The Utilization of Cotton Byproducts as Oil, Animal Feed, Bioenergy, Biochar and Linters.

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Managing Director - Gimatex Industries Pvt. Ltd.
President - Indian Spinners Association
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Cotton Production & by Country Worldwide

- Leading Cotton Producing Countries Worldwide
- Total Production – 22871 (Production in thousand MT)
- Cotton Production (33%) – 7776.14 (Thousand MT)
- Seed Production (66%) – 15094.86 (Thousand MT)
Cottonseed Products and Their Many Uses

Take a look at the chart below and discover how cottonseed touches your family’s life everyday.

As the second leading producer of cotton, the United States accounts for 20% of world production of cottonseed.
Bioenergy Products from Cottonstalks

- Briquettes
- Pellets
- Mushroom
- Charcoal
Cotton Linters

After employing the Ginning process for recovery of lint from cotton seed, a certain amount of fuzz (very short fibres unsuitable for spinning) remains on the cotton seeds. This fuzz is known as cotton linters and are removed in de-linting machines.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>10% Max</td>
</tr>
<tr>
<td>Ash Content</td>
<td>1.5% Max</td>
</tr>
<tr>
<td>Trash Content</td>
<td>2% Max</td>
</tr>
<tr>
<td>Alfa Cellulose</td>
<td>75-85% Max</td>
</tr>
</tbody>
</table>

Packaging: Bales of 165KG.
Bale Cover – Cotton bags
Bale Strip- Available in PP Strap/ Gi Wire/MS Strip
LINTER APPLICATION

BLEACHED LINTERS
Used For Medical Grade Cotton

PAPER & PULP
Used For Being Rich In Alpha Cellulose

TEXTILES
Used For Nonwoven Fabrics

CELLULOSE ACETATES
Used In Paints, Lacquers & Films

CELLULOSE ETHER

NITRO CELLULOSE

REGENERATED CELLULOSE
Used For Manufacturing Textile Fiber.
**Cotton Seed Hulls**

Cottonseed hulls are the outer coverings of cotton seeds and are made up of Ligno Cellulosic material.

**PARAMETER**          **RESULT**  
Protein                5% Min  
Fiber (Crude)          40-45%   
Moisture               12% Max  
Oil Content            1-1.5%   
Sand & Silica          1% Max   
Nitrogen               6.25%    

Packaging: Available in Compact Hull Packing (20-40Kg) and Loose Bagging in HDPE PP Bags (35-40Kg)
CATTLE FEED: To Be Mixed With Regular Feed
MUSHROOM FARMING: Used As A Substrate
OIL DRILLING: To Be Used In Mud
FURFURAL PRODUCTION: Used As A Raw Material
DE-OILED CAKE: To Be Mixed With Cotton Seeds
Cottonseed Refined Oil

Cottonseed oil is a cooking oil extracted from the seeds of cotton plants of various species, mainly Gossypium hirsutum and Gossypium herbaceum, that are grown for cotton fiber, animal feed and oil.

**Parameter** | **Result**
--- | ---
FFA | 0.02-0.08
Moisture | 0.05 Max
Iodine Value | 101-110
Peroxide Value | 0.2-0.8
T.B.H.Q | Positive
Odour | Odourless
**BENEFITS**

- High smoke point & low calorie absorption.
  - **FRY KING**
- High % of unsaturated fatty acids makes it a healthy choice.
  - **NATURALLY HYDROGENATED**
- High level of antioxidant preserves freshness and gives longer shelf life.
  - **α - TOCOPHEROL**

**NEUTRAL TASTE**
Tastes like whichever ingredient it's added to.

**VITAMIN E**
Fights free radicals & is essential for good health.

**CHOLESTEROL FREE**
Being extracted from plants, helps reduce cholesterol level.

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### Tocopherol Content In Various Edible Oils

<table>
<thead>
<tr>
<th>Oil Crop</th>
<th>Total (mg/100g)</th>
<th>Contents (mg/100g)</th>
<th>α Tocopherol equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>66</td>
<td>19</td>
<td>43</td>
</tr>
<tr>
<td>Corn</td>
<td>104</td>
<td>26</td>
<td>75</td>
</tr>
<tr>
<td>Cottonseed</td>
<td>65</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Olive</td>
<td>13</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Palm</td>
<td>26</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Peanut</td>
<td>13</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>67</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Soyabean</td>
<td>104</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>Sunflower</td>
<td>65</td>
<td>62</td>
<td>3</td>
</tr>
</tbody>
</table>

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**OIL APPLICATION**

- **COOKING**
- **FRYING**
- **SAUTEING**
- **SALAD DRESSING**

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₹5 Per Tin Of Oil Is Spent On The Welfare Of The Cotton Farmers.
BENEFITS of Cotton Seed Oil

Cardiovascular Benefits
This all-purpose Vitamin E rich oil helps blood vessels to repair themselves, and slows the progression of cardiovascular disease.

Helps Prevent Cancers
The antioxidant levels found in cotton seed oil help to safeguard the human body from cancers.

Prevents Early Ageing
Due to the rich Vitamin E content in the oil, it’s one of the most effective oils to prevent the signs of aging.

Cotton seed oil helps to protect and fight free radicals that harm skin.

Skin Benefits

Memory and Cognition Benefits
The nutrients found in cotton seed oil contribute to a healthy brain & great nerve function.

Helps in Regulating Weight
The higher nutrition content in Cotton seed oil has been seen to enhance weight loss as it does not contain trans fats which are difficult for the body to burn.

Reduces Inflammation
Mono unsaturated fats have been proven to reduce inflammation throughout the body.
# Why Cotton Seed Oil?

## 1. ADVANTAGE
- Lighter &
- Better Quality

## General Characteristics of Refined Oil

<table>
<thead>
<tr>
<th>Name of Parameter</th>
<th>Groundnut Oil</th>
<th>Rice bran oil</th>
<th>Soya Refined oil</th>
<th>Cotton seed Refined oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFA</td>
<td>0.77%</td>
<td>0.25%</td>
<td>0.06%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Colour</td>
<td>7.5 unit</td>
<td>13.00 unit</td>
<td>1.4 unit</td>
<td>1.9 unit</td>
</tr>
<tr>
<td>Peroxide Value</td>
<td>1.32 meq/kg</td>
<td>1.5 meq/kg</td>
<td>0.98 meq/kg</td>
<td>0.76 meq/kg</td>
</tr>
<tr>
<td>Density</td>
<td>0.9107 gm/cc</td>
<td>0.9168 gm/cc</td>
<td>0.9166 gm/cc</td>
<td>0.9158 gm/cc</td>
</tr>
</tbody>
</table>

Cotton Seed Oil you get more with every kilo
Why Cotton Seed Oil?

2 ADVANTAGE Smoke point

- SUNFLOWER: 227 Celsius
- SOYA: 232 Celsius
- COTTONSEED: 240 Celsius
- RICE BRAN: 254 Celsius
- GROUND NUT: 232 Celsius

Cotton Seed Oil remains stable at high temperature.
## Why Cotton Seed Oil?

### ADVANTAGE
High shelf life

<table>
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<tr>
<th>Oil Crop</th>
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<th>Contents (mg/100g)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Soyabean</td>
<td>104</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Cottonseed</td>
<td>65</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>Sunflower</td>
<td>65</td>
<td>62</td>
<td>-</td>
</tr>
<tr>
<td>Palm</td>
<td>26</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Olive</td>
<td>13</td>
<td>12</td>
<td>-</td>
</tr>
</tbody>
</table>

Tocopherol Content In Various Edible Oils

*Food Cooked with Cotton Seed Oil remains fresh for longer duration*
Cottonseed Meal

Hi-Protein Gossypol Free Cottonseed Meal 50% & 55% Protein

- Cotton Seed Meal is coarse and a powdered material and is rich in protein. It is produced under hygienic conditions.
- High Protein Gossypol Free cotton seed meal is designed to support the least cost feed formulation customized as per the need of various segments of market without the adverse impact of Gossypol.

A HIGH QUALITY FEED FOR ANIMAL GROWTH

This product has been approved by Director of Poultry Research, Hyderabad by taking trial on Actual Birds (Broiler) under guidance of Dr. S.V.Ramarao. with inclusion up to 15% Cotton Seed Meal.

Free Gossypol - 30 to 40 PPM by liquid chromatography (LC) & 300 to 400 ppm by Spectrophotometer

✓ NON TOXIC AND SAFE

Packing 50 KG PP BAG
## Product Comparison

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Parameter</th>
<th>Normal Cotton DOC (37% protein)</th>
<th>SOYA DOC (46% protein)</th>
<th>Cotton DOC (51% Protein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Protein (%)</td>
<td>37</td>
<td>46%</td>
<td>51</td>
</tr>
<tr>
<td>2</td>
<td>Moisture (%)</td>
<td>10</td>
<td>9 Max</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Oil (%)</td>
<td>7</td>
<td>1.5 Max</td>
<td>1.5 Max</td>
</tr>
<tr>
<td>4</td>
<td>Crude Fibre (%)</td>
<td>12</td>
<td>6 Max</td>
<td>5 Max</td>
</tr>
<tr>
<td>5</td>
<td>Gossypol (%) by Liquid Cromatography</td>
<td>800 ppm</td>
<td>0</td>
<td>40 ppm</td>
</tr>
<tr>
<td>6</td>
<td>Sand &amp; Silica (%)</td>
<td>2</td>
<td>1.0 Max</td>
<td>0.5 Max</td>
</tr>
<tr>
<td>7</td>
<td>Lysine (%)</td>
<td>1.22</td>
<td>2.69</td>
<td>2.42</td>
</tr>
<tr>
<td>8</td>
<td>Methionine +Cystine (%)</td>
<td>0.5</td>
<td>0.98</td>
<td>1.49</td>
</tr>
<tr>
<td>9</td>
<td>Arginine (%)</td>
<td>2.8</td>
<td>2.82</td>
<td>5.87</td>
</tr>
<tr>
<td>10</td>
<td>Total Amino Acid (%)</td>
<td>32</td>
<td>40.94</td>
<td>49.26</td>
</tr>
<tr>
<td>11</td>
<td>Ratio of Amino Acid in Crude Protein (%)</td>
<td>65</td>
<td>91.6</td>
<td>95.6</td>
</tr>
</tbody>
</table>

Cottonseed Meal with its methionine content being 50% higher than soybean meal and its total methionine+cystine content being also 150% as soybean meal.
Hi-Protein Cottonseed Meal (50% and 55% Protein)

**Cattle Feed**
- Very high rumen Bypass protein digestibility >50% after 48 hrs.
- Feed mixed with SBM gives lower feed cost and much better feed quality parameters
- Increased milk yield and milk fat due to high protein & energy content
- Gossypol free meal adds to further growth & life of Cattles
- Ideal replacement for Cotton seed cake which has high Oil and low protein

**Aqua Feed**
- Very high protein > 52% & very low fibre content < 5% results in high growth feed mix
- Granular powdered form becomes much more palatable when mixed with other materials
- Palatability of Cotton Seed meal is appreciable compared to other plant ingredients and is very rich in Arginine
- Good Amino Acid profile with high Lysine, Methionine & Cystine ensures additional supplementation is significantly reduced
- Less Gossypol results in reduction of Iron Salts which disturbs Immune balance & supports growth of harmful microbes.

**Poultry Feed**
- Presence of high Lysine >2.3% along with Methionine+Cystine >1.5% reduces the feed mixing cost
- Gossypol removal results in harmless feed mix having no toxicity effect with better survival rate
- High Digestibility results in good body weight gain and growth due to better feed conversion rate
- No Egg yolk discoloration & increase in Egg weight due to toxicity of Gossypol
- Improved Quality, fertility & hatchability of Eggs
- Good amino acid profile results in balanced diet when mixed in right proportion with Soyabean DOC
Reproductive toxicity is seen particularly in males, where gossypol affects sperm motility, inhibits spermatogenesis and depresses sperm counts, disrupts oestrus cycles, pregnancy and early embryo development, particularly in the monogastric species.

Gossypol – Free State & Bound State (Bound Gossypol also becomes free once it consumed while digestion by non ruminants)

Gossypol causes several Patho-physiological effects such as growth reduction, decrease in haemoglobin and reproductive performance. It causes Anorexia & weight Loss.

Signs of gossypol toxicity and its Effect in Feed Industries.

- Laboured breathing and anorexia.
- Acute toxicity has been shown in the heart, lung, liver, and blood cells, resulting in increased erythrocyte fragility.
- Generalised oedema and congestion of lungs and liver, fluid-filled thoracic and peritoneal cavities, and degeneration of heart fibres.
- Reproductive toxicity is seen particularly in males, where gossypol affects sperm motility, inhibits spermatogenesis and depresses sperm counts, disrupts oestrus cycles, pregnancy and early embryo development, particularly in the monogastric species.
Thank You Everyone...