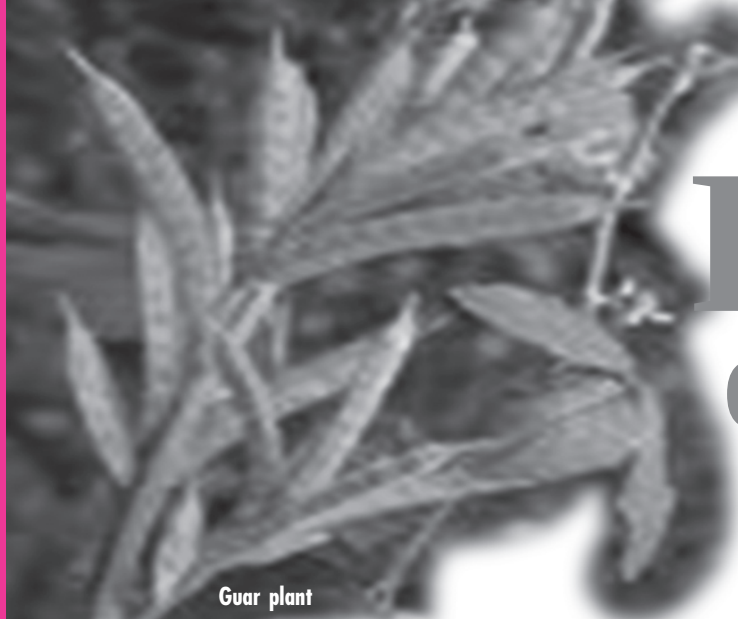




Guar plant

Promise of Guar meal

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GUAR, *Cyamopsis tetragonoloba* (Family Fabaceae), is a drought-tolerant summer annual legume mainly grown in the Northwestern part of the country, which includes the states of Rajasthan, Gujarat, Haryana and Punjab. Other main guar producing countries are Pakistan, U.S.A. and Brazil. India is the single largest producer and exporter of guar gum accounting for more than 80% of the global output and trade.

The country exports over 250000 tons of guar gum. The net worth of Indian export is estimated over Rs 1300 crores. There is a large demand from the petroleum industry and oil drilling industries because relatively at low concentration guar gum gives high viscosity. Guar has now assumed a larger role among the domesticated plants due to its unique functional properties.

Guar gum is one of the best thickening, emulsifying and stabilizing agents. In food industries, guar gum is used as gelling, viscosifying, thickening, clouding and binding agent as well as for stabilization, emulsification, preservation, water retention, and enhancement of water-soluble fibre content.

The by-product of guar gum industry consisting of the outer seed coat and germ material is called guar meal. The guar meal after gum extraction is a potential source of protein and contains about 35 to 47.5% crude protein, which is one and a half times more the level of protein in

guar seed. The protein content in guar meal is well comparable with that of groundnut oil cake.

At lesser concentrations, it is used as a feed for livestock including poultry. Guar meal contains a few deleterious substances as anti-nutritional factors, such as, residual guar gum and trypsin inhibitor, which makes it unfit for full exploitation in the feed industry. Considering its nutritional potential an effort has been made to document the recent research efforts in relation to nutritional quality of guar meal.

Composition of Guar Seed

Guar seed contains splits (29%), a source of guar gum, derived from the ground endosperm of the guar plant. It is primarily the ground endosperm of guar beans. The guar seeds are dehusked, milled and screened to obtain the guar gum. It is typically produced as a free flowing, pale, off-white coloured, coarse to fine ground powder. The nutritional value of guar seed is given in Table 1.

Guar Meal Composition

Guar meal is a 100% natural agricultural product and is rich in protein and carbohydrate suitable for feeding to ruminants and livestock. It is a high-protein by-product produced during extraction of

galactomannan gum from the guar bean. During the extraction process, two fractions are produced (germ and hull). Germ and hull fractions are usually combined to form the marketed product, guar meal.

Guar meal typically comes in two forms: (a) Guar Meal Churi, which is in powder form and (b) Guar Meal Korma in granular form and their average composition is:

	Guar Meal Churi	Guar Meal Korma
Crude protein	38% Min	50% Min
Crude fat	1% Max.	7% Max.
Moisture	10% Max.	8% Max.
Fibre	6% Max.	5% Max.
Sand/Silica	1% Max.	1% Max.

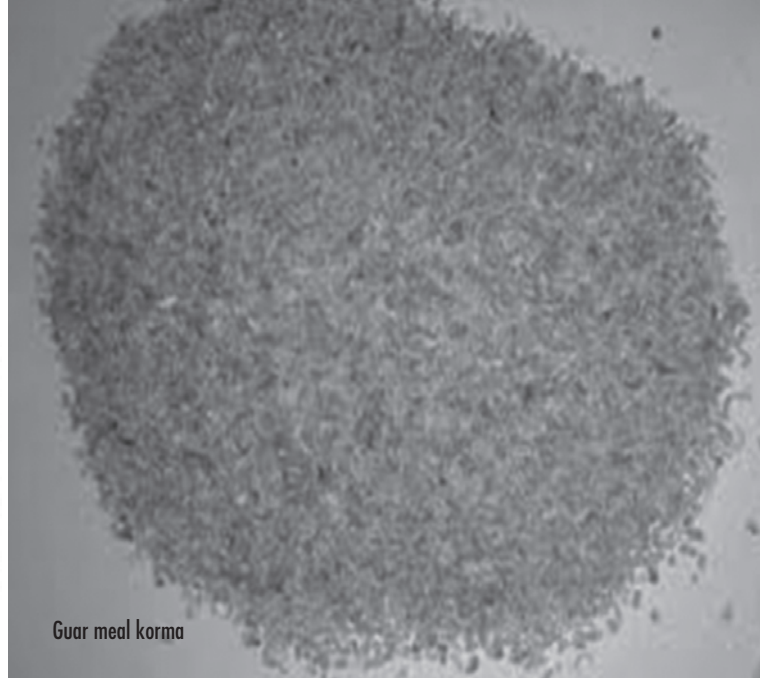
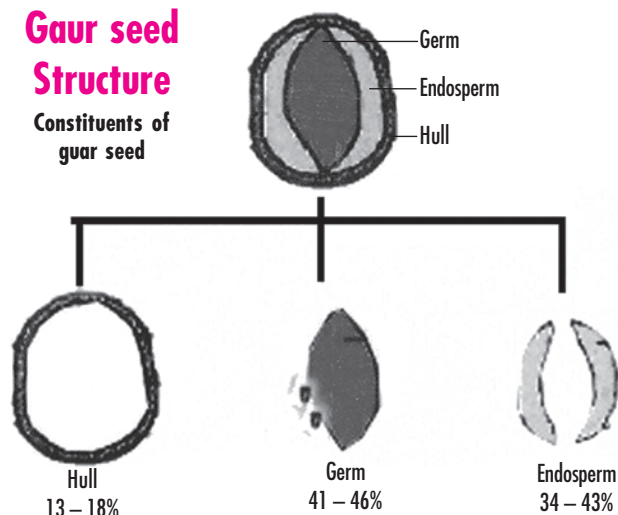
After scrutinizing the earlier reported work, two major parameters, namely, trypsin inhibitor and residual gum, seem to be responsible for imparting the deleterious effects in guar meal.

TABLE 1
NUTRITIONAL VALUE OF GUAR SEED

Part of seed	Protein %	Type of sugar
Hull (13-18%)	5	D-glucose
Endosperm (34-43%)	5	Galactomannan
Germ (41-46%)	55.3	Glucose

Gaur seed Structure

Constituents of guar seed



The presence of several toxic substances as antinutritional factors (ANF) in guar meal contributes a bitter taste to this abundantly available protein-rich by-product and makes it unsuitable as feed for monogastric animals. Excessive concentration of guar meal in poultry diets causes diarrhea, depresses growth rate and increases mortality of broilers and decreases egg production and feed efficiency of laying hens.

A large portion of this meal remains unutilized owing to the presence of several toxic substances like residual gum, polyphenols, lignins, trypsin inhibitor, saponins, total phenols content, some foul-smelling components, possibly organic acids, aldehydes, and cyanogens.

Research work for the determination of toxic components present in guar meal has been reported by several workers in the past. After scrutinizing the earlier reported work, two major parameters, namely, trypsin inhibitor and residual gum, seem to be responsible for imparting the deleterious effects in guar meal.

Trypsin inhibitor was listed as a deleterious factor because the chicks fed guar meal had been reported to present pancreatic hypertrophy, which can also be found in chickens fed un-heated soybean meal. However, the trypsin inhibitor was not universally accepted as a primary factor for the deleterious effects of feeding guar product to poultry.

The trypsin inhibitor activity in guar meal was reported to be significantly lower than in soybean meal commonly used in poultry which indicates that the negative

effects on performance of poultry when fed diets containing guar meal are not likely due to trypsin inhibitor activity. Rather, the effect is found to have been because of residual guar gum.

Removing Anti-nutritional Factors

Plant phytochemicals exhibit diverse pharmacological and biochemical actions when ingested by animals and humans. Most of the toxic and anti-nutrient effects of these compounds in plants could be removed by processing methods such as soaking, germination, boiling, autoclaving, fermentation and genetic manipulation.

The toxic effects of oxalate, phytate and tannins could be avoided, provided the plant food is cooked before consumption. The trypsin inhibitor values were significantly reduced by the above stated methods, with cooking being the most effective. Soaking of the beans overnight reduced the trypsin inhibitor activity (TIA) by 6.3% and cooking of the soaked beans caused further reduction by 66.7%.

A significant decrease in TIA in winged bean after cooking of the presoaked bean has been reported. Reduction in phytic acid content during soaking, cooking or germination has been reported by many investigators for chinese legumes, pea, faba bean, dry bean, lentil and black bean, respectively. It was reported that cooking or autoclaving of *Dolichos lablab* seeds reduced the tannin contents by 70% and 60%, respectively. Germination

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significantly increased *in vitro* protein digestibility of *Dolichos lablab* seeds to 92.27%, whereas roasting and autoclaving significantly decreased it to 85.28% and 86.97%, respectively.

Soaking, cooking of presoaked beans and germination are good potential methods for improving the nutritional value of lablab beans by reducing the antinutritional factors such as trypsin inhibitors and phytic acid. Cooking of legume seeds for 30 minutes also destroyed the anti-nutritional factors such as trypsin inhibitors, haemagglutinins, phytic acids, lectins and goitrogens, thereby improving the nutrient availability for better performance of the bird fed such diets.

Upgrading of guar meal is being initiated at the Indian Institute of Natural Resins and Gums (IINRG), Ranchi through detoxification of anti-nutritional factors present in meal by using heat, enzyme and various chemical treatments for utilizing the same in feed industry.

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