



Research Article

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EFFECT OF AROMA FINISH IN KID'S WEAR GARMENTS USING BAMBOO FABRIC

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ABSTRACT

Kids wear should be loose enough for their freedom of movement. As bamboo is a natural fibre which are smoother, rounder and is often considered as natural anti-bacterial, it can be used as fabrics. As kids are more sensitive to microbial infections, kids wear can be treated with anti-microbial finishes. In order to hide the odour created by sweat the fabrics can be given aroma finish using microencapsulation technique. Reactive dye finishes and aroma finish were given. Colour fastness to light, washing, perspiration, rubbing is tested and anti-bacterial activity was evaluated before and after finishing with dyes and fragrance oil. During the analysis, the fragrances in microcapsules/ pickup at 225g/m² (GSM) were 10 at 70% and 9 at 80%. Simultaneously the fragrances in microcapsules/ pickup at 227g/m² (GSM) were 9 at 70% and 8 at 80%. The reading for colour fastness to light, washing, perspiration, dry rubbing and wet rubbing after dyeing and after finishing were found to be 4 and 4, 5 and 4/5, 4 and 4, 4 and 4, 5 and 4/5. For antibacterial activity of fabric, both *Escherichia coli* and *Staphylococcus aureus* exhibited 25mm and 27mm of inhibitory zones. The dye and lavender oil finished fabrics exhibited 29mm and 31mm of inhibitory zones respectively. The proposed research will illustrate the significance of dye and aroma finished bamboo fabric with antibacterial activity. Thus the developed product will be with aroma finish, perspiration and anti-bacterial activity which could be comfortable for kids and also protective against pathogenic microbes.

Keywords: Bamboo, Fragrance, Reactive dye, Antibacterial activity, Microencapsulation

INTRODUCTION

Kids are the most care able person in our family. So, we should give additional care while selecting their garments. During construction, kids cloth should be loose enough to allow freedom of movement. Don't cut neckline, armhole etc., too small. Use as few seams as possible. In construction use only flat seams so, as to minimize rubbing and irritation of the kid's tender skin. Sleeveless styles are more comfortable than set-in sleeves. To make the dressing easy for a child the garments can be constructed with full back opening and in simple styles.

An important aspect to be considered in the garment is the perspiration property. Summer wear garments should have more absorbent property due to sweat dissipation. The fabric must absorb and release the moisture effectively¹.

The fabric should bring some sort of fragrance to hide odour created by sweat dissipation. In order to develop these properties in garment, the garment can be subjected to aroma finish².

Perspiration is an important aspect in our daily life. Children's they don't know even to express their feelings and what is wrong with it. Also if it is in summer the normal garments cannot satisfy the wearer even if there are perfumes. Performance with beauty describes the potential of textile finishing. Fragrance finishing of textiles is one such immaculate magnanimous entry into any textile culture. These are the reasons which motivate the investigator to conduct a study about "Effect of aroma finish in kid's wear garments using bamboo fabric". Fragrance finishing of textiles is the process enhances the value of the product by adding some incentives to it². The world market place is continuously changing and so is demand of people changing. Every person desires for some change .i.e. something new &

unique. The successful effective implementation of change has to be done to in the market.

Today the most popular use of essential oils is for aromatherapy. Each type of oil is attributed with a range of properties that help to achieve 'physical and emotional balance. Aromatherapy includes blends of various fragrances like musk, pineapple, rose, lavender, jasmine, lemon, peppermint etc., which are applied on the fabric with the help of a binder³.

This aroma finish can be given by using microencapsulation technique. This technique of fragrance has been used to maintain a fresh aroma on textiles. In this microencapsulation technique the fragrance are applied in the form of atoms. Once the fabric got abrade with the wearer's body the aromatic atoms are broken out and produce the fragrance odour to the wearer. The microcapsules are a container which protects its contents from evaporation, oxidation and contamination till its release it's triggered by gentle rubbing⁴.

Knitting of bamboo fabric is relatively a new entry in the knitting world, but it has become quite popular very quickly and with good reason. Bamboo is a beautiful natural fibre that wears well and is often considered as natural anti-bacterial. Bamboo gives better comfortless in knitting than weaving⁵.

Knitting is nothing but intermeshing of fabric loops. Knitting industry plays an important role in our Indian economy by foreign exchange. Interlock knit will give better appearance and life to the garment while comparing to the other types of knitted fabrics.

Interlock fabrics are thicker than other kind of materials and particularly recommended for casual wears. Interlock is a kind of weft knitting, where it is similar to rib⁶. It is similar in appearance on both the sides of the fabric. For garment outfits interlock knit

will be durable and will not curl much while comparing to other knitted fabrics.

Bamboo fabric is very much similar to the softness of silk. Since the bamboo fibres are without chemical treatment, they are naturally smoother and rounder with no sharp spurs to irritate the skin, making the bamboo fabric hypoallergenic and perfect for those who experience allergic reactions to other natural fibres such as wool or hemp⁵. On that same note, bamboo fabric is also anti-bacterial and anti-fungal. This is because bamboo possesses an anti-bacteria and bacteriostatic bio-agent called "Bamboo Kun"⁷.

Microbial infestation poses danger to living things causing infection⁸. Textiles act as a carrier for growth of microorganisms. Pathogenic and odour causing bacteria grow and cause damage to textiles⁹. Hence kids are more sensitive to bacterial infections, Kids wear can be treated with antimicrobial finishes.

This beneficial quality of the bamboo plant remains in its textile form, killing all bacteria, keeping the wearer feeling fresher and odour free properties of the bamboo made the investigator to select this fabric to construct kids wear garment.

MATERIALS AND METHODS

The bamboo yarn of 40^S count has been knitted using interlock type. Hence bamboo yarn knitted with interlock was selected for the study with the following particulars. It is shown in table 1.

Reactive dye

Reactive dyes react with the fibre molecules to form a chemical compound. These dyes were applied with alkaline solutions or with neutral solutions which are alkalized in a separate process. Sometimes heat treatment is also used for developing different shades.

First, dye solution is taken in the above mentioned ratio to get the dark pink colour. Then the Glauber's salt is added with soda ash and caustic soda flakes. Then the machine was set to run at 25°C for 30 minutes with the pH value 10.8 (Table-2).

Followed by, the dye solution was taken in the above mentioned ratio to get the orange colour. Then the Glauber's salt is added with soda ash and caustic soda flakes. Then the machine was set to run at 25°C for 30 minutes with the pH value 10.8 (Table-3).

Selection of finishing

Perspiration is the most problematic issue in the children's casual wear. So in order to overcome the unpleasant smell the fabric can be subjected to aroma finish. Now a day making children to wear garment themselves is a tough task. In order to bring the intention in the children to wear their costume themselves and to attract the children the garment can be given aroma finish.

Selection of aroma finish

It is the method of imparting a good smelling agent in any textile substrate. This was done by micro encapsulation technique, by imparting the microcapsules in the fabric with the smelling agent according to the flavours. Once the wearer wear the garment consisting of aroma finish the fabric would abrade with the wearer's body where the micro capsules burst out the fragrance to make the wearer to feel the fragrance and it hides the

unpleasant smell due to perspiration. It also gives a wonderful soft touch to the fabric. Hence the investigator has selected this finish.

Lavender

This is the flavour which was extracted from the lavender flower. The fragrance will make the children to wear the garments themselves. In designing kids garment the things used should attract the kids. So in that way this lavender flavour will attract the kids and it was suggested by most of mothers too. So the investigator has selected this lavender flavour. This lavender flavour is available commercially, after buying the flavour, mix it with binder and applied on the fabric by using micro encapsulation technique (Table-4).

Preparing the solution

Measure the correct weight of capsule of your application. In the above example it was 1500g. Mix the capsule paste well. Separately weight the binder needed. The weight of the binder was estimated 25% from the total weight of the capsules. So this equates the binder weight 500g. Slowly, add the binder to the capsule paste, with constant agitation. The mixture needs to be mixed for ninety seconds separately with a high shear mechanical mixer, so that the binder wraps around the capsules properly.

Preparation of machine

Calculate the quantity of water needed for the batch – tank based on the total volume of solution required, minus the weight of micro capsules paste and the weight of the binder. Need to prepare 200l in total of bath solution, so the water volume needs to be 200l – quantity of capsules (1.500kg) minus quantity of binder (0.500kg) = 198l

Mix the capsule paste with the above mentioned quantity of water and adjust the pH to 6.5 with acetic acid. During this stage it is possible to add a softening agent to the pad solution – non-ionic or cationic softeners should be used.

Finishing process

First the fabric is passed through the padding mangle which will apply the chemical consisting of fragrance flavours with binder. Then the machine was set to run for 5 minutes. So that, the finish will impart in whole length of the fabric. Then the fabric was taken away and the squeezing process was done. During squeezing the fabric pick up was about 70% - 80%. Then the fabric was sent to dry (Table-5).

Drying

After dipping and soaking, the fabric was transferred to relax dryer to dry the finished fabric by maintaining the temperature at 140 °C. The temperature of the dryer should be maintained and it should not exceed 140 °C. If it exceeds then it will lead in damaging the capsules.

Evaluation method

Colour fastness to light

The test for fastness light was done with the help of fade-o-metre, an apparatus having very strong electronic lamps or a special carbon-arc light. The sample was exposed to light for thirty hours of duration. Then the samples were removed from the machine and they were compared with the fabrics which were unexposed

to light. Then best results have obtained according to the withstanding time of the samples

Colour fastness to washing

The fabric specimen was taken. Then the machine was prepared with water with liquor ration of water to detergent was 50:1. Then the specimen was immersed in the water and the temperature was set to about 40°C and the machine was set to run about 15 minutes. Then the specimen was set to rinse and it was dried. The change in the colour of the fabric was measured with the help of grey scale. The equipment used for colour fastness to washing was digital washing fastness tester.

Colour fastness to perspiration

Place the fabric between two 5 x 5 pieces each drawn from undyed cloth and stitch point all four sides to form a composite specimen.

Acidic test liquor

It was prepared by dissolving and 2.65gm of sodium chloride and 75gm of crease per litre and adjust the pH value of the solution was 5-6 with addition of acetic acid.

Alkaline test liquor

It was prepared by dissolving 3gm of sodium chloride and adjusting the pH of the solution to 7.2 with addition of sodium bicarbonate.

Wet one of the composite specimens thoroughly in the acidic test liquor to specimen ratio of 50:1. Allow to remain in the liquor for 30 minutes in room temperature for the test liquor and place the specimen between two glass plates in the Perspirometer and place the apparatus in the incubator or air even for 4 hours at 37 °c or - 20 °c. At the end of the period remove the specimen and separate the test piece and two piece of undyed cloth and dry them at room temperature. Treat the second composite specimen similarly and degree of staining of the corresponding and two pieces of undyed cloth using geometric scale and assign rating.

Colour fastness to rubbing

Colour fastness to rubbing deals with the colour fastness property of the fabric while rubbing. This could be determined with the help of the following two types.

Dry rubbing

Take one test specimen and fix it to the rubbing device. Fix a piece of dry undyed cloth in place over the end of the finger of rubbing device. Rub that to and from in a straight line along a track 10 cm along on the dry test specimen ten times in ten seconds to the downwards force of 900gm on the finger. Evaluate the degree of staining of the undyed cloth piece with the help of grey scale with reading.

Wet rubbing

Take a fresh dry specimen and fix it on the rubbing device. Soak a fresh undyed cloth piece in distilled water and square it. Fix a wet piece of undyed cloth in place over the end of the finger of the test device and rub it as in previous case. Dry the piece at room temperature and assign the rating.

Antibacterial activity of the bamboo fabrics before and after finishing (EN ISO 20645)

The native biological properties of the bamboo fabrics made interest to evaluate the antibacterial activity in the present study. The evaluation was made before and after finishing with dyes and fragrance oil (lavender). The antibacterial activity was tested using a standard EN ISO 20645 method.

Briefly, test specimens (before and after finished fabrics) were cut into pieces (20mm in diameter). Sterile AATCC bacteriostasis agar plates were prepared. Using sterile 4mm inoculating loop, one loop full of culture (*Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 6538) was transferred by swabbing all around the surface of the agar plate and also covering the central area of the petridish. The plates were incubated at 37°C for 24 hours. The inoculated plates were examined for the interruption of growth along the swabs of inoculum beneath the fabric and for a clear zone of inhibition beyond the fabric edge. The average width of the zone of inhibition around the test specimen calculated in mm.

RESULTS AND DISCUSSION

Colour fastness test

The designed and constructed garment (Middi and Middi top) was subjected to different colour fastness test respective to light, washing, perspiration, dry and wet rubbing. In Table.6 the properties were evaluated for the fabric after dyeing and after aroma finishing.

During the analysis, the garment showed results varying from good (4) to excellent (5) for the samples after dyeing and after aroma finishing. Garment showed good colour fastness to light, to perspiration and to dry rubbing after dyeing and after finishing. The garment showed excellent colour fastness properties to washing and wet rubbing for after dyed samples; and also very good colour fastness properties for after finished samples.

Antibacterial activity of the bamboo fabrics before and after finishing

The antibacterial activity of the fabrics was evaluated and presented in Table-7. As proved earlier about the native antibacterial properties of bamboo fabrics, the present investigation also exhibited good inhibitory zones against the test organisms. Both *Escherichia coli* and *Staphylococcus aureus* exhibited 25mm and 27mm of inhibitory zones respectively. The dyes and lavender oil finished fabrics showed excellent antibacterial activity. Both the test organisms exhibited 29mm and 31mm of inhibitory zones respectively. The antibacterial activity expressed in the present study was mainly due to the dual actions of the bamboo and the lavender oil collectively. As the bamboo contains the native antibacterial properties, the lavender oil synergistically get into action to retard the growth of bacteria. The mode of action of both bamboo and lavender oil could act on either the cell wall or cytoplasmic membrane of the organisms.

Drafting & Construction of Garments Design: Middi & Middi Top

The middi and top was drafted and constructed using the measurements presented below separately. The proposed middi design with two colour shades (Pink + Red and Red + Yellow) was illustrated in Fig. 1.

The pattern for the middi top was presented in Fig. 2. The pattern was drawn and cut as per the measurements presented in Table-8. Two cuts were made one in the middi top front and the other in the back. The entire pattern was made and designated with their respective numbers in numerals. The draft with these numerals was presented in Table-9. The pattern was drawn to illustrate the seam allowance for the length of the middi top, shapes for front neck, back neck, shoulder slope, side seam and bottom. Similarly, the pattern was drawn and the draft was designated in a range with numerals separately for middi, waist and over coat in Fig. 3, 4 and 5 with their respective Tables (Table-10, 11 and 12).

Middi Top and Middi

The pattern was drawn and the draft was designated in a range with numerals for middi, in Fig. 2 and 3, and Table-8 and 9.

Waist band

The pattern was drawn and the draft was designated in a range with numerals for waist, in Fig. 4, and Table-11.

Over coat

The pattern was drawn and the draft was designated in a range with numerals for waist, in Fig. 5, and Table-12.

Stitching and designing of garment for kids

In Fig. 6, the final midi was constructed by finishing the neck by bias binding, followed by stitching the shoulder, side seam and bottom hem. Skirt and overcoat was stitched separately and subjected for a wear study.

Table-1: Fabric particulars

| S. No | Fabric particulars | Composition |
|-------|--------------------|-----------------|
| 1 | Fabric composition | 100% bamboo |
| 2 | Fabric structure | Interlock |
| 2 | Fabric count | 40 ^s |
| 4 | Dia | 22" |
| 5 | GSM | 200 |

Table-2: Selection of Colour I

| S. No | Colour selection | Shade % | Soda ash : liquor ratio | Caustic soda flakes |
|-------|------------------|---------|-------------------------|---------------------|
| | | | 20 : 1 | 40 : 1 |
| 1 | Pink | 0.20% | 2 | 1 |
| 2 | Red R | 0.20% | | |

Table-3: Selection of Colour II

| S. No | Colour selection | Shade % | Soda ash liquor ratio | Caustic soda flakes |
|-------|------------------|---------|-----------------------|---------------------|
| | | | 20 : 1 | 40 : 1 |
| 1 | Red | 0.20% | 2 | 1 |
| 2 | Yellow | 0.10% | | |

Table-4: Fragrances in microcapsules/ pick up

| S. No | GSM | Pick up 70% | Pick up 80% |
|-------|---------------------|-------------|-------------|
| 1 | 225g/m ² | 10 | 9 |
| 2 | 227g/m ² | 9 | 8 |

Table-5: Requirements for capsule preparation and finishing the fabrics

| S. No. | Conditions | Requirements |
|--------|--------------------------|--|
| 1 | GSM (Fabric weight) | 225 gram per meter square |
| 2 | Pick Up | 70% to 80% |
| 3 | Required GPL | 10GPL contains (8.2g capsule / 1.8g binder) |
| 4 | Volume of water to treat | (2000 m * 225 * 80%) / 2000 = 180 litres |
| 5 | Microcapsules required | 200 l*10gpl = 2000g (1500g capsules and 500g binder) |

Table-6: Evaluation by Colour fastness test

| S. No | Colour Fastness | After Dyeing | After Finishing |
|-------|-----------------|--------------|-----------------|
| S1 | To Light | 4 | 4 |
| S2 | To Washing | 5 | 4/5 |
| S3 | To Perspiration | 4 | 4 |
| S4 | To dry rubbing | 4 | 4 |
| S5 | To Wet rubbing | 5 | 4/5 |

5 - Excellent, 4/5 – Very Good, 4 – Good, 3/4 – Fair, 3- Moderate, 1/2- Poor

Table-7: Antibacterial activity of finished fabrics

| S. No. | Samples | Zone of Inhibition (mm) | |
|--------|-----------------|-------------------------|------------------------------|
| | | <i>Escherichia coli</i> | <i>Staphylococcus aureus</i> |
| 1 | Control | 25 | 27 |
| 2 | Finished fabric | 29 | 31 |

Table-8: Measurement of Middi top

| Fabric segments for stitching | Measurements of each segment (inch) |
|-------------------------------|-------------------------------------|
| Chest | 21 |
| Waist | 21 |
| Hip | 23 |
| Back width | 11 |
| Front waist length | 10 |
| Top length | 15 |
| Skirt length | 20 |

Table-9: Drafting procedure for Middi Top

| Score range (Designated numerals) | Pattern of Middi Top |
|-----------------------------------|--|
| 0 - 1 | $\frac{1}{4}$ chest + 1 $\frac{1}{2}$ " seam allowance |
| 1 - 2 | top length = $\frac{1}{2}$ " seam allowance |
| 2 - 3 | same as 0 - 1 |
| 0 - 3 | same as 1 - 2 |
| 0 - 4 | $\frac{1}{12}$ chest |
| 0 - 5 | $\frac{1}{12}$ chest + $\frac{1}{2}$ " seam allowance |
| 0 - 6 | $\frac{1}{8}$ chest + $\frac{1}{2}$ " seam allowance |
| Shape 4 - 5 | for back neck |
| Shape 4 - 6 | for front neck |
| 0 - 7 | $\frac{1}{2}$ back width |
| 1 - 8 | $\frac{1}{4}$ chest |
| 8 - 9 | same as 1 - 7 |
| Shape 4 - 10 | for shoulder slope |
| 1 - 13 | front waist length |
| 12 - 13 | $\frac{1}{2}$ seam allowance |
| Shape 8, 13, 2 | for side seam |
| 2 - 14 | $\frac{1}{2}$ " seam allowance |
| Shape 3 - 14 | for bottom shape |

Table-10: Drafting procedure for Middi

| Score range (Designated numerals) | Pattern of Middi |
|-----------------------------------|--|
| 0 - 1 | $\frac{1}{4}$ waist + 1 $\frac{1}{2}$ seam allowance |
| 0 - 2 | skirt length + $\frac{1}{2}$ seam allowance |
| 1 - 3 | Join |
| 0 - 4 | $1\frac{1}{2}$ |
| 4 - 5 | $\frac{1}{2}$ |
| 5 - 8 | $1\frac{1}{2}$ |
| 8 - 9 | $\frac{1}{2}$ |
| 2 - 6 | $1\frac{1}{2}$ |
| 6 - 7 | $\frac{1}{2}$ |
| 4 - 6 and 5 - 7 | Join |
| 7 - 10 | $1\frac{1}{2}$ |
| 10 - 11 | $\frac{1}{2}$ |
| 8 - 10 and 9 - 11 | Join |
| 1 - 3 | Shape |

Table-11: Drafting procedure for Waist

| Score range (Designated numerals) | Pattern of Waist |
|-----------------------------------|--|
| 0 - 1 | $\frac{1}{4}$ waist + 1 seam allowance |
| 1 - 2 | $1\frac{1}{2}$ |
| 2 - 3 | Same as 0 - 1 |
| 0 - 3 | Same as 1 - 2 |

Table-12: Drafting procedure for Over Coat

| Score range (Designated numerals) | Pattern of Over coat |
|-----------------------------------|---|
| 0 – 1 | $\frac{1}{4}$ waist + 1 $\frac{1}{2}$ seam allowance |
| 1 – 2 | top length = $\frac{1}{2}$ ” seam allowance |
| 2 – 3 | same as 0 – 1 |
| 2 – 3 | same as 0 – 1 |
| 2 – 3 | same as 0 – 1 |
| 0 – 4 | $\frac{1}{12}$ chest |
| 0 – 5 | $\frac{1}{12}$ chest + $\frac{1}{2}$ ” seam allowance |
| 0 – 6 | $\frac{1}{8}$ chest + $\frac{1}{2}$ ” seam allowance |
| Shape 4 – 5 | for back neck |
| Shape 4 – 6 | for front neck |
| 0 – 7 | $\frac{1}{2}$ back width |
| 1 – 8 | $\frac{1}{4}$ chest |
| 8 – 9 | same as 1 – 7 |
| from 7 – 9 | Square down |
| 7 – 10 | 1” |
| Shape 4 – 10 | for shoulder slope |
| 1 – 13 | front waist length |
| 12 – 13 = | $\frac{1}{2}$ ” seam allowance |
| Shape 8, 13, 2 | for side seam |
| 2 – 14 | $\frac{1}{2}$ ” seam allowance |
| Shape 3 – 14 | for bottom shape |

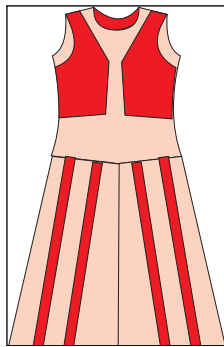


Fig. 1. Middi and middi top design with colour shade used

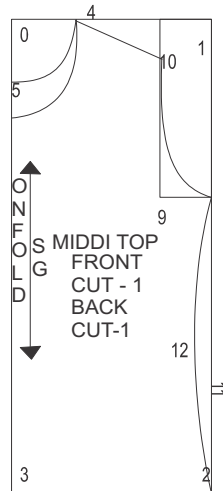


Fig. 2. Pattern draft with designated numerals for Middi top

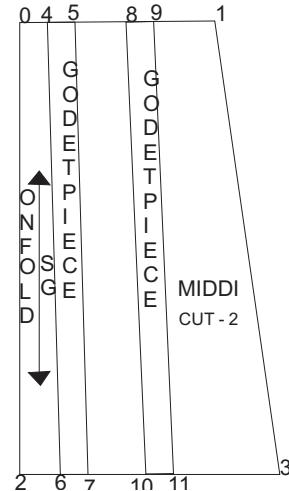


Fig. 3. Pattern draft with designated numerals for Middi

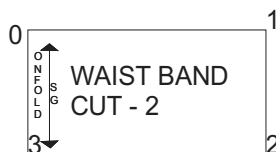


Fig. 4. Pattern draft with designated numerals for Waist band

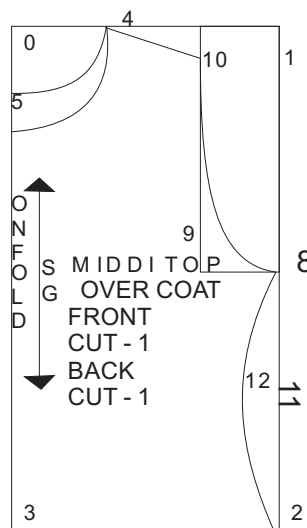


Fig. 5. Pattern draft with designated numerals for Over Coat



Fig. 6. Final constructed middi – Wear Study

CONCLUSION

This research work of applying of aroma finish in bamboo material has given a new feel to the fabric. The constructed garments attract the children due to the fragrance in the garment. Bamboo fabric was rated as excellent for children's tender skin. Bamboo fabric has the inbuilt property in the fibre itself like odour free, coolness, excellent colour fastness, antibacterial and UV protection. So bamboo fabrics are highly recommended for kids. Hence it is concluded that applying aroma finish in kids garment gives a pleasant smell to the wearer and hide the unpleasant smell due to perspiration. More over the application of aroma finish in bamboo is highly recommended for kids because of its eco – friendly property. The fragrance finished textiles are very new in the current market and they have gained the much more importance in day to day life. Further recommendations were given as follows, aroma finish can be applied in gent's formals to determine the mental relaxation of the wearer, aroma finish can be applied in home furnishing items and bamboo fibre can be blended with the other natural fibres with printing effects.

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