BLUEAGAVE: A NEW AGENDA IN FOOD, ENERGY AND TEQUILA

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Abstract: - Blue agave scientific name is Agave tequilana Weber and it belongs to Rigidae, Agavaceae family is a Mexican plant that has been allied with tequila since 16th or 17th century. The tequila industry indicates geographically the bagasse residues and agave production that can be used as a biofuel. This industry has grown up over time and resulting in the increasing agave production and use of biofuels for the second generation. This review paper presents, when some industries have been affected by the unprecedented change, with diversified demand and predictions of increased competition by tequila production but can be advantageous to the biofuels industry. The genetic resources from landraces may be beneficial for both ethanol production and conservation. [4]

Tequila has different types of brands and every brand has different quality and alcohol levels. Mexican tequila has the best quality for consumption and Mexico imported tequila in some countries which are labeled, advertised, and manufactured in Mexico.[5]

Mezcal is also manufactured in Mexico and imported into other countries.

Keywords: - Blue Agave agriculture, bagasse, animal feedstock, bioethanol, genetic resources, mezcal.

1. INTRODUCTION

Agave tequilana needs minimum irrigation and it is cultivated in soils, hence it is not a basic crop plant. A. tequilana is the only plant that is used for tequila production but biofuel production raises the value of this plant. There are at least 150-300 Agave species worldwide, and a large number of species are found in Mexico only[6]. A. tequilana is also using in some medicinal products, for instance- sugar syrup because agave has high inulin and carbohydrate concentration.

Tequila and mezcal are the most popular beverages of A. tequilana. After the research of biofuel production from agave, a debate has been raised between food and fuel. In 2008, tequila industry production was approx. 311.7 million liters and the bioethanol industry is predicting to have an annual production potential of approx. 100.6 million liters for domestic fuel. It is concluded that biofuel feedstock does not compete with the human food supply.[7]

This review paper first introduces about Agave plant and their importance then the detail about tequila production and use of agave plants in different substances in the food industry and then some points of conservation of landraces which concludes the new agenda which makes clear the value of genetic resources which increase the breeding potential of blue agave for biofuel.[8]
This research gives you an overview of the tequila industry and biofuel production, it is the main topic for research and the manufacturing process of tequila. Gene pool also plays a very important role in Agave production and increases its quality as well.[9]

There are different types of Agave plants use for mezcal - Foxtail agave, agave salmiana, agave angustifolia, parry's agave, agave geminiflora, agave potatorum, etc..[10]

2. IMPORTANCE OF TEQUILA INDUSTRY

The tequila industry is used to generate biofuel, valuable bioproducts, and alcoholic beverages which is obtained from Agave tequilana Weber var.[11] It gets recognition from the international market when it possesses the title of origin since 1974.[12]

The first stage is fermentation, through the cooking or non-cooking process fermentable sugars are obtained from agave. Carbohydrates are hydrolyzed which is present in the raw agave juice at high temperatures (75-800C).[13]

The next stage is an alcoholic fermentation process by different microorganisms, it transformed to ethanol, CO2, other compounds.Now the last stage is distillation, after the two-stage fermented process, the distillation process is performed to obtain tequila.[14]

In the cooking process, after cooking shading, washing, and pressing process are done and get bagasse which is used for biofuel similarly in the non-cooking process after shedding bagasse is release by the diffuser.[15]

Agave is preventing from flowering and dying early but fully ripen plant is used for harvesting, for harvesting "coa" knife is used it is a special type of knife with a circular blade on a long pole.[16] Agave plants should have the right amount of carbon dioxide for fermentation if it harvested too late or too early then carbon dioxide gets affected.

After harvesting, it baked in the oven to break down fructans

into fructoses. When it is baked it is mashed with a large stone wheel which is known as tahona. Wastage can be used as biofuel or animal feeding.

The juice is stored in some wooden container or steel container for fermentation and gets low content of alcohol. Clear silver tequila is produced after two-stage fermentation. Hydrogen has the highest energy content which fulfills the growing energy demands, during combustion H2 only generates water vapors hence it is a carbon-free source of energy so the biohydrogen products are obtained from agave bagasse and tequila vinasse.

There is a difference between the taste of valley and highlands agave plants tequila which is easily noticeable. Village agaves have earthier flavor in tequila while the plants grown in the highlands have sweeter and fruitier-tasting tequila.

3. BLUE AGAVE GENE POOL

In 1970, the augmentation in the tequila industry basically depends on the large use of one landrace as its most of the part is being used to meet the quality standards of the obligatory tequila in a way alike to industry and various wine industries set goals and master plan outside the Europe.[17] It has been observed that the Homogeneity of Blue agave plantations is an advantageous characteristics of agricultural management of raw material for mechanization, automation and standardization. Along the broadening of homogeneous vending scaled agave production, it is possible that maybe we can lose the genetic diversity that was previously the Mexican landscape.

To enumerate, the old tequila landraces are the part of the genetic diversity was even now cultivated, anatomical and gentic characteristics of numerous agave landraces were foregather from the census data.

The put forward disparity between the group of other agave and Tequila Agave Group is too holded up by the Taxonomial grouping of species that is used in other regions for the purpose different species used for mezcal production.[18]

4. NEW AGENDA OF BLUE AGAVE AND LANDRACES CONSERVATION

Eventually recurring episodes of blue gave uncontrolled supply, somewhat in answering to skyrocketing prices, an attempt was done in order to avail oneself surplus agave bu constructing up the insulin and fructose syrup industry, and additionally in continue, the agave biofuel industry in mexico. The production of beverages is called aguardiente or distillates, under Mexican standard NON-EM-012SCFI-2006, [19]excess agave is getting emerged by the another industry, together with which is produced in parts of the Mexico not secured by geographical status.

There is; however a insufficiency of true data on agave group and inulin production. Based information available from the tequila industry, together with the blue agave plant checklists organized by the National Chamber of the Tequila industry and the union of Tequila makers and the Council for Regulation Tequila (CRT), and observed that production of blue agave increased in market as per the demands.[19] Now with standing shooting up diversification of products, an alternative is present for biofuel from blue agave to use it as a bio-mass.

The mandatory quality standards for raw materials does not set by the tequila industry. Rather, each and every brand sets their own levels of quality. Good Qulaity can be classified as 25-30% in total which reduces the concentrations of sugar after hydrolysis. Others follow the best approach which focuses on the fermentation and therefore, the quality of the final product. Additionally, soil, harvest age and, climate conditions, and harvest season were also detected as one of the degrading factor to quality and the sugar content.[19]

By the use of the agave harvest residue market of agave were diversified, and bagasse is being used as a production. Requests are rapidly increasing recently for tequila agave 100% sugar, and the resulting shoot up in residue and for the coming second generation bio fuel production and the resulting count up in residue. [19]If the necessary goals productions extend as a imaging bio ethanol for agave sugars, and it's expected that the amount of agave remaining part might be get doubled in the upcoming years. In the current time, there is a minimal use for agave bagasse though it can be considered that can be used as fiberboard production and composite animal feed. These left outs can be examined and take them in use as a solid fuel or can be for ethanol production because high sugar content found in it. As per the data 32 % leaves constitute that is the total biomass of the agave plant and it contains 13.1 -16.2 & TRS.[19] In the Bagasse represented data it has been noted down that it is the 40% of the total weight of milled agave and 5-20% TRS it contains.[24]

5. CONCLUSION

Under the law of the US, only tequila is sold which is manufactured in Mexico, as it would be for consumption in Mexico. However, only tequila can be sold in the U.S. which has more than 40% alcohol concentration. [20]

Similar to the Canadian law any product of tequila must be manufactured in Mexico, However, tequila which is imported in Canada for sale to be diluted with purified water to maintain it to the desired strength legally and then sold.

Nowadays, tequila is one of the famous beverage which has a demand in worldwide. Earlier the production of the agave plants is high and the product made from this plant is low but when it gets recognition the manufacture of tequila increased and because of the increase in the demand for the product the yield of agave should be increased. [20]

Some other products are also formed like sugar syrup, animal composite, bioethanol, and bioproducts.

Biofuel or bioenergy is the recent research topic of Agave and it is also a new agenda for researchers to use wastage of agave as a biofuel.

Since 17th-century tequila is in the market, the valley agave plant has a different taste of tequila. The sugar content is affected by climate conditions, fruit ripens age, harvest time, and introduces valuable genetic resources to improve the yield of blue agave.[20]

As, tequila industry will grow up and also have increase in the production of the products based on it.

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