43)23.89	(28)15.56	(30) 16.67	(24) 13.33	(40) 22.22
PN ₁	(48)26.67	(16)8.89	(33)18.33	(42)23.33	(20) 11.11	(31)17.22	(41)22.78	(27) 15.00	(56) 31.11	(36) 20.00
PN ₂	(44)24.44	(15)8.33	(71)39.44	(55)30.56	(21) 11.67	(41)22.78	(80)44.44	(26) 14.44	(20) 11.11	(42) 23.33
PN ₃	(45)25.00	(22)12.22	(61)33.89	(47)26.11	(19) 10.56	(41)22.78	(23)12.78	(15) 8.33	(17) 9.44	(57) 31.67
PN ₄	(49)27.22	(20)11.11	(40)22.22	(46)25.56	(28) 15.56	(33)18.33	(32)17.78	(24) 13.33	(13) 7.22	(47) 26.11
PN ₅	(52)28.89	(21)11.67	(32)17.78	(47)26.11	(29) 16.11	(28)15.56	(32)17.78	(19) 10.56	(44) 24.44	(51) 28.33
PN ₆	(37)20.56	(25)13.89	(48)26.67	(55)30.56	(23) 12.78	(31)17.22	(16)8.89	(16) 8.89	(26) 14.44	(96) 53.33

*=Cotton/nettle, *=Acrylic/nettle, *= Polypropylene/nettle, %= Percentages, *=Multiple responses, f= Frequency

(EPI=31, PPI=25) weaves were also woven using acrylic (2/24)/nettle (6Nm).

Acrylic (2/32)/nettle (6Nm) union fabric was woven in plain (EPI=36, PPI=27), twill (EPI=65, PPI=34), basket (EPI=36, PPI=29) weaves. Samples in plain (EPI=21, PPI=13), twill (EPI=28, PPI=20), basket (EPI=30, PPI=16) weaves were also woven using polypropylene (2/120)/nettle (6Nm). Besides, union sample in selected plain (EPI=39, PPI=28), twill (EPI=38, PPI=36), basket (EPI=31, PPI=37) weaves were also woven using polypropylene (single ply)/nettle (6Nm). (Table 2).

Preference of respondents for suitability of union fabrics for different handloom textile products:

For taking the preferences of respondents with respect to the suitability of union fabrics for different handloom textile products, the developed samples of union fabric were shown to them. The respondents preferred CN₂ (41.67 %) union fabric for jackets as compared to other fabrics, followed by AN₅ (51.67 %) for stoles and PN₂ (39.44 %) for carry bags. The respondent also preferred PN₂ (30.56 %) for coasters. Union fabric CN₄

(42.78 %) was preferred by the respondents for cushion covers, and CN₃ for rugs (38.89 %). Similarly, union fabric PN₂ (44.44 %) was also preferred for file covers and CN₁ was preferred (45.56 %) for seat covers. Union fabric CN₄ (37.78 %) was also preferred for table runners, and PN₆ (53.33 %) was preferred for wall hangings by the respondents (Table 2). Thus, it is evident that nettle union fabrics were preferred by the respondents for both clothing and home textile products.

Conclusion :

The findings of the present study revealed that union fabrics were found to be suitable for varied end uses. Nettle with cotton, acrylic or polypropylene combinations in union fabrics has been found suitable for heavy weight clothing for winter wear and home textile products. To promote and make nettle textiles suitable for varied climatic conditions, end uses and affordability, blending of nettle is recommended.

Authors' affiliations:

Kanwaljit Kaur Brar and Harinder Kaur Saggi, Department of Apparel and Textile Science, College of Home Science, Punjab Agricultural University, Ludhiana (Punjab) India

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