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Growth of Aloe vera (*Aloe barbadensis*) on potting media made with varying levels of cowdung in Nigeria

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ABSTRACT: The growth of Aloe vera (*Aloe barbadensis*) in potting media using top soil, sand and cowdung was evaluated under screenhouse conditions. Aloe grew best in potting media containing 60 per cent topsoil, 20 – 30 per cent sand and 10 – 20 percent cowdung by volume. These potting media had pH values close to neutral, higher organic matter content, available P and total N than either topsoil or sand used alone.

Key Words: Aloe vera; *Aloe barbadensis;* Potted plants; Potting media; Growth response.

Introduction

Aloe vera (*Aloe barbadensis*), which belongs to the family Liliaceae, is a plant of considerable merit in the tropics where its fleshly and succulent leaves are highly valued as a veritable source of minerals and vitamins essential for body growth and development (Thompson, 1986). It also provides an excellent result in improving the hair and skin when mixed with the native black soap (Kafaru, 1994). Furthermore, it could be used for curing some diseases and wounds such as asthma, sore throat, scrapes and abrasions, stings by insects and stinging nettle, ulcers, arthritis and some skin diseases (Thompson, 1986).

In Nigeria, Aloe vera is mainly produced as a potted plant which could be grown on different potting media. Growth medium composition has been found to affect plant growth (Blessington *et al*., 1981; Fonteno *et al*., 1981). A lot of research has been carried out on potting media made with different organic and inorganic fertilizer materials for the growing of some plants (Wang and Blessington, 1990; Hew and Hee, 1990). However, there is practically no information on the growth response of Aloe vera to growth media containing cowdung which is regarded as a good organic manure (Lund and Doss, 1980; Agboola and Obatolu, 1989; Jin *et al*., 1996). Hence, this study was undertaken to examine the growth response of the Aloe vera plant to potting media made with varying levels of cowdung.

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Materials and Methods

Two identical completely randomised screen house experiments, replicated four times, were carried out in succession between August 1999 and May 2000 in the Department of Crop Production of the Federal University of Technology, Akure, Nigeria ($7^{o}16'$ N; $5^{o}12'$ E). In the screenhouse, temperature and relative humidity fluctuated between 25 – 31oC and 57 – 82%, respectively, during the experiments. Aloe vera suckers with an initial average weight of about 16g each were sown, one per 0.79 litre capacity plastic pot filled with top soil, sand and different potting media.

The experiment consisted of six treatments: (1) top soil (0 – 15 cm, standard), (2) potting medium A containing top soil mixed with sand and cowdung in the ratio of 3:1.5:0.5 by volume (10% cowdung) respectively, (3) potting medium B containing top soil mixed with sand and cowdung in the ratio of 3:1:1 by volume (20% cowdung); (4) potting medium C containing top soil mixed with sand and cowdung in the ratio of 2.5:1:1.5 by volume (30% cowdung); (5) potting medium D containing top soil mixed with sand and cowdung in the ratio of 2:1:2 by volume (40% cowdung); and (6) sand serving as the control.

In preparing the potting media, the topsoil and sand were sieved separately to remove stones, pebbles and other extraneous materials. The cowdung was air-dried, pulverized and passed through a 2 mm sieve. Samples of the topsoil, sand and the different potting media after mixing were analysed in the laboratory for chemical properties using the method described by AOAC (1990).

Data were collected five months after planting (MAP) on the following growth parameters: leaf number and sucker number per plant, leaf length, plant height, root length and total biomass. The data were subjected to statistical analysis of variance (ANOVA) and means were compared using the least significantl difference (LSD) test at the 5% probability level.

Results

Table 1 presents the chemical properties of the topsoil, sand and potting media used in this study including their percentage composition by volume. There were differences in chemical properties amongst the topsoil, sand and the different potting media. The topsoil was acidic and found to have the lowest pH value while the highest was recorded in potting medium D containing 40 percent cowdung. Potting media A, B and C had pH values close to neutral. Incorporation of cowdung into the topsoil and sand increased the pH as well as the total N, available P and exchangeable Ca. The addition of 10 – 30 percent cowdung and 20 – 30 percent sand to the topsoil resulted in an increase in organic matter content. Potting medium B with 20 percent cowdung recorded the highest organic matter content while potting medium D containing 40 percent cowdung had a lower organic matter content than the value recorded for the topsoil. Sand had the lowest organic matter content, total N, available P and exchangeable Ca and Mg.

Data on the effect of topsoil, sand and the potting media utilized in this study on the vegetative growth parameters of Aloe vera are presented in Tables 2 and 3. Significant ($P < 0.05$) differences occurred amongst the treatments in leaf length, plant height, leaf number, sucker number and total biomass per plant, but root length remained unaffected. The highest leaf number, longest leaf length and tallest plants were observed in potting medium B containing 20 percent cowdung. However, potting medium A made with 10 percent cowdung had plants with the greatest total biomass, although this was not significantly different from that recorded in potting medium B. The topsoil produced plants with the highest sucker number which was not significantly different from that produced in potting medium A. Sand recorded the lowest values for all the parameters observed.

Discussion

The present study provides empirical evidence that potting media with optimum composition of top soil, sand and cowdung can support the growth of Aloe vera plant better than either top soil or sand used alone. Cowdung is regarded as a good organic manure containing most of the essential nutrients needed for plant growth (Lund and Doss, 1980; Agboola and Obatolu, 1989; Jin *et al*., 1996). In this study, potting media

Table 1: Chemical properties of potting media and their percentage composition by volume.

		Composition	By	Volume (%)				Exchangeable	Cations	(meq. $100g^{-1}$)
Growth media	PH	Top soil	Sand	Cowdung	Organic matter (%)	Total nitrogen (%)	Available phosphorus(%)	K	Ca	Mg
Top soil	4.50	100	0	0	3.20	1.37	9.72	0.012	0.08	0.13
Sand	6.69	0	100	0	0.09	0.42	1.47	0.003	0.02	0.03
A	7.20	60	30	10	4.72	2.13	16.25	0.007	0.19	0.04
B	6.95	60	20	20	6.34	1.68	11.48	0.106	0.13	0.09
C	6.84	50	20	30	4.96	1.58	11.76	0.005	0.12	0.05
D	8.29	40	20	40	2.26	1.79	10.64	0.003	0.15	0.04

made with 10 and 20 percent cowdung proved to be the optimum for the growth of Aloe vera. The addition of cowdung to topsoil and sand in the foregoing proportions resulted in increased pH as well as increased total N, available P and exchangeable Ca. This is consistent with the findings of Jin *et al*. (1996) who recorded an increase in soil pH and available P in media containing cowdung relative to chemical fertilizer treatment. The improved performance in growth parameters obtained with potting media containing 10 and 20 percent cowdung presumably resulted from the optimum pH values, high organic matter content and total N recorded in these potting media. Topsoil did not quite support the growth of Aloe vera in this study probably due to the low content of available P and pH value. It has been established that at low pH values, the amounts of total N, available P, Mo and V are on the decrease, while toxic elements such as Fe, Mn, Co and Cu are on the increase (Yagodin *et al*., 1989).

The poor performance of sand may be the result of its low organic matter content, low nitrogen and other mineral elements. Hence, it is used mostly in combination with organic materials and has been found to be most satisfactory for rooting cuttings (Hartman and Kester, 1983).

Table 2: Effect of potting media on vegetative growth parameters of Aloe vera in Experiment 1 (5 MAP).

Potting media*	Leaf No. per plant	Leaf length (cm)	Plant height (cm)	Root length (cm)	Sucker No. per plant	Total biomass (g plant^{-1})
Topsoil	9.0	13.6	19.3	12.0	4.7	65.4
Sand	7.8	8.6	10.9	9.0	0.5	23.1
A	11.0	18.8	23.0	14.0	4.5	150.4
B	11.3	23.4	26.8	14.2	2.3	139.3
C	9.3	20.4	24.9	13.4	2.0	77.6
D	10.0	20.2	24.4	13.3	2.3	95.4
LSD (P=0.05)	1.6	3.5	3.7	NS	1.9	35.2

*As in Table 1; NS = No significant difference.

Table 3: Effect of potting media on vegetative growth parameters of Aloe vera in Experiment 1 (5 MAP).

Potting media*	Leaf No. per plant	Leaf length (cm)	Plant height (cm)	Root length (cm)	Sucker No. per plant	Total biomass (g plant^{-1})
Topsoil	9.5	13.2	19.6	12.1	4.4	59.3
Sand	7.0	6.9	12.5	8.2	1.0	19.9
A	10.8	16.0	21.5	14.9	3.5	131.6
B	11.3	22.6	26.1	13.3	2.8	126.5
C	9.8	20.2	25.5	9.8	2.5	78.5
D	9.0	20.1	24.7	14.2	1.3	87.5
LSD (P=0.05)	1.5	3.3	4.2	NS	1.3	36.7

*As in Table 1; NS = No significant difference.

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