

ARC CONTROLLED ENVIRONMENT USERS MEETING 1976

21st October 1976

This was held at ARC Weed Research Organization by kind permission of the Director, Mr. J.D. Fryer.

The following were present:

Mr. D. Dickinson	University of Reading - Dept. of Agriculture & Horticulture, Plant Environment Lab., Shinfield, Reading RG2 9AD
Dr. F. Minchin	
Mr. A.E. Canham	- Horticultural Research Lab., Shinfield Grange, Cutbush Lane, Shinfield, Reading
Mr. R. Constantine	- Applied Res. Sect., Dept. of Agricultural Botany, Earley Gate, Reading
Mr. D.E. Filby	N.I.A.E. Wrest Park, Silsoe, Bedford
Dr. R.G. Hurd	G.C.R.I. Rustington, Littlehampton, Sussex BN16 3PU
Mr. F. Douglas	
Mr. R.E. Randall	
Mr. A.P. Gay	
Dr. E.A. Baker	Long Ashton Research Station, Long Ashton, Bristol BS18 9AF
Dr. J. Skerrett	
Dr. C.G. Guttridge	
Dr. K. Bambridge	University of Nottingham, School of Agriculture, Sutton Bonington
Mr. M. Yeomans	
Mr. D. Cox	P.B.I., Maris Lane, Trumpington, Cambridge
Miss Margaret A. Ford	
Dr. R.P. Martin	University of Oxford, Dept. of Agriculture & Science
Dr. E.R. Taylor	MAFF, ADAS, Block A Government Offices, Coley Park, Reading RG1 6DT
Dr. E.J. Evans	
Dr. G.N. Thorne	Rothamsted Experimental Station, Harpenden, Herts
Mr. C.C. Hole	N.V.R.S. Wellesbourne, Warwick
Dr. R. Hardwick	
Dr. J.L. Brewster	
Mr. V. Priest	ARC Letcombe Laboratory, Letcombe Regis Wantage, Oxon
Mr. A.L. Bedwell	
Mr. C.H.S. Walter	
Dr. P. Hayes	Queen's University, Dept. of Agriculture Field Botany Division, Newforge Lane, Belfast BT9 5PX
Dr. A.P. Brown	Birmingham University, Dept. of Biochemistry, PO Box 336, Birmingham B15 2TT

Mr. Colin Eagles

University College of Wales, Welsh Plant
Breeding Station, Plas Gogerddan,
Nr. Aberystwyth SY23 3EB

Dr. J.C. Caseley
Dr. D.C. Coupland
Mr. R.C. Simmons
Mr. C Stent

W.R.O. Begbroke Hill, Yarnton, Oxford,
OX5 1PF

1. Minutes of previous meeting

These had been circulated after the last meeting. There were no matters arising.

2. Technical

Light sources. Colin Walter (Letcombe) mentioned some interesting work from the Climate Laboratory, Dept. of Scientific and Industrial Research, Palmerston New Zealand, where a combination of lamps are used including mercury vapour, metal arc and tungsten iodide (for details see Warrington I.J., Mitchell K.J. and Halligan G. (1976), Agricultural Meteorology 16, 237-245)

Cultural methods. There was interest in soil-less systems of growing plants which allowed clean removal of root systems. Peter Hayes (Belfast) successfully grows several species of grass on black polythene beads floating on nutrient solution. Black 904 Alkathene K38-02 beads cost about £120 for 200 kg and are obtainable from local ICI offices. Margaret Ford at P.B.I. grows cereals on Lytag which is watered or intermittently flooded with nutrient solution. Lytag is a chemically inert porous granular material consisting of sintered pulverised ash from coal fired power stations. It cost £7.50-8.50 m³ depending on distance from power station.

Lytag Ltd.
Tilbury Power Station Road
Tilbury, Essex. 037-526767

Letcombe have difficulty in obtaining horticultural grade vermiculite. N.V.R.S. and P.E.L. use commercial grade without any problems. Dennis Dickinson (P.E.L.) buys by the truckload from:

Dupre Vermiculite Ltd.,
Tamworth Road
Hertford SG13 7DL 0992-52541

Minimum order 100-149 bags at £1.44 bag delivery + VAT included

3. Monitoring and recording

Light. Delivery of spares for the Kipp solarimeter were very slow when the agents were Shandon Scientific, but the situation may have improved since ENRAF-NONIUS took over the Kipp and Zonen U.K. agency:

ENRAF-NONIUS
High View House
165 Station Road
Edgeware
Middlesex HA8 7JU 01-952-1643

Richard Hardwick (N.V.R.S.) has found the Lambda PAR (photosynthetic active radiation) meter reliable. It is imported by:

T. and J. Gump
Scientific Instruments
Carlone House
Church Road
Ramsden Bellhouse
Nr. Basildon, Essex 0268-710677

Humidity. The performance of the Varsala humidity sensor has been inconsistent. They have operated satisfactorily for several months in the air duct of Saxcil cabinets at P.E.L., but rapidly became contaminated resulting in zero drift, when used in an asperated psychrometer at W.R.O. Chris Stent (W.R.O.) found washing the sensor according to the manufacturers instructions temporarily improved performance, but within a few weeks the sensors were totally defective. Varsala had troubles with quality control and G.C.R.1 and W.R.O. had defective sensors replaced by the U.K. agents, Rhodes. Fred Gay (G.C.R.1) found this company had no experience with humidity measurement and suggests technical advice should be obtained from the manufacturers:-

Varsala Oy
PL 26
SF-00421 Helsinki, Finland

Another U.K. company, Lee Dickens, market these sensors and have expertise especially with making the associated electronics including humidity controllers:

Lee Dickens
Desborough
Kettering
Northants Kettering (0536) 760156

Accumulation of dirt and grease on wet bulb wicks reduces the temperature depression and the manufacturers of the Delta T psychrometer advise that the wick should not be touched with bare hands.

CO₂. Richard Simmons (W.R.O.) found the Hamden GST10 Multiplexer designed for use with the 'Gas-o-mat' conductivity CO₂, detector was poorly constructed and extremely unreliable in action as sample air leaked from one channel to another.

Recording. Following a discussion on measurement of environmental factors in C.E. facilities, Gillian Thorne mentioned that the American Society of Horticultural Science has 'guidelines' for reporting studies conducted in controlled environments (Hort. Science Vol. 7 (3), 1972, 239).

4. Spares and replacements

Satchwell Duotronic Controller. Frank Douglas (G.C.R.I.) reported that the Duotronic fitted to the Saxcil cabinet is no longer obtainable. The replacement Satchwell 265 cost about £260. This cannot be fitted without substantial modification to the Saxcil cabinet. The 1000 ohm Duotronic servo feedback pots are out of production and the few remaining in stock cost £3.00 each. Dennis Dickinson (P.E.L.) has replaced the Duotronic that controls the

heaters with the Nobel controller which has performed very well. As this is a zero voltage-switching burst firing controller the Duotronic Variac and associated fuses can be removed from the cabinet. Nobel are currently making a prototype solid state cooling controller for P.E.L. which uses the existing modulating valve. Estimated cost is about £70 complete with 2 sensors.

Nobel Engineering Ltd.
Chase Works
Woods Way
Mulberry Industrial Estate
Goring-by-Sea, Sussex Worthing 40777

Trist controls. Peter Hayes (Belfast) reported that Ronald Trist Ltd. who supply several makes of sensing and control devices including Sauter and Herion had been taken over by:

Bestobel Mobrey Ltd.
Bath Road
Slough
Bucks

Cabinet door seals. Chris Hole (N.V.R.S.) uses black 'Vitoplastic 110' (expanded polyurethane) 18x18 mm with open cells and an adhesive carrier tape laminated to it:

Vito Self Adhesives Ltd
Hardwick Trading Estate
Kings Lynn
Norfolk Kings Lynn 61521/2

This company supplies seals made from expanded polyethylene, polyurethane, neopreneate in stock sizes and cut to order.

Glycol. Ken Bambridge (Sutton Bonington) reported that the glycol used when the Saxcils were first installed was made to BS 3151. Shell advised that the glycol is stable, but that the rust inhibitor (%w/v sodium benzoate 5-7.5 and sodium nitrite 0.45-0.55 in undiluted glycol) would probably have decreased and after 10 years 60% of the original level of inhibitor should be added.

Pigmy tungsten bulbs. Users find that currently available heavy duty bulbs have a relatively short life in the Saxcil lamp housing. Dropping the voltage still appears to be the most reliable way of extending bulb life (see notes from previous years).

5. New makes and designs

Fisons are about to build a prototype cabinet designed as a replacement for the Saxcil. The price of the basic unit is expected to be about £7,000. Provisional specifications for the Fi-totron 3 2360G3 and a questionnaire for comments on the design were sent by Fisons and made available at the meeting. Further copies are available from:

Mr. G.N. Ward
Environmental Equipment
Fisons Scientific Apparatus
Bishop Meadow Road
Loughborough, Leics. 0509-31166

Ted Baker (L.A.R.S.) has had a number of problems with his Fisons 1755GH, such as deionised water siphoning out of its reservoir, but in general has found Fisons helpful and their service quite good.

Vötsch. Rothamsted have one Vötsch cabinet (model VAPHO/1500/S) which controls very well when it is working, but its reliability and ease of repair have not met expectations and spares from TR International, the U.K. agents, are expensive. W.R.O. had two problems with the lighting system of their Vötsch rooms. Although the specification was for connection to a 415 V 3 ph supply in the U.K. the lamp system had an unacceptably low power factor (0.5). Vötsch claim that in Germany power factor correction was not made on individual pieces of equipment, however they eventually fitted capacitors which raised the power factor to 0.9. Secondly the light output from the lamps fell more rapidly than expected from published data. Assistance from Alan Canham and Richard Constantine and use of the University of Reading photometry room enabled it to be shown that this was due to the use of 380 V (Continental) control gear. While the majority of electrical equipment rated at 380 or 220 V performs normally on 415 or 240 V, overrunning fluorescent lamps results in end blackening and rapid fall in light output. Vötsch have agreed to supply and fit transformers to drop the voltage to 380 V. The temperature and humidity control are excellent and the general construction of these rooms is good. On view at W.R.O. were three Saxcil cabinets and three Vötsch rooms type UK2PH/5/302/S:

Internal dimensions: 4.8 m long x 3 m wide x 2.2 m high

Temperature range: 8-30°C (sensor Pt resistance).

Dewpoint range: 5-30°C (sensor LiCl unit).

(Room 3 is equipped with more powerful cooling equipment allowing minimum temperatures of 3°C with 2°C dewpoint).

Light intensity: 33,000 lux switchable in 3 sets of 11,000 lux each.

Light sources: 96 8 ft FR96/VHO high output fluorescent tubes plus supplementary tungsten lamps, all mounted in two removable fan ventilated lamphouses.

Air velocity: 0.25 m/s upwards-

Fresh air input: 100 m³/hour.

Other facilities: 2 set points for temperature and humidity control, selected by clock programmable in 15 minute segments. Walls lined with reflective 'Melinex' coating. 4 x switched splash-protected 13A socket outlets in room.

Work by W.R.O. The bench system consists of 19 trolleys 0.7 m x 0.7 m - trolleys are freely movable, and have attachment points for side panels to constrain airflow, Airflow system extensively modified to give more even airflow. CO₂ injection and monitoring facility. Comprehensive alarm and system status indication. Smoke detectors in air preparation chamber, fire alarm repeater tone sounders in each room. Cables from each room to instrument room carry data logging signals and power supplies for ventilated psychrometer units.

The three Saxcil cabinets have positive humidification using a Delta-T psychrometer for humidity control and measurement.

Both cabinets and rooms have a low pressure watering system to increase the precision of placement and volume of water applied. Mains pressure is reduced with a Norgren 20AGX reducing valve:

Norgren
Shipston-on-Stour
Warwickshire 0608-676

The lightweight lance has a Mead Fluid Dynamics valve (MV-70 microline air pilot with long straight lever):

Mead Fluid Dynamics Ltd.
Chalmers Way
Middlesex 01 -980-0971

Any Other Business

A survey of controlled environment facilities within the University of Reading and associated institutes has been prepared by Rod Summerfield (P.E.L.) for the University of Reading Plant Sciences Joint Committee. Anyone particularly interested in receiving a copy should contact Rod Summerfield.

Next Meeting

We have been invited to hold the next meeting at Rothamsted in the autumn of 1977.

John Caseley

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