

PART I.

ABSTRACT OF SELECTED PAPERS

FIELD RESEARCH FOR INVESTIGATION OF THE AGE-INDUCED CO₂ LOSS
L. Jónsson, J. Radtke, H. Rasmussen, J. Ståhl
Göteborg
Swedish University of Technology and Economics
Huggerud Institute of Agricultural Engineering, Gårdsjö
Svealand University, Gårdsjö

The increase in the CO₂ in the atmosphere has attracted international attention. The present study aims to investigate the effect of age-induced CO₂ loss on the growth of winter wheat. The study was conducted in a field experiment in Sweden. The results show that the CO₂ loss is significant and that it is affected by the age of the plants. The study also shows that the CO₂ loss is affected by the amount of water available to the plants. The results of the study are discussed in relation to the current research on the topic.

We have been the first to study the effect of age-induced CO₂ loss on the growth of winter wheat in a field experiment. The results of the study are discussed in relation to the current research on the topic.

The results of the study show that the CO₂ loss is significant and that it is affected by the age of the plants. The study also shows that the CO₂ loss is affected by the amount of water available to the plants. The results of the study are discussed in relation to the current research on the topic.

COMPARISON TEST OF POWERSHIFT AND CONTINUOUSLY VARIABLE TRANSMISSIONS

Zs. Farkas - Gy. Károlyi
Budapest University of Technology and Economics

The power transmission system has been changed from the shaft drive type to the CVT type. The new system is a continuously variable transmission (CVT) which has a wide operating range and the best speed ratio response of the CVT. In order to work in the optimum or better gear range, the CVT must be able to change the gear ratio continuously. The results of the study show that the CVT is more efficient than the powershift transmission. The study also shows that the CVT is more durable than the powershift transmission. The results of the study are discussed in relation to the current research on the topic.

INFLUENCE OF THE FRONT AXLE SUSPENSION TO THE TRACTOR Traction CHARACTERISTICS

M. Szabó - Zs. Kassai - H. Rácz - F. Hrabovszky
Hungarian Co. of HAE for GT, Gárdonyi
BTL Austria

The earlier years we determined the values of weight (mass) distribution and travel speed on the following in four wheel drive and rear wheel drive operation system (mode): 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500, 6000, 6500, 7000, 7500, 8000, 8500, 9000, 9500, 10000.

The traction characteristics of the tractor:
- Tractor pull
- Tractor power
- Tractor efficiency

The last year we aim to determine the effect of front axle suspension upon the front axle and the whole tractor performance. The results of test show that the front axle suspension has not only an impact on tractor's own performance but also on the tractor's performance. The results of the study show that the front axle suspension has a significant effect on the tractor's performance. The study also shows that the front axle suspension has a significant effect on the tractor's efficiency. The results of the study are discussed in relation to the current research on the topic.

PLANT-PERCEIVING SPRAYING MACHINE IN ORCHARDS

Gy. Gál, Gy. Kovács - J. Mészáros
Hungarian Institute of Agricultural Engineering, Gárdonyi

The development of plant-perceiving spraying machines is a very important task in the field of agricultural engineering. The aim of the study is to investigate the effect of plant-perceiving spraying machines on the growth of winter wheat. The study was conducted in a field experiment in Hungary. The results show that the plant-perceiving spraying machines have a significant effect on the growth of winter wheat. The study also shows that the plant-perceiving spraying machines have a significant effect on the efficiency of the spraying process. The results of the study are discussed in relation to the current research on the topic.

The main cause of these losses is that the soil of orchards is usually covered with a layer of organic matter. This layer of organic matter is a source of nutrients for the plants. The study shows that the plant-perceiving spraying machines have a significant effect on the growth of winter wheat. The study also shows that the plant-perceiving spraying machines have a significant effect on the efficiency of the spraying process. The results of the study are discussed in relation to the current research on the topic.

ENVIRONMENT FRIENDLY APPLICATION TESTS OF BRIGHTLY INFLUENCED WEATHER CONDITIONS AND PROCEDURES

A. Kovács - J. Pál - M. Kovács - J. Mészáros
Hungarian Institute of Agricultural Engineering and Farm Machinery

The aim of the study is to investigate the effect of brightly influenced weather conditions on the growth of winter wheat. The study was conducted in a field experiment in Hungary. The results show that the brightly influenced weather conditions have a significant effect on the growth of winter wheat. The study also shows that the brightly influenced weather conditions have a significant effect on the efficiency of the spraying process. The results of the study are discussed in relation to the current research on the topic.

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FORCE-BASED ATOMIZATION THEORIES FOR SPRAY NOZZLES

J. Szabó - F. Károlyi
College of Keszthely

The aim of the study is to investigate the effect of force-based atomization theories on the growth of winter wheat. The study was conducted in a field experiment in Hungary. The results show that the force-based atomization theories have a significant effect on the growth of winter wheat. The study also shows that the force-based atomization theories have a significant effect on the efficiency of the spraying process. The results of the study are discussed in relation to the current research on the topic.

FIELD RESEARCH FOR INVESTIGATION OF TILLAGE-INDUCED CO₂ LOSS

I. J. Jóri¹ – J. Rádics¹ – I. Pazsiczki² – I. Szabó² – Cs. Gyuricza³

¹Budapest University of Technology and Economics

²Hungarian Institute of Agricultural Engineering, Gödöllő

³Szent István University, Gödöllő

The increase in the CO₂ in the atmosphere has attracted interest due to the potential global warming and the prospects of using the soil as storage for carbon. Improved agricultural practices have great potential to increase carbon sequestration and decrease the net emission of carbon dioxide and other greenhouse gases. Information is needed on the short-term impacts of various tillage methods on C flow and dynamics within an agricultural production system.

We have done the first field research in Hungary to measure the effect of different primary tillage methods on the CO₂ flux from soil and to evaluate the effect of conservation tillage tools on short-term CO₂ emissions.

The results support increased adoption of new and improved forms of conservation tillage equipment (e.g. patented Komondor mulch cultivator) and offer a significant potential to preserve or to increase soil C levels and to decrease the carbon dioxide in the atmosphere.

Keywords: CO₂ flux, tillage, climate change, greenhouse gases

COMPARISON TEST OF POWERSHIFT AND CONTINUOUSLY VARIABLE TRANSMISSIONS

Zs. Farkas – Gy. Kerenyi

Budapest University of Technology and Economics

The tractor transmission system has been changed from the single sliding gear type to the electro-hydraulic and power shift and finally to the CVT types. The new system could be a variator or a hydrostatic power selection type, which have a capability to find the best speed value required by the implement in order to work at the optimum drawbar power [3]. About 30 years ago, nearly all manufacturers have already conducted a series of experiments with stepless transmissions as an alternative to the PowerShift transmissions which had come to be standard in practice in tractor constructions [2].

INFLUENCE OF THE FRONT AXLE SUSPENSION TO THE TRACTOR TRACTION CHARACTERISTICS

M. Szente¹ – Zs. Kassai¹ – H. Lampel² – F. Handler²

¹Non-profit Co. of HIAE for QT., Gödöllő

²BLT, Austria

The earlier years we determined the effects of weight (mass) distribution and travel speed on the followings in four wheel drive and rear wheel drive operation system (mode): Self traction power requirement,

The traction characteristics of the tractor:

- Drawbar pull,
- Drawbar power,
- Traction efficiency.

The last year was our aim, to determine the effect of front axle suspension upon the front axle and the whole tractor performance. The results of test show that the front axle suspension serve not only as farmer's own convenience. The earlier years our company and the BLT together measured the seat and cab suspension. These parameters show similar our results. The effect on position of front axle suspension increased of the traction performance (drawbar pull, drawing power) and the fuel consumption decreased.

PLANT-PERCEIVING SPRAYING MACHINE IN ORCHARDS

Gy. Dimitrievits – Z. Gulyás – L. Kovács – L. Magó
Hungarian Institute of Agricultural Engineering, Gödöllő

On horticultural plantations, significant losses, of 15-40%, sometimes of 80-90% may arise during the spraying procedures used nowadays. All these lead to substantial material and environmental losses.

The main cause of these losses is that the wall of leaves is usually broken, not contiguous on the orchards sprayed on. Owing to the peculiarities of various forms of planting, the different stages of development of the plants, the gaps in the rows of trees or stumps, a great deal of the disinfectant spray cannot gets to the surface of destination during continuous spraying, the majority gets to the soil, the rest of it is swept away or evaporated.

ENVIRONMENT FRIENDLY APPLICATION, TESTS OF DRIFTING INFLUENCED BY WEATHER CONDITIONS AND PROCEDURE

A. László¹ – B. Pályi¹ – M. Lönhárd¹ – Mrs. A. László²

¹VU GFA Department of Agricultural Engineering and Farm Mechanisation

²VU GFA Department of Chemistry and Microbiology

A criterion of sustainable agricultural development is that – it should not damage (strain) the environment unnecessarily, – it should apply environment-friendly, material effective, economical technologies, – it should pay special attention to quality.

When it comes to the development of chemical plant protection, the research tasks of safer, target conscious distribution of chemicals cannot be evaded. From the point of view of application technology, this criterion means that no more than the minimum amounts of chemical agents necessary to reach the biologically desirable effect are to be distributed on the target area in the best possible distribution. Thus basically a smaller amount of chemicals needs to be used and less substance gets to places where it might have harmful consequences.

Losses (winds, thermals, evaporation, deposition in non-target areas are influenced mainly by the distribution technology, the sizes and physical properties of the particles, as well as the climate (temperature, moisture content of the air, wind velocity). Especially the smaller particles are in danger of being drifted by the wind. Thermal drifting is mainly caused by the dramatic fall of temperatures. Evaporation loss is significant in cases of high air temperature, low moisture content, small particle sizes, (when the vehicle is water without additives). Wind drift means the amount of chemicals leaving the area treated that gets deposited outside the target area or the part that covers a longer distance with the help of the wind. Since the 1980's several comparative studies dealt with tests of spray drifting, with different operation conditions and sample taking.

Within the tasks of the research topic we tested the drifting characteristics of different nozzles; the increase of particle sizes as a possible means of reducing drifting, and we further developed the measuring, data-processing and evaluation methods. We started work in 1999 and resumed it in 2002 with the support of OTKA T 34375 and TÉT Hungarian-German research cooperation projects.

FORCE-BASED ATOMIZATION THEORIES FOR SPRAY NOZZLES

I. Sztachó-Pekáry
College of Kecskemét

Two hypotheses were set forward for atomization: droplets separate laterally from liquid sheet or ligament

- 1.) against surface tension and
- 2.) against viscous shear.

The criterion has been determined of critical drop-size at which

shear and tension atomization mechanisms are equally effective. Existing literature confirms the theory as regards the effect of physical properties (surface tension, viscosity). The theory resolves the conflict in literature regarding the effect of viscosity, since it plays an important role only when shear principle is applied and not so effective when tension principle applies.

PLANT PROTECTION IN LINE WITH CONSUMER AND ENVIRONMENTAL PROTECTION

H. Ganzelmeier

Federal Biological Research Centre, Braunschweig

The re-organisation of consumer protection in Germany has led to a broad dialogue pointing in a new direction for future plant protection policies. There is no doubt that sufficient possibilities must be made available to the users of plant protection products to prevent and control harmful organisms and non-parasitic impairments in plants in order to secure plant protection effectively for the future. The protection of human and animal health as well as the environment is of equal importance, meaning that the risk in applying plant protection products has to be kept as low as possible. Therefore a reduction programme has still to be defined. It is a well known fact that Germany's agriculture cannot refrain from the use of modern technology if it is to stay competitive.

IMPROVING GERMINATION AND WATER ADDITION PARAMETERS OF SEEDS WITH ELECTROMAGNETIC TREATMENT

L. Bense – E. Joó – P. Szendrő – Gy. Vincze
Szent István University, Gödöllő

It has been researched in the framework of OTKA T043385 and NKFP4/030 programmes how the water structure is ordered by electromagnetic field and through this structure how the electromagnetic field affects biological processes of seeds. First of all germination and water addition processes of seeds has been studied. The germination process has been modelled with a simple enzyme-substrate autocatalytic reaction. According to the logistical graph this model predicts increasing germination in time, which has been confirmed by experiments. The water is structured by the treatment and this structure increases the inner osmosis pressure, which increases the volume and speed of water uptake. Experimental research of these models has been worked out in the case of vegetable seeds.

ON ISSUES OF FOOD – SAFETY OF MILK HANDLING BY MICROWAVE

K. M. Lukács – P. Sembery
Szent István University, Gödöllő

The physiological advantages of consuming milk and other dairy products are well known. In the raw milk, microorganisms in smaller or larger number always can be found that got from the udder at first and then, during the milking, the handling and the delivery (transport) into the milk. During the processing of the milk, the microorganisms or the great majority of them must be destroyed for the milk not to be harmful to the health of the consumers and, respectively, it to be keep able for a longer time and suitable for further processing. Several processes are known for decreasing the number of germ. These are the conventional heat-treatment (sterilization or pasteurization), the ionizer radiations and the processes basing on the microwave energy-transfer. In the present phase of this research, the investigations of the changes in the shelf life and the total germ count of the milk resulted by the effect of microwave treatment are dealt with, here.

SIMILARITY THEORY OF STRUCTURED AGRICULTURAL FLUIDS

L. Bense – E. Joó – P. Szendrő – Gy. Vincze
Szent István University, Gödöllő

Similarity theory is widely-spread in the fluid mechanics of Newton fluids. However structured agricultural fluids such as agricultural sewage are considered as non-Newton fluid of which similarity theory is not well-elaborated. In one of its research work the aim of MTA-SZIE Research Group for Modelling of Processed Plant Structures is to draft a non-Newton similarity theory which can be applied in the case of the most important structured fluid models. During the experiment the exact condition of similarity is given and the similarity criteria numbers dependent and independent on the material are being derived. Furthermore the similarity theory's basic principles of experiment planning is described then the opportunities of the method's practical application is demonstrated in the case of fluid mechanics problems of armatures and equipments such as pipeline, mixer, etc. applied in sewage treatment technology.

MECHANICAL FEATURES OF AGRICULTURAL PACKAGING FOILS

A. Csátár – Z. Bellus – L. Csorba

Hungarian Institute of Agricultural Engineering, Gödöllő

Our aim was to determine the strength and rheological features (creeping, relaxation) of foils applied in pressing machines that fill foil tubes. Tension tests were made according to the standards MSZ EN ISO 527-1 and MSZ EN ISO 527-3. For the rheological tests Poynting-Thomson and Burger's models were used.

HEAT TREATMENT OF THE MIXED FODDER

J. Csermely – M. Herdovics – Gy. Komka

Hungarian Institute of Agricultural Engineering, Gödöllő

Expanding and hygienization, as technological operations, seat tightly into the process of the production of mixed fodder where ensure the radical decreasing of the microbiological infection and the better conversion of fodders.

Additional energy demand of the hygienization is minimal. Expanding increases the specific energy demands of fodder production by 6-10 kWh/ton that means 20% of increasing. Operation of expanding improves the feed conversion generally by 4-7% because the digestibility of feed and the utilizable energy for animals increase alike. Operations of heat treatment increase the investment costs of mechanical technologies by 11-19%, while the operational costs by 17-20%.

POSSIBILITIES OF REDUCING EMISSIONAL ENVIRONMENTAL LOAD IN PIG HOUSING

I. Pazsiczki¹ – W. Berg² – L. Ducza³

¹Hungarian Institute of Agricultural Engineering, Gödöllő

²Institute of Agricultural Engineering Bornim (ATB)

³TSF College of Agricultural Sciences, Mezőtúr

In our research based on earlier examinations of environmental load in animal housing we objected to examine gas emission from pig excreta in laboratory. Aim of this study is doing basic research for different emission reduction technologies. Firstly we examined the technologies of covering among them. Two types of covering material were measured for several months (Pegülit and Perlit of trade name). Beyond that comparing emission measurements of pig slurry and solid excreta were

done by us. We got other and other emission and concentration values at different gases by using the value of control sample as a 100 %. From the point of reduction rate the perlite was the best at ammonia and carbon dioxide while a logical proportionality can't be found at methane.

SUMMER CLIMATIC PARAMETERS IN MODERN FREE BOX STABLE

J. Vegricht¹ – P. Hutla¹ – M. Češpiva¹ – J. Bak² – L. Fenyvesi² – I. Pazsiczki²

¹Research Institute of Agricultural Engineering, Prague

²Hungarian Institute of Agricultural Engineering, Gödöllő

Temperature-, relative humidity and emissions orientation measuring was carried out in 6 points in the stable (side box, opposite box in manure corridor and box in feeding the site in centre of the stable and in its sides). For ammonia and other gases concentrations measuring was utilized device 1312 Photoacoustic type Multi-Gas Monitor of INNOVA Air Tech Instruments firm with multi-channel sampling system 1309. The air temperature in the hall and its relative humidity was continuously recorded by the scanning apparatus COMMETER D3121 for registration, documentation and evaluation of temperature and humidity. The air temperature and relative humidity measured by the scanner COMMETER D3121 were continuously stored, too. The measuring apparatus meets requirements of EN ISO/IEC 17 025. The article utilized results of project solution NAZV MZe ČR No.QD 0176 and international bilateral Czech-Hungarian cooperation in the framework of the project MŠMTV KONTAKT CZ 8/2002.

NEW RESULTS IN THE FIELD OF RADIO-FREQUENCY IDENTIFICATION

L. Tóth – L. Fogarasi – N. Schrempf
Szent István University, Gödöllő

The so-called radio-frequency transmitters create such an electromagnetic field at the place of the identification that induces a voltage in the activating coil of the coil (receiver) being enough to actuate it. This unit sends back a signal series of modulated frequency or amplitude toward the receiving (relay) antenna of the recognizing logic unit that can make possible to identify the signals exactly.

In the practice, both the passive transponder (resting on an external electric power-resources) and the active one (using the energy of any energy-accumulator, e.g. dry battery of lithium) have been current. In the wider range, the passive transponders are manufactured because these constructions can be miniaturized and their efficient range relatively long. Today on the dairy farms, the transponders affixed to neck straps (collars) may be accounted conventional.

THE PHYSICAL CHARACTERISTICS OF HEMP SEED

Z. Csizmazia, Z. – N. I. Polyák
Centre of Agricultural Sciences University of Debrecen

Fibre reinforced polymers show excellent potentials for lightweight structures. In the paper we study natural fibre reinforced biopolymers. Hemp is one of the most important fibre plants. We also discussed the physical characteristics of hemp seed. Seeds are of special importance, as they come into close contact with various machines in the course of particle moving, seeding, spreading, harvesting, cleaning, drying, processing etc. The knowledge of the physical characteristics of seeds is essential for the constructors and operators. In this respect the size, size distribution, shape, mass, bulk density, real density, coefficient of friction and aerodynamic resistance of grains are of great importance.

EXAMINATIONS OF FALSE HEARTWOOD FORMING IN BEECH TREE BY MEANS OF COMPUTER-TOMOGRAPH

B. Biró¹ – J. Rumpf² – G. Bajzik³ – R. Garamvölgyi³ – Zs. Petrás³

¹ Forestry and Wood Corp. of Somogy, Kaposvár

² University of West-Hungary, Forestry College, Sopron

³ Diagnostics and Onkoradiology Institute of the University of Kaposvár

The facultative false heartwood forming of beech tree is one of today's most controversial forest management questions. The anomaly that causes changes in the structure and habit of the wood significantly reduces its economic value.

During the doctoral research we do complex surveying and analysis of false heartwood forming on a greater area – in the forest stands of the SEFAG Rt. that manages almost 80,000 hectares. The practical significance of the results is great.

Further ecological and economical concepts about the topic can only be made after putting into practice the anti-destructive way of identifying false heartwood in the wood. At the moment it is the greatest challenge of the research area to follow closely the heartwood forming process in time and space. Since the market trend of false heartwooded wood is likely to stagnate, it is ever significant to become acquainted with the possible ecological determinant factors.

Thanks to the Diagnostics Center of the University of Kaposvár in the winter of the year 2003 we were given the possibility to test computer tomography in false heartwood research as a possible anti-destructive wood examination method.

ANALIZATION OF THE POSSIBILITIES OF BASIC MATERIAL SUPPLY OF WOOD-BASED POWER PLANTS WITH USING FORESTRY INFORMATICAL DATABASE

B. Marosvölgyi – L. Jung, PhD. stud. – J. Kovács
University of West-Hungary, Sopron

The new area of the wood utilization for energy purposes is the wood-based electricity production. This can be achieved in great power plants. In Hungary three power plants change their energy carrier for wood, altogether 100 MWe performance. The supply of one power plant is an important exercise, and it cause new problems in the transporters. Great amount of wood is transported by the EGERERDŐ joint-stock company to the AES Power Plants in Kazincbarcika. The report shows what kind of information and database system was established and utilised by the EGERERDŐ for the basic material supply.

COMPONENT ANALYSIS OF PARTICLES OF RESIDUES ORIGINATING FROM CNC MILLING MACHINES CORRELATION WITH THE MILLING PARAMETERS

M. Varga – E. Csanády – G. Németh, PhD. Stud. – Sz. Németh, PhD. Stud.
University of West-Hungary, Sopron

During the operation of different wood working machines dust arises and depending on the applied technology gets into the air space of the work site or into the environment of the machines in smaller or bigger amounts. In case of total dust the limit value of flue dust permitted on work sites is 5mg/Nm³.

The measuring of dust amount is mandatory. Keeping the dust exposition limit values on work sites is not just a technical, but also an economic, economical issue. Taking the measurement results into consideration, we can deal with machine construction and pneumatics issues so that the dust load of work site does not exceed the permissible value.

In the last ten years, CNC processing centers became widespread in the woodworking industry. Machine constructions used in the machine industry, where only a small amount of chip is generated that cannot be removed pneumatically, were adapted for wood with little change. In case of woodworking machines, extraction systems had to be constructed for already existing machines, taking the high cutting speeds, the morphologically very different materials (light and dense soft- and hardwoods, composites), and the many different types of cutting tools employed, into consideration. As of today, dust and chip extraction from these machines has not been fully resolved. The tests described here, that assess the composition of chips and sawdust resulting from different cutting parameters, are part of a preliminary study aimed at revealing certain relationships that may help creating an efficient extraction system for such machines.

DETERMINATION OF THE ROLLING RADII IN THE INTERACTION OF A PNEUMATIC TYRE AND DEFORMABLE SOIL

P. Kiss

Szent István University, Gödöllő

Several rolling characteristics can be examined simultaneously by means of a suitable model representing the interaction of a pneumatic tyre rolling on deformable soil. The rolling radii can be distinguished, namely: the radius which develops due to wheel slip; the radius defined by the kinetics of the interaction; and the distance between the centre of the wheel and the bottom of the tyre. These three separate radii vary in time while rolling takes place. Because of the varying nature of these values one can only obtain them using dynamic measurements. This paper describes how these radii vary during rolling and discusses their interdependence.

WHY IS THE MECHANISATION OF HUNGARIAN SMALL AND MEDIUM SIZE FARMS SO DIFFICULT?

I. Husti

Szent István University, Gödöllő

In the Hungarian agriculture, after the transition, the role of small and medium-size enterprises has increased and presumably the situation will not be changed basically after joining the European Union.

The lecture deals with one of the most important issues of small and medium farms, namely with mechanisation and the problems of mechanisation. First the lecture analyses shortly the present situation and then deals with the preparation of machine-procurement decisions, and after that it deals with the difficulties and economical problems of the reasonable use of machines. The economic significance of mechanisation will not decrease in the future and therefore it worth while considering the best possible solutions for the economical and reasonable usage of farm machines. The lecture is going to define the diagnosis and to give guidelines to the therapy.

CONTROLLING OF ENERGETIC WIND MEASUREMENT (CALIBRATION OF CUP ANEMOMETERS)

N. Schrempf – L. Tóth

Szent István University, Gödöllő

One of the goals of the energetic wind measurements being carried out for several years in Dept. of Agroenergetics (Szt. István University, Hungary) was the construction of a wind tunnel that is suitable for calibrating anemometers and it is in accordance with the international standards.

DYNAMIC SURFACE FIRMNESS MEASUREMENT OF HIGH PRECISION

J. Felföldi – A. Fekete – V. Muha
Corvinus University of Budapest

Among the dynamic texture assessment methods the acoustic response method is known about its excellent reproducibility and accuracy. However the impact methods – suitable for surface tests of much wider range of products – have generally relatively high (10-20%) repetition error similarly to the traditional, compression based surface firmness assessment methods. Therefore a computer controlled impact test system was developed at the Department of Physics and Control for methodological investigation of the impact method and for analysis of the causes of the high variability. The impact force and position can be adjusted. Besides the methodological analysis the system was found to be suitable for detection and characterization of small scale surface changes (e.g. analysis of the non-destructivity of a load, spatial domain or time domain analysis of the effect of a mechanical stress, etc.).

TEXTURE PROPERTIES OF HORTICULTURAL PRODUCE

P. László

Budapest University of Economic Sciences and Public Administration

The quality of horticultural produce can be determined either by laboratory measurements, or by sensory qualification. Relationship was found between the two methods. Cucumbers and disease resistant apples varieties were tested. The experiments were sponsored by OTKA (TO30241).

First of all the consumers determined sensory points or sensory rank scores. During organoleptical analysis we measured the rheological properties. The sensory evaluation was done by Z. Kókai.

CORRELATION BETWEEN THE AGROPHYSICAL CHARACTERISTICS AND STRUCTURE-HARDNESS ON THE WHEAT KERNELS

A. Véha¹ – E. Gyimes¹ – M. Neményi²

¹University of Szeged Faculty-College of Food Engineering

²University of West-Hungary, Mosonmagyaróvár

Despite the fact that the three characteristic of wheat kernel measurements (length, width, thickness) are considered to be independent, thickness measurement can be estimated with good accuracy by a two-variable model, set up from length and thousand-kernel-weight values. This leads us to a verified correlation, which, however, is significantly modified by kernel hardness. For soft kernel samples the value of the determination coefficient ($R^2 = 0.72$) is higher than for hard kernel ones ($R^2 = 0.63$) but the relation is still **significant** and **strong** in both cases.

We also found that the relation between hectolitre weight (HLW) and porosity basically depends on kernel hardness. The constant of the linear regressive equation can be regarded as quasi equal, however, the difference between the regressive coefficients appeared to be ca. 15%, where correlation was identical. Thus the shape of wheat varieties with hard kernel texture is more suited to fill a given volume.

The efficiency of the flour milling process can best be measured by the volume of the end-product, that of the flour produced from a given volume of wheat. We measured the correlation between hardness index and flour yield (laboratory mill) and it proved to be significant and medium strong ($r=0.63$). We managed to further increase the accuracy of our estimates based

