# Jute

## General information

### Overview

Jute is a long, soft, shiny vegetable fiber made from plants in the genus Corchorus, family Malvaceae. Like kenaf, industrial hemp, flax (linen) and ramie, jute is a bast fiber plant, one in which the fibers extracted from the stem or bast. Jute is one of the cheapest natural fibers and is second only to cotton in amount produced and variety of uses. It can be spun into coarse, strong threads. When woven it is called hessian or burlap. There is growing interest in using jute as reinforcement in composites, replacing glass.

### Designation

Jute

### Typical uses

Jute is used chiefly to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. The fibers are also woven into curtains, chair coverings, carpets, area rugs, hessian cloth, and backing for linoleum.

## Composition overview

### Compositional summary

Jute fibers are composed primarily of cellulose and lignin

| | | | | |
|---|---|---|---|---|
| Form | | Fiber | | |
| Material family | | Natural | | |
| Base material | | Cellulose | | |
| Renewable content | | 100 | | % |

## Composition detail (polymers and natural materials)

| | | | | |
|---|---|---|---|---|
| Natural material | | 100 | | % |

## Price

| | | | | | |
|---|---|---|---|---|---|
| Price | * | 0.159 | - | 0.68 | USD/lb |

## Physical properties

| | | | | | |
|---|---|---|---|---|---|
| Density | | 0.047 | - | 0.0542 | lb/in^3 |

## Mechanical properties

| | | | | | |
|---|---|---|---|---|---|
| Young's modulus | | 1.89 | - | 8.7 | 10^6 psi |
| Yield strength (elastic limit) | | 21 | - | 76.9 | ksi |
| Tensile strength | | 34.7 | - | 125 | ksi |
| Elongation | | 1.16 | - | 1.8 | % strain |
| Flexural modulus | * | 1.89 | - | 8.7 | 10^6 psi |
| Shear modulus | * | 1.88 | - | 3.23 | 10^6 psi |
| Poisson's ratio | * | 0.343 | - | 0.357 | |
| Shape factor | | 1 | | | |
| Fatigue strength at 10^7 cycles | * | 23.2 | - | 49.9 | ksi |
| Mechanical loss coefficient (tan delta) | * | 0.00226 | - | 0.00325 | |

## Impact & fracture properties

| | | | | |
|---|---|---|---|---|
| Fracture toughness | 0.638 | - | 14.6 | ksi.in^0.5 |

## Thermal properties

| | | | | |
|---|---|---|---|---|
| Glass temperature | * 716 | - | 734 | °F |
| Maximum service temperature | * 752 | - | 788 | °F |
| Thermal conductivity | * 0.144 | - | 0.202 | BTU.ft/hr.ft^2.°F |
| Specific heat capacity | 0.287 | - | 0.291 | BTU/lb.°F |
| Thermal expansion coefficient | * 8.33 | - | 16.7 | µstrain/°F |

## Magnetic properties

| | |
|---|---|
| Magnetic type | Non-magnetic |

## Optical properties

| | |
|---|---|
| Transparency | Opaque |

## Absorption & permeability

| | | | | |
|---|---|---|---|---|
| Water absorption @ 24 hrs | * 2.2 | - | 2.6 | % |
| Water absorption @ sat | 11 | - | 13 | % |
| Humidity absorption @ sat | * 3.67 | - | 4.33 | % |

## Durability

| | |
|---|---|
| Water (fresh) | Acceptable |
| Water (salt) | Limited use |
| Weak acids | Limited use |
| Strong acids | Unacceptable |
| Weak alkalis | Limited use |
| Strong alkalis | Unacceptable |
| Organic solvents | Acceptable |
| Oxidation at 500C | Unacceptable |
| UV radiation (sunlight) | Good |
| Flammability | Highly flammable |

## Primary production energy, CO2 and water

| | | | | |
|---|---|---|---|---|
| Embodied energy, primary production | 2.74e4 | - | 3.02e4 | BTU/lb |
| Sources<br>61.9 MJ/kg (Ecoinvent v2.2); 72 MJ/kg (Ecoinvent v2.2) | | | | |
| CO2 footprint, primary production | 2.69 | - | 2.96 | lb/lb |
| Sources<br>2.58 kg/kg (Ecoinvent v2.2); 3.06 kg/kg (Ecoinvent | | | | |
| Water usage | * 7.06e4 | - | 7.81e4 | in^3/lb |

## Processing energy, CO2 footprint & water

| | | | | |
|---|---|---|---|---|
| Fabric production energy | * 1.07e3 | - | 1.17e3 | BTU/lb |
| Fabric production CO2 | * 0.198 | - | 0.218 | lb/lb |
| Fabric production water | * 28.5 | - | 42.9 | in^3/lb |

## Recycling and end of life

| | | | | |
|---|---|---|---|---|
| Recycle | ✗ | | | |
| Recycle fraction in current supply | 8.55 | - | 9.45 | % |
| Downcycle | ✓ | | | |
| Combust for energy recovery | ✓ | | | |
| Heat of combustion (net) | * 7.25e3 | - | 7.61e3 | BTU/lb |
| Combustion CO2 | * 1.39 | - | 1.46 | lb/lb |
| Landfill | ✓ | | | |
| Biodegrade | ✓ | | | |

## Links

ProcessUniverse

Reference

Shape