

Guide to interpreting soil and soil mix test results based on ‘Sufficiency range’ and ‘ASM specifications’

Soil Test Parameters: Sufficiency range for Soil / Soil mix in Singapore

Soil sufficiency range is a measure of the nutrient concentration range that lies between deficiency value and excess concentration in soils for general plant growth. This range is pivotal in understanding soil fertility and to assess soil test results. The following table on sufficiency range for soil and soil mixes developed by NParks can be used as a guiding reference by end-users and industry professionals to interpret their soil test results and work on recommendations for managing soils for sustainable plant growth in Singapore.

Table 1: Soil Test Parameters: Sufficiency range for Soil/Soil mix*

Soil Test Parameter (Method)	Sufficiency range
pH (pH in water (1:2.5 dilution))	5.5 – 7.5
Electrical Conductivity (EC) (EC in water (1:5 dilution))	< 2.0 mS/cm
Total Nitrogen (Kjeldahl method)	1500 – 2000 mg/kg
Extractable Phosphorus (Mehlich 3 extract & read using ICP-OES)	30 – 60 mg/kg
Extractable Potassium (Mehlich 3 extract & read using ICP-OES)	150 – 300 mg/kg
Extractable Calcium (Mehlich 3 extract & read using ICP-OES)	1000 – 2000 mg/kg
Extractable Magnesium (Mehlich 3 extract & read using ICP-OES)	100 – 180 mg/kg
Extractable Sodium (Mehlich 3 extract & read using ICP-OES)	<100 mg/kg (Acceptable limit)
Extractable Boron (Mehlich 3 extract & read using ICP-OES)	0.5 – 20 mg/kg
Extractable Copper (Mehlich 3 extract & read using ICP-OES)	1- 50 mg/kg
Extractable Iron (Mehlich 3 extract & read using ICP-OES)	50 – 100 mg/kg
Extractable Manganese (MnAI Index)** (Mehlich 3 extract & read using ICP-OES)	25 – 100 mg/kg
Extractable Zinc (Mehlich 3 extract & read using ICP-OES)	1 – 50 mg/kg
C:N Ratio	15:1 - 24:1
Cation Exchange Capacity (By Ammonium displacement using 1M Ammonium acetate)	Low: <10 cmol/kg Medium: 10-20 cmol/kg High: >20 cmol/kg

*This sufficiency range is used by Soil Management Laboratory, National Parks Board, Singapore, for providing comments and recommendations based on soil test results using the methods mentioned above (References 1 and 2).

**Using pH dependent activity index, derived from MnAI – Mn Activity Index ($MnAI = 101.7 + 3.75Mn - 15.2pH$).

Specifications For Soil Mix for General Landscaping Use

Suitable general purpose soil mixture, referred to as Approved Soil Mix (ASM) for general landscaping use can be mixed in the proportion of 3 parts soil, 2 parts compost and 1 part sand on a dry weight basis. The specifications for soil mix / ASM are intended as a guiding reference for use by end-users, suppliers of soil mixes for landscaping and garden use, and those involved in providing and specifying landscaping and garden soil-based growing media.

Table 2: Approved Soil Mix Specifications (CUGE Standards CS A03:2013)

Soil Test Parameters (Method)	Required Range / Value
pH (pH in water (1:2.5 dilution))	5.5 – 7.5
Electrical Conductivity (EC) (EC in water (1:5 dilution))	Less than 2.0 mS/cm
Bulk Density (Disturbed samples)	Greater than 0.8 Mg/m ³
Moisture Content (Gravimetric method @ 105°C)	Less than 30%
Organic Matter (Loss on ignition method @ 350°C)	Minimum 10% by dry weight
C:N Ratio	15 - 30:1
Cation Exchange Capacity (Ammonium acetate method)	Greater than 10 cmol/kg soil by dry weight
Pathogens (Standard methods)	Fecal coliforms <1000 MPN per g total solids

References

1. Philip V (2014) An Interpretation Manual for Laboratory Tests of Soil Management Section, Plant Health Laboratory Department, Agri-Food & Veterinary Authority, Singapore. PSH General Requirements SOP PSH_G/SOP 6 Version No: 11, Page 7 of 7.
2. Philip V, George ER, Ghosh S, and Yap ML (2021) Nutrient sufficiency range of soils and plants in Singapore. *In*: Rakshit A et al. (eds.), Soil Science: Fundamentals to Recent Advances, Springer, Singapore. P. 669-681. https://doi.org/10.1007/978-981-16-0917-6_33.
3. Centre for Urban Greenery and Ecology (2013) CS A03:2013 – Specifications for Soil Mixture for General Landscaping Use. National Parks Board, Singapore. ISBN: 978-981-07-6456-2.

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