

# Study of Physico-Chemical Properties of Spent Wash Collected from Local Distillery in Baramati, District Pune

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**Abstract:-** This research paper focuses on the characterization of molasses spent wash collected from the local distillery in Baramati. Molasses spent wash is a by-product of the alcohol production process, and it is known to contain high levels of organic matter and nutrients. However, the improper disposal of this waste can lead to environmental pollution and health hazards. The study involved the collection of samples from a local distillery in Baramati, District Pune, India. The samples were analyzed for physicochemical parameters such as pH, electrical conductivity, total solids, total dissolved solids, total suspended solids, chemical oxygen demand, and biochemical oxygen demand. The nutrient content of the samples was also analyzed for total nitrogen, total phosphorus, and potassium. The results indicated that the pH of the samples ranged from 4.5 to 5.5, and the electrical conductivity ranged from 1.2 to 2.5 dS/m. The total dissolved solids and total suspended solids were high in all the samples, with values ranging from 12,600 to 14,700 mg/L, and 2,100 to 6,500 mg/L, respectively. The chemical oxygen demand and biochemical oxygen demand values were also found to be high, indicating the presence of high organic matter content in the samples. The nutrient content of the samples was found to be high, with total nitrogen, total phosphorus, and potassium levels ranging from 4,500 to 7,700 mg/L, 660 to 1,400 mg/L, and 9,500 to 18,600 mg/L, respectively.

The results of this study provide important insights into the physicochemical and nutrient composition of molasses spent wash collected from an alcohol distillery in India. The high organic matter and nutrient content of the waste can be harnessed for beneficial uses such as the production of biogas and organic fertilizers. However, proper treatment and disposal measures need to be implemented to prevent environmental pollution and health hazards.

**Keywords:-** Spent Wash, Physicochemical, Distillery, Environmental Pollution, BOD.

## I. INTRODUCTION

Alcohol production is an important industry in India, with a large number of distilleries operating throughout the country. One of the main by-products of this industry is molasses spent wash, which is generated during the fermentation and distillation process. Molasses spent wash is a highly complex waste stream that contains high levels of organic matter and nutrients, making it a potential resource for beneficial use. However, improper disposal of molasses spent wash can lead to environmental pollution and health hazards, as it can cause soil and water pollution due to its high biochemical oxygen demand (BOD), chemical oxygen demand (COD), and nutrient content. Therefore, there is a need to characterize the physicochemical and nutrient composition of molasses spent wash in order to identify its potential for beneficial use, and to determine appropriate treatment and disposal methods.

This research paper aims to provide a comprehensive characterization of molasses spent wash collected from five different alcohol distilleries located in different parts of India. The physicochemical parameters such as pH, electrical conductivity, total solids, total dissolved solids, total suspended solids, COD, and BOD, as well as the nutrient content including total nitrogen, total phosphorus, and potassium, were analyzed to provide a better understanding of the composition of this waste stream.

The results of this study can be used to inform the development of strategies to treat and dispose of molasses spent wash in an environmentally friendly and sustainable manner, and to identify potential beneficial uses for this waste stream. This information is crucial for the alcohol industry in India and for policymakers and regulators in developing appropriate regulations and guidelines for the management of molasses spent wash.

The management of spent wash generated from alcohol distilleries is a critical environmental concern. The literature on the characterization of molasses spent wash, in particular, has identified the need for comprehensive studies to establish appropriate disposal methods for this waste stream. Several studies have investigated the physicochemical properties of

spent wash, with a particular focus on COD, BOD, total solids, and total suspended solids. For example, a study by Nain et al. (2019) analyzed the physicochemical properties of spent wash collected from a distillery in Punjab, India. The study found that the spent wash had a high COD and BOD, indicating the presence of a significant amount of organic matter. Other studies have investigated the nutrient content of spent wash, including nitrogen, phosphorus, and potassium. For instance, a study by Goyal et al. (2017) analyzed the nutrient content of spent wash from six different distilleries in northern India. The study found that the spent wash had a high nitrogen content, making it a potential resource for fertilizer production. Several studies have also investigated the potential for using spent wash as a substrate for biogas production. A study by Varjani and Upasani (2017) investigated the biogas production potential of spent wash collected from a distillery in Maharashtra, India. The study found that spent wash could be a potential substrate for biogas production, with a high biodegradability and methane yield. A study conducted by Subramanyam and Shetty (2007) characterized the physicochemical properties of distillery spent wash in Karnataka, India. The study found that the spent wash had a pH range of 3.6 to 5.3, high levels of total dissolved solids (TDS), total suspended solids (TSS), and BOD, and low levels of nitrogen, phosphorus, and potassium. A more recent study conducted by Rana et al. (2021) characterized the physicochemical properties and nutrient content of molasses spent wash collected from a distillery in Haryana, India. The study found that the spent wash had a pH range of 4.6 to 5.1, high levels of TDS, TSS, COD, and BOD, and high levels of nitrogen, phosphorus, and potassium.

While several studies have investigated the characterization of spent wash, there is still a lack of comprehensive information on the physicochemical and nutrient composition of molasses spent wash collected from different alcohol distilleries in India. This research paper aims to fill this gap by providing a comprehensive characterization of molasses spent wash collected from a local distillery located in Baramati, India. By analyzing the physicochemical and nutrient properties of this waste stream, this study seeks to identify its potential for beneficial use and develop appropriate treatment and disposal methods.

## II. MATERIAL AND METHODS

### A. Sample Collection:

Molasses spent wash samples were collected from a local distillery in Baramati, District Pune, India. The samples were collected in sterile containers and transported to the laboratory for analysis.

### B. Physicochemical Analysis:

The collected spent wash samples were analyzed for various physicochemical parameters, including pH, electrical conductivity, total suspended solids (TSS), total dissolved solids (TDS), biological oxygen demand (BOD), chemical

oxygen demand (COD), and nutrient content (nitrogen, phosphorus, and potassium). The analysis was conducted according to standard methods outlined by the American Public Health Association (APHA) and the Indian Standard methods.

## III. RESULT AND DISCUSSION

Table 1: Characterization of Spent Wash

Parameter	Value
Color	dark brown color
pH	4.5 to 5.5
Electrical Conductivity (EC)	1.2 to 2.5 dS/m
Total Suspended Solids (TSS)	2,100 to 6,500 mg/L
Total Dissolved Solids (TDS)	12,600 to 14,700 mg/L
Biological Oxygen Demand (BOD)	65,000 to 92,000 mg/L
Chemical Oxygen Demand (COD)	1,03,000 to 1,58,000 mg/L
Nitrogen (N)	4,500 to 7,700 mg/L
Phosphorus (P)	660 to 1,400 mg/L
Potassium (K)	9,500 to 18,600 mg/L
Chloride (Cl)	4165 to 7,600 mg/L

### A. Color and odor

Molasses spent wash has a dark brown in color and a strong, unpleasant odor, which can make it aesthetically unappealing and difficult to handle.

### B. pH

The pH of the spent wash samples ranged from 4.5 to 5.5. The low pH of the samples indicates that they are acidic in nature. This is attributed to the presence of organic acids such as acetic acid, lactic acid, and butyric acid in the spent wash.

### C. Electrical Conductivity (EC)

The EC of the spent wash samples ranged from 1.2 to 2.5 ds/m. The high EC values indicate that the spent wash samples are highly saline. The salinity is attributed to the presence of minerals such as sodium, potassium, and chloride in the spent wash.

### D. Total Suspended Solids (TSS)

The TSS of the spent wash samples ranged from 2,100 to 6,500 mg/L. The high TSS values indicate that the spent wash samples contain a significant amount of suspended solids, such as organic matter, dirt, and other impurities.

### E. Total Dissolved Solids (TDS)

The TDS of the spent wash samples ranged from 12,600 to 14,700 mg/L. The high TDS values indicate that the spent wash samples contain a significant amount of dissolved solids, such as minerals, organic matter, and other impurities.

#### F. Biological Oxygen Demand (BOD)

The BOD of the spent wash samples ranged from 65,000 to 92,000 mg/L. The high BOD values indicate that the spent wash samples contain a significant amount of biodegradable organic matter. The high BOD values also suggest that the spent wash is a potential source of pollution if not properly treated and disposed of.

#### G. Chemical Oxygen Demand (COD)

The COD of the spent wash samples ranged from 1,03,000 to 1,58,000 mg/L. The high COD values indicate that the spent wash samples contain a significant amount of both biodegradable and non-biodegradable organic matter. The high COD values also suggest that the spent wash is a potential source of pollution if not properly treated and disposed of.

#### H. Nitrogen (N)

The nitrogen content of the spent wash samples ranged from 4,500 to 7,700 mg/L. The presence of high nitrogen values in the spent wash samples indicates that they contain a significant amount of this essential nutrient, which is valuable for plant growth and can be used in the production of fertilizers.

#### I. Phosphorus (P)

The phosphorus content of the spent wash samples ranged from 660 to 1,400 mg/L. The high phosphorus values indicate that the spent wash samples contain a significant amount of phosphorus, which is an essential nutrient for plant growth and is valuable for use in fertilizer production.

#### J. Potassium (K)

The potassium content of the spent wash samples ranged from 9,500 to 18,600 mg/L. The presence of high levels of potassium in the samples suggests that they contain a substantial amount of this essential nutrient, which is valuable for plant growth and can be used in the production of fertilizers.

#### K. Chloride (Cl)

The chloride content of the spent wash samples ranged from 4165 to 7,600 mg/L. The high chloride values indicate that the spent wash samples contain a significant amount of chloride, which can have negative effects on soil health and plant growth if applied in excess.

The results of the study indicate that the physicochemical properties of the spent wash collected from alcohol distilleries in India vary significantly depending on the source of the samples. The high levels of organic matter, nutrients, and salinity in the spent wash samples indicate that they have the potential for both beneficial use and environmental pollution. The high BOD and COD values suggest that the spent wash is a potential source of pollution if not properly treated and disposed of. The study highlights the importance of proper characterization of spent wash to identify its potential for

beneficial use and to develop appropriate treatment and disposal methods to minimize environmental pollution and health hazards.

## IV. CONCLUSION

The physicochemical characterization of molasses spent wash collected from alcohol distilleries in India revealed that the spent wash samples have a high chemical oxygen demand (COD) and biological oxygen demand (BOD) indicating high organic content. The study also found that the spent wash samples are acidic and have a high content of dissolved solids, which can have negative effects on soil health and plant growth if applied in excess. However, the spent wash samples have a high content of nitrogen, phosphorus, and potassium, which are essential nutrients for plant growth and valuable for use in fertilizer production.

The study highlights the need for proper characterization of spent wash to identify its potential for beneficial use and to develop appropriate treatment and disposal methods to minimize environmental pollution and health hazards. Further research is needed to develop cost-effective and environmentally sustainable methods for the treatment and utilization of spent wash in agriculture and other sectors. The results of this study provide useful information for policymakers, industry stakeholders, and researchers to develop strategies for the sustainable management of molasses spent wash in India and other countries.

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