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Effect of Postmethanated distillery Spentwash on the growth and yield of beetroot

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Abstract
A field experiment was conducted at Amaravathy sugars, Udumelpet to study the effect of spentwash on beetroot crop. Results revealed that the treatment applied with spentwash (100% N through post methanated distillery spentwash) increased the yield of beetroot. Application of PMDSW favoured the yield attributes of Beetroot by enhancing the availability of nutrients. The maximum yield (10.80 t/ha) was obtained at T5 (PMDSW@ 288.33KL-1ha-1) and the minimum yield 7.5 t/ha) was obtained at T1 (Absolute control). 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, Beetroot, 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). 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
Field experiment was conducted using Beetroot var. Ruby Queen 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 cluster bean. The plots were applied with treatments which comprises of PMDSW application by 70.83 KL/ha (25%), 141.66 KL/ha (50%), 213.03 KL/ha (75%),
283.33 KL/ha (100%) as basal for T2, T3, T4, T5 respectively. Calculated quantity of PMDSW was uniformly applied in each plot for the treatments T2 to T5. Then, the applied PMDSW were mixed with soil by ploughing for providing better soil aeration and consequent reduction of BOD level in the soil-water system. All the cultural practices including gap filling, thinning, weeding and plant protection measures were carried out as per the TNAU recommendations.
Details of the field experiment were enlisted in table 1.

Table 1: Details of field Experiment

S. No	Particulars	
1.	Crop	Beetroot
2.	Variety	Ruby Queen
3.	Duration	75-80 days
4.	No.of.treatments	6
5.	No.of.Replication	4
6.	Design	RBD
7.	Plot area	145 sq.m
8.	Plot size	60 m x 24 m
9.	Seed rate	10 Kg/ha
10.	Spacing	60 x 22 cm
11.	Nutrient Recommendation	60:160:100 NPK Kg ha-1
12.	Date of Sowing	28.09.2016

Treatment Details

T1: Absolute control

T2: 25% N through PMDSW + 75% through inorganic fertilizer

T3: 50% N through PMDSW + 50% through inorganic fertilizer

T4: 75% N through PMDSW + 25% through inorganic fertilizer

T5: 100% N through PMDSW T6 – Recommended dose of NPK

The soil samples from the experimental field was collected in different treatments at different periods and they were analysed for soil physio-chemical and biological properties in the laboratory. The results analysed were given in the table 2.

Results and Discussion

Impact of PMDSW application on soil properties

The PMDSW applications at different rates significantly increased the soil pH. The EC of the soil was significantly higher (0.56 dSm-1) with the application of PMDSW @ 283.33 kL ha-1 as basal but it was within the critical limit of 1.00 dSm-1. Application of PMDSW registered higher availability of N, P, K, Ca and Mg elements in soil. Among the levels of PMDSW, basal application 283.33 KL ha-1 registered higher availability of major and secondary nutrients in PMDSW applied soils. The soil available N, P and K at the post harvest stage of the beet root were 181.0 kg ha-1, 13.6 kg ha-1 and 356 kg ha-1 respectively for the basal application of PMDSW @ 283.33 kL ha-1 and the soil available Ca was 7.69 mg kg-1 and available Mg was found to be 3.64 mg kg-1 respectively. The organic carbon status was highest in the basal application of PMDSW@ 283.33 kL ha-1.

Table 2: Changes in soil chemical and biological properties collected from the experimental field

Parameters	Initial soil	Two months after planting
	Mean of 6 replicates	
pH	7.54	7.62
EC (dSm-1)	0.38	0.56
Organic carbon	0.68	0.46
Ex changeable Na (cmol (p+) kg -1)	0.29	0.22
Ex changeable K (cmol (p+) kg -1)	1.20	0.59
Available Nitrogen (Kg ha-1)	208.18	181.00
Available Phosphorus (Kg ha-1)	16.13	13.60
Available Potassium (Kg ha-1)	352.40	356.00
Available Calcium (Kg ha-1)	6.29	7.69
Available Magnesium (Kg ha-1)	3.56	3.64
Bacteria (x 106 CFU g-1 of soil)	29.52	16.95
Fungi (x 103CFU g-1 of soil)	10.33	6.75
Actinomycetes (x 102 CFU g-1 of soil)	5.98	2.33

Where

T1: Absolute Control;

T2: 25% N through PMDSW + 75% through inorganic fertilizer;

T3: 50% N through PMDSW + 50% through inorganic fertilizer;

T4: 75% N through PMDSW + 25% through inorganic fertilizer;

T5: 100% N through PMDSW; T6 – Control (RD of NPK)

Impact of PMDSW application on yield of Beet root

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 Beetroot 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) [1]. The maximum yield (10.80 t/ha) was obtained at T5 (PMDSW@ 288.33KL-1ha-1) and the minimum yield 7.5 t/ha) was obtained at T1 (Absolute control). This is in confirmation with Zalwadia *et al*., 1997 [5], 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 3: Effect of Post Methanated Distillery Spentwash (PMDSW) on yield of Beetroot

Treatments	Yield (Tonnes /ha)
T1	7.50
T2	9.50
T3	9.20
T4	10.00
T5	10.80
T6	9.70

Fig 1: Beetroot harvested from the experimental field

Conclusions

This study reveals the efficiency of utilizing post Methanated distillery spentwash for Beetroot cultivation in combination with different dosage of spentwash application. The different treatments followed showed sustainable growth and yield out of which 100% Basal N (283.33 KL/ha-1) through PMDSW showed prominent growth, yield and quality.

References

1. Gahlot DK, Kukreja K, Suneja S, Dudeja SS. Effect of digested distillery spent wash on nodulation, nutrient

uptake and photosynthetic activity in Chickpea (*Cicerarietinum*). *ActaAgronomica Hungarica* 2011;*59(1):1-13.*

2. Kumar V, Chopra AK. Impact on physicochemical characteristics of soil after irrigation with distillery effluent. Archieves of Applied Science and Research 2011;3(4):63-77.
3. Tharakeshwari M, Jagannath S. Responses of *Vigna radiata* and *Vigna unguiculata* seedlings to distillery effluent. Nat. Environ. Pollut. Technol. 2011;10(4):563-566.
4. Rani R, Shrivastava MM. Int. J Ecology Environ. Sci., 1990;16:125-132.
5. Zalawadia NM, Raman S, Patil RG. Influence of diluted spentwash of sugar industries application on yield and nutrient uptake by sugarcane and changes in soil properties. J. Indian Soc. Soil. Sci. 1997;45:767-769.