



Organic Food Quality & Health

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## Dear Readers

This is the last edition of the FQH newsletter. The board of FQH decided to change the way of publishing news concerning organic food quality and health.

In future you are welcome to visit our website <http://www.organicfqhresearch.org> for recent news.

Members are still welcome to send their newest research results and information of their institutes to the coordinator who will publish it on the website.

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# Approaches Used in Organic and Low-Input Food Processing: Impact on Food Quality and Safety - Results of a Delphi survey from an expert consultation in 13 European countries<sup>1</sup>

*Ursula Kretzschmar and Otto Schmid<sup>2</sup>*

## 1. Background

### Study design

The overall objective of the subproject on processing, where the Delphi expert survey was an important task, is “to develop of a framework for the design of “minimum” and “low input” processing strategies, which guarantee food quality and safety.” It should support the overall aim of the integrated QLIF Project (Quality of Low-Input Food) in improving quality, ensuring safety and reducing costs along the European organic and “low input” food supply chains through research, dissemination and training activities.

The method chosen was the Delphi method. The work was carried out in the form of a two-step Delphi survey. In the first round 250 experts in 13 countries in Europe were involved, and were asked to respond to a standardised questionnaire in October and November 2004 and the second round from March to May 2005. The Delphi expert survey was designed in such a way that the most important and currently discussed aspects regarding organic food processing have been taken up.

120 experts from 13 countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Italy, Netherlands, Slovakia, Spain, and Switzerland) answered the first round and 83 experts from 13 countries answered the second round. Based on the experiences from other EU projects (Hamm et al. 2002), a classification was made with regard to the development stage of the country in the organic market development.

**Table 1 Country classification in the organic market development of participating countries**

<b>Mature market countries</b>	<b>Growth market countries</b>	<b>Emerging market countries</b>
Austria Denmark Switzerland	Finland France Italy Netherlands United Kingdom Germany	Belgium Czech Republic Slovenia Spain

<sup>1</sup> Originally published as: Kretzschmar, Ursula and Schmid, Otto (2006) Approaches Used in Organic and LowInput Food Processing: Impact on Food Quality and Safety Results of a delphi survey from an expert consultation in 13 European countries . Paper presented at Joint Organic Congress, Odense, Denmark, May 30-31, 2006. <http://orgprints.org/7098/>

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2/5 of the respondents came from mature market countries and growth market countries whereas 1/5 came from emerging countries. This corresponds quite well to the actual market situation in Europe1 .

## Expert selection

The experts were chosen in such a way as to have a good representation of food processors from the milk, meat, vegetable/fruit and cereal sector as well as processing specialists, with different field of activities (research, advice, certification, consumer information, government agencies). In the first round with a relation of 55% food processing companies to 45% non processors and in the second round 46% food processing companies to 54% non processors.

## Definitions

### Defining organic food processing

The main focus of the first part of the survey was to narrow and clarify definitions which are often used to characterize organic food processing. When asking questions about minimum processing and freshness/fresh produce the answers did not vary very much. However exploring the definition of careful processing and authenticity, the experts had a quite different understanding of these terms. On the other hand, in the second round of the survey, we found out that authenticity is regarded as very important for an organic product. In the second survey we tried to find a suitable definition. The definitions with the best acceptations of the terms careful processing, fresh product and authenticity are as follows:

- *Careful processing*: **“the maximum to keep the important compounds and the maximum to avoid undesired compounds or nutritional losses”**.
- *Fresh product*: **Product with a short shelf life needs to be stored at a specific temperature or under controlled temperature conditions”**.
- *Authenticity*: **“Production and processing steps and the origin are visible/recognizable to the consumer”**

A final definition of the terms “fresh product, careful processing and authenticity” seems not to be of such a high need, as originally expected. Based on the feedback from the experts we can conclude that instead of a final definition of the terms “careful processing” and “authenticity” a more elaborated definition of the production methods as well a good labelling would be more helpful for the producers as well for the consumers, when the intent of these two terms can be addressed indirectly.

## General comments

### Important aspects in organic food processing

The most interesting point of part two of the survey was the finding that aspects like sensory quality, freshness, minimum use of additives and authenticity are regarded as the most important aspects for the success on the market, all aspects that are recognizable to the consumer.

## Food safety

Regarding food safety issues, most of the experts do not expect more problems with organic food compared to conventional food.

Nevertheless there are some experts who mentioned that they were expecting more food safety problems. For example: higher contamination by mould spores; higher risk of contamination in food by micro-organisms; animal problems with parasites; higher residues of dioxin in organic eggs; problems arising from naturally occurring mycotoxins and toxic micro-organisms.

## Ways to regulate or clarify/harmonise organic food processing issues

An important question was “which aspects should be regulated” at an EU regulation level and which ones at other levels (national, private company or label level) or do not be regulated at all. The feedback from the experts was quite differentiated depending on the different areas. At the EU regulatory level, initial first priority was stated as the minimum use of additives, followed by minimum and careful processing. Quality/sensory aspects however were not seen to be primarily at EU level, because companies should have the chance to develop individual sensorial profiles to their products. We can conclude, based on the feedback from the food processing specialists and processors in the Delphi Survey, that in the future revision of the EU regulation 2092/91 a much more differentiated approach is necessary:

- **EU regulation / State regulations:** regulatory framework but with more flexibility for regional variation and private sector rules.
- **Private standards:** focussing really on the special quality and regional aspects.
- **Private company level (internal quality standards):** focus on the special sensory quality and general quality management.
- The experts recommended clearly that some new instruments should be developed:
- **Common “Code of practice” of the organic food sector:** setting the overall baseline for sustainability and health aspects => IFOAM and private umbrella organisations (e.g. of organic food processors), operators.
- **GMP (Good manufacturing practices):** elaborated by organic and other advisory/consultancy services specialised in organic agriculture and organic food processing.

The table gives an overview about all interviewed subjects regarding regulation or clarifying/harmonising organic food processing issues.

**Table 2: What to regulate at which level**

ISSUE	Relevant in survey	EU Reg. /state (all)	EUReg/state (processors)	Private standard	Private company	Code of Practise	GMP private
Freshness	high	+	~	+	+	+	+
Minimum/careful processing	high	++	++	+	~	+	~
Minimal use of additives	high	+++	+++	~	~	~	~
Sensory quality	medium		~		++	+	+
Environ. friendly processing	high	+	~	+	~	+	+
Environ. friendly packaging	high	+	~	+	+	+	+
Social standards	medium	~	~	+	~	+	+
Regionality	medium	~	~	++	+	~	+
Seasonality	Lower	~	~	+	+	+	~
Whole food	Lower	~	~	~	~	+	+
Health aspects	lower	+	~	~	~	+	+
Authenticity	high	+	++	+	~	~	~
Restricted use sugar/salts	No	~	~	~	~	~	~

Scale: 0-15 % of experts = ~ not significant 15-30 % = + 30-45 % = ++ > 45 % = +++

With regard to the question of whether the EU-Regulation 2092/91 is sufficient an interesting difference between the answers of the processors and the non-processors could be observed. 45.5 % of the food processors think EU Regulation 2092/91 is sufficient as opposed to only 33.3% of the non-processing organisations. This difference between food processors and non-processing organisations could be found several times. We need to think about what the reasons for this discrepancy are. But in general it can be stated that, with the exception of having clear rules for the minimum use of additives and processing aids, no significant preferences or only tendencies regarding the possible ways to regulate or harmonise different aspects of organic food processing have been identified. A “code of practice” for the organic food sector seems however to be a good instrument which would allow not all issues to be described in detail in the EU regulation 2092/91. The organic food sector should take more self-responsibility by defining such a Code of Practice. A general Code of Practice for organic food processing will be elaborated and published as outcome of the QLIF subproject 5 until the end of 2005. (see: [www.qlif.org](http://www.qlif.org))

In general most of the experts expect special processing methods used in the production of organic food but when asking more specific for the involved experts it was very difficult to select those methods that are usable/suitable or not usable/suitable for it. Regarding the use of additives, however, the answers given were very clear. There is a tendency to prefer additives from certified organic origin both from processors' as well as from non-processors' point of view.

Furthermore, clear separation guidelines based on HACCP concepts (organic HACCP) in order to reduce the risk of contamination with GMO or conventional pesticides were supported, in particular by 64.8% of the experts from non-processing organisations. Processors show a nearly equal result of 45.3% pro and 39.1% contra HACCP guidelines. With regard to stricter labelling requirements,

the non-processing organisations prefer to have stricter guidelines. The same preference was also expressed regarding packaging.

**Table 3: Possible new appendages to EU Reg. 2092/91 especially annex IV**

Area	Actual	New
Flavours: 67.5 % think that flavours should be certified organic (20.5% no).	Natural flavours	Flavours certified organic
Flavour enhancers: 85.5% wouldn't allow the use of flavour enhancers.	Not clearly regulated	Prohibited
Colouring 85.5 % think that the current regulation is sufficient.	Colouring with certified organic ingredients	No revision; Colouring with certified organic ingredients
Antioxidants 74.2% prefer the use of organic antioxidants and also a high level of 60.2% would support the obligation of using certified organic antioxidants .	Synthetic antioxidant allowed	Antioxidants certified organic and of non-synthetic origin
Preservatives: the prohibition of preservatives generally in the organic food sector is acceptable for 55.4% (36.1%no).	Some preservatives are allowed	Stronger restriction for preservatives
Raising agents 67.6% think that the carrier should be certified organic.	Carrier can be non organic	Carrier must be certified organic
Emulsifiers With regard to the risk of GMO contamination 83.1 % think that emulsifiers should have to be certified organic.	Conventional	Certified organic
Enzymes 52.5% think that the use of enzymes in organic products is acceptable. 66.3 % don't accept the use of enzymes for the sole use of standardizing the process/product.	GMO free	Specific requirements depending on the use
Area	Actual	New
Micro-organisms 56.6% in 2nd round (72.5% 1st round) think that micro organisms should be certified organic in comparison to 31.3% in 2nd round (20.8% 1st round) who do not see a need.	Conventional	Certified organic
Anti-caking agents 53% think that anti-caking agents should be certified organic in comparison to 22.9 % who do not see a need.	Conventional	Certified organic
Separation in the production process (parallel processing) 68.7% think that specific separation guidelines would be helpful.	Sufficient separation	Product specific separation guidelines (based on HACCP concept)
Labelling processing methods 54.2% would prefer the processing methods to be listed on the packaging compared to 38.6% who would not.	Non-organic ingredients, certification body	Labelling of some processing methods
Labelling of processing aids: 58.5 % say yes to a labelling of processing aids compared with 31.7% who say no.	Non-organic ingredients, certification body	Declaration of certain processing aids, like enzymes (extended labelling rules)

Area	Actual	New
Labelling of the origin 69.9% would support the labelling of the origin of the ingredients and 25.3 % would not.	Non-organic ingredients, certification body	Indication of the origin of the ingredients
Packaging 75.9% would prefer environmentally friendly packaging but 69.2 % also have the opinion that the packaging which provides the best protection of the product is acceptable instead of environmentally friendly packaging	No requirement in the regulation	No revision at the moment

The survey gives interesting information for the newly started major revision of the EU regulation 2092/91 with regard to processing, in particular for the revision of Annex VI and article 5:

Minimum and careful processing methods would be interesting fields for research. Due to the limited possibility of using additives and processing aids in organic food processing, it is important to research and develop suitable production and processing methods with regard to the requirements for an organic product and the principles of organic agriculture.

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- Beck, Alexander; Kretschmar, Ursula und Schmid, Otto, (Eds.) (2006) Organic Food Processing - Principles, Concepts and Recommendations for the Future. Results of a European research project on the quality of low input foods [With contributions from Angelika Ploeger, Marita Leskinen, Marjo Särkkä-Tirkkonen, Monika Roeger, Thorkild Nielsen and Niels Heine Kristensen]. FiBL-Report. Research Institute of Organic Agriculture FiBL, Frick, Switzerland. <http://orgprints.org/8914/>

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For more information se [http://orgprints.org/view/projects/eu\\_qlif\\_sub5.html](http://orgprints.org/view/projects/eu_qlif_sub5.html).

# News from Eastern Europe: Summer Academy in Lednice na Moravě, Czech Republic

***Alberta Velimirov<sup>1</sup>***

For six years now the Summer Academy on Organic Farming has been held under the auspices and sponsorship of the Czech Ministry of Agriculture and the Ministry of Environment, the Austrian and Slovakian Ministries of Agriculture in Lednice na Moravě in Czech Republic. It always takes place at the end of June. It is organised by the farmers associations Pro-Bio (CZ) and Bio Austria together with FiBL and the Palacky University Olomouc.

This year's Summer Academy addressed issues of permanent grassland, organic food quality and organic vegetable growing. Information about all three topics can be found under [www.pro-bio.cz](http://www.pro-bio.cz). In the context of FQH especially the conference part about food quality, organised by FiBL Austria, is of special interest.

In the last years organic food quality has been a main topic of many national and international conferences, focusing on cultivation effects, which result in measurable product quality differences. But food quality is only one aspect in the whole food system, comprising process quality (production, processing, transport, and marketing) and nutrition quality (choice of quality, eating habits, storage, preparation). In Lednice "eating organic" was presented as the presently best functioning alternative to the established food system and was highlighted from different angles.

There is much concern among politicians, medical doctors and dieticians about the increase of nutrition-related health problems and the decline of food quality. Consumers in turn are worried by food alerts and scandals, pesticide residues, new technologies (GE, irradiation), synthetic additives resulting in an ever growing market for "natural" foods. To match the complex network of food production and processing as well as eating habits and food safety an equally complex approach is required. The organic food system offers practicable solution on all levels.

To corroborate this hypothesis the contributions presented at Lednice were chosen to highlight some important advantages of the organic food system

- the quality of organic food
- the health impact of diet composition inherent to organic agriculture
- future challenges for organic production to compete with modern life styles
- global issues connected with food security for all

An important issue concerning food safety are pesticide residues. The public is reassured, that Maximal Residue Levels (MRL), derived from good agricultural practice, do not constitute a health risk for consumers. But there are discrepancies between MRLs and the Acute Reference Dosis (ARfD), a value defining the amount of a toxin, that can be ingested over 24 hours without health risks. The ARfD can be exceeded, even when the MRL is below the accepted limit. Furthermore possible combined effects of multiple residues cannot be predicted from the scale of effects of the individual substances. These problems of the established food chain were addressed in the first

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presentation (Burtscher, Global 2000 Vienna). Similarly many food additives single or in combination might pose further risks for consumers. In organic processing only 36 additives are permitted as opposed to 310 in conventional foods (Srový, Nutritionist, Prague, Czech Republic).

**Consumption of organic food dramatically reduces exposure to residues of pesticides, veterinary medicinal products, some contaminants and risky additives.**

Yet absolute safety is not a realistic prospect, since new problems are emerging all the time. Some plant metabolites might act as natural plant toxins, mycotoxins have to be dealt with and last but not least toxic compounds result from processing steps, such as acrylamide and furan in heat processed foods. Continuous improvement and control are necessary along the whole food chain (Hajšlová, Institute of Chemical Technology Prague).

Cultivation methods and animal care definitely have an influence on food quality, but more research is necessary to understand the metabolic pathways concerned. According to a number of comparative research results health promoting secondary plant metabolites are favored by organic methods, especially by organic fertilisation. Their contents can be up to 50% higher. Under optimal conditions this could mean 50% more healthy substances in our food. Epidemiological studies have shown that diet containing 50% more plant food (conventional) could prolong our lives by 1-2 years. It is an interesting approach to estimate how much longer our lives could be, when substituting the conventional by organic plants with more healthy phytonutrients? (Brandt et al., University of Newcastle).

**Generally we can say, that with organic foods more micronutrients, vitamins, secondary metabolites are ingested, even if there are examples of higher metabolite contents in conventional variants, too. This is still a new field of research and the results can be used to further optimise organic nutrient density and phytochemical contents.**

These above mentioned presentations all dealt with chemical aspects of food quality. But there is more to food than just its material components. Food also provides us with energy and according to Schrödinger with negentropy.

The main advantage of secondary metabolites is their reductive power, protecting the organism against free radicals and balancing the intricate reduction-oxidation-processes in our body. The P-value is calculated from the parameters electrical conductivity, pH-value and the redox potential and indicates the activity of electrons. Especially fresh food from organic agriculture shows a considerable advantage in this respect (Kappert, University of Natural Resources and Applied Life Sciences, Vienna).

It is known since the 1920ies, that living cells produce a certain type of ultra weak light (biophotones) for self regulation and coordination with all other cells. The intensity of biophotone emission reflects the physiological state of test products, whereas delayed luminescence (light storage capacity) corresponds to excited states of the coherent photon field indicating higher negentropy. Living systems import negentropy and store it (Schrödinger "What is life?" 1943). Thus higher levels of negentropy mean higher quality of life. Biophotonics have been used to differentiate foods from different production systems with favorable outcomes for the organic variants (Klima, 2006).

According to consumer surveys taste plays a major role when choosing foods. It is therefore important to investigate and optimise sensory quality aspects of organic products. Fresh organic plant foods are often described as more intensive and product typical. Out of 12 sensory tests consum-

ers preferred organic strawberries in 11 instances (Meltsch, LVA-Food Testing & Research Institute, Vienna).

Despite all the above mentioned quality advantages, the switch from conventional to organic foods is only the first step to a healthy diet. Diet composition and lifestyle have to be adapted as well to make a noticeable difference in health and well-being.

A pilot study, investigating diet changes has been conducted in a German convent with 32 nuns. The first step, the introduction of freshly cooked instead of ready-made meals, activated the immune system, whereas with the second step, when the conventional products were substituted by bio-dynamic ones, no measurable physical differences were found. But according to a comprehensive questionnaire the subjective well-being was positively influenced. The meaning of these results has to be discussed in detail, since in the long run health is also strongly influenced by psychological and mental conditions (Leiber et al., Section for Agriculture at the Goetheanum, Dornach, Switzerland).

A healthy diet depends on a need-oriented composition and the quality of the ingredients. In official recommendations this latter aspect is usually ignored. Regarding the composition of typical central-European meals, the main focus is on animal-based foods, vegetable, cereals and fruit only play underparts. But according to new findings this should be the other way round. So far official nutritional recommendations have mostly failed to make a real difference, thus showing very clearly, how difficult it is to change eating habits. External factors such as social status, job, hobbies and recreational activities tend to have a much higher impact on the nutritional behavior of people than any advice. But since eating out plays an increasing role in the modern lifestyle, there is a good chance of allowing people to experience and learn to appreciate “organic” meals in staff canteens, school buffets, restaurants etcetera (Kaiblinger & Zehetgruber, Gutessen, Vienna, Austria).

**Organic agriculture could provide an easy solution to the problem of harmful diets: area-wide organic production would automatically result in balanced diets, since more cultivable land is used for plant food and feed and there is no intensive livestock farming.**

While the western world is concerned about obesity, food safety and quality, developing countries worry about undernourishment, food insecurity and quantity. The loss of fertile agricultural areas to produce feed for western intensive meat production is well known, illustrating how our eating habits have a far-reaching impact. To create the opportunities for poor people to produce their own food farmland must be made available and organic agriculture based upon cheap, local materials and technologies should be applied, providing a realistic option to combat hunger and food insecurity, contrary to the Green Revolution and the imposition of unsustainable genetic engineering. Furthermore indigenous plants and animals as used in traditional agriculture provide the familiar food and keep the producers independent. But organic projects in developing countries will reach the aim “food for all” only, when the interests and the needs of the local population is at the center of all efforts (Hauser, Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences, Vienna).

With this programme presented at the 2006 Summer Academy we hoped to succeed in giving an idea of what “eating organic” implies as well as an indication of where future efforts are necessary to realise a truly sustainable and healthy food system. But radical change needs radical rethinking as Einstein already knew: “You can’t solve a problem with the same mind-set that got you into the problem in the first place!

## Presentations

- Brandt, Kirsten; Lück, Lorna; Schmidt, Christoph; Seal, Chris and Leifert, Carlo (2006) [Biologische Qualität: Mögliche Auswirkungen biologisch erzeugter Lebensmittel auf die menschliche Gesundheit](#) [Organic Quality How food produced using organic methods may affect consumer health ]. Paper presented at 6. Europäische Sommerakademie für Biolandwirtschaft, Lednice na Moravé, CZ, 29.06. - 01.07.2006.
- Burtscher, Dr. Helmut (2006) [Pestizidrückstände – wie sicher sind die gesetzlichen Höchstwerte?](#) [Pesticide residues – how safe are Maximal Residue Levels?]. [oral] Presentation at 6. Europäische Sommerakademie für Biolandwirtschaft, Lednice na Moravé, CZ, 29.06. - 01.07.2006.
- Hauser, Dr. Michael (2006) [Nahrung für alle? Biologische Landwirtschaft und Nahrungsmittelsicherheit in Entwicklungsländern](#) [Food for all? Organic agriculture and the household food security equation in developing countries]. [oral] Presentation at 6. Europäische Sommerakademie für Biolandwirtschaft, Lednice na Moravé, CZ, 29.06. - 01.07.2006.
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# Latest Results with Gas-Discharge-Visualisation to assess the Inner Quality of Apples

*Franco Weibel<sup>1</sup> and Christoph Bigler<sup>2</sup>*

Gas-Discharge-Visualisation (GDV) is a computerised version of the “Kirlian-Photography”. Samples are exposed to a high frequent and high voltage electrical field which causes the emission of electrons and photons. The resulting light emission (“corona”) is digitally captured and analysed. GDV is easy to handle, objective and “holistic” because samples can be measured in their natural condition. The aim of our study was to explore if GDV provides useful complementary information compared to standard analyses about the inner quality of apples. We pursued three approaches: First we tested the potential of GDV to distinguish organic grown apples from conventionally grown apples. For this experiment we used “Golden Delicious” apples from five organic/conventional farm pairs (n=10) in Switzerland. Data were collected in 2003 and 2005. In a second approach we exposed apples from one organic/conventional farm pair to a short microwave treatment and measured after stress exposure again with GDV. In the third approach we measured apples (“Topaz”) from four different organic plant-nutrition systems including a comparable bio-dynamic system and a common organic system (both based on compost).

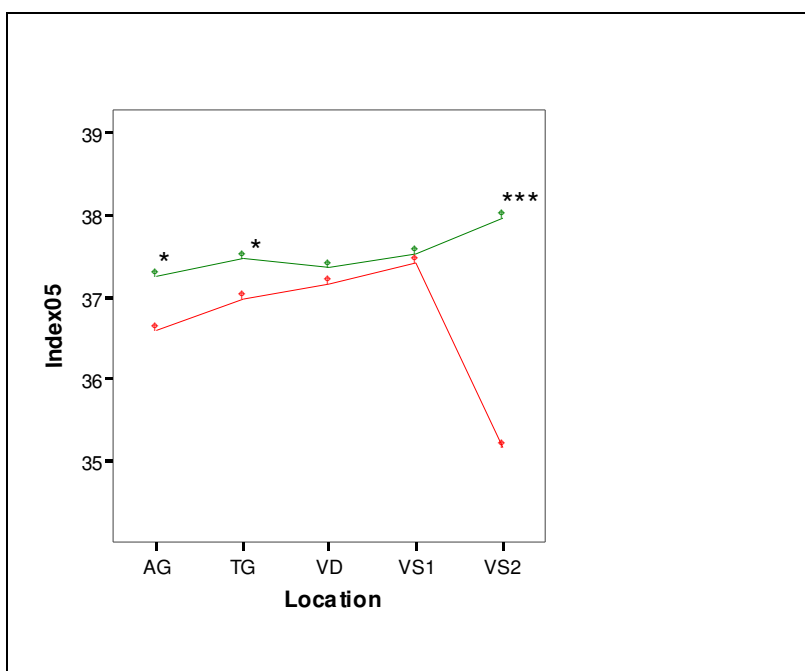


Fig. 1: Means of GDV-Index05 from “Golden Delicious” apples harvested in 2005. Each location shows an organic (green) and a conventional (red) produced sample. (Tukey-Test, pairwise: \*  $p = 0.05$ , \*\*\*  $p = 0.001$ )

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The results of the GDV-studies can be summarised as follows:

- With the GDV-method differences can be identified significantly in three of five locations between organic and conventionally grown apples. (Fig.1) We used an index based on five GDV-parameters (created by discriminant analysis). With standard analyses the differences between organic and conventionally grown apples were not so pronounced.
- The microwave treatment has a stronger effect on GDV-parameters of conventionally produced apples than on GDV-parameters of organically produced apples.
- Differences can be identified between apples from the bio-dynamic plant-nutrition systems and the common organic system. The GDV-parameter of the bio-dynamic system is similar to the control systems without compost. Further, the bio-dynamic apples showed better values in standard-quality-parameters (firmness, sugar content).

The GDV-method seems to be a sensitive tool to assess inner differences of apples between conventional, organic and bio-dynamic cultivated systems. Other standard parameters (like firmness, sugar content, ripeness etc.) have also an effect on GDV-parameters. Further research, also with other foodstuff is needed to verify the results and to be able to interpret the results in terms of consumer relevant quality.

## Reference

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## Imprint

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