SUMMARY

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The problem of thickening agent is becoming to worry the food manufacturer from both economic and hygenic point of view. In recent years the trend of using organic recourses in food production become persisting popular demand. So, the use of guar Cyamposis tetragonolobal jumb to the surface. The know how, and technique of this gum was still opaque to most manufacturer.

This work was carried out to get aware of the nature of guar, the molecular weight, the method of extract, the processing aspects concerning, agitation, pH, temperature and sequestering agents, and its effect on some products; i.e. jams and juices.

It was found that the hull constitute 14.5% and the germ 44.4% of the seed. The gum content of the whole seed, endosperm content and percentage of gum in endosperm varied 19.1-34.1%, 38.0-49.9%, and 47-68% respectively in 20 samples.

Chemical Composition

Guar seeds showed to be more rich in protein content than other seeds from the same family, i.e., mung beans, faba beans and lentlis. The protein content was 48.9%, 25.0%, 24% and 25% respectively on wet basis.

Also moisure content in guar seeds are more by merly two percent than other seeds (table 1). On other hand the guar seeds show high percentage of crude fat than other seeds and the carbohydrate content showed lower percentage in guar seeds than other seeds; the same table (1).

In addition, the results obtained, regardind the mineral constituents, pointed out that guar gum could be safely used for edible purpose (table 2).

Also, Guar seeds contain all the essential amino acid and its was in high percentage than in the faba, mung and lentlie seed [table (3), Figs 2,3,4,5]

Guar polysaccharide was extracted by using four different methods i.e coldwater & hot water, alkali treatment and with acid, the isolation of this polymer using cold water gave the highest yield (17.5%) (table 4).

The average molecular weight was determined physically by using viscosity measurments and hence its value was 220X10^3 also molecular weight was determined chemically on the basis of the amount of liberated formaldehyde for each anhydroglycose unit using periodate oxidation. According to these results the guar gum has a molecular weight 166X10^3.

The results of periodate oxidation technique indicated that the guar polysaccharide has (1——> 4) glycosidic linkage also has a branched structure with Ca 16.7% of the units in terminal position.

Results obtained from acid hydrolysis, cupper-ammonium and peridoate oxidation suggest the guar polysaccharide to consits of about 171 repeating segments each segment composed of a main chain of manoopykanose (four anhydromannopyranose units) joined by (1——> 4) glycosideic linkages while galacto-pyranose (two anhydrogalactopyranose units) are glycosidically joined to mannopyranose units through B(1——> 6) bonds. At the same time the linkage between the two units of galactopyranose units is B(1——> 4) as shown in Fig. (9).

The pure polysaccharide were identified as D(+) galactopyranose and D(+) mannopyranose in the molar ratio 1:2, while mung beans and faba beans were found to comprise arabinose, glucose, fructose and sucrose. On the other hand, lentils was found to exceed those by ribose and xylose.

Hydration of guar polysaccharide resulted viscous colloidal thixotropic dispersion.

Technological Know How:

The effect of type of agitation on viscosity (Table 7, Fig. 14&15) showed that, a concentration of 1% at 25°C of guar & C.M.C gave a strong relative viscosity (130.9 & 34.1) in slow electric agitation; while pectin and arabic gum of some concentration gave low relative viscosity as it was (1.5) & (1.2) at the same speed.

Slow electric stirrir should high viscosity; while magentic stirrir gace low viscosity for all solutions.

Guar increase the viscosity linerally up to 1%, thereafter guar gum solutions behave as non newtonian solutions; as a result of the complex molecular interactions at higher concentration (Table 8). The linearlity in viscosity with increasing the concentration is not equal in all thickening agents and does not increase parllely in all caés. Guar gum is the most one to response with increasing concentration (5.5, 18.2, 55.9 and 130.9).

The pH of solution was effective on the relative viscosity over of pH range (5&6&7). The viscosity inclined to decrease below pH 4. Carboxymethyl cellulose (C.M.C) followed the same trend, while pectin showed opposite direction as it gave high relative viscosity at pH 3.

Guar from this aspect is more benefit for fruits having pH over 4.

Temperature showed to influences the rate of hydration and development of maximum viscosity. Maximum viscosity was reached at 25°C in guar and C.M.C as it was 130.9 & 34.1. Increasing the temperature to 40&60&100 affected the realtive viscosity as it decrease by increasing the temperature. In case of pectin and arabic gum the increase in temperature did not affect the viscosity as it was stable along the all degrees. So, it could be concluded that maximum viscosity of guar gum dispersion is achieved with temperature of 25–40°C.

The effect of sucrose on viscosity showed that addition of sucrose significntly affected the relative viscosity in the solution. The addition of sucrose to guar solution decreased the viscosity by increasing the sucrose percent. On the other hand, sucrose increase the viscosity with the other thickening agents.

The stored guaran solution develop full viscosity after 10 days. The viscosity increased from 99.8 to 158.2 after 10 days storage.

Industrial Application:

In Jams:

Good results were obtained along strawberry and apricot jam. The concentration of guar gum showed to play important role in thickening the jams. The viscosity in both two jams were found to increase linerally by increasing the guar concentration from 0.5 to 0.7 to 1 g.Kg of the sugar.

Results showed that guar compete sugar for the available water; and the presence of sugar the hydration of the gum.

Results showed that the sugar proportion, i.e, sucrose/fructose ratio impact and interfere in the bodying structure of the jam depending upon the percent of each sugar to the other. The increase in fructose to sucrose lead to a decrease in the viscosity of both

The substitution of sucrose by 60% or 100% fructose could get good results with guar concentration over 0.7-1.0 g/kg of sugar. By this way the problem which restrict the use of higher fructose was over come by substituting guar gum instead of pectin substances which become very expensive and need special condition of pH and sugar concentration to get the need concentrated point.

<u>In juices</u>:

Guar showed to be more effective than other thickening agent to maintain the cloud stability of the orange juice. The cloud retention was proportionally lineared with the guar concentration, juice transmission at 1% guar concentration was less than at concentration of 0.7% and subsequently at 0.5%. The stability of orange juice was more promises with guar than C.M.C at the same concentration. Pectin and arabic gum showed less response on cloud stability in comparison to guar or C.M.C.

Pasteurizing of non pasteurizing the juice showed the effect the stability during storage.

The addition of any thickening agent with concentration over (0.5—1%) will help in reducing the transmission rate, i.e. incrasing the cloud stability of the juice. The concentration of 1% guar gum was found to be prosper in maintaining the cloud stability of orange juice which was more effective and superior than other agents; especially from organic point of view. On the other hands pectin in ratio of 1% is more proper to tomato juice for maintaining cloud stability, than guar. This finding may be due to the nature of tomato juice which response with pectin than any other agent.

Concentrated orange juice also was stable with guar gum especially at higher concentration (1.5%).