



Introducing
1st Time
in India

Leading the New Direction of Cottonseed Processing



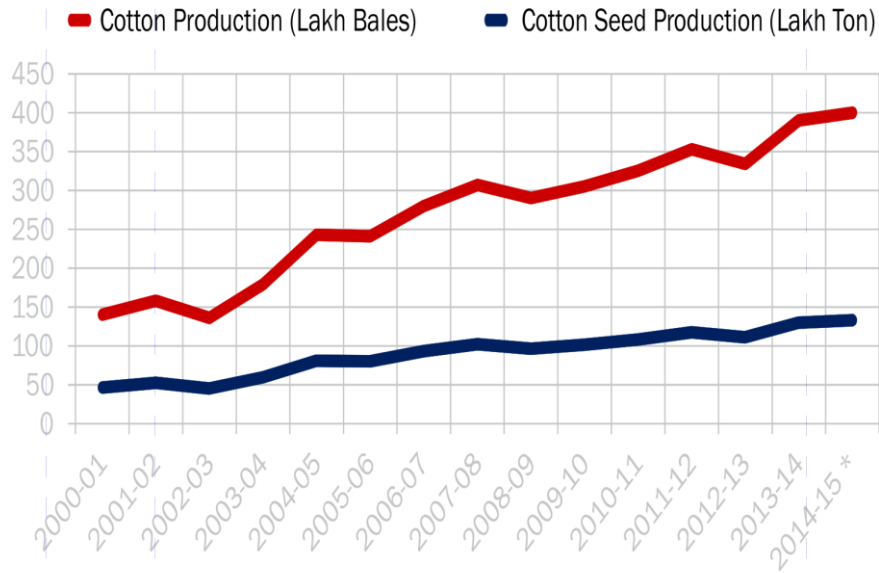
Manufactured By
**CHINA LEADER BIOLOGICAL SCIENCE &
TECHNOLOGY Co. Ltd.**
BEIJING, CHINA



Marketed By
PATEL BROTHERS SERVICES & ENGINEERING Pvt. Ltd.
6, Elphinstone Building, 10 Veer Nariman Road,
Mumbai – 400 001
Tel.No.+91 22 40493939 • Email : patelco@vsnl.com
Contact Details: MR. P N K MENON : +91 9820155832
MR. DEEPAK GOENKA : +91 9822579466
Website : www.pbse.in



ALL INDIA COTTON PRODUCTION



- ❑ As a country India has emerged as the second largest producer of Cotton in the world.
- ❑ Against this backdrop, the processing of cotton seed has assumed significance.

Year	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15 *
Lakh Bales	140	158	136	179	243	241	280	307	290	305	325	353	334	390	400
Cotton Seed Production (@333Kg per Bale) Lakh Ton	46.62	52.61	45.29	59.61	80.92	80.25	93.24	102.23	96.57	101.57	108.23	117.55	111.22	129.87	133.20



Carver Technology & Equipment Pvt. Ltd.
www.carver-india.com



COTTON SEED

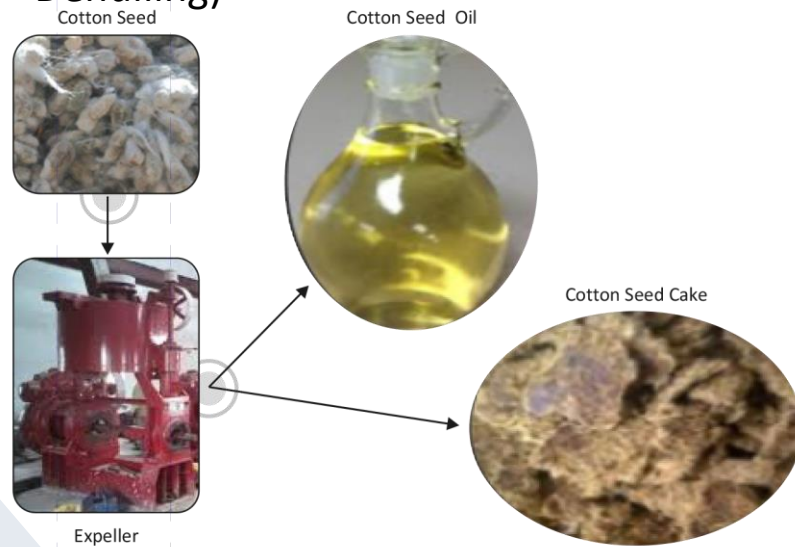
- ❑ It is 63~65% of Cotton Harvested.
- ❑ It is Rich Source of Edible Oil – 18-20%.
- ❑ It can lead to self sufficiency and save foreign exchange.
- ❑ It is Abundant Source of Cattle Feed especially Vegetable Protein.
- ❑ It can be used in Poultry & Aqua feed and replace Soya Meal.
- ❑ It is Best Source for Linter & Cotton Seed Hulls.
- ❑ It has Export Demand and can earn foreign exchange.



TRADITIONAL COTTON SEED PROCESSING

More than 95% of Cotton Seed is presently processed by traditional method.

It involves simple mechanical crushing the seed to produce Oil & Cake. (without undergoing the process of Delinting & Dehulling)

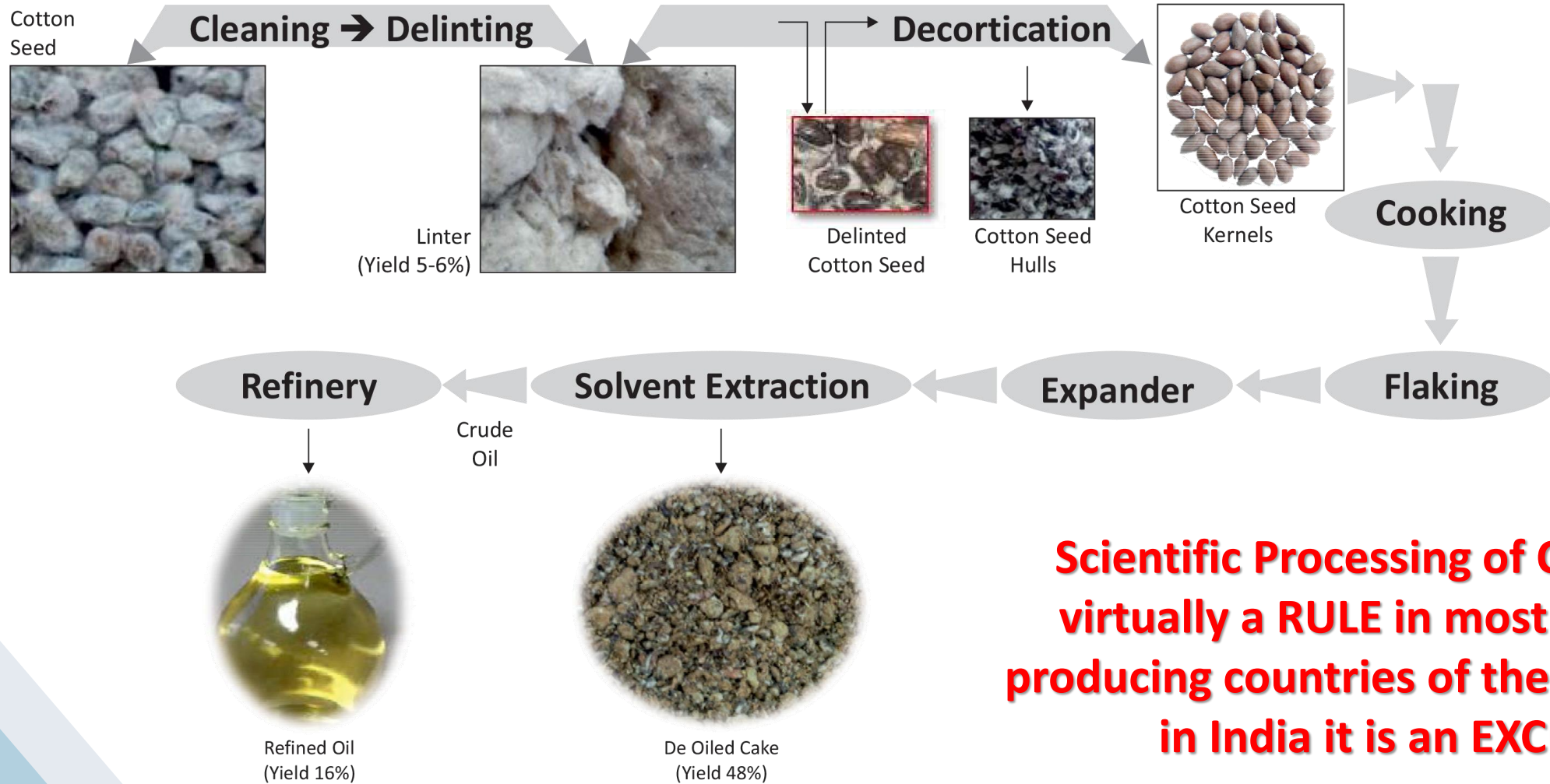


- ❑ The oil cake contains all the **non-nutritional material** i.e; Linter, Hull, Oil & dust etc.
- ❑ Besides the oil cake is **low in protein content**.
- ❑ All the **value added products** gets mixed in the oil cake.
- ❑ This oil cake finds application only to **Dairy Cattles**.
- ❑ There are about **2,000 processing units** in the country.
- ❑ Due to this primitive nature of processing, the **oil yield is low** about 10% of the total volume of seed & 6-7% of oil cannot be extracted, which becomes part of the oil cake.

This is serious limitation of the process.



SCIENTIFIC COTTON SEED PROCESSING



Scientific Processing of Cotton Seed is virtually a RULE in most of the cotton producing countries of the world; whereas in India it is an EXCEPTION..



SCIENTIFIC COTTON SEED PROCESSING - STEPS

Step 1	Cleaning of Seed	For removal of Impurities. Impurities affect quality of Oil and other Products. Cleaning Protects machinery from damage.
Step 2	Delinting	For removal of linters-fuzzy portion left out on outer covering of seed after Ginning.
Step 3	Decortication	For removal of outer covering of seed called Hull. It is necessary since it absorbs the Extracted Oil thereby reducing oil yield.
Step 4	Cooking & Flaking & Expanding	To prepare the kernels to release oil for efficient extraction of oil.
Step 5	Solvent Extraction	Treatment of the kernel+hull with Hexane, to extract oil & produce de-oiled cake.
Step 6	Refinery	It involves washing, degumming, bleaching & de odourisation of Oil to enhance grade.



COTTON SEED BY - PRODUCTS

[A] Cotton Seed Oil :

- ❑ Cotton seed oil contains about 50% essential Poly-unsaturated fatty acid against about 30% in other oil which prevents coronary arteries from hardening. It is one of the few oils in American Heart Association's list of "OK FOOD" Cotton seed oil has a high level of natural antioxidants that contribute to its long fry life and long shelf life.

[B] Cotton Seed Linter's :

- ❑ Even after employing the Ginning Process for recovery of lint from seed cotton , a certain amount of fuzz (very short fibers unsuitable for spinning) remains on the cotton seeds. This fuzz is known as Cotton Linters and are removed in Delinting Machines. These are used in the manufacture of Paper, Absorbent Cotton and Man Made Fibers. These are prized raw material for high grade bond, currency, low grammage tissues and filter paper. Hence have a huge export demand.
- ❑ Bleached cotton linters are being used by our Ordnance Factories for production of propellants, for gun ammunition & also various missiles.



Carver Technology & Equipment Pvt. Ltd.
www.carver-india.com



COTTON SEED BY - PRODUCTS

[C] Cotton Seed Hulls :

- ❑ Hulls are the outer covering of cotton seeds. These are used as roughages in **Cattle Feed**, mixing in special formulation of compound feeds, petroleum drilling operations (mud additive) & mushroom cultivation composts.
- ❑ There is a big demand from India for **Mushroom Cultivation** around the world.

[D] Cotton Seed Meal (D.O.C.) :

- ❑ This is produced as a result of Scientific Cotton Processing. It contains almost negligible oil & has very high by-pass type protein content approx. 38%. This product has huge demand in domestic markets and exports for animal feed industry.
- ❑ Cottonseed meal is the **Most Abundant Plant Protein Feed** after soybean meal. It is a concentrated sources of protein and energy for live stock.

Cotton Seed thus produces as much food for Man and feed for Animals.



Carver Technology & Equipment Pvt. Ltd.
www.carver-india.com



Estimated National Loss due to Traditional Processing of Cotton Seed for 2013-14 & 2014-15*

	2013-14		2014-15	
Production of Cotton Seed (Lakh Ton)	129.87		133.20	
Availability for Scientific Processing 95%	123.38		126.54	
Estimated Losses due to Traditional Processing	Qty (‘000 Ton)	Value (Crore Rs.)	Qty (‘000 Ton)	Value (Crore Rs.)
1) Cotton Seed Oil 6%	740.28	4441.68	759	4555.44
2) Cotton Linter @ 5%	616.90	2159.15	633	2214.45
3) Cotton Hull @ 26%	3207.88	5132.61	3290	5264.06
4) Cotton Meal @ 48% #	5922.24	4145.57	6074	4251.74
		15879		16285

Avg. Price of Oil = Rs. 60 per KG

Avg. Price of Linter = Rs. 35 per KG

Avg. Price of Hull = Rs. 16 per KG

Differential price between Oil Cake & Meal = Rs. 7 per KG

- ❑ Cottonseed is considered as ‘Golden Goose’. It is palpable that Country loses average worth as mentioned every year due to the Traditional Processing of cottonseed. It is therefore, considered essential to shift from Traditional to Scientific Processing of cottonseed in the larger interest of the State and Industry. Alone loss of Edible Oil is HUGE. There is a shortage of vegetable oil. About 50% of our requirement is met through import spending precious foreign exchange. In spite of the heavy imports prices are skyrocketing due to inadequate indigenous production and increasing trend of consumption. Wasting the huge quantity of cottonseed oil from indigenous production in the background of huge import to meet the domestic requirement is a tragic happening which a country like India, can ill-afford.



Carver Technology & Equipment Pvt. Ltd.
www.carver-india.com



Limitations of Cotton Seed De-Oiled Cake (D.O.C.)

The natural presence of Gossypol and less availability of Lysine due to binding of Gossypol with Lysine during Processing - limits the use of Cotton Seed De-Oiled Cake as feed for Poultry & Aqua.

- ❑ Gossypol is a Polyphenolic Binaphthyl Dialdehyde, a yellow pigment present in the entire cotton plant including its seed.
- ❑ Feeding Diets containing Gossypol to animals would cause negative effects such as growth depression, reproductive disease and intestinal and other internal organ abnormalities.
- ❑ The presence of Gossypol decreases the digestibility of Amino Acids during enzymatic digestion and thus reduces the Nutritional Value of Cottonseed Protein.
- ❑ There is an immediate need to find an alternate Protein Supplement in Poultry & Aqua Feed.
- ❑ In India, about 13 million tons of Cottonseed is produced annually and these could be a potential protein source for Poultry & Aqua Feed.

A Step - Ahead

- ❑ We are now introducing in India – Patented and Revolutionary Technology from China.
- ❑ Beyond what is discussed till now, PBSE have introduced Technology for Gossypol Extraction from cotton seed to produce material similar to Soyabean Meal.
- ❑ We can support Indian Cotton Seed Processing to produce feed material of 55% Protein Content and less than 400ppm Gossypol content.
- ❑ This feed material will complement use of Soya bean Meal in Poultry & Aquatic Feed.
- ❑ The Growing Poultry & Aqua Industry in the country shall be highly benefitted from the Domestic Availability of this feed material.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



PRODUCT SPECIFICATION OF DGCSP PRODUCED IN INDIA

CLASS ITEMS	HIGH QUALITY		1ST GRADE		2ND GRADE	
	50 Protien	55 Protein	50 Protien	55 Protein	50 Protien	55 Protein
Crude Protein %	≥50	≥55	≥50	≥55	≥48	≥53
Crude Fiber %	≤7.5	≤6.5	≤8.0	≤7.0	≤9.0	≤8.0
Cruse Ash %	≤7.5	≤7.5	≤8.0	≤8.0	≤9.0	≤9.0
Moisture %	≤7.5	≤7.5	≤8.0	≤8.0	≤9.0	≤9.0
Free Gossypol (1) ppm	≤400	≤400	≤450	≤450	≤500	≤500
Free Gossypol (2) ppm	≤30	≤30	≤40	≤40	≤50	≤50
Lysine %	≥2.4	≥2.65	≥2.25	≥2.45	≥2.1	≥2.35
Methionine + Cystine %	≥1.5	≥1.65	≥1.4	≥1.55	≥1.3	≥1.45
Total Amino Acid %	≥93	≥93	≥90	≥90	≥87	≥87
KOH Solubility %	≥53	≥53	≥50	≥50	≥47	≥47
Aflatoxin B1 (per kilo DCP)	≤50	≤50	≤50	≤50	≤50	≤50
Mould Count (per kilo DCP)	≤50 × 1000	≤50 × 1000	≤50 × 1000	≤50 × 1000	≤50 × 1000	≤50 × 1000
Salmonella	Not to be detected	Not to be detected	Not to be detected	Not to be detected	Not to be detected	Not to be detected
Arsen(as in total arsen)mg/kg	≤10	≤10	≤10	≤10	≤10	≤10
Lead(as pb) mg/kg	≤40	≤40	≤40	≤40	≤40	≤40
Fluorine (as F) mg/kg	≤1000	≤1000	≤1000	≤1000	≤1000	≤1000

DGCSP - Apparent and True Metabolic Energies (Unit : MJ/Kg)

DGCSP

Apparent Metabolic Energy 9.10 ± 0.63
True Metabolic Energy 10.19 ± 0.63

- ❑ Degossypolised Cotton Seed Protein (DGCSP) is produced in various grades in China since two decades – using patented technology Invented by our Technology Partner from China.
- ❑ DGCSP so produced finds wide application in Poultry, Aqua, Pig & Goat feed.
- ❑ Because of High Nutritional features DGCSP is widely recommended by the feed industry.
- ❑ Production of DGCSP in India shall provide concrete solution to feed crisis of the Poultry & Aqua Industry growing at fast pace.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



DEGOSSYPOLIZED COTTONSEED PROTEIN (DGCSP) PRODUCTION PROCESS

FLOW CHART



- ❑ The DGCSP production technology by soaked & repeated degossypolization owned by China-Leader Biotech is the most advanced process in China and the product DGCSP thus produced is of the highest nutritive level in China and most welcomed by feed industry and breeding industry.
- ❑ The process is based on several self-owned invention patents and utility-model patents.



SUMMARY ON THE FEATURES OF DGCSP PRODUCTION PROCESS

- ❑ Low temperature is kept for cottonseed treatment throughout the process so as to avoid protein denaturation to the maximum degree and so as to ensure DGCSP nutritional potency.
- ❑ The powder content of the cottonseed flake from the preparatory section is small, which is well suited for oil extraction and gossypol removal. Optimal Control of the temperatures at Various points in preparatory section could yield product with high level of digestibility and nutrition.
- ❑ Application of one-step oil extraction process for cottonseed and use of drag-chain extractor are suited for spraying extraction of cottonseed flake with low residual oil. The de-oiled wet cottonseed meal was sent to another specialized soaking and repeating extractor and in methanol of low concentration, gossypol, sugar and other anti-nutritional factors are removed. The degossypolization based on soaking in methanol of low concentration (85-90%) makes it possible to thoroughly remove gossypol in short period of time (about 35 minutes) & with little protein denaturation.
- ❑ The above process has successfully overcome the defect of certain process which has to depend on long time soaking in methanol and then drying to avoid worsen testing result of free gossypol. Certain process produces large amount of alcoholic denatured and thermal denatured gossypol and meanwhile amino acid combines with gossypol and other anti-nutritional factors thus decreasing amino acid content in protein and decreasing digestibility.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



SUMMARY ON THE FEATURES OF DGCSP PRODUCTION PROCESS

- ❑ By application of soaking degossypolization process, residual oil in the meal could be further extracted to reduce oil residue in protein to less than 10%. By using methanol of low concentration, gossypol is removed while other anti-nutritional factors could also be removed such as aflatoxin, tannin, phytic acid, and various sugars. The moisture contained in methanol could extract out other water-soluble anti-nutritional factors to further improve nutritive level of the product.
- ❑ By using liquid extractor, the methanol in wet cottonseed meal is removed not only to maximize the decreasing or methanol content in wet meal, to lighten the load of the dryer and to cut down coal consumption but also more importantly, to avoid protein thermal denaturation and alcoholic denaturation to its maximum to produce the product with high amino acid content and with better digestibility.
- ❑ Since the liquid extractor has extruded out most methanol and moisture, only one low-temperature disc dryer is used to get the drying result. By using one-step drying process, the drying time is shortened and protein denaturation is small. In this way, the energy consumption for drying is economized & the nutritional level of DGCSP is maintained.
- ❑ By using the originated humidifier over which the Company own Independent intellectual Property, the residual solvent in cottonseed meal is further recovered to reduce solvent consumption and the moisture content in cottonseed meal is rationally regulated to yield in a cost-effective way a type of DGCSP product with little protein denaturation, high nutritional level and moderate moisture content.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



SUMMARY ON THE FEATURES OF DGCSP PRODUCTION PROCESS

- ❑ The film evaporator is used to recover methanol to avoid liquid overflow in rectifying column so that the process is stabled.
- ❑ The low temperature process makes it possible that pigment is not solidified into DGCSP nor into cottonseed oil. Therefore, the pigment contact is low in crude oil to wholly guarantee oil quality and the color of DGCSP is light yellow or yellow.
- ❑ The whole process of oil extraction , gossypol removal and solvent recovery is under slight negative pressure. Quantitive emission of tail gas under control. A series of measures are taken to ensure the separation and recovery of the solvent to minimize solvent consumption and to further ensure the project to have objective economic benefits.
- ❑ The whole processing system is under automatic control, which makes production more stable and process parameter regulation more accurate and as a result, which achieves the effect of energy saving, consumption decreasing and product quality improvement.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



COTTONSEED PROTEIN

- Cottonseed Protein is a type of quality protein, which is produced by low temperature degossypolization of its raw material cottonseed. It has the features of low fiber content, high metabolic energy and high lysine effective value. Cottonseed protein is a high-grade protein ingredient in animal feed with its free gossypol being equal with or less than 50ppm(HPLC), its crude protein content being above 50% and its ratio of total amino acids to crude protein being as high as more than 95% and in addition, its amino acid composition being very similar to ideal balanced protein pattern. At present, because of several of its nutritive index are better than soybean meal while its price is RMB 100-200 lower than soybean meal per ton, cottonseed protein has been widely used in livestock feed and aquatic feed to partially replace vegetable and animal proteins such as soybean meal, corn protein powder and fish powder. The table on right shows the protein test index of the cottonseed protein produced based on the process developed by China Leader Biological Science & Technology Co. Ltd. Test index of similar products produced by any other processes could not reach up to such level.

Note: EAA/NEAA means Essential Amino Acid / Non Essential Amino Acid

COMPARISON ON AMINO ACID CONTENT AMONG SOYBEAN MEAL/COTTONSEED MEAL & DGCSP

Items	Soybean	Cotton Seed Meal	DGCSP
Lysine (%)	2.69	1.39	2.35
Methionine + Cystine(%)	0.98	0.71 (0.35+ 0.36)	1.49 (0.62+ 0.87)
Arginine (%)	2.82	3.14	5.87
Isoleucine (%)	1.85	0.96	1.68
Leucine (%)	3.16	1.76	2.98
Phenylalanine (%)	2.11	1.5	2.73
Alanine (%)	1.73	1.27	1.99
Threonine (%)	1.69	1.02	1.71
Valine (%)	1.78	1.25	2.16
Aspartate (%)	4.56	2.84	4.70
Serine (%)	1.90	1.18	2.08
Glutamate (%)	8.71	6.64	12.03
Glycine (%)	1.74	1.21	2.14
Tyrosine (%)	1.40	0.78	1.44
Histidine (%)	1.39	1.14	1.90
Proline (%)	2.43	1.59	2.01
Total Amino-Acids (%)	40.94	28.91	49.26
Crude Protein (%)	44.70	40.50	51.50
Portion of Total Amino-Acids in Crude Protein(%)	91.60	71.40	95.60
Digestible Energy of Pig(cal/ g)	3370	2250	3290
Metabolic Energy of Chicken(cal/g)	2390	1860	2420
Dry Matter (%)	89.6	82.9	93.6
EAA/NEAA	1:1.25	1:1.35	1:1.09



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



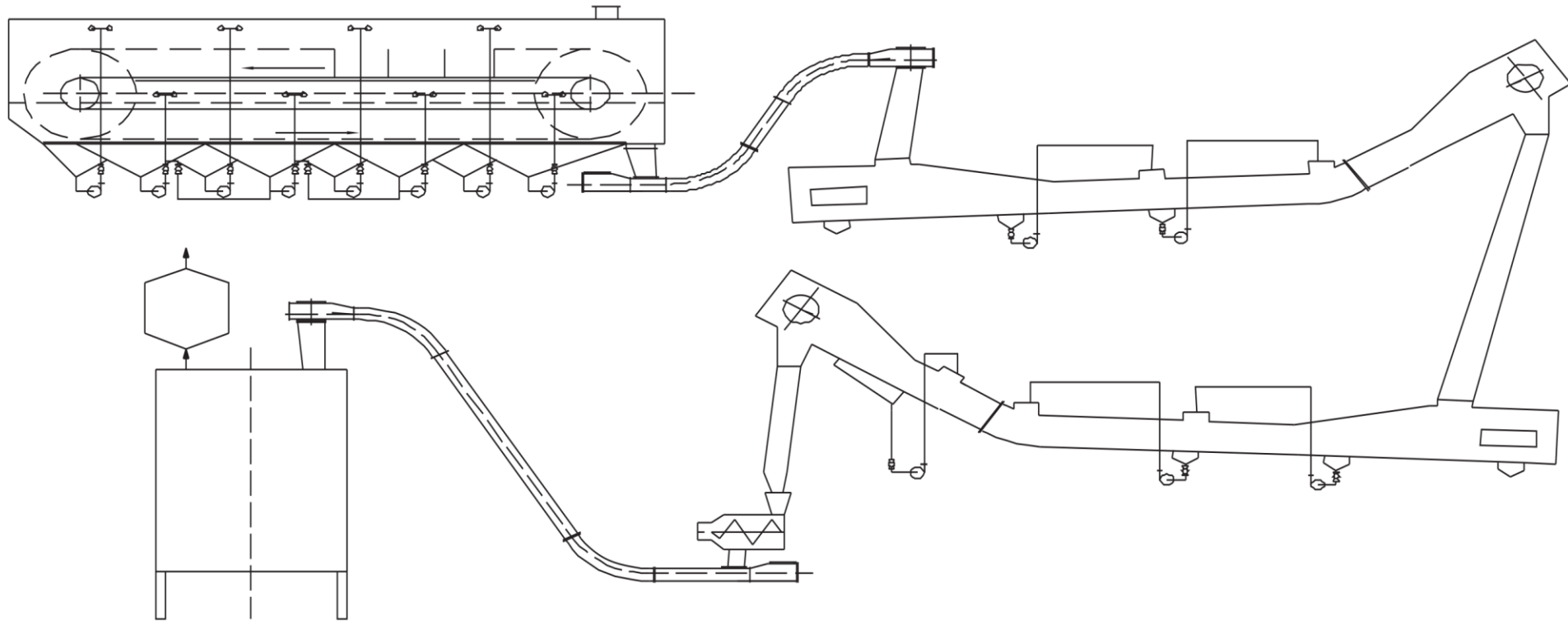
- ❑ By the end of 1960's when he worked for Purina Co., Mr. Rinehart was the first one to apply the method of KOH Protein Solubility for the assessment of suitability in soybean processing and shortly after that, the method was popularized in Brazil. Being easy to learn and with good repeatability and re-productivity, the method was widely adopted by various countries in the world. And it has been applied by Chinese large oil mills as an indispensable test item for each batch of soybean meal.
- ❑ There are big differences on the KOH protein solubility of degossypolized cottonseed protein produced by different processes.

- ❑ KOH Protein Solubility is inversely proportional to thermal denaturation and alcoholic denaturation of degossypolized cottonseed protein:
 1. The higher the protein drying temperature and the longer the protein drying time, the more serious the protein thermal denaturation is, i.e. the lower the protein solubility.
 2. The higher methanol concentration in degossypolization and the longer the degossypolizing time, the more serious protein solubility decreasing is.
- ❑ KOH solubility of degossypolized cottonseed protein is proportional to its amino acid digestibility.



FEATURES OF SOAKED & REPEATED DEGOSSYPOLIZATION PROCESS FOR COTTONSEED PROTEIN

- Oil Extractor of Drag Chain Type Soaked & Repeated Degossypolization with Low Concentration of Methanol in 2 or 3 Extractors Solvent Removal By Extrusion Pressing Lightly Dried, Low Protein Denaturation, 50~55% Protein Content In Final Product



FEATURES OF SOAKED & REPEATED DEGOSSYPOLIZATION PROCESS

- ❑ By using soaked & repeated degossypolization extractor, methanol and cottonseed meal more fully contact each other to result in better degossypolization.
- ❑ Deoiled wet cottonseed meal is washed with big quantity of low concentration and more quantity of anti-nutritional factors and various types of sugar are extracted out to result in over 50% KOH protein solubility, high amino acid content, high digestion rate and higher nutrient level of final product
- ❑ Solvent removal by extrusion pressing decreases drying load, reduces protein denaturation and makes protein KOH solubility equal with or higher than 50%. It could minimize denatured gossypol content to result in high content of amino acid in cottonseed protein in high protein digestion rate.
- ❑ The technology could raise the ratio of material to solvent as to 1 (material) to 2 (solvent).

FEATURES OF SOAKED & REPEATED DEGOSSYPOLIZATION EQUIPMENTS

- ❑ Due to the fact that all oil is extracted by oil extractor, the selected extractor is more than twice bigger than the extractor for the same black cottonseed processing capacity. Besides, our production line uses two sets of such big extractor, one for oil extraction and one for gossypol removal. Consequently, the full set of equipment is more expensive.
- ❑ Oil extraction and gossypol removal use their own specialized extractor to result in low oil residue in the meal, in better degossypolisation effect and more importantly, in removal of large quantity of anti-nutritional factors from the meal together with gossypol removal to ensure high nutrient level of cottonseed protein.



APPROVED AND AUTHORIZED PATENTS



Sr. No.	Patent No./Patent Application No.	Title of Patent	Nature of Patent	Remarks
1	ZL201220504382.8	Structure Improvement on Sealed Crewer Conveyor	Utility Model	Authorization Proclamation Made & Certicate Issued on April 10 th ,2013.
2	ZL201220504339.1	Screw & Barrel Structure of Extruder for Solvent Extracted Material	Utility Model	Authorization Proclamation Made & Certicate Issued on April 10 th ,2013.
3	ZL201220498977.7	Integrated Dual Liquid Phase Extractor	Utility Model	Authorization Proclamation Made & Certicate Issued on April 10 th ,2013.
4	ZL201220504579.1	Solvent Removing Humidifier	Utility Model	Authorization Proclamation Made & Certicate Issued on April 10 th ,2013.
5	ZL201320061047.X	Goswypol Extractor of Multi Cyclic Soaking Type	Utility Model	Authorization Proclamation Made & Certicate Issued on July 17 th ,2013.
6	ZL201320061049.9	Integrated Dryer of Disc Type for Solvent Recovery Based on Its Concentration	Utility Model	Authorization Proclamation Made & Certicate Issued on Aug. 7 th ,2013.
7	ZL201320061058.8	Cottonseed Processing Line Producing Degosypolized Cottonseed Protein by Cold Pressing Pretreatment	Utility Model	2013 Authorization Proclamation Made & Certicate Issued on Aug. 7 th ,2013.
8	ZL201320061048.4	Wholly Soaked & Repeated Reverse Current Extractor	Utility Model	Authorization Proclamation Made & Certicate Issued on Aug. 7 th ,2013.
9	ZL201210483256.3	Cottonseed Treatment Method for Producing Concentrated Degosypolized Protein	Invention	Notified for the payment on license fee on Oct.24 th ,2013.



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



APPROVED AND AUTHORIZED PATENTS

PENDING PATENTS

Sr. No.	Patent No./Patent Application No.	Title of Patent	Nature of Patent	Remarks
1	201210371021.5	Solvent Removing Humidifier	Invention	Patent Application on Sept.29 th , 2012
2	201210365979.3	Integrated Dual Liquid Phase Extractor	Invention	Patent Application on Sept.27 th , 2012
3	201310041870.9	Integrated Dryer of Disc Type for Solvent Recovery Based on Its Concentration	Invention	Patent Application on Feb.24 th , 2013
4	201310041868.1	Wholly Soaked & Repeated Reverse Current Extractor	Invention	Patent Application on Feb.24 th , 2013
5	201310041939.8	Cottonseed Treatment Method & Processing Line for Producing Degossypolized Cottonseed Protein by Cold Pressing Pretreatment	Invention	Patent Application on Feb.24 th , 2013



Patel Brothers Services & Engineering Pvt. Ltd.
China Leader Biological Science & Technology Co. Ltd.
www.pbse.in



PROJECT ACHIEVEMENTS (A)

REAL PHOTOS



PROJECT ACHIEVEMENTS (B)

REAL PHOTOS



(Effect Picture)



FACTORY LAYOUT



PRETREATMENT WORKSHOP

DECORTICATOR



EMBRYO ROLLING, SOFTENING, DRYER / COOLER



SOAKED DEGOSSYPOLIZATION WORKSHOP - OIL EXTRACTOR



SOAKED DEGOSSYPOLIZATION WORKSHOP - GOSSYPOL EXTRACTOR

Capacity Of 300 Tons Black Seeds /day



SOAKED DEGOSSYPOLIZATION WORKSHOP - GOSSYPOL EXTRACTOR

Capacity of 150 Tons Black Seeds /Day



SOAKED DEGOSSYPOLIZATION WORKSHOP – Methanol Recovering Equipment



DEGOSSYPOLIZED COTTONSEED PROTEIN – Pulverizing & Packing Process





Application Degossypolized Cottonseed Protein in Raising Broilers & Laying Hens

中唐瑞德
SINO-LEADER BIOTECH

Dr. PAN Baohai

Feedstuff Research Institute, Chinese Academy of Agriculture Sciences

Removing toxic gossypol from cottonseed during the process of cottonseed oil extraction to make protein resource in cottonseed be applied in a comprehensive and efficient way remains a worldwide technological problem in agricultural products processing industry. In the year of 2000, the R & D team headed by Mr. Wang Yupeng for cottonseed processing and comprehensive use (the now major technical team in China Cotton Leader Biological Science & Technology Co., Ltd., Beijing – Sino-Leader Biotech) successfully solved this difficult problem by developing Degossypolized Cottonseed Production Technology under Liquid –Liquid-Solid Phases which was granted the Chinese patent and filled the gap in the world. In recent years, they developed the Soaking & Repeating Degossypolization Technology for producing Cottonseed Protein which was again granted the Chinese patent and which was further improves the digestibility and nutrition level of degossypolized cotton seed protein. The market price of the degossypolized cotton seed protein produced by this technology could be 1,200 to 1,500 RMB Yuan higher per ton as compared with the cottonseed meal produced in traditional way. The content of toxic gossypol in the degossypolized cottonseed protein meets the requirement on

the edible food level specified by UNFAO. In addition, the quality of protein has substantially improved and the nutritive value stays even with soybean protein. Therefore, degossypolized cottonseed protein can substitute soybean meal and fish meal to be widely used in feed, breeding, pharmaceutical and fermentation industries. After over ten years of effort, more than 40 production lines have been established in China based on this Soaking & Repeating Degossypolization Technology for Producing Cottonseed Protein with a total cottonseed processing capacity being closed to 1,500,000 tons per year. The Production process is as following: black cottonseed is pre-cleaned to remove impurities and then decorticated ~ screening separation of kernel from hull – resulted cottonseed kernel is to go through low temperature softening, pressing, sheeting and drying and then enters into solvent extracting system for oil-the de-oiled wet meal goes to degossypolizing extractor and to be extracted twice by solvent to make the content of gossypol meet the process requirement ~ the solvent – free wet meal is to be dried at low temperature- the final product of cottonseed protein contains less than 0.04% of gossypol and more than 50%of protein.





1) Nutritive Value of Degossypolized Cottonseed Protein

As shown in Table 1 below, the content of all amino acids like lysine, methionine and etc. in degossypolized cottonseed protein is significantly raised up as compared with normal cottonseed meal, among which lysine is 40% higher and methionine + cystine is nearly 50% higher.

When compared with soybean meal, the content of all amino acids except lysine and isoleucine remain even or are higher. When compared with fish meal which has high content of protein and has comparatively speaking balanced amino acids composition, the content of arginine, histidine and phenylalanine in degossypolized cottonseed protein remain even or higher whereas the content of other amino acids are still lower than fish meal.

Table 1 Amino Acid Composition in Cottonseed Meal, Degossypolized Cotton Protein , Soybean Meal and Fish Meal (% Dried Substance)

	Cottonseed Meal	Degossypolized Cottonseed Protein	Soybean Meal	Fish Meal
Arginine	4.59	5.98	2.82	3.82
Histidine	1.1	1.22	1.39	1.59
Isoleucine	1.33	1.56	1.85	2.5
Leucine	2.4	3.12	3.16	4.45
Lysine	1.65	2.61	2.69	4.64
Methionine + Cystine	1.16	1.7	0.98	2.15
Phenylalanine	2.22	2.86	2.11	2.43
Theronine	1.32	1.82	1.69	2.56
Valine	1.88	2.13	1.78	3.02
Crude Protein	41.00	56.14	44.70	62.00





2) Digestibility of Degossypolized Cottonseed Protein

It is shown by the result that the true metabolizable energy of laying hens fed with degossypolized cottonseed protein is 10.19mj/kg, which is higher than normal cottonseed meal (8.49MJ/Kg) and close to normal soybean meal (10.19MJ/kg).

The content of truly digestible amino acid of degossypolized cotton seed protein is better than normal cottonseed meal and stays even with soybean meal(Table2).

Table 2 Digestibility of Degossypolized Cottonseed Protein (50%CP) for Broilers

Items	True Digestibility	Content of Truly Digestible Nutrition
Aspartic acid	86.23	4.2
Threonine	82.53	1.50
Serine	89.73	1.94
Glycine	34.71	1.51
Glutamic acid	89.78	11.11
Alanine	74.36	1.54
Cysteine	91.29	0.86
Valine	80.49	1.84
Methionine	81.93	0.54
Isoleusine	80.08	1.43
Leucine	80.32	2.53
Tyrosine	84.29	1.30
Phenylalanine	86.57	2.45
Lysine	89.56	2.20
Histidine	83.78	1.63
Arginine	93.60	5.59
Proline	79.64	1.70
Tryptophan	85.84	0.75
Average	81.57	-
Energy Mj/Kg	10.19	-





3) Application of Degossypolized Cottonseed Protein In Poultry Feed

Degossypolized cottonseed protein is a raw material very suitable for poultry feed because its methionine is 50% higher than soybean meal and also its total amount of methionine + cysteine is 150% as in soybean meal.

In the trial tests made by Tiankang Technical Development Co. of Xinjiang Province, degossypolized cottonseed protein replaced the soybean in the feed for laying hens by different proportions (0%, 25.3%, 17.9% and 7.5%) to give four formulations of same nutritive level for breeding laying hens. As is shown in the study, laying hens in different groups are all in healthy state and, except in Group II where the taste of egg is slightly worse, the yield, weight and quality of eggs in different groups have no apparent differences whereas the feed costs in the groups using degossypolized cottonseed protein are reduced to different extents (Table 3).

Table 3 Influence of Degossypolized Cottonseed Protein on the Productivity of Laying Hens

	Group I			Group II			Group III			Group IV		
	Egg	Egg	Feed	Egg	Egg	Feed	Egg	Egg	Feed	Egg	Egg	Feed
Age	Yield	Weight	Per	Yield	Weight	Per	Yield	Weight	Per	Yield	Weight	Per
(Week)	(%)	(%)	(g)	(%)	(%)	(g)	(%)	(%)	(g)	(%)	(%)	(g)
38	85.7	61.25	899	85.5	60.2	847	84.6	59.23	880	89.8	59.45	896
39	88.7	61.65	901	86.9	62.3	844	86.1	59.65	882	89.6	60.45	894
40	85.7	62.73	898	90.4	61.1	846	86.2	61.05	884	89.1	61.45	895
41	88.4	62.22	903	91.4	60.0	848	90.4	61.78	885	89.1	60.9	897
42	88.6	62.30	900	90.0	60.5	848	88.8	62.03	883	89.0	62.15	896
43	85.9	62.30	896	88.4	62.7	882	85.7	61.8	868	90.3	61.2	875
Average	87.1	62.1	890	88.7	61.1	853	87	60.92	880	89.5	60.93	891



Wang Ying et al. made an effect evaluation on application of degossypolized cottonseed protein in breeding broiler chicks in the year of 2004. It is shown by the study that when 0%, 5% and 10% of degossypolized cottonseed protein is added in the ration of broiler chicks to replace soybean meal the feed intake and feed –meat ratio of the broilers in the two groups using degossypolized cottonseed protein have no apparent difference as compare with the control group. However, adding degossypolized cottonseed protein could increase the daily weight gain by 2%.

The study made by He Ring et al. in 2003 shows that addition of about 10% degossypolized cottonseed protein in the ration of broiler has no apparent influence on its productivity as compared with soybean meal.

Jia Xihan et al. made trial tests in 2007 on replacing soybean meal by degossypolized cottonseed protein for broiler chicks. The result shows that the additions of degossypolized cottonseed protein in the ration at early and middle stages could be as high as 6% and at late stage, 9% which have no influence on productivity of broilers (table 4)

Table 4
Influence of Degossypolized Cottonseed Protein
on the Productivity of Broilers

	Cottonseed Protein Adding Amount %				
	0	3	6	9	12
Average Daily Weight Gain (g)	21.92 ^a	21.12 ^a	21.91 ^a	21.71 ^a	20.40 ^a
Average Daily Feed Intake (g)	49.92 ^a	49.31 ^a	51.69 ^a	49.99 ^a	49.39 ^a
Feed -Meat Ratio (F/G)	2.28 ^a	2.34 ^{bc}	2.36 ^c	2.31 ^{ab}	2.42 ^d

Remarks: Source of Data from Jia Xihan et al. (2007)

4. Brief Summary

To sum up, due to the reason that the production of degossypolized cottonseed protein is based on Process under Liquid –Liquid-Solid Phases, not only the content of various nutrients is raised up and the content of anti-nutritional factors like gossypol, aflatoxin and tannin is reduced down but also the digestibility of various nutrients is improved. When applied to the feed for broilers and laying hens. degossypolized cottonseed protein could be added in appropriate proportion according to different species and different growth stages, which not only cuts down the feed cost but also brings substantial benefit to poultry farmers.





Thank You !

