SUBJECT	FORENSIC SCIENCE
Paper No. and Title	PAPER No. 5: Forensic Chemistry & Explosives
Module No. and Title	MODULE No. 14: Country Made Liquor and Illicit Liquor
Module Tag	FSC_P5_M14

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TABLE OF CONTENTS

1. Learning Outcomes

After studying this module, you shall be able to know about-

- The significance of Country made and Illicit Liquor
- The issues related with country made and illicit liquors
- Their forensic importance and examination

2. Introduction

India is the third largest liquor market in the world and one of the fastest growing markets in the world, on the back of demographics & economy. The history of the human consumption of alcohol is closely related to the history of world's societies, in terms of invention, manufacture, trade and religion. While nobody knows when beverage alcohol was first used, it was presumably the result of a fortuitous accident that occurred atleast ten thousand years ago. The primitive people probably discovered alcohol much as they did fire, as a gift of nature plus curiosity. It has been acknowledged that first cave dwellers drank the extracts of mashed berries that had been exposed to airborne yeast. When people found that the juice produced pleasant feelings and reduced discomfort, they began to intentionally produce an alcoholic drink. In almost every part of the world different civilizations had developed some type of alcoholic beverages.

There are different types of alcohols that people consume. Largely, it is the ethanol or ethyl alcohol. For the purpose of preparation of potable ethanol, yeast is employed for the fermentation process. Various types of alcoholic beverages, including commercial, licit non- commercial, illicit home brewed and sometimes adulterated alcoholic beverages that diverge state by state and area, are consumed. The alcoholic beverages to beer, distilled spirits (or liquor) and wine, all varieties of alcoholic beverages are based on fermentation, the natural process of decomposition of organic materials having carbohydrates. Liquor production involves the extra step of distillation, which reduces the original water content and significantly increases the alcoholic strength. India has the fastest developing liquor market in the world.

However, deterring government policies continue to keep foreign liquor out of the country and limit liquor trade across states leaving domestic liquor price extremely high for Indian consumers. Restrictions on foreign liquor have led to a growing number of illegal liquor businesses in India. For example, a state-wide prohibition on liquor sale in Gujarat, has given rise to wide - scale trades of bogus and low-priced liquor tailed by a rise in organized crimes in areas where demand is high.

A lack of quality control results in many impurities and adulterants being present in or added to illicit alcoholic beverages. These include heavy metals like lead and arsenic, organic solvents and sometimes sedative drugs like benzodiazepines and barbiturates. However, the most dramatic effects are seen when methyl alcohol is added. This almost always leads to deaths or serious organ damage, including loss of eyesight.

3. Country Made Liquors

Country Liquor, also called Indian Made Indian Liquor or IMIL, is brewed and mostly sold locally. Most of the country liquor is retailed in northern states. Ethanol from molasses and grains are used in the north while palm and coconut are used in the south for producing the country liquor. Liquor manufacturers in India largely use ethanol distilled from molasses, which is a by-product in sugar production. Procurement of this natural resource plays a decisive role in Indian made foreign liquor and Country Liquor production in India. For that reason, sugarcane farmers, molasses producers, and alcohol distilleries are central participants in India‘s liquor production chain. Country made alcoholic beverages are prepared from any cheap raw material available locally, e.g. sugarcane, rice, or coarse grains, Country liquor is manufactured in authorized distilleries and traded from approved outlets within the same district. Common varieties of country liquor like arrack, *desi sharab*, *taari* (taadi or toddy) and *handia* (an *adivasi* and tribal drink in Orissa) are widespread among the poorer sections of the population. *Feni* (Cashew feni) which is an alcohol distilled from the fermented juice of apple of the cashew tree and is prepared with a particular pot- still through a series of distillations.

But, distilling the cashew apple into liquor called feni is clearly a Goan contribution to the wealth of liquor. Spiced spirit means flavored country spirit in which the flavoring agents are either added during the course of distillation or reduction. These flavoring agents or essences are mostly selected from among the cardamom, neem, aniseed, orange, coriander, ginger, jasmine, peppermint, mundi (Spharanthus indica), mango, khus- khus, pineapple, rose, banana, pomegranate, etc. Excise duties are paid, but since production costs are low, the retails prices are also low. The licensing systems and some governmental monitoring of the production process ensure uniformity in harmful intoxicants. Northern and western India is sugar producing areas, and a huge amount of molasses is available in these states at a much reduced price. As a result, molasses is the main raw ingredient for country liquor there. In south India, coconut and other palms are used for the similar purpose. In addition, inexpensive grains are used for the preparation of country made liquor all over India. Home fermentation and distillation are also common in several tribal areas.

Another category of liquor is Homemade liquor, which could neither, is called as country made liquor nor illicit liquor, because of their uncertain legitimacy. They are home- made alcoholic beverages. Home fermentation and distillation of alcoholic beverages for self-consumption are also common in several tribal areas in the country, especially in the East and North East region of the country. Home production for self- consumption is also common in some parts of India and a quite large percentage of the inhabitants is reportedly producing their own liquors at home for personal consumption. As per the Bureau of Indian Standards (BIS) norms, Country made liquors can be classified broadly into following types:

Plain Country Spirit

Plain country spirit shall be the alcoholic distillate obtained from fermented mash of molasses, cereals, potato, cassava, fruits, jaggery (GUR), juice/sap of coconut, palmyra and other palm trees, mahua flowers or any other source of fermentable carbohydrates. The distillation shall be carried out in such a way that the spirit has flavor derived from the natural volatile principles already present in the raw materials used or formed during fermentation.

Blended Country Spirit

Blended country spirit shall be a blend of pot-still distillate, rectified spirit which may be obtained from fermented molasses, grain or any other source of fermentable carbohydrates.

Spiced Country Spirit

Spiced country spirit shall be made out of plain or blended country spirit and flavorings with or without colour.

4. Illicit Liquors

Besides licensed distilleries, a number of small production units operate clandestinely. The raw materials used are similar to those in the country made liquor, but since they evade legal quality controls the alcohol concentration in their products varies and adulteration is frequent. Illicit liquor is also known as non-commercial alcohol goes by many names such as moonshine, bootlegged, local, illicit or unrecorded alcohol. It actually includes alcohol beverages that are not manufactured within the commercial setting and are as a result not reflected in formal statistics. These beverages are largely out of the reach of the government control and therefore not taxed. Finally, non-commercial alcohol is habitually not subject to the equivalent criteria of quality and purity as its commercially made counterparts are. The illicit market consumption is far more than legal sales. The illicit India made Foreign liquor is produced clandestinely by the existing producers or by small underground networks of producers and also smuggled from one state into another or from outside the country. In India illicit country liquor is customarily manufactured surreptitiously in small production divisions with resources similar to the materials used for the country made liquor, with no authorized quality control checks on them. Cheaper than the licensed country made liquor illicit liquor is prevalent among the poorer sections of the population. It is common to find samples containing upto 56% alcohol.

One dangerous adulterant is industrial methylated spirit, which occasionally causes mass poisoning of consumers who lose their lives or suffer irreversible eye damage. Since no government revenues are paid, illicit liquor is considerably less expensive than licensed country made liquor, and thus finds a ready market among the poor. In many parts of India illicit liquor production and marketing are like a cottage industry, with every village having one or two illegal operations. In addition to the commercial production of illicit liquor, home production for personal consumption also is common in various parts of the country. Methyl alcohol or methanol costs economical and is intoxicating adulterant, therefore used in illicit or adulterated liquors or as ethanol substitution. Methanol is a extensively available chemical with a variety of uses including as a solvent, in chemical synthesis and as a fuel. Methanol has a relatively low intrinsic toxicity, however, it is metabolized to highly toxic compounds, which can cause blindness, coma and metabolic disturbances that can be life-threatening**.** Methyl alcohol poisonings, whether they take place occasionally or epidemically, are exceptional but awfully dangerous poisonings.

Many occurrences of methyl alcohol poisoning occur when methanol is added to illicitly or informally- produced alcoholic drinks and the same are reported from many parts of India with recent increase in hospital admissions. Methyl alcohol or methanol (CH_3OH) or wood alcohol, is a colorless, volatile and toxic liquid having specific gravity of 0.81, boiling point of 65°C and molecular weight of 32.04 gm/mole. It is found frequently in high concentration in automotive antifreeze, varnishes, and de-icing solutions, paint thinner, windshield wiper fluid, and many other industrial products. Methyl alcohol poisoning most frequently occurs by way of oral ingestion of illicit or adulterated liquors or as ethanol substitution, also absorbed transdermally or by inhalation. Trace amounts of methanol are found naturally in fruit juices - this is non-toxic. Methanol is also a product of fermentation and is found in both alcoholic and non-alcoholic fermented drinks.

Concentrations of 6-27 mg/L have been measured in beer and 10-220 mg/L in spirits. In these concentrations methanol is not harmful. Complications arise when higher concentrations are formed in the course of inaccurately managed distillation processes, but more predominantly when methanol is deliberately added to fortify informally-produced spirits and illicit alcoholic drinks.

Often such drinks are sold in unlabeled containers in markets and in illegal drinking venues. Illicitly- or informally produced alcohol may also be retailed in legitimate bars, mostly in some tourist areas. Consumers may choose these drinks because of their low cost compared to taxed alcohol. Some illicitly-produced drinks are made to appear legitimate through bottle design and labeling and consumers can be misled into believing they are buying a genuine brand of alcohol. Bottles may be sold in shops, markets and bars, often at a 'bargain' price.

5. Forensic Analysis

5.1 Analysis for Methyl Alcohol

5.1.1 Chromotropic Acid Test

About 1 ml or appropriate amount of sample (distilled or as such depending upon the nature of sample and concentration of methanol) is taken in a test tube and about 2 ml of Potassium Permanganate solution (3 gm potassium permanganate and 15 ml of Phosphoric/Ortho Phosphoric Acid in 100 ml distilled water) is taken and shaken well. Now few crystals of Sodium Bisulphate are added with shaking till disappearance of colour (Potassium Permanganate colour) of the solution. About 1 ml of Chromotropic Acid (5% of aqueous solution of sodium salt of Chromotropic Acid) and concentrate Sulphuric Acid is added slowly with inner sidewall of the test tube to the extent of 15 ml. Appearance of violet colour indicates the presence of Methanol.

5.1.2 Schiff's Reagent Test

About 4.5 ml of sample (distilled or as such depending upon the nature of sample) is taken in a test tube and 0.5 ml of ethanol (if the concentration of ethanol is high in the sample, the sample is fortified accordingly is added so that 5 ml volume should contain only 0.5 ml ethanol. 2 ml of 3% Potassium Permanganate solution and .2ml of Phosphoric Acid is added. The whole content is left for 10 minutes. 1 ml of 10% Oxalic Acid is added followed by 1ml of concentrated Sulphuric Acid. The contents are cooled at room temperature. 5 ml of Schiff's reagent is now added and kept for half an hour to observe the colour. Appearance of purple colour indicates positive test for the presence of methanol.

5.2 Test for Furfural

About 5 ml or appropriate amount of sample (distilled or as such depending upon the nature of sample and concentration of furfural) is taken in a test tube and about 1 ml Aniline and about 0.5 ml Hydrochloric Acid is added to it and kept for 15 minutes. Appearance of red colour indicates the presence of Furfural.

Alternative method

About 2 ml or appropriate amount of the sample (distilled or as such depending upon the nature of sample) is taken in a test tube and about 0.2 ml of Aniline and about 0.4 ml of Glacial Acetic Acid is added to it. If the furfural is present in the sample, red colour develops in a few seconds & reaches its maximum intensity in 5-10 minutes.

6. Summary

- Country made liquor is alcoholic product usually prepared from fermentation of carbohydrates present in cereals, jaggery, fruits, mahua, palm, molasses etc. The liquors are sold in the market in various brands and covered under Excise Act.
- Methanol (also known as wood alcohol, wood spirits, methyl alcohol and carbinol), is a commonly available chemical. Methanol has many industrial applications and is also found in a number of household products including varnishes, antifreeze, windscreen wash, and fuel for model aircraft.
- Occurrences of methanol poisoning arise from the consumption of adulterated counterfeit or informally-produced spirit drinks. There have been several outbursts in recent years, including in India, Czech Republic, Cambodia, Pakistan, Ecuador, Estonia, Libya, Indonesia, Turkey, Nicaragua, Uganda, Kenya and Norway.
- The informal and illicit production of alcoholic drinks is practiced in various parts of the world, including in countries where alcohol is banned. Some common names for these drinks include: hooch/ moonshine (USA), chang'aa/ kumi kumi (Kenya), tuak/tapai (Malaysia), tonto/waragi (Uganda), talla (Ethiopia) and samogon (Russia).