EVALUATION OF LOOSE ROCKWOOL AS A GROWING MEDIUM FOR POT CHRYSANTHEMUMS: COMPARISON WITH PEATLITE AND SOIL MIXES[1]

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Hortiwool® (loose rockwool, product of Rockwool Industries) as a growing medium was compared with peat-lite and soil mixes in chrysanthemum production cv. 'Yellow Mandalay.' Plant heights, total leaf area, and fresh and dry weights of potted plants grown in rockwool and peatlite mix were similar. The soil medium produced the highest fresh weight yield. The quality of flowering plants obtained from the three different growing media were comparable. Results indicate that loose rockwool without amendments can be adapted as a potting medium for chrysanthemum production with constant fertilizer injection in good water.

Introduction

Various rockwool products are being used as growing media for hydroponic culture of vegetables and cut flowers in Europe (2,5). In America where many commercial mixes derived from sphagnum peat are readily available, rockwool as a growing medium has received little attention, probably due to lack of research information. Hanan in 1983 reported that potting mixtures containing loose rockwool provided an excellent growth of geranium, chrysanthemum and Kalandroe (3). The objective of this experiment was to study the feasibility of using loose rockwool as a sole source of growing medium in the production of pot chrysanthemums.

Materials and Methods

Three potting media compared were Peatlite mix (Sunshine No. 2, product of Fisons Western Co.), Colorado State University soil mix (1 part soil: 2 parts peat: 1 part perlite) and Hortiwool® (loose rockwool, product of Rockwool Industries). Rooted 'Yellow Mandalay' chrysanthemum cuttings were planted in 6" standard plastic pots (5 cuttings/pot) on October 11, 1985, and grown under a long day condition (night break 10 p.m.-2 a.m.) in a fiberglass covered (FRP) greenhouse. Plants were pinched on Oct. 20, and the night lighting was turned off on Nov. 15. Plants received three weekly foliar sprays of 3,000 ppm B-nine (SADH) when shoots were 2" long. The greenhouse temperature during the cultural period fluctuated from 64°F night to 64°-75°F day (heated to 64°F, cooled at 75°F). The day illumination intensity during the growing period varied, with an average of approximately 30 to 80 klux. Plants were irrigated with tap water as needed for the first five days after establishment. They were then watered as needed with a 200 ppm $N\text{-}P_2O_5\text{-}K_2O$ solution made from Peter's 20-20-20 (product of W.R. Grace Co.) throughout the growing period.

A total number of 360 plants (5 plants/pot, 4 plants/medium, 3 media, 6 replications) was used with a complete randomization for treatments. Pots were initially spaced 8" apart and then 12" apart as final spacing on a 4 ft. wide, raised bench. One-half of the plants were harvested on Jan. 17,,1986, for growth measurements, and the other half was kept until the end of Feb. to observe finished products.

Results

While plants' heights and number of branches showed no difference among the treatments, the soil medium gave larger leaf areas and greater fresh and dry weights as compared to peatlite mix and rockwool. No statistical difference was found between peatlite mix and rockwool for any of the measurements made (Table 1). Rockwool grown plants were uniform in height and shape. The plant quality at flowering was similar in all media tested (Fig. 1). The root

Table 1: Influence of 3 different growing media on growth of potted chrysanthemum cv. 'Yellow Mandalay'

	GROWING MEDIUM		
	Soil Mix	Peat Lite	Rockwool
Plant Height (cm)	28.1 ± 3.1a	24.2 ± 2.6a	25.2 ± 2.0a
Number Branches	3.9 ± 0.9a	3.2 ± 0.7a	3.3 ± 0.7a
Leaf Area (cm^2)	781.7 ± 200.0a	545.5 ± 115.1b	606.8 ± 114.7b
Fresh Weight (g/plant)	39.4 ± 10.8a	28.2 ± 6.4b	30.4 ± 6.1b
Dry Weight (g/plant)	5.3 ± 1.6a	3.3 ± 0.8b	3.6 ± 1.0b

Data presented as mean ± standard deviation. Mean comparisons were made for each line separately by Duncan's multiple range test ($p = 0.05$). Measurements were taken on January 17, 1986, 9 weeks after planting.

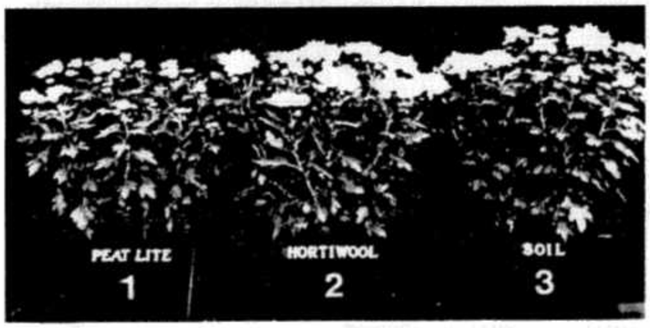

Figure 1: 'Yellow Mandalay' chrysanthemums grown in peatlite mix (1), rockwool (2) and soil mix (3).

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systems produced in rockwool medium were as vigorous as those grown in peatlite and soil mixes (Fig. 2).

Discussion

Plants established in rockwool showed a slower growth rate at early stage as compared to those established in peatlite or soil mixes. The difference in growth was more evident as plants became established. Although fresh weight in the soil medium was significantly higher at the time of growth measurements, the difference in plant size among the three different media became less apparent as plants matured and bloomed. Measurements of the same growth parameters at later stage should have been made. Since rockwool has little buffering or nutrient holding capacity, crop production in rockwool requires a constant feeding program with complete nutrient solutions that are pH-balanced. Rockwool based production of cut flowers (4,6) and pot plants (1) has been successful with a constant nutrient injection system at Colorado State. Results of this experiment indicate chrysanthemum production in loose rockwool as a sole source of potting medium is feasible. Further study is needed to examine nutrient concentrations for optimum production of chrysanthemums in rockwool.

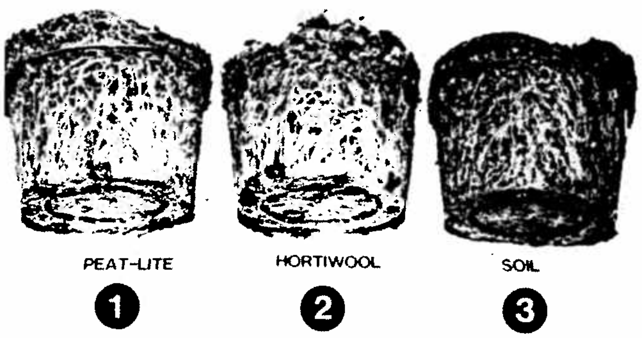

Figure 2: Development of root systems of 'Yellow Mandalay' chrysanthemums grown in peatlite mix (1), rockwool (2) and soil mix (3).

Literature Cited

1. Goldsberry, K.L. and H.M. Maffei. 1986. Response of Easter lilies grown in rockwool, peat-lite and soil media to warm water irrigation. Colo. Greenhouse Growers' Assoc. Res. Bul. 436:3-5.
2. Hamrick, D. 1985. Rockwool: controlling plant nutrients hydroponically. Grower Talks, April 1985, pp. 75-80.
3. Hanan, J.J. 1983. Use of rockwool as a potting mixture; comparison with peatmoss, soil, and vermiculite. Colo. Greenhouse Growers' Assoc. Res. Bul. 395:1-5.
4. Hanan, J.J. 1986. Yield and quality of 'Samantha' roses in three inert media. Colo. Greenhouse Growers' Assoc. Res. Bul. 435:1-3.
5. Krause, W. 1983. Rockwool development. The Grower. April, 1983. p. 21.
6. Lee, C.W., K.L. Goldsberry, and J.J. Hanan. 1986. Production of cut snapdragons in rockwool. Colo. Greenhouse Growers' Assoc. Res. Bul. 438:1-2.

SPECIAL NOTE ON INFORMATION SOURCES

There have been two recent publications that deal specifically with greenhouse production, one on diseases of floral crops and another on the use of CO_2 in greenhouses. Both of these come in a two volume set with detailed information that probably goes beyond what the practicing grower needs. However, they are complete and a good addition to personal libraries. Unfortunately, they are not cheap, in the range of $70.00 to $80.00 per volume.

1. Strider, D. L. ed. 1985. Diseases of Floral Crops, Praeger Scientific.

   (Order through CBS International Publishing, 383 Madison Avenue, New York, NY 10175)

   Volume I: Damping off, Botrytis diseases, Powdery Mildews, Wilts, Root rots, Rust diseases, Bacterial diseases, Viruses and virus diseases, nematode problems, Abiotic disorders, Disease control, Azalea, Begonia, Bulbs, Carnation, Chrysanthemums.

   Volume II: Cyclamen, Easter Lilies, Foliage plants, Gerberas, Geranium, Gladiolus, Gloxinias, african violets and other Gesneriads, Gypsophilia, Hydrangea, Kalanchoe, Orchids, Poinsettias, Roses, Snapdragons, Statice, Other flowering pot plants.

2. Enoch, H. Z. and B. A. Kimball. 1986. Carbon Dioxide Enrichment of Greenhouse Crops. CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, FL 33431.

   Volume I: Worldwide status and history, CO_2 enrichment in the Netherlands, CO_2 enrichment in some countries of Eastern Europe, CO_2 enrichment in the U.S., CO_2 enrichment in Norway, CO_2 measurement and control, CO_2 sources and problems in burning hydrocarbon fuels for CO_2 enrichment, Organic materials degradation, Dynamic optimalization of CO_2.

   Volume II: Fixation of inorganic carbon in plant cells, effects of CO_2 enrichment on photosynthesis on C_3 plants, Effects of CO_2 concentration on photosynthesis and respiration of C_4 and CAM plants, Effects of CO_2 on composition, anatomy, and morphology of plants, CO_2 stimulation of growth and yield under environmental restraints, Woody plant reactions to CO_2, Influence of CO_2 on stomatal conductance, Influence of elevated CO_2 on crop yield, CO_2 fertilization of carnations and some other crops, CO_2 enrichment for greenhouse rose production, CO_2 enrichment of tomato crops, CO_2 enrichment duration as determined by climate, Economics of CO_2 enrichment.

A third textbook, utilized for teaching graduate level courses in basic methods for measuring the environment of plants, may be of interest to those desiring a better understanding of principles and limitations of environmental measurement. After all, environmental manipulation in greenhouses for profit is the name of the game.

3. Hanan, J. J. 1984. Plant Environmental Measurement. Bookmakers Guild, 1430 Florida Avenue, Longmont, CO 80501.

Environment, Errors and units, electricity and signal control, temperature, radiation, humidity, gas analysis, wind velocity (fairly extensive tables on physical constants, definitions, conversions, etc.).

FORT COLLINS GREENHOUSE CLIMATOLOGICAL SUMMARY FOR FOUR WEEKS BEGINNING NOVEMBER 2, 1986 (See Bulletin 426 for details.)

	Week beginning							
	11/2/86		11/9/86		11/16/86		11/23/86	
	Day	Night	Day	Night	Day	Night	Day	Night
Average outside temperature (°F)	40	34	33	22	48	40	46	34
Maximum outside temperature (°F)	59	50	61	48	60	56	60	53
Minimum outside temperature (°F)	26	20	8	4	34	27	28	21
Degree-days of heating	86	109	112	151	60	88	67	109
Average hours in the period	9	15	9	15	9	15	8	15
Accumulated total solar radiation (MJ/sq.m.)	65	—	69	—	50	—	49	—
Average relative humidity (%)	73	87	58	76	45	58	42	60
Maximum relative humidity (%)	100	100	84	94	64	87	73	85
Minimum relative humidity (%)	40	56	19	40	21	25	20	30
Average absolute vapor pressure (mb)	6	6	4	3	5	5	4	4
Average wind speed (mph)	2	1	2	2	5	3	2	0
Maximum wind speed (mph)	13	12	29	24	47	38	31	20
Average CO_2 concentration (Pascal)	24	—	24	—	24	—	26	—
Maximum CO_2 concentration (Pascal)	41	—	49	—	38	—	46	—
Accumulated gas consumption (cu.ft./sq.ft.)	20	56	32	104	21	68	21	74

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