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ABSTRACTS

CARBOHYDRATES AND MACROELEMENTS IN BRANCHES OF CV. GOLDEN DELICIOUS APPLES DURING DORMANCY

S. BULATOVIĆ, M. JOVANOVIĆ, R. DŽAMIĆ and M. JAĆIMOVIĆ

(Faculty of Agriculture, Beograd — Zemun)

On the basis of experimental results obtained and the considerations connected with the dynamics of starch, sugar, nitrogen, phosphorus and potassium contents in branches of cv. Golden Delicious Apples, as well as on the basis of the best adapted line of trend, the following conclusion can be inferred:

1. The starch content in branches of cv. Golden Delicious Apple in the beginning of investigation period manifested a tendency to increase, reaching maximum at the end of February, then decreased until the end of dormancy.

2. Similar behaviour was observed concerning the quantity of sugar which showed a tendency to increase until the end of February, then decreased until the end of dormancy.

3. The fluctuation of macroelements (N, P, K) during dormancy (January — April) manifested various tendencies: nitrogen content had a tendency of permanent increase, phosphorus — a tendency of slight but constant decrease, while the content of potassium had a tendency to decrease, being the lowest at the beginning of March, when the curve obtained an increasing orientation until the end of investigation period.

FURTHER ANALYSES OF INDOLE AUXINS IN *SPINACIA OLERACEA*

LJ. ČULAFIĆ

(Institute of Botany, Faculty of Science and
Institute for Biological Research, Beograd)

In studying the endogeneous hormones in dioecious long day plant *S. oleracea* L., we have detected, by chromatography and bioassays, the presence of eight substances active in oat first internode test. According to the Rf values, the partition between different solvents and fluorescence characteristics, two of them were identified as tryptophan and indole acetic acid. In further work it was shown, according to colour reactions and fluorescence, that other active substances are also indolic. A combination of preparative chromatography on Sephadex G 25 and DEAE Sephadex A 25 columns with thin layer and gas chromatography was applied for their further identification. One of the acidic substances seems to be similar to 5-OH-indole acetic acid.

INHERITANCE OF SUNFLOWER PHOTOSYNTHETIC APPARATUS MODEL

T. ČUPINA and LJ. VASILJEVIĆ

(Institute of Agricultural Research, Novi Sad)

The research was conducted on sunflower inbreds and hybrids of F-1 generation. The following characteristics of the photosynthetic ap-

paratus were examined: leaf area size, leaf shape and their geometrical order on the plant, and the content of plastid pigments in leaves. The yield of grain per plant was determined at the end of vegetation. The variance analysis, method of simple correlation, method of regression, and regression variance analysis were used to find the order of changes and relations among the characteristics examined.

A positive correlation between the grain yield per plant, leaf area size per plant, and pigment content per plant was found among the examined inbreds (crossing component) and the hybrids of F-1 generation.

The hybrid progeny inherited the examined photosynthetic activities and grain yield per plant dominantly or intermediately in most cases. A positive effect of heterosis per hybrid plant was found in the leaf area, pigment content, and grain yield. It can be assumed that the positive heterosis for the grain yield of hybrids was conditioned by an increased heterosis of certain indicators of the photosynthetic apparatus.

ATTEMPTS AT PLASTID ISOLATION UNDER STERILE CONDITIONS

Z. DEVIDĚ

(Institut of Botany, University of Zagreb)

Attempts have been made to obtain crude isolates of plastids under sterile conditions. In these isolates, however, the plastids have as a rule damaged envelopes. In spite of that fact they preserve their microscopic structure and colour up to 8 months, if they are kept in white light (2000 lx) in hanging drop preparations.

Although these simple methods are not of any use in serious research for the time being they may be useful for teaching purposes.

The progress of these attempts will be presented.

MORPHOLOGICAL CHANGES IN *ABIES ALBA* MILL. SEEDS DURING A SIX-WEEK IMBIBITION AT 3 °C AND AT 20 °C

B. DRUŠKOVIČ and M. VARDJAN

(Institute of Biology and Department of Biology, University of Ljubljana)

Unstratified seeds of the fir *Abies alba* Mill. (year 1971) begin to germinate only after a six-week period, whereas stratified seeds start to germinate in a few days' time. Our study centred on the histological-anatomic changes of the embryo from intact seeds imbibed for 6 weeks at the temperatures of 20 °C and 3 °C (stratification).

In both cases the embryo in the seed becomes markedly elongated, which is wholly due to the elongation of the hypocotyl. The radicle does not become elongated but becomes considerably enlarged.

The radicle enlargement and the hypocotyl elongation are in part effected by the cell division and in part by the cell growth. Because of such a growth the embryo changes its form, it becomes slightly bent and twisted.

The pressure of the enlarged radicle leads in the end to a split of the seed coat at the micropylar end. Now the radicle passes through the fissure completely passively, driven out by the elongated hypocotyl.

The changes of the embryo, as described above are more pronounced at the temperature of 3° C than at 20° C.

The seeds that have not undergone the changes outlined do not germinate or display anomalies in germination, e. g. instead of radicles it is cotyledons that come out of the integuments.

CONTRIBUTION TO THE STUDY OF SOME PROPERTIES OF PROTEINS IN THE ENDOSPERM OF NORMAL (+) AND OPAQUE-2 (O₂) FORMS OF CORN HYBRIDS

M. DŽAMIĆ, V. HADŽI-TAŠKOVIĆ-ŠUKALOVIĆ, and D. JELENIĆ
(Agricultural Faculty and Maize Research Institute, Beograd – Zemun)

The paper discusses the results of investigations into some biochemical properties of protein endosperm of normal and opaque-2 corn hybrids and some properties of free amino acid "pool" (ZP SK 72 and ZP SK 72-o₂).

Separations on polyacrylamid gel showed that no protein fraction extracted by Osborne-Mendel method is homogeneous but consists of many subfractions. Protein fractions from both genotypes have generally similar electrophoretic mobilities, giving the identical number of subfractions (disc) on gel, except for the albumin fraction on SDS gel, which shows with o₂ hybrid some subfractions not existing on the electroferogram of the normal hybrid.

The investigations show that under the influence of o₂ gene in the hybrid, the total quantity of protein is decreased, while at the same time lysine and triptophan increase, which draws attention to the changed aminoacidic structure of the endosperm.

An analysis of aminoacidic structure of albumin fractions and zeins of both genotypes show that their relation is rather equilized and that the mutation effect has not caused changes in the structure of these proteins.

This leads to the conclusion that the changed aminoacidic structure of the endosperm depends mainly on mutual quantitative proportions of the individual subfractions and fractions of protein.

Investigations are continuing.

SULPHUR DIOXIDE UPTAKE BY SOME HIGHER PLANTS IN TOLERANT CONCENTRATION RANGE

N. FALLER

(Poljoprivredno-prehrambeno tehnološki fakultet, Osijek)

The above-ground parts of sunflower, maize, tobacco and oil radish plants were exposed to sublethal SO₂ concentrations for a few days. The nutrient solutions were poor in the sulphur content. The only limiting

plant growth factor was the sulphur dosaged to the air, which the plants utilized. The fumigation gas was labelled by $^{35}\text{SO}_2$. The concentration ranged over four degrees to $1.5 \text{ mg SO}_2/\text{m}^3$. The highest dose caused a slight leaf injury in the sunflower and maize.

The assimilated SO_2 amounts depended upon the concentration, with the uptake essentially linear up to $1 \text{ mg SO}_2/\text{m}^3$, and above it relatively decreased, except for the oil radish. The absorption was 0.7 mg S for oil radish, 1.2 mg S for maize, and 1.7 mg S for sunflower and tobacco plants per gram of dry weight of leaf per day and at the SO_2 concentration of 1 mg/m^3 of air. The differences may be caused in addition to the plant species by the environment factors, because the trials were carried out in different seasons and meteorological circumstances. The lowest values were obtained during the coldest period.

THE INFLUENCE OF THE SOIL MOISTURE ON THE CONTENT AND DISTRIBUTION OF B, Cu, Mg, Fe AND Mn IN THE ABOVE-GROUND PARTS OF WINTER WHEAT

M. GEORGIEV

(Department of Botany, Faculty of Science, University of Skopje)

In a pot test on cinnamon-forest soil, well supplied with N, P, K, Mg, Fe, Mn, Cu and B an investigation was made of the effect of the soil moisture from 40%, 50%, 60% and 70% of the retentional capacity on the yield, contents and distribution of B, Cu, Mg, Fe and Mn in leaves, stalks, peels and grain of winter wheat throughout the period of growth.

The greatest production of organic substance, and at the same time the uptake of B, Cu, Mg, Fe and Mn both in the above-ground parts and the whole plant occur at 70% soil moisture. The yield and uptake are reduced with reduced soil moisture, especially below 50%.

In the shooting the highest contents of B, Cu, Mg and Mn in the leaves are found in the plants of 70% and 60% soil moisture, and Fe 40%. In the course of developing, the contents of B, Mg, Fe and Mn increases, and Cu decreases.

In the time of shooting the highest concentrations of B, Cu and Fe are found in the stalk of the plant — 40%, and Mn — 70%. In the course of development, the concentrations of B and Mg increase, and Mn shows a decreasing tendency.

In the time of heading the highest quantity of Cu, Mn and Fe in the peels in g of dry substance, is found in the plants of 70% and 60% soil moisture, and of B — 40%.

In the last two stages the contents of B and Mg in the peels of the plants of 40% and 50% soil moisture increase, and with Cu and Mg of 60% and 70% decreases.

In the milk-maturity and the hard dough stage the plants of 60% and 70% soil humidity have the highest B, Mg, Cu, Fe and Mn contents in the grain. The contents of Mg, Cu and Fe increase, and B and Mn decrease with the ripening of the grain.

In the course of development a part of B, Cu and Mg from the leaves and stalks is transmitted to the grain.

INFLUENCE OF THE SOIL MOISTURE ON THE CONTENT OF PHOSPHORUS IN THE LEAVES, STALKS AND PEELS, PHOSPHORUS FRACTIONS IN THE GRAIN AND THE CHLOROPHYLL PIGMENT IN THE LEAVES OF WINTER WHEAT

M. GEORGIEV and M. SPASENOSKI

(Department of Botany, Faculty of Science, University of Skopje)

The influence of the soil moisture of 40%, 50%, 60% and 70% from the retential capacity upon the content of total P in the leaves, stalks and peels of the ear, the phosphorus fractions in the grain and chlorophyll pigment in the leaves of Bezostaja wheat in the course of development have been investigated.

In the shooting stage the highest content of total P per g of dry substance in the leaves and the stalk is found in the plants with 70% soil humidity. A reduction in the soil humidity causes the reduction of its content. In the heading stage, however, the highest content of total P is found in the peels of the plant — 40%. As the plants develop from the shooting stage to the hard dough stage the concentration of the total P decreases.

In the milk-ripe stage the highest content of lipid P in the grain is found in the plants of 40% soil humidity. An increase in the soil moisture diminishes the P content. In the other P-fractions there are no noticeable differences in single plants.

In the course of ripening of the grain from milk-maturity to the heading stage, the content of total, phitin, ester as well as nucleic acids P increases, and the inorganic P decreases.

In the milk-maturity stage the grain of the plant of 40% soil moisture has the highest concentration of total, inorganic and phitin P, as well as phosphorus of nucleic acids and the highest concentration of ester P.

In the course of development of plants, part of the P of the leaves and the stalks is transmitted to the grain.

In the shooting period and the heading period, the content of chlorophyll pigment in the leaves on g of dry substance increases with an increase in the soil moisture above 40%.

THE INFLUENCE OF CYTOKININS AND AUXINES IN THE EXUDATE OF PINE ROOTS ON THE GROWTH OF *SUILLUS VARIEGATUS*

N. GOGALA and F. POHLEVEN

(Institute of Biology and Department of Biology BF University of Ljubljana)

The research done so far has disclosed that KIN and endogeneous cytokinins in the exudate of Cormophyta affect the growth of mycorrhizal fungi ^(1, 2). IAcA in the nutritional medium inhibits the growth of mycelium.

Cytokinins in the exudate of germinating plants were extracted, purified, and separated through paper chromatography. The eluated substances were subsequently added in two different conc. to the nutri-

tional medium inoculated with *S. variegatus*. It has been found that the growth of the mycelium is significantly accelerated by all natural cytokinins, and particularly by cytokinin "C" which in its r_t value corresponds to zeatine. It is also the synthetic zeatine that responds to *S. variegatus* by an accelerated growth, whereas zeatine ribozide does not have such an effect.

We have also examined the growth of mycelium in various conc. of KIN and IAcA. The conc. of KIN was gradually changed from 1 γ /l to 300 γ /l, but each conc. had 10 γ /l of IAcA added. In combination KIN and IAcA react synergistically.

The results speak in favour of the hormonal theory of the regulation of the development of mycorrhiza.

(¹) G o g a l a, N., 1971. Österr. Bot. Z. 118, 321—333.

(²) G o g a l a, N., 1972. Österr. Bot. Z. 121, 255—267.

THE INFLUENCE OF STRATIFICATION AND OF GROWTH HORMONES ON THE GROWTH OF ISOLATED FIR EMBRYOS IN STERILE CONDITIONS

N. GOGALA AND M. VARDJAN

(Institute of Biology and Department of Biology BF University of Ljubljana)

For normal germination the seeds of the fir *Abies alba* require stratification. In order to establish the depth and shape of dormance, isolated embryos were cultivated *in vitro*.

Isolated embryos were cultivated in sterile conditions on a nutritional medium according to Ching-Kao(¹). The embryos had been isolated from stratified seeds and from seeds imbibed at room temperature. Moreover, whole seeds were soaked in various concentrations of KIN and isolated embryos were cultivated on media with definite concentrations of GA_3 .

The stratification speeds up the dynamics of the growth of roots in isolated embryos.

Similarly, the growth of roots is increased by an appropriate concentration of the growth hormones KIN and GA_3 .

It follows that the amount of germination stimulators (cytokinins, gibberellins) in unstratified embryos is too low for normal germination. This is indicated also by the results of the biotests of endogeneous cytokinins and gibberellins.

(¹) Ching-Kao, 1971. Quarterly J. of Chinese For. 3 n. 2, 129—133.

BIOELECTRIC POTENTIAL OF THE ROOT OF *LEMNA MINOR*

M. GRBOVIĆ*, Č. RADENOVIĆ, Z. DAMJANOVIĆ*

Center for Agricultural Research, Maize Research Institute, Department of Physiology, Biochemistry and Technology, Beograd.

*Center for Multidisciplinary Studies, University of Beograd)

As part of general investigations into the bioelectric phenomena of plants, special attention has been devoted recently to the electrophysiology of higher plants. Duckweed *Lemna minor* was the object of our research in this field. Standard electrophysiological methods were used for measuring bioelectric potentials.

The generation of bioelectric potentials in the root of *Lemna minor* was studied. The measurement of the electric "profile" of the root of *Lemna* was performed. Different values of bioelectric potential were measured, depending on the position of the microelectrode in the root. It has been found that bioelectric potential varies from -40 to -110 mV.

PHOTOREVERSIBILITY OF PAULOWNIA TOMENTOSA SEED GERMINATION

D. GRUBIŠIĆ

(Institute for Biological Research, Beograd)

Positive photoblastic seeds of *P. tomentosa* were used for a study of red — far red reversibility of germination. The seeds differ very much from those described previously⁽¹⁾, since they have a higher light sensitivity and homogeneity of response: over 90% germinates after a single irradiation period of two seconds with red light ($60 \mu\text{W cm}^{-2} \text{ nm}^{-1}$). This stimulative effect can be nullified by far red light.

Three days after the start of imbibition in darkness, the seeds were irradiated for 1 min with red light, then returned to darkness for various periods, before being irradiated with far red light for 1 min. It was found that the far red reversion was complete during the first six hours, and then started declining with the length of the dark period between the two irradiations. Full escape of reversibility was reached only after 60 hours. These results show that the presence of P_{fr} is necessary for a very long period and that the half time of P_{fr} decay is much longer than in some other systems.

⁽¹⁾ Borthwick, H. A., Toole, E. H. Toole, V. K., 1964. Israel J. Bot. 13, 122—133.

INFLUENCE OF DIFFERENT NITRATE AND POTASSIUM RATIO IN NUTRITIVE SOLUTIONS ON THE CONTENT OF NITRATE AND NITRITE IN SPINACH LEAVES

S. GRUJIĆ and R. KASTORI

(Chemistry Department and the Faculty of Agriculture, University of Novi Sad)

Poisonings with spinach containing higher quantities of nitrate are known and recorded in literature. In view of this fact we wanted to investigate the possibility of decreasing the content of nitrate nitrogen in spinach balanced by mineral nutrition, i. e. by the increase of potassium concentration in nutritive substrate.

Assays were carried out in aqueous cultures at different ratios of NO_3 and K in a nutritive solution.

According to the results obtained one may conclude that under the conditions of intensive plant production, characterized today by still greater usage of nitrogen, it is possible to decrease nitrate and nitrite accumulation in vegetative parts of plants by balanced mineral nutrition. The use of particular quantities of potassium produces both high yield and better quantity, i. e. an increased dietetic value.

CONTRIBUTION TO THE STUDIES OF NUCLEIC ACIDS EXTRACTION FROM YOUNG SUNFLOWER PLANTS BY PHENOL-DETERGENT METHODS

*B. GRUJIĆ-INJAC, S. GRUJIĆ, S. KEVREŠAN, J. KANDRAČ
and R. KASTORI*

(Faculty of Science, Beograd, Institute of Chemistry, University of Novi Sad and
Faculty of Agriculture, Novi Sad)

From young sunflower plants aged for about 15 days, the authors have extracted nucleic acids (NA) by the application of different phenol-detergent methods. The preparations obtained were analysed in UV spectrum in order to determine the extinction ratios of the characteristic wavelengths (230, 260 and 280 nm). Preparations were separated according to the types of NA by chromatography on methylated albumin and kiselguhr.

The results have shown that the quality of preparation obtained by standard methods is insufficient whereas the extraction of some types of NA is incomplete. Modification of the method where the two detergents were combined gives better quality preparation and more efficient extraction of particular groups of nucleic acids.

DISTRIBUTION OF HORMONES AND INHIBITORS IN DRY APPLE SEEDS

M. JABLANOVIĆ, M. NEŠKOVIĆ, D. GRUBIŠIĆ and R. KONJEVIĆ

(Faculty of Science, Priština and Institute for Biological Research, Beograd)

In the course of studies of the hormonal relationships involved in the development of apple fruits, growth substances obtained from dry, unstratified seeds were analysed. The seeds were peeled off and the seed coats, together with the adhering endosperm tissue were extracted separately from the embryos. Five groups of biologically active substances were separated. Extracts of seed coats and endosperm have a relatively high content of gibberellins and auxins. They also contain three groups of strong inhibitors, one of them similar to abscisic acid. Embryos contain a considerably lower level of inhibitors, and only traces of gibberellin-like and auxin-like activity. Many details were obtained concerning the biological activity and chromatographic properties of all groups of active substances. The possible importance of the seed coat and endosperm localization of inhibitors and stimulators for the dormancy and germination, respectively, is discussed.

SOME CHARACTERISTICS OF THE EFFECT OF PROMETRINE ON BEANS IN THE PHASE OF GERMINATION

V. JANJIĆ, V. BOGDANOVIĆ and M. TRIFUNOVIĆ

(Department of Pesticides, INEP Zemun)

The present paper discusses the effect of prometrine on the mobilisation of reserve nitrogen compounds, followed through the changes of total nitrogen, in the first stages of bean growth and development.

On the basis of the results obtained, it has been observed that herbicide prometryne affects the mobilization of nitrogen. The rate of its effect depended directly on the concentration applied. Changes taking place in other organs are in direct functional correlation with the changes in cotyledons.

A rational use of reserve nitrogen and other nutrients indicates that herbicide prometryne affects the biochemical energetic processes during the germination of the bean seeds.

CURRENT PROBLEMS OF PHYSIOLOGICAL PLANT ECOLOGY AND THE RESULTS OF THE DEPARTMENT OF PHYSIOLOGICAL PLANT ECOLOGY OF THE INSTITUTE FOR BIOLOGICAL RESEARCH

M. JANKOVIĆ and M. KOJIĆ

(Institute for Biological Research, Beograd)

In the present paper current problems of physiological plant ecology are discussed and the connection between ecology i. e. physiological ecology and plant physiology is indicated. The questions of the dependence and characteristics of basic physiological and biochemical plant processes on the ecological factor of habitat are analysed on the one hand, and on the other the basic characteristics of metabolism and energetic of ecosystems.

Some of the questions which are analysed from the ecophysiological aspect are cytoecology, water regime of plants, photosynthesis, respiration, biochemical aspect of plant ecology, ecological factors of habitat and importance of some factors for ecophysiology, ecophysiological aspects of plant cover organic productivity, turnover of matter and energy flow in the ecosystems, processes of decomposition and mineralisation, ecoanatomical and ecomorphological studies and their importance for the ecophysiology, ecophysiological questions connected to the pollution of environments, ecophysiological-biochemical models and their importance for the development of physiological plant ecology.

Many of these questions are studied in the Department of physiological plant ecology of the Institute for biological research, especially water balance and photosynthesis, organic productivity, and ecological analyses of habitat. A short analysis of the results is given in the paper.

THE FIRST RESULTS OF THE STUDIES OF PLANT PHOTOSYNTHESIS INTENSITY IN THE FIELD CONDITIONS

M. JANKOVIĆ, R. POPOVIĆ, J. DIMITRIJEVIĆ

(Institute for Biological Research, Beograd)

One of the basic question of physiological plant ecology is the problem of estimating plant photosynthesis in the community field conditions. That kind of research hat not been done in our country yet. For that reason the main aim of the study has been the construction of convenient portable apparatus and the use of method for measurement of plant photosynthesis in natural conditions.

We have constructed and tested the conductivity apparatus according of the latest model⁽¹⁾. The paper presents the results of the calibration of the apparatus on the basis of which the dependence of the number of division at the potentiometer scale on absorbed quantity of CO₂ is presented graphically. The results of preliminary measurements of the photosynthesis of some significant plant species in the community *Chrisopogonum pannonicum typicum* at Deliblatski pesak are also given. The photosynthetic intensity is given in terms of both mg per 1 dm square and in g of leaf dry weight per hour.

(¹) Vaznesenskij, L. V., 1971., *Konduktometričeskij pribor dlja izmerenija fotosinteza i dihanija rastenij v paljevih uslovljah*. Izd. »Nauka«, Leningrad.

THE INDUCTION OF ORGANOGENESIS AND EMBRYOGENESIS IN PUMPKIN TISSUE (IN VITRO) AND THE POSSIBILITIES OF FURTHER RESEARCH

S. JELASKA

(Institut of Botany, University of Zagreb)

Studies published previously^(1,2) reported that callus tissues of *Cucurbita pepo* L. could achieve organogenesis and embryogenesis under defined conditions. Proliferation and embryoid differentiation continued even after four years of subculture, but pumpkin tissues require continuous addition of auxin to express their totipotency.

As this "system" is different from the carrot "system"^(3,4) the author will compare the two and discuss possible further research into pumpkin tissues in order to elucidate the problems of somatic embryogenesis.

(¹) Jelaska, S., 1974. *Physiol. Plant.* 31, 257–261.

(²) Jelaska, S., 1974. *Acta Bot. Croat.* 33, 73–80.

(³) Smith, S. M. and Street, H. E., 1974. *Ann. Bot.* 38, 223–241.

(⁴) Reinert, J., Backs-Hüsemann, D. and Zerbán, H., 1970. In *Les Cultures de Tissus de Plantes*. Colloq. Internat. No. 193 du C.N.R.S., Strasbourg.

THE CHANGES OF EMBRYOGENIC POTENTIAL IN SUBCULTURED PUMPKIN CALLUS

B. JELENČIĆ and S. JELASKA

(Institut of Botany, University of Zagreb)

Three strains ("DE", "Ž₅" and "Wc") of pumpkin embryogenic callus⁽¹⁾ were used for experiments. Differences in these three strains were in the mode of their growth, ability for embryonic induction (EP) and growth substances in nutrient medium.

"DE" has grown with 1 mg l⁻¹ 2,4-D, "Wc" with 0.3 mg l⁻¹ 2,4-D + 2 g l⁻¹ yeast extract and "Ž₅" with mg l⁻¹ IBA. "Wc" has shown the weakest, "DE" middle and "Ž₅" the best EP. The EP was conditioned with growth regulators and the manner of the strain's growth could be changed if the growth regulator was changed.

Thus, the strain "Wc" could show important embryogenesis and growth of plantlets on a medium with IBA and vice versa, "Ž₅" showed a decline in EP on a medium with 2,4-D and yeast extract. This decline in the embryogenic capacity was reversible because it can be restored if callus is transferred again on the medium containing IBA.

(¹) Jelaska, S., 1974. *Physiol. Plant.* 31, 257–261.

RESEARCH INTO THE CORRELATION AMONG THE LEAF AREA, LEVELS OF N, P, K AND Ca IN PLANTS AND YIELD DEPENDING ON THE MINERAL NUTRITION OF CORN

B. JOCIĆ

(Institute of Agricultural Research, Novi Sad)

A research of a stationary type was conducted in field conditions. Increasing amounts of single elements of N, P, and K, combinations of two elements, and the combination of all three elements were used for plant nutrition. The plants were analysed five times during the vegetation: at the stage of 5—7 leaves, the stage of 11—14 leaves, tasselling, milk maturity, and the end of vegetation. The following indicators were examined: leaf area, the rate of accumulation of dry matter, and the level of N, P, K and Ca in different plant parts.

The correlation found among the examined indicators ranged from very high to low.

There was a high correlation between the yield of corn and nitrogen nutrition ($r = 0.96$), the yield and nitrogen level in plant tissue ($r = 0.96$), and the yield and leaf area ($r = 0.97$). A low correlation was found between the yield and P and K nutrition, and P, K, and Ca levels in plant tissue ($r = 0.11-0.35$).

A high correlation was also found between the leaf area and nitrogen nutrition ($r = 0.99$), and the leaf area and nitrogen level in plant material ($r = 0.98$). The correlation between the leaf area and other indicators was low.

Also, the correlation was found between the levels of the examined elements in plant tissue and their application in mineral nutrition. The nitrogen nutrition brought the highest increase of the level of these elements ($r = 0.98$), while the phosphorus and potassium nutrition brought a considerably lower increase ($r = 0.67-0.88$).

CONTENT OF MACROMETABOLITIC ELEMENTS IN LEAVES OF SOME IMPORTANT APPLE CVS. GROWN ON DIFFERENT ROOTSTOCKS

M. JOVANOVIĆ and R. DŽAMIĆ

(Agricultural Faculty, Beograd—Zemun)

On the basis of investigation of the content of macroelements in leaves of apples, cvs. Jonathan, Golden delicious and Red delicious grown on six different rootstocks (seedling — *M. silvestris*, M_1 , M_2 , M_3 , M_4 and M_{11}) the following conclusion can be inferred:

1. Differences in macroelements content between various rootstock combinations are statistically significant, varying between combinations of types rootstock cultivars and nutrients.

2. Components of grafting, rootstock and cultivars are able to effect the level of nutrients in leaves of the fruit tree. The degree of influence of any component varied according to years and interaction components.

3. The data obtained suggest that the nutrient content of a cultivar is the result of a "stionic" effect, i. e. interaction between component parts united by grafting.

4. The fact that trees can differ so markedly in the nutrient content depending upon the rootstock and cultivars suggests that these factors must be taken into consideration when leaf analysis is used as a diagnostic aid in nutrition and for establishing the fertilizer requirement of the fruit tree.

THE INFLUENCE OF DROUGHT AND HEAT STRESS ON MAIZE PLANT

B. KEREČKI, LJ. ZARIĆ, D. JELENIĆ, M. PENČIĆ

(Maize Research Institute, Beograd)

Crop injuries, which occur very often during the growing period in our climatic conditions, are due to high temperatures accompanied with relatively low air humidity.

The heat stress causes the greatest damage on the plant during the fertilization period. The aim of the research was to find out the effects of the heat stress on some physiological parameters.

An experiment was carried out with the maize hybrid, ZP 755, in the 8th phase of tassel development. The plants were grown in an open green house, in Mitcherlich pots, on the soil whose moisture content was 30%—70% of the maximum water capacity. Heat stress was provoked in the heat stress chamber with the temperature of 44—46 °C, relative air humidity of 26% and wind velocity of 9 m/min.

Water fractions, intensity of transpiration and the concentration of the cell liquid were determined only in the leaf of plants exposed to heat stress, while nitrogen fractions were determined in the leaf, stalk and root.

On the basis of results obtained it can be stated that the drought and heat stress cause considerable changes in all water and nitrogen fractions. The amount of bound water in the treated plants increased while the amount of free water decreased. At the same time the total amount of soluble, nonprotein and protein nitrogen increased in relation to the control plant.

ATTEMPTS AT VEGETATIVE PROPAGATION OF *PINUS NIGRA* ARN.

B. KOLEVSKA-PLETIKAPIĆ

(Institut of Botany, University of Zagreb)

Attempts were made to achieve vegetative propagation in *Pinus nigra* Arn. by means of cuttings and tissue culture.

Short shoots are able to regenerate roots. Treatment with growth regulators as IAA, IBA or IPA have the best effect. 2,4-D and 2,4,5-T induce the formation of callus only, while NAA does not show any stimulative effect. The meristem of the terminal bud shows some activity, however, a normal development of a new shoot could not be achieved so far.

From 2—4 cm long hypocotyl fragments it is possible to obtain callus tissue, which can be maintained and subcultured in vitro on a modified MS-medium. Experiments to induce in this callus some processes of differentiation, as histogenesis and organogenesis, are in progress.

THE PRESENCE OF INHIBITORS IN PAULOWNIA TOMENTOSA SEEDS

R. KONJEVIC

(Institute of Botany, Faculty of Science and Institute for Biological Research, Beograd)

The occurrence of inhibitors in seeds of *P. tomentosa* was investigated after a 24 h imbibition period, at the time when seeds reached the full light sensitivity. The inhibitors were separated by column chromatography on DEAE Sephadex A-25, thin layer and gas chromatography. It was noticed that during imbibition some inhibitory substances leached out from the seeds. Therefore, the content of inhibitors was determined in: (a) water in which the seeds had been imbibed, (b) petroleum ether fraction, obtained by shaking the methanol extract with petroleum ether at pH 7.0, (c) fraction of "neutral" inhibitors from the extract, not retained by Sephadex column and (d) fraction of "acidic" inhibitors eluted from the column.

In each fraction a least two inhibitory substances were detectable in biological tests. A substance from fraction (b) has the R_f value similar to xanthoxin, while fraction (d) seems to contain abscisic acid.

THE MECHANISMS OF FLORAL INDUCTION IN LEMNACEAE FROM SLOVENIA

B. KRAJNČIČ

(First High School, Maribor)

After some preliminary research^(1, 2) the biological characteristics and photoperiodic reactions of *Lemnaceae* from Slovenia were investigated. So far more than 23 interesting clones were axenically isolated and cultured as previously described^(1, 2).

From among 20 amino acids, added exogeneously to the stock nutrient solution at the start of the dark period at the concentration of 10^{-6} M, flowering induction was significantly promoted: 1. in the long-day clone of *Lemna minor* (Barje) under long day (serine for 27,3%, glutamic acid for 25,8%, and threonine for 22,4% over control) and 2. in the daylength-neutral clone of *Spirodela polyrrhiza* (Petanjci) under long day (glutamine for 37,6%, leucine for 27,6%, serine for 21,1% over control) and under short day (valine for 47,2%, tyrosine for 38,7%, histidine for 22,8%, tryptophane for 22,4% over control).

Of the microelements tested so far Zn⁺⁺ and Cu⁺⁺ promoted flower induction in the daylength-neutral clone of *Spirodela polyrrhiza* (Petanjci) under long day at pH 4,7—4,8.

(¹) K r a j n č i č, B., 1974. Acta Bot. Croat. 33, 81—88.

(²) K r a j n č i č, B., 1974. Biol. vestn. (Ljubljana) 22, 21—28.

SOME PHYSIOLOGICAL CHANGES IN MYCOPLASMA INFECTED TOMATO PLANT (*LYCOPERSICON ESCULENTUM*)

K. KRIVOKAPIC¹, B. PLAVŠIČ² and D. BUTUROVIČ³

(Department of Biology, Faculty of Science¹, Institute for Agricultural Research², Sarajevo)

Mycoplasma infection provoked conspicuous symptoms in plants which were quite different from those caused by bacteria or by viruses.

The symptoms were located in the region of the flower (hypertrophy of calix, proliferation and partial or total sterility). The anatomical changes were mostly limited to the phloem which was hyperplastic (increase of phloem by the very intensive cell divisions).

We have supposed that the syndrom described appeared as a consequence of some physiological changes. We investigated the content of pigments (chlorophyll and carotenoids), sugars (reducing and total), total proteins and auxins in the diseased and healthy control plants. In diseased tomato plants there were significant decreases of pigments, sugars and proteins, and also the fresh and dry weight were markedly lowered. Preliminary investigations indicate that some changes would also appear in the auxins content.

EFFECTS OF SOME HERBICIDES ON THE GROWTH OF *LEMNA GIBBA* AND *SPIRODELA POLYRRHIZA*

M. KRSNIK-RASOL and L. RENDIĆ

(Institut of Botany, University of Zagreb)

Research has been done into the effects of two newly synthesized and insufficiently examined herbicides "CTS" (4-chloro-4', 6-bis (ethyl-amino)-6'-isopropylamino-di-(s-triazinil)-sulfide), "CPS" (4-chloro-4', 6-bis (isopropylamino)-6'-ethylamino-di-(s-triazinil)-sulfide) and the already well known atrazin on the growth of *Lemna gibba* G₁ and *Spirodela polyrrhiza* S₄.

As simple and suitable plants *Lemna gibba* and *Spirodela polyrrhiza* were used because they multiply fast in a nutrient solution. The simplest methods of counting the fronds and measuring the weights of fresh and dry biomass have shown that all three substances have a stimulative effect on the growth and procreation of the fronds when they are added to the medium in relatively low concentrations (10^{-7} , 5.10^{-7} M) while the concentrations of 10^{-4} and 10^{-3} M markedly check the growth or have a lethal effect. It has been found out that the herbicides affect the content of chlorophyll in the fronds.

COMPARISON OF AUXIN ACTIVITIES OF INDOLEACETIC ACID, TRYPTOPHOL, AND TRYPTOPHOL GLUCOSIDE

V. MAGNUS, S. ISKRIĆ and S. KVEDER

(Ruđer Bošković Institute, Zagreb)

When tryptophan, tryptamine, or indoleacetaldehyde were supplied to etiolated pea seedlings (*Pisum sativum* L. cvs. Lincoln and Telephone), only minor amounts of indoleacetic acid (IAA) were formed, the major metabolites being tryptophol (TOH) and tryptophol glucoside (TO-Glc). In order to gain an insight into the possible physiological significance of this effect, the auxin activities of these two compounds, in comparison with IAA, were investigated.

It was found that, in the pea-stem section test, a 1000 x greater amount of TOH or a 50 000 x greater quantity of TO-Glc was required to produce the same growth promoting effect as IAA. From kinetic ex-

periments it was concluded that TOH and TO-Glc were physiologically active only after being transformed to IAA. These conversions as well as the uptake of indolic compounds from external solutions are very rapid reactions.

TOH and TO-Glc, which accumulate during the incubation of metabolic precursors of IAA, are therefore extremely ineffective as possible "reserve auxins". More likely, they are part of a buffer mechanism preventing synthesis of physiologically unfavourable quantities of the growth hormone.

STUDIES OF BLEACHED STRAINS OF *EUGLENA GRACILIS*

E. MARČENKO

((Ruder Bošković Institute, Zagreb)

Four different strains of bleached mutants of *Euglena gracilis* have been isolated by the author (1 "yellow", 1 "colourless" and two "white" strains).

The ultrastructure of the plastid development has been studied especially in the yellow strain⁽¹⁾. This strain is unstable when grown in light and at raised temperature (30 °C) which cause its irreversible bleaching⁽²⁾.

The yellow strain as well as the green wild type could be bleached by chloramphenicol⁽³⁾.

Ultraviolet light produces bleaching of plastids in the yellow strain which is photoreactivated by visible light. It has been shown also that in comparison with the green, yellow and colourless strains, the rate of growth of the two white strains is markedly slower and temperature optima for growth lowered.

(1) Marčenko, E., 1973. *Protoplasma*, 76, 417—433.

(2) Marčenko, E., 1974. *Protoplasma*, 82, 119—123.

(3) Marčenko, E., 1974. *Cytobiologie*, 9, 281—289.

THE MUTUAL EFFECT OF AFUZ-ALI VARIETY AND SOME ROOT STOCKS UPON THE AMINOACID IN LEAVES AND ROOTS OF THE WINE GRAFTS

M. MILOSAVLJEVIĆ, A. NAKALAMIĆ and M. VUČKOVIĆ

(Institute for the Application of Nuclear Energy in Agriculture, Veterinary Medicine and Forestry, Beograd — Zemun)

Previous investigations⁽¹⁾ have shown that the aminoacid content in leaves of the grafted wine depends on the root stock qualities. In order to establish the mutual effect of the variety and the root stock upon the aminoacid content in leaves and roots, two-year-old Afuz-ali grafts were used on different root stocks, bred under controlled conditions as a sand culture. Free aminoacid content was measured as well as the content of the same in the protein complex.

(1) Milosavljević M. et al., 1972. *Contemporary Agriculture* 10, 20, 49—53.

The results show that the effect of the root stocks 5A, 5BB, and 41B is shown in the decrease of aminoacid content in Afuz-ali variety leaves. The decrease in free aminoacid content is larger than the decrease in total aminoacids. Afuz-ali variety increases free aminoacid content in the roots of the root stock. Such aminoacid content could mean that the root stock slows down the growth of the above-ground Afuz-ali shoots, while Afuz-ali accelerates the growth of the root system in the root stock.

A STUDY OF THE EFFECT OF LIGHT ON ^{14}C -LABELLED FREE GIBBERELLINS

M. NESKOVIĆ, R. KONJEVIĆ and D. GRUBISIĆ

(Institute of Botany, Faculty of Science and Institute for Biological Research, Beograd)

Earlier results concerning the red light effect on gibberellins in pea (*Pisum sativum* L. cv Alaska) internodes⁽¹⁾ have shown that a brief light treatment of etiolated plants brings about an increase in free gibberellins after 20 min, followed by a decrease within the next two hours. In further work plants were fed with ^{14}C -GA₃ or ^{14}C -mevalonic acid, in order to study the origin of free gibberellins, accumulated in short periods after the light treatment. Experiments with ^{14}C -GA₃ do not support the hypothesis that changes in the rate of gibberellin translocation may be involved. In the plants fed with ^{14}C -mevalonic acid several radioactive substances were found and some of them seem to be affected by light. A study of their biological activity and identification is in progress.

(¹) Nešković, M. and Konjević, R., 1974. J. exp. Bot. 25, 733—739.

THE EFFECT OF BLUE LIGHT ON THE ULTRASTRUCTURE OF MAIZE CHLOROPLASTS

D. NIKOLIĆ

(Institute for the Application of Nuclear Energy in Agriculture, Veterinary Medicine and Forestry, Zemun)

The effect of blue light (400—525 m μ) and energy up to 1302 erg/cm²/sec, was compared with the white light (380—750 m μ) and energy up to 15 094 erg/cm²/sec by absorption by the leaf in the process of chlorophyll synthesis and illumination time, whereas the same chlorophyll content was established in both white and blue light.

By illumination of the model maize plant (from C₄-group) with white and blue light, we were able to follow both — chloroplasts differentiation in the mesophyll cells and the differentiation of chloroplasts in the parenchymous cells of the bundle sheath.

In mesophyll chloroplasts formed in blue light, the thylakoid system remains unchanged when compared with the white light, except that some sites between thylakoids are fused with the neighbouring membranes into a thick electron dense layer. Moreover, the number of thylakoid grana is considerably reduced if compared with chloroplasts in the white light.

SIGNIFICANCE OF KARYOLOGICAL INVESTIGATIONS IN PLANT TISSUE CULTURES

D. PAPEŠ

(Institut of Botany, University of Zagreb)

Imperfections and occasional irregularities in chromosome replication and distribution are the main mechanism of variability and consequently of evolution. On the other hand it is also known that the variabilities in chromosome number occur within a population of a species without any phenotypic differences in the plants. Furthermore, different chromosomal instabilities have been noticed in individual plants which grow and develop normally in spite of that fact.

Many more chromosomal instabilities are known to appear in tissues and cells, when they are separated from their stable environment of the intact organism and put into a strange environment represented by the culture medium; in such cases the variability and evolution of the cell populations may present a serious problem.

Consequently it seems plausible that the study of cells and tissues could not be correctly undertaken without a constant checking of the chromosome complement. The application of cytological techniques for the recognition of the mechanisms of chromosomal irregularities seems therefore to be equally important as the knowledge of the culture medium.

The author will discuss some problems such as the importance of the choice of material, advantages and disadvantages of the use of polysomatic and non-polysomatic plants as experimental objects, and the significance of the haplonts of higher plants for physiological and genetical studies.

PHYSIOLOGICAL ASPECTS OF MAIZE HYBRIDS AND LINES RESISTANCE TO HIGH TEMPERATURES STUDIES BY PHOTO- -INDUCED BIOLUMINESCENCE

M. PENČIĆ, Č. RADENOVIĆ and Ž. VUČINIĆ

(Center for Agricultural Research, Maize Research Institute, Department of Physiology, Biochemistry and Technology, Beograd)

The intensity of photo-induced bioluminescence as a function of high temperatures was investigated.

The differences in the intensity of the characteristic peak, equilibrium and saddle points were determined.

The time period between the above points are given. They characterize the relationship between high temperatures and photo-induced bioluminescence.

THE APPLICATION OF CHEMICAL MICROSCOPY IN THE DETECTION OF ALKALOIDS IN PLANT TISSUES

B. PEVALEK and Z. DEVIDE

(Institut of Botany, University of Zagreb)

Alkaloids and related substances in plant tissue can be easily detected by simple methods of chemical microscopy.

Studying callus tissues from the plant tissue collections of dr. S. Jelaska the younger author (B. P.) was able to detect alkaloids and alkaloid-like substances in several strains of callus tissue.

The study of the dependence of the alkaloid content on the composition of the culture medium is now in progress and the results, obtained so far, will be presented.

PHOTOCHEMICAL ACTIVITIES OF THE BLACK PINE CHLOROPLASTS

M. PLESNICAR AND M. BOGDANOVIĆ

(Institute for the Application of Nuclear Energy in Agriculture, Veterinary Medicine and Forestry, Zemun)

Our earlier investigations showed that plastids of the black pine (*Pinus nigra* Arn.) cotyledons grown in the absence of light contained both chlorophyll pigments and a developed grana system⁽¹⁾. Previous examinations (unpublished data) have also shown that chloroplasts isolated from the black pine cotyledons grown in the dark reduce potassium ferricyanide when exposed to light. These data were later confirmed by measuring the rate of oxygen evolution and noncyclic photophosphorylation in the presence of potassium ferricyanide as electron acceptor. It was thus established that chloroplasts of the black pine grown in the dark for 10 to 14 days have a functional photosystem 2.

The results obtained indicate that the activity of the photosystem 2 from the chloroplasts formed in the dark does not differ remarkably from the activity of the chloroplasts formed in the light. In contrast to the literature data⁽²⁾, which indicate that the photosystem 2 of chloroplasts from *Pinus sylvestris* L. cotyledons grown in the dark for 21 day, was not formed, our data obtained with chloroplasts from the black pine cotyledons after 10 and 14 days of germination give evidence about a completely formed photosystem 2.

(1) Nikolić, D., Bogdanović, M., 1972. *Protoplasma*, 75, 205–213.

(2) Oku, T., Sugahara, K., Tomita, G., 1974. *Plant and Cell Physiol.* 15, 175–178.

EFFECT OF SULPHUR DIOXIDE ON THE METABOLISM OF PHOSPHORUS IN BEAN PLANTS

M. PLESNIČAR and M. ČUK

(Department of Pesticides INEP, Zemun)

This work is a study of the uptake, translocation and accumulation of phosphorus in the leaves of beans at different stages of development. The metabolism of phosphorus and its incorporation into some components of leaf cells was also followed. The changes in these processes taking place on exposing the plants to low concentrations of sulphur dioxide were measured.

Bean plants were grown in nutrient culture, under controlled light, temperature and humidity conditions. They have been exposed to known sulphur dioxide concentrations (0.02–0.40 pmm) in a glass cylinder with a constant gas flow. The radioactive $\text{KH}_2\text{}^{32}\text{PO}_4$ was applied by the nu-

trient medium; its distribution over the different parts of the plant was followed by radiometric method.

The results obtained indicate that the low sulphur dioxide concentrations during 24—72 hours stimulative affect the metabolism of phosphorus in bean plants in different phases of their development. Before the appearance of any visible symptom of damage the changes were registered in the metabolism of ribonucleic and deoxyribonucleic acids, phospholipid components, inorganic phosphorus and some other phosphorus compounds.

WATER POTENTIAL OF CORN IN DEPENDENCE OF OSMOTIC PRESSURE OF NUTRIENT SOLUTION

Ž. POPOVIĆ and R. KOSTIĆ

(Faculty of Agriculture, Zemun)

The resistance of the corn to drought is determined by its physiological properties, the result of which is the disposition with the available water quantity or plant water regime. In order to provide data on the characteristics of water disposition of individual cultivars, we also use the pressure chamber nitrogen bomb. For this purpose an apparatus was constructed which facilitated the observations of the change in water potential in the leaf of the following corn cultivars: SK -1, SK -3, SK -4, SK -58 and SK -46 A.

All the plants were cultivated in chamber with constant conditions of temperature and lighting for seven days, after which they were transferred to nutrient solutions to which adequate quantities of manitol were added in order to achieve an osmotic pressure of different values, such as: 0.08 M (2 atm.), 0.22 M (6 atm.), 0.40 M (10.6 atm.) and 0.56 M (15.0 atm.).

It has been established that there are evident differences between individual cultivars in the water potential values as well as in the changes of these values due to the stay in manitol solution.

THE GREENING OF SOME WHEAT CULTIVARS AT DIFFERENT TEMPERATURES

Ž. POPOVIĆ and R. KOSTIĆ

(Faculty of Agriculture, Zemun)

In order to explain the physiological bases of wheat frosthardiness, we have for years been investigating the fermentative activity of extracts obtained from the cultivars of different origin and resistance to low temperature influences. The influence of low temperatures on the amylase activity was studied in the first place. At this stage of work we are investigating the speed of greening of etiolated wheat seedlings on temperatures 5°, 15° and 22° C. The following cultivars were studied: Bezostaya, Libelula, Hybrid 013, Timočanka, Sava, Zlatna dolina (Golden Valley), Selection No. 1/1—15, Selection No. 13/1 and Selection No. 23/2.

The results show that in Bezostaya cultivar the chlorophyll synthesis is the least dependent on temperature changes and the most dependent is with Selection 13/1 and Selection 23/2. It is similar with Libelula, especially after eight hours of exposition to the light.

The differences in the rate of attaining the constant interrelationship between chlorophyll *a* and *b* were determined.

THE EFFECT OF TEMPERATURE ON THE FORMATION OF PHOTOSYNTHETIC APPARATUS IN MAIZE HYBRID

Ž. POPOVIĆ, D. NIKOLIĆ, R. POPOVIĆ and M. VUČKOVIĆ

(Institute for the Application of Nuclear Energy in Agriculture, Veterinary Medicine and Forestry, Zemun)

The effect of different temperatures (15°, 30° and 40° C) on the formation of the photosynthetic apparatus in the leaf of maize hybrid (SK-48A) was studied. Moreover, the activity of photosystem II was determined in leaves of maize grown at the above-mentioned temperatures.

It has been established by electron microscope that chloroplasts in plants grown at 15° C have a higher starch content than those in plants grown at 30° C and 40° C. These chloroplasts contain small amounts of chlorophyll.

The activity of photosystem II was followed separately in mesophyll chloroplasts and parenchymatous cells of the bundle sheath. Some marked differences were observed in the activity of the chloroplast photosystem II in both cell types. The chloroplasts grown at 15° C showed a considerably lower activity of the photosystem II. There was no difference in the chloroplast structure, chlorophyll synthesis or photochemical activity in the plants grown at 30° C and 40° C.

CARBOXYLASE ACTIVITY IN THE LEAF OF MAIZE IN DEPENDENCE OF GROWTH CONDITIONS

Z. POPOVIĆ*, A. RASTOVIĆ and B. MARTINOVIĆ

(Faculty of Agriculture, Zemun—Beograd*,

Institute for the Application of Nuclear Energy in Agriculture, Veterinary Medicine and Forestry, Zemun)

Hybrid SK-48A was grown up to the formation of the second leaf for the isolation of phosphoenolpyruvate carboxylase, the activity of which determined under defined, *in vitro* conditions (medium pH 8.3, temperature 80° C, time of incubation 5 minutes, and a constant ratio among medium components).

The maize was grown at the following temperatures: 10° C/13° C, 30° C/25° C and 40° C/35° C, and constant light intensity.

At the same time, the chlorophyll content and total protein diluted in TRIS buffer was also determined.

It was established that the highest carboxylase activity of the extract was found in the plant grown at 30° C/25° C. The leaves of these plants had the highest protein and chlorophyll content.

This is part of the investigations related to the formation and functioning of the photosynthetic apparatus in different maize hybrids.

TRANSPORT EFFICACY AND THE BIOELECTRIC ACTIVITY OF THE MAIZE ROOT

Č. RADENOVIĆ, M. PENČIĆ and Ž. VUČINIĆ

(Center for Agricultural Research, Maize Research Institute, Department of Physiology, Biochemistry and Technology, Beograd)

Bioelectric activity and the efficacy of the maize root to transport ions have been examined. These examinations were performed by measurements of the bioelectric potentials and the application of the physico-chemical analysis for the transport numbers of cations and anions.

The following results are presented:

- The relationship between the bioelectric potential and the various concentration ratios of salts. The isoelectric point and a linear dependence of the bioelectric potential for a wide concentration range are established.
- The relationship between the transport numbers of selected cations and anions, and different root segments.
- An analysis of the bioelectric potential kinetics and the transport efficacy of the root under specified environmental conditions.

ANATOMY AND FINE STRUCTURE OF EMBRYOGENIC CALLUS TISSUE OF *CORYLUS AVELLANA* L.

LJ. RADOJEVIĆ, R. VUJIČIĆ AND M. NEŠKOVIĆ

(Institute for Biological Research and Institute of Botany, Faculty of Science, Beograd)

A callus tissue culture of *Corylus avellana* L., isolated from the immature embryos and cultivated for two years on agar synthetic medium, was repeatedly found to be capable of somatic embryogenesis. In sections of the tissue, bipolar structures are interpreted as globular to cotyledonary stages of embryoid development. 2,4-D did not inhibit the induction of embryoids, although it prevented their further development into plantlets. The omission of 2,4-D permitted the "germination" of embryoids, although the plantlets remained small. Plantlets often had unequal cotyledons, or both cotyledons grown together in a cup-like structure. The effect of various factors on the growth of plantlets was studied.

Callus cells in active proliferation were also studied by electron microscopy. A characteristic feature of these cells was the presence of aggregated cisternae of the endoplasmic reticulum. They are often circular and bear ribosomes crystallized in tetramer units. Bundles of fibrous material are often found not only in the cytoplasm, but also in nuclei.

5-HYDROXYTRYPTAMINE AND ITS METABOLITES IN PLANTS

I. REGULA

(Institut of Botany, University of Zagreb)

Over the last two decades much attention has been said to investigations of biological activity of 5-hydroxytryptamine. This metabolite induces many physiological phenomena and some pathological changes hazardous to human health. The wide and varied activity of serotonin

in organisms gave an impulse to investigations of serotonin distribution in living beings.

This is why some species of *Urticaceae* (*Urtica pilulifera*, *U. pilulifera* var. *dodartii*, *U. membranacea*, *U. thunbergiana*, *U. cubensis*, *Laportea gigas*) have been investigated. Alcoholic extracts from above-ground-parts of the plants analysed by chromatographic methods have been found to contain 5-hydroxytryptamine as well as two other metabolites one of which shows a great similarity with bufotenine. Only serotonin could be determined in the seeds.

In *Elaeagnaceae* (*Elaeagnus umbellata* and *Shepherdia argentea*) serotonin has been found in leaves, bark and seeds.

In *Solanaceae* serotonin has been found only in *Solanum lycopersicum*, but not in *S. dulcamara* and *S. nigrum*.

While serotonin and its metabolites occur in different plant parts in the mentioned families they are present only in the cotyledons of *Juglandaceae* (*Juglans regia*, *J. mandshurica* and *J. sieboldiana*).

THE REACTION OF SOME PLANT SPECIES TO THE SUBSTITUTE OF Ca AND K FOR Sr IN A NUTRITIOUS SOLUTION

M. SARIĆ and B. KRSTIĆ

(Faculty of Agriculture, Institute for Biology of the University of Novi Sad)

The problem of the possibility of substituting ions has been paid a particular attention lately, the possibility of total and partial substitute of K for Rb, Ca for Sr and K for Na being a frequent topic.

We have investigated the possibility of total substitute of Ca and K for Sr in the following plant species: maize, sunflower, peas and cucumber.

The substitute of Ca and K for Sr has been investigated in comparison to three controls: complete nutritious solution, lack of K, lack of Ca in relation to the weight of dry matter and content of ions: N, P, K, Ca and Sr.

According to the synthesis of organic matter of overground part the results show that the most effective was the substitute of Ca for Sr in maize, then cucumber, and sunflower, while in peas the effect was negative. Considering the root the situation is different because maize and cucumber reacted well, sunflower followed and in peas the reaction was the lowest.

It is interesting to note that in peas it was possible to substitute K for Sr in relation to the weight of both overground parts and root. The other plant species, and especially cucumber, did not show any effect.

The content of individual ions depends on the variety of nutrition and plant species.

RESEARCH INTO THE INFLUENCES OF RED LIGHT ON THE AUXIN IN THE PEA STEM (*PISUM SATIVUM*. L)

M. SPASENOSKI

(Department of Botany, Faculty of Science, University of Skopje)

The stem of eight-day-old etiolated pea seedlings (*Pisum sativum*, cv. Aljaska) with the third internode of 5—25 mm has been studied to determine the phytohormone auxins and their changes after being treated with red light for 5 minutes.

The extraction was done with methanol. The extract was separated into acid and neutral ether fractions which were then analysed by chromatography. In order to examine the biological activity of the extract, M-test was used with the cuts of the first internode of *Avena sativa*.

The results show that auxins are present in the extract of the etiolated pea seedlings. After being exposed to light, the quantity of the endogenous auxin was measured in short time periods of 2 hours. The first changes were measured after 10 minutes, when the total quantity of the auxin increased, so that the maximum was reached two hours after exposure to light.

THE MEDIUM AS A FACTOR FOR ISOLATION OF INTACT ETIOPLASTS

Ž. STANKOVIĆ

(Faculty of Sciences, Novi Sad)

The attempts at the isolation of pea etioplast have been made in modified media of sucrose and sorbitol, which have been used mainly for the isolation of chloroplast, as the existing media for isolation of etioplast have not given satisfactory results.

So far the results have shown that intact etioplasts are difficult to be isolated completely. In the majority of cases isolated etioplasts in sucrose medium show relatively smaller or larger vacuoles, and very often other changes. Etioplasts isolated in the sorbitol medium swell intensively, and especially their thylakoids which appear in the form of vesicles.

Considerable improvements in the preservation have been achieved by adding 1—5 mM Na₂EDTA to both the sucrose and the sorbitol media.

By adding ficoll to the sucrose medium vacuolisation could not be perceived, but a larger number of etioplasts appeared with various protuberances, which disappeared as time passed. Similar changes and also swelling of thylakoids, were also noticed in the etioplasts isolated in sorbitol-ficoll medium.

THE EFFECT OF ATRAZINE ON PHOTOSYNTHESIS IN SOME INBRED LINES AND HYBRIDS OF MAIZE

L. M. STEFANOVIĆ and M. PLESNIČAR

(Maize Research Institute, Zemun and Pesticides Department INEP, Zemun)

Although most of the literature data indicate that maize plants are resistant to triazine herbicides, there are some inbred lines in which an increased susceptibility has been noticed.⁽¹⁾

The aim of this work was to study the effect of atrazine (2-chloro-4-ethylamino-6-izopropylamino-s-triazine) on the photochemical activities and content of chlorophylls in four inbred lines (OH-43, C-103, R-59, TD-191) and two hybrids (ZP SC-666t, ZP SC-48A).

The rate of oxygen evolution in the suspension of isolated chloroplasts with potassium ferricyanide as an electron acceptor was measured

by oxygen electrode. The rate of ATP synthesis by non-cyclic photophosphorylation as well as the contents of chlorophyll per gram of fresh leaf were also recorded.

The results indicate that atrazine applied in concentration $1,02 \times 10^{-4}$ mols /2.7 kg of sand/ 10 plants has an inhibitory effect on the tested photochemical activities.

(¹) Eastin, E. F., 1971. Agronomy Journal, 63, 4, 656—657.

THE REVERSIBILITY OF THE OSCILLATIONS OF BIOELECTRIC POTENTIAL IN *NITELLA* UNDER THE INFLUENCE OF LITHIUM IONS

Ž. VUČINIĆ, Č. RADENOVIĆ, Z. DAMJANOVIĆ* and M. PENČIĆ

(Center for Agricultural Research, Maize Research Institute, Department of Physiology, Biochemistry and Technology, Beograd,

* Center for Multidisciplinary Studies, University of Beograd)

The results of research into oscillation phenomena in living cells of green alga *Nitella mucronata* are presented. Electrophysiological methods and microelectrode technique were used in these investigations.

The variation in the oscillations of the membrane potential under the effect of lithium has been established. By changing the standard solution (NaCl + KCl) with 10^{-2} M LiCl solution, the membrane potential begins to oscillate with minimal damping. These oscillations can last from a few minutes to over half an hour, with the generation of more than 20 spikes. In the course of these oscillations, the form and duration of spikes are changed. The changed form of these oscillations is reversible when the solution of lithium chloride is replaced by standard solution.

STUDIES OF PLASTID TRANSFORMATIONS IN LEAVES OF AUREA-VARIETIES

I. TRANSFORMATION OF PLASTIDS IN THE MAPLE-TREE

M. WRISCHER, N. LJUBEŠIĆ and Z. DEVIDÉ

(Ruder Bošković Institute, Zagreb)

Leaves of the maple-tree (*Acer negundo* L. var. *odessanum* [H. Rothe]), if they are exposed to intense sunlight, cannot green but remain yellow. In these leaves the plastids do not contain grana, but only single thylakoids. The concentration of chlorophylls and carotenoids, as well as the photosynthetic activity, are very low.

Leaves grown in the shadow turn normally green. They contain chloroplasts with grana, high concentrations of pigments and normal photosynthetic activity.

Yellow leaves are able to regreen in a few days if they are shaded, so that only about 25% of the light reaches the leaf surface. On the contrary, green leaves, if exposed to intense sunlight for a period of about 3 weeks, do not yellow. In these leaves the chloroplasts contain many plastoglobules, what is the obvious sign of their senescence.

STUDIES OF PLASTID TRANSFORMATIONS IN LEAVES OF AUREA-VARIETIES

II. ULTRASTRUCTURAL STUDIES OF PLASTIDS OF THE ASH-TREE

M. WRISCHER, N. LJUBEŠIĆ and Z. DEVIDÉ

(Ruder Bošković Institute, Zagreb)

If the leaves of the ash-tree (*Fraxinus excelsior* L. var. *aurea* /Willd./) are permanently exposed to intense sunlight, they remain yellow. Only leaves grown in the shadow turn green. There is a good correlation in the concentration of pigments, the photosynthetic activity and the possibility of the regreening of yellow leaves, between this variety and the aurea-variety of the maple-tree already described. After a long exposure to intense sunlight the yellow leaves of the ash bleach completely and fall out.

Besides a very rudimentary photosynthetic apparatus and numerous plastoglobules, the plastids in yellow leaves of the ash-tree contain conspicuous membranous inclusions, which probably represent degenerative stages of the thylakoid system. Their origin has been studied in detail.