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Available Boron in Calcareous Soils of Saurashtra

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The calcareous nature and alkaline reaction of the soils of Saurashtra influence the availability of boron in these soils. Some work on available boron content in these soils have been reported (Mehta *et al.* 1964; Dangarwala *et al.* 1983). In the present investigation, intensive survey had been done by taking two hundred eighty two surface (0-15 cm) soil samples from all the talukas of Junagadh and Rajkot districts. The samples were analysed for their physico-chemical characteristics (Jackson 1973) and hot-water soluble boron (Hatcher and Wilcox 1950). The soils were calcareous in nature, alkaline in reaction and normal with respect to salt content with corresponding mean values of 3 to 33.5% $CaCO_3$, pH 7.6 to 8.8 and CEC 0.11 to 1.28 dSm^{-1}). Majority of soil samples (92%) had more than 10% lime. From fertility point of view, the soils were low to high in organic C and available P, while medium to high in available K.

TABLE 1

Range and mean values of soil characteristics.

Soil Characteristic	*Junagadh district (158)**		*Rajkot district (124)*	
	Range	*Mean*	*Range*	*Mean*
Clay (%)	8.9 — 70.3	37.9	8.2 — 69.2	30.7
pH (1:2.5)	7.6 — 8.8	8.2	7.6 — 8.8	8.3
EC (1:2.5) dS-m^{-}	0.11 — 1.28	0.50	0.11 — 1.90	0.49
Calcium carbonate (%)	3.0 — 33.5	22.9	6.0 — 33.0	19.0
Organic carbon (%)	0.12 — 1.12	0.58	0.27 — 1.08	0.63
Available P_2O_5 (kg ha^{-1})	15.6 — 134.4	54.7	15.7 — 100.8	46.7
Available K_2O (kg ha^{-1})	287.0 — 1378.0	539.0	179.0 — 885.0	453.0

*The figures in parentheses indicate number of soil samples.

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Hot water soluble B in the surface soils of Junagadh and Rajkot district ranged from 0.06 to 1.49 and 0.08 to 1.71 ppm with a mean of 0.74 and 0.90 ppm respectively (Table 2). Out of 282 surface soil samples, 84.7% were found above the critical limit and 20.6% above 1 ppm B which is toxic limit for sensitive crops. Out of 28 talukas 5 talukas viz., Talala and Vanthali in Junagadh district as well as Jamkadorna, Malia and Wankaner of Rajkot district were having lower values of available B (0.5 ppm). The maximum number of soil samples from Rajkot district were in the range of 0.76 to 1.0 ppm, while those from Junagadh district in the range of 0.51 to 0.75 ppm (Fig.1). The higher values of available B in the soils of Rajkot district is ascribed to less leaching lower average rainfall (625 mm) in this district than that of Junagadh district (1020 mm).

TABLE 2

Talukawise distribution of available boron.

Junagadh district			*Rajkot district*		
Taluka	*Range*	*Mean*	*Taluka*	*Range*	*Mean*
Junagadh (10)*	0.36 — 0.95	0.58	Rajkot (14)	0.84 — 1.71	1.15
Mendarda (9)	0.34 — 0.90	0.56	Kotds-Sangani (6)	0.84 — 1.65	1.21
Talala (9)	0.25 — 0.54	0.43	Gondal (9)	0.80 — 1.25	0.93
Patan-Veraval (9)	0.54 — 0.84	0.67	Jetpur (10)	0.69 — 1.05	0.84
Malia-Hatina (10)	0.64 — 1.05	0.83	Dhoraji (10)	0.59 — 1.65	1.02
Mangrol (11)	0.54 — 1.05	0.80	Upleta (14)	0.72 — 1.59	1.03
Keshod (11)	0.45 — 1.00	0.64	Jamkandorna (9)	0.25 — 0.94	0.55
Porbandar (10)	0.65 — 1.39	0.95	Lodhika (8)	0.54 — 1.05	0.81
Ranavav (11)	0.68 — 0.91	0.78	Padadhari (8)	0.55 — 1.65	1.02
Kutiana (10)	0.81 — 1.49	1.23	Morvi (10)	0.51 — 1.54	0.96
Manavadar (11)	0.56 — 1.15	0.83	Maliya (6)	0.08 — 0.65	0.38
Vanthali (11)	0.06 — 0.52	0.35	Wankaner (8)	0.27 — 0.54	0.46
Bhesan (9)	0.56 — 0.91	0.73	Jasdan (12)	0.66 — 1.50	1.01
Visavadar (12)	0.34 — 0.79	0.54			
Una (15)	0.61 — 1.45	1.07			
Overall (158)	0.06 — 1.49	0.74	Overall (124)	0.08 — 1.71	0.81

*The figures in parentheses indicate the number of soil samples.

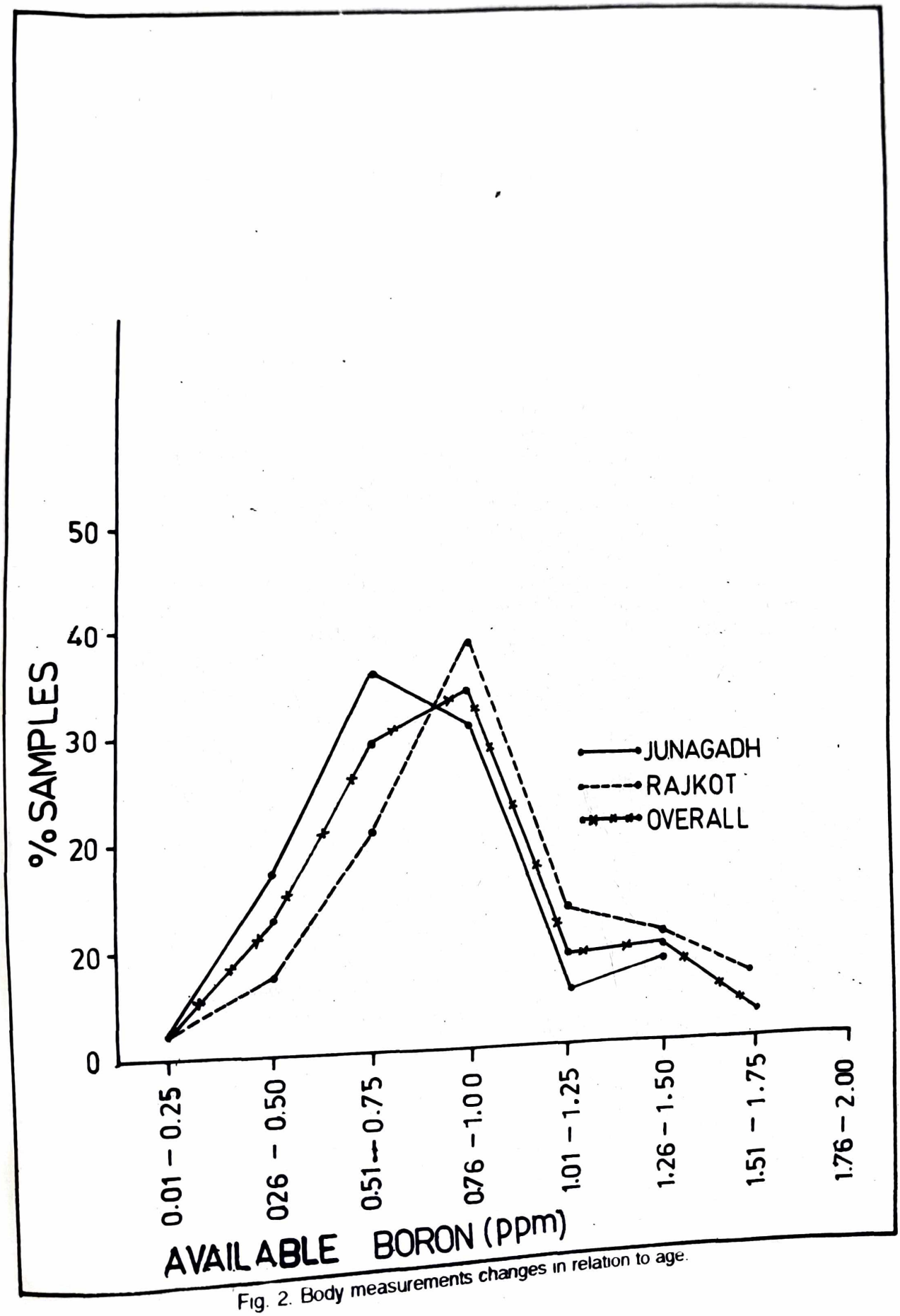


Fig. 2. Body measurements changes in relation to age.

The variation in available B content of all the surface soil samples was closely related to pH ($r=0.474^{**}$), EC ($r=0.242^{**}$), $CaCO_3$ ($r=0.286^{**}$) and organic C ($r=0.224^{**}$). However, it did not show any significant relationship with available P ($r=0.055$) and K ($r=-0.017$). The positive association of available B with pH and EC might be due to the formation of sodium and calcium borates which are highly soluble at high pH. The significant positive relationship between available B and organic C is ascribed to retention of B by soil organic matter (Tisdale *et al.* 1985). These results are in agreement with those of Chavan *et al* (1980).

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