Dr. Minnie Mathew

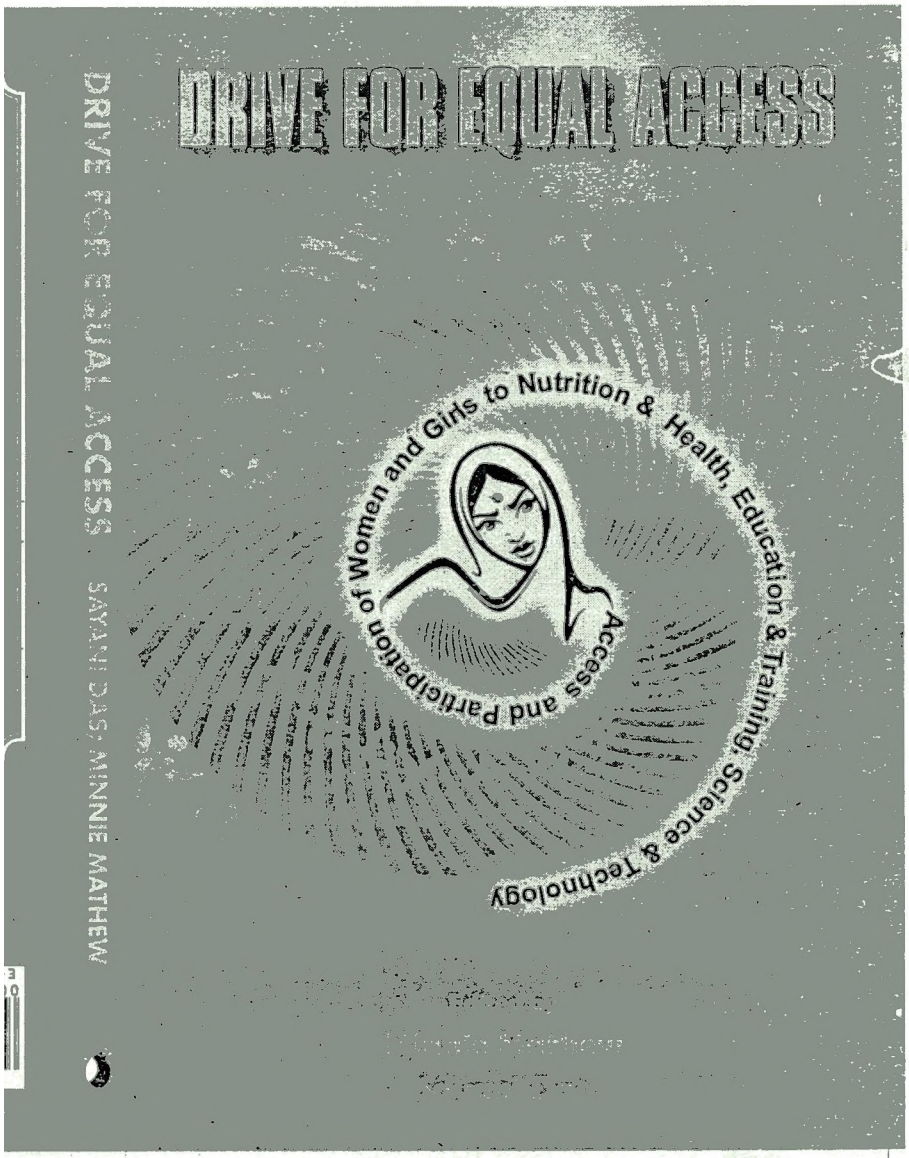
PARTRIDGE

ISBN 978-1-4828-5760-
9000
9 781482 857603

9 781482 857603

6.00 x 9.00
229 mm x 152 mm

Document Size: 15" x 12"
305 x 381 mm




.424
10.76mm

**6.00 x 9.00**
229 mm x 152 mm

*Content Type: Black & White*
*Paper Type: White*
*Page Count: 200*
*File Type: InDesign*
*Request ID: CSS1462747*

# DRIVE FOR EQUAL ACCESS

Access and Participation of Women and Girls to Nutrition & Health, Education & Training, Science & Technology

**Avinashilingam Institute for Home Science and Higher Education for Women – Deemed University**
**Coimbatore, Tamil Nadu, India**

Edited by

Minnie Mathew

and

Sayani Das

PARTRIDGE

ISBN: Softcover 978-1-4828-5760-3
eBook 978-1-4828-5759-7



Print information available on the last page.

Partridge India
A Penguin Random House Company
1663 Liberty Drive
Bloomington, INDIANA 47403
USA

To order additional copies of this book, contact
000 800 10062 62
orders.india@partridgepublishing.com
www.partridgepublishing.com/india

# Table of Contents

# Foreword

It is my pleasure to introduce the book ***'Drive for Equal Access'***, which evolved from the International Women's Day National Symposium in 2014, held at our esteemed all-women institution.

**'Drive for Equal Access'** depicts the **'drive'** for the very existence of the various social institutions of India, which strive to bring the gender justice through equality and equity in society as its functional and broader responsibility.

The book gives a pan-Indian understanding of girls' and women's struggles in all aspects of their living and being. Their health and nutrition needs, their education and employment needs, their science and technology needs are voiced by the nationally eminent gender scholars who participated in the symposium. The stories of struggles and achievements by grassroots women portrayed by the authors through their research-based micro-studies support the unanimous voices that demand for opportunity for girls and women's participation in development and empowerment.

The book sensitizes the readers towards 'gender justice' and raises critical issues that should be confronted by the decision-makers in public-private life. It is a good handbook on gender roles and relations for students, researchers, and policy makers. I strongly recommend this book as it is not only descriptive of the social status of women in contemporary Indian society, but it creates an urge in human minds to set a social change...

**Dr. P.R. Krishna Kumar**
The Chancellor
Avinashilingam Institute for Home Science and
Higher Education for Women – Deemed University
Coimbatore, Tamil Nadu, India

# EMPOWERMENT OF WOMEN THROUGH HANDICRAFTS FROM AGAVE *AMERICANA* FIBRES

**R. Sunitha[1] and G. Krishnabai[2]**

[1]Dr. R. Sunitha, Assistant Professor, Department of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu. Email: sunitha1976adutex@gmail.com

[2]Dr. G. Krishnabai, Retired Dean, Faculty of Home Science, and Retired Head of the Department and Professor of Textiles and Clothing, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu. Email: krishna_1946@yahoo.co.in

## ABSTRACT

The purpose of the study is to innovate eco-friendly fashionable products and at the same time bring out the job potentialities in procuring raw materials and manufacturing the products. This may motivate women to become entrepreneurs at minimum investment. This study exhibits vividly that it is cent percent possible to extract fibres from the leavers of non-food crop Agave *americana*. These fibres also have good affinity towards dye. These also lend themselves to prepare handicraft items and accessories.

***Keywords:*** Agave *americana*, entrepreneurs, handicrafts and accessories

## INTRODUCTION

India is a tropical country blessed with plenty of renewable resources obtainable from plant kingdom. The natural fibres are eco-friendly as they are biodegradable in nature. The plant fibres obtained from stem are soft when compared to the fibres obtained from leaves. So the leaf fibres are restricted to only limited uses due to their hard nature. Keeping this in view, the study has been focused on extraction and processing of the fibres so as to lend themselves to various end uses for handicrafts and fashion accessories. The handicrafts provide several job opportunities for women. Accessories are given much importance in fashion world helping women in generating their income. Entrepreneurship for women would surely empower them. This study focuses on how the abundantly available natural minor fibres are extracted, to be utilized to empower women through self-employment.

Hence the specific objectives of the study are to:

1. extract the fibres from the leaves of Agave *americana* using various methods and determine the best out of them
2. study the effect of processing on the fibres
3. find the properties of the fibres at different stages of maturity of the plant
4. produce various handicrafts and accessories to create job opportunities for women

## METHODOLOGY

The matured leaves were cut from the Agave *americana* plants and fibres were extracted from these leaves by various methods. The method used for extraction of fibres was of great importance since the quality as well as the quantity of extracted fibres strongly influenced by the method of extraction.

### 1. Extraction of the Fibres from the Leaves

The fibres were extracted by the following methods.

### 1.1 Stagnant Water Retting

Franck (2005) feels that retting is quicker in soft water than in hard water and also adds that the color and lustre of the fibres are remarkably improved by

using soft water. Considering this fact, soft water was used not only for retting but also for the whole process.

The fresh Agave *americana* leaves were pounded, and made into bundles and immersed in stagnant water for fungal action for required period. The gas formation indicates the commencement of fungal action says Stout (1970). Retting in water is caused by micro-organisms which soften and disintegrate lignin and hemicellulose. After softening, the fibres can be stripped easily from the rest of the leaf, express Pardeshi and Paul (2003). The completion of the retting process took 23 days. Then the retted leaves were taken out and scraped to remove the decomposed matter surrounding the fibres. The extracted fibres were then washed thoroughly, dried and combed.

### 1.2 Chemical Retting

In chemical retting, the leaves were subjected to alkali. As suggested by Corbman (1983), sodium hydroxide was used for chemical retting. The concentration of 0.5 percent was used for the process as it was proved to be the best concentration for chemical retting. After 20 days when the retting was completed, the retted leaves were taken out and scraped to separate the fibres. The extracted fibres were then washed thoroughly in fresh water, dried and combed.

### 1.3 Decortication

Hall (2004) suggests that the leaves are f leshy and require mechanical decortication for separation of the fibres. The investigator decorticated the leaves for the extraction of fibres as instructed by Doraisamy and Chellamani (1993). The leaves of equal length were arranged together and fed into the decortication machine. As the drive rotates three to five leaves were fed between the drum and the backing plate. Owing to the crushing, beating and pulling action, the pulpy material was removed. When it was half way through, the leaves were slowly pulled and the other half was fed in the same manner as before. Then the fibres were washed, dried and combed when they were slightly wet, using a suitable brush.

## 2. Fibres from Plants of Various Stages of Maturity

The leaves from plants of different stages of maturity were cut and collected. Fibres were then extracted from the leaves by decortication and analyzed.

## 3. Processing of the Fibres

**3.1 Scouring:** The scouring process is done to remove the nitrogenous matters and to make the operations of bleaching and dyeing efficient say Modi and Garde (1995). The parameter and the operational range are given in the Table I.

**Table I**
**RECIPE USED FOR SCOURING OF FIBRES**

| No. | PARAMETER | OPERATIONAL RANGE |
|---|---|---|
| 1 | **Sodium Carbonate** | 2-3% |
| 2 | **Sodium Silicate** | 1.0-1.5% |
| 3 | **Wetting Agent** | 0.1% |
| 4 | **Material to Liquor Ratio** | 1 : 4 |
| 5 | **Temperature** | 60°C |
| 6 | **Time** | 10 Hours |

After scouring process, the liquor was drained off and the fibres were washed thoroughly in cold water.

**3.2 Bleaching:** Bleaching is done using Hydrogen peroxide. This is done to brighten the fibres and to improve the dye affinity.

**3.3 Dyeing:** Needles (2001) is of the opinion that direct dyes penetrate cellulosic fibres readily, have good affinity for these fibres and are reasonably colour fast. Taking this into consideration, the investigator selected direct dye of two colours namely blue and orange for dyeing the Agave *americana* fibres. The dyeing procedure was carried out as instructed by Shenai (1983). Amount of dye solution was calculated using the following formula.

$$\text{Amount of solution to be taken in cc} = \frac{w \times p}{c}$$

where w = weight of the material, p = percentage of solution and
c = concentration of the prepared solution

The required amount of dye was dissolved in cold water. The fibre skeins were entered into the dye bath and stirred well for 20 minutes, then the temperature was slowly raised to 60°C and common salt was added (10 percent of the weight of the material). The temperature was then raised to 100°C and dyeing was continued at the same temperature for 30 minutes. The fibres were then taken

out from the dye bath, given soap boiling for 15 minutes and then washed thoroughly with cold water and then dried under shade. Fibre swatches are given in Appendices 1f and 1g. These colored fibres were used for making accessories and handicraft items.

### 4. Preparation of Handicraft Items and Accessories

The dyed fibres are made into handicraft items like bags, wall hangers and decorative pieces. These fibres are also utilized to make fashionable accessories (Plate 1).

### 5. Evaluation and Estimation of Cost

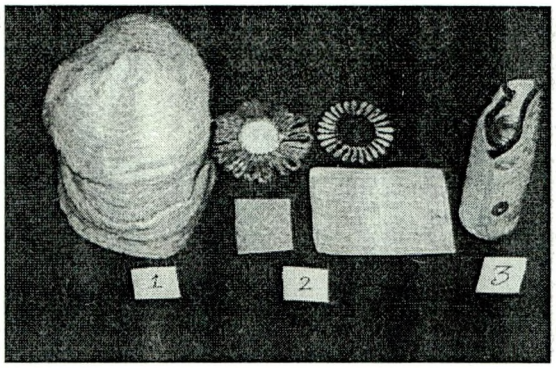
### 5.1 Evaluation of Extracted Fibres

The fibres extracted by various methods were evaluated for various parameters such as general appearance, color, luster and texture. These were judged visually by a set of 25 Post Graduation students belonging to Textiles and Clothing Department. Their ratings were consolidated and recorded.

The fibres were also evaluated for essential parameters like length, diameter, force and elongation. The tests were carried out to compare the method of extraction as well as the maturity of fibres.

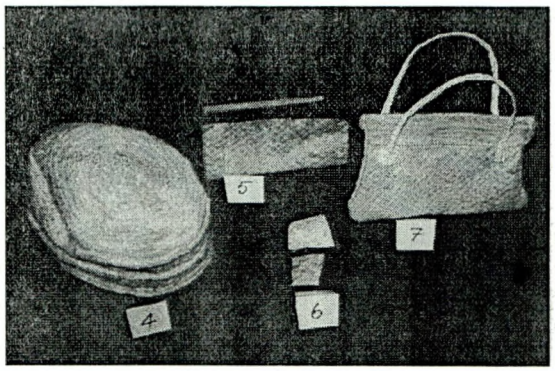
**PLATE 1 – PRODUCED PRODUCTS**

The cost of the fibres was then calculated.




1. TEA COZY
2. TABLE MATS
3. FEEDING BOTTLE CASE

4. CAP
5. PURSE
6. CELL PHONE CASE
7. HAND BAG




8. APPLIQUE
9. BRACELET
10. WAIST BAND
11. GARLAND
12. LETTER HOLDER

13. DUSTER
14. WALL HANGER
15. BIRDS NEST
16. PHOTO FRAME
17. DOLLS
18. FIBRE FOUNTAIN

## FINDINGS OF THE STUDY

The findings of the study are expressed under:

### i. Visual Evaluation of Extracted Fibres

**Table II**
**VISUAL EVALUATION OF EXTRACTED FIBRES (%)**

| No. | Samples | General Appearance | | | Color | | | Lustre | | | Texture | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Good | Fair | Poor | Bright | Medium | Dull | Good | Fair | Poor | Soft | Coarse | Very Coarse |
| 1 | **Decorticated** | 80 | 20 | - | 56 | 40 | 4 | 60 | 40 | - | 68 | 32 | - |
| 2 | **Stagnant Water Retted** | 12 | 80 | 8 | 24 | 52 | 24 | 20 | 68 | 12 | 12 | 72 | 16 |
| 3 | **Chemical Retted** | 4 | 24 | 72 | 8 | 36 | 56 | 8 | 40 | 52 | 8 | 28 | 64 |

The above Table II reveals the following findings:

- **General appearance:** The decorticated fibres were rated as good in appearance by 80 percent of the judges whereas stagnant water retted fibres were rated as fair by 80 percent of the judges. About 72 percent of the judges rated the chemical retted fibres as poor in appearance.

- **Color:** The colour of the decorticated fibres were rated as bright by 56 percent of judges, whereas stagnant water retted fibres were rated as medium by 52 percent of the judges. The chemical retted fibres were rated as dull by 56 percent of the judges.

- **Lustre:** The decorticated fibres were rated as good in lustre by 60 percent of the judges, whereas stagnant water retted fibres were rated as fair in lustre by 68 percent of the judges. The chemical retted fibres were rated as poor in lustre by majority of the judges.

- **Texture:** The decorticated fibres were rated as soft in texture by 68 percent of the judges, stagnant water retted fibres were rated as coarse

by 72 percent and chemical retted fibres were rated as very coarse by 64 percent of the judges.

It could be concluded that the decorticated fibres are good in general appearance and lustre, bright in colour and soft in texture. So, the fibres extracted by the process of decortication could be called as the best of all the three methods. Hence the decorticated fibres could be utilized for making handicrafts and other accessory items.

**ii. Physical Tests**

- **Length:** The length of the Agave *americana* fibres was found to be 100-125 cms.

- **Diameter:** Higher the diameter, lesser is the spinnability of the fibre express Ashwini *et al.* (2004). The diameter of Agave *americana* fibres viewed under the projection microscope ranged from 150µm to 300 µm. The average was found to be 235µm.

**iii. Characteristics of the Fibres Extracted by Various Methods**

The characteristics of the fibres based on various methods of extraction are given in Table III.

The force in grams required to rupture the fibre obtained by chemical retting, ranged between 434.03 and 2007.78 with an average of 1153.89. This was followed by decorticated fibres with an average of 724.14 and stagnant water retted fibres with an average of 300.34. The elongation of decorticated fibre ranged from 3.19 to 9.39 percent with an average of 5.98 percent. The fibre extracted by stagnant water retting ranged between 1.18 percent and 9:19 percent with an average of 6.01 percent, followed by chemical retting with an average of 3.92 percent. Basra (2002) feels increased elongation is associated with improved quality of the yarn, which in turn improves the quality of the fabric.

**Table III**
**FIBRE CHARACTERISTICS BASED ON VARIOUS EXTRACTION METHODS**

| No. | Extraction Method | Force (gram) | | | Elongation (percent) | | | Time of Rupture (seconds) |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Average | Minimum | Maximum | Average | |
| 1 | **Decortication** | 309.19 | 1152.93 | 724.14 | 3.19 | 9.39 | 5.98 | 16.85 |
| 2 | **Stagnant Water Retting** | 37.21 | 499.79 | 300.34 | 1.18 | 9.19 | 6.01 | 12.30 |
| 3 | **Chemical Retting** | 434.03 | 2007.78 | 1153.89 | 1.60 | 5.88 | 3.92 | 2.42 |

The time required to rupture, in seconds, for decorticated fibres was found to be the highest of 16.85 followed by water retted fibres of 12.30 and chemical retted fibres of 2.42. Among all the three methods, force and elongation of the decorticated fibres were found to be moderate. The time taken for rupture was found to be maximum in the case of decorticated fibres. The fibre extracted through decortication method is strong enough to do embroidery, and other surface embellishments. These fibres could be utilized for making all accessories as these are stronger.

### iv. Fibres from Plants of Various Stages of Maturity

**Table IV**
**FIBRE CHARACTERISTICS BASED ON VARIOUS STAGES OF MATURITY**

| No. | Stages of Plant | Force (gram) | | | Elongation (percent) | | | Time of Rupture (seconds) |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Average | Minimum | Maximum | Average | |
| 1 | **Matured** | 857.36 | 1946.28 | 1341.38 | 4.04 | 7.25 | 5.89 | 3.53 |
| 2 | **Moderate** | 380.47 | 1003.77 | 708.72 | 1.60 | 5.88 | 3.92 | 2.42 |
| 3 | **Tender** | 207.77 | 1141.35 | 658.20 | 1.20 | 5.63 | 3.81 | 2.34 |

Table IV reveals that the force, in grams, required to rupture the fibres was found to be the highest for matured fibres namely 1341.38 followed by moderate and tender fibres as 708.72 and 658.20 respectively. The elongation percentage of matured fibre ranged between 4.04 and 7.25 with an average of 5.89 which is the highest among the three samples. This was followed by moderate fibre with an average of 3.92 and the tender fibre of 3.81. The time taken for rupture by the matured fibre was the highest of about 3.53 seconds followed by moderate fibre of 2.42 seconds and tender fibre of 2.34 seconds. Among the three stages of growth of the fibres, it was found that the matured fibres required the maximum time for rupture with a maximum elongation and force. So, matured fibres proved to be the strongest of all the three. Hence the matured fibres could be utilized for making handicraft items and other accessories.

### v. Evaluation of the Prepared Handicraft Items

The handicraft items were prepared by the scholar for evaluation. The items namely wall hangers, photo frame, decorative piece, ear rings and slippers were prepared. These were evaluated for their beauty and other decorative aspects which gave best results as per the evaluation of the judges. The cost estimation of the products is expressed in the Table V.

**Table V**
**COST ESTIMATION OF PRODUCTS**

| No. | Particulars | Cost in Indian Rupees (₹) |
|---|---|---|
| | **Preparation Cost** | |
| 1. | Fiber Extraction | 15/ Kg |
| 2. | Fiber Bleaching | 10/Kg |
| 3. | Fiber Dyeing | 5/Kg |
| 4. | Spinning and Miscellaneous Expenses | 2/Kg |
| | **Selling Price in Total** | 32/Kg |

From 1 Kg of extracted, bleached and dyed fibres, decorative pieces - 3 wall hangers, 5 table mats, 2 bags, and accessories - 10 earrings and 2 garlands were prepared.

**vi. Estimation of Costs**

The products made out of the fibres were also cost effective. Any entrepreneur can be successful with limited investments. Women can do this at home as these do not need much of space or investment. This also gives more benefit when it is produced in large scale.

## CONCLUSION

Thus from the findings of the study it is clear that strongest fibres are obtained from matured leaves of Agave *americana* plant through decortication. These fibres are strong enough and have good affinity towards dye to be converted into handicraft and accessory items.

These when dyed give wonderful bright colors. Women can do this at home as these do not need much of space or investment. This also gives more benefit when it is produced in large scale. Women can become successful entrepreneurs by starting the business of making handicraft items with this fibre and other minor fibres. Fashionable eco-friendly accessories also could be made from such minor fibres which have high potentiality for export value.

## REFERENCES

Basra, A.S. (2002), Cotton Fibres, Developmental Biology, Quality Improvement and Textile Processing, CBS Publishers and Distributors, New Delhi. Pp. 207.

Corbman, B.P. (1983), Textiles Fibre to Fabric, Mc Graw Hill, New Yok. Pp. 259.

Doraisamy, I. and Chellamani, P. (1993), Pineapple Leaf Fibre, Textile Progress, Vol. 24, No.1, Textile Institute, Manchester, Pp.1-5.

Franck, R.R. (2005), Bast and Other Plant Fibres, The Textile Institute, Woodhead Publishing Limited, Abington Hall, Cambridge: England. Pp. 31, 233.

Hall, A.J., (2004), The Standard Handbook of Textiles, Woodhead Publishing Limited, England. Pp. 27.

Modi, J.R. and Garde, A.R. (1995), Chemical Processing of Cotton and Polyester- Cotton Blends, Textile Association of India, Ahmedabad. Pp. 5, 12.

Needles, H.L., (2001), Textile Fibres, Dyes, Finishes and Processes, Standard Publishers, New Delhi. Pp. 148, 167.

Pardeshi, P.D. and Paul, R. (2003), New Cloth Market, Vol. 17 (Nov). Pp. 29, 231.

Sen, K.K. and Sen, S.K. (1994), Glucon Type of Gum From Ramie, Research and Industry, Vol. 39, No.4, Pp. 224.

Stout, E. (1970), Introduction to Textiles, John Wiley and Sons, New York, Pp. 81, 82.