International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(3): 2782-2785
© 2019 IJCS
Received: 25-03-2019
Accepted: 27-04-2019

Deshmukh DP
Department of Soil Science and Agricultural Chemistry.
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

PW Deshmukh
Department of Soil Science and Agricultural Chemistry.
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

SM Bhoyar
Department of Soil Science and Agricultural Chemistry.
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

SP Gawai
Department of Soil Science and Agricultural Chemistry.
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Correspondence
Deshmukh DP
Department of Soil Science and Agricultural Chemistry.
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Characterization of physical attributes of tank silt of natural reservoirs in western Melghat region of Dharni

Deshmukh DP, PW Deshmukh, SM Bhoyar and SP Gawai

Abstract
The present investigation was carried out to study the characterization of physical attributes of tank silt of natural reservoirs in Western Melghat region from Dharni during 2015-16. The tank silt samples were collected from eleven natural reservoirs namely Mandwa, Jutpani, Baru, Gambhri, Gawandho, Sadarbadi, Khari, Bodbo, Titamba, Dhodra, Lavada. The physical parameters were analyzed and statistically compared using standard error of deviation. The percent silt content was estimated higher than sand and clay percent in all the tank sediments. However, the sand percentage in Baru (3.50 %) and Mandwa reservoirs (5.30 %) were reported lower than other reservoirs. The lower value of bulk density (1.15 Mg m^{-3}) and higher value of particle density (2.59 Mg m^{-3}) was recorded in Gawandho and Titamba reservoir respectively. Highest Hydraulic conductivity was recorded in Sadarbadi reservoir while higher value of available water content was observed in Dhodra reservoir (52.79 % at 33 kPa and 29.53 % at 1500 kPa).

Keywords: Tank silt, sand, silt, clay, Bulk density, particle density, hydraulic conductivity

Introduction
The imbalance use of chemical fertilizers, pesticides and synthetic substances over a long period has resulted in poor soil fertility, human and animal health hazards, disturbed ecosystem that led to decreased productivity and reduced profitability of all cultivable lands. Use of harmful chemicals and artificial treatments in crop production has changed the soil structure, soil texture and biological health leading to problems like salinity and alkalinity. Hence, the most urgent concern is to make radical adjustments in such faulty agricultural practices so as to ensure minimal damage to human health and the environment without any reduction in crop productivity.

Agriculture is the predominant occupation of the rural people which constitute about 65 percent of the country's population. The stagnation in the production and productivity of food grains for the past few years has become a matter of concern and posing a serious threat to our national food security. Soil health degradation has emerged as a major factor responsible for the stagnation in agricultural production

Due to ever increasing population pressure, the land resources per capita are gradually shrinking and simultaneously food grain production along with nutritional security is possible only through judicious use of both organic and inorganic sources. The supplementary and complimentary use of the organic manures and chemical fertilizers will increase not only the nutrient use efficiency and crop yield but also help to maintain a high level of soil productivity. In India, about 188 million ha of area is subjected to various forms of soil degradation. The degradation of soil health in many intensively cultivated areas is manifested in terms of loss of soil organic matter, depletion of native soil fertility due to imbalanced and unscientific use of fertilizers and loss of top fertile soil due to erosion which is now one of the major constraints in improving crop productivity. The upper layer of soil sediments that are removed by the erosion and gets deposited into the low lying ponds through natural streams popularly known as tank silt. Recycling of tank silt will rejuvenate the depleting storage capacity of the tank, ground water recharge as well as its application to cultivable soil improves soil properties in an economical manner. Importance of small storage reservoirs cannot be de-emphasized. Therefore, tank silt is a feasible substitute for inorganic fertilizers in the context for improving soil quality and its resilience to moisture stress during dry spells in dry areas.

The people of the Melghat area in Vidarbha region of Maharashtra belongs to tribal community, less literate and unaware of the modern scientific developments. The main occupation of the natives is agriculture accompanied with less land holding. Therefore, the socio-economic status of the people in Melghat is poor. Melghat is not only the green treasure of Maharashtra owing to its biodiversity but also gifted with natural reservoirs due to high rainfall intensity and topography.

There is a growing need of feedback from the large number of farmers in these areas. Hence, the study was undertaken to generate the information on the contents of tank silt and its advantages and disadvantages if any and for characterization of physical attributes of tank silt of natural reservoirs in Western Melghat region of Dharni.

Materials and methods

The present investigation was carried out by collecting tank silt samples in the vicinity of eleven reservoirs of Melghat region of Dharni Tahsil which lies between North latitudes 21.5527^0 and east longitudes 76.8923^0 , 305 m to 1045 m above mean sea level receiving annual rainfall varying from 1000 – 2250 mm with average temperature ranges from 43^0 C in summer to a minimum of 12^0 C in winter. The tank silt samples from all the eleven natural reservoirs namely Mandwa, Jutpani, Baru, Gambhri, Gawandho, Sadarbadi, Khari, Bodbo, Titamba, Dhodra, Lavada were collected by using global positioning system and were analyzed for its physical properties using standard methods. The data was statistically compared by using methods of standard error of deviation analysis

Result and discussion

1. Particle size distribution of tank silt of natural reservoirs

The particle size distribution of above eleven reservoirs revealed that the composition of the sediments deposited in the tanks varied widely and reflecting the varied percentage of sand, silt and clay with two different textural classes.

Particle size analysis of various tank silt samples ranged from 3.50 % to 19.50 % sand, 55.70 % to 66.40 % silt and 20.20% to 31.00% clay with mean value that is 13.49 % sand, 61.48 % silt and 25.03 % clay respectively. The textural classes of the tank silt from various reservoirs was classified as silt loam to silt clay loam with ± 1.54 sand, ± silt and with ±1.10 clay.

The percent silt content was estimated higher than sand and clay percent in all the tank sediments. There were no much more deviation in the deposition of silt in all the tanks. However, the sand percentage in Baru and Mandwa reservoirs were reported lower as compared to other reservoirs. There was no much more variation in the deposition of clay percentage however, more deforestation and slope reflected on the deposition of sediments in the repetition. Krishnappa *et al.* (1998) reported in the particle size analysis and observed in kolar Tahsil of Karnataka.more silt content is beneficial in improving available water contain of the cultivable soil if added. The similar findings were drawn by Bhanavase *et al.* (2011) [3].

Table No. 1: Particle size analysis of tank silt of natural reservoirs

Tank Silt					Textural Calss
Sr. No.	Name of Location	Sand (%)	Silt (%)	Clay (%)	
1	Mandwa	5.3	66.4	28.3	Silt clay loam
2	Jutpani	17	59.5	23.5	Silt loam
3	Baru	3.5	65.5	31	Silt clay loam
4	Gambhri	14.5	57.9	27.6	Silt clay loam
5	Gawandho	15.4	55.7	28.9	Silt clay loam
6	Sadarabadi	16.4	62.4	21.2	Silt loam
7	Khari	19.5	58.2	22.3	Silt loam
8	Bobdo	17.8	62	20.2	Silt loam
9	Titamba	11.8	64.2	24	Silt loam
10	Dhodra	11.2	61.9	26.9	Silt loam
11	Lavada	16	62.6	21.4	Silt loam
	Maximum	19.5	66.4	31	
	Minimum	3.5	55.7	20.2	
	Average	13.49	61.48	25.03	
	S.E. (m) ±	1.54	1.01	1.10	
	C.V. (%)	37.90	5.42	14.60	

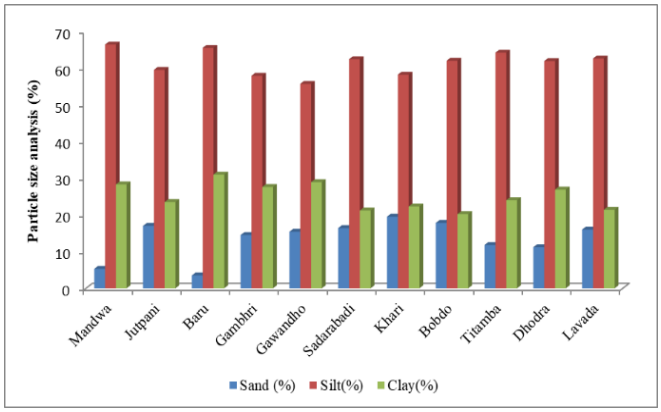

Fig 1: Particle size analysis of tank silt of natural reservoirs

2. Bulk density and Particle density of tank silt of natural reservoirs

The bulk density from the tank silt samples of eleven natural reservoirs ranged from 1.15 to 1.50 Mg m^{-3} and particle density ranged from 2.46 to 2.59 Mg m^{-3} with the mean value as 1.25 Mg m^{-3} and 2.53 Mg m^{-3} with ± 0.03 bulk density and ± 0.01 particle density respectively. This might be due to more silt percentage and less clay size fraction in the various tank silt samples.

The lowest bulk density into 1.15 Mg m^{-3} was noted from the tank silt sample of Gawandho natural reservoir. However, the highest bulk density was seen 1.50 Mg m^{-3} in the tank silt sample collected from Lavada natural reservoir. However, in general, variation in bulk density might be due to the content of silt particle.

The highest particle density 2.59 Mg m^{-3} was viewed in the tank silt of Titamba natural reservoirs. The value of lowest particle density 2.49 Mg m^{-3} recorded in the sample from Jutpani reservoirs. The similar value was perceived in bulk density and particle density of tank silt in Poochikadu village of Tamilnadu was reported by Jeyamangalam *et al*. (2012).

Table 2: Bulk density, Particle density and Hydraulic conductivity of tank silt of natural reservoirs

Sr. No.	Name of Location	Bulk density (Mg m^{-3}	Particle density (Mg m^{-3})	Hydraulic conductivity (cm hr^{-1})
1	Mandwa	1.23	2.51	0.9
2	Jutpani	1.21	2.46	0.86
3	Baru	1.33	2.55	0.91
4	Gambhri	1.16	2.49	0.97
5	Gawandho	1.15	2.52	1.03
6	Sadarabadi	1.25	2.56	1.06
7	Khari	1.19	2.54	0.96
8	Bobdo	1.2	2.57	0.87
9	Titamba	1.42	2.59	1.05
10	Dhodra	1.47	2.53	0.94
11	Lavada	1.5	2.48	0.98
	Maximum	1.5	2.59	1.06
	Minimum	1.15	2.46	0.86
	Average	1.28	2.53	0.96
	S.E. (m) ±	0.04	0.01	0.02
	C.V. (%)	9.88	1.58	7.24

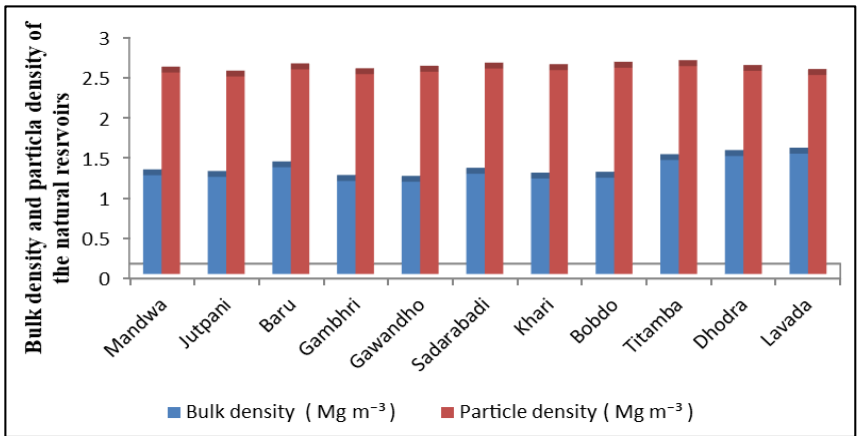

Fig 2: Bulk density and Particle density of tank silt of natural reservoirs.

3. Hydraulic conductivity of tank silt of natural reservoirs

The Hydraulic conductivity from the tank silt samples of natural reservoirs in Melghat ranged from 0.86 cm hr^{-1} to 1.06 cm hr^{-1} with mean value that is 0.96 cm hr^{-1} with ± 0.02. The lowest Hydraulic conductivity reported in the sample of Jutpani reservoir 0.86 cm hr^{-1} however, highest hydraulic conductivity was found 1.06 cm hr^{-1} Sadarbadi reservoir of tank silt which may be due to less clay content. The increase in clay and silt content of soil due to tank silt application has been reported by Krishnappa *et al* (1998) in Kolar district of Karnataka.

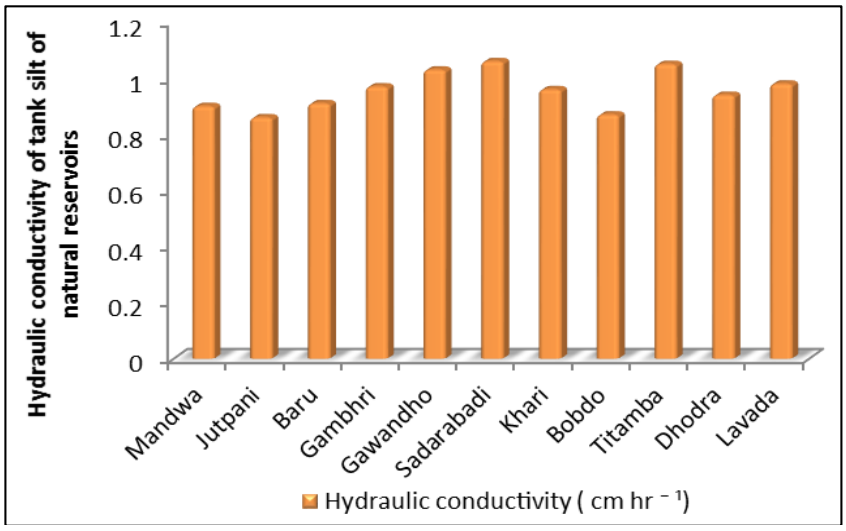

Fig 3: Hydraulic conductivity of tank silt of natural reservoirs

4. Available water capacity of tank silt of natural reservoirs

The available water capacity from the tank silt samples of eleven natural reservoirs ranged from 17.67 to 26.57 % with mean value that is 22.34 % with ± 0.75.

The higher available water capacity 26.57 % was viewed in the tank silt of Gambhri natural reservoir. The value of lowest available water capacity 17.56 % recorded in the sample from Sadarbadi reservoir. The results were obtained in confirmation with results obtained by Jaymangalam *et al.* (2012) and Telenge Patil (2013) at Tamilnadu and Akola in Maharashtra respectively.

Table 3: Available water capacity of tank silt of natural reservoirs

Sr. No.	Name of Location	Available water capacity		
		33kpa	1500 kpa	AWC (%)
1	Mandwa	44.77	24.15	20.62
2	Jutpani	45.53	21.03	24.5
3	Baru	45.98	24.21	21.37
4	Gambhri	46.02	19.45	26.57
5	Gawandho	42.31	20.75	21.56
6	Sadarabadi	36.13	18.76	17.56
7	Khari	44.03	26.06	20.97
8	Bobdo	48.5	26.19	22.31
9	Titamba	52.59	27.68	24.91
10	Dhodra	52.79	29.53	23.26
11	Lavada	48.77	26.78	21.99
	Maximum	52.79	29.53	26.57
	Minimum	36.13	18.76	17.56
	Average	46.13	24.05	22.33
	S.E. (m) ±	1.41	1.08	0.73
	C.V. (%)	10.17	14.90	10.91

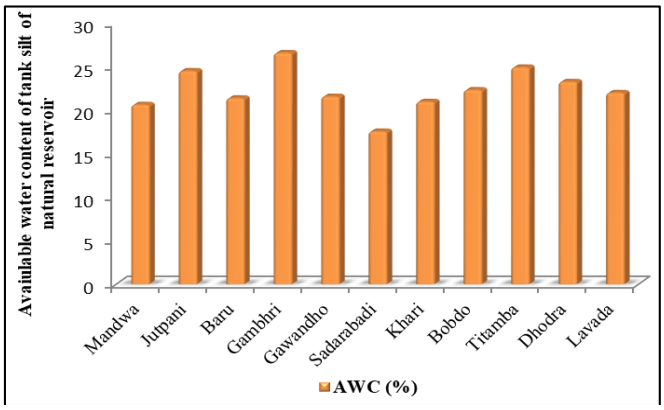

Fig 4: Available water capacity of tank silt of natural reservoirs

Conclusion

From the above study it can be concluded that more silt content is beneficial in improving available water content of the cultivable soil if added. Tank silt can be a feasible option for improving soil quality. Thus, tank silt of natural reservoirs of western Melghat region of Dharni helps to improve physical properties of the soil.

References

1. Annadurai BN. Arunachalan and Mahalingam. Effect of Tank Silt and press mud mixture amended on the physical properties. J Soils and Crops, 2005; 15(1):26-29.
2. Annadurai B. The Soil Reclaimation using tank silt in Tuticorin District of Tamilnadu, IJEP V 2011; (8):679-683.
3. Bhanavase DB, Thorve SB, Upadhey SK, Kadam JR, M Osman. Effect of Tank Silt application on productivity of rabi sorghum and soil physico-chemical properties. Indian J. Dryland Agric. Res. and Dev. 2011; 26(2):82-85.
4. Black CA, Evans DD, White JL, Ensingager LK, Clark Method FE. of soil analysis part –II, Amer. Soc. Agron.Inc. Medison, USA, 1965, 770.
5. Black GR, Hartge KH. Bulk density in method of soil Analysis Part – I. Klute A. (Ed) Method of Soil analysis part –I, Amer. Soc. Agron. Inc. Medison, USA, 1986, 770.
6. Gupta JP, Agarwal RK. Soil physical properties and nitrogen mineralization as affected by bentonite clay and pond sediment amendments. Agrochemia. 1980; 24:416-423.
7. Jayamangalam FB, Annadurai, Arunachalam N. Effect of tank silt as organic amendment on physical properties of soil using Groundnut. Journal of Soils and Crops. 2012; 22(1):10-14.
8. Joshi RH, Deshpande TL. Use of silt from tank and other sources as a manure in Madhya Pradesh – JISSS. 1953; 1:125-130.
9. Klute A. Water retention. Laboratory Methods. In a Klute (Ed.) Methods of soil analysis part 1. 2nd ed. Agron. Monograph 9. Madison, Wiscosin. 1986, 635-662.
10. Osman M, Suhas P, Wani C, Vineela R. Murali. Quantification of Nutrients Recycled, by Tank silt and its impact on Soils and crop A pilot study in Warangal District of A.P. ICRI-SAT. Patancheru. 2009, 502:324 AP, India.
11. Osman M, Katyal JC, Mishra PK. Soil physical properties and seeding growth in alfisol amended with tank silt, poultry manure and paddy husk. Indian Journal of Soil Conservation. 1997; 25(1):14-17.
12. Sen A, Asija GL. Action of tank silt on soils. The Indian Journal of Agricultural Sciences. 1954; 24:51-62.
13. Vaidya PH, Dhawan Degraded land hybridization with tank silt: Impact on Soil quality and productivity of Soybean. Indian J. Dryland Agric. Res. And Dev. AS. 2015; 30(2):30-36.