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ON THE POLYSACCHARIDE CONTENT OF EARTHWORM CASTS

EARTHWORM casts (excretions) have more of plant nutrients, and soil particles in them are more aggregated in comparison to the corresponding cast-free soil.[1-5] However, there is considerable evidence that soil polysaccharides, claimed to be mostly of microbial origin,[6-10] play a key role in soil aggregation. But no attempt seems to have been made to characterise the chemical nature of the organic constituents which could possibly be responsible for increased stability of soil aggregates in the worm-casts.

Large earthworm casts (almost spherical, 2 to 4·5 cm. diameter) appeared on the soil surface in abundance in plots of Punjab Agricultural University Farm growing maize and bajra, in the month of September. The casts were collected from four fields together with the corresponding soils. The casts were identified invariably to be excretions of *Euthyphœus waltoni*.

Air-dried earthworm casts were ground to pass 1 mm. sieve. 5 gm. of the samples were taken in 250 ml. Erlenmeyer flasks with 50 ml. distilled water and refluxed on steam-bath for 24 hours. Dry aqueous extracts, cast-free soil and earthworm cast samples were then hydrolysed with 6 N HCl (1 gm./10 ml.) for 24 hours (a preliminary trial had shown that for maximum liberation of soil polysaccharides a hydrolysis period of 24 hours was sufficient) by the procedure described by Singh and Bhandari (1963) and polysaccharide content (as apparent glucose) was estimated by Dubois *et al.* (1956) method. Nitrogen and organic carbon were estimated using the procedures described by Bremner (1960) and Mebius (1960), respectively, and pH by glass-electrode (soil-water suspension, 1 : 2·5).

It can be seen (Table I) that the worm-casts have considerably more of organic carbon and nitrogen than the parent soils. Except in one case, pH of all casts samples is lower than the cast-free soils.

The results further indicate (Table II) that on an average 4·5% of the organic carbon in the worm-casts has accounted for as polysaccharide fraction extractable with hot water, whereas in the case of aqueous extracts of soils no such quantitative characterization was possible.

TABLE I

Chemical analysis of soil and earthworm casts (Expressed as percentage on oven-dry basis)

	Soil					Earthworm casts				
	1	2	3	4	Avg.	1	2	3	4	Avg.
pH ..	7·9	8·2	8·3	8·1	8·1	7·7	8·1	8·4	8·0	8·0
Organic carbon	0·51	0·53	0·49	0·50	0·51	0·69	0·74	0·72	0·84	0·75
Nitrogen ..	0·068	0·069	0·064	0·061	0·065	0·075	0·078	0·079	0·082	0·078
C/N ..	7·5	7·7	8·2	8·2	7·7	9·16	9·5	9·1	10·2	9·5

TABLE II

Distribution of polysaccharides in soils and earthworm casts (Percentage of total organic carbon)

	Soil					Earthworm casts				
	1	2	3	4	Avg.	1	2	3	4	Avg.
In aqueous extracts	Trace	Trace	..	Trace	..	4·92	3·47	5·81	4·17	4·5
In acid extracts	6·89	9·27	8·21	6·9	7·81	31·72	34·89	39·53	40·27	36·6

Acid hydrolysis of the soils and the casts has brought into solution as much as 7·81 and 36·6%, respectively, of the organic carbon as polysaccharides. In view of this evidence it may reasonably be stated that earthworm casts contribute significantly towards the polysaccharide content of soils and, therefore, play an equally important role in creation of water stable aggregates, like bacterial and fungal polysaccharides.

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Hissar, *July* 1, 1967.

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ZIRCONS FROM THE QUARTZITES OF DODGUNI AREA, TUMKUR DISTRICT, MYSORE

The Dodguni area forms the southern part of the Chitaldrug schist belt of Dharwars. The rock types are quartzites, ferruginous quartzites, limestones, phyllites and schists. The general trend of the rocks varies from NNW-SSE to N-S. The main structure of the area is a northerly plunging anticline, the dip of the limbs varying from 50 to 80 degrees.

The quartzites occur as narrow elongated bands, the width generally not exceeding fifteen metres. Their colour is usually white, but sometimes it is grey or brown. Pichamuthu (1937) reported for the first time the occurrence of current bedding and ripple marks from the quartzites of this area.

The heavy minerals were separated from nineteen samples of quartzites taken from different parts of the area. Zircon, tourmaline, biotite, ilmenite, and magnetite are present, but zircon is most abundant. Prolonged reworking has resulted in the destruction of the less stable non-opaque minerals, leaving only the stable mineral zircon.[1] Zircons constitute more than fifty per cent. of the heavy residue.

The zircons are usually hyacinth red in colour. Brown, colourless, turbid and black varieties are also noticed. The majority of zircons are well rounded. Less rounded zircons preserve the original faces. Zircons with rounded outgrowths on rounded zircons are often noticed.

The length and breadth of about 250 grains of zircons from each specimen were measured. The following curves were constructed for each sample: (1) frequency-elongation ratio, (2) frequency-length, (3) frequency-breadth, (4) frequency-size and (5) cumulative frequency diagram for size.

Out of the nineteen samples, sixteen show an average maximum of elongation ratio at 1·4, the variation being from 1·3 to 1·5. The three other samples which are from the eastern part of the area have maxima at 1·5, 1·85, and 2·1, the frequency at maxima for these being very low as compared to the rest of the sixteen samples. In the frequency-length curves the average of the maxima are at 0·07 mm. and 0·1 mm. The frequency-breadth curve shows an average maximum of 0·09 mm. A cumulative frequency diagram was drawn to calculate the parameters of the size—quartiles, percentiles, and median, from which values of coefficient of sorting, skewness, and kurtosis were determined[3,4] (*see* Table I).

Table I

Size distribution of zircons

	Mean mm.	Mode mm.	Median mm.	Sorting coefficient Q_3/Q_1	Skewness $\frac{Q_3Q_1}{M^2}$	Kurtosis $\frac{Q_3 - Q_1}{2(P_{90} - P_{10})}$
Average ..	·088	·091	·092	1·169	1·00	·27
Range ..	·049–·112	·072–·118	·08 –·114	1·06 –1·32	·88–1·18	·22–·28