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## Effect of postmethanated distillery spentwash on the growth and yield of Bhendi

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### Abstract

A field experiment was conducted at Amaravathy sugars, Udumelpet to study the effect of spentwash on Bhendi crop. Results revealed that the treatment applied with spentwash (100% N through post methanated distillery spentwash) increased the yield of bhendi. The highest fruit yield of 9,884.00 kg ha<sup>-1</sup> and dry matter production of 2,341.00 kg ha<sup>-1</sup> were recorded in the same treatment. The per cent increase over the control was 15 and 28 per cent, respectively. The enormous quantities of plant nutrients present in spentwash offers an excellent opportunity to use it as a liquid fertilizer along with irrigation water, thus enabling the farmers to save cost incurred on fertilizers and at the same time achieve higher yields of crops.

**Keywords:** Distillery effluent, spentwash, Bhendi, Fertilizers

### Introduction

Spentwash is an agro-industrial waste generated during alcohol production in distilleries. At present in India, there are 319 distilleries with the capacity of producing 3.29 billion litres of alcohol which in turn generates 49.35 billion litres of wastewater (Kumar and Chopra, 2013) [2]. Utilization of industrial effluent in agriculture either for irrigation or cultivation of the crop with the nutrients in spentwash has been increased in recent times (Tharakeshwari and Jagannath, 2011) [3]. Most of the crops showed higher yield with respect to different concentration of effluent application. Since spentwash generated contains organic and inorganic nutrients exceeding the normal level; proper treatment of the wastes is emphasized before using it for either irrigation or composting. Hence the effluent undergoes biomethanation process to reduce the high bio-chemical oxygen demand and chemical oxygen demand and the resulting product is called as post-methanated distillery effluent which can be further utilized in agriculture. On the other hand, Extensive use of inorganic fertilizer not only degrades the soil quality but also affects the productivity of the crop. The application of post-methanated effluent for crop production reduces the environmental impact of inorganic fertilizer on soil properties which in turn reduces the need of inorganic fertilizer. This research was carried out to study the effect of post-methanated effluent application on crop growth, yield and quality.

### Methods

#### i) GC-MS analysis of Post Methanated Distillery Spentwash

The possibility of using post biomethanated distillery spentwash as foliar spray was assessed by analyzing its biochemical constituents by GC-MS. Freeze dried exudates were dissolved (100µg/100µl) in IV-methyl-IV-TMS-trifluoroacetamide for derivatisation into trimethylsilyl ethers and esters. 0.5µl of this solution were injected Triplus RHS Auto sampler Gas chromatograph with Mass Spectrophotometer (Thermo Scientific - DSQ II) in the split mode with a ramping temperature of 50C per minute up to temperature of 280°C. TRSMS (0.25mm IP, 0.25µf, 30 meter) column was used; the helium flow rate was 1ml/min. The temperature gradient started at 70°C and rose to 300°C at a rate of 5°C/min. The gas chromatograph was coupled to a NIST/EPA/NIH Mass Spectrophotometer library Version2.00. The transfer line temperature was set to 280°C, the ion source to 200°C, the filament to 70eV. The mass

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spectrometer was run in the TIC mode from 40 to 620 amu. and the experimental time was 30 minutes.

### Field experiment

Field experiment was conducted using Bhendi var. CoBhH1 as test crop at Research and Development Farm, M/s Amaravathi Co-operative Sugar Mills Ltd., Krishnapuram, Udumalpet, Tirupur District, Tamil Nadu to assess the effect of different doses of PMDSW on the physico-chemical properties and microbial properties of soil, growth, yield and quality of Bhendi. Calculated quantity of PMDSW was uniformly applied in each plot. It was mixed with soil by thorough ploughing in order to provide better soil aeration and consequent reduction of BOD level in the soil system. On 25th day of PMDSW application, the plots were ploughed. Subsequently ridges and furrows were formed by adopting a spacing of 45 cm between the two ridges. Bhendi seeds were sown by adopting a spacing of 45 cm between the two ridges

and 30 cm apart. All the cultural practices including gap filling, thinning, weeding and plant protection measures were carried out as per the crop production guide.

### Treatment Details

#### T1 – Control (Recommended NPK)

T2 – 25% N through PMDSW + 75% N through Inorganic

Fertilizers T3 – 50% N through PMDSW + 50% N through

Inorganic Fertilizers T4 – 75% N through PMDSW + 25% N

through Inorganic Fertilizers T5 – 100% N through PMDSW

T6 – Absolute Control

### Results and Discussion

#### i) GCMS analysis

The results showed that the PMDSW contains Butylated hydroxyl toluene agents like 9, 12, 15-Octa deca tri enoic acid, Hexa decanoic acid, 1-Dodecanethiol, Octa methyl cyclo tetra silaxane and octa decane, which are found to be growth stimulators and have anti-fungal activities.

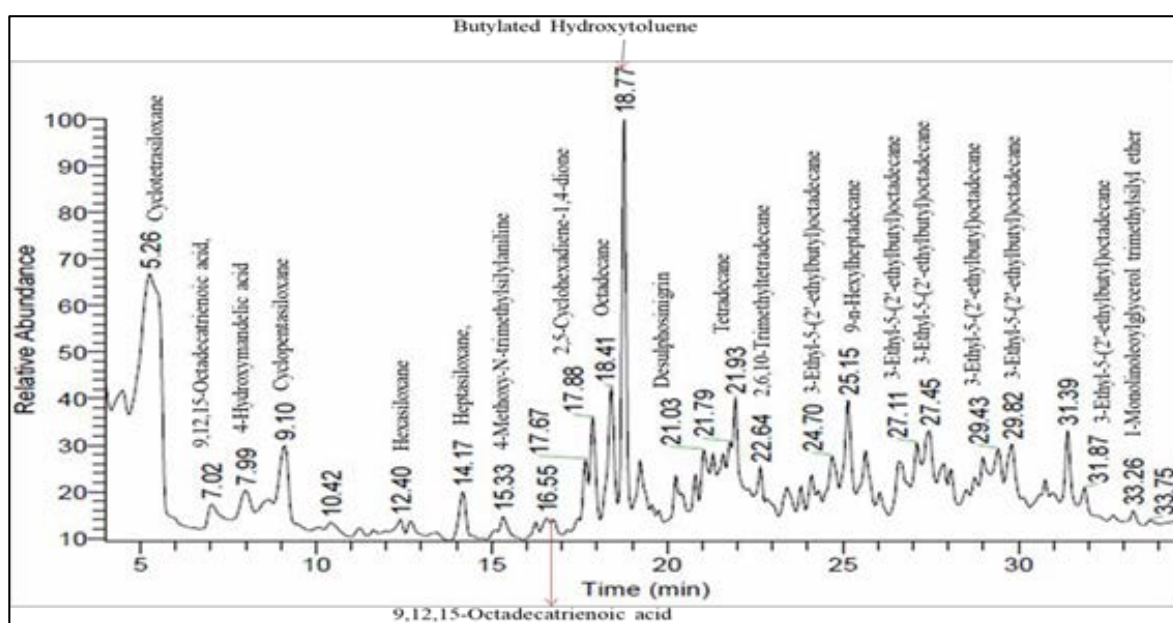


Fig 1: Compounds detected in GC-MS analysis of Post Methanated Distillery Spentwash

#### ii) Impact of PMDSW on Bhendi crop

Consistent growth and yield was observed between the different dosages of spentwash application. In this context, a field experiment was conducted and the results of the study are discussed below. Application of PMDSW favoured the yield attributes of Bhendi over control which may due to the increased availability of nutrients which in turn increased the photosynthetic activity and results in increased yield (Gahlot *et al.*, 2011). The growth attributes viz., plant height, plant girth, number of leaves plant<sup>-1</sup>, leaf area index and yield attributes viz., fruit length, single fruit weight, fruit yield and dry matter production were relatively high in the treatment that received 100% through PMDSW. The highest fruit yield of 9,884.00 kg ha<sup>-1</sup> and dry matter production of 2,341.00 kg ha<sup>-1</sup> were recorded in the same treatment. The per cent increase over the control was 15 and 28 per cent, respectively. In case of dry matter production, treatment PMDSW @ 20.83 KL/ha showed an increase of 19% from control. This is in confirmation with Zalwadia *et al.*, 1997, who reported that application of distillery spentwash increased the level of organic carbon, N,P,K and Ca in soils with significant increase in yield of crops like sugarcane, rice, cotton, maize, sorghum, bajra and red gram. In Citrus maxima the shoot

length, leaf number/plant, leaf area, chlorophyll content and phytomass exhibited a gradual increase upto 10% effluent concentration application (Rani and Srivastava, 1990).

Table 1: Effect of PMDSW on Yield and Yield attributes of Bhendi

Treatments	Fruit length (cm)	Single fruit weight (g)	Fruit yield (kg ha <sup>-1</sup> )	DMP (kg ha <sup>-1</sup> )
T1	13.00	22.00	8608.00	1833.00
T2	13.50	22.80	9067.00	1904.00
T3	14.80	23.50	9353.00	2094.00
T4	15.40	24.10	9592.00	2202.00
T5	16.30	24.80	9884.00	2341.00
T6	14.60	23.44	9300.80	2074.80
SEd	0.36	0.56	221.99	52.72
CD (0.05)	0.79	1.22	483.67	114.87

### Conclusions

This study reveals the efficiency of utilizing post Methanated distillery spentwash for Bhendi cultivation in combination with different dosage of spentwash application. The different treatments followed showed sustainable growth and yield out of which 100% Basal N through PMDSW showed prominent growth and yield in Bhendi.

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