CHAPTER-II

REVIEW OF LITERATURE

CHAPTER-II

REVIEW OF LITERATURE

2.1 Introduction

2.2 Theoretical Framework

2.2.1 Jaggery

2.2.1.1 'Kakavi'

2.2.2 Use of Jaggery or Gur

2.2.3 Steps of Jaggery Production

2.2.4 Importance of Jaggery or Gur

2.2.5 Traditional method of Jaggery production

2.2.6 Manufacture of Jaggery or Gur

a) Extraction of juice from cane

b) Purification of the juice

c) Concentration into Jaggery

2.2.7 Different parts of sugarcane crusher

2.2.7.1 Roller

2.2.7.2 Trash turner

2.2.7.3 Bed Plant

2.2.7.4 Spur gear

2.2.7.5 Crank

2.2.7.6 Transmission shaft

2.2.8 Cleaning of pans before making Jaggery:

2.2.9 Jaggery Powder

2.2.10 Advantages of Manufacturing of Jaggery

2.2.11 Quality of Jaggery

2.2.12 Factors affecting the quality of Jaggery

CHAPTER-II
REVIEW OF LITERATURE

2.1 Introduction:

The researcher started the investigation with the stage of collection of relevant literature on the subject. The data and information were obtained from the various sources such as Reports, Surveys, and other publications like books, journals and websites etc. In this chapter, the literature has been reviewed in two parts i.e. (i) Theoretical framework (ii) Review of Earlier studies conducted by other scholars on the relevant topics.

2.2 Theoretical Framework:

It is necessary to clarify the concepts used in the discussion. So following theoretical framework has been presented:

2.2.1 Jaggery:

Maharashtra is the largest state in India which is producer and consumer of Jaggery. In Maharashtra, most vegetables curries and dals contain Jaggery. Jaggery is specially used during Makar Sankranti for making sweetmeat called tilgul. Similarly, in Gujarat on Makara sankranti, this preparation is made, and known as dal na ladu. In rural Maharashtra, water and a piece of Jaggery is given when someone arrives home from working under a hot sun. Kakavi, a by-product from production of Jaggery, is also used in rural Maharashtra as a sweetener[1].

Jaggery is a solid product having various natural color shades from faint yellow to backish gray. This solid produce starts free flowing during rainy season. Jaggery is a highly concentrated final produce, in a semi-solid form, obtained from the boiling of sugarcane juice, plam tree juice etc[2].

2.2.1.1 'Kakavi':

Liquid Jaggery locally known as 'Kakavi' is an intermediate product obtained while concentration of sugarcane juice after purification for Jaggery making. It is semi-liquid syrup like product. A small but significant amount of sugarcane production is utilized for Jaggery industry to meet the demands for sweetening agent mostly in cooking and alcoholic industries.

The quality of liquid Jaggery is largely depends upon the quality the composition of cane juice, type of clarificants used and striking temperature at which liquid Jaggery is collected. The sugarcane juice quality in turn mainly depends upon the parameters such as soil type, fertilizers used, management practices, stage of maturity of cane and the variety. Following table gice the chemical composition of typical 'Kakavi[3]'

Table 2.1
Chemical Analysis of Good (Mature cane) and Bad (Immature cane) Jaggery of Co-419)

Constituent	Immature cane	Mature cane	Cane Deteriorated
Moisture percent	4.57	7.48.	7.11
Glucose percent	11.31	8.09	12.41
Source ratio	76.43	81.09	78.73
Glucose ratio	14.80	9.98	15.76
Ash (carbonated) percent	1.97	1.40	1.76
Total non-sugar percent	8.04.	3.61	8.86
Organic non-sugar	6.07	2.21	7.10
Total Nitrogen percent	0.05	0.04	0.05
Total P2O5	0.1047	0.1697	0.1499
Lime(Cao) percent	0.1568	0.1101	0.1963
Acidity(cc.N/10 NaOH per 100 gr.jaggery	46.15	38.476	30.77
PH	6.2	5.6	6.6
Physical features			
Colour	Dark yellow	Light Golden yellow	Yellow to Dark yellow

Source: P.C. Das, Sugarcane in India, Kalyani Publishers New Delhi, 2006, P-44.

Table 2.2

The Composition of typical Kakavi.

Ingredients	Proportions
Water[%]	30-35
Sucrose[%]	40-60
Invert Sugar[%]	15-25
[Mainly dextrose & laevulose]	--
Mineral Matter	
Calcium [%]	0.30
Iron [mg/100g]	8.5-11.0
Phosphorous[mg/100g]	3.00
Nitrogenous Compounds	
Protein [mg/100g]	0.10
Vitamin B [mg/100g]	1 4.0

Source: www.shahujaggery.com

Jaggery is a typical Indian product and, therefore, it has a unique place in the Indian culture from ancient times, Mention is made of 'Gur'in the Rig Veda. According to Lacen, a researcher, the word 'Gur'is derived from the word 'Gour', which is the name of a city in Bengal. At the time of Indians Independence in 1947, the production of sugarcane within the country was only about 74 millions tones; out of which , 59.49% was being used for the production of Jaggery and 'Khandsari' (raw sugar) and 19.61% for the manufacture of white sugar and the remaining 20.92% for feed, seed and chewing purposes. The per-capita consumption of the sweeteners in the country was as low as 12.4 kg per head annually. The use of sugarcane for Jaggery and a 'Khandsari' decreased from about 59.47% to 43.40% while that for white sugar increased from 19.61% to 44.60%[4].

2.2.2 Use of Jaggery or Gur:

a) Jaggery is used as an ingredient in both sweet and savory dishes and traditional unrefined sugar.

b) Jaggery is a natural sweetener made by the concentration of sugarcane juice[5].

2.2.3 Steps of Jaggery Production:

Jaggery is an unrefined healthy sweetener produced using concentrated sugarcane juice. Since, it is unrefined the color ranges from light to dark brown. Jaggery is an integral part of Indian cuisine and it is called by different names I India like Jaggery, Bella, Gur and Vellam. It is available indifferent shapes and sizes.

1st Step: The top and the root portions of the sugarcane are cut and they are fed into a machine to extract the juice.

2nd Step: The juice is directly fed into a big iron vessel. At a time there are 3 vessels with one single tunnel of fire is the dried sugarcane waste.

3rd Step: The scum is periodically removed from the liquid becomes semi solid Chemicals like Sodium carbonate, Sodium bi-carbonate alum etc., are used to filter out the dirt.

4th Step: The semi solid Jaggery is poured into 8 feet by one half feet molds and left to dry partice from the sugarcane juice.

5th Step: Harvested Jaggery is removed from the molds by upturning the molds.

6th Step: Jaggery is ready to eat[6].

2.2.4 Importance of Jaggery or Gur:

India leads the world in sugar production. India is also the largest producers of traditional sweeteners like Jaggery and 'Khandsari' sugar. Jaggery means a stone with pink yellow color and having sweetness greater than honey. The Jaggery, mainly manufactured in different states if India such as Uttar Pradesh, Bihar, Maharashtra and Andhra. Jaggery is also produced from palm in India[7].

The production of Jaggery is the dominant decentralized cottage industry in cane growing area of different states in India. Inspite of remarkable expansion of sugar industry in the country since 1932, the production of Jaggery is still contained as it is used in diet and it has a medicinal value. Also, Jaggery is a rich source of energy. It is cheaper than white sugar. It provides employment in rural area. Jaggery is an important item of the Indian diet. It is used for different purposes such as direct consumption by human is being, stock feeding and in milk, tea or coffee as an excellent sweetening agent

and also used in innumerable palatable dishes. About 10.3 million tones of Jaggery is produced annually in India. It meets about 40% demand of sweeteners in the country[8].

Only 3000 to 4000 tones Jaggery valued about Rs. 10 million are exported to several countries every year. Jaggery produced in solid, liquid or powder form has never been reported to possess any health hazards. It is known as eco-friendly nutritive sweetener, semi-liquid Jaggery which goes by the name 'Kakavi'. Locally is an intermediate product obtained during Jaggery making process? It has high nutritive value. It appearances is like jams or honey. Generally 'Kakavi' contains water sugars and non-sugar. Jaggery is prepared in different shapes and sizes in solid from and supplied to markets in various parts of the country. Jaggery powder appears like sugar with crystals. Jaggery in powder form is easy for consumption without the need for scraping the Jaggery in solid form at the time of utilization. Jaggery powder has more nutritive value than sugar[9].

Jaggery is known as 'Gur' in north India and 'Vellum' or 'Bella' in south India. Jaggery is solidified cane juice after concentration, which still contain impurities. It is hard and crystalline and its color ranges from golden yellow to brownish yellow. The traditional vertical crushers driven by a pair of bullocks are replaced by powder driven vertical crushers. The larger units employ power driven horizontal crushers with capacity up to 40 TCD. TCD means tones of cane crushed per day. For Jaggery making the juice is boiled and evaporated in open pans placed on underground furnace heated by direct fire with dry bagasse as fuel[10].

2.2.5 Traditional method of Jaggery production:

The manufacture of Jaggery is carried upto the middle of March only. The farmers, being generally poor, have in most cases, very inefficient equipment for extracting juice and converting it into Jaggery. Most of the profit goes to the money lender, the 'Zamindar' and the 'Dalal'. In some places, where large quantities of good quality Jaggery are produced both the equipment and the method of working are better. Majority of these crushers are of local make, and in a number of cases consist of rollers mounted on wooden farmers. Being the most important Jaggery- producing area, a large number of different types of furnaces for boiling the Jaggery are used. The juice coming from the crushers is stored in tins or in earthen pots, from where it is transferred to the

Bel and is boiled into Jaggery[11].

Hydrous powder was used at some places during the final stages to improve the color of the finished product. The Jaggery produced in this region, especially in the western parts, was of good quality. The shapes or forms in which Jaggery lumps are prepared in different areas differ considerably. West Bengal also occupies an important place among the cane growing states and stands fourth in respect of the cane acreage. The Jaggery manufacturing season begins in the lying lands, generally from the middle of September and lasts till the middle of December. Bengal also manufactures Jaggery with the juice of date palm. The most popular bullock-driven crusher in west Bengal was the 'Renwick'crusher[12].

In Punjab the sugarcane crop was sown during the period from February to April and was harvested from December to February, when the Jaggery-making operations also go on. Jaggery-making was generally carried in Punjab on better lines than in other states in India. The system of land tenure that was peasant proprietorship, and better financial status of the Punjabi cane growers are greatly responsible for this as a result, it has been comparatively easy for the state Department of Agriculture to introduce improvement. This department has already introduced improvement; in the local furnaces is still being introduced[13].

Like in Maharashtra, wooden crushers were formerly in use in this region also. Due to the efforts of the Department of agriculture, these have now been replaced by iron crushers. These are only three types of furnaces that are in use in Madras. One of these was a local furnace and the other two are improved types. The first operation was the removal of impurities such as pieces of bagasse, trash, etc, mixed with the juice. The juice was heated and the scum was removed with an iron handle. Then, a small amount of Ginger oil was added. This facilities correct judgment of the striking point[14].

2.2.6 Manufacture of Jaggery or Gur:

The manufacture of the typical Indian product Jaggery (gur;gul, Marathi;bella,Kannada;bella, telugu;vellum,tamil) is one of the most important cottage industries of the country from ancient times. Mention is made of gur in the Rig veda. Before the grant of protection to the white sugar industry in 1931, most of the sugarcane produced was utilized making Jaggery. It is for the food and a sweetening agent. The

preparations from gur have a peculiar aroma. It is no wonder that the gur industry is thriving very well as a cottage industry in spite of the rapid expansion of the white sugar industry and consumes more than 50% of the cane produced even today. The production of gur has increased from 2 million tones in 1930-31 to 8 million today. The consumption of gur has also increased 4 times. The yields of gur have increased from 3.16 tones during the last 45 years. The per-caput consumption of gur has nearly doubled from 6.5 kg in 1930-31 to 13.8 kg in 1973-74[15].

Considerable research work has been done for the manufacture of gur along scientific lines from improvement in crushers for gur. Yet it must be admitted that the processing of gur continues to be crude and wasteful. The lump sugar-gur or Jaggery or artisan sugar is a nutritive sweetening agent, manufactured primarily from sugarcane. In some parts of the world it is also produced from various plams and sweet sorghum.

Artisan sugar or gur is known as panela in Papua New Guinea, Pincillo in Mexico, Papelon in Venezuela, bangre or rapadura in Brazil, rapadou in Haiti, Panochas or muscavado in the Philippines and panela or chancaca in Columbia, Bolivia and peru, namtarm, sai baeng (or red sugar) in Thailand, yellow sugar in Vietnam, gul adjawa or gula mangkok in Indonesia. In India about 34% cane is used for making gur and khandasari. Sugarcane is the major raw material for the manufacture of Jaggery through the product is also prepared in small quantities from Palmyra, date and coconut Palms. Even today the harvest of cane for gur manufacture is done in a large measure, taking into account the festival days- Deothan Ekadasti, some-time in the middle of November in the north when the cane is believed to have ripened, and pongal in the south in January[16].

Three main operations are involved in the manufacture of Jaggery.

a) Extraction of juice from cane

b) Purification of the juice

c) Concentration into Jaggery

a) Extraction of juice from cane:

This is done with a crusher or series of crushers. The use of wooden rollers fitted close to one another vertically or horizontally has now been replaced by iron rollers, the 3-roller ones being in general use. These are either drawn by bullocks or run by power. The juice extraction is about 55% to 60%. Many crushers of improved design run by

power are being farmers. In spite of this improvement, the loss of sugar from cane in gur manufacture remains significantly high.

b) Purification of the juice:

The juice is boiled for concentration and circular pan, made of iron or zinc sheets, over a furnace. The essentials of a good furnace are-

i) a regular supply of fresh air

ii) a feeding mouth of suitable dimensions

iii) a passage for the smoke to escape, and

iv) an arrangement to receive the ash at the bottom

c) Concentration into Jaggery:

The striking point temperature generally ranges between 118c and 123c. The juice of bad quality or immature cane needs a higher striking point.

i) When the boiling has progressed sufficiently, a small quality is taken out of the pan and thrown into a bucket of cold water. If the mass forms into a ball with a metallic sound when thrown against the side of the pan, the boiling is taken as complete.

ii) At the striking point, the boiling mass when stirred will leave the bottom of the pan clear instead of striking to it.

iii) At the striking, if the wooden stirrer is taken out of the pan and head in the air, the sticking mass will form long silky threads flowing in the air and will not fall in drops. The pan at the striking point is immediately removal from the furnace and is stirred for a few minutes. The hot liquid, gur, is then transferred by lifting and tilling the boiling pan into a cooling pan, as the tempture falls, the gur begins to crystallize. It is stirred slowly and intermittently to avoid loss of granular structure. The smi- soild mass is the put into moulds[17].

2.2.7 Different parts of sugarcane crusher:

2.2.7.1 Roller:

There are three rollers in this machine which are fitted to the frame. The first and second rollers are of about 10 inches (25 cm) diameter, grooved perpendicularly and connected with each other. The third roller is of 8 inches (20cm) diameters, grooved horizontally which are connected with first roller.

2.2.7.2 Trash turner:

It is steel plate and placed in between second and third roller. It diverts the sugarcane towards first and second roller.

2.2.7.3 Bed Plant:

It is a tin plate on which the three rollers are placed. It is made cane shaped at the front side from which the extracted juice comes out and is collected in the container.

2.2.7.4 Spur gear:

There are three gears placed on each of three roller and they are called spur gears.

2.2.7.5 Crank:

Crank a part of the frame, receives the power from transmission shaft.

2.2.7.6 Transmission shaft:

It is wooden part of the frame and serves as medium through which power is transmitted finally from spur gear to the roller. Liquid Jaggery is collected in semi-liquid form from the boiling pan and packed in suitable containers for marketing. Improper preparation of Kakavi during storage results into crystallizations of sucrose which is not preferred by the consumers. Similarly microbial growth causes fermentation and gives unpleasant odour to the product rendering it unfit consumption. Preparation of 'Kakavi' starts with crushing season of a cane from October to February[18].

2.2.8 Cleaning of pans before making Jaggery:

The Indian state of Maharashtra is the largest producer and consumer of Jaggery. In Maharashtra most vegetables curries and dals contain Jaggery. Jaggery is specially used during 'Makar Sankranti' for making sweetmeat called tilgul. In rural Maharashtra, water and a piece of Jaggery is given when some when someone arrives home from working under a hot sun. Kakavi, a byproduct from production of Jaggery, is also used in rural Maharashtra as a sweetener. It contains many minerals not found in ordinary sugar and is considered beneficial to health by the traditional Ayurvedic medical system).

2.2.9 Jaggery Powder:

Jaggery is made in the natural way and no chemicals are used for its processing for which it does not loose its original properties. Hence it is rich in important mineral like salts: 2.8 grams/ 100 grams, whereas only 300 mg/ kg is obtained in refined sugar.

Magnesium present in Jaggery strengthens our nervous system and helps to relax our muscles and gives relief from fatigue and takes care of our blood vessels. It also along with selenium acts as an antioxidant property scavenges free radicals from our body. The potassium and low amount of sodium present in it maintain the acid balance in the body cells and also combats acids and acetone and control our blood pressure. Jaggery is rich in iron, and helps to prevent anemia. It also helps to relief tension take care of asthma as it has anti allergy properties .It is good for migraine and is good for girls those who do not get free flow at the time of their period .even at the time of post pregnancy it has great benefits to perform to remove all clotted blood from the body of a women within post 40 days after the birth of a baby. The preventive ability of Jaggery on smoker's smoke-induced lung lesions suggest the potential of Jaggery as a protective food for workers in dusty and smoky atmosphere even for those who are engaged in wollen industries, the wool dust clogged in the food pipe could be cleared with Jaggery. Thus we may conclude saying that those who are exposed to higher levels of pollution. Jaggery helps them to breathe easier and counter pollution problems naturally.

It has moderate amount of calcium, phosphorous and zinc so it helps to optimum health of a person .along with all its benefits it purifies the blood and prevent rheumatic afflictions and bile disorder thus help to cure jaundice (take pre soaked Jaggery juice) [19].

2.2.10 Advantages of Manufacturing of Jaggery:

1. Manufactured at the place of harvest avoiding transport of cane.
2. Cane can be harvested conveniently.
3. Semi-skilled persons are needed for gur making.
4. Nutritive Value of gur is more than sugar[20].

2.2.11 Quality of Jaggery:

The final quality of Jaggery largely depends on the variety soil, cultural, fertilizer and irrigational practices adopted. The external physical features of a simple of Jaggery like its color and texture mainly determine the price at the quality of Jaggery from different markets, which are mainly due to the factors mentioned above. A really superior-quality gur is associated with higher sucrose and lower glucose content, low moisture, low-insoluble impurities and low-alkalinity of ash. The proper distribution of

these in the juice is essential to give good gur of standards food value. Bad quality gur is associated with high organic non-sugars, high total and non-protein nitrogen, high colloids and pectin's and a low amount of phosphate. The fact that gur obtained sometimes is bad in spite of high purities and low proportion of non-sugar organic matter suggests that particular constituents in non-sugar play a part than the total quality.

Deterioration in the quality of Jaggery seems to be from 4 angles, viz, physical, chemical, biological and micro-biological. Impairment of color such as darkening and loss of body through disintegration is the most common form of physical damage. The taste also is affected in some cases. Change in chemical composition is the manifestation of chemical deterioration the physical characteristics- color, form and taste color of gur is mainly due to iron phenol pigments, Avoiding iron contamination by using galvanized iron pans for juice boiling results in bright yellow color of Jaggery[21].

2.2.12 Factors affecting the quality of Jaggery:

The good quality of Jaggery such as light color, good crystalline structure, hardiness, sweet taste, good flavors and longer storage life etc depends on some factors as follows:

2.2.12.1 Variety:

The quality of Jaggery various according to the variety of sugarcane. These variations are not only attributed to the variation in the sucrose content of the verities alone but also the process of caloricity of the juice.

2.2.12.2 Maturing:

Sugarcane is a heavy feeder so, adequate maturing is most essential for getting higher yield.

i) Nitrogen, when applied in higher dose, increase the organic non-sugars, colloids, gums, pectin's and non- protein Nitrogen and decreases the phosphorus content of juice which affects the quality of Jaggery.

ii) Nitrogen compounds or alkali salts in juice results in the production of Jaggery having dark pigmentation and adversely affects the purity, invert sugar and moisture content of Jaggery.

iii) Due to application of Nitrogen in higher dose, the total organic acid content of Jaggery is increased consequently the pH of Jaggery is decreased lending to poor

keeping quality and poor color of Jaggery.

iv) The phosphorus application improves the clarity of and also the quality of Jaggery.

v) The recommended amount of organic manures and supper phosphate should be applied for the production of better quality juice of sugarcane.

2.2.12.3 Irrigation:

Irrigation influences much on the production as well as the quality of juice of sugarcane. The water containing the amount of soluble salt should be avoided. Timely irrigation should be ensured to avoid the poor quality of Jaggery. Irrigation at harvesting causes the more water content of juice and involves more cost of production of Jaggery as it requires more fuel for the final production of Jaggery.

2.2.12.4 Judgment of Maturity:

The sugarcane should be harvested when the crop has matured sufficiently. The proper state of maturity has been discussed earlier out of these, estimation of juice brix at top and bottom portion of the standing crop is a good method of judgment of maturity of sugarcane.

2.2.12.5 Harvesting and Cleaning:

The harvesting of sugarcane should be done at ground level. The sugarcane is then cleaned and top portions are removed. The cane should be crushed just after harvesting or at least within 24 hours after harvesting otherwise the can losses the water and recovery of juice will be below.

2.2.12.6 Crushing and extraction of juice:

Juice of sugarcane is extracted by crushing the same in three roller power operated sugarcane crusher. The sugarcane crusher and the surrounding should be kept clean and hygienic to avoid fermentation losses due to organism. The fermented juice produces low quality Jaggery.

2.2.12.7 Boiling pan and furnace:

The boiling pan should be galvanized iron pan to prevent reaction of iron with constituents. The pan needs to be cleaned properly after each installment of making Jaggery. Otherwise, the quality of Jaggery will be low and will not fetch higher price use of proper furnace is essential for production of good quality Jaggery. The furnace should have a chimney for the escape of burst gases. The ash in the furnace should be removed periodically to provide air flow and better combustion[22].

2.2.12.8 Grading of Jaggery or Gur:

In the market, Jaggery is generally purchased after inspection. The color and texture are visually examined; the hardness is tested by driving the thumb nail and the flavors by tasting a small piece. Thus the methods are based mostly on visual examination. Quality standards have to be developed in fixing Jaggery grades in different Jaggery markets.

Among the characters to be considered in the grading of Gur, the physical ones are color, texture, taste, hardness and flavors and the chemical ones are sucrose, reducing sugars, dirt and insoluble, ash, moisture, lead number and soluble alkalinity[23].

2.2.13 Benefits from Jaggery:

Jaggery is made in the natural way and no chemicals are used for its processing. For which it does not loose its original properties. Hence it is rich in important mineral like salts: 2.8 grams/ 100 grams, whereas only 300 mg/ kg is obtained in refined sugar. Magnesium present in Jaggery strengthens our nervous system and helps to relax our muscles and gives relief from fatigue and takes care of our blood vessels. It also along with selenium acts as an antioxidant property scavenge free radicals from our body .The potassium and low amount of sodium present in it maintain the acid balance in the body cells and also combats acids and acetone and control our blood pressure. Jaggery is rich in iron, and helps to prevent anemia. It also helps to relief tension take care of asthma as it has anti allergy properties .It is good for migraine and is good for girls those who do not get free flow at the time of their period .even at the time of post pregnancy it has great benefits to perform to remove all clotted blood from the body of a women within post 40 days after the birth of a baby. The preventive ability of Jaggery on smoker's smoke-induced lung lesions suggest the potential of Jaggery as a protective food for workers in dusty and smoky atmosphere even for those who are engaged in wollen industries, the wool dust clogged in the food pipe could be cleared with Jaggery. Thus we may conclude saying that those who are exposed to higher levels of pollution. Jaggery helps them to breathe easier and counter pollution problems naturally. It has moderate amount of calcium, phosphorous and zinc so it helps to optimum health of a person .along with all its benefits it purifies the blood and prevent rheumatic afflictions and bile disorder thus help to cure jaundice[24].

2.2.14 Nutritional aspects of Jaggery:

The common Indian diet is deficient in nutrition. Therefore, the nutritional potential of Jaggery in this context is considerable for the greater advantages of major it of population living in rural areas. One hundred grams of the eco-friendly sweetener (Jaggery) contains about 0.4 gm of protein, 01 gm fat, 8gm calcium, users gm phosphorous, 11.4 mg iron, 0.6 to 1.0 gm minerals and 3830 kcal/ kg energy on the other hand, in sugar industry, though more sucrose is recovered due to higher percentage of juice extraction, contains minerals. Free monosaccharide those are important for health and nutrition, are last. In Jaggery though sucrose recovery is low due to low juice extraction, it is supplemented by the recovery of reducing sugars and minerals which make it more nutritive and health friendly.

Besides being a sweetening agent, Gur is an article of food and is on the diet of the rural population. Various beliefs are held regarding its nutritive and medicinal values Jaggery is considered a mild laxative and is supposed to have more warning effect than sugar. It is accepted that gur has a greater sweetening quality than sugar. The custom of giving gur to mothers and cows during the period of location, just after delivery, is also common. Gur contains proteins, facts, calcium and phosphorus, etc. As this study highlight the problems of financial management Jaggery production units, it is necessary to present the conceptual background of financial management[25].

2.2.15 Benefits of Jaggery for health:

Jaggery is considered by some to be a particularly wholesome sugar and, unlike refined sugar, its retains considers Jaggery to be beneficial in treating throat and lung infections; sahuans saxena found that in rats Jaggery can prevent undamaged from particulate matter such as coal and silica dust Gandhi felt that Jaggery was healthier than refined sugar, as it was not introduced into his own personal diet and recommended it for use in his invested goat-milk diet[26].

2.2.16 Financial Management:

2.2.16.1 Introduction:

Finance is the life-blood of business activities. Finance is very needed for all type organization, viz, small, medium and large scale organizations. The requirement of finance is equally important even to agriculture and services sector. A well-knit financial system directly contributes to the growth of economy.

The financial management plays a very vital role in management of organization. In financial management, all the disciplines are considered properly and suitable provisions should be made. Achievement of organizational objectives and goals, the techniques of financial management should be properly considered because in financial management all the techniques are based on cost reduction and cost control, so, that profit maximization and wealth maximization of the business achieved automatically. For efficient working of business concern different concepts, tools and techniques are adopted in financial management. Financial management involves the application of general management principles to a particulars financial operation. Financial management is that part of management which is concerned mainly with, raising funds in the most economic and suitable manner, using the funds as profitable as possible, planning future operations and controlling current performances and future developments through financial accounting, cost accounting, budgeting statistics and other means financial management provides a best guide for future resources allocation; it implies the designing and implementation of certain plan. Financial management involves a making of day to day financial decision in a business of any size financial management implies a more comprehensive concept than the simple objective of profit making and efficiency[27].

Financial management includes determining financial needs, sources of funds, financial analysis, optimal structure, Cost volume profit analysis, profit planning and control, fixed assets management, project planning and evaluation, capital budgeting management, dividend policies and investment decision. Financial management is the specialized function directly associated with the top management. The significance of this function is not only seen in the 'line' but also in the capacity of staff in the overall administration of a company. It has been defined by different experts in the field[28].

a) Financial management is the area of business management devoted to a judicious use of capital and a careful selection of sources of capital in order to enable a business firm to move in the direction of reaching its goals.

b) Financial management is the application of the planning and control functions to the finance function.

2.2.16.2 Scopes of Financial Management:

a) Financing Decision:

It involves the finance manager in determining the best financing mix or the capital. The cost and risk involved in financing are two major considerations in taking financing decision.

b) Investment Decision:

The investment decision is perhaps the most important of three. It involves investment in both long lived assets and in short-term assets. Capital investment, a major aspect of the decision, is the allocation of funds to investment proposals whose benefits are to be realized in the future.

c) Dividend Decision:

The opposite of this is the retention decision- now much to retain. The most crucial point is to determine the amount of surplus to be distributed as dividend to the shareholders formulating a dividend policy bring into focus the retention policy of the firm and vice-versa. The decision to invest in a new capital project financing of the investment cost of capital as an important decision criterion issued in the investment decision. The financing decision in turn, influences and is influenced by the dividend decision, for retained earning used in internal financing represent dividends foregone by shareholder. Therefore, each firm should strive for an optimal combination of the three decisions to achieve its objectives.

The present study aims at studying the financial management of Jaggery production units in the context of its marketing system, price realization, ascertainment of cost and fixation of selling price etc. So it is relevant that the conceptual framework of financial management has been highlighted the financing decisions, investment decisions and dividends decision etc[29].

2.3 Review of Earlier Studies:

Along with the conceptual framework, it is necessary to take review of earlier studies to know whether the aspect of the present study has been covered. Following is the review of earlier studies conducted by other scholars on the relevant topics.

A study conducted by K.N. Ravikumar and V.T. Raju[30] examined the marketing system of Jaggery and to work out the producers share in consumers rupee in the marketing of observed that the marketing of Jaggery involves a number of middlemen and market function arises between the producer and the final consumer. However, there was a large scope for improving the efficiency of Jaggery marketing in this area. The study pointed out that the related market suffered from the lack of good storage facilities especially for storing the Jaggery during peak season. Therefore, it was suggested that, a credit facility for marketing of Jaggery also need to be strengthened, besides the development of transport and other infrastructural facilities in the study area.

Jaswant Singh and S.R.Mishra[31] in their study emphasized that Indian industries should come forward to make the process of manufacturing of Jaggery automatic in such a way that on one hand, sugarcane or its extracted juice is fed and from the other hand, Jaggery in well packed cubes and bricks is obtained. Jaggery cubes and bricks made in uniform sizes have a very good demand in India as well as abroad. Its colorful packaging would attract more consumers. Being a natural sweetener and processing nutritional and medical values, it would have a high demand in the developed countries. Also food and fruit processing plants may make soft drinks from sugarcane juice having an expert potential moreover, with regard to the Governments policy, they suggested that:1)the government should fix the price of Jaggery and 'Khandasari' at the national level; 2) there should be some kind of incentive schemes for setting up Jaggery and 'Khandasari' manufacturing plants; 3) the government should allow the use of horizontal crushers and vecuum plant technology by Jaggery manufactures;4) the Government should introduce a new insurance policy for sugar as well as for Jaggery and 'Khandasari'.

A study carried out by M.Y. Teggi. H. Basavaraja, G.K. Hiremath and R. S. Poddar[32] revealed that the cost of sugarcane played a major role in determining the cost and returns structure of Jaggery processing units. The results further indicated that, on an average, 189 tones of Jaggery were produced annually. The study further revealed that the Jaggery processing units were required to produce only 69.32 tones of Jaggery to

reach the break –even level. It was interesting to note that, on an average, Jaggery processing units were processing around 139 tones of Jaggery annually. The time period required for achieving the break-even volume of output by the Jaggery processing unit with the present capacity utilization was only 87 days. Thus, the results showed that Jaggery processing in the study area was profitable. The investment made in the establishing a Jaggery processing units was repaid within a short span of one year. The net present value of Jaggery processing units at 15% discount rate was estimated at Rs. 9, 07,374 over its average life span. High and positive net value reiterated the profitability of the Jaggery production. The internal rate of return of return in Jaggery processing was more than 100%.

K.Singh[33] in his study, pointed out that there were three Jaggery marketing cannels, namely, 1) From Jaggery producer to consumer 2) From Jaggery Producer to retailer, to consumer, in the Ambedkar Nagar market. He revealed that the producers share in the economics rupee decreases. Marketing cost incurred by the producer increases with the increase in the number of intermediaries. Therefore, it was suggested that adequate and appropriate storage facilities for Jaggery should be developed, so as to improve the processing efficiency and to develop Jaggery marketing centre at the Taluka level.

A study conducted by S.N. Gupta and R.G.Upadhyay[34] revealed that the decline in the market arrivals of Jaggery was indicative of the gradual decrease in the production of 'Gur' and 'Khandasari' in rural areas of Bellia district of Eastern U.P. Further it was noted that in the months of November to February, when the supply of Jaggery comes in the market from the Jaggery producing farmers, the wholesaler price and retail price of both the products began downward movement and stabilized at substantially lower levels. Thus, the farmers were deprived of the better Jaggery prices.

A study conducted by S.T. Pawar[35] in their study designed and assembled an electronic device, which can precisely detects these two stages in Jaggery manufacturing process, it was observed that the present manufacturing process is traditional one. In this process a skilled and experienced person known as 'Gulvaya' confirms the two storage slight variation in the judgments of 'Gulvaya' affects the quality of Jaggery and it can lead to the maximum loss of farmers.

A study conducted by V.K. Madalia and A.R. Patel[36] revealed that as compared to

1950-51, the area under sugarcane had increased eight times and the production of Gur and increased by about six times in Gujarat state during the period from 1950-51 to 1980-81. However, it was indicated that the productively of Gur had remained more or less stagnant during this period, which showed that the achievement in the production of Gur was largely due to the expansion in the areas under sugarcane cultivation. This shows that there was a considerable scope for increasing the Gur production by improving the yield per hectare. It emphasized that there is a need to popularize the use of improved furnace in the Gur making. It was also suggested that to sustain the interest of farmers in Gur making, it was necessary to pay them a reasonable price for their product. It is therefore, strongly recommended that a stable price structure for Gur based on the cost of production should be enforced. The study also suggested that productivity of Gur has been stagnant for the last many years. There is much scope for the increasing the production through enhancing yield levels.

A study carried out by S. Pruthi and R. Kundra[37] showed that the Jaggery and Khandasari industries in terms of production, sales and earning. Generally, these industries are based on the traditional technologies; therefore, they are self- Sufficient. Further, these industries give employment opportunities to a large number of unskilled and semi-skilled people enable them to earn their bread, which ultimately check their mobility out of the rural areas in search of jobs.

V. Dubey and U. Lal[38] conducted a study on Gur Grading in Uttar Pradesh and made an attempt to fix suitable standards for the grading of Jaggery in Different parts of Uttar Pradesh, where more than 48 lakh tones of Jaggery is produced every year. Jaggery samples were collected from different Zones of the state for this purpose. They found that on the basis of color, texture etc. Jaggery samples collected from the Western Uttar Pradesh were of the best quality. The samples collected from the Tarai region were comparatively poorer in quality.

A study conducted by S.S. Rupe[39] examined the trends in the Jaggery making industry, the structure of sugarcane cultivation, cost structure of Jaggery and compared the manufacturing costs of selected Jaggery making units in Karveer Taluka of Kolhapur District. It was observed that the most of Jaggery part of Kolhapur District had played an important role in Jaggery Production, according for about 22.48% production in the total production of Jaggery in Maharashtra state. It was observed that among sampled farmers,

47.17% farmers were sending their sugarcane to sugar factories and 58.83% farmers were using their sugarcane for Jaggery-making. However, due to frequent fluctuations in the prices of Jaggery, the income of Jaggery producers was not certain. Consequently, output of Jaggery showed declining trend. The main problem faced by the Jaggery industry was the shortage of labour cost was higher in Jaggery- making In the light of above conclusions, the study made some suggestions such as 1) subsidy on the agricultural input like fertilizers should be continued 2) Jaggery grading be made more Scientific and the concerned Government department should fix certain criteria for this purpose 3) should be Jaggery well so that quality Jaggery can be produced, 4) To avoid the fluctuations in the prices of Jaggery the Government should fox the prices under the support price policy.

A study conducted by M.R. Naidu, I. Narendra and P.B. Parthsarathly[40] pointed out that the proportionate total during 1993- 94 resulted in highest return of Rs.461 with cost benefits ratio: 1:11. The sudden increase in demand for Jaggery and the spurt in price during 1992-93 and 1993-94 were due to the failure of sugarcane crop in the northern belt of the country and also due to the lifting up of the Jaggery Storage restriction beyond 250 quintals and reduction in the sales- tax on Jaggery from 11.4% to 4%. It can be conducted that the regulated marketing at Ankapalle was found to be working on healthy footing as the marketing costs charged were at prescribed level and there showed that there was a better share for the producer from the consumer's rupee, ranging between Rs. 0.80 to 0.93 during the period of study. The, however, suggested that in order to increase the producers share in the consumer rupee, commission should also be charged on weight basis and not on price basis. It was also suggested that preparation of powder Jaggery enhances net return to farmers.

A study conducted by B.B. Desai and A. A. Kale[41] pointed out that the techniques like sealed packaging by incorporating fungicides in the packaging film can prevent the running off of Jaggery and by avoiding the contact with moisture and microorganisms. Thus it is possible to improve the marketability of Jaggery by establishing technology for optimal export and storage conditions.

A study carried out by J. P. Patil and N. B. More[42] We that the Jaggery prepared from early maturing varieties of sugarcane, namely, co-8014 and co-7219, was superior as compared with Jaggery prepared from the middle maturing varieties namely co-740,

com 7125 and 7527. It was further repealed that the Jaggery of co-8014 variety prepared up to December and Jaggery of co-740, com-7125 and co-7219 prepared during January were better for storage.

Shri. S.S. Rupe, [43] "has "conducted the study on the Growth and Prospects of Jaggery Industry in Kolhapur District of Maharashtra state, the objectives of the his is to take a historic- review of the Jaggery industry in Kolhapur District and to understand the Jaggery making process as practiced in the study area and to evaluate the performance of the Jaggery- making units in the study area. Data have been collected through a structured interview schedule administered to the respondent owners of the sampled Jaggery- making units. It was observed that Hatkanangale Taluka has made profit followed by Chandgad, Shahuwadi and Karveer Taluka. Kagal had lowest profit. In all seven Taluka our farmers should profit of Jaggery production produced from Ratoon sugarcane similarly the yield of Jaggery per pan was 2.8 quintals for Ratoon sugarcane as compared to 2.5 quintals for 'suru' sugarcane. Therefore an appropriate strategy for the development of the Jaggery industry in rural areas is required to implement. Therefore it was suggested, to people should try to understand about the good quality Jaggery and nutritional importance of Jaggery and Grading of Jaggery in the Market should be done by authorized persons and accordingly reasonable price be fixed. Therefore, the proper hygienic condition should be maintained at the Jaggery unit and cold storage facilities should be provided by market the committee to the Jaggery manufacturing farmers and forward marketing of Jaggery should be developed.

Anjugam M, has carried out the study entitled[44] "Value addition of sugarcane-A case of Jaggery production; The present study has analyzed the growth and performance of area, production and productivity of sugarcane, comparative economics of sugarcane and Jaggery production and has identified the constraints in Jaggery production. The study conducted in the western zone of Tamil Nadu, has revealed that the growth rates in area and production of sugarcane are positive during the post-liberalization period in India, Tamil Nadu state and the western zone of Tamil Nadu. However, the productivity of sugarcane has shown a negative growth rate in India and Tamil Nadu, which might be due to monsoon failure during this period. The productivity of cane in the western zone of Tamil Nadu has shown a low but positive growth rate, may be due to change in the cropping pattern and better access to sugar mills. Small and marginal farm households

have been found involved in Jaggery while registered growers supply cane to the sugar factory. The net income realized from Jaggery production has been recorded as Rs 14138, which is higher than that farm the cane produced for sugar factory. Delays in cutting of cane by the sugar factories and labour problems during harvesting season have been found as the major reasons for Jaggery making. Non-remunerative prices, lack of government support in price policies and traditional technology have been identified as the major constraints in Jaggery production. The study has suggested that introduction of modern technologies, creation of infrastructure and formulation of appropriate price polices need be encouraged to enhance Jaggery production among the farmers to get remunerative price for their produce.

References:

1. P.C. Das, Sugarcane in India, Kalyani Publishers New Delhi, 2006, P-44.
2. P.C. Das, op.cit, P-38.
3 Jaggery in grate Kolhapur jaggery house
4. www.shahujaggery.com
5. S.S. Rupe, Growth and prospect of Jaggery industry in Kolhapur District of Maharashtra State, Shivaji University, Kolhapur, 2007.
6. www.shahujaggery, op. cit.
7. J. Thuljaram Raw, Sugarcane, Indian council of Agricultural Research New Delhi, 1983, P-92.
8. J. Thuljaram Raw, Sugarcane, op.cit. P- 35.
9. J. Thuljaram Raw, Sugarcane, op.cit. P- 54.
10. Padmanabhan, K.R., "Economic of Jaggery Industry in Madalia District", in: Khadi Gramodyog, August, 1967, P- 777.
11. S.S. Rupe, op.cit. P-27.
12. Desai, B.B. and Kale "Factors influencing Quality of Jaggery- A Review", in: Report of the All India co-ordinated Research Project on Processing, Handling and storage Jaggery and Khandasari, 1994, P- 21.
13. J. Thuljaram Raw, op. cit. P- 37.
14. P.C. Das, op.cit, P-68.
15. J. Thuljaram Raw, Sugarcane, op.cit. P- 70.

16. J. Thuljaram Raw, Sugarcane, op.cit. P- 30.
17. Ravikumar and V.T. Raju "Marketing of Jaggery, A Case Study from Andhara Pradesh", in Indian Journal of Agricultural Marketing Vol- 10 (3), 1996, P- 93.
18. Ravikumar and V.T. Raju, op. cit. P- 97.
19. Jaggery in grate Kolhapur jaggery house
20. P.C. Das, op.cit, P-44.
21. Desai, B.B. and Kale, op. cit, P- 39.
22. Padmanabhan, K.R., op.cit. P- 780.
23. Shri Chhatrapati Sahakari Gul Kharedi Vikas Sangh ltd, Kolhapur, Annual reports, 2008.
24. www.jaggery production.com
25. S.S. Rupe, op.cit. P- 20.
26. Shri Chhatrapati Sahakari Gul Kharedi Vikas Sangh ltd, Kolhapur,op.cit. P- 25.
27. Bhabatosh BanerjeeAsoke K. Financial Policy and Management, Accounting, Ghosh-Prentice Hall of India Private ltd, 2005, P-5.
28. Ravi M. Kishore, Cost Accounting and Financial Management, Taxmann Allied Services (p) ltd, 2006, P-742.
29. Ravi M. Kishore, op. cit. P-744.
30. Ravikumar and V.T. Raju, Op. cit., Vol- 10 (3), 1996, P- 96.
31. Sing, Jaswant and Mishra: "National policy for Khandasari" in: Research and Industry in India, Bharatiya sugar, July, 1997, P-33, 34.
32. Teggi M.Y. Bassvaraji H. et al, "Economics of Jaggery Production in Bijapur District, Indian Journal of Agricultural marketing, Vol- (1and 2), 1998, p- 29, 34."
33. Singh K.K., Marketing of Jaggery, An Economic Study on price, Department of economics, 2002, P-17.
34. Gupta, S.N. and Upadhayay, R.G.,Seasonal price Behaviour of Jaggery in Ballia District, National Seminar on marketing in India, Department of economics, Shivaji University, Kolhapur 23 and 24 March, 2002.
35. Pawar, S.T. Comparative studies on Jaggery Manufacturing Units and Development of a Device for it" an unpublished M.Phil Dissertation in Physics, Shivaji University, Kolhapur.1995.

36. Padmanabhan, K.R.,"Economic of Jaggery Industry in MadaliaDistrict", in: Khadi Gramodyog, August, 1967, P- 777- 780.
37. Pruthi, S. and Kundra, R., "Gur and Khandsari Industries, A case study", in: "Khadi Gramodyog, July, 1980, P-441-449.
38. Dubey, Varmeshwar and U.Lal: Gur Grading in Uttar Pradesh", in: Indian sugar", May-1989, P- 101-106.
39. Rupe, S.S., "Economic of Jaggery- Making: A Case Study of five units in Karveer Taluka, District Kolhapur, unpublished M.Phil Dissertation in Economic, Shivaji University, Kolhapur, 1993.
40. Naidu, I., I. Narendra I. And P.B. Parthasarathy, "Temporal variation in Jaggery Marketing at Anukapalle of Andhra Pradesh- An Economic Analysis", in Indian journal of Agricultural marketing, 1995, P- 47 and 48.
41. Desai, B.B. and Kale "Factors influencing Quality of Jaggery- A Review", in: Report of the All India co-ordinated Research Project on Processing, Handling and storage Jaggery and Khandsari, 1994, P- 21, 39.
42. Patil, J.P. and N.B. More, "Studies of influence of Different planting Dates and varieties on the Jaggery Quality and storability under flood conditions" in: All India co-ordinated Research project on Processing,1994.
43. S.S. Rupe, Growth and prospect of Jaggery industry in Kolhapur District of Maharashtra State, Unpublished Ph.D theses,Shivaji University, Kolhapur, 2007.
44. Anjugam M, Value addition of sugarcane, A case of Jaggery production, Department of Agricultural Economics, Tamil Naidu Agricultural University, Tamil Naidu, 2007.