FERTILISING STANDARDS FOR POTTING COMPOSTS BASED ON THE 1 : 1½ VOLUME EXTRACTION METHOD OF SOIL TESTING

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Abstract

The standards for assessing the quality of potting composts with respect to pH, salinity and nutrient supply at present commonly applied in the Netherlands, are described.
The extent to which the standards conform to available trial data is discussed.

In order to assess the chemical properties of the factory made compost like those presented in the authors' paper "Potting substrates in the Netherlands" (this symposium), soil analysis standards are set up based on the 1 : 1½ volume extraction method. Sonneveld et al. (1974) gave a full account of this method, stressing its advantages over the previously used 1 : 25 weight extraction method like the independence of the interpretation of the analytical data of the organic matter content, the superior quality of the salt index and the greater speed of the analysis, since drying of the soil samples is no longer needed.
The standards for the pH - water of potting compost are 5.0 - 6.5 for vegetable crops and most pot plants and 4.8 - 5.3 for iron chlorosis sensitive potplants; that of seed compost (e.g. cyclamen) is 5.3 - 5.9 and of compost for cuttings (e.g. for begonia) 4.7 - 5.1.
The standards for the chloride and total salt contents of potting composts are given in Table 1, those for nitrogen, phosphorus, potassium and magnesium content in Table 2. For convenience, in the following the 1 : 1½ volume extract values just mentioned will be referred to as Cl-water, EC (short for electrical conductivity), N-water, P-water, K-water and Mg-water, respectively. The higher limit of the range termed moderate in Table 1 is the maximum allowable, so if higher, the potting compost is considered unsuitable. The lower limit of the range termed normal in Table 2 is the minimum allowable, so if lower the potting compost is regarded as unfit for use as such.
Since there is only one single set of standards for each analytical value, regardless of crop differences, it is obvious that the designations of the respective ranges for the various analytical values cannot be but more or less arbitrary. This

arbitrariness is to be noted for instance if, for Cl-water, the terms "fairly low", "moderate" and "fairly high" for the ranges 1.2 - 2.2, 2.3 - 3.3 and 3.4 - 5.0 meg/l, respectively, are compared with the actual maximum values allowable for the various crops. Those are namely 2.2, 3.3 and 5.0 meq/l for pot plants, chloride sensitive vegetable crops (e.g. lettuce) and fairly chloride tolerant vegetable crops (e.g. tomato), respectively. Consequently, in the interpretation of analytical data of potting composts, one should use the standards of tables 1 and 2 with utmost care, ever watchful to make allowances for variations in crop and growing conditions, at least if known.

To indicate what analytical data are to be expected in a potting compost, average values for those of a common factory made flower potting compost, consisting of sand, frozen decomposed peat and peat moss with 7 kg dolomite lime, 1.5 kg 16 + 10 + 20 compound fertilizer, 150 g triple superphosphate, 250 g Sporumix PG (a trace element mixture) per m^3 (see the earlier cited authors' paper) are given (units as in Tables 1 and 2) :

pH	Cl-water	EC	N-water	P-water	K-water	Mg-water
5.7	0.5	1.4	7.2	35	2.2	1.8

The samples were taken shortly after the compost preparation. The fertilisers supplied are meant to suffice for the first four to six weeks after planting, varying according to crop and pot size.

Comparison of standards with trial data

As the standards are set up more or less empirically, it is certainly useful to appraise the extent to which the moderate or normal ranges of the standards in tables 1 and 2 conforms to available trial data. The relevant trial data can be reviewed as follows. When earlier trials than 1973 are being reported, the analytical data presented are converted 1 : 25 weight extract values, the conversion being effected with the regression equations of Sonneveld et al. (1974). Likewise, when saturation extracts instead of 1 : 25 weight extracts were used, analytical values are converted into 1 : 1½ volume extract values.

Cl-water

A six weeks' trial with gloxinia (Van der Boon and Arnold Bik, 1967) showed a decline in growth at a Cl-water of 1.7 meq/l and upward.

EC

In a two months' trial with gloxinia (Arnold Bik, 1970) a decline in growth was observed to set in at an EC of 1.6 mmho/cm. Originally, the salinity was measured as EC_e (specific conductivity of the saturation extract in mmho/cm at 25°C), EC_e can be converted into EC, using the equation $EC = 0.384\ EC_e + 0.012$ ($r = 0.99$; $n = 24$). In a plant raising trial with tomatoes Boertje (1973) found that when pelleted seeds were set out in soil blocks, EC should not exceed 1.2 mmho/cm. When the seeds, however, were set out in 14 cm plastic pots, the maximum allowable EC was 1.5 mmho/cm.

N-water

In a study on the raising of young tomato plants in soil blocks, Spithost (1969) found an optimum N-water of 7.1 meq/l. In the gloxinia trial mentioned in the preceding paragraph the optimum N_e (N content in the saturation extract) was 15 meq/l, which corresponds with an N-water of 7.1 meq/l. The conversion from N_e to N-water was effected with the equation N-water = 0.38 N_e + 1.41 (r = 0.99; n = 5). In the gloxinia trial referred to in the paragraph on Cl-water the best leaf colour, which showed a marked N effect, occured at an N-water of 7.5 meq/l.

P-water

In the last gloxinia trial mentioned in the preceding paragraph the minimum P-water, required for good growth, was 16.4 mg/l.

K-water

In the same trial as discussed in the P-water paragraph, the K-water restrictive for growth was 1.7 meq/l and downward. In a recent seven weeks' trial also with gloxinia, comprising five K and four Mg levels, the average K-water coinciding with the highest dry shoot weight was higher, viz. 2.3 meq/l. The average optimum K-water found in a similar trial with pot chrysanthemum was almost the same viz. 2.2 meq/l. In a plant raising trial with tomatoes in 14 cm plastic pots, including 0 and 350 g K_2O m^3 as potassium sulphate, plant fresh weight after five weeks was 3 and 34 g, K-water being 0.1 and 2.9 meq/l, respectively.

Mg-water

In the K x Mg trials mentioned in the K-water paragraph, for gloxinia average dry weight yield remained practically constant within a Mg-water range from 1.1 to 2.3 and decreased slightly from 2.3 to 2.7 meq/l. For chrysanthemum, average dry weight yield was constant within a Mg-water range from 1.2 to 1.7, then decreased markedly from 1.7 to 2.3 and increased slightly again from 2.3 to 2.9 meq/l.

Setting the foregoing trial data against the standards of tables 1 and 2 the following inferences may be drawn :

As regards Cl-water, it seems justified to lower the maximum value for pot plants from 2.2 to 1.8 meq/l.

As for EC, a maximum value of 1.6 mmho/cm would better fit in with the pertaining trial data than the present one.

Concerning N-water, a range from 5.5 to 7.2 meq/l seems to better fit the qualification normal than the present one.

The normal range for P-water seems appropriately chosen as does the one for Mg-water.

As to the normal range for K-water, the trial data suggest a raise from 1.5 - 2.1 to 1.8 - 2.4.

When shifting the moderate or normal range for any of the 1 : 1.5 volume extract values, it is obvious that the other ranges for the analytical value involved should be adjusted accordingly.

As to the applicability of the standards to supplementary fertilising programs, e.g. in case of peat culture of cut flowers, there is some evidence from practice indicating that they hold fairly good under those circumstances. However, for elaborating this subject trial data are far too scarce as yet.

References

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Table 1 - Standards for classification of the chloride and total salt content of potting composts as determined in the 1 : 1½ volume-extract

Analytical value	Unit	Ranges: Low	Fairly low	Moderate	Fairly high	High	Very high
Cl-water	meq/l	<1.2	1.2-2.2	2.3-3.3	3.4-5.0	5.1-6.7	>6.7
Total salts	mmho/cm*	<0.7	0.7-1.2	1.3-1.8	1.9-2.7	2.8-3.6	>3.6

* specific conductivity of the extract at 25°C

Table 2 - Standards for classification of the nitrogen,phosphorus, potassium and magnesium content of potting composts as determined in the 1 : 1½ volume-extract

Analytical value	Unit	Low	Fairly low	Normal	Fairly high	High	Very high
N-water	meqN/l	< 1.9	1.9-3.6	3.7-5.4	5.5-7.2	7.3-9.0	>9.0
P-water	mgP/l	< 8	8-14	15-21	22-28	29-35	>35
K-water	meqK/l	< 0.8	0.8-1.4	1.5-2.1	2.2-2.8	2.9-3.5	>3.5
Mg-water	meqMg/l	< 0.7	0.7-1.2	1.3-1.8	1.9-2.4	2.5-3.0	>3.0