ABSTRACT
If you want to know tella, come across Ethiopian holidays, it is certain you will find and enjoy it. Tella is an alcoholic beverage, which is common in Ethiopia. Irrespective of the science behind the production of tella, it has many consumers. And if it is methodologically produced the acceptance of tella will increase.

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ABSTRACT

Traditional beverages are many in type. Some of them consider as local beer. Tella is one of the most common local beer in Ethiopia and Eretria. There are 3 types of tella, ZILEL, which is made from barley, maize or sorghum and other like grains, CORAFE, which is made from lightly roasted barley, and LIFTER, which is made from well roasted barley or sorghum and is darker in color. They all contain hops. It is traditionally drunk on major religious festivals, saints’ days and weddings.

Tella (ZILEL) is home-brewed beer which differs from the others in some respects. First it is brewed with barley or wheat, hops, or spices. Secondly, it has a smoky flavor due to the addition of bread darkened by baking and use of a fermentation vessel which has been smoked by inversion over smoldering wood. Tella is not processed under government regulations hence the alcohol content varies but is usually around 2% to 4%. Filtered tella has a higher alcohol content ranging from 5% to 6%.

CHAPTER ONE

1.1. INTRODUCTION

Tella is most common local alcoholic beverage in Ethiopia. The science of tella production is the core principle to know behind tella production. Though every individual know how to make tella, the contents and specific process almost unspecified. So the main reason to do project on the science of tella production is this science. The very beginning principle of tella production is too simple. Adding some effect and some additives to this principle gives us the one which we need. Tella makers have no one and common principle of tella production. After finishing this project everyone can make one typical types of
tella. That is the very important part of this project. This science of tella production will be expressed in different way in this project. Researchers make many research on tella. Most of the researchers do in the same way as the traditional tella makers. Because of this, the researcher did not influence the society on making tella. Specially the one which was made last year during Ethiopian business competition. It especially this research is tried to shorten the time of making tella by making most of the raw material readymade.

1.2. BACKGROUND

The history of tella is same with the history of beer as it is the father of modern beer. For this reason, tracing the history of beer is same as tracing the history of tella (local beer).

Tella (local beer) is believed to be over 10,000 years old. Although no one knows its exact origins, some agricultural historians believe that the first tella may have been produced accidentally when a stash of grain was soaked by rain and then warmed by the sun. If this mixture were spontaneously fermented by wild, airborne yeast which thrives in just these warm, moist conditions tella would have been produced.

1.3. PROJECT QUALIFICATION

Everybody can make tella though the quality differ. The only one that can makes some difference between tella productions is that of the different in the proportion of the raw materials used for the tella production: the time needed for each steps for the process and the type of additives used for tella. Adjusting the gap between the amount and quality of the raw material can give us the best result. Doing this is too easy as everyone can know the type of raw material for tella production. That is why the qualification of this project is certain for its completion. Without any doubt, we can finish this project on time with feasible economic analysis, but we still need the help of chemical analysis’s and the local tella producer for further knowledge.

1.4. PROBLEM OF THE STATEMENT

Tella is bold common for all Ethiopian people. If we go any house at holyday, we are certain we can find tella. If it is most common local beer, upgrading the production process to the modern way is important. Doing research on this local
alcoholic beverage indirectly helps for the people of the country. The main reason
doing this project is this. As it is not scientifically produced its standard is
decreasing. The cause for decreasing the respect of tella consumer is due to the
quality of tella and production standard. The only trick solution for solving this
problem is standardizing the process. The main initiating problem of this project is
this issue of standardization of tella production process.

1.5. OBJECTIVE

1.5.1. GENERAL OBJECTIVE
This project has main objectives. Some of the main objectives of this project are
listed below.

1. To standardize the process of tella production in Ethiopia to systematic and
   simple way.
2. To prepare scientific guiding manual for the production of tella Ethiopia.

1.5.2. SPECIFIC OBJECTIVE
Beside of the main objective there are some other specific objectives.

1. To encourage this business as one of common and beneficial business area.
2. To shorten the long time process of tella production, in order to save time
   and energy.
3. To make it modern in its quality and quantity
4. To clearly specify the main and best steps for tella production
5. To make tella production very simple, and every individual can make it for
   sell or for home.

1.6. SCOPE AND LIMITATION
The scope of this project is limited due to some reasons. Some of the most
common reasons to limit this project are common for all most of such projects. To
list the main reasons, Shortage of money for any expenses during the project,
shortage of enough information when asking people about the project, shortage
of time for fully doing this project and other minute to consider. Due to those and
other kind of problems this project is limited.
CHAPTER TWO

2.1. LITERATURE REVIEW
There is no enough information to read about tella production. Some bloggers write about tella in brief. The brief explanation of those bloggers is not talking about the science of tella production rather simply explaining about its locality, popularity and alcoholic contents. Even though it is most common type of alcoholic drink in Ethiopia and Eritrea, researchers and scientist do not do project on tella as expected. But there are some written documents about tella on the web and on libraries. Some of them are: lisan online magazine says about tella that tella is the very common type of Ethiopian holyday drink. African journal of food science go deeper on this type. This journal descripts tella starting from its alcoholic content to its pH level. Ethiopian traditional alcoholic beverage namely tella is very common drinks in the country. purposely for ‘filtered’ tella sampling and five for the unfiltered tella samples. The alcoholic contents of filter-tella, were measured and found in the range of 3.84 to 6.48% v/v ethanol. Difference in pH values and ethanol levels among all samples was significant (p<0.05). Variations within samples of each vending houses, coefficient of variation (CV>10%) among all samples were significant, though the variation in pH of the alcohols studied were analyzed and found at drinking range or according to European Brewery Convention. Finally, sensory responses which were taken from the community (people drinking these alcohols), indicated that they are high in aroma (bitterness for tella than other drinks reported) (Tadele Yohannes and at el : 2013).

2.2. METHODOLOGY
The methodology of this project is not so special. It uses the most common steps of breweries. As we know tella is the father of alcoholic beverage. Some of the
methods invested in this project are the upstream (preparation), fermentation process and downstream (filtration).

To do this project some application software are used. Those software will help in developing the best diagrammatical design of the reactors during simulation and designing and data collection. Some of the software which are used in this project: Microsoft Visio, superpro designer and Microsoft word 2013.

2.2.1. FLOW SHEET DIAGRAM
In the process of tella production there are many steps to consider. Steps listed in here may vary from steps listed in other research. The best steps will use in this project are feasible in economy. Some of the steps which are considered in here are the process of immersing, kilning, brewing and bottling. The diagrammatic expression of the steps are shown as flow sheet of units and arcs.

2.2.2. PROCESS FLOWSHEET DISCRIPTION

2.2.2.1. SLEEPING BARLEY: most of the raw material used to make tella is barley, but there are many grains used to make tella. If we use barley sleeping is very important step. Malting (germination) begins by immersing barley, harvested at less than 12 percent moisture, in water at 12 to 15 °C for 40 to 50 hours. During
this steeping period, the barley may be drained and given air rests, or the steep may be forcibly aerated. As the grain imbibes water, its volume increases by about 25 percent, and its moisture content reaches about 45 percent. A white root sheath, called a chit, breaks through the husk, and the chitted barley is then removed from the steep for germination.

**Germination:** Activated by water and oxygen, the root embryo of the barleycorn secretes a plant hormone called gibberellic acid, which initiates the synthesis of \( \alpha \)-amyrase. The \( \alpha \)- and \( \beta \)-amyrases then convert the starch molecules of the corn into sugars that the embryo can use as food. Other enzymes, such as the proteases and \( \beta \)-glucanases, attack the cell walls around the starch grains, converting insoluble proteins and complex sugars (called glucans) into soluble amino acids and glucose. These enzymatic reactions are called modification. The more germination proceeds, the greater the modification. Over modification leads to malting loss, in which rootlet growth and plant respiration reduce the weight of the grain.

In traditional malting, the steeped barley was placed in heaps called couches and, after 24 hours, spread on a floor to permit germination. Because respiration of the grain causes oxygen to be taken up and carbon dioxide and heat to be produced, control of aeration, ventilation, and temperature was achieved by manually turning the grain. Large-scale floor malting with mechanical turners were introduced, later replaced by pneumatic malting, in which germination occurred in boxes with the bed automatically turned, aerated, and ventilated with forced air. In some modern malting operations, gibberellic acid is sprayed onto the barley to speed germination, and bromates are used to suppress rootlet growth and malting loss.
**KILNING**

Green malt (ብቅል) is dried to remove most of the moisture, leaving 5 percent in lager and 2 percent in traditional malts. This process arrests enzyme activity but leaves 40 to 60 percent in an active state. Curing at higher temperatures promotes a reaction between amino acids and sugars to form melanoidins, which give both color and flavor to malt.

In the first stage of kilning, a high flow of dry air at above room temperature is maintained through a bed of green malt. This lowers the moisture content from 45 to 25 percent. A second stage of drying removes more firmly bound water, the temperature rising to and the moisture content falling to 12 percent. In the final curing stage, the temperature is raised. The finished malt is then cooled and screened to remove rootlets.

**MILLING**

For efficient extraction with water, malt must be milled. Early milling processes used stones driven manually or by water or animal power, but modern brewing uses mechanically driven roller mills. The design of the mill and the gap between the rolls are important in obtaining the correct reduction in size of the malt. The object is to retain the husk relatively intact while breaking up the brittle, modified starch into particles.
MASHING

The milled malt, called grist, is mixed with water and powder hop, providing conditions in which starch, other molecules, and enzymes are dissolved and rapid enzyme action takes place. The solute-rich liquid produced in mashing is called the wort (ጋን). Traditionally, mashing may be one of two distinct types. The simplest process, infusion mashing, uses a well-modified malt, two to three volumes of water per volume of grist, a single vessel called a mash tun (ጋን), and a single temperature. With well-modified malt, breakdown of proteins and glucans has already occurred the starch readily gelatinizes and the amylases become very active. Less-well-modified malt, however, benefits from a period of mashing at lower temperatures to permit the breakdown of proteins and glucans.

Other sources of starch that gelatinize can be mashed along with malt. Wheat flour and corn (maize) flakes may be added directly to the mash, whereas corn grits and rice grits must first be boiled in order to gelatinize. Their use requires a third vessel, the cereal cooker. For the aromatic qualities and flavors of tella some any other additives are added with malt during mashing. One of the most common in traditional and modern tella production is hop.

HOPS (ጌሾ)

Several varieties of the hop (Humulus lupulus) are selected and bred for the bitter and aromatic qualities that they lend to brewing. The female flowers, or cones, produce tiny glands that contain the chemicals of value in brewing. Humulones are the chemical constituents extracted during mashing. One fraction of these, the α-acids, is isomerized by heat to form the related iso-α-acids, which are responsible for the characteristic bitter flavor of tella. Traditionally, the dried hop cones are
added whole to the boiling wort (የአጭል), but powdered compressed hops are often used because they are more efficiently extracted.

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**FERMENTATION**

The wort found from the mixing of malt, hop and water is now ready for further mixing. At this stage wort, darkened bread (መጠቓ) and water are mixed together. Tella has a smoky flavor due to the addition of bread darkened by baking and use of a fermentation vessel which has been smoked by inversion over smoldering wood. This fermentation process produce somewhat more gelatin product. The final product of the chemical reaction steps is this highly concentrated gelatin tella (ድፍድፍ). This product is considered as final product although it is highly concentrated.

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**DILUTION**

The gelatin like highly concentrated tella product (ድፍድፍ) mixed in water in order to decrease its concentration. In here no chemical reaction takes place. The only things happen in this step is dilution of the highly concentrated tella to commercialize one. This step takes the shortest period of time of all steps. At this step two different product are produced. One pure modernized concentration tella
which is the main product to drink. The second and by product of tella production process is the residue. The residue sometimes diluted again and again to get pure less in quality tella product. The final waste product of tella is given to cattle.

General process flow sheet of tella production using superpro designer.

2.3.1. RAW MATERIAL
Testy and beautiful tella is the result of carful controlling of each production process steps. The major steps of process steps are preparation, formation and extraction. From the above list preparation may have the highest contribution for tella production. During preparation (upstream) raw materials are specified. The raw material specification may vary from place to place due to availability, costly, test of final production and other criteria. Some of the most common specified raw material for all most of tella production in Ethiopia are like: barley, Dagusa, sorghum, Teff, and maize. Those all are what we call raw materials. The raw
materials are used for tella production in the form of malt, hop and darken bread (መጠቃ).

CHAPTER THREE

3.1. IMPROVEMENT

Tella is produced through long steps and procedures. Those steps and procedures are tiresome for some tella makers. Tella maker needs about a week to make tasty and the most common tella. So this lengthening time of tella production must shortened to feasible time. The improved part of this fermentation is the addition and making of readymade raw material. This method of shortening tella production is good to make it modern. The best way making the most of the raw material ready-mades. And shorten the time to the most available time. The most summarized method of tella production needs about six steps. Each of the above steps need time to produce some intermediate products. The Intermediate products of each steps are the raw materials for the next step. This sequential and chain like method of tella production’s time is too much to wait for the final product. So making every intermediate product readymade will help to fasten the time of harvesting tella. Making all of them readymade and putting them on shelf is the best way to make tella in short period of time. If most of the intermediates are readymade and found on shelf, everybody can make tella in short period of time.

3.3. DISCUSSION

Significant variations in pH values of the tella within the sampling sites and pH value ranged from 4.00 to 4.99. There is also significant variations in the alcohol content of tella samples observed where the values ranged from 3.98 to 6.48 (% v/v) and averaged 5.17 (%v/v). Wide variations in results were obtained and this might be attributed to different methods of preparation of the beverages at the domestic level and the constituent variations are also suggested in literatures (Vogel and Gobezie, 1983). As these fermentations are natural and, thus, controlled, alcohol produced during the fermentation methods are spontaneous, and variability of the product is inevitable (Zvauya et al., 1997). Statistical one-way ANOVA analysis indicated that at the 0.05 (p = 0.028) level, the means of the ethanol (% v/v) of ‘filtered’ and ‘unfiltered’ tella are significantly different. The Original gravity reported for ‘unfiltered’ tella was found in the range of EBC (European Beer Convention). Conditions such as
temperature, aeration and actions of the microorganisms also obviously affect the level of the alcohol in the samples (Sahle and Gashe).

3.4. CONCLUSION
The science of tella production is somewhat left behind. Tella production standardization will help to the people who are living by making tella and selling it. Improvement of tella production can be successful by making the raw material readymade. The shelf life of readymade raw materials must be long. To find them in every shop and by them like orange powder for tea.
REFERENCES