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Research Article

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Evaluation of physical properties of irrigated soils of Gir Somnath district of Gujarat

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Summary

Thirty surface (0-15 cm) soil samples were collected from each talukas of Gir Somnath district *viz.*, Talala, Veraval, Sutrapada, Kodinar, Gir Gadhada and Una. The physical characteristics properties of the soils were determined by using standard methods. The soils of Gir Somnath have overall values of bulk density, particle density, total porosity, MWHC and expansion varied from 1.24 to 1.45, 2.07 to 2.67 Mg m^{-3}, 36.96 to 53.39, 31.06 to 56.89 and 5.54 to 35.52 per cent with mean value of 1.34, 2.49 Mg m^{-3}, 46.00, 41.91 and 21.97 per cent, respectively.

Key words : Physical properties of soils, Bulk density, Particle density, Porosity, MWHC

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Introduction

Maintenance of favorable physical environment in soil is a prerequisite in soil management for the better plant growth in sustainable agriculture. The soil physical condition consisting of different parameters like bulk density, particle density, porosity, MWHC and expansion are the reflections of moisture content and genetic characteristics. Many of these soils have suitable topography and physical as well as chemical conditions for irrigated agriculture, but are still under-utilized. Little is known about the morphology and physic-chemical properties of these soils. The soils of sand dune fields have been ignored because of being low in productivity and due to their weak manifestation of pedogenic development compared to the other soils. Such information for newly formed Gir Somnath district of Saurashtra region of Gujarat was lacking. Therefore, an attempt has been made to study the some important physical properties of cultivated farmer's field of coastal Gir Somnath district.

Resource and Research Methods

Thirty surface soil samples (0-15 cm) were collected from each of the six talukas of Gir Somnath district, *viz*., Talala, Veraval, Sutrapada, Kodinar, Gir Gadhada and Una during May, 2014. Soil samples were air dried, ground carefully with a wooden mortar and pestle to break soil samples and passed through 2 mm sieve. The bulk density, particle density, total porosity were dermined as per methods described by Richards (1954), while maximum water holding capacity and expansion were determined as per methods decribed by Chopra and Kanwar (2011) and Piper (1950), respectively.

Research Findings and Discussion

The data on bulk density, particle density, porosity, MWHC and expansion obtained from the present investigation are presented in Table 1. The bulk density values is commonly used as an index of soil physical conditions. The bulk density values of the soils for the entire district were ranging from 1.24 to 1.45 with a mean value of 1.34 Mg m^{-3}. The lowest bulk density (1.24 Mg m^{-3}) was recorded in a sample collected from Una taluka. The data further revealed that the lowest (1.31 Mg m^{-3}) and highest (1.37 Mg m^{-3}) mean value were recorded in Una and Sutrapada talukas, respectively. The overall particle density was varied from 2.07 to 2.67 with mean value of 2.49 Mg m^{-3}. The lowest (2.07 Mg m^{-3}) and highest (2.67 Mg m^{-3}) values were recorded in a samples collected from Una and Sutrapada-Gir Gadhada-Una talukas, respectively. The data further revealed that the lowest (2.46 Mg m^{-3}) and highest (2.53 Mg m^{-3}) mean values were obtained in the soils of Veraval and Gir Gadhada-Una talukas, respectively. These results are in conforming with an earlier repoted by Ogunwale and Isa (2004); Savalia *et al*. (2009); Shirgire (2012) and Gandhi (2013).

The overall pore space ranged from 36.96 to 53.39 with a mean value of 46.00 per cent. The lowest (36.96 %) and highest (53.39 %) pore space value was recorded in a sample collected from Sutrapada and Una talukas, respectiveluy. The data further revealed that the lowest (44.34 %) and the highest (47.88 %) mean values were recorded in the samples collected from Sutrapada and Una talukas. These finding are parallel to those of Savalia (2005) who suggested that the total porosity less than 40 per cent in the soils indicates the poor air-moisture regime. The overall MWHC of soils of Gir Somnath district varied from 31.06 to 56.89 with a mean value of 41.91 per cent. The lowest (31.06 %) and highest (56.89 %) MWHC values were recorded in the samples collected from Kodinar and Talala talukas, respectively. The lowest (39.36 %) and highest (45.16 %) mean values were obtained in the soils of Sutrapada and Talala talukas. Similar results were reported for Savalia (2005) and Gandhi (2013). The overall expansion of soils of Gir Somnath varied from 5.54 to 35.52 with a mean value of 21.97 per cent. The lowest (5.54 %) and highest (35.52 %) values were recorded in Talala and Una talukas, respectively. The lowest (20.13 %) and highest (24.11 %) mean values were observed in Una and Kodinar talukas, respectively. These differences were due to the

Table 1: Talukawise range and mean values for bulk density, particle density, porosity, MWHC and expansion of soils of Gir Somnath district

Name of taluka	Bulk density (Mg m^{-3})	Particle density (Mg m^{-3})	Porosity (%)	MWHC (%)	Expansion (%)
Talala	1.25-1.38	2.33-2.60	41.03-50.07	34.75-56.89	5.54-31.22
	(1.32)*	(2.48)	(46.84)	(45.16)	(21.63)
Veraval	1.30-1.43	2.24-2.65	39.18-50.29	32.25-46.53	10.22-29.87
	(1.35)	(2.46)	(45.15)	(41.29)	(20.56)
Sutrapada	1.26-1.45	2.25-2.67	36.96-49.92	33.93-47.74	13.11-29.40
	(1.37)	(2.47)	(44.34)	(39.36)	(22.01)
Kodinar	1.26-1.44	2.24-2.63	37.43-50.13	31.06-49.73	8.58-34.68
	(1.36)	(2.49)	(45.18)	(42.88)	(24.11)
Gir Gadhada	1.26-1.43	2.27-2.67	39.39-52.13	34.24-50.16	13.14-34.26
	(1.35)	(2.53)	(46.62)	(42.29)	(23.37)
Una	1.24-1.45	2.07-2.67	38.26-53.39	32.90-51.02	5.86-35.52
	(1.31)	(2.53)	(47.88)	(40.45)	(20.13)
Overall	1.24-1.45	2.07-2.67	36.96-53.39	31.06-56.89	5.54-35.52
	(1.34)	(2.49)	(46.00)	(41.91)	(21.97)

* Values in parenthesis are mean values

variation in depth, clay, silt and organic carbon content in soils (Thangasamy *et al*., 2005). These results are in conformity with an earlier reports of Ogunwale and Isa (2004) and Savalia *et al*. (2009).

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