



**ENGLISH LANGUAGE ABSTRACTS OF PHD DISSERTATIONS
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**Development of a functional dairy food enriched
with Spirulina (*Arthrospira platensis*)**

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Dissertation Adviser: László Varga, PhD, associate professor

The objective of the dissertation was to monitor the influence of a cyanobacterial (Spirulina) biomass on the growth, acid production and survival of various microorganisms. Because of its beneficial biological effects, Spirulina was used as a food additive to produce a functional fermented dairy product, for which a detailed manufacturing technology was developed. The influence of Spirulina on the sensory properties of fermented milks was determined, and storage experiments were carried out to study the changes in viability of the microbiota in the control and Spirulina-enriched products. The cyanobacterial biomass increased the vitamin content and improved the fatty acid and essential amino acid composition of cow's milk.

New scientific findings:

1. Used at the rate of 3 g/dm³, Spirulina significantly increases ($P < 0.05$) the acid production by various strains of mesophilic lactic acid bacteria (e.g. *Lactococcus lactis* subsp. *lactis* NCAIM B.2128, *Lc. lactis* subsp. *lactis* var. *diacetyllactis* NCAIM B.2127, *Lc. lactis* subsp. *cremoris* ATCC 19257, *Lc. lactis* subsp. *cremoris* NCAIM B.2124, and *Leuconostoc mesenteroides* subsp. *cremoris* NCAIM B.2120) during fermentation in milk; and it also stimulates ($P < 0.05$) the growth of *Lc. lactis* subsp. *lactis* NCAIM B.2128, *Lc. lactis* subsp. *lactis* var. *diacetyllactis* NCAIM B.2127, and *Lc. lactis* subsp. *cremoris* ATCC 19257.
2. Based on the results of agar diffusion assays, it is concluded that aqueous extracts from the Spirulina biomass are capable of inhibiting the growth of various foodborne pathogens and food spoilage microorganisms such as *Sarcina* sp., *Acetobacter* sp., *Listeria monocytogenes* NCAIM B.01373, *Micrococcus luteus* T21, *Proteus mirabilis* HNCMB 61370, *Salmonella* Typhi-suis HNCMB 15016, *Staphylococcus aureus* HNCMB 112002 and *Staphylococcus epidermidis* HNCMB 110001.

3. Patentable manufacturing technology for production of a novel Spirulina-enriched functional fermented milk has been developed. On the evidence of results from sensory evaluations, optimum organoleptic properties are achieved when the product is prepared with the mixed culture of *Lc. lactis* subsp. *lactis* NCAIM B.2128 and *Lc. lactis* subsp. *cremoris* ATCC 19257, and is supplemented with sucrose at 10%, Spirulina biomass at 0.3%, and strawberry-kiwifruit flavor at 1.5%. During the first 2 weeks of refrigerated storage at 4 ± 2 °C, the Spirulina biomass significantly increases ($P < 0.05$) the viability of mesophilic starter bacteria in the product developed.

Relationship between conditional changes, milk yield and fertility of dairy cattle

ZOLTÁN GERGÁ CZ

Dissertation Advisers: † Ernő Báder candidate, professor and
Endre Szűcs, DSc, associate professor

The objective of the dissertation was to support the justification of the easily attainable and efficient method of condition scoring with the help of the farm veterinary and nutrition management, to better the sanitary conditions and performances of the cows, and to clarify the relationship among condition, number of lactations, particular conception rates, blood and urine parameters. I also want to draw attention to the critical time periods of veterinary and feeding around and after calving, and examine the indicators among extremely hot weather conditions.

Material and method: I made frequent condition scoring (in the 1–5 scale system) on two dairy-farm and recorded data were: condition score (BCS), average daily milk yield (ÁNT), days of lactation after calving (TNSZ), number of completed lactations, 305 days of milk yield (305 NT), open days (number of days elapsed from calving to the next conception) (ÚFI), and the conception rate (TI).

Furthermore, blood and urine tests were made 94 times on 2247 high yielding cows raised on some other dairy farms of the country. The analysed parameters: haemoglobine, plasma acetous, FFA/NEFA, AST, glucose and carbamid concentration, and urine pH, carbamid and NSBÜ values. The results were classified according to the average days of lactation (TNSZ): –12 (before calving), 3, 18, 44, 76, 104, 133 and 218 days.

New scientific findings:

1. The condition score (BCS) has a moderate effect ($P \leq 0.05$) on conception rate (TI) if the score does not fall under $BCS = 3.0$. Significant ($P \leq 0.001$) relation was observed in increasing the rate of TI if $BCS < 3.0$.
2. On the bases of blood and urine tests it can be stated that the trends of changing values of haemoglobin, glucose, aceto-acetic-acid, FFA/NEFA and AST close follow the curve of condition change.

3. Condition reaches its lowest score on the 44th day after calving, when the rate of decrease is 0.83 score. According to blood tests, even besides such condition decrease, sub-clinical fat mobility diseases, ketosis and intensive liver cell damage occur.

4. In factor analysis three group factors and one individual could be differentiated. The factors possess the following percentages from total variance in rank order 19.7%; 13.3%; 12.1% and 11.6%. The defined four factors according to their weight: (1) factor of acid-base balance (urine pH and NSBÜ), (2) factor of protein supply (blood plasma and urine urea), (3) factor of condition (BCS and haemoglobin), (4) factor of liver function (AST).

5. By analysing blood and urine tests taken in extremely hot weather conditions were founded significant ($P \leq 0.001$) differences in the concentration of blood haemoglobin, aceto-acetic acid, FFA/NEFA, AST, urea and urine pH and NSBÜ. It can be stated from results that the multiparous cows tolerate heat stress not as well as the primiparous ones.

The precision agriculture aided by remotely sensed data

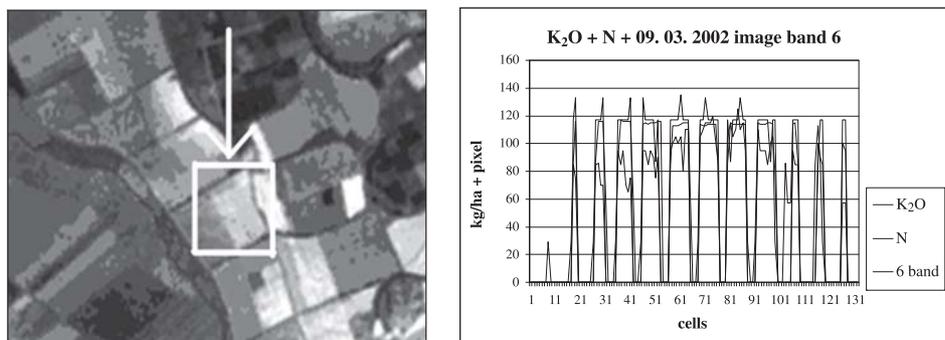
ISTVÁN GYULAI

Dissertation Adviser: Károly Katz, candidate, professor

The author made his PhD work at Faculty of Agricultural and Food Sciences, Mosonmagyaróvár, Institute of Biosystems Engineering. Current paper presents the investigations whether does exist a mathematical or other connection between remotely sensed data and soil data or fertiliser program?

The study is a part of the research has been going on some years at University of West Hungary at Mosonmagyaróvár.

Figure 1. The experimental field on satellite image (left, Copyright FÖMI); Potassium (K_2O) + Nitrogen (N) fertilizer and satellite image dated 09. 03. 2002. band no. 6. synchronism (right)



The experimental field is 15.3 hectares (ha). In November 2001 soil sampling was taken on the experimental field, and by reason of later nutrient replenishment 63 management units were established.

Synchronism testing

The author gathered satellite images and management units into a single system. Pixel size: 50x50 metres. The management units were collected in tables, and the pixel values of satellite image bands were exported, tabulated. The tables were converted into Excel programme.

The correlations around 0.9 show that the data structure is right, data are kept together, zero pixel values and non-zero pixel values are arranged.

Interconversion

Is there a connection between separate spots on space images and fertilizer programme spots? How much do nutrient replenishment data and space image data complement each other? It can be interpreted that the two tables are each a surface and what distance there is between these surfaces and how they join. The calculation is described with the following formula: $g(x) \cong A f(x) + B$

Search for A and B value where in x_i pixel points the $g(x_i) \cong A f(x_i) + B$ approximation is the best! The task is to solve with least square method, which is the variation of deviation to be minimum.

Error:= error (A, B) = $\Sigma(g_i - (Af_i + B))^2$

Result: 09.03.2009 satellite image band 6 versus K_2O . A = 1.0069 joining near one, B = 7.9102

Error= 82375 → average deviation = 25

09. 03. 2009 satellite image band 6 and Nitrogen portion: A = 0.8298 joining near one,

B = -1.6579 distance between them. Error = 96826 → average deviation = 27

The error significantly exceeds table values (between 20–120), the average deviation is 44–48%, thus the interconversion is not possible, relation could not be defined between satellite image and fertilizer portions by this way.

Economic basis of changes in data supply of accountancy in animal husbandry

ÁRPÁD KISS

Dissertation Adviser: Barnabás Reke, candidate, professor

On the example of animal keeping enterprises the thesis investigates the evaluation and registration practice featuring production factors of the sector and options of choice as well as the applicability of accountancy reports from the point of view of economic decision-making and process evaluation.

1. Considering technical parameters

Among the elements of technical parameters (biological basis, technology, by-products, environment and animal well fare measures) the study covers the investigation of the influence

of biological basis. The introduction of the International Accountancy Standards, IAS 41, in 2001 resulted in a considerable gap between the international and the Hungarian regulations. This standard definitely puts an end to the concept of historical cost based accounting, while the Hungarian Law of Accountancy preferred the value realized in the past.

2. Scope of evaluation

Enterprises can comply with the requirements of a reliable and real overall picture first of all through the evaluation of property according to the Law of Accountancy and through public information supply. The solvency requirements apply to items of assets connected to animal stock (value expressible in money, self-negotiability /the negotiability requirement can assert itself both in the practice and in the theory only limited/, transferability, possession, ownership). The changing in the environment and regulations of accountancy attach growing importance to the market price determination within the evaluation of assets. Its mechanical application leads to serious deformation of information false recognition of property value.

3. Informative content of statements

Market participants qualify the usefulness of information about accountancy data and published statements upon their contribution to decision-making process. Behind the question there is the relationship between a reliable and valid overall picture and the demand of economic decision-making on information. In the process of decision-making finance is only one of the aspects. We should consider in the decision-making process economic ethical and non-economic factors, especially in the field of agriculture and animal husbandry.

4. Features of financial statement users

The reasons for the difference between the real and valid overall picture and the demand of holders of interest (market participants) is the different understanding of phrases and the range of values reflecting the interest of users and that of the standards of the Law of Account, which is different in every respect This part of the paper investigates how the accountancy and market participants apprehend the real and valid overall picture of an enterprise and introduces the most important characteristics of value enhancement processes at an enterprise on the basis of animal farms involved into the investigation.

Investigation of Factors Influencing Germination of Volunteer Sunflower Plants (*Helianthus annuus* L.) with the application of GPS

PÉTER JÁNOS POMSÁR

Dissertation Adviser: Péter Reisinger, candidate, professor

The objectives of the dissertation were as follows:

- to reveal the causes of sunflower achenia dispersion,
- to find the relationship between the quantity of dispersed and germinated seeds,
- to find factors influencing the dispersion and spring of volunteer plants in order to solve this scope of problems.

1. We assumed that we could separate causes before and during harvesting in our investigations on seed dispersion. Seed dispersion before harvesting greatly influences the rate of volunteer plants that can measurably be reduced by the elaboration of a proper technology. Investigating the quantity of dispersion by harvesters means the rate of spreading and its distribution.
2. We expected that the most effective method is to incorporate seeds shallowly just after harvesting in order to enhance autumn germination and voluntary growing. Shallow cultivation after harvesting could be one of the key elements of controlling voluntary sunflower growing.
3. Scientific publications confirm that germination of the seeds lying at different depths in the soil depends on soil warming up and it sometimes happens in several waves. This postponement has an important influence on weed control in the following crop, i.e. if abandoned, crop could become weedy.
4. Soil cultivation technology applied after harvesting can also have an important influence on the germination of dispersed sunflower seeds. In case of shallow tillage seeds get under optimal germination conditions, but those seeds which got deeper, could be preserved.
5. By the help of GPS we can follow the depletion dynamic of dispersed seeds on a given field. Seeds dispersed after harvesting will not be displaced by soil cultivation too much, so it offers a good opportunity to study the depletion tendency of volunteer plants in the following years.
6. The use of chemicals dominates in weed control methods, but there are notable results of mechanical and agro-technical field methods. A feeding trial was suggested as a new possible "biological" method to find out, how many seeds a day Hungarian poultry could take up.

New scientific findings:

1. Achenium dispersion may happen before harvesting. However the main cause of sunflower dispersion is the combine harvester. Achenia disperse mostly through the threshed parts.
2. Sunflower achenium germination in winter wheat. On average 14.42% of achenia dispersed after harvesting and germinated in autumn. The rate of volunteer sunflowers, however did not show any close correlation to the dispersed quantity.
3. Germination depth and trends of emerging, 4.5% of sunflower seeds germinated during spring time. The earliest plants emerged on 27th April from germination depths of 0.5 and 10 cm, but plants from 15 cm germination depth emerged only after 20th May.
4. Germination test of volunteer sunflowers in spring after the year of dispersion. There was only a difference of 10 cm between the deep and shallow cultivation of the fields. But as a result of shallow cultivation, 5.9% of the seeds emerged, whereas 12.8% of the seeds emerged after deep cultivation.
5. Volunteer sunflower germination tracked by DGPS methods. Evaluating data obtained in 2002–2003 we observed that peak emergence occurred happened in both years on the same sample areas. There was however a notable reduction between the two years.

Compared to the foregoing year, 15% of the seeds germinated in 2003, i.e. there was a considerable depletion tendency of seeds that got into soil after harvesting and got preserved.

6. Biological method to reduce the number of volunteer sunflowers by feeding them to brood hens. Based on the research results, fodder uptake of hens following the change of fodder greatly varied. Hens that got used to goats, fed on sunflower seeds well, we measured an average daily uptake of 100 g.

Mitigation of the heavy metal content of waste heaps by growing plant species

RITA TURY

Dissertation Adviser: Pál Szakál, candidate, professor

The objective of the dissertation was to establish adequate conditions to the growth of test plants on the flotation waste heap with acidic pH and meanwhile to keep the metal uptake of plants on the lowest possible level in order to avoid the inclusion of these metals (Cd, Pb, Cu and Zn) into the food chain. In order to achieve this, various treatments were applied with the inclusion of compost, mordenite, sewage sludge, synthetic zeolite, clinoptilolite, lime hydrate, lime sludge, wood-chips, alginite, synthetic zeolite (zeolon), lime hydrate and control along with their combinations. In the first and second year, into half of the plots, barley (*Hordeum vulgare*) was seeded whereas into the other half, lucerne (*Medicago sativa*) was put in. In the third and fourth year, instead of barley, Red Fescue (*Festuca rubra*) was put into the experiment plots. During this work, changes in the elements accumulation (cadmium, copper, lead and zinc) in the roots and shoots of the plants resultant from the various treatments were compared. Also, the growth of plants in each plot was monitored. Metal uptake indicated an identical tendency for all three test plants. However, metal accumulation of the plants was, by a various extent, reduced as a result of the treatments. This was the most significant in plots where due to the treatment, pH of the flotation sludge increased thus a higher cation-binding took place, supplying available nutrients for the plants. Compost treatment indicated good results for all three plants examined, due to the favourable nutrient-supply capacity and the binding of toxic elements in a form of complex compounds.

As a result of mordenite, alginate treatments, compared to the treatments mentioned above, metal uptake was proved to be more significant. As a result of these treatments, no improvement was indicated regarding the nutrient-supply capacity of the sludge, basic conditions to the growth of plants therefore were not established. Lime sludge when combined with other substances (wood-chips, alginite) did not indicate as good results as the treatments mentioned before. By such treatments, heavy metal accumulation could be reduced to a limited extent. The plants indicated a slight growth only, and remained

extenuate until the end of the vegetation period, with many of them becoming decayed. Their metal uptake was more significant in comparison to when synthetic zeolite and clinoptilolite were added. As a result of these treatments, an increase of the sludge's pH was observed. Heavy metal uptake was the most significant, compared to the control, when lime dehydrate, lime sludge and lime sludge + lime dehydrate were applied. Plants hardly grew in the plots mentioned above, without growing generative organs at all. Presumably, the growth of plants here was inadequate partly due to nutrient deficiency; although the lime applied reduced the acidity of the waste heap but did not supply nutrients indispensable to the growth of plants.

Increasing of n-3 fatty acid content and improvement of oxidative stability in animal production by feeding

ESZTER ZSÉDELY

Dissertation Adviser: János Schmidt, academician, professor emeritus

Feeding comprehensively influences animal originated food composition (e.g. fat content, protein content, fatty acid profile, vitamin content) and so nutrition value. Having known the role of different substances in each metabolism process there is a possibility to produce so-called functional food products, and due to their special nourishing substances some illnesses can be delayed or its development can be avoided by eating them. Among nutrients lipoids have come into the limelight for a decade, which is in connection with the extensive role of the fatty acid in the organism.

Hungarian people's fatty acid supply using sunflower seed oil and pork-fat based on the Hungarian traditional cooking does not meet the food requirements. First of all, n-3 fatty acid supply falls behind the accepted level. One possibility to improve Hungary's fatty acid supply is to add n-3 fatty acid to the diet of the farming animals and this way n-3 content in animal originated food can be increased. It can be solved in a biological way. To prove the above mentioned theory experiments were carried out with broiler, geese and rabbits.

Numerous experiments were carried out how to increase n-3 fatty acid content in some animal originated food at University of West-Hungary, Faculty of Agricultural and Food Sciences, Department of Animal Nutrition. So there are lot experiences in this subject and there are appropriate conditions for experiment and laboratory analysis. Considering the fact that there are few data about other animal species (e.g. goose, rabbit) in Hungarian as well as in the international scientific literature the research was expanded on two other animal species like goose and rabbit.

The oxidative stability is also an important point of view, when increasing the n-3 fatty acid content of meat. During the experiments the oxidative stability was examined in animal

originated food while n-3 fatty acid was increased and the animals were fed from different originated vitamin E in different doses, or on the other hand whether their degradation significantly could be slowed down.

Consumers' important questions were taken into consideration as well, namely cooking methods (frying, boiling) could not be damaged by the increased n-3 fatty acid, and whether changing fatty acid content influenced adversely the organoleptic properties of the prepared food.

According to the carried out trials the following *new scientific findings* can be stated:

1. Feeding animals with green forage or diet supplemented with 4% linseed oil significantly decreased MUFA and increased PUFA content in tissues of geese and rabbits. Both treatments decreased n-6/n-3 fatty acid ratio for the experimented species. The effect of linseed oil is considerably greater than that of the green forage.
2. The fatty acid composition of the diet has different affect on the fatty acid profile of fat from different parts of the body in geese.
3. D- α -tocopherol of fatty acid distillate as source of natural form of vitamin E was a more effective antioxidant in the case of meat-type hybrid geese, broiler chicken and rabbits than the dl- α -tocopherol-acetate produced by industrial way.
4. Organoleptic properties of the food prepared from the meat of rabbits and geese fed diet supplemented with 2% linseed oil were not influenced by dietary treatment.
5. The fatty acid composition of meat with high n-3 fatty acid content is not changed by cooking the products for 2 hours in a traditional way or boiling it in a pressure-cooker for 20 minutes, and frying it without adding fat.
6. Frying the meat in pork fat or sunflower oil for 15-20 minutes long means some change in fatty acid content but it does not result absolute n-3 fatty acid content decreases.