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Spent Wash Solid (SWS) and Spent Wash-Press Mud Compost (SWC) - Its Effect on Concentration of Nutrient in Wheat Fodder

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***Abstract*: A long term field experiment was carried to study the effect of Every year (EY), Alternate year (AY) and after Two year (TY) applications of spent wash solids (SWS) on yield and nutrient uptake by wheat (for fodder) results of effect on wheat at fifth year are reported. Results revealed that SWS was found better than PYM and Press Mud (PM) in terms of wheat fodder yield. Nitrogen uptake in SWS was more or less similar, the former two being as good as PYM.**

***Keywords*: Spent was solids, spent wash press mud compost, wheat fodder)**

1. Introduction

In India there are over 246 distilleries with potential of producing nearly 2215 million liters (installed capacity) of alcohol per year (Anonymous, 1991). In distillery, spent wash is obtained as waste product after distillation of fermented mash (molasses + yeast) for alcohol production. The quantity of distillery waste commonly known as spent wash produced in a distillery is about 12-15 times that of alcohol produced (Manohar Rao, 1983). At this rate, the production of spent wash could be estimated as 33225 million liters of spent wash from 2215 million liters of alcohol that could be produced per annum in the country. For Odisha, it could be estimated as 7155 million liters of alcohol per annum. The demand for alcohol as a source of energy, raw material for chemical industry will always increase and so that of the spent wash.

2. Material and methods

A long term field experiment was started from the year 2012-13 to study the effect of Spent wash solids (SWS), Spent wash-press mud compost (SWC) and their interval of application on yield nutrient uptake by wheat (fodder) and on soil properties at Orissa University of Agricultural University (OUAT), Bhubaneswar, Odisha. This was the fifth year of the long term experiment (2017-2018). A field experiment was laid out in split plot design with following treatment which was replicated three times.

Main – treatments: Organic sources

- No organic source, control (CK)
- Spent wash solids i.e. lagoon dried spent wash (SWS)
- Press mud (PM)
- Compost prepared from spent wash and press mud in 2:1 proportion (SWC)
- Farmyard manure (FYM) organic sources were applied at the rate of 15 t ha-1.

Sub-treatment: Interval of application

- Every Year (EY)
- Alter Net Year (AY)
- After two year (TY)

In kharif season, the wheat crop for fodder was taken. The material in treatments 2 to 5 were applied just before wheat crop was sown.

A. Plant analysis

The plant samples of sorghum were digested in H_2SO_4 and H_2O_2 (1:1) mixture as per the method of Parkinson and Allen (1975). This extract was used for N, Fe and K determination. The plant samples were also digested in HNO_3: HClO4 (4:1) (Johnson and Ulrich, 1959) and the extract was used for P and micronutrient determination (except Fe).

- *Total Nitrogen:* It was determined in H_2SO_4: H_2O_2 extract by Micro-Kjeldahl method as described by Keenny and Nelson (1982).
- *Total phosphorus:* It was determined in HNO3: HClO4 extract using the Vanado-molybdate yellow color method as described by Jakson (1967).
- *Total potassium:* It was determined in H_2SO_4: H_2O_4 extract on Flame – Photometer.
- *Micronutrients:* Mn, Zn and Cu were determined in HNO_3: $HClO_4$ extract and Fe in H_2O_4: H_2O_2 extract on the Atomic Absorption Spectro-phometer, make Perkins Elmer model 2380.
- Plant sample were also analyzed for crude fat, crude protein, crude fiber and soluble carbohydrates (AOAC, 1975).
- *Moisture:* It was determined gravimetrically.
- *Crude fat:* It was determined by using Soxhlet apparatus using petroleum ether.
- *Crude protein:* plant sample digested in H_2SO_4: H2O2 used for the determination of nitrogen. 6.25 to get percent crude protein multiplied the percent nitrogen.

Table 1

(i) Nitrogen concentration (%)

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	2.11	3.14	2.30	2.35	2.22	2.42	0.09/NS
AY	2.11	2.88	2.41	2.59	2.16	2.43	
TY	2.09	2.30	2.66	2.50	2.66	2.44	
Mean	2.10	2.77	2.46	2.48	2.35		
SEM±=0.11		Interaction		SEM ±		CD 5%	
CD% = 0.37		A x B		0.22		NS	
		B x A		0.21		NS	

(ii) Phosphorus concentration (%)

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	0.16	0.22	0.16	0.19	0.17	0.16	0.002/0.01
AY	0.16	0.17	0.16	0.18	0.19	0.18	
TY	0.16	0.14	0.18	0.18	0.17	0.17	
Mean	0.16	0.18	0.19	0.18	0.18		
SEM±=0.004		Interaction		SEM ±		CD 5%	
CD% = 0.01		A x B		0.005		0.01	
		B x A		0.006		0.02	

(iii) Potassium concentration (%)

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	2.80	7.30	2.13	3.23	2.43	3.58	
AY	2.77	7.33	2.40	3.00	2.67	3.63	
TY	2.70	4.40	2.70	2.43	2.63	2.97	
Mean	2.77	6.34	2.41	2.89	2.58		
SEM±=0.32		Interaction		SEM ±		CD 5%	
CD% = 1.03		A x B		0.31		0.93	
		B x A		0.41		1.2	

(iv) Iron concentration (mg kg^{-1})

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	720	718	710	808	602	712	36.21/NS
AY	753	828	678	910	678	769	
TY	670	628	828	861	820	762	
Mean	714	725	739	860	700		
SEM±=38.17		Interaction		SEM ±		CD 5%	
CD% = NS		A x B		80.97		NS	
		B x A		76.34		NS	

(v) Manganese concentration (mg kg^{-1})

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	68.3	90.0	91.7	85.0	85.0	84.0	1.3/NS
AY	77.0	88.3	83.3	85.0	88.3	84.4	
TY	72.7	90.3	84.3	77.0	91.3	83.1	
Mean	72.7	89.6	86.4	82.3	88.2		
SEM±=2.5		Interaction		SEM ±		CD 5%	
CD% = 8.2		A x B		2.8		NS	
		B x A		3.4		NS	

(vi) Zinc concentration (mg kg^{-1})

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	53.8	62.5	75.8	74.2	74.7	68.2	3.6/NS
AY	57.7	70.7	68.8	85.7	68.7	70.3	
TY	56.0	68.7	69.8	71.0	56.2	64.3	
Mean	55.8	67.3	71.5	76.9	66.5		
SEM±=3.9		Interaction		SEM ±		CD 5%	
CD% = 12.9		A x B		8.0		NS	
		B x A		7.7		NS	

(vi) Copper concentration (mg kg^{-1})

B/A	CK	SWS	PM	SWC	FYM	Mean	SE±/CD 5%
EY	40.00	40.33	43.33	38.00	40.67	42.27	1.42/NS
AY	40.00	40.00	34.67	38.67	38.33	39.33	
TY	40.00	41.67	35.83	40.67	40.00	39.63	
Mean	40.00	40.67	37.94	39.11	42.67		
SEM±=4.45		Interaction		SEM ±		CD 5%	
CD% = NS		A x B		3.18		NS	
		B x A		5.15		NS	

- *Crude fiber:* The defatted sample (from crude fat determination) was boiled in dilute H_2SO_4 (0.25N) and subsequently in dilute NaOH (0.31N) and passed through muslin cloth. The residue obtained was dried weighed and ignited and again weighed.
- *Carbohydrates:* It was obtained by difference. 100-(% moisture +% crude fat + % crude protein + % crude fiber +% ash).

B. Statistical analysis of data

The data obtained on physical and chemical properties of soil and concentration and uptake of nutrient by plants were analyzed by using split plot analysis procedure as given by Panse and Sukhatme (1967).

3. Results and discussion

Data obtained are presented in Table 1. Effect of organic sources, interval of application and interaction on Fe and Cu concentration was non-significant. Effect of interval of application and interaction on N, Mn and Zn concentration was non-significant.

- *Nitrogen concentration:* The highest N concentration was found in SWS which was however, on par with SWC and PM and recorded significantly higher concentration than PYM. The FYM and PM were as good as control.
- *Phosphorus concentration:* All the sources recorded higher concentration of P than control. The sources did not differ from one another. The EY application showed the highest value which was on par application showed the highest value which was on par with AY application and found significantly better than TY application. The EY SWS as found significantly superior to all other EY, AY and TV application of other and AY SWS and TY SWS.
- *Potassium concentration:* The SWS recorded the highest value, which was considered higher than other sources. The other sources were on par with each other and control. The EY and AY application was on par and were found significantly superior to TY application. The EY SWS, AY SWS and TY SWS recorded significantly higher value than their respective other organic sources. The EY SWS, AY SWS were on par and both recorded significantly higher values than TY SWS.
- *Manganese concentration:* Application of organic sources resulted in higher uptake of Mn than control. The sources were however, on par with each other.
- *Zinc concentration:* Similar trend as in concentration of Mn was obtained in Zn concentration.

4. Conclusion

This paper concludes that spent wash solid (SWS) and spent wash-press mud compost (SWC) - its effect on concentration of nutrient in wheat fodder.

References

[1] AOAC, 1975. Official methods analysis. Association of official Analytical chemists.12thEdn. Washington, D.C.
[2] Anonymous, 1991.List of distilleries in India along with their licensed and installed capacities, All India Distilleries Association, New Delhi.
[3] Jakson, M.L. 1967. Soil chemical analysis. Prentice Hall of India Pvt. Ltd. New Delhi: pp. 498.
[4] Johnson, C.B. and Ulrich, A. 1959.Analytical method for use in plant analysis. Bull. Calif. Agric. Exp. Stn., 776, pp. 57-59.
[5] Keenny, D.R. and Nelson, D.W. 1982.Nitrogen inorganic forms.In Methods of soil analysis, Part-2, Chemical and microbiological properties, Page, A.I. (Ed.), II Edition, Soc. Agron.Inc. and Soil Sci. Soc. Am. Inc., Madison, Wisconsin, U.S. A, pp. 643-693.
[6] Manohar Rao, 1983. Production of methane gas from still age on commercial scale in India.Indian Sugar. 32(12), pp. 873-880.
[7] Olsen, S.R. and Sommers, L.E. 1982. Phosphorus.In "Methods of soil analysis", Part 2. Chemical and microbiological properties, Page, A.L. (Ed.) II Edition, Am. Soc. Agron. Inc. and Am. Soc Am Inc. Madison, Wisconsin, U.S.A.pp. 403-427.
[8] Panse, V.G. and Sukhatme, P.V. 1967. Statistical method for agricultural workers, ICAR, New Delhi.
[9] Parkison, J.A. and Allen, S.E. 1975. A wet oxidation procedure suitable for determination of N and mineral nutrient in biological materials.Commun. Soil Sci. Pl. Anal. 6, p. 145.