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SUMMARY

I. EDITORIAL

With a slight delay in the original publication date, for which we hope our readers will excuse us, we continue our work of information and interdisciplinary discussion directed to all, near or far, who are directly or indirectly interested in phytotronics.

We continue to receive financial aid from large research centers, phytotrons, industrial firms, as well as from individual and private sources. To

all those who send us funds we ask you to kindly address them to : Monsieur le Regisseur de la Circonscription Gif-Orsay, CNRS, 91190, Gif-sur-Yvette, France. Postal Checking Account 9152-76 Paris, with an additional note: Participation for the cost of publishing the bulletin "Phytotronic Newsletter".

If it is not always possible for us to send each contributor a receipt, due to the administrative structure of the CNRS, we can publish an annual account of amounts received, which will show the funds paid and how they were used. Thank you in advance for your understanding.

As each one of you can see in the summary, the present issue is more polyvalent than preceding ones, because we are always looking for ways to expand our efforts of informing not only scientists but also businessmen and practitioners. Indeed, letters recently received show us that indispensible information was passed on by us to others and this gives us enormous satisfaction.

So, as you can see, practitioners as well as scientists and businessmen will be interested by our analysis of three scientific and technical meetings Cultivation of flowers in Barcelona, Vegetable cultivation in Avignon and Greenhouse engineering in Silsoe.

An industrial firm sent us a notice on an Identification of test objectives and parameters for the purpose of defining test chamber characteristics. We thought that scientists, researchers, technicians and practitioners will certainly be aided in their work of setting up guidelines which are indispensible and are absolutely essential as well for builders.

For air-conditioned units we include some references and descriptions of build-it-yourself equipment as well as information from Scientific Systems Corporation (USA) which can be added to the list of manufacturers given in issue N°2 (May, 1972).

For practical and technical purposes we reproduce a short description of a new plant conveyor, thereby hoping to interest other manufacturers in interesting new material.

In the column Research Strategy we only give two references for articles which summarize the work of the Tobacco Research Board of Rhodesia. This column certainly merits being expanded but no phytotron or research center sent us news. We hope to receive some from you as a token of your interest.

Finally, the last column of news has already been a success judging by the letters that we have received, especially from people who are working alone or, who are far from important centers. Also we strongly urge our readers to keep us informed of all meetings which might interest our readers.

Thank you in advance.

P. CHOUARD and N. de BILDERLING.

II. Symposium : CULTIVATION OF FLOWERS UNDER PROTECTION IN THE MEDITERRANEAN REGIONS

April 24 - 30, 1973, Barcelona

This symposium was organized by the International Society of Horticultural Science (Protected Culture Commission, Ornamental Plant Section) by Professor J. CARDUS.

The minutes which follow were based upon the text published in Chronica Horticulturae of September 1973, as well as on the summaries of papers which were specially sent to us by those organizing the symposium whom we heartily thank.

In opening the session, Professor Jose CARDUS AGUILAR, President of the organizing Committee and the man who worked to make this symposium possible, presented the subject by retracing the history of Mediterranean floriculture, whose roots go back to Roman antiquity. It is, however, only in the second half of the 19t)• century that it becomes a major agricultural activity, thanks to the Nice-Paris railroad connection, thanks to progress in breeding, thanks also to such men as Alphonse LARR in France or the Italian horticulturist Beniamino FARINA in Spain. Today, floral cultivation is developing in the entire Mediterranean Basin and, so, poses new problems not only to local specialists but also to importing countries. It is then urgently necessary to determine its position on the economic level as well as on a technical one.

No better place could be found than Barcelona for this purpose. Officially opening the work of the colloquium, Mr Jose LOSTAO, representative of the Spanish Ministry of Agriculture, and Mr Alfonso CANOVAS, assistant to the Mayor of Barcelona, both underlined the importance that the authorities attach to floriculture in the economy of a country located at the door of the Common Market. In addition, the proximity of Barcelona to the horticultural area of El Maresme and to the Floriculture Station of the Instituto Nacional de Investigaciones Agrarias in Cabrils provided added attractions to visit which were greatly appreciated by the 120 participants from 16 countries.

1st SESSION. Structures, equipments, climate of shelters suitable for flowers and vegetables growing in the Mediterranean regions

In his preliminary report "Shelters for cultures in the Mediterranean countries", Professor A. NISEN (Belgium gave a very complete description of shelters and their complex relationship within the Mediterranean climate, with plants' requirements, with economic factors, with human problems ... If there are no "unique" shelters, the Mediterranean Basin is logically the best place for "plastic" shelters with temporary cover using a film of short duration.

11 papers were presented at this session :

1. Culture protection using plastic in the Mediterranean regions. F. BENOIT (Belgium). Polyethylene replaced every year is the most common roofing material.

2. Types of shelters most often used in the "El Maresme" region. M. SAN PEDRO ARESTE Spain Comparative study of different methods of protection used the last few years.

3. Results of the evaporative cooling system in greenhouses with roses and carnations. R. TESI (Italy). This system gave for the Pisa region in 1970-71 a reduction in the max. temperature of 3-4°C at a distance of 3,5 m

from the fans and of 5-7°C at a distance of 3,5 m from the humidified pads in comparison with temperatures in a greenhouse without cooling, while with respect to the outside temperature, the reductions were respectively 1-2°C and 3-4°C. An increase of 10-20 % in the min. relative humidity was observed in comparison to the one outside. Given the total cost of the installation (£ 800 per sq. m p. year) it is not economical to use the cooling system for the cultivation of carnation cut-flower.

4. Study of the climate in a floral greenhouse in the region of Frejus. R. PORTAL (France). In the greenhouses, ventilation, heating, shading and watering judiciously used by the horticulturist in summer and winter can bring about good results.

5. The evaporative power of air and the possibilities of controlling the same in greenhouses. A. CARCIA-HOMS and J. CARDUS (Spain). For the Barcelona region it seems advisable to supply the greenhouses with a good zenithal ventilation instead of a lateral one, in order to avoid high evaporation rates. It is sometimes even better to use a minimum amount of ventilation and to maintain high rates of hygrometry by using humidifiers.

6. Rate of carnation shoot growth as affected by variations in light conditions during the season of high light intensity (A preliminary report). E. KAUKOVIRTA (Finland). Observations made by commercial growers in Finland have shown that the rate of growth and flower development varied considerably in Finnish conditions during the months of high light intensity and sometimes caused difficulties in the timing production. New experiments are in progress.

7. Effects of bulb vernalization and plastic film covers upon tulip flowering. C. TALIA MARIA (Italy). Cold treatment of bulb produced stem elongation and increased the fresh weight of cut flowers. Plastic covers have a slight depressing effect upon flower quality.

8. Influence of temperature on the vegetative and generative development of Haemanthus hybrid "ring Albert". J. PETERS (The Netherlands). The length of rest required varied between 80 and 120 days at 10-15°C.

9. The influence of covering material on greenhouse environmental conditions and on the growth and yield of Baccara roses. N. ZAMIR, B. DASBERG and A. FEIGIN Israel . Light intensities and air temperatures were the same in the four greenhouses of 208 sq. m covered with glass, fiberglass and polyethylene film. The humidity was somewhat lower in the glass covered greenhouse during the hot hours of the summer days. Leaf temperature was highest under glass and lowest under polyethylene. The total number of flowers harvested during the season was the same in all greenhouses.

10. The present situation for the use of plastic films in horticulture. M. HANRAS France . In western Europe more than 180 000 tons of plastic were used in 1973, alone for horticultural growing techniques. In the future there will be an increase in the life span of plastic films, as well as the development of special films : polyethylene of long durability and EVA (copolymere vinyl-acetate).

11. Some observations concerning climate control in plastic covered greenhouses in the Valais. G. CESAR (Switzerland). A warming system by propelled warm air and a cooling system by water evaporation are proposed. Method of calculating the water balance in greenhouses.

2nd SESSION. Varietal diversification of flower species for growing under protection in the Mediterranean regions.

Opening the session devoted to genetics and the selection of plant material by his report ; "The diversification of floral species for growing under protection in the Mediterranean regions", E. BENINGER (France), exposed several contradictory tendencies in the present situation :

- Whereas consumers want a larger diversity and innovations, the flower growers and wholesalers want a limited and stable choice of good varieties in order to rationalize their business.

- The necessity of presenting the same products throughout the year explains the increased use of greenhouses for cultivation, but this technique is accompanied by the need for plant material to adapt to these artificial conditions.

- For plant material for multiplication and especially for bulbs, the Mediterranean region remains dependent on Europe, that is on varieties adapted to more northern latitudes.

9 papers were presented at this session :

1. Investigating and breeding Chrysanthemum indicum in Germany and in Tenerife. Ch. JORDAN (Federal Republic of Germany). The Federal Research Institute for Horticultural Plant Breeding in Ahrensburg tests and crosses varieties of Chrysanthemum indicum especially for winter production in Northern Europe, and part of this work is done in Tenerife, the other in Hambourg.

2. Work on greenhouse rose stocks at the Station d'Amelioration des Plantes at Frejus. C. GOUJON (France). On a short term basis work consists of creating clones from seeds with the qualities of R. indica major. On a long term basis it is necessary to recreate a stock multiplied annually by seed using R. canina in the budding technique.

3. Successful winter production of the Gerbera in greenhouses in the Mediterranean region. J. MEYNET (France). Successful winter production of the Gerbera depends on early flowering, the number of vegetative points that are visible early and the morphology of the root system.

4. Use of greenhouses during the summer for growing different Chrysanthemum indicum varieties. A. GRAIFENBERG (Italy). It is possible to cultivate Chrysanthemums in greenhouses after early tomatoes or melons. To have the flowers in bloom before November 1st, one must use the non-pinched 9-10 weeks varieties.

5. Search for hybrid varieties of Renonculus for cultivation under shelter. J. MEYNET (France). Cultivation under shelters of Renonculus is possible if we find good F1 hybrids and precise growing techniques.

6. Production of cut carnations in greenhouses on the Riviera Ligure. E. GARIBALDI ACCATI (Italy). A study in a heated greenhouse of the influence on production of cuttings of different densities of mother plants of "White Sim" and of different times of planting.

7. Analysis of the correlations in carnation. R. PONZ ASCASO (Italy). A study of 15 varieties,-discussion of possibilities for obtaining a floral stem having good commercial qualities.

8. Influence of rootstocks in rose culture. R. OBIOL and J. CARDUS (Spain). A study of the influence of rootstocks on the production and quality of flowers of Baccara rose, including density of planting.

9. Greenhouse comparison tests of different varieties of roses. M. MILIA (Italy). A study of 13 cultivars of roses grafted onto R. indica major. The most satisfying results were obtained with Super Star, Allegro, Baccara and Carina.

3rd SESSION. Economic problems of protected cultivation in the Mediterranean regions. Market requirements.

In his introductory speech s "Mediterranean floriculture and the European market" J. Cl. GARNAUD (France) pointed out that if the consumption of flowers and plants in Europe is steadily increasing, the demand remains affected by holidays and seems to be restricted by high prices and a certain monotony in supply. Mediterranean countries have the advantage of favorable ecological conditions, a geographical proximity and privileged relations with the E.E.C.

7 papers were presented at this session.

1. The United Kingdom - a new market for Mediterranean flowers. R.W. FOLLEY U.Y. . The British are not big consumers of cut flowers. 60 % of flower sold are bought by individuals. The greenhouse carnation crop is organized for winter production, but higher winter prices attract supplies from abroad. Promoting the sale of cheaper flowers could have enlarged the market in the period between the end of the bulb flowers and the start of garden flowers.

2. Roses in Tenerife. J. SANTOS (Spain). Rose culture has been developed in Tenerife during the last five years. Consideration of the limits of profitability of such cultivation.

3. Floriculture under protection in South Africa. O.J. OLIVIER and M.C. BOLTON Rep. South Africa). Commercial flowers and bulb production started already 25 years ago. Research work at the Horticultural Research Institute is concentrated on producing carnations and chrysanthemums free of virus diseases and selecting rose cultivars.

4. Evolution and prospects of development of the protected floral cultures in the French Mediterranean area. J.P. GIANNESINI (France). For 1975, 1700 hectares of floral cultures under glazed shelters and plastic covers are expected, Roses and carnations predominate with the following optimal industrial norms s 50 roses a year per sq. meter under glass, 20 carnations per sq. meter under plastic cover or 18 flowers of Gerbera stock, for example, under composite greenhouse.

5. Production and commercialization of the Anthurium on the Canary Islands. J. PEREZ AFONSO (Spain). Particularities of cultivation of the Anthurium and possibilities of its expansion in the Canary Islands.

6. Pattern of competition between floriculture in N .W. Europe and the Mediterranean area. W.G. de HAAN (The Netherlands). In principle the production of cut flowers in N.W. Europe and in the Mediterranean countries are complementary. It might be worthwhile selling part of the production of the

Mediterranean countries via Dutch agents. This may be advantageous for both parties.

7. Flower-growing under controlled conditions in Israel. R.H. ELSBERG (Israel. The Israel floral cultures are 10 years old. The main problems are the construction of greenhouses as well as their ventilation and heating. Main export crops are roses, spray carnations, gerberas and some house-plants.

4th SESSION. Physiology, nutrition of cut flowers and plants: conditioning and transport of flowers.

The authoritative report of A.H. Halew (Israel) "Transport and conditioning of cut flowers" brought the issue up to date perfectly. The development of research at Rehovot may permit for the near future truly new methods of preconditioning before shipment. Flowers cut at the bud stage could be shipped by refrigerated container boats directly to the wholesalers, or could have special treatment before being sold, after a certain stabilization period.

12 papers were presented at this session.

1. Evolution, problems and trends of cut flower transportation in Italy. E. GARIBALDI ACCATI (Italy). Flower crops in Italy cover more than 8000 Ha. Most cut flowers are shipped by air, rail, buS and refrigerated trucks.

2. Study on prolonging the life of cut flowers of the Mediterranean varieties of Dianthus caryophyllus. P. CAMPRUBI and J.F. AQCILA (Spain). Studies corroborate the hypothesis that the vessel's blockage may be an enzymatic process that makes it possible to stop the displacement of the microelements of the environment (coenzyme) and to prolong the flower's life.

3. Existing relation between the climatological and the nutritive elements absorbed by the carnations grown in greenhouses. M. LASALA and J. CARDUS Spain . Nutrition of the carnation Sims is similar for three types of substratum containing various organic matter. There is some relation between the absorption of certain elements, the illumination and the mean temperatures. Production seems to be higher when the organic matter contents increases in the substratum.

4. Influence of CCC and dark period on the length of the stem of the Chrysanthemums. J. MIRANDA de LARRA (Spain). The plants which endured a longer dark period showed an increase in the length of t-e stem compared to the untreated plant; furthermore, a decrease of length in those treated with CCC was more effective with one dose (2 500 ppm) than two.

5. Fertilization of Roses grown in peat moss. I. MENEVE and R. GABRIELS (Belgium). Highest yields (fresh weight of marketable cut flowers) were obtained with the ionic proportion (m. eq. % anionic and cationic nutrients) 64N - 18S - 18P - 38K - 26 Ca - 36 Mg at an optimal dose of 510 m. eq. per plant of Rosa America's Junior Miss in greenhouse. The best ratio anions : cations are equal to 1, 3.

6. Breaking dormancy of gladiolus corm and inhibitors inducing dormancy. Y. TSUKAMOTO (Japan). Soaking in benzyladenine solution at 20 ppm for 24 hours,

followed three days later by resoaking in gibberellin solution at 100 ppm, resulted in a breaking of dormancy in gladiolus corms and in a good growth of shoot and root after sprouting.

7. Improvement of cut flower quality opening and longevity by preshipment treatments. A.H. HALEVY and S. MAYAX (Israel). By treating the stems of cut carnations, chrysanthemums, roses and gladioli flowers with solutions containing high sugar concentrations and bacteriocides it is possible to "load" the flower stems with enough sugar for their development and full opening.

8. Trials with ethephon and other growth retardants on potted chrysanthemums. G. PERGOLA (Italy). Dimethazide showed better results on "Bright Golden Anne" potted chrysanthemums and was less influenced by the environmental differences than the other chemicals.

9. Research on the nutrition of Asparagus plumosus, Baker. L. VOLPI (Italy). A greater requirement of phosphorus and of potassium, at a parity with nitrogen was observed during the rewakening of the vegetative cycle of the plant, whereas, as regards the potassium, there is absorption during the colder periods.

10. Extraction and identification of flavonoid pigments in Mediterranean varieties of Dianthus caryophyllum. Ma.D. VIDAL (Spain). The colouring does not depend exclusively on the pigments. The co-pigmentation as well as the micromorphology of the epidermis of the petals also have an influence.

11. Culture of Strelitzia reginae in Canary Islands. Application of leaf analysis. E.F. CALDAS and V.G. y A. DIAZ (Tenerife). Proposition for a method of sampling leaf analysis of Strelitzia on the youngest leaf which is thoroughly developed.

12. Greenhouses for training, experimentation and research. P.F. MARTINEZ and J. MIRANDA (Spain). Description of the greenhouses and the work done at the Escuela Tecnica Superior de Ingenieros Agronomos of Madrid.

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It seems that this Symposium organized in Barcelona was very successful and responded to the objective set by Van ONSEM, President of the "Ornamental Plant" section of ISHS, which was to contribute to promote floriculture on a world scale.

Symposium : CULTIVATION OF VEGETABLES UNDER PROTECTION IN THE MEDITERRANEAN REGIONS

Avignon, April 30 - May 4, 1973.

This symposium which was held in Avignon on May 2, 3 and 4 1973, brought together 94 participants from 15 countries ; and 42 had already attended the Symposium "Cultivation of flowers under protection in the Mediterranean regions"

organized the week before in Barcelona.

To attempt to consolidate these two meetings and to show the development of cultivation under shelter in the area of Roussillon, an excursion was organized between Perpignan and Avignon : on April 30 a visit to the experimental horticultural Station of Alenya and a visit to two cultivations (a glasshouse and a large aerated plastic shelter) ; on May 1 a visit to the experimental domain of Balandran in Bellegarde : trials with greenhouse varieties carried out by : Centre Technique Interprofessionnel des Fruits, Legumes et Champignons (CTIFL) and experiments with cultivation techniques in a greenhouse carried out by : Institut National de Vulgarisation des Fruits, Legumes et Champignons (INVUFLEC). The excursion ended with a visit to the Vilmorin Breeding Station in Ledenon, and with a short stop in Pont du Gard.

During the two days of meetings which were held at the Maison de l'Agriculture at Avignon, four subjects were discussed by 29 speakers.

1st SESSION. Influence of the Mediterranean climate on the environment under shelter. Chairman : . CARDUS (Spain).

This session allows for discussion between researchers working mainly either on the physical aspects of modifications of the local climate by the greenhouse, on plant behaviour as a function of types of shelters or their orientation, or on formulating the climatic needs of plants.

7 papers were presented at this session.

1. Influence of the regional climate on formulating the greenhouse climate particular situation of the Mediterranean regions. J. DAMAGNEZ France . For some essential climatic factors such as evapotranspiration, the microclimate of the protected culture closely depends on the external local climate. The energy balance of a vegetation under greenhouse, may be Expressed by reference to energy balance of the same vegetation in the natural conditions. Except for water, which is practically never a limiting factor in greenhouses, the important modifications are : on the balance of radiative exchange (differences observed are a function of regional climate, material of the cover and the temperature regimes of the greenhouse), and on the turbulence near the vegetation (generally reduced as compared to the exterior conditions).

2. Influence of the latitude on greenhouse luminosity. A. NISEN (Belgium). Latitude influences maximum or “potential” luminosity (day length and sun height), local microclimate modifies "real" insolation (haze) and light quality. Shape and orientation of greenhouses and shelters depend on local climate, season and type of culture. The lighting of a shelter has to be estimated not only by reference to total energy which is received but more by its partition in time and in space. A shelter must capture maximum light when this latter is in deficit, the other climatic factors being optimized, and assures a lighting for the protected surface as homogeneous as possible.

3. Orientation of greenhouses in the Mediterranean region. R. BRUN and 0. de VILLELE France). The North-South orientation was a factor contributing to the homogeneity of microclimatic conditions in greenhouses. This orientation increases the yield and intake and allows a better utilization of the soil space and increases the ability of the greenhouse to withstand wind.

4. Optimal temperatures for pepper under shelter. J. RYLSII and A.H. HALEVY

(Israel). Under low temperatures there is an increase in the percentage of fruit set and in parthenocarpic fruit development. High day temperatures and low light intensity induces flowers to drop off, particularly at the early stage of flower development. This emphasizes the importance of ventilation in the plastic tunnels. The best length/ diameter ratio of the fruit was obtained with a night temperature increased up to anthesis, followed by a low temperature (8-10°C) thereafter.

5. Results obtained in inflatable plastic greenhouses with spring vegetable crops. R. TESI (Italy). Thermal and lighting conditions are better than for the traditional greenhouses. Continuous permanent influx of air into the greenhouse prevents thermal inversions during the night and the modification of the CO2 content. Between the two extremities of the greenhouse there was a difference in the maximum temperature of 1-4°C and in the minimum temperature of 0.5-2°C. During June-July the maximum temperature increases excessively and it is recommended to take away the protecting film during this period. The installation costs were Lira 600 per m2, and the maintenance costs Lira 0.85 per m2 per day during April, and Lira 1.1 per m2 per day during July. Cultures : tomatoes and peppers.

6. Greenhouse cooling, present techniques and prospects. A. GAC (France). In a completely closed greenhouse submitted to solar radiation during the summer, temperatures reached between 60 and 75°C. Main interest was a forced convection system with or without supplementary cooling by water evaporation. Technically, cooling a greenhouse with a frigorific machine is possible, but economically is too expensive today. However, with the evolution of industrial techniques it is not impossible to find an application for frigorific machines for the production of heat requiring plants of high commercial value.

7. Influence of the external climate on the microclimate of the greenhouse at level of the exchange surface. J.P. CHIAPALE, J. DAMAGNEZ and A. MORENO (France - Spain The temperature of the surface of the canopy is a function of the energy balance. The difference between the ambient temperature and that at the surface of canopy : increases with the intensity of radiative exchange, diminishes with the growth of turbulence intensity in the neighbourhood of the surface. In a greenhouse the intensity of radiative exchange takes a dominant place and is a function of : the characteristics of the external climate and the amount of heating required in the greenhouse. The first results show growing techniques (horizontal or vertical growing which favour the convective exchange) must bring about important changes in the actual average temperature of the canopy.

2nd SESSION. Varietal diversification of the vegetable species for growing under protection in the Mediterranean regions. Chairman L. BASOCCU (Italy).

Three speakers analyzed the physiological characteristics that can be linked to a better adaptation to climatic conditions within the greenhouse. Then, there was a discussion of the most interesting varieties in two Mediterranean countries : Italy and Spain.

7 papers were -resented at this session.

1. Constraints on plants laid by climatic conditions. S. de PARCEVAUX (France). This problem is complex since the plant integrates the action of

all climatic factors and optimal conditions of growth are dependent as much on the interactions between factors as on their own level. It is necessary to respect a certain balance between temperature and light ; a temperature lower at night than in the day is favourable to growth, some momentary water deficiency can be sometimes favourable to the normal evolution of a culture.

2. Breeding eggplant (Solanum melongena) for cultivation under shelter varietal differences linked to the water status of the plants. E. POCHARD (France). Winter and spring cultivation of eggplant under shelter give plants an excessive vegetative development accompanied by flowers falling off before or after anthesis. Varieties coming from regions with a temperate and humid climate (Japan) set fruits more easily during short days. Fruit setting could be improved by cultural practices reducing the growth of the root system or diminishing the water supply of the plant. The weak potential of evapotranspiration in the greenhouse maintains in the plants a too high water potential by hydropassive stomatal closure. Setting of fruit is absent when the dry matter content in standard leaves is under 16-17 % or when the water deficit of the same leaves is under 3 %. Breeding for under shelter cultivation must then be based on the search for genotypes with a weak root system and high specific transpiration.

3. Possibility of measuring net assimilation by simulating a greenhouse climate. J. CARDUS and A. GARCIA-HOMS (Spain). Description of the simulating apparatus. Hygrometry influences net assimilation which increases by about 30 %, depending on the plant species, when one passes from 25 % to 80 % of hygrometry with specified conditions of CO_2 concentration, temperature and light.

4. Varieties used in Italy for the main vegetable protected production, information and characteristics for their choice. L. BASOCCU and G.F. ACCATI (Italy). Analysis of the following cultures : strawberry, tomato, pepper, eggplant, zucchini, melon and lettuce.

5. Problems concerning lettuce crop in Italy. A. CAVALCHINI (Italy). Discussion of surfaces in open air and under shelter cultivation in different regions.

6. Comparison in greenhouses between varieties and hybrids of various Plants in second culture. S. LEONI (Italy). Experiment in Southern Sardinia in a glasshouse, heated by warm air after chrysanthemum cultivation for cut flowers. The most interesting crops are, in decreasing order : cucumber, tomato, eggplant, and pepper for sowing between January 25 and February 3.

7. Testing of 0galalla, Solana and Gorella cultivars under polyethylene mulching and tunnels. R. BARRERA and G. ALVAREZ-PRIDA (Spain). Experiments for protection against late frosts in the month of April.

3rd SESSION. Specific Mediterranean cultural problems for vegetables under protection. Chairman : A. BRY (France).

After recalling certain notions which should not be forgotten when cultivating under shelter, a number of techniques were described for growing tomatoes, cucumbers and melons. Studies done in Tunisia and in Algeria were then presented. Particular problems of fertilization were reviewed. Finally, the need for coordinating experimental methods among research stations was emphasized.

emphasized.

7 papers were presented at this session.

1. Problems and solutions in growing winter and spring tomatoes under plastic. U. ILONER (Israel). In the South-East Mediterranean Basin tomatoes are grown under low plastic tunnels. Planting time is the end of October and November and the harvesting period is mid March until May. Best results are obtained with polyethylene perforated sheets in combination with trickle irrigation, plant nutrition, herbicides and Uraset or Tomaset.

2. Effects of different techniques on the growth and yield of some varieties of female winter cucumbers. J. SANTOS CAFFARENA (Spain). Experiments were done with 16 female winter cucumbers with an irrigation system, mulching, pruning and training, especially for Canary Islands production.

3. Protected cultivation of vegetable in Tunisia. D. ELLISECHE, A. M'HEDHBI and J.C. LABERCHE (Tunisia). There are about 150 Ha with polyethylene low tunnels and 2 Ha of plastic greenhouses for growing Charentais muskmelon, Fakous cucumber and pimento. Experiments with other cultures : zucchini, french bean, strawberry and tomato.

4. Influence of greenhouse climatic conditions on muskmelon production. C. WACQUANT France . On young plants, the warmer treatments 19°C minimum) are favorable to the growth and give an earlier flowering of male flowers and hermaphrodites than the cooler treatments (16° minimum), and consequently an earlier harvest with an identical total yield. On older plants, after plantation, for a difference of 3 to 5°C, the higher temperatures result in a more vigorous growth and an earlier yield. Low temperatures promote formation of female flowers, which are numerous and appear at a lower level on the plant. They increase the number of fruits and reduce the size of the fruits. Some differences in behaviour are observed between cultivars.

5. The importance of collaboration between different research centers. A practical example : the effect of flat plastic-film covering on the development of lettuce. F. BENOIT and M.D. HARTMANN (Belgium - Germany F.R.G.). In order to avoid irrational and costly reduplication of research, it will be necessary in the future to allow the results of trials carried out at one station to be tested out under the ecologically different conditions of other stations. Collaboration and close co-ordination allowed a more objective and immediate interpretation of results, offering the possibility of checking out a particular management system in different places. Trials on protecting lettuce with polyethylene sheets of 0.05 mm thickness perforated at a spacing of 30 cm with holes of 1 cm in diameter at St Katelijne-Waver (Belgium) and at Geisenheim (F.R. Germany).

6. Aeration of low plastic tunnels : effect of the position of the perforations. D. FRUTOS, P. DAUPLE and C. SAMIE Spain - France). Above 30 cm from the ground, the maximum air temperatures d:creased from 2 to 4°C when there were perforations on the roof ; the minimum temperatures were the same. The ground temperature at -5 cm, was from 2 to 3°C higher in the tunnel perforated on the top. The mean percentage of set flowers was 5 % higher (three first clusters) and 15 % higher (clusters from the 4th to the 8th order) in the tunnels perforated on the roof. The accumulated yield until July 24, 1972 was from 5 K9/plant (perforations on the roof), versus 3 Rg/ plant (lateral perforations). Results are certainly determined and linked

to modifications of turbulence under the tunnels.

7. Specific problems of fertilization of vegetables under shelters in the Mediterranean region. A. ANSTETT (France). Mediterranean soil has low levels of humus and excess calcium ions. Foliar spraying could attenuate the nutritional imbalance in microelements. Water is frequently too rich in calcium, sodium and magnesium, which produces a nutritional imbalance between potassium and magnesium, potassium and sodium, and also sulfate and phosphate. There is excessive use of superphosphate, potassium sulfate and ammonium sulfate which aggravated existing imbalances.

4th SESSION. Economic problems of the protected cultivation in the Mediterranean regions. Nation and international market requirements. Chairman : J.M. JACOBS (The Netherlands).

The last session began with a precise and critical analysis of the conditions necessary for protected cultivation to successfully develop. A report on the place of these productions within all of the systems of vegetable production was followed by a reflection on the importance of "earliness" in Northern European countries and on the northern edge of the Mediterranean Basin. The viewpoint of the southern hemisphere was also presented. A panorama of the evolution of protected cultivation in southern France ended the session.

6 papers were presented at this session.

1. Economic problems of protected cultivation in the Mediterranean regions. M. MUT CATHALA (Spain). The future of production zones of protected vegetable cultivation will depend on several factors : an existing commercial structure, a concentration of the production in zones having technical assistance, research programs which create new varieties and production of new technics with new products, and finally, a support of competition (low production costs). Most interesting productions under shelters are : tomato, lettuce, cucumber, strawberry, pepper, eggplant, melon and zucchini.

2. The economic role of under-shelter culture in all the systems of vegetable production. F. LAURET (France). Shelter technology is part of all systems of production. Economic consequences of the shelter are : (1) shelter technology reduces annual harvest fluctuations by regularizing production, especially in open field cultivation. (2) Shelter technology enlarges the period of abundant production and modifies the price curve and (S) Shelter technology permits production everywhere all year round in heated glasshouses.

3. Economic aspects of "earliness" in vegetable production with reference to Great Britain in the E.E.C. R. FOLLEY (U.K.) . In western Europe protected cultivation produces earlier harvest during the marketing season. The effects of earliness on the market are good (higher price and consumer is pleased). Close to the western seaboard of Europe, earliness is limited to short-cycle crops of 6-10 weeks duration and part of the season to long-cycle crops. A study of the countries of origin of out-of-season imports of vegetables into U.K. shows how unprotected production, even far away, has taken precedence over protected production at less distance. Typically Mediterranean products are in increasing demand.

4. Plasticulture trials in Algeria. M. "AMADI (Algeria). This relatively new technique is developed near the seaboard where ecological factors are

favorable. Greenhouse problems are those of correct ventilation. Tunnels and low-shelters are increasingly in use. The use of mulching film is hardly developed.

5. All year round vegetable production without protection. O.J. OLIVIER (Republic of South Africa). The original settlement at the Cape for vegetable industry was found in 165Z with the object of supplying fresh vegetables and fruits to the ships of the India Trading Company. The Republic of South Africa is self sufficient in winter and summer vegetables without any protection or shelters.

6. Panorama of evolution of protected vegetable crops in the French Mediterranean regions. J.P. GIANNESINI (France). Protected cultivation is limited in comparison with other Mediterranean regions. The slow evolution i3 explained by commercial reasons, due to the local market which must take into account foreign competition. Main crops are : lettuce, tomato, early pepper, melon, strawberry, asparagus, cucumber, french beans, greenhouse eggplant, celery and radish.

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The two long days of conferences ended with a visit to the Palace of the Popes and a visit to the Commercial Agricultural Fair of Avignon.

A last excursion took those attending the Congress across the vegetable-growing zone of Chateaurenard, to the Centre de Recherches Agronomiques of Montfavet (Vegetable improvement Station, Plant pathology Station, Bioclimatological Station), and finally, to the area of Berre where 200 Ha of greenhouses are concentrated.

It would also be interesting for our readers to take up again some remarks made in Chronica Horticulturae (Vol. 13, NO 2, p. 29) about this Symposium. Does a Symposium of such a vast subject still hold interest in that it only brings together a small number of specialists in one area ? This meeting was justified by the remarkable phenomenon which one can witness : the very rapid development, termed "explosive" by one speaker, of under-shelter cultivation in various countries in the Mediterranean Basin. Southern France, the northern limit of this area, constitutes a privileged place to reflect both on the technical and economic problems. Look at the present development of greenhouses (60 Ha of vegetable culture in 1965, 900 Ha in 1973), and more particularly of plastic greenhouse-tunnels, which should interest horticulturists in the Nordic countries used to heavier and more automized equipment, and producers in more Mediterranean countries used to lighter structures. One can also note another new development : the choice of varieties cultivated of tomatoes, melon, pepper, eggplant. Finally, a survey of various research and experimentation centers in the Midi region of France was given. And along with all this, we must mention the touristic attraction of the region at this time of the year.

This Congress showed that many problems posed by under-shelter vegetable cultivation were common to different Mediterranean countries. It helped to develop exchange of information between researchers and technicians from a region where there are less international technical meetings than in Northern Europe.

IV. SUBJECT DAY "GREENHOUSE ENGINEERING"

October 16, 1973, received from E. HARRIS
Scientific Information Section - NIAE
Wrest Park, Silsoe, U.K.

The Subject Day on Greenhouse Engineering was attended by over 100 invited representatives of the glasshouse industry, including growers, glasshouse manufacturers and equipment suppliers, together with members of the research advisory and education services and the trade press. It was organized not only to present the latest information on selected engineering research topics, but also to stimulate discussion to help ensure that research is relevant to the present and future needs of industry.

Eight papers were presented under the chairmanship of Ir S.B. SPENCER covering three main topics : Structures, Environment and Mechanization. The papers were supported by static information displays and demonstrations of measurement techniques and instrumentation, and by a working experimental gantry rig for glasshouse mechanization. Useful discussions and exchanges of information took place after the paper presentations and during viewing of the exhibits.

1. Engineering research for the glasshouse industry. K.W. WINSPEAR.
The introductory paper reviewed the progress made by the glasshouse industry in adopting aids to efficiency by mechanization over the past decade. Engineering research had played a part in this process and many of the innovations arising out of research had the double benefit of improving the environment or the technique as well as releasing workers to do more interesting and worthwhile tasks. Nearly half the glasshouse acreage in Englad and Wales now consisted of modern structures erected since 1966, with re-building spread quite uniformly over each size of holding group. The large nurseries, however had invested proportionately more in modern automatic systems such as ventilation, heating and irrigation than the smaller holding. Automatic ventilation of the glasshouse, practically unknown in 1965 had by 1972 been installed in nearly half the nurseries over 2.5 acres in size and in 27 % of the total acreage. The ways in which past and present research projects met the objective of improving the efficiency of the glasshouse grower were discussed, and an attempt was made to identify factors likely to influence glasshouse industry in the future.

2. Wind loading of glasshouse structures. D.A. WELLS and R.R. HOXEY.
Details of the experiments to determine the wind loads on glasshouses are presented. These loads were important in the design of the structure but insufficient data existed to allow accurate predictions of such loads to be made. Measurements of full-scale glasshouses under natural wind conditions would enable relationships (pressure coefficients) to be derived between wind velocity and wind loads. These, when applied to statistical predictions of maximum wind speed would allow design loads to be determined. Three glasshouses were being used in the work - a 6.4 m wide single-span and multi-span types of 3.2 and 6.4 m module. During periods of high winds recordings were made of the free stream wind velocity at a height of 10 m and of the wind pressure at 48 points of each glasshouse. The system response was such as to allow the effects of gusts down to 0.4 s duration to be studied.

3. Inflated roof greenhouses. G.E. BOWMAN.
A greenhouse incorporating a double-layer inflated roof showed that this offered the possibility of worthwhile fuel saving, minimum loss of light due to the structural members and easy access, for a reasonably low capital investment. Against these advantages had to be set the problem of large forces in the structural members, loss of light reflected by the second plastic film and the difficulty of handling large areas of film plastic during construction or subsequent recladding. Consideration was given to the forces in curved film and in the supporting structure, in relation to weather and crop loads. Experimental forms of inflated roof greenhouse were described : in comparison with a metal-frame glasshouse a fuel saving of some 20 % was reported.

4. The design of ducted-air heating systems. B.J. BAILEY and J.R. DAWSON.
Authors on the design of ducted-air heating systems, drew attention to the important requirement for uniformity of temperature in the region of the crop. To achieve this using warm air required the perforated ducts to have uniform heat output per unit length. Part of the heat transfer from an air duct was by radiation convection from the duct wall but most was by the discharge of warm air from the perforations. Uniform heat output along the duct could only be produced if the perforations were correctly spaced. The spacing depended on the temperature and pressure of the air within the duct, which changed from one perforation to the next. The design thus required repetitive calculations which were done with the aid of a computer. Te-t ducts 56 m long were installed on a 60 x 9.1 m single-span glasshouse. Measurements of the glasshouse air temperature showed the standard deviation of the temperature variation along the length of the house to be 0.25 C. The design method would be simplified to allow of use by growers.

5. Fan ventilation of glasshouses. J.S. WOLFE and R.F. COTTON.
The paper describes how the solar heat passing through the glass was transferred to the air partly by evaporation of water from the plants and partly by raising their temperature and hence that of the air. When excess heat was removed by fan ventilation, the uniformity of temperature in the house depended on the pattern of air flow. A uniform stream of air as assumed in theoretical studies results in a gradient of temperature. Such a simple pattern might occur in houses with a larger air inlet with evaporative cooling pads; with other types of inlet the flow pattern was shown to be more complex and influenced by the inlet configuration and in some cases the roof configuration. The flow was also modified by the crop. Temperature rise and variation along the direct air path and vertically had been investigated to validate factors used in calculating ventilation system capacity.

6. Delta X - a new control system. B.J. HEIJNA.
Ir B.J. HEIJNA of Holland spoke of the many types of controller for greenhouse climate marketed in his country. One type offered by three firms, controlled the plant environment on the basis of air moisture vapour deficit (Delta X) Plant transpiration depended upon moisture deficit and absorbed solar radiation : the Δx control system operated so as to avoid excessively high or low transpiration rates. A light-dependent controller was associated with the mixing valve of the heating system and a moisture vapour deficit - dependent controller was connected to the ventilators. Δx control systems have been used commercially for tomatoes, cucumbers, roses, freesias and carnations. Although such systems cost over £ 1000, growers claim that the saving of labour and worry is worth this expense.

7. Travelling gantries for glasshouse mechanization. J.B. HOLT and J.S. ASPINWALL. Greenhouse mechanization work based on gantries which travelled on rails and spanned the crop growing area was described. Various crop production methods might call for a range of gantries some of which could carry implement materials, workers and machines such as planters and harvesters. The benefits which the gantry span system was expected to offer in the production of any crops were listed and the specification of possible gantry systems outlines. Bed widths, without pathways of between 3 and 10 m (10 and 33 ft) were envisaged and both powered and non-powered gantries discussed. For the lighter unpowered gantries heating pipes might be used for rails, but for the heavy duty machines special rails would be installed. Experimental 20 ft span powered and unpowered gantries were shown in the laboratory : the engineering problems of propulsion, guidance and control were being studied. A rotary cultivator. tines and tray lifting equipment had been operated on the powered gentry and the problems of remote control were being examined to see if the equipment could operate with only occasional supervision.

8. Mechanization of transport in greenhouses. J.C.J. KUIKEN. The paper from Wageningen described why it has become increasingly necessary to mechanize the operations in glasshouses. Among the factors listed as affecting the choice of a transport system were the ways the crop may be grown and the seasonal distribution of the labor requirement. After describing, with the aid of illustrations the more advanced aids to be seen on commercial holdings, the I.T.T. projection on "Industrial plant production systems" was covered. This embraced sowing, transplanting, spacing, harvesting and similar operations as well as transport to and from the growing area. The author claimed that the system of moving plants to a work zone would be suitable for all crops which can be grown in soil blocks, pots or containers but not those which require strong supports.

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N.B. Proceedings of this Subject Day containing full text of all papers presented have been published at £ 2 each. Write to Ir E. HARRIS, Scientific Information Section - NIAE, Wrest Park, Silsoe, Bedford, MK5 4HS United Kingdom.

V. PLANT CULTURE UNDER CONTROLLED ATMOSPHERES

After our publication in Phytotronic Newsletters NO 4-5-6 (November 1973, p. 11-12) of Guidelines for reporting studies conducted in controlled Environment chambers, one society of growth chambers equipment sent us the following paper which we are happy to diffuse because it certainly helped scientists, technicians and horticulturists when they establish specification for chamber construction.

Identification of test objectives and parameters for the purpose of defining test chamber characteristics

Ir R. LEROY - Service Phytotronique, S.A. L'AURORE, 27 rue Gabriel Péri, 94220, Charenton-le-pont, France

This document has been prepared with a clearly defined objective in view namely, the preparation of a definitive specification for the construction of controlled-environment plant culture chambers.

It is, above all, a check-list for the end-user. All relevant factors can be logically reviewed, from primary objectives to capital and operating costs.

The complete check-list, with suitable comments ("yes", "no", "imperative", "future", "optimal" etc ...) and quantitative and qualitative data marked in the margin opposite each item, provides the builder with the basic information he needs to make a preliminary selection of methods and materials best suited to the needs of the end-user.

With this basic information in front of them, the end user and the builder can progress rapidly to a formal, detailed project specification.

Details of client :

Name of Laboratory
Address
Telephone NO
Specialization (if any)
Name of person responsible.

On-site technical service and facilities :

Name of architect
Person responsible for construction projects

Voltage : 380 V 3-phase + Neutral + Ground *
220 V 3-phase + Ground *

* delete items not applying.

Type of chamber construction :

Masonry
Prefabricated.

Structural planning :

Building plans including
- General site plan
- Orientation
- Detail plans of chamber sites
- Elevation dwg
- Schematics : water supply
drainage
electrical.

Operational planning :

Location of machinery
- Integrated with chamber
- Underground
- Independently located.

Control panels and boxes
- Near the chamber
- Independent and randomly located
- Independent but grouped.

Plant handling conditions. General considerations

Useable ground area, considering

- Area required by plants
- Access for "in situ" treatment
- Frames or tanks on fixed tables
- Frames or tanks on mobile trolleys
- Introduction and removal of plants during test sequences
- Weight of each unit, or groups of units to be handled during each test.

Useable height, considering
- Use of fixed-height frame or tank supports
- Use of variable height frame or tank supports
- If weight precludes use of variable height equipment, use mobile luminous ceiling.

Average duration of a complete test : example,
- Between two complete plant cycles
- Between two decontaminations.

Routine operations :
- Watering cycle(s) : automatic
- Watering cycle (s) : manual
- Approx. water req't/24 hrs/chamber
- Feeding cycle(s) : nutritive solution
- Water req't, nutritive solution/24 hrs/chamber

Number of operator-entries/day/chamber and time spent inside.

Cultivation. Specific conditions

Containers (frames or tanks) for rooting media
- Total weight of soil
  " of it sand
  to " is vermiculite (or equiv.)
- Surface area covered by anti-evaporation film

Cultivation in liquid medium : surface protected or not ?

Containers with independent temp. control.

Total darkness capability for plants even if chamber is located in illuminated area.

Hermetic characteristics of chamber for
- Qualitative or quantitative control of atmospheric compos4.tion
- Addition of gaseous or bacterial pollution
- Complete extraction of all pollution in air extracted from chamber.

Presence of parasites

- Nematodes
- Acarida
- Others.

Specific information
- On oligoelements (for example, prohibited use of certain materials, Zn, Cu, Sn etc. in the environmental control equipment).
- On microorganisms, moulds and bacteria (need for germicidal or anti-bacterial washes on partitions, floors, ceilings and environmental control equipment).
- Formulation of products used for decontamination (quaternary ammonia etc.).

Type(s) of plant(s) under test :

- Approx. mass of organic matter exposed to air (i.e. above rooting media).

Test conditions

Temperatures

- Minima : both test requirements and operating costs must be considered when selecting lower limits.

A I H.P. refrigeration compressor produces
- 3220 Fg`hr (12900 BTU/hr) at+ 5°C
- 2580 Fg/hr (10320 BTU/hr) at 0°C
- 2180 Fa/hr (8790 RTT1/hr) at - 5°C.

- Maxima : tolerances to be stated
  - on a plan view, 20 cm from the walls (often ± 0.5°C)
  - in the vertical axis, between points 10 cm from the floor and 20 cm from the ceiling (often ± 20C).
    between the true and real values (often ± 0.2°C).
    between t_1 and t_2 (often ± 0.5°C).

- Variation :
  Rate of exchange between maxima and minima conditions (often 10°C/hr)
  - average (non-linear)
  - linear (requires use of a programmer).

Hygrometry

- Minima : maxima

Hygrometric conditions are always a function of temperature.

1st case using simple equipment with low operating costs.

at 6°C, from 85 % to 90 %
at 8°C, to 75 % to 90 %
at 15°C, from 50 % to 90 %
at 20°C and above, from 45 % to 90

2nd case : using dryer, whatever the type, operating costs are higher,

at 6°C, from 35 % to 90 %
at 8°C, and above, from 40 % to 90 %.
This second case required a sealed chamber and a more sophisticated method of regulation.

- Tolerances : rarely less than + 5 %.

- Variation : in the order of 20 %/hr.

Lighting :

- Sources in double ceiling

Type of double ceiling

- glass or acrylic resin.

- Sources located within chamber environment. (Necessary for research requiring high luminosity, but expensive to install and operate).

Note : L'AURORE is the only manufacturer currently building a low-heat mobile "Xenon" ceiling for use within the chamber environment, which does not add to the cooling load when maintaining minimum temperature conditions.

Spectrum :

- Since most major manufacturers of lamps offer a very limited range of wide-spectrum equipment, it is best to ask for the spectral diagram and composition of all wide-spectrum proposed.

Note : One of the best available light sources is the SYLVANIA GRO/VHO wide-spectrum tube with incorporated reflector, 2.40 x 215 W.

Intensity :

- Lux. No need to worry about this, as a lux-meter indicates the radiant energy for ? = 555 nm, according to the relation

  - 1 W = 680 lumen at 555 nm,
  - 1 lux = 1 lumen/m2 = 1/10 ftcd.

Radiant energy

Some curves now in use, which express emission as a function of wavelength, are based on the concept of radiant energy. This is given for those wave-bands which affect vegetable metabolism in microwatts/cm2 or ergs/cm2.
(1 microwatt = 10^4 ergs/sec.).

Ventilation :

- Horizontally
- Vertically

The direction of ventilation should be selected on the basis of the various considerations listed below:

Horizontal plane

- Poor horizontal temp. stability
- Good vertical temp. stability
- Good condition of epithelial cells
- Minimal disturbance of frame or tank moisture
- Good moisture conditions in apical zones
- Dust particles in suspension kept to minimum
- Rate of airflow at vents is low
- Dry climate easily obtained
- Useable surface area C chamber area
- Easier soil upkeep.

Vertical plane

- Good horizontal temperature stability
- Poor vertical temperature stability
- Drying action on under-leaf epithelial cells
- Frame or tank moisture radically affected
- Drying out of apical zones
- Dust in suspension
- Rate of airflow through vents can be high
- Dry atmosphere difficult to control
- Useable surface area < chamber area

Note In discussing the vertical plane above, it is understood that the direction of ventilation is from bottom to top. However, for tests using gaseous pollution (or aerosols), ventilation must be from top to bottom.

- Air speeds

(Normally between 0.3 and 0.5 m/sec). For complicated test conditions, such as very dry atmospheres, etc... it must be increased to 0.7 m/sec.

- Replacement of atmosphere

(Normally renewed 3 to 5 times/hr). To maintain very dry conditions, renewal rate should be reduced to 1 vol/hr. As a general rule, replacement should be variable between 0 and 10 vols/hr.

Controls :

These should be selected on the basis of the following criteria, which are listed in ascending order of cost :

- Tolerance on temperature and humidity (average)
- Close tolerance on temperature and humidity
- Two max. and min. temp. humidity conditions/24 hrs.
- More than two maximum conditions/24 hrs
- Desired rate of change of average temperature and humidity under uncontrolled conditions.
- Single "on-off" control for all light sources
- Linear "rate of change" control for temperature and humidity
- Time switches on individual light sources
- Simultaneous control of temperature, humidity and lighting
- Independent control of temperature, humidity and individual light sources
- Automatic control of ancilliary operations (automatic watering, nutritive solution, addition of C02, gaseous pollution, etc.).

Safety and security devices :

- Conformity of equipment to current standards.
  Reference number of relevant standards.
  Use of automatic cut-outs on power circuit in case of high-low temperature limits being exceeded, with resultant damage to plants. (The chamber temperature returns to ambient, even if it is in the dark - the lesser evil!)
  "Elapsed running time" counter on light sources so that tube replacement can be programmed.
  Independent recording circuit.
  Warning lights indicating functions "on".
  Warning lights indicating both functions "on" and "malfunction".
  Security device on hygrometry controls in case upper or lower limits are exceeded, either during stable test conditions or during changeover to other conditions.

Any other considerations not included it this document.

VI. SELF-ASSEMBLED GROWTH CABINETS

After our request of references, we received the following :

1 . A controlled-environment facility for Tropical pasture species by C.T. GATES, Division of Tropical pastures, technical paper N°6, C SIR`; Australia 1970, 13 pages.

This facility can be completely constructed by a normal workshop facility and the appendix list plans for construction of essential units and some data regarding their performance.

2. An automatically programmed Environmental Tunnel by J.A.F. ROBERTS and J.S. COLE. Journal Agric. Engng. Res., 1968, 13, 3, 254-265.

3. A double shell plant growth cabinet by I.H. RORISON. The New Phytologist, 1964, 63, p. 358-362.

4. Programmed control of plant growth-room climate by F. SUTTON and I.H. RORISON. The New Phytologist, 1968, 67, P. 973-975.

5. The use of Food Freezers to build Plant Growth Cabinets by ULF WUNSCF', Lantbrukshogskolans Annalen, 1966, 32, p. 417-426.

6. Armoire de Thermotherapie by M. RAYSSAC, Revue Horticole, 1969, p. 1668-1669.

7. Professor D.R. DAVIES from John Innes Institute (U.K.) sent us a brief description of two installations which he has designed and built :

(1) Growth rooms

Five growth rooms have been constructed, four with internal dimensions of 8' x 8' and one 6' x 10'. The materials and methods of construction used have been such that the units could be constructed by the Laboratory's technical staff ; the walls are constructed of a timber framework covered on both sides with insolating board, and the whole of the inner surface is covered with a reflecting material. The light plenum is isolated from the controlled environment area by a double glazing of Perspex and glass and is cooled by drawing air at ambient temperature from outside the laboratory over the lamp units. Within the growth room, air circulation, in a vertical direction, being introduced through slots in the floor and extracted via ducts situated in the light Plenum. The air treatment area is situated on top of the cabinet above the light plenum. High pressure sodium, high pressure mercury or high intensity fluorescent lamps can be installed within the units to give a range of light qualities and light intensities. Temperature regimes of between 12 and 35°C can be maintained. The price of the materials used was £ 2 000 per cabinet (1971).

(2) A new design of controlled environment unit for Plant Sciences.

The basic principle involved in this new system involves regulating the temperature of the substrate in or on which the biological systems are grown rather than regulating the air temperature around the plant or vessel used. Temperature regulation is achieved by circulating water at a predetermined temperature through a metal shelf on which the plant or microorganism is grown. This area is isolated from the light plenum above it by a perspex sheet, the light plenum being cooled by drawing air over the light units. Several such units can be integrated together in a vertical series and a typical installation, of which we have built six, involves four controlled environment shelves each of 17 sq. ft. These shelves have proved ideal for tissue culture systems, also for growing green algae and some fungi and could be suitable for certain plant seedlings. Full details will be published in the subsequent issue of Laboratory Practice. The cost of the materials used in these units was £ 21 per sq. ft. (1971). Excellent control of temperature and of light distribution over the shelves has been achieved, and construction has proved extremely simple and the maintenance minimal.

Further details regarding both this unit and the growth rooms described above can be obtained from Professor D.R. DAVIES, John Innes Institute, Colney Lane, Norwich, Nor 7DF.

VII. PLANT GROWTH CHAMBERS

Manufactured by Scientific Systems Corporation,
9020 South Choctaw, Baton Rouge, La 70815 (USA).

Reach-in models:

TWINcubators and the single compartment MONO twins are suitable for seedling studies and small plants or plant flats. They are available in 1000, 2000 and 8000 FC models. Next is size is the RPG-66 series with 12 sq, ft area, a choice of Light Banks and several other accessory options. RPG-66 prices range from $ 4,000 to $ 9,500. The RPG-90-HP is our largest and most advanced Reach-in. With a 10,000 FC Lamp Bank it is priced at $ 11,975 ; model RPG-92-HP has a standard fluorescent lamp drawer and, less the spectral aluminium interior, is priced at $ 8,975.

Walk-in models:

Series 2000 have 32 ft2 of adjustable plant bed, illumination levels to 5000 FC and Plexiglas lamp barriers. Series 2000 are priced from $9,600to $ 14,500.

Series 4000 are 37 ft2 chambers with illumination levels to 6500 FC. Plexiglas lamp barriers, full proportioning temperature controls, water-cooled lamp housing, and the modular plug-in mini-panel system are standard. Prices range from $ 11,750 to $ 16,500.

For applications requiring more space and/or higher lighting levels, we recommend our Series 6000. Useful growth area is 8i ft2. A unique Multivapor/lucalox lighting system in prefocused puramidal reflectors provides unmatched plant illumination. Series 6000 are priced in the range of $20,000to $ 25,000.

If you have problems, write us and tell us your requirements.

VIII NEW POT PLANT CONVEYOR

received from J.A.C. WEIR,
Agricultural section, Electricity Council,
30 Millbank, London SWIP 4RD (U.K.)

Initial development of the conveyor was by the Electricity Council in collaboration with Simplex of Cambridge Ltd and T. Rochford & Sons, who provided the facilities for the trials. After the commissioning trials it was moved to the National College of Agricultural Engineering where it is at present.

The limiting factors in putting a number of layers of plants in a glasshouse is not that of engineering construction, but simply utilization of natural daylight. All plants must receive the maximum amount of daylight and, at the same time, each plant should receive a similar amount of light.

This problem has already been tackled on the Continent, by means of the development of tower qlasshouses which so far, has not proved to be a commercial proposition.

Simplex of Cambridge and the Electricity Council in their joint project, adapted the principle of the tower-glasshouse by using a horizontal two-tier conveyor in a conventional glasshouse. The prototype pot-plant conveyor is a single endless loop of two chains, running over two 1.2 m (4 ft) diameter sprockets at the ends of the conveyor. The pot plants are carried in wire baskets, suspended transversely at regular intervals along the length of the loop. These baskets swing freely and the plants are at all times in their natural upright position.

Two of these loops in parallel are contained in a rigid steel framework of basic dimensions of 14 m (45 ft) by 3.8 m (12.5 ft). This is considerably smaller than the commercial module envisaged. The twin loops are rotated continuously at a linear speed of approximately 0.3 m/min (1 ft/min), for normal operation, by sprockets at one end which are driven by a small 0.75 hp variable-speed, dc electric motor.

One total revolution of the conveyor takes approximately 90 min and the plants spend 45 min in shade and 45 min in full daylight alternately. Each plant received a total daily amount of light equal to half the total amount available in co... ... Letely unshaded conditions plus half that which filters through the top layers of plants to the lower. For practical purposes it can be assumed that the daily light energy integral received *by* any plant is only fractionally more than half that received by a plant standing out on a bench in the same position.

For most plants, the daily light integral throughout the year is more than adequate for maximum photosynthesis, but for pot-chrysanthemums and possibly for poinsettias, the light during the four short-day months of the year (November. December. January and February) can often fall below the optimum requirement. Supplementary lighting could be used to make up this deficiency (a bank of fluorescent tubes could be fixed quite easily between the two tiers).

In a glasshouse filled with pot plants, either on static or overhead moveable benches, all the services, such as watering, feeding and lighting, have to be taken to the individual plants. With the prototype pot-plant conveyor, the position is reversed, in that the plants are conveyed to the services - watering, feeding, lighting, "stopping", disbudding, distribution and collection.

As a result of our trials with the conveyor so far, it is estimated that it is possible to increase the output of a glasshouse by up to 45 per cent for pot-mums or poinsettias. For peperomias, begonia semperflorens or saint paulias, the output can be increased by 70 per cent.

A hypothetical costing done two years ago showed that, provided an increase in output of not less than 25 per cent over an equivalent conventional production unit could be achieved, the conveyor system could be an economic proposition. It is possible that increased costs of steel etc. . . may well have put this "threshold" percentage up to 35 per cent at present prices (1973).

Note from the Editors of the Phytotronic Newsletter. In France and in the Federal Republic of Germany companies exist which manufacture a similar system where trays are hooked directly to wheels, therefore without a chain or conveyor, with a lateral displacement in the greenhouse, from top to bottom, instead of a longitudinal displacement on two levels.

IX. RESEARCH STRATEGY

Tobacco Research Board of Rhodesia gives us information that their research results obtained with a programmed tunnel phytotron are detailed in two papers :

1 - J.S. COLE and D.L. FERNANDES. Effects of light, temperature and humidity on sporulation of Erysiphe cichoracearum on tobacco. Trans. Br. Mycol. Soc., 55 (3), 1970, p. 345-353.

2 - Sporulation of Powdery Mildews, particularly Erysiphe cichoracearum DC. on Tobacco by J.S. COLE in Ecology of leaf surface microorganisms. p. 323-337. Ed. Preece T.F. and Dickinson C.D. Academic Press, London and N.Y. 1971.

X. INFORMATION FOR PHYTOTRONISTS

a) New books

- Growelectric - Handbook NO 2 - Lighting in Greenhouse. Ed. The Electricity Council, 30 Millbank, London SWIP 4RD. Sept. 1973 98 pages. Price 50p.

- Compte rendu du 5eme Colloque International sur les plastiques en Agriculture held in Budapest in 1972. Ed. Comite des Plastiques en Agriculture, B.P. 122, 92527, Neuilly-sur-Seine, France. 1100 pages. English and French, Price: 150f

- Le MaTs-grain. Text of conferences of Colloque d'Information Scientifique of February 5, 1973 in Namur. Ed. C.R.A. 22, avenue de la Facult6, 5800, Gembloux, Belgium.

- Compte Rendu des Recherches 1971-1972 of the Station 1'A.aelioration des Plantes. Ed. C.R.A. 22, avenue de la Facult6, 5800 Gembloux, Belgium.

- Semaine d'Etude des Problemes Mediterraneens. 13-17 September 1971. 12 conferences, 87 communications, 720 pp. Price 750 F.B. Ed. Bulletin des Recherches Agronomiques, 2, avenue de la Facult6, 5800 Gembloux, Belgium.

- Semaine d'Etude des Problemes Intertropicaux. 11-15 September 1972. 11 conferences, 86 communications. 840 pp. Price 1000 F.B. Ed. Bulletin des Recherches Agronomiques, 2, avenue de la Faculte, 5800, Gembloux, Belgium.

- Semaine d'Etude Sol et Fertilisation. 3-7 September 1973. 11 conferences, 39 communications. 658 Pp. Price 1000 F.B. Ed. Bulletin des Recherches Agronomiques, 2, avenue de la Facult6, 5800 Gemhloux, Belgium

- La Floraison et sa Regulation Photop6riodique. N.P. AKCENOVA, T.V. BAVRINA and T.N. XONSTANTINOVA. Ed. Nauka, Moscow, 1973, 290 pp. (in russian).

- Le R81e de la Temperature dans la Nutrition des Plantes. by A.I. KOROVIN. Ed. Hydrometeoizdat, Leningrad, 1972, 284 pp. (in russian).

- Principles of Environmental Physics. John L. MONTEITH. Ed. Edward Arnold, London, 1973. 242 pp. Price £ 3.

- Annual Report and Accounts. 1973. Agricultural Research Council of Rhodesia, P.O. Box 8108, Causeway, Salisbury.

- Who's Who in Ecology, 1973. New York, Special Reports Inc. 8 West 40th Str. N.Y. 10018, 291 pp.

- Leaf diffusion resistance to water vapour and its direct measurement. C.J. STIGTER, J. BIRNIE and B. LAMMERS. Med. Land-bouwhogeschool Wageningen 73-15-1973, 56 pp.

- Agricultural Meteorology in Japan, by several authors. Ed. by Y. Mihara, University of Tokyo Press, 1973, 200 pp.

- Ternperatuurregeling by Xasverwarming. Ir W. TAVEIRNE, 1973. Ed. Ministerie voor landbouw, Merelbeke, Belgium (in dutch).

b) Climate Laboratory News, issue N°2 of January 1974, of the N.Z. has just come out.

It has some interesting information in it :

(a) Climate room use (room x week). The percentage breakdown over the twelve month period (May 1st 1973 - May 1st 1974) was

DSIR	-	17.2 %
M. AF	-	21.1 7.
Forest Service	-	36.8 7.
Universities	-	24.9

(b) New projects : 2 for Forest Service, 1 for DSIR and 1 for Universities.

(c) Visit of Professor H. HELLMERS from Duke University (USA). He was particularly impressed with the fully automated systems developed there for watering and feeding plants in the controlled climate rooms and for monitoring and regulating CO2 levels in the rooms. He concluded : "Much could be saved by the kind of set-up operating in Palmerston North with a solenoid valve system automatically operated from the central control room. If we can get the money, we will work on that when I go back".

(d) Total construction costs of Palmerston North was : 958,000,000 US for 182 m2 (1969).

(e) Description of controlled environment facilities at the Forest Research Institute in Rotorua : 3 controlled environment rooms 3.7 m wide x 3.7 m deep x 8 m high to accomodate particularly Pinus radiata trees up to 7 m tall under definable and reproducible conditions.

c) Meetings and Conferences

1974 April 14 - October 18, WIG 74.
International Horticultural Exhibition in Vienna (Austria)

Inquiries : Touragri, 8, rue d'Athenes, Paris 9°, France.

1974 May 8-14, Warsaw, Poland.
1st Meeting on "Nuclear equipment in plant physiology"
Round table discussion on nuclear equipment. Exhibition and discussion on joint experiments in plant physiology.

Inquiries : R. Antoszewski, 96-100 Skierniewice, Res. Inst. of Pomology Poland.

1974 May 15-16 and 17, Silsoe, Bedford, United Kingdom.
National Institute of Agricultural Engineering Golden Jubilee open days. In addition to exhibits and demonstrations showing its present work and facilities there will be special exhibits illustrating 50 years of agricultural engineering research.

Further information : W. 'WRIGHT - NIAE, Wrest Park, Silsoe, Bedford MK45 4HS United Kingdom.

1974 May 20 - 22, Arlon, Belgium.
International Conference "Informatics and Environment" organized by Fondation Universitaire Luxembourgeoise. General topics : Problems in collecting data and in setting up data banks regarding environment. Treatment of mathematical models and optimization : operational research concerning control of environment. A few examples of realizations.

Informations : Fondation Universitaire Luxembourgeoise, 140, rue des D6portes, 6700 Arlon, Belgium.

1974 June. Moscow (USSR)
Twelfth International Grassland Congress

Inquiries : Secretariat of the Organizing Committee of the International Grassland Congress, 107139 Moscow, 1-139, Orlikov per., 1/11, Room 832, Moscow, USSR.

1974 June 4 - 8, Giessen, Federal Republic of Germany.
4th International Rapskongress. Methods and expects of selection. Fertilizers and Phytotechnics. Diseases and pests. Biochemistry and nutritional physiology of rapsoil. Rapsoil cakes. Marketing. Excursion around Schleswig-Holstein (crop, Improvement Station and Manufacturer).

Inquiries : Sekretariat des Internationalen Rapskongresses, Diepenbroc-strasse 32. D.44, Munster, Federal Republic of Germany.

1974 June 14 - 22, Warsaw, Poland.
Seventh International Congress of Seed Testing Association (ISTA).
Seed Symposium and Exhibition.

Inquiries : ISTA, Secretariat, Box 68 X-1432 As-NL H, Norway.

1974 June 15, Versailles, France.
"Open door day" with visit of school and exhibition of "Ecole d'Horticulture de Versailles a cent ans".

Inquiries : Association des Ingeinieurs Horticoles ENSH, 4, rue Hardy, Versailles, France.

1974 July 1 - 5, Meudon (near Paris), France.
CNRS International symposium on Factors and regulation of fruit maturity, organized by R. ULRICH.
Program : Influence of external factors on maturation (physical, chemical and biological factors). Regulation of maturation (internal factors, gas exchange, growth regulators, metabolism, genetics). French or English speakers. All communications will be published.

Inquiries : Dr D. COME, Laboratoire de Physiologic des Organes Vegetaux Après recolte, CNRS, 4ter route des Gardes, 92190, Meudon, France.

1974 July 7 - 17, San Diego, California (USA).
2nd International Drip Irrigation Congress.

Inquiries : Ir Sterling DAVIS, POB 2326, Riverside, Cal. 92506, USA.

1974 August 8 - 12, Kumasi, Ghana.
Ist West African Horticultural Symposium (Tropical and Subtropical Horticulture). Theme of Symposium : Current research on horticultural crops in West Africa,

Inquiries : J.C. NORMAN, Dept. of Horticulture, University of Science and Technology, Kumasi, Ghana.

1974 August 12 - November 15, Wageningen, The Netherlands.
4th International Course on Vegetable Growing. Climatic and pedologic factors, soil fertility, seeds, seed production, selection, horticultural technics, sanitary protection, marketing, statistics, yield, economy, cultural aspects, conclusions.

Inquiries : international Agricultural center, P.U. Box 88, Wageningen, The Netherlands.

1974 August 26 - 30, Bari, Italy.
Eucarpia - Tomato group symposium. Genetic problems and improvement of tomatoes.

Inquiries : Dr Matteo CIRULLI, Instituto di Patologia Vegetale, Universita di Bari, Via Amendola 165 1A - 70126, Bari, Italy.

1974 August 26-30, Dubrovnik, Yugoslavia.
International Seminar on Heat and Mass Transfer in the Environment of Vegetation. Granted by Unesco and several National organisms.
General topics : soil, lower atmosphere, plants, bioengineering of plant growth and productivity. Pollution of soil, water in the soil and vegetation. At total 15 lectures and 36 papers.

Informations : International Center for Heat and Mass Transfer Atn. Mr K.D. MAGLIC, P.Q. Box 522, 11001 Belgrade, Yugoslavia.

1974 September 2 - 6, Gembloux, Belgium.
4th Study week "Agriculture and Environment". Agriculture and hydrology. Eutrophization of surface water. Protection of sheet water. Management of rural space. Conservation of wild life in rural space. Crop protection and environment. Ecology of green spaces. Modern culture methods.

Inquiries : Semaine d'Etudes Agriculture et Environnement, 12, avenue de la Facult6, 5800, Gembloux, Belgium.

1974 September 3 - 7, Tokyo, Japan.
5th International Heat Transfer Conference, organized by the Science Council of Japan and sponsored by the Assembly for International Heat Transfer Conferences.
Between 39 announced sessions, session 36 is : Biological and Environmental Heat Transfer.

Inquiries : Organizing Committee of Fifth International Heat Transfer Conference, Science Council of Japan 7-22-34 Roppongi, Minato-lu, Tokyo 106, Japan.

1974 September 8 - 14, The Fague, The Netherlands.
1st International Congress of Ecology. General themes : Flow of energy and matter between trophic levels. Comparative productivity in ecosystems. Diversity, stability and maturity in natural ecosystems. Diversity, stability and maturity in ecosystems influenced by human. Strategies for management of natural and man-made ecosystems. The significance of ecological principles for Society.

Inquiries : Intecol, Laboratory of Limnology, University of Wisconsin, Madison, Wisc. 53706, USA.

1974 September 8 - 15, Buenos Aires, Argentina.
6th Congress of Plastics in Agriculture.

Inquiries : Camara Argentina de la Industria Plastica, Sarmiente 2494, Buenos Aires, Argentina, or C.I.P.A. 21, rue Pinel, Paris 13°, France.

1974 September 10 - 18, Warsaw, Poland.
Nineteenth International Horticultural Congress. 87 sessions.

Inquiries : Secretariat Nineteenth International Horticultural Congress 00930 Warszawa 71, Poland.

1974 September 12 - 15, Hortimat, Orleans, France.
International Exhibition of Horticultural Machinery.

Inquiries : HORTIMAT, Domaine de Cornay, 45590, St-Cyr-en-Val, France.

1974 September 23 - 28, Wurzburg, BRD.
1st Meeting of the International Association of Plant Physiology (IAPP).
General topics : macromolecular structure of membrane and functions. Transport and structures. Photosynthesis and chloroplasts. Respiration and mitochondrias. Growth and cell walls. Plant productibility and water relations.

Inquiries : Professor P.E. PILET, Institut de Biologic et de Physiologic Vegetales, Place de la Riponne, 1005, Lausanne, Switzerland.

1974 September 23 - 29. Biddinghuizen, The Netherlands.
Congres International de Genie Rural (CIGR).

Inquiries : Intern. Agric. Centre, POB 88, Wageningen, The Netherlands.

1974 November 4 - 14, Japan, and November 15 - 19, Formosa.
9th International Congress on Mushroom Science.

Inquiries : Joint Commission on Rural Reconstruction, 37, Nan Hai Road, Taipei 107, Republic of China.

1974 November 8 - 17, Valencia, Spain.
1st International Horticultural Exhibition Iberflora 74.

Inquiries : Iberflora 74, Apartado 13, Valencia, Spain.

1975 Prague, Czechoslovakia.
Colloquium on the Winter Hardiness of Cereals.

Inquiries : Dr S. RAJKI, 2462 Martonvasar, Hungary.

1975 April, Melle, Belgium.
Azalea Symposium.

Inquiries : J. van ONSEM, Inst. of Ornam. Plant Growing, Caritasstraat 21, 9230, Melle, Belgium.

1975 April 1 - 4, Vienna, Austria
Vth Symposium fur industriallen Pflauzenbau, previously fixed on September 22-26, this symposium will be delayed.

Inquiries : Dr E. BANCHER, Institut fur Botanik der TH Wien, Getreidemarkt 9, 1060, Vienna, Austria.

1975 April 13 - 16. Long Ashton, United Kingdom.
5th Long Ashton Symposium : Environmental effects on crop physiology, will mark the occasion of the retirement of Professor J.P. HUDSON. Sections : weather and microclimate. Studies on whole plant responses to weather. Physiological processes and their response to environmental factors (i.e. photosynthesis, respiration etc ...) Syntheses and modelling.

Inquiries : Dr J.J. LANDSBERG, Microclimatology Section, Research Station Long Ashton, Bristol BS18 - 9AF, United Kingdom.

1975 May 13 - 16, Rijswijk, near The Hague, The Netherlands.
Symposium on protected cultivation in Netherlands, on the occasion of the 75th anniversary of the Research Stations at Aalsmeer (1974) and Naaldwijk (1975). Topics : 1) Control of cultural conditions in greenhouses. 2) Control of growth conditions into the soil. 3) Climate needs for vegetable crops. 4) Climate needs for floral crops. 5) Other specific aspects of protected cultivation.

Inquiries : Ir Y. Van KOOT, Commission on Protected Cultivation ISHS, Proefstation voor de Groenten under glass. Zuidweg 38, Naaldwijk, The Netherlands.

1975 July, Leningrad, USSR.
XII International Botanical Congress. Among a number of symposia planned for the section on "Plant Growth and Development" there is an International Symposium on Phytotronics, with professor F.W. WENT's chairmanship and participants of following persons : L. EVANS, S. WELLENSIEK, B.S. MOSHKOV, P. CHOUARD, P. GAASTRA, P. KRAMER, J. DOORENBOS, K.J. MITCHELL, S. RAJKI, W.M. LEMAN, F.E. REIMERS, I.T. TUMANOV and A.F. KLESHNIN.

N.B. Secretariat Phytotronique hopes to be able to publish in English and French all conferences and papers presented at this symposium in one book titled "Phytotronic 4".

Inquiries : Professor A.F. KLESHNIN, Organizing Committee of 12th International Botanical Congress, Komarov Botanical Institute, 2 Prof Popov street, Leningrad 197022 USSR.

1975 October, Sofia, Bulgaria
IInd International Symposium on Plant Growth Regulators, organized by the Bulgarian Academy of Sciences "M. Popoff" Institute of Plant Physiology. Chairman : Professor Dr T. KUDREV. Topics ; Natural plant growth regulators. Synthetic plant growth regulators. The Abstracts and the papers will be published in English or Russian.

Informations : IInd Int. Symposium on plant growth regulators. "M. Popoff" institute of Plant Physiology, 36 Street, Block 6, Sofia 13, Bulgaria.

1976 Spring, Lausanne, Switzerland.
Cucumbercae under protection.

Inquiries : Dr G. PERRAUDIN, Station Federale de Recherches Agronomiques 1962 Pont de la Morge, Switzerland.

1976 Summer; Tokyo, Kuyshu, Kyoto, Japan.
International Symposium on Biotrons and Biotronics.

Inquiries : Dr M. KONISHI, Laboratory of Applied Botany, Faculty of Agriculture, Kyoto University, Kyoto, Japan.

d) Phytotronic at Horticultural Congress in Warsaw.
The definitive program foresees three meetings for session N°25 " Phytotrons and Horticultural Research" :

Thursday, September 12 - 2,30 - 5,30
Friday, September 13 - 2,30 - 5,30
Monday, September 16 - 2,30 - 5,30

During these meetings there will be at least two introductory lectures and more than 20 papers.

A trip to the Phytotron of Cracow with Professor MARKOWSKI will probably be organized and reserved only for phytotronic specialists participating in the 25th session.

After the Congress the Phytotronic Secretariat intends to edit as quickly as possible a new volume "Phytotronic 3" including papers in English or in French.

The Committee for Standardizing measures of environmental factors in Phytotrons presided over by Dr P. GAASTRA has not sent us any information.

The next two International Congresses of Horticulture (September 1974) and of Botany (July 1975) will be the subject of Phytotronic Meetings bringing together in a symposium all those interested in these problems.

This will probably account for the publication of two new collections of Phytotronic 3 and Phytotronic 4 with complete texts of lectures and discussions.

But we cannot, nor do we claim to want to do everything, review everything, or discuss all subjects. We therefore hope for your cooperation.

Thank you in advance for all that you will be sending to us and which we look forward to using in our coming issues.