



Unlocking Agricultural Sustainability: Potash Derived from Molasses as a Key to Efficient Nutrient Management

Deep Malik^{1*} and Vikrant Varshney^{2*}

¹Director – Technical and Statistics (Sugarcane and Ethanol)

²Executive – Technical and Statistics

Indian Sugar and Bio-Energy Manufacturers Association (ISMA), New Delhi-110049

Received : June 12, 2024; Accepted : June 25, 2024

ABSTRACT

Potash derived from molasses; a potassium rich fertilizer derived from ash in molasses-based distilleries is a by-product of sugar-based ethanol industry. This paper presents the use of PDM in agriculture and explains the effectiveness of PDM for soil. This paper also explained how the PDM is emerging as the substitute to MoP (muriate of potash with 60% potash content). The distilleries produce a waste chemical called spent wash during production of ethanol which is burnt in incineration boiler (IB) generating ash to achieve zero liquid discharge (ZLD). The potash-rich ash can be processed to produce PDM having min. 14.5% potash content and can be used by farmers in field as an alternative to MOP. PDM is emerging as source which can change the economy of farmer and the sugar sector too.

Keywords: Potash derived from molasses (PDM), spent wash, uses of PDM, size of potash, muriate of potash (MoP), potash ash

INTRODUCTION

The most important nutrients for our soil are N, P, K and potash is one of them.

Notified under Fertilizer Control Order (FCO), PDM is 100 % indigenously manufactured with min. 14.5% K₂O content. (OM, Department of Fertilizer, 2022).

Potash derived from molasses (PDM) represents a potassium-rich fertilizer crucial for agricultural productivity. Derived from molasses, PDM embodies water-soluble potassium compounds, constituting an essential component in plant nutrition. This water solubility facilitates rapid uptake by plants post-application, thereby enhancing plant health, bolstering disease resistance, and augmenting crop yields. Notably, PDM offers a sustainable alternative in regions lacking local sources of potash, thereby mitigating the

necessity for importation and its associated external liabilities. Typically, potash is sourced from potassium salt deposits, such as muriate of potash (MOP), which originate from ancient dried seas and is 100% imported (PIB, 2024).

PDM presents a viable solution to address potassium deficiencies in agricultural soils. This paper examines the significance of PDM as a potassium fertilizer, elucidating its role in agricultural sustainability and its potential as an alternative to imported potassium sources (krishakjagat.org). Manufacturing and sale of PDM is going to be another revenue stream for sugar mills to add to their cash flows and also to make payment to farmers in timely manner. It is another initiative of Central Government to reduce import dependence in fertilizer sector.

*Corresponding Author email: deep@ismaindia.org; vikrant@ismaindia.org

Table 1 : Specifications of PDM

Parameter	Content % by Weight
Moisture % (max.)	5.00%
Water Soluble Potash (K_2O %) (min.)	14.5%

(4- FCO Specifications).

Production of PDM in sugar industry

Molasses, by-product of sugar production under goes fermentation to yield alcohol. Subsequently, the resultant weak alcohol undergoes distillation in specialized facilities known as distilleries. Distillation, a purification technique involving controlled heating or cooling, separates the alcohol from other components in the solution. Consequently, pure concentrated alcohol is obtained, while spent wash, a by-product of the process, is generated. Characterized by its highly acidic nature with a pH range of 4.1-4.5, spent wash is rich in organic pollutants, as indicated by its high bio-chemical oxygen demand (BOD) and chemical oxygen demand (COD). Spent wash contains valuable nutrients essential for plant growth, including approximately 25-30% potassium as K_2O , 1.02-1.08% phosphorus as P_2O_5 , along with calcium, magnesium, sulfur, and carbon.

Spent wash undergoes concentration within a multi-effect evaporator (MEE) system. The MEE operates through a series of vessels designed to heat the solution, effectively removing impurities by exploiting differences in boiling points among components. As the solution progresses through the vessels, a reduction in pressure occurs, leading to a corresponding decrease

in the boiling points of the solution's constituents, facilitating evaporation at lower temperatures. Following concentration, the solution proceeds to an incinerator boiler, where it undergoes combustion to yield potash ash. This ash, enriched with vital nutrients, is subsequently transported to a granulation plant for conversion into PDM granules (Krishna 2019).

Potential of PDM from sugar based ethanol industry (DFPD, 2024).

Sugar based ethanol industry can produce potash in any of the 3 forms:

- PDM from incineration boiler (IB) ash
- PDM after biogas (CBG) extraction
- MOP (by further processing of PDM)

About 286 sugar mills have ethanol distilleries. Out of these, 90 - 95 distilleries have installed incineration boilers with potential of about 10 - 12 LMT PDM production annually.

Presently about 5 LMT of potash ash / granules generated from ethanol distilleries is being sold domestically as per the reports from Government of India.

Table 1 : Potash Ash generated and sold in last three years (in LMT)

Financial Year	PDM Sold after Granulation	Potash Ash Sold Ungranulated	Total Potash Ash Commercially Sold
1	2	3	4 (2+3)
2020-21	0.56	1.50	2.06
2021-22	0.60	2.61	3.21
2022-23	0.68	4.12	4.80

Note: The potential may increase with installation of more incineration boilers and spent wash dryers in rest of these distilleries.

Government's push for promotion of PDM (PIB Release, 2024).

The Central Government has facilitated mutually agreed price of potassium derived from molasses (PDM) at

₹ 4263/MT for sale by sugar mills to fertilizer companies for the current year. In addition, PDM manufacturers can also claim subsidy at ₹ 345/Ton at present rates under nutrients based subsidy scheme (NBS) of department of fertilizers.

Table 2 : Year wise declared subsidy on PDM under NBS (DFPD, 2018)

Year	2021-22	2022-23	2023-24
Subsidy (Rs./MT)	1467	1467	345 (Rabi)
Subsidy (Rs. per bag of 50 Kg)	73.35	73.35	17.25 (Rabi)

Table 3 : Currently India is fully import dependent for muriate of potash (MoP) (60 % K) [FAI, 2024]

Import of MOP in last 5 years	
Year	Quantity (Figures in LMT)
2019-20	36.70
2020-21	42.27
2021-22	24.60
2022-23	18.18
2023-24 (up to July)	28.69

Uses of PDM

PDM are used as fertilizer and boosts plant growth and crop yield. It promotes healthy growth and milk production. Potash also finds applications in recycling, explosives, pharmaceuticals and soap production. (Chris Kozicki).

Environmental and economic impact (CRIYAGEN)

1. Environmental impact:

- *Spent wash utilization:* PDM is produced from spent wash, a by-product of alcohol distillation. By utilizing this waste material, PDM contributes to environmental sustainability.
- *Soil health enhancement:* PDM improves soil fertility, prevents leaching, and enhances aeration and water retention.
- *Eco-friendly:* PDM reduces reliance on chemical fertilizers, promoting an eco-friendlier approach to agriculture.

2. Economic benefits:

- *Cost-effective:* PDM production utilizes existing resources (spent wash), making it cost-effective.

- *Domestic production:* By producing PDM indigenously, countries can reduce dependency on imported potash.
- *Crop yield improvement:* PDM's potassium content enhances plant growth, leading to better crop yields.
- *Additional revenue for sugar mills:* Sugar mills can sell PDM as an additional revenue source, benefiting both the industry and farmers.

CONCLUSION

In conclusion, potash derived from molasses (PDM) offers a crucial potassium-rich fertilizer sourced from molasses, with water-soluble compounds vital for plant nutrition. Its rapid uptake enhances plant health and crop yields, addressing soil deficiencies sustainably. PDM reduces import reliance, provides revenue for sugar mills, and ensures timely payments to farmers. By utilizing spent wash, PDM production mitigates environmental pollution, transforming waste into valuable fertilizer. Granulation optimizes nutrient delivery, benefiting agriculture and the environment. In summary, PDM represents a sustainable solution, bridging economic and environmental gaps in agriculture.

ACKNOWLEDGMENT

We extend our sincere gratitude to Mr. Deepak Ballani, Director General, ISMA, for his invaluable guidance and support and allowing us to work on this paper and giving it a final touch. His support has been instrumental in shaping the clarity and precision of the conclusions drawn herein.

REFERENCES

- CRIYAGEN: PDM : Enhancing soil fertility and crop yields. Available at Chem Process Systems P. Ltd. and CSIR - Central Marine Chemicals Research Institute, Zero Waste” Technologies for Potash Fertilizers from Distillery Wastes.
- Department of DFPD, GoI (2024). Presentation on Production of PDM.
- DFPD (2023). Promotion of Potash Derived from Molasses.
- FCO Specifications T1629716094-FCO specifications. pdf (rcfltd.com)
- Fertilizers Association of India, 2024, Presentation of Potash Derived from Molasses.
- Kozicki Chris, Uses for Granulated Potash.
- Krishna Arvind (2019). BCM-BIO-POTASH – A boon to Farmers And - Alcohol Industr.
- Office Memorandum (2022). Department of Fertilizers, Ministry of Chemicals & Fertilizers
- PIB Release (2024). Department of Food and PD.
- PIB Release (2024). Ministry of Consumer Affairs, Food and Public Distribution
- The Role of Potash in Sustainable Agriculture and Advancing Food Security (krishakjagat.org)