Unit 5
YARNS

Can you tell?

- *Apart from fabric construction for what purpose we make use of yarns?*
- *Why khadi fabric has different texture than your uniform fabric?*
- *What type of instrument is used for spinning yarn?*

Let's learn more about yarns, its types and more such information in this chapter.

To weave or knit a fabric it is necessary to have yarns. Thus making of yarns is as old as manufacturing of fabric and definitely predates recorded history. Most fabrics like woven, knitted, braided, knotted, netted, lace and crochet fabrics are made up of yarns. Yarns are made up of either short staple fibers or long continuous filaments.

The characteristics of the fibre and the way they are assembled determine the characteristics of the yarn. The characteristics of the yarn and the way they are assembled determine the characteristics of the fabric. The type of yarn used to make a fabric determine how a fabric may perform when you wear, launder or dry–clean it.

Some fabric characteristics that are determined by yarns include the surface texture (rough, smooth, harsh, soft, crinkled); its weight (light, heavy, medium); its comfort (cool, warm, clammy, comfortable, soft) and its performance (abrasion, strength, pilling)

5.1 INTRODUCTION

Yarn is defined by the American society for testing materials (ASTM) as:

"A yarn is a continuous strand of textile fibre, filament or material in a form suitable for knitting, weaving or otherwise intertwining to form a textile fabric"

Yarn occurs in the following forms

- A number of fibres twisted together.
- A number of filaments laid together without twist.
- A number of filaments laid together with more or less twist.
- A single filament – A monofilament.
- One or more strips made by the lengthwise division of a sheet of material such as natural or synthetic polymer, a paper or a metal foil.

Yarns composed of staple fibres are frequently called spun or staple fibre yarns. These yarns are fuzzy yarns with protruding fibre ends.

A Filament yarn is composed of long fibres. Filament yarns may be either multifilament (composed of several filaments) or monofilament (composed of a single filament). Filament yarns are smooth in appearance.

5.2 YARN TWIST

Twist is the spiral arrangement of the fibres around the axis of the yarn. Twist is produced

by revolving one end of the fibre strand while the other end is held stationary. Twist binds the fibres together and gives the spun yarn strength. The number of twists is referred to as **turns per inch** (tpi).

Table 5.1

Mount of Twist

Amount	Number of Twist
Low twist	2 – 3 tpi
Average twist	20 – 25 tpi
Hard twist	30 – 40 tpi
Crepe twist	40 – 80 tpi

Amount of Twist

The amount of twists varies with

- The length of the fibres
- The size of the yarn
- The intended use

Increasing the amount of twist up to the point of perfect fibre to fibre cohesion will increase the strength of the yarn. In general, the more the twist, the stronger the yarn. Beyond an optimum point however added twist will cause the yarns to kink and eventually the yarn will become brittle and will loose strength.

Increased twist will add elasticity to yarn. This can be observed in the stretchy and curly characteristics of crepe yarns, which are highly twisted. Highly twisted yarns are more resistant to abrasion; they shed soil easily because of a smoother surface and less space between fibres for soil to lodge; and they tend to appear smooth, uniform and of low lustre.

Yarns with low twist are soft and fluffy; they tend to be warmer because there are air spaces to serve as insulation areas. Filament yarns of low twist have more lustre as they reflect more light than high twist yarns. Low twist yarns are less strong, show abrasion, wear more quickly than yarns with high twist.

Table 5.2

Comparison of high twist and low twist yarn

Low twist yarn		High twist yarn	
1.	Less strong yarns.	1.	More strong yarns.
2.	More lustrous yarns.	2.	Less lustrous yarns.
3.	Less elastic yarns.	3.	More elastic yarns.
4.	Yarns have less abrasion resistance	4.	Yarns have more abrasion resistance
5.	Yarns are lofty, soft and warm.	5.	Yarns are regular in appearance and harsh to touch.
6.	Yarns soil readily.	6.	Yarns soil less.

❖ **Balanced of Yarn:** Balanced yarns are those in which the twist is such that the yarn will hang in loop without kinking, doubling or twisting upon itself.

❖ **Unbalanced Yarn:** Unbalanced yarns will twist and retwist in the opposite direction.

Smooth fabrics require balanced yarns, but for crepe and textured effects, unbalanced yarns are frequently used.

❖ **Direction of twist**

The direction of twist is described as S – twist and Z – twist.

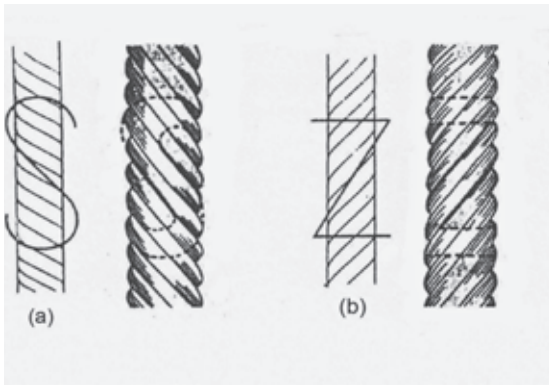


Diagram 5.1 Direction of twist

- **'S' Twist:** A yarn has S – twist if, when held in a vertical position, the spiral conform to the direction of slope of the central portion of the letter 'S'.
- **'Z' Twist:** A yarn has Z – twist if the direction of spirals conforms to the slope of the central portion of the letter 'Z'.

5.3 YARN NUMBER

Yarn number is a measure of linear density. To some extent the yarn number is an indication of diameter when yarns of the same fiber content are compared. Yarn Number is frequently called yarn count in the indirect system, where as in the direct system it is referred to as Denier.

❖ COUNT [INDIRCT SYSTEM]

Spun yarn size is expressed in terms of length per unit weight. It is called indirect system of yarn numbering because **finer the yarn larger is the number.**

The count is based on the number of hanks (1 hank is 840 yards) in 1 pound of yarn in cotton system. Cotton sewing threads provide an example of yarn number. The most commonly used mercerized thread is number 50. No. 60 thread is suitable of finer fabrics while No. 40 thread for heavier fabrics like denim. drill; and number 8, 16, 20 thread for making buttonholes or for sewing on buttons.

The woolen and worsted system are similar to the cotton system, except that hanks are of different lengths.

Woollen hank – 300 yards

Worsted hank – 560 yards

Table No. 5.3

Cotton System.

Number or count of spun yarn	Length (Hank – yards)	Weight (Pounds)
No. 1	1 (840 yards)	1
No. 2	2 (1680 yards)	1
No. 10	10 (8400 yards)	1

In the above example yarn count no. 1 will be thicker than yarn count 10. Cotton thread for daily use have a count of 50. For stitching thin fabrics, a yarn with count of 60 is more suitable. For thick fabrics like denim, Khaki, drill etc. a yarn count of 40 is more suitable.

❖ DENIER – [DIRECT SYSTEM]

The size of both filament fibers and filament yarns expressed in terms of weight per unit length – denier. In this system, the unit of length remains constant. The numbering system is direct because **finer the yarn, the smaller is the number.**

Table No. 5.4

Filament Yarns size

Denier	Length	weight
1	9000 meters	1 gram
2	9000 meters	2 grams
3	9000 meters	3 grams

Filament yarns are made in a specific denier for certain end uses. For example.

Yarn denier and uses.

Yarn denier	Uses
20	sheer hosiery
40 – 70	Blouses, shirt Support hosiery
140 – 520	Outerwear
520 – 840	Upholstery
1040	Carpets, knitting yarns

Internet my friend!

Find out information on contribution of khadi in India's freedom struggle.

5.4 CLASSIFICATION OF YARNS

Yarns are classified into two basic groups as Simple yarns and Novelty yarns.

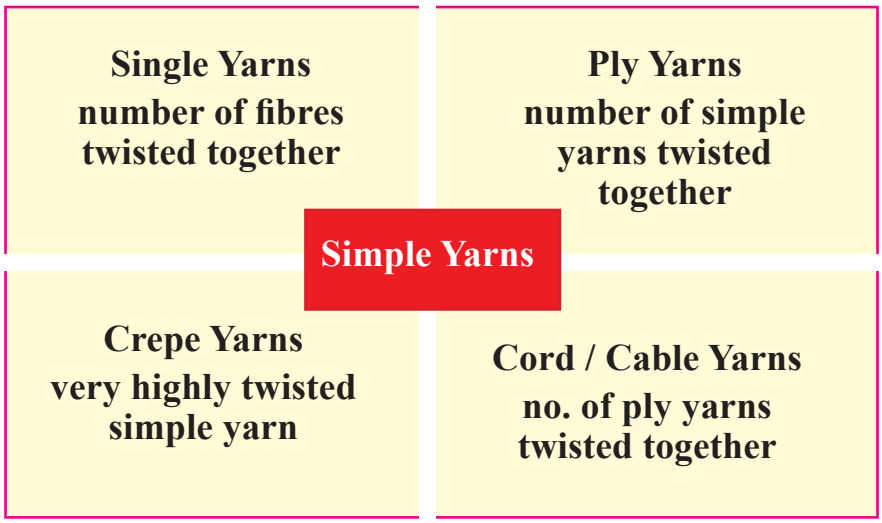
Table No. 5.5

Classification of Yarns

Yarns

Simple Yarns	Novelty Yarns
• Single yarn	• Slub yarn
• Ply yarn	• Flock yarn
• Cord or cable yarn	• Boucle Yarn
• Crepe Yarn	• Nub (spot) and yarn Knot (knop) yarn
	• Chenille yarn

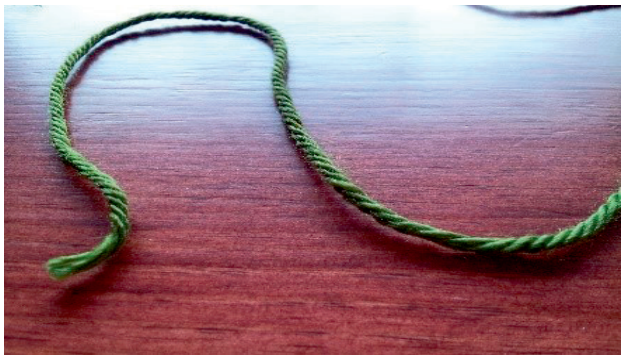
Chart no. 5.6 Types of Simple yarns



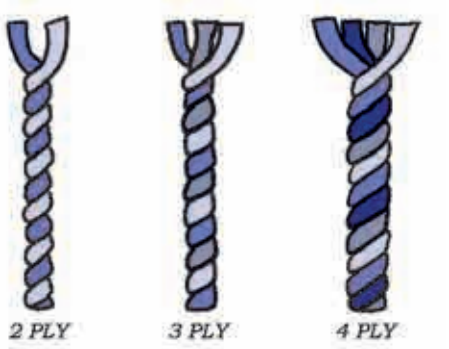
I. SIMPLE YARNS

- Yarns that are even in size, have an equal number of turns or twist per inch throughout their length and are relatively smooth and uniform are called simple yarns.
- **Simple Yarns:** A single is the most basic assemblage of fibres – either staple or filament – suitable for operations involved in making fabrics. When a single yarn is untwisted it will break apart into the individual fibres from which it has been made.
- **Ply Yarns:** A ply yarn is made by twisting or more single yarns. In the naming of ply yarn. Especially a simple ply, the number of singles used precedes the word ply. For example, if two singles are use, the resulting yarn is called two ply; if four singles are use. It is four ply.

Single Yarns



Ply Yarns



Cord Yarns

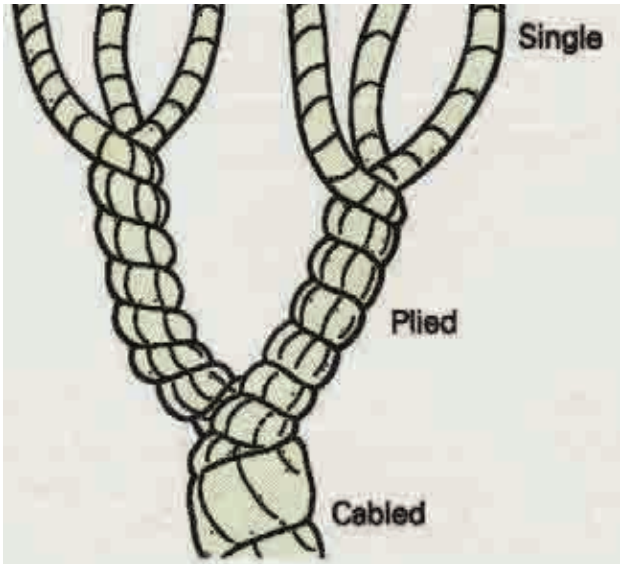


Diagram No. 5.1 Simple Yarn, Ply Yarn and Cable Yarn

- **Cord/Cable Yarns:** Cord or cable yarns consist of two or more ply yarns twisted together. In identifying a cord. One must indicate the number of plies, in the cord. Thus a 'two, four ply cord' indicates that each ply is made up of four singles and that two of these four ply yarns have been combined to make the cord.
- **Crepe Yarns:** Crepe yarns are variation of simple yarns. However, a crepe yarn possesses a high degree of twist, so that yarn tends to kink. This kinkiness results in the rough texture.

USES OF SIMPLE YARNS

Simple yarn tends to produce smooth flat fabrics which are usually considered durable and easy to maintain. These yarns are mainly suitable for fabrics of apparel use.

II. NOVELTY YARNS

Complex or novelty yarns are primarily for their appearance value. They differ from

the simple yarns in that their structure is characterized by irregularities in size, twist and effect. They are called fancy or novelty yarns, because they lend an interesting or novel effect to fabrics made with them. They create textural variations in the fabric.

❖ Characteristics of Novelty Yarns

- Novelty yarns are usually plied yarns but they are not used to add strength to the fabric.
- If novelty yarns are used in one direction only, they are usually in the filling direction. They are more economical in that direction and are subjected to less strain and are easier to very for design purpose.
- Novelty yarn effects are permanent.
- Novelty yarns that are loose and bulky give crease resistance of the fabric, but they make the fabric spongy and hard to sew.
- Generally, the smaller the novelty effects, the more durable fabric is, since the yarns are less affected by the abrasion.

❖ Basic structure of Novelty Yarns

Complex ply yarns are usually of the following parts.

- Base Yarn
- Effect Yarn
- Binder Yarn

The base yarn controls the length and the stability of the end product. The effect yarn forms the design or effect. The tie or binder yarn holds the effect yarn so that it will remain in position using use and care of the product.

Most complex yarn are either single or ply; occasionally a cord in use in complicated novelty yarns.

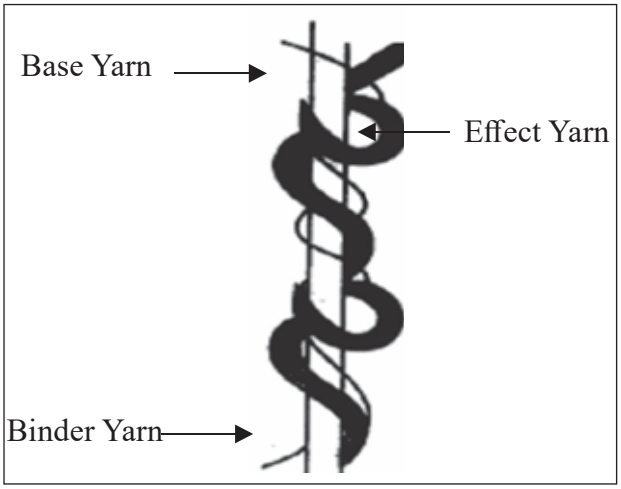
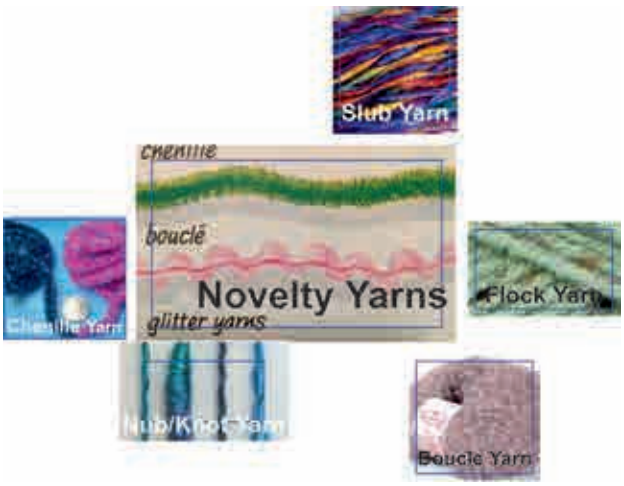


Diagram 5.3 Basic Structure of Novelty Yarns

Chart 5.7 : Types of novelty YarnS



❖ Slub Yarn

In the single slub yarn the yarn is left untwisted or slackly twisted in irregular intervals in order to produce soft bulky sections. This yarn is found in selected knitting yarns.

Pic. No. 5.2 Slub Yarns

Pic No. 5.3 Flock Yarns

- **Flock Yarns:** Flock yarns, frequently called as flake yarns are usually single yarns in which small tufts for fibre are inserted at irregular intervals and held in place by the twist of the base yarn. These tufts may be round or elongated. These tufts are not permanent and can come out after repeated use. Flock yarn is used for effects in suiting and dress fabric.

- **Boucle Yarns:** Boucle yarns are characterized by tight loops projecting form the body of the yarn at fairly regular intervals. These yarns are of three ply construction. The effect yarn that forms the loop is wrapped around a base yarn and then the binder and tie yarn holds the loop in position. These are used to give textured effected to coating dress fabrics. The yarn is also available to consumer for hand knitting. These yarns are soft to touch and give irregular texture to fabric.

Pic. No. 5.4 Boucle Yarn

Pic. 5.5 Boucle Yarns

- **Nub (spot) and knot (knob) yarns:** The terms nub, spot, knot, knob are often used interchangeably; however there are minor differences. In nub or spot yarn the base yarn is held almost stationary while the effect yarn is wrapped around it several times to build up an enlarged segment. The nub is so secured that no binder is required. The knot or knob yarn is produced in much the same way except that brightly coloured fibres are frequently added to the enlarged knot.

Pic. No. 5.6 Nub Yarn

Pic. No. 5.7 Knot Yarn

- **Chenille Yarns:** Chenille Yarn created special effect in fabric and in chenille rugs. The yarn resemble a hairy caterpillar- "Chenille" is French for caterpillar. This yarn is then used a filling in chenille fabrics of warm clothing.

Pic. No. 5.8 Muffler of chenille yarn

Pic. No. 5.9 Chenille Yarns

Let's do this

Make a list - where yarns are used for household & other miscellaneous uses in your house.

❖ Uses of Novelty Yarns

Complex or novelty yarns add texture and design to a fabric and are valued for their appearance. However there may be problem in comfort, maintainers and durability. Some complex yarns are rough and harsh. So they many actually be uncomfortable in wearing apparel. On the other hand, many loop yarn are pleasant to touch and they increase warmth making them ideal for sweaters or fabrics where warmth is a desirable property. The rough surface of many novelty yarns and their irregular twists and loop that characterise these yarns may cause them to snag easily and the abrasion resistance is reduced.

Although complex yarns usually require careful handling. They are often selected for their appearances regardless of problems that they might create to the consumer. These yarns are mainly used in fabrics for home decoration such as curtains, upholstery, carpets. They also add interesting textural effects in suiting and coating fabrics and are also popular in knitted fabrics.

Table No. 5.6

Comparison of simple and Novelty Yarns

Simple Yarns		Novelty Yarns	
1.	Usually Smooth in appearance.	1.	Structure is charaterised by irregularities
2.	Used in fabric for functional value.	2.	Used in fabric for appearance value.
3.	Generally more durable.	3.	Generally less durable.

EXERCISE

Objective Type Questions

I. Match the pairs.

A		B	
1.	Slub yarn	a)	Enlarge segment
2.	Chenille yarn	b)	High twist
3.	Boucle yarn	c)	Hairy caterpillar
4.	Nub yarn	d)	Fine texture
5.	Crepe yarn	e)	Loops
		f)	Uneven twist
		g)	Even surface

II. State whether the following sentences are true or false.

1) Unbalanced yarns are those in which yarn will hang in loop without kinking.
2) Direct system of yarn numbering is used for filament yarn.
3) Generally, higher the twist, weaker the yarn.
4) High twist yarns are soft and warm.
5) Yarn count is indirect system of yarn numbering.
6) Denier is direct system of yarn numbering.

III. Select and write the most appropriate answer form the given alternatives for each sub question.

1) Yarns composed of staple fibres are called as
   a) Filament yarn b) Spun yarn c) Fancy yarn
2) A filament yarn is composed of
   a) Curly fibres b) Long fibres c) Short fibres
3) Appearances of a filament yarn is
   a) Smooth b) Fuzzy c) Rough
4) High twisted yarn are more
   a) Elastic b) Soft c) Warm
5) Low twisted yarns are
   a) Stronger b) Weaker c) Finer

IV. Circle the odd word

1 a) crepe b) slub c) ply d) single e) Cord

2 a) Chenille b) Flock c) Crepe d) Boucle e) Nub

SHORT ANSWER TYPE QUESTIONS

I. Answer the following.

1) What is spun yarn?
2) What is filament yarn?
3) Write the names of two Novelty yarns.
4) Write the names of two simple yarns.
5) Describe boucle yarn.

II. Define the following terms.

1) Yarn 2) Yarn twist

III. Draw diagrams of the following.

1) S and Z twist
2) Basic structure of novelty yarn.

IV. Differentiate between.

1) Simple yarn and novelty yarn.
2) Low twist yarn and high twist yarn

V. Write short notes.

1) Yarn twist
2) Describe basic construction of novelty yarn with diagram.
3) Three Characteristics of novelty yarns.

VI. Give reasons.

1) Spun yarns are fuzzy in texture.
2) Filament yarns are smooth in texture.
3) Low twisted yarns are less durable.
4) Novelty yarns required careful handling.

LONG ANSWER TYPE QUESTIONS

1) Classify the yarns. Describe Slub, boucle, chenille yarn.
2) Describe various simple yarns and write their uses.
3) Explain 'count' of a yarn.
4) Explain 'Denier' of a yarn.

SELF STUDY/PROJECT

- Collect khadi fabric samples and identify the novelty yarns used in it.
- Collect novelty yarn sample found in apparel & household fabrics and observe the novelty effect.